Senator H. Tati Santiesteban
Chairman
The Honorable William P. Hobby
Lieutenant Governor
Texas Senate
71st Legislature

Honorable Members
Texas Senate
71st Legislature

Dear Governor Hobby and Fellow Members:

The Senate Committee on Natural Resources respectfully submits its interim report for consideration by the Members of the 71st Legislature.

H. Tati Santiesteban, Chairman
The Senate Committee on Natural Resources held seven hearings during the interim following the 70th Regular Legislative Session to study significant natural resource issues facing the 71st Legislature. The statements and conclusions in this report reflect testimony from a variety of sources, including agency reports, public testimony (oral and written), and expert witnesses.

Members of the Committee were Senator H. Tati Santiesteban, Chairman; Senator John T. Montford, Vice Chairman; and Senators Ken Armbrister, J.E. "Buster" Brown, Ted Lyon, Bill Sarpallus, Bill Sims, Frank Tejeda, Hector Uribe, John Whitmire, and Judith Zaffirini.

The staff responsible for the research and the writing of this report included Grace Klement, Committee Clerk; Chris Tinnell, Assistant Committee Clerk, Chris Bombela, Legislative Aide, and Mannie Kalman and Cristobal P. Aldrete, General Counsels. Linda Willis provided secretarial assistance.

Each section of this report identifies a separate issue, presents a history of the topic, and summarizes suggestions for legislative action.

This report is respectfully submitted to the Members of the 71st Legislature.
SENNATE COMMITTEE
ON
NATURAL RESOURCES
INTERIM REPORT
TO THE
71ST LEGISLATURE
January 1989

Senator H. Tati Santiesteban
Chairman
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RIGS-TO-REEFS
I. OVERVIEW

Operating oil and gas platforms in the Gulf of Mexico have created the country's most extensive artificial reef system and, coastal fishing states value these structures as prolific fishing grounds. However, when the structures are no longer productive, the Mineral Management Service (MMS) of the Department of Interior and various state agencies, require they be removed and the sea floor be restored to its original condition. The physical removal and disposition of the abandoned structures pose a number of serious problems (liability, maintenance, navigation and interference with national security) to both state and federal officials. The National Fishing Enhancement Act of 1984 mandated the creation of a national artificial reef plan and directed studies of possible uses for abandoned platforms. In Texas, the Parks and Wildlife Commission has been granted the authority to construct or contract the construction of artificial reefs in state or federal waters adjacent to the state.
II. BACKGROUND

Natural organic reef complexes are three-dimensional prominences solidly attached to the sea floor and are usually formed by colony-building organisms, such as corals or sponges. Of the reefs growing at the present time, the majority occur in shallow tropical seas and satisfy a set of parameters which include depth, salinity, clarity, temperatures and sea floor conditions. The framework's structure must be strong enough to withstand the ordinary action of wind and wave.

The conditions around reef complexes attract numerous varieties of fish and other marine life. Reef environment provides shelter and protection from predators, resting places from strong currents and, visual, tactile and even auditory points of reference. More important, however, there is an abundant supply of food sources in the vicinity of a reef complex, principally algae, smaller fish, and encrusting organisms which attach themselves to the reef surfaces.

III. HISTORY

For centuries, commercial fishermen from all corners of the earth have recognized these structures as prolific fishing grounds. In fact,
countries that depend heavily on the sea for food have worked to enhance their coastal fishing areas by constructing "artificial reef" complexes. The ancient Chinese piled rocks on the sea bottom to extend the floor up into the water column, thereby creating a three-dimensional structure. The Japanese have built artificial reefs for more than two hundred years, and their structures have evolved from relatively small units of scrap material, wood and rock into very large, extensive and sophisticated structures of concrete-reinforced steel.

Artificial reef construction in the United States dates back to the 1940's, when several states, including Texas, began to experiment with various construction materials. The Texas program commenced with transported oyster shells followed by the utilization of old cars, tires, clay pipes, construction rubble, salvaged liberty ships, and oil and gas rigs. Proper distribution of this salvage forms three-dimensional structures and an ultimate haven for marine life.

In the Gulf of Mexico, about 300 artificial reefs have been permitted off the coasts of Florida, Alabama, Mississippi, Texas and Louisiana. However, some 4,000 "unplanned" artificial reef complexes have formed in the Gulf, all in the vicinity of operating oil and gas structures. According to federal and state regulations, when production ceases from the platforms, they must be cut off 5 meters below the sediment
line, removed from the water and disposed of onshore. Because these structures become prolific fishing grounds, the commercial and recreational fishing industries are interested in preserving them as artificial reefs, if not in situ, then transported to planned artificial reef sites. Serious issues including cost and liability are involved in the removal of the platforms and the ultimate construction of the reefs.

The Texas Parks and Wildlife Department has been involved in the construction of artificial reefs since 1947 and has actively participated in the development of the National Artificial Reef Plan. A minimum of 1,240 acres of Texas sea floor have been covered with artificial reef material. The Department was delegated the responsibility for maintaining markers on five Liberty Ship reefs acquired from the Texas Coastal and Marine Council in 1985. In addition to the intentional reef building in Texas, there is a minimum of 2,191 unintentional artificial reef areas in the form of open water disposal sites, piers and docks, jetties, oil and gas well shell pads, and offshore platforms.

IV. RIGS TO REEFS

Operating oil and gas drilling rigs and production platforms located in the Gulf of Mexico have created an extensive artificial reef system
in this country. The design characteristics of these structures are very effective in attracting numerous forms of fish and aquatic life. A term currently being used for converting obsolete platforms to artificial reefs is "rigs-to-reefs." Generally, all that remains of a platform prior to disposal are the submerged platform support jacket and the superstructure consisting of one to three decks and a heliport. Although the superstructure can add valuable surface area to a benthic reef, it is the platform jacket, or underwater support structure, that is most inherently suitable for artificial reef development.

Because the platforms are so effective in attracting fish, they have become particularly beneficial in areas which would otherwise be devoid of natural relief or shelter. For instance, the unconsolidated mud bottom beneath Louisiana's coastal water is not conducive to natural reef development, hence, their artificial reef system is constructed primarily of oil and gas structures. More than 4,000 such structures are located in the Gulf of Mexico in both federal and state waters, as far out as 130 miles, and in waters deeper than 1,000 feet. Most of these structures, which represent nearly 99 percent of the nation's offshore oil and gas platforms, are off the coast of Louisiana.
Since the inception of the Federal offshore leasing program in 1954, the Gulf of Mexico Outer Continental Shelf Region has led the nation in offshore energy production while retaining its pre-eminence in offshore fishery production. In recent years, offshore energy development off the coasts of Louisiana and Texas has been recognized as having a direct significant effect on recreational fishing, commercial hook-and-line fishing, and scuba diving. Scientists and technical journalists have speculated favorably on adaptability, suitability, and wisdom of the rigs-to-reefs concept. Leading fishery administrators have also commented favorably on the multiple-use value and potential of oil and gas structures for fisheries enhancement.

V. ECONOMIC AND BIOLOGIC IMPACT

In the National Fishing Enhancement Act (NFEA) (1984), Congress recognized the social and economic value of developing artificial reefs, established national standards for artificial-reef development, called for the creation of a National Artificial-Reef Plan under the leadership of the Department of Commerce, and established a reef permitting system under the U.S. Army Corp of Engineers that limits the liability of participants in the program. The law strongly encourages the development of artificial reefs, but authorizes no direct appropriations for administration, planning, construction,
enforcement, monitoring, or research on artificial reefs. Congress intended that artificial reef support and development be accomplished through existing federal programs in conjunction with public and private cooperation leading to the use of materials. The law also calls for an evaluation of incentives likely to encourage private sector support for artificial-reef development. The National Artificial-Reef Plan lists materials and design standards, which include oil and gas structures among recommended materials.

Since 1982, in a Gulf and South Atlantic charter-boat survey, the National Marine Fisheries Service has been tracking offshore charter-boat catch rates, (or fishing success) off the coast of Louisiana where most of the effort is directly associated with producing oil and gas structures. Initial results in NMFS published data and regular monthly reports indicate that overall success rates for recreational fishing from charter-boats offshore Louisiana consistently and significantly exceed all other Gulf and South Atlantic States. As confirmed by survey results produced independently by the NMFS, offshore rig fishermen from Louisiana consistently catch more fish, bigger fish, and consistently more desirable fish than those marine fishermen focusing their efforts at all other locations.
The cost of removing an individual structure ranges from hundreds of thousands to tens of millions of dollars, depending on size, location, and water depth. Assuming the artificial-reef program in the Gulf of Mexico could effectively utilize only one-half of existing offshore structures, and that the average cost of removing these structures is $2,000,000, then 2,000 structures and $4 billion can potentially be directed to artificial-reef development and fishery enhancement projects. (Rigs-to-Reefs; OCS Report MMS, 1984)

Rarely is it feasible to reuse obsolete structures for oil and gas operations. The scrap value barely pays for shore-based dismantling and disposal, and most of the removal costs are irretrievable. The oil and gas industry is anxious to cooperate with responsible reef developers who are willing and able to accept future responsibility and liability for rigs-to-reefs projects, and who would likely devote a major portion of disposal savings to supporting artificial-reef development projects.

In 1980, Exxon donated a prototype submerged-production system template to the State of Florida for use as an artificial reef. Since then, five other structures have been deployed on four planned artificial-reef sites.

--In 1983, Tenneco donated the jacket and decking components of a 500-ton production platform from Louisiana to establish a new reef in 175 feet of water 22 miles off Pensacola.
--In 1985, Tenneco retired a rig, transporting it over 900 miles, using portions of three former platforms creating Florida's largest artificial reef near Miami and Ft. Lauderdale.

--In 1983, Alabama permitted a reef site 50 miles south of Mobile Bay in 240 feet of water to receive an obsolete production platform donated by Marathon Oil Company. New and innovative flotation technology was utilized to remove and transport Marathon's structure to the designated site.

--Between 1977 - 1983, three drilling rigs, sunk during oil and gas operational accidents, were permitted to private individuals as artificial reefs off the coast of Texas.

--In 1984, two U.S. Navy research structures resembling oil and gas production platforms were dismantled off Florida for use as permanent artificial reefs. They have become very popular fishing locations.

The cost of establishing the six described Rigs-to-Reefs projects ranged from one to five million dollars each. Projects involving interstate transport of oil and gas structures cost the donating companies as much, or more, than other disposal options available to them. When a petroleum company or offshore lease operator can no longer produce commercial quantities of oil and gas from a production platform, all existing wells are plugged and abandoned according to state and federal regulations.

About 400 offshore platforms have been totally removed from U.S. offshore locations at considerable economic and environmental cost. Several alternatives to total removal from the marine environment have been suggested:
--Leave structures in place as is.
--Partially remove--enough for safe navigation.
--Topple on location forming artificial reef.
--Remove and relocate to designated reef site.
--Combinations of the above.

Each involves the conversion of abandoned structures to designated, high profile, artificial reefs. Each has advantages and disadvantages, depending on location and perspective. The total impact of artificial reefs on other ocean activities have not been fully identified or resolved. For instance, artificial reefs remove the amount of bottom available for shrimping (the single largest commercial fishing industry in the State of Texas and the most valuable in the United States).

VI. LEGAL LIABILITIES, MAINTENANCE & NAVIGATIONAL HAZARDS

Maintenance, liability, navigational hazards and interference with national security are all issues that need to be addressed.
The present state law relating to artificial reefs is contained in Section 12.016 of Texas Parks and Wildlife Code. This statute authorizes the Parks and Wildlife Department to "construct or contract for the construction of artificial reefs in the coastal water of this state or in international or United States water adjacent to the coastal water of this state."

Section 12.016 does not refer to any issues concerning liability for which the department would be responsible as a consequence of accepting ownership and maintaining artificial fishing reefs. As a state agency, the department enjoys sovereign immunity except for the limited waiver of immunity found in the Texas Tort Claims Act (Chapter 101, Civil Practices and Remedies Code).

As a general proposition, there is tort liability under Section 101.021 (subchapter B.) for personal property, if the governmental unit, were it a private person, would be liable to the claimant according to Texas law. Liability of the state government under the act is limited to money damages in a maximum amount of $250,000 for each person and $500,000 for each single occurrence for bodily injury or death and $100,000 for each single occurrence for injury to or destruction of property.
There is a federal permit requirement for the construction and management of artificial reefs (33 USCS §2104). Subsection 2104 (b)(1) provides that "each permit issued by the Secretary of the Army subject to this section shall specify the design and location for construction of the artificial reef and the types and quantities of materials that may be used in constructing such artificial reef."

All permits to be issued must specify the terms and conditions for the construction, operation, maintenance, monitoring, and managing the use of the artificial reef as are necessary for compliance with all applicable provisions of law.

A person to whom a permit is issued under the federal act "shall not be liable for damages caused by activities required to be undertaken under any terms and conditions of the permit, if the permittee is in compliance with such terms and conditions." (The terms and conditions pertain to those set forth supra.)

Additionally, the statute provides that any person who transfers title to artificial reef construction materials to a person to whom a permit is issued "shall not be liable for damages arising from the use of such materials in an artificial reef, if such materials meet applicable requirements."
The one problematic provision set forth in the statute is contained in subsection (c)(3), which states "The Secretary may not issue a permit subject to this section to a person unless that person demonstrates to the Secretary the financial ability to assume liability for all damages that may arise with respect to an artificial reef and for which such permittee may be liable."

Given the dollar limitation of liability as delineated in the Texas Tort Claims Act, and the necessity of a legislative act for the assumption of and excess liability, there is a dilemma as to whether the federal permitting agency would consider the Parks and Wildlife Department to have satisfied the subsection (c)(3) requirement.

Should the department secure a permit and be able to establish compliance with all the provisions under 33 USCS §2104, there should be no legal exposure to the state under the Texas Tort Claims Act.

Artificial reefs could interfere with shipping and National Defense. The U.S. Department of Defense has concerns, especially as related to submarine activity.
VII. LEGISLATIVE HEARING

The Senate Committee on Natural Resources held two public hearings: one in Corpus Christi on October 7, 1987 and another in Galveston on September 30, 1988. The hearings were held per direction of Senate Resolution 624 (Brown, 70th Session) and allowed interested parties to express their concerns and recommendations on the effects of converting obsolete oil rigs into artificial reefs. In these two hearings, testimony was heard from a variety of witnesses representing various entities and an array of expert and public views.

HEARING I

At the Corpus Christi hearing, Mr. Villere Reggio, Outdoor Recreation Planner for the Minerals Management Services (MMS), Department of the Interior, described the department's regulations which require that non-producing oil and gas platforms be removed from the sea floor. He informed the Committee of a 1983 MMS policy statement which assessed public interest and determined that reef structures are valuable entities. The policy involves cooperation among federal agencies, states and responsible parties in the creation of these reef structures and directs the Department of Interior to be responsible
for the implementation of oil rigs in federal waters, taking into account shipping lanes before reef sites are designated.

Mr. Joe Mosely, a private citizen from Corpus Christi, was employed by the Texas Coastal Marine Council fifteen years ago when Texas participated in the Liberty Ship Program, which involved the sinking of 12 World War II cargo ships in areas of the Gulf. He informed the Committee that 11 of the ships were sunk in pre-selected sites and one was accidentally sunk in the wrong location. Mr. Mosely recommended that the best approach to converting rigs would be to have a balance of interests involving all interested parties.

Dr. Robert B. Ditton, a professor in the Department of Parks and Recreation at Texas A&M University, gave testimony based on studies done by the Texas Coastal and Marine Council, Texas A&M Sea Grant Program and the Minerals Management Service. In a 1978 study to determine the extent to which sunken liberty ships were being used for recreational fishing, Ditton stated that petroleum platforms were being used for over 50 percent of the recreational fishing trips in the adjacent Galveston Bay Complex. Another study illustrated that seven times more fishing trips were made in bays than were made off-shore and that collectively, bay fishermen spend five times more revenue than do off-shore fishermen. According to Ditton, Texas has several alternatives when determining reef plans.
--Do nothing and let the platforms be taken to shore and scrapped.

--Set up a rigs-to-reefs program where State of Texas maintains obsolete platforms and accepts liability.

--Initiate a reef planning process which makes use of a variety of reef material, not just petroleum platforms.

Ditton advises against the idea of implementing a rigs-to-reefs program for the sole reason that obsolete petroleum platforms are plentiful. He added that the Committee could learn from past mistakes, such as the Texas Liberty Ship Program where a program was implemented because a resource was available. Ditton recommends the Texas Parks and Wildlife Department as the agency to take charge of the program if the goal of the program is fisheries enhancement.

Ms. Virginia Van Sickie and Dr. Charles Wilson, co-chairmen of the Louisiana Artificial Reef Initiative testified on Louisiana's reef program. They informed the Committee that Florida had problems when too many people illegally created artificial reefs by not applying for permits from the Corps of Engineers. Several grass beds were covered damaging commercial fish nets. As a result, the State of Florida placed a moratorium on all ocean dumping.

Ms. Van Sickie, who is also the Assistant Director for the Louisiana Geological Survey, stated that research has found that 70 percent of
the recreational fishing trips off the coast of Louisiana were to production platforms, but that by the year 2000, two-thirds of these rigs will no longer be producing and must be removed (a loss of about 1600 structures). These rigs are particularly important to Louisiana since natural reefs are rare. The soft silt that lies on the sea floor does substrate for communities of coral, barnacles, muscles and other encrusting organisms to attach to. Ms. Van Sickle said that the habitat associated with off shore rigs attracts 20 to 50 times more fish than do soft water bottoms of the same size.

According to Dr. Wilson, when Louisiana determined artificial reef sites, they coordinated and compromised between governmental departments and special interest groups including: scuba divers, shrimpers, recreational and commercial fishermen, the gas and oil industry, and the Navy. Furthermore, they relied on information supplied by the Minerals Management Service, the Sea Grant College Program Data Base and the Artificial Reef Development Center at the Sports Fishing Institute. Ultimately, seven sites were selected, all of which are a considerable distance from shore and are difficult to reach by smaller boats.

Dr. Wilson stressed that the program must involve good, advanced planning and a joint effort between the state and the oil industry, with the state accepting liability. According to Wilson, oil
companies will not participate in the program unless they are relieved from lingering liability, and would rather forego the expensive method of transporting the structure ashore. He stated that the state should survey and collect data from various user group entities when selecting sites, and should maintain buoys if they are located in shallow water. Wilson contended that rigs are less susceptible to washing up on shore and in shipping lanes as are other "materials of opportunity" and are therefore, less of a burden.

Dr. William B. Fisher, director of the Texas Bureau of Economic Geology and the Chairman of the Geology Department at the University of Texas at Austin, recommended that the Committee implement a comprehensive planning mechanism with the Parks and Wildlife Department, General Land Office or Department of Commerce. Dr. Fisher recommended that the plan pinpoint the number and location of the structures, determine the proportional needs for each population center, address priority for certain kinds of marine habitat and endangered species, and compromise between the various user entities involved. Furthermore, Dr. Fisher estimated that the cost to remove these structures from now until the year 2020 could be $7.5 billion, and that an artificial reef plan would not only mitigate these costs but also create new jobs in the process.
Mr. James C. Quigel, environmental advisor for Cities Service Oil and Gas Company of Houston, testified on behalf of the Off-Shore Operators Committee. He emphasized that the Oil and Gas Industry supports rigs-to-reefs projects, but stated that the state must accept future liability for the obsolete platforms and provide an economic advantage over on-shore scraping to gain the widespread support of the oil industry. In addition, Quigel stated that tax incentives could be offered to oil companies when costs of creating reefs are equal, or are greater than the normal amount to remove structures.

Dr. Gary Matlock, Director of Fisheries for the Texas Parks and Wildlife Department, stated that if reefs are placed in overfished areas, fishermen will have a distinct advantage over already endangered species of fish since the structures will attract fish and thus appeal to fishermen. However, if the reefs are placed in other areas not accessible to most fishermen, then endangered species may thrive in these areas.

Matlock specified five permitted sites where liberty ships are located that are accepting rig material for artificial reefs, and in his opinion, relieve the oil company from liability. The sites are marked by at least one buoy, which costs the Texas Department of Parks and Wildlife about $13,000 a year each to maintain. According to Matlock, the only requirement is that the reef material must be deposited in a
way that does not increase the marking costs. Matlock estimated that about $150,000 (less than 1 percent of the total budget of his department) is spent on this program.

Mr. Ralph Rayburn, the executive director of the Texas Shrimp Association, testified that the shrimp industry supports artificial reefs placed in areas that are untrollable due to already existing obstructions, and should be constructed of materials that will not displace in different tidal conditions. Rayburn contended that this process will open more sea bottom for drag nets that otherwise would not exist if rigs remained in place.

The majority of public testimony (mainly from scuba divers) favored a rigs-to-reefs program and agreed that such a program would create jobs, promote tourism, and benefit fish populations. In opposition to the program, a member of the rigs-to-reefs committee of the Texas Shrimp Association, stated that, under the advice of the Concerned Shrimpers of America, his committee does not support a rigs-to-reef program for the state of Texas.
In the Galveston hearing, Mr. Dana Larson, representing the Gulf Coast Council of Diving Clubs, informed the Committee of the many companies which have donated large amounts of money (one donated $250,000) and/or structures to the state of Louisiana for the research and development of artificial reefs. According to Larson, these donations could have been given to Texas and used for the purchase of buoys which he says cost about $6,000 each and $1,000 a year to maintain.

Mr. James H. Endacott, assistant general counsel of OXY U.S.A. Inc., indicated that OXY would support rigs-to-reef legislation if it includes an enforceable indemnification agreement to relieve a reef donor of liability. While Mr. Endacott realizes that Texas has additional restrictions in its constitution, he stated that an unofficial opinion by the Louisiana Attorney General's Office views a donation to Louisiana as an indemnification which protects a private entity from a lawsuit. He further stated that Texas could do the same.

Mr. James E. Daily, engineering manager of Brown and Root U.S.A. Inc., and a former Assistant Professor of Ocean Engineering at the University of Texas at Austin, addressed the subject of alternative uses for nonproductive rigs. One of the uses which Mr. Daily described is a solution to Annex 5 of the Marine Pollution Treaty, which became effective in December, 1988, and restricts the discharge
of shipborn solid wastes. His plan involves the conversion of an obsolete rig into a trash collection center which could charge a fee for the removal of trash from ships. If the converted rig is also an incineration site, the ash could be used to construct cinder blocks for reef construction.

Public testimony from two scuba divers supported the rigs-to-reefs concept, the placement of rigs in specific places and alternate uses for rigs. The divers emphasized that sites should be located closer to shore to accommodate the general public; and that more distant sites, such as the spectacular Flower Gardens Reef (located 120 miles from Galveston), could be aided by a stable platform to sleep and rest on. Their testimony emphasized that timing is opportune since the most popular diving area (Cozumel) was damaged by a recent hurricane and that Texas tourism could prosper if better diving attractions were made available.
FIGURE 1 Deep water platform.
PHASE I
Offshore Louisiana Artificial Reef Planning Areas

1. West Cameron Planning Area
2. East Cameron Planning Area
3. South Marsh Island (78) Planning Area
4. South Marsh Island (146) Planning Area
5. Eugene Island Planning Area
6. South Timbalier Planning Area
7. West Delta Planning Area
8. Main Pass Planning Area

Reef complexes will be sited within each planning area. Reef complexes will not exceed 3/4 mi² in area.
## TABLE 1

### LORAN C AND LATITUDE/LONGITUDE COORDINATES FOR ARTIFICIAL REEF PLANNING AREAS, OFFSHORE LOUISIANA

#### West Cameron Planning Areas

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#### East Cameron Planning Area

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#### South Marsh Island (Block 76) Planning Area

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#### South Marsh Island (Block 146) Planning Area

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#### Eugene Island Planning Area

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#### South Timbalier Planning Area

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**Mass Pass Planning Area**

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**West Delta Planning Area**

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### TABLE II. GULF OF MEXICO PERMITTED ARTIFICIAL FISHING REEFS

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<th>Year Permitted</th>
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<td>87° 42' 25&quot;</td>
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<td>1978</td>
<td>Alabama Department</td>
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<td>1967</td>
<td>Dry Dock</td>
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<td>Kelly</td>
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<td>30' Lifeboats</td>
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<td>240</td>
<td>50</td>
<td>1982 (Pending)</td>
<td>Abandoned Oil</td>
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**MISSISSIPPI**

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<th>Year Permitted</th>
<th>Sponsor</th>
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**TEXAS**

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<td>97</td>
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<td>Atlantic Richfield Co</td>
<td>Sunken Drill Rig</td>
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With several thousand structures in existence, it is impractical to analyze the cost of removing each offshore structure. Rather, the structures were divided into five categories on the basis of size and type. A removal estimate was performed for each category and a total estimate was developed accordingly. These estimates are based on current techniques and 1985 dollars not adjusted for inflation. Allowances are made for techniques expected to be developed in both design and removal technology, however, it is not expected that these will substantially reduce costs.

Category I includes smaller structures, single-well caissons, well protectors, and other items that can be removed using equipment with lifting capacity not over 100 tons (jacket weighing less than 100 tons). Generally, these structures are in water depths of 20 feet or less. However, some of the very old structures in deeper water (up to 50 feet) also fall into this category.

Category II covers typical eight-pile structures in water depths up to 100 feet, with jackets weighing 500 to 700 tons. Until better techniques become standard, these structures will also be removed by lifting.

Category III includes structures with jackets weighing from 1,200 to 1,500 tons. This encompasses typical present-day structures in water depths of 100 to 200 feet.

Category IV covers structures located generally in 200 to 400 feet of water. The cost estimates are based on cutting the jacket into sections, lifting the sections onto cargo barges, and returning them to shore.

Category V includes all structures installed beyond the 400-foot water depth. Generalizations about the most favored removal procedure are not practical for structures of this size; each requires custom development of removal procedures.

Figure 7 employs the platform population data and life expectancy estimates presented in the previous chapter to estimate the number of structures in each category to be removed each year. The number of structures to be removed will gradually increase from about 30 a year, at present, to well over 200 in the future. However, as is shown, the bulk of these will be the small structures of Category I and Category II. These are relatively inexpensive structures to remove. The real problems will not begin until Category IV structures begin to be removed somewhere in the 1995 to 2000 time-frame. Removal of the deep-water Category V structures built in the past few years, as well as others being contemplated, is not anticipated until around 2005.

With few exceptions, Category I and II structures will be completely removed and returned to shore. These are not difficult to remove, and therefore can be removed cheaply when no longer useable. Even if operators were allowed to leave structures in place, liability considerations and maintenance costs would dictate the removal of the bulk of these structures. Since the water depth of these structures is also relatively shallow, they are not likely to be treated as structures to be cut off at some point below the waterline with the bottom section left in place. For purposes of preparing an overall estimate, typical removal procedures were developed for a structure of this category. The normal removal cost of a Category I structure is estimated to be in the range of $50,000 to $400,000. Larger equipment and more time on location is required for Category II. It is estimated that the average removal cost of these structures will range from $600,000 to $1.3 million.

For this study, it was assumed that structures in Categories III, IV, and V would also be removed completely and returned to shore. Considering the additional size and complexity of these structures, it is estimated that the removal of Category III structures by present techniques would cost from $1 Million to $2.5 million and $15 million. Similar removal procedures would be used, except when the weight of the jacket requires cutting into sections for convenient lifting and transporting to shore on cargo barges. Onshore dismantling and disposal costs represent about 20 percent of the total removal costs for Category I-IV structures.

For Category V, the very deep-water structures, the cost of removal would begin at $15 million. An unpublished, detailed cost study, prepared by an owner of one of these structures several years ago, estimated the removal cost at over $70 million. At the present time, this estimate would probably range from $90 million to $100 million. Very special and specific procedures would be required for each structure in this category in order to make a satisfactory estimate. Onshore disposal costs for Category V structures would range from $3 million to $6 million. The committee’s estimates of removal cost are comparable to estimates prepared by the E&P Forum (E&P Forum, 1984).
Based on the number of structures shown in Figure 7, and using the cost of the categories described, the total cost of removing the platforms in the Gulf of Mexico has been projected, as shown in Table 2.* Cumulative costs are shown in Figure 8. Assuming 1985 dollars, the committee estimates that by the year 2005 about $2 billion will be required to remove the structures; this cost will rise to about $7.5 billion by 2020. These estimates do not take into account structures in Alaska and California, some of which will be expensive to remove. The estimates do not address advanced platform concepts intended for deeper water. Only one of these structures, a guyed tower, is in place on the U.S. outer continental shelf. When Alaska and California platforms are included (see Tables 3, 4A, and 4B), these costs increase to an estimated $2.5 billion by 2005 and $8.5 billion by 2020.
FIGURE 7 Estimated number of structures to be removed by category—Gulf of Mexico.

FIGURE 8 Total cost of removing Gulf of Mexico structures.
### TABLE 2  Number of Structures to be Removed and Estimated Removal Costs in the Gulf of Mexico

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<th>III</th>
<th>IV</th>
<th>V</th>
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I. BACKGROUND

"Rivers are often the lifeblood of communities: their water is used for drinking, energy, and industry. Rivers are historical, geological, archaeological, biological, botanical, and cultural focal points. They are often the wellspring of civic pride, the connecting links and dominant resources in agricultural valleys, and the homes of diverse and sometimes rare ecosystems. They are also recreational resources, providing opportunities for fishing, wildlife study, rafting, wading, canoeing, and skating.

The primary reason river protection has developed slowly is the nature of the resource itself. Water is the most politically volatile of all resources. Mixed ownership patterns, development demands, distrust of government, the absence of land acquisition funds, a conservation constituency that is difficult to organize, and the rights and needs of riparian landowners have combined to impede most efforts to protect rivers and streams." (America's Rivers)

The idea of a Texas river protection system has a history of landowner/recreationist conflicts, legal ambiguities, and unresolved water use priority questions. One of the most important underlying problems is the complex and multilayered issue of river ownership. At first glance the statutory provision that the waters of all navigable rivers and streams in Texas are state-owned seems clear. A pivotal purpose of this law is that of navigation, the right to pass over the water. Multiple definitions of navigability, however, result in differing readings of the law. The law becomes even more complicated
in regard to ownership of the riverbeds and banks under and alongside navigable waters.

The federal definition of navigability considers those rivers which are 'navigable in fact' to be 'navigable in law.' Unlike most other states, Texas has not adopted this federal definition and has, instead, enacted independent legal standards for navigability. As a result of the state's 1837 "30-foot statute, (Section 21.001(3), Natural Resources Code V.A.T.S.), streams in Texas are defined as navigable if they retain an average width of 30 feet from the mouth up. Since this statute includes streams that may not be 'navigable in fact,' Texas law allots thousands of miles of riverbeds to the State which would be privately owned under common or civil law.

This legal reality has extensive ramifications for recreational river use. State ownership of the beds of navigable streams, even if the stream waters may be privately owned, grants usage rights to the general public. Simply stated, the general public has the right to navigate all rivers or streams 30 feet or more in width, regardless of ownership of the bed.

Texans' public right to navigable waterways results in a "Catch-22" situation for both private landowners and river recreationists. The right to navigate such waterways does not carry with it a
corresponding right of access to the rivers and streams that run through private land. Access across private property to public waters must involve the consent of the landowner. As established by the Texas Supreme Court in Diversion Lake Club v. Heath (1935), violation of this rule may lead to civil or criminal trespass prosecution. The fact that nearly all Texas riverbanks are privately owned greatly compounds the access problem.

The growing popularity of river recreation in Texas since the 1960s has been demonstrated in numerous reports urging the state to adopt a clear policy of river management (i.e. "This Land is Your Land," "Pathways and Paddleways," "Texas Waterways"). Increasing demands for legislative action from recreationists, landowners, and environmentalists emphasize the powerfully political nature of the Texas rivers protection issue.

II. WILD AND SCENIC RIVERS PROGRAMS IN OTHER STATES

The Federal river protection program was established in 1968 through the enactment of the Federal Wild and Scenic Rivers Bill. It is a recreation-oriented system that protects 3,700 miles of streams in the U.S., 40 percent of which are managed by state and local governments.
In the early 1970s state programs began to follow the federal lead. Presently, twenty-eight states have initiated statewide river protection systems. They are Arkansas, California, Connecticut, Florida, Georgia, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Virginia, Washington, West Virginia, and Wisconsin.

In addition to the rivers protected nationwide by the Federal Wild and Scenic Rivers System, the statewide river conservation programs protect a total of 317 river segments and 11,404 river miles. In Texas there is no state river protection system, and a portion of the Rio Grande is the only river segment protected under the federal system.

In the early 1980's The River Conservation Fund surveyed all fifty states for river conservation activities and provided a comprehensive report on the 28 existing rivers programs. The paragraphs that follow summarize the general conclusions derived from this survey.

Each state was found to be unique in program structure, implementation, orientation, and attitude. All scenic river programs provide some degree of state-level protection against the construction of dams. This is significant, for it is difficult to imagine a more catastrophic threat to a river: it ceases to exist for the length of
the impoundment, and downstream environmental impacts may be permanent and severe. Most state programs also provide some protection against massive, dewatering diversions and against channelizations, which probably vie for second place as far as threats to the stream and streambed itself are concerned. Although there are serious questions about how real and permanent these protections are, all of the states with river programs have made some commitment to keep their rivers flowing free.

The more successful state river programs were found to share a number of common features. Specifically, it was found that:

1. Successful state programs network well with other levels of government;
2. Successful programs coordinate their activities with other state and local agencies, and this task is made easier by a consistency provision in the enabling legislation;
3. State and local governments have the advantage over the federal government of being able to institute land-use controls, and successful programs make the best of what they have; and
4. The best programs aggressively seek citizen participation throughout the study, designation, and management process.

Finally, a number of nationwide trends were observed. First, there is a move away from the traditional federal parks management method and toward management options that provide for greater local input and control. Second, after approximately five years of dormancy that lasted between 1975 and 1980, there has been an impressive surge of activity in river conservation at the state, local and private levels.
Third, the river conservation movement is expanding to include pastoral and urban streams, as well as whitewater rivers.

The states' process of protecting rivers has proceeded in several directions. Scenic river programs modeled after the National Wild and Scenic Rivers System are the most common. Other programs are very similar to standard park units. Maine and Iowa have constructed programs around an inventory of the state's resources. An increasing number of states are relying on legislation and plans developed for individual rivers. There is a great variety of plans featuring intricate relationships between state and local government. There is also a strategy that requires cooperation between the federal and state governments.

The trend in the states is to move away from traditional scenic river programs in favor of alternatives that give both the state and local communities more management options. Demands for local control and the fact that most states have not made use of many other river management authorities both contribute to this trend.

Maine's rivers program exemplifies the new statewide strategies. It uses a statewide rivers inventory to identify high priority streams, assess the state's tools for managing rivers, and build agency and political support for a comprehensive river conservation plan.
Section 2(a)(ii) of the National Wild and Scenic Rivers Act has worked well for the states, but problems created by federal agencies and by local governments dim its potential. This section of the law enables the U.S. Secretary of Interior to designate state-managed streams as components of the federal system subject to all of its protections. Given the federal hydropower permitting problems the states have, Section 2(a)(ii) can give the states the protection they need from federal actions detrimental to their streams. (pp. vi, vii, 7, 8.)

III. SUMMARY OF SB 702: TEXAS RIVERS CONSERVATION SYSTEM

In the early 1970s, shortly after enactment of the Federal Wild and Scenic Rivers Bill, an assessment of Texas rivers was conducted by the Texas Parks and Wildlife Department. The agency published Texas Waterways, A Feasibility Report on a System of Wild, Scenic and Recreational Waterways in Texas (1973). This document described the characteristics and values of many rivers, and declared that numerous rivers were worthy of designation as wild, scenic, or recreational.
Although a state river protection system was not instituted at that time, the idea resurfaced in February 1986. Leaders of several conservation and river recreation groups began discussing the concept, and within a few months, they had revived interest in protection of free-flowing rivers in Texas. The Sierra Club was one of the lead organizations in this campaign. Others included National Audubon Society, Texas Committee on Natural Resources, American Rivers, and Texas River Recreation Association. The result of this collective effort was the drafting of Senate Bill 702 (S.B. 702).

There had been earlier proposals for a Texas rivers protection system, including passage by the Senate in 1969 of the "Texas Natural Rivers Act" (S.B. 319 by Senator Kennard, 61st Texas Legislature). S.B. 702 was drafted using these earlier legislative efforts, the 1973 Parks and Wildlife publication, and other state and federal river protection bills as models.

On March 5, 1987, Senator H. Tati Santiesteban introduced S.B. 702 in the Texas Senate. In the House of Representatives, the bill (H.B. 1250) was introduced by Representative Robert Saunders. The bill was entitled the Texas Rivers Conservation Act (TCRA). The goals of the TCRA were to provide better protection and management of selected
rivers or segments of rivers within the confines of state ownership and jurisdiction, and to encourage private landowners to voluntarily assist in such efforts. To that end, the bill would allow the Texas Legislature to designate certain rivers as wild, scenic, or recreational. A 'wild' river is one that does not contain any human-made structures and is unpolluted. A 'scenic' river does not contain significant human-made structures and has a minimum of development. A 'recreational' river is one that has undergone some development, but still has important scenic, historic or recreational value.

The TRCA would have established a 1000-plus mile system of rivers to be protected from reservoir construction, channelization, and diversion. The river system would include eleven segments on seven different rivers, ranging in length from 25 to over 200 miles each. The rivers ranged from the popular whitewater sections of the Guadalupe near New Braunfels to the secluded Neches River in East Texas.

Activities which might be detrimental to the character of the protected rivers would be subject to review by Texas Parks and Wildlife and would require permits issued by that agency. The jurisdiction of the Texas Water Commission over water rights permits and discharge permits would remain with that agency, and no dual
permit from the Texas Parks and Wildlife Department would be required for activities authorized by the Water Commission.

The bill did not provide for taking of any private property right. Section 32.003 recognized existing water rights. Section 32.027(a) provided that normal activities of private landowners along units of the system would not be restricted within the boundaries of their own property, and Section 32.027(c) stated that unauthorized use of private property constitutes trespassing. The only method TRCA provided for affecting use of private property was through easements voluntarily entered into by landowners and the Texas Parks and Wildlife Department.

Since additional funds would be needed by the Texas Parks and Wildlife Department to fully implement the TRCA, the bill would have established a system whereby those that made greatest recreational use of rivers would bear such cost. Sections 32.105 - 32.020 proposed a Texas Rivers Conservation Fund, set out uses of the Fund, and created a tag fee system for various watercraft used to float rivers. These tags would not be required for motorboats or sailboats. The proceeds from this fee system would be earmarked for the administration of the system, and for campground and access point acquisition.
A number of river segments were recommended in the Act for immediate designation as units of the Rivers Conservation Act. Those river segments would be immediately protected as provided in the Act. Other rivers could be added to the system by the Texas Legislature by legislative enactment at some future time. There was no provision for designation of additional rivers by the Parks and Wildlife Department, although the Department could study other rivers and recommend additional designations to the Legislature. Any river which is included in the Federal Wild and Scenic River System would also be included in the Texas Conservation System.

The Committee Substitute for S.B. 702 was reported favorably out of The Natural Resources Committee, but was never called for a floor vote. The corresponding House Bill 1250 was reported favorably out of subcommittee, but died in committee.

IV. A VIEW TO THE FUTURE

Many Texans feel that Texas is overdue in joining the ranks of the 28 other states that have taken action to provide special protection and management to selected rivers with extraordinary wild, scenic, ecological, and recreational values. As recreation and tourism become
even more important in the Texas economy the likelihood of a resurgence of the river conservation issue increases.

Outlined below are some of the expressed concerns regarding the river conservation issue which may affect future legislative efforts in the area of a Texas river conservation system:

-- That the State would seek powers of eminent domain, rather than voluntary easements, to gain access to State-owned property (rivers);

-- That riparian landowners would be restricted from use of rivers and adjacent lands visible from the rivers, in order to keep them scenic;

-- That the encouragement of river use by recreationists would enhance the potential for trespassing, littering, vandalism and the endangering of livestock, ultimately interfering with the businesses of ranching and farming;

-- That the ability to pursue public water projects under the State Water Plan could be jeopardized by restrictions;

-- That a designation of a river segment as wild, scenic, or recreational would involve, for all practical purposes, a corresponding dedication of river water from the upstream drainage area needed to maintain natural flow through the segment; that water would no longer be available for other public uses having higher priority under the Water Code;

-- That a Texas River Conservation Authority could potentially have an incalculable negative impact on the orderly development of water resources in the state;

-- That federal river conservation legislation is adequate and additional state involvement could be perceived as land use legislation which infringes on the rights of private ownership;

-- That the priorities for use of water resources (advocated by previously proposed legislation) are not consistent with the priorities set forth in Section 11.024 of the Texas Water Code;
--That, with enough strategically placed designations, the Parks and Wildlife Department would be empowered with sweeping authority and could substantially control the use and appropriation of water throughout the state;

--That the process of adding protected river segments to the system could remove to a great extent the ability of Texas citizens to participate in those designations, and could jeopardize the state's ability to pursue public water projects under the State Water Plan; and

--That the cost of planning for future public water projects could escalate significantly because of planning requirements included in the drafting of river conservation legislation, especially with respect to considering the 'potential' designation of units and in economically evaluating 'aesthetic values.'

V. LEGISLATIVE HEARING

The Senate Committee on Natural Resources met in a public hearing on April 13, 1988, in Houston, Texas, to discuss a state rivers conservation system. The Committee heard expert testimony from witnesses representing the Parks and Wildlife Department, Sierra Club, Angelina and Neches River Authority, Texas River Recreation Association, and the Riverside Protection Coalition. Additional testimony was presented by other persons with interest and/or experience in the rivers issue.

Dr. Wilson E. Dolman, representing the Texas Parks and Wildlife Department (P&W), expressed that agency's endorsement of a state river protection system in Texas. He noted the significance of rivers to
P&W activities, and outlined some of the department's responsibilities for resource protection as follows:

--- to investigate serious pollution incidents, to develop conservation recommendations for consideration by other governmental agencies and to participate in administrative and judicial actions;

--- to protect the water quality in streams and rivers, to review and comment on permits for waste water discharges and hazardous waste disposal; and

--- to identify and catalogue, for potential future preservation, those river habitats determined to be at high risk, such as bottom land hard woods along east Texas rivers.

Dr. Dolman itemized four significant river system-related issues. The first is the question of determining the balance needed between river development projects and the benefits they provide versus the need to protect and preserve free flowing natural streams for agriculture, wildlife and environment. A second issue is the need for greater cooperation and coordination among the water regulatory agencies. Third, is the need for more research on river issues and for public education about what is known about rivers. Fourth, is the need to examine the economic benefits of the recreational use of Texas rivers. Since 25 percent of the public parks in Texas are on rivers, this makes an important statement as to the importance of these rivers to the tourism economy of the state.

He concluded his testimony with the information that the department's most recent five-year recreation plans identify the need for more
protection of rivers, and enumerate specific river segments deserving protection.

Dr. Ken Kramer testified on behalf of the Lone Star Chapter of the Sierra Club. Due to extensive coverage of the issue during the previous session, Dr. Kramer limited his testimony to three central concerns. First, he emphasized the flexibility and variety possible in designing a river conservation system. He discussed the need to take into consideration those things which are unique to Texas in terms of law, the actual rivers needing protection, and the state's cultural, historical heritage.

Dr. Kramer's second point stressed the environmental importance of preserving significant rivers and river segments. From an ecological standpoint, surface water dams and reservoirs do not always present the best and highest use of river water. In addition to the maintenance of wildlife habitat, native fish populations, and river recreation opportunities, river flows are an important factor in maintaining high water quality. Preservation of river ecosystems greatly affects the preservation of natural areas in general. This is especially crucial in semi-arid parts of the state, where river or riparian habitat is often the most important wildlife habitat available.
Thirdly, Dr. Kramer presented slides of the Texas rivers under consideration, in order to provide a visual context for discussion of a state river protection system. He also addressed the question, raised by a Committee member, of whether establishing a state river system would involve automatic inclusion within the more stringent federal wild and scenic river system. He felt that this concern could be adequately laid to rest by the inclusion of the following provision in a state rivers bill: "The designation by the Legislature of a river or river segment as wild, scenic or recreational and as a unit of the system does not constitute a recommendation that the river or river segment be included in the national wild and scenic river system. The governor and the director of the system are expressly prohibited from applying to the Secretary of the Interior for the inclusion in the national wild and scenic river system of any river segment of the Texas Rivers Conservation System."

Mr. Steve Lilly, representing the Angelina Neches River Authority, urged the removal of the Neches River from consideration as a protected river on the grounds that 20 percent of the river is already protected in the thicket national preserve. He claimed that the remaining 80 percent needs to be left for future use in industrial or economic development. He further noted that if a state river system became effective, it would essentially stop all future growth and development in the Neches River basin.
Extensive testimony was provided by Mr. Tom Goynes, representing the Texas River Recreationist Association, the Texas Waters Authority, Texas Canoe Racing Association, and the San Marcos River Foundation. He presented two basic premises: One, that all of the navigable rivers of Texas belong to all of the people of Texas, not just to the riparian landowners, nor just to the River Authorities, but to all of the State's citizens. He further stated that these rivers are considered by Texas law to be public highways. Two, the Texas Legislature is directed by our State Constitution to protect these rivers and the public's right to use them. The problem, as Mr. Goynes sees it, is that under our current system the Legislature has virtually no authority to protect and preserve our rivers. If a river authority can fund a reservoir or the channelization of one of our streams, and assuming the Army Corps of Engineers (COE) is contracted to do the job, it is only that organization's Environmental Impact Statement that can possibly deter the project. He stated that it is time for the Texas Legislature to accept the responsibility of protecting some of our most popular rivers from the Army COE.

Mr. Goynes acknowledged the excellent conservationist record held by riparian landowners, but stressed that time and again he has seen where these landowners are absolutely powerless, on their own, to stop
the COE. In rare instances where a dam or channelization was stopped, it was the cooperation between landowners and river recreationists worked, not the landowners working alone. He suggested that the strength of a state river system not be limited to just the river authorities, but in empowering the legislators of Texas to decide the future fate of the state's streams. Mr. Goynes also offered several suggestions for simplifying and improving the S.B. 702 version of a rivers bill that was proposed during the previous session.

During the questions that followed his testimony, Mr. Goynes was challenged on his claim that the Legislature has given away its authority over rivers. A Committee member pointed out that reservoirs can **not** be constructed without a permit from the state via the Texas Water Commission (TWC). Goynes responded that although the TWC is a state agency, unfortunately, that agency's permitting process does not offer Texas rivers much actual protection.

Mr. Arthur Nagle, representing the Riverside Landowners Protection Coalition, took Mr. Goynes' suggestion about simplifying the rivers bill a step further. Rather than revising the bill, Mr. Nagle recommended that it be discarded entirely. The landowners he represents, along Central and West Texas rivers, spoke out against the bill in 1987. They are again strongly opposed to placing Texas river segments under a state river protection system. These landowners,
according to Mr. Nagle, do not challenge the public's right to use of the rivers. They feel, however, that adequate public access is already afforded by existing state parks. What they do object to is trespass, vandalism, and waste disposal on abutting private property, all of which are illegal activities they believe to be associated with river use by the public.

Mr. Nagle outlined three major problems plaguing rural owners of land bordering Texas rivers. The first is the lack of respect for private property by too many users of the public rivers. This problem is aggravated by the fact that the normal trespass notification actions required by law to the public are ineffective along rivers, i.e., landowners cannot erect trespass resistant fences along river banks. The second problem grows out of the first, this being the trespass and vandalism issue. Trespass offenses are not restricted to the area immediately adjacent to river beds, but extends to acres of private property. The third problem identified by Mr. Nagle underlies the other two. Vagaries in certain state statutes (regarding navigability, trespass, gradient boundary lines, etc.) contribute significantly to the belief by some that, despite a river system's worthwhile intent, the actual results of such a system would impede or threaten the property and privacy rights of landowners.
Additional testimony was presented by a research student from North Texas State University, proposing the use of an evaluation process called geographical information systems (GIS). This system uses national or state defined standards for certain criteria (cultural, scenic, historic, geologic, or wildlife values) to determine whether each river segment should be granted protected status. Mr. John Earl Smith spoke on behalf of the Texas Farm Bureau, stating that organization's intense opposition to a river protection system. Similar sentiments were expressed by Mr. Con Mims, and Mr. Ed Feith, speaking for the Nueces River Authority in Uvalde, and the Association of Electric Companies of Texas respectively. The testimony concluded with a statement by Mr. Donald A. Green, of the Harris County Flood Control Task Force, urging that a river protection system be instituted at the state level in Texas.

VI. SUMMARY

The controversial issues associated with proposals for a state river protection system seem to group themselves into core categories, including: 1) the potential for inclusion in a more stringent federal system; 2) potential restriction of industrial and economic development; 3) potential conflicts as to agency regulations and
jurisdictions; and 4) ramifications for riparian landowners. Many of the specific concerns expressed during the 70th legislative session were repeated during the Senate Natural Resources Committee's legislative hearing on April 13, 1988.

Many of the concerns expressed in testimony touched on problems inherent in current state statutes concerning navigability and trespass. Especially confusing is the issue of gradient boundary lines, basically, the belief that there is a strip of land along navigable rivers that is "public." Landowners hold deeds that describe their ownership to mid-stream, and pay ad valorem taxes accordingly. From their perspective, therefore, state claims to riverbed ownership makes infringement of their property and privacy rights an inevitable corollary of a state river system.

Advocates of a state river system acknowledge the history of conservationist efforts by riparian landowners. In addition, however, river protection proponents emphasize the need for legislative intervention in order to protect Texas' crucial water supply, ecological, and recreational values which, once lost, are difficult, if not impossible, to recover.
POTENTIAL
TEXAS RIVER CONSERVATION ACT
DESIGNATED RIVER SEGMENTS

FIGURE 1

[Diagram of Texas rivers with segments marked as Scenic, Recreation, and Wild River Segments, with source cited as Texas Water Development Board, 1989.]
BOLL WEEVIL CONTROL IN TEXAS
I. SUMMARY

Cotton is the number-one cash crop in Texas with an estimated economic impact of $3 billion. Since its introduction into the state in 1892, the boll weevil has been the number-one insect pest to this important commodity. Today, the boll weevil infects approximately 1.9 million acres out of the 4.5 million acres planted. Annual losses in yield, plus direct costs for control, are estimated at $36 million. A significant effort to eradicate the boll weevil in the state is underway. Effective strategies to control this pest vary according to various production regions. They include the planting of short season varieties of cotton, the use of uniform planting and harvesting times with stalk destruction, the use of insecticides, or a combination thereof. The largest statewide effort in boll weevil control is through a concept known as Integrated Pest Management which focuses on defining the problems, arriving at a method of attack, and then using pesticides as safely and efficiently as possible. Current legislation allows farmers and the Texas Department of Agriculture to establish pest management zones for more effective boll weevil control.
II. INTRODUCTION AND BACKGROUND

Fourteen southern states, including Alabama, Arizona, Arkansas, California, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas, comprise the Cotton Belt of the United States. Of the fourteen, Texas produces the largest quantities of cotton.

Agriculture contributes approximately ten billion dollars to the economy of the state of Texas, making it one of the nation's leading agricultural states. Of the nearly 138 million acres of farmland in the state, 4.5 million are planted in cotton. Cotton is the number-one cash crop and its share of the state's economy is estimated to be a total of three billion dollars. According to USDA figures, Texas cotton producers harvested 4.635 million bales of cotton during 1987.

In an average year, farmers expect to lose one of every eight bales of cotton produced due to insect pest damages. Producers and entomologists generally agree the boll weevil is the pest that poses the greatest threat to the cotton industry. The boll weevil began its slow migration into South Texas from Mexico during the early 1890's and has moved across the Cotton Belt at rates averaging between 40 and 160 miles per year. Today, this pest is found throughout the Cotton
Belt and is responsible for hundreds of millions of dollars in damages to farmers. In Texas alone, the boll weevil infests approximately 1.9 million acres of the 4.6 million acres planted, causing annual losses estimated at $36.3 million in yield and direct control costs.

Damage is inflicted to cotton when adult female weevils chew into the cotton bolls to lay their eggs. The damage is multiplied many times over by weevil larvae as they hatch and feed upon the contents of the bolls. Since the cycle from egg to adult takes about 21 days, there can be several generations per year causing mass devastation.

The boll weevil is a hardy insect, and if supplied with the proper environmental conditions, it may survive cold winter months through a natural phenomenon referred to as diapause. Diapause occurs when ample food and shelter are available to the insect just prior to winter. The supply of food allows the weevil to store body fat to help it survive the cold chill of the season. Texas, with its long hot summers and short mild winters, provides the weevil with an ideal habitat conducive to survival. This insect problem is particularly magnified in South Texas and the Lower Rio Grande Valley where a maximum number of frost-free days exist. When weevils are allowed to over-winter, or diapause, as spring arrives and cotton is planted, the insects begin their attack on the new crops. If the numbers are not checked at an early stage, their move into a new cotton crop can be
quick and devastating. Furthermore, Mexico has increased its cotton planting near the Texas border where there is limited pest control. Any plan of attack on the boll weevil along the international border should include consideration for cooperation from the federal governments of the United States and Mexico, as well as the affected states.

III. CURRENT BOLL WEEVIL CONTROL PROGRAMS IN TEXAS

A significant effort to eradicate the boll weevil from Texas and the nation is currently underway. Boll weevil research, education, and operational control programs are implemented in the state of Texas by individual farmers, farmer organizations, the Texas Agricultural Extension Service (TAEX), the Texas Agricultural Experiment Station (TAES), the Texas Department of Agriculture (TDA), the Natural Food, Fiber, and Protein Commission (NFFPC), the United States Department of Agriculture/Agricultural Research Service (ARS) and the United States Department of Agriculture/ Animal and Plant Health Inspection Service (USDA/APHIS).

According to Dr. Raymond E. Frisbie of the Texas Agricultural Extension Service, effective strategies to control the boll weevil vary according to production regions in the state. These strategies
can be divided into several categories. They include the planting of short season varieties of cotton which combine fiber qualities and good yield potential with an early, rapid fruiting characteristic that allows the plant to escape late season boll weevil population. This approach has been particularly successful in the Lower Rio Grande Valley, the Coastal Bend, the Central River Bottoms and Blackland production areas of the state (See enclosed map). Cultural practices, such as the setting of uniform planting and harvesting dates combined with post harvest plant sanitation, extend the time period when cotton is unavailable for weevil reproduction. Research findings demonstrate that if there is a delay in the time of planting, cotton will not be advanced enough in growth for boll weevils, emerging from diapause or hibernation in the spring, to feed or successfully reproduce. This tactic is practiced widely in the Rolling Plains and the St. Lawrence areas. The combination of planting short season varieties and using uniform planting times, if practiced on an area wide basis, offer a tremendous opportunity to save insecticide control costs during the season.

Another strategy uses insecticides to reduce the numbers of weevils entering diapause during the fall of the year. Diapause control programs have been extremely effective in pest suppression on an area-wide basis, especially in the Rolling Plains area. The most effective programs have been conducted in counties just east of and
adjacent to the High Plains and in the St. Lawrence Valley. These programs have been vital in stopping the establishment of infestation in the High Plains, the largest cotton producing area in Texas and the United States. Insecticide application in the fall of the year supplemented by in-season treatment is the strategy being utilized by El Paso Valley cotton farmers to control a pest recently introduced into that area.

The largest statewide effort in the boll weevil battle is through a concept known as Integrated Pest Management (IPM). This program "is a system of pest suppression that optimizes the best combination of control tactics in harmony with the existing crop production practices for the greatest net profit." In the early 1970's, producers in various areas of the state cooperated with the Texas Agricultural Extension Service in implementing an IPM pilot project. The IPM program is primarily educational. It focuses on defining the problem, arriving at a method of attack, and using pesticides as efficiently and as safely as possible. Efficiency is obtained by spraying the right pesticide at the right time to obtain the maximum pest kill. In doing so, less pesticide applications are needed, saving the producer considerable expense and reducing the amount of chemicals released into the environment. IPM programs that have undergone economic evaluation have shown increases in net profits to individual producers and aggregate increases in revenues to the region and the state.
IV. LEGISLATIVE HISTORY

Until 1987, there was very little legislation pertaining to the control of cotton's number one pest. In 1987, the 70th Legislature passed the Boll Weevil Act (Senate Bill 1189) which allows farmers and the TDA to establish pest management zones for boll weevil control. When established, these zones would define periods during the year in which cotton can and cannot be grown. The bill requires that infested cotton stalks be plowed under and destroyed, and gives the TDA authority to take the necessary action to complete the destruction. Strict enforcement by the TDA will lead directly to reduced losses and significant lowering of insecticide use.

V. LEGISLATIVE HEARING

The Senate Committee on Natural Resources met in a public hearing on June 24, 1988, in El Paso, to discuss the potential economic impact of the cotton boll weevil on the Texas cotton industry and to examine a variety of effective measures which might control this destructive pest. Expert testimony was presented by representatives of various governmental agencies and organizations concerned with the boll weevil
problem as well as farmers who are the most directly affected by the pest.

Mr. William Lovelady, President of the El Paso Valley Cotton Association and member of the National Cotton Council, defined the basic boll weevil problems and discussed the control programs in other areas of the United States Cotton Belt. He informed the Committee that there are three principle boll weevil control programs currently in use within the nation's cotton growing zone. They are the Southeastern United States Boll Weevil Eradication Program, the High Plains of Texas Program, and the Southwest Program of Southern California and Central/Southwestern Arizona. These programs are a cooperative effort between the State Foundation for the Boll Weevil which represents the producers, various state departments of agriculture which represent the state governments, and the Animal, Plant and Health Inspection Service (APHIS-USDA) representing the federal government. These programs are 70 percent producer funded and 30 percent federally funded with state governments occasionally providing additional funds. These successful programs have been designed to eradicate the pest where possible, or contain it by prohibiting its migration into other areas. These three programs have been successful and they share many common elements; yet they are different enough to cover the diverse needs of all three regions of the Cotton Belt.
Dr. Raymond E. Frisbie, Professor of Entomology, Texas Agricultural Experiment Station, Texas A&M University, discussed boll weevil problems specific to Texas and explained the biology and ecology of the pest, presented various strategies for pest control, previously touched on in this report, and defined the role of the Agricultural Experiment Station in pest management with regards to the boll weevil.

Mr. Clifford Hoelscher, Executive Officer of the Saint Lawrence Cotton Growers Association, Chairman of the Texas Association of Cotton Producer Organizations (TAPCO), and a cotton farmer from Glasscock in Pecos County, Texas testified that unless state participation is restored at adequate funding levels for boll weevil control efforts, the cotton industry's future could be jeopardized. Mr. Hoelscher explained that the Texas cotton industry does not request or expect the state to absorb the total cost of boll weevil control, but feels that farmers need substantial financial assistance. Mr. Hoelscher recommends that, to further support the State's boll weevil control program, the Texas Legislature should do the following:

--Appropriate monies directly and very specifically to the Texas boll weevil control program.

--Consider appropriations adequate enough to support integrated pest management and boll weevil control programs administered by TPMA.
--Increase support to the boll weevil diapause program.

--Consider increased funding to the Natural Food and Fiber Protein Commission for boll weevil research.

--Consider increased funding to Texas Agricultural Experiment Stations for boll weevil research.

--Consider increased funding to the Texas Agricultural Extension Service integrated pest management program with a focus on technology transfer of boll weevil control tactics and strategies in major cotton producing areas of the state.

--Encourage establishment of pest control zones under SB 1198 (70th Legislative Session) for area wide suppression of the boll weevil through increased funding. It is important that the legislature encourage the Texas Department of Agriculture, by whatever means available, to move forward as quickly as possible to establish such a program.

--Encourage state cooperation with Texas cotton commodity organizations and USDA to open dialogue with the Mexican government in order to develop a meaningful international effort to battle the boll weevil.

Mr. Jim Ed Miller, President of the Texas Pest Management Association (TPMA) testified that TPMA is a non-profit, multi-commodity, statewide organization that operates in agreement with Texas A&M University to run the Integrated Pest Management Program (IPM). According to Mr. Miller's testimony, the IPM program is the most effective, safest and most profitable approach to crop production known today. Integrated pest management includes diapause programs, stalk destruction, delayed planting, pheromone trapping and biological controls. Mr. Miller explained that all of these programs are working, but they need to be expanded. This can be done only by increased funding, especially for the boll weevil suppression plan.
Dr. Raymond E. Frisbie was recalled to testify, this time as the Extension IPM Coordinator for the Texas Agricultural Extension Service at Texas A&M University. Dr. Frisbie defined integrated pest management as a controlled system for the suppression of insects, weeds, disease and pests which uses cultural, biological and chemical techniques in the program. He discussed the capabilities of the extension service in implementing pest management programs.

Paul Martin, Director of the Pest Management program for the Texas Department of Agriculture (TDA), explained the agency's past and current involvement in boll weevil programs. TDA has primarily supported boll weevil diapause programs which, according to Mr. Martin, are most effective in West Texas and the High Plains. He reported that the 70th Legislature granted TDA $50,000 for boll weevil control during the biennium. Mr. Martin's testimony emphasized that boll weevil control needs to be a community approach using all the available applicable tactics and strategies.
**COTTON**

*Acres Planted*  
1985

1 dot = 1,000 acres

*Includes American-Pima and Upland Cotton.
Dots indicate quantity without respect to geographic location within the county.

### LEADING COUNTIES IN PRODUCTION

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Spread of boll weevil in the United States, 1892-1934.
TEXAS COLONIAS
I. OVERVIEW

Residents of Texas colonias experience a lack of essential infrastructure services such as potable water, paved roads, and wastewater treatment and drainage provisions. Previous legislative studies on colonias have concentrated on the Lower Rio Grande Valley. This report outlines the origins of colonias, focuses on the El Paso County situation, and addresses the international ramifications of transboundary water issues.

II. ORIGINS OF COLONIAS

Colonias are unincorporated subdivisions built along the United States-Mexico border that frequently lack sewage facilities, drinking water, electricity, paved roads and gas utility services. Colonias often develop when land is subdivided by developers and the lots are placed for sale without adequate infrastructure for water, sewer or drainage. Without these infrastructure improvements, the lots can be sold at a lower price than would otherwise be the case, and are often purchased by low-income families.
A typical lot, about 60 feet by 100 feet, is sold for about $2,000 to $8,000 under a contract of sale, on the installment plan. Typically, the purchaser will build his own home on the lot without regard for any building code requirements that may be applicable. Once the lot is sold, the original developer has no incentive and the new owner has no financial means to install adequate water and sewer improvements that help establish a healthy community. This has resulted in many rural subdivisions--colonias--characterized by substandard housing, inadequate roads and drainage, and a lack of adequate water and wastewater disposal systems.

Due to the lack of available potable water, many colonia residents rely on water from irrigation ditches or from shallow wells they drill on their small plots of land, usually within the proximity of their pit latrines or outhouses. The water is dangerously contaminated and is often stored in used 55 gallon chemical drums.

In recent years, the proliferation of colonias has accelerated to a point that potentially threatens the environment and general health and well-being not only of their residents, but of the resources and population of the surrounding areas as well. Colonias are a fact of life along the border and must be controlled and humanely helped.
III. THE TEXAS SITUATION

The Texas-Mexican border stretches 1,250 miles from Brownsville on the Gulf of Mexico to El Paso and comprises over half of the entire 2,000 mile international boundary with Mexico. (Appendix B provides a county-by-county breakdown of the Texas-Mexico colonias.) To date, legislative and agency studies of the colonias in Texas have focused primarily on the Lower Rio Grande Valley of South Texas.

In 1986, the Texas Water Development Board conducted an extensive reconnaissance-level study of the water and sewerage needs of the colonias in Cameron, Hidalgo, and Willacy counties. Principle components of the study included: a) identification of the size, location, and population of the colonias, b) determination of the characteristics of existing water use and sewer service arrangements, c) projection of water and sewer service needs through the year 2010, and d) identification of alternative solutions to water and sewer needs and estimations of implementation costs. Economic costs and limited supply were found to be the major obstacles to satisfying the water needs of the colonias. Water supply from the Rio Grande River is allocated on the basis of water rights and is regulated and managed by the Texas Water Commission's Watermaster.
A recurring problem in the management of Texas' colonias has been the lack of clearly defined parameters for the regulatory authority assigned to city and county government. Although Texas counties have been delegated the responsibility to provide for public health, safety and welfare, they have not been given specific authority over the provision of water and wastewater services in unincorporated areas. County subdivision and zoning regulatory authority extend only to matters concerning the provision of adequate roads and drainage therefrom and building standards in floodplains.

In general, counties in Texas have little inherent powers, since they are considered merely as extensions of state government. Rather, they exercise only those powers or responsibilities which have been expressly conferred by state statutory and constitutional law. Therefore, unlike municipalities and counties in other states, Texas counties, lacking ordinance making powers, are severely restricted in regulating subdivision development or providing water and wastewater services to their residents.

Most of the estimated 70,000 colonia residents in the Hidalgo, Cameron and Willacy counties have running water (about 86%), but the service is frequently unreliable due to poor treatment and distribution
systems or is provided only through yard taps. Inadequate waste disposal systems, septic tanks and outhouses (none have centralized sewer service), have led to various severe public health problems. As harsh as these conditions are in Rio Grande colonias, the situation is even worse in the colonias of El Paso County.

IV. **FOCUS ON EL PASO**

In the 1950s, the valley east of El Paso consisted mostly of cotton farms, often owned and tended by Hispanic families whose roots in the area stretched back for centuries. As the cotton market began collapsing, the farmers sold off their land little by little to developers. These developers then sliced it up into subdivisions and offered plots for as little as $1,000 down and $1,000 a year. The plots were sold on sale contracts, meaning that title did not transfer until all payments were made. Some of the subdivisions received water from the city of El Paso, but others had no source. By the late 1970s, the colonias were growing at a 10-year rate of 200 percent. And, in 1979, in a retroactive attempt to control the growth of the colonias, the City El Paso and the Public Service Board imposed a moratorium on water connections to the colonias, citing economic and planning considerations. However, due to economic considerations
beyond El Paso's domain and the water cutoff, colonias continued to
grow. Currently, in El Paso County, 28,000 colonia residents are
without running water and 53,000 have no sewer service. El Paso's
Lower Valley population has almost doubled since 1970, from 12,550 to
22,894 in 1985. Colonia residents often have no water, no sewers,
poor roads, and no drainage. Sewage waste generated by some 53,000 El
Paso County residents goes into septic tanks or illegal cesspools,
eventually contaminating the ground water on which all of El Paso
relies.

In response to these problems, the Legislature created the Lower
Valley Water District. The district will be able to acquire
irrigation water rights outside the city and to assign these rights to
El Paso's Public Service Board (PSB) during seasons of peak water
demand. In exchange, the PSB, with its greater sophistication and
good bond rating, has agreed to finance a water treatment facility to
make the Lower Valley's irrigation water drinkable.

Addressing the living conditions that prevail in colonias will require
more than city, county, and state involvement. The assistance of
other units of government is needed to effectuate solutions and
implement reforms. Policymakers within state and federal governments
are now considering roles that they might play in addressing the
problems of the colonias. Congress may consider whether and how to aid these communities through federal assistance. Legislation to do so has been introduced in the House of Representatives.

V. INTERNATIONAL RAMIFICATIONS

Public health and environmental problems that move across international boundaries present special challenges to policymakers. In the present context, the challenge arises to the extent that colonias on the U.S. side of the border suffer adverse effects of inadequately treated wastes that are discharged from Mexico. Domestic laws and procedures guide solutions to problems on one side of the border, but these solutions may not be available, and a different set of policy and institutional tools may be required, in the context of international concerns.

There is a history of negotiation and efforts to resolve transboundary water pollution problems between the United States and Mexico. Officials of both countries are involved, as well as the International Boundary and Water Commission (IBWC), established under an 1889 Convention to monitor and resolve water-related disputes. The Commission has authority, for example, to investigate, plan, and
supervise construction of environmental projects in accordance with bilateral agreements.

U.S. and Mexican cities and towns along the border are integrated economies and interdependent societies. They comprise the interface between a highly developed, decentralized society and an emerging nation with a very centralized governmental system. Transnational environmental issues must therefore be considered within the larger framework of many, interrelated concerns which make for successful foreign relations. One of these concerns involves co-production facilities along the border. The co-production or "maquiladora" program is the most universally acclaimed program on the border in terms of job creation and tangible benefits to both sides of the river. Because the co-production option has been so aggressively promoted by the Mexican government, the resulting bilateral cooperation may be one component of ultimate, comprehensive solutions to colonias and other problems affecting the border.

VI. LEGISLATIVE EFFORTS

During the 70th legislative session, several bills pertaining to county land use, subdivision of water and wastewater authority were
introduced including SB 600, which would have given counties the authority to ensure that adequate drinking water and sewage facilities were available to residential lots in subdivisions; H.B. 1797, giving counties over 150,000 population local option and general ordinance making authority; H.B. 2207, giving counties over 149,000 population local option, limited ordinance making authority in regard to subdivisions in the areas of lot sizes and specifications, building codes, water and wastewater provision, and a few other public health related areas; and S.B. 125, giving coastal counties local option and general ordinance making authority.

Three bills passed which addressed water and wastewater issues in rural areas: S.B. 408, which allows cities of 5,000 or more in counties along the Rio Grande to have extraterritorial jurisdiction in areas within 5 miles of their city limits and which also specifically requires plat approval when land is subdivided using a metes and bounds description in a deed of conveyance or sales contract (previously some developers used this method to avoid plat requirements); H.B. 2622, which required that plats contain a statement describing the extent of water availability to the subdivision and if it will be made available, how and when; and H.B. 1875, which regulates on-site sewage disposal systems through a state-wide permit system, registration of installers, and allows TDH
to adopt necessary rules and delegate authority to local governmental entities.

Two legislative proposals concerning colonias problems were introduced in the 100th session of Congress. One, H.R. 4606, proposed by Representative Ronald D. Coleman, was introduced too late in the session to be addressed. The bill would have established a U.S.-Mexico Border Regional Commission patterned after the Appalachian Regional Commission. Membership would be comprised of the governors or representatives of the states of Arizona, California, New Mexico, and Texas, as well as federal and congressional representatives. The members would review and approve applications to fund programs and demonstration projects in the areas of health, water resources, housing, vocational and technical education, and sewage treatment.

The second federal legislation, H.R. 3524, also known as the Colonia Water and Sewage Service Act, was introduced by Representative Solomon Ortiz. Although the bill was never passed out of the House Committee on Agriculture; had the bill been passed, it would have provided targeted funds through two existing Farmers Home Administration (FmHA) programs, the water and sewage grant program and a separate program that aids low-income housing repair through loans and grants. The Act would have authorized increased funding for these two FmHA
programs—$20 million more for water and sewage grants and $20 million more for the section 504 low-income housing program, of which $15 million would be for loans and $5 million would be for grants—to be targeted to rural areas within 30 miles of the border that separates the U.S. and Mexico. The bill also would waive the current requirement under section 504 of that program that funds be allocated to persons 62 years or older.

VII. LEGISLATIVE HEARING

Senator Tati Santiesteban convened the Committee on Natural Resources in El Paso on Austin 10, 1988, for a public hearing on Colonia issues. The Senator opened the meeting by presenting a succinct historical account of the origins and development of present Colonias and their problems. He outlined the two forms of action which are now required in order to correct the mistakes of the past. Future growth of the illegal subdivisions must be prohibited, and the existing subdivisions must be supplied with water and sewage facilities. He stressed that meeting these two challenges will demand a collective effort involving city, county, and state levels of government.
Testimony began with a statement by the Honorable Jonathon Rogers, Mayor of El Paso. He identified the major problems facing Colonias as the lack of county zoning authority and of potable water. He reported favorable progress on the former, i.e., due to the health record, the county can now limit lot sizes to one-half acre in areas without water, and one acre in areas with water. The potable water issue, however, continues to be thwarted despite the recently established Lower Valley Water Authority (LVWA). Agreement has been reached between the LVWA, the Irrigation District and the Public Service Board that water needs to be supplied. Now, the problem is that the Bureau of Reclamation is requiring completion of the environmental impact statement (EIS) prior to assignment of the essential water rights. The EIS will require up to two years and up to $600,000 dollars for completion. Mayor Rogers requested the Committee's assistance in convincing the Bureau of Reclamation to modify their requirement in order to resolve the situation.

The Committee heard next from Father Ed Roden, and other representatives of the El Paso Interreligious Sponsoring Organization (EPISO). Father Roden attributed the development of Colonias to the "American Dream" concept on the part of the residents and to exploitation and false assurances on the part of the developers. Unfortunately, the result of this combination is disproportionately
greater than the parts, i.e., the influx of disease in and beyond the colonias and distorted societal priorities. He explained this last point with the example of 26 million gallons of water used on a golf course in one summer while thousands live without any access to clean water at all.

Because Texas government has exhibited a "laissez-faire" approach, citizens organizations like EPISO have managed to bring the plight of the Colonias to the attention of the nation. As a result, the nation is watching to see how this "Third World" within Texas will be addressed. Father Roden especially emphasized the misconception believed by some that Colonia residents are appealing for government aid because of their own unwillingness to do for themselves. In actuality, the scope of the problem transcends any degree of personal effort and sacrifice. Their best efforts are being made, but the problem is more of a burden than they can bear without government intervention.

Teodora Trujillo, another EPISO activist, outlined some of the citizen organization's political efforts and achievements in resolving the Colonia problems to date. Margarita Martinez briefed the Committee on EPISO's proposals for the future, and listed four specific actions needed at the state level, which include:
'--a capital pool of money to be made available to the LVWA for a Water Distribution system and for sewer system installation;

--monies to be made available through grants and low interest funds so that residents can have access to the water that is available;

--same action as #2, to allow for a revolving loan account by which in-door plumbing could be financed; and

--adequate regulatory authorities to be granted to the county to ensure its power to halt the continuing expansion of Colonias.

Father Roden announced EPISO's plans to conduct a Water Summit, calling upon representatives of all levels of government to assess the emergency water situation, and put forth realistic figures of what funds can be expected from each entity to end this state and national embarrassment.

County Commissioner Mary Haynes of Precinct 4 testified and corroborated the previously submitted information. She suggested that the money needed to deliver safe water will exceed $200 million, obviously requiring state and federal assistance. She acknowledged the Texas Water Development Board for recent assistance in developing a water management plan, and strongly urged the legislature to continue to make affordable bond money available to the communities for needed water projects. She explained how developers can use a meets and bounds filing to avoid the requirement of plat approval by
the Commissioner's Court. In addition, she endorsed the recommendation of granting the county ordinance authority.

Dr. Laurence Nicky, Director of the El Paso City/County Health District, presented extensive information, accompanied by slides, of the public health implications of the problems in the Colonias. He outlined the Health District's efforts to cope, and the restrictions they experience due to seriously inadequate public health funding because of a lack of locally generated tax dollars.

The Committee heard from three witnesses in regard to what the Texas Water Development Board (TWDB) is doing, through its state planning and financing programs, to deal with the problems of water and sewer service needs in the Colonias. Dr. Herbert Grubb, Director of Planning, summarized the Board's efforts to date in funding regional water and sewer planning projects in Cameron, Hidalgo, Willacy, and El Paso counties. In conclusion, he stated the Board's commitment to developing plans which can be moved into implementation as quickly as possible, which plans attempt to solve the most serious problems first and to address all remaining problems as funding will allow. Dr. Grubb then introduced Dan Knorr to present a summary of a recent study the TWDB funded.
In April 1987, the TWDB entered into a regional water and wastewater services planning contract with El Paso County, the Town of Anthony, and the LVWA. The project has produced a feasibility plan for regional water supply and wastewater systems for portions of El Paso County, excluding the City of El Paso. The plan recommends feasible methods for providing those services, describes the facilities which would be required, sets forth schedules for installing facilities and providing services in incremental stages, estimates the costs of providing the services, and develops methods for managing and financing the systems. The plan also suggests measures for providing interim services to areas not scheduled to be served by regional systems until late in the planning period. Currently, the final draft report is under review by the Board's staff.

Mr. Reginald Arnold, Executive Director of the TWDB, concluded the Board's presentation to the Committee. He explained how the seed money for the Board's funding program was obtained, how it has been matched with bond money, and specific projects for which it has been used. He estimated that funds for planning activities will be used up by the end of 1989. He emphasized that the efforts they have extended to the Colonias have all been in the form of loans and not grants. That money is coming back to the state to be reused hopefully for similar projects.

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The Committee Chair recognized Jose Louis Sanchez, District Director for Congressman Ron Coleman, who submitted for the record a written statement from the Congressman. Senator Santiesteban reminded the audience and the panel of Coleman's commitment to the Colonias and the tremendous assistance he provides.

Six public witnesses addressed the Committee about the Texas IAF network (Industrial Areas Foundation), which has worked for 15 years to build broad-based organizations to give poor and politically disenfranchised citizens vehicles for participation in the democratic process. Their testimony explained how the IAF's agenda for change and education relates to the Colonias, and how Colonia efforts in other counties might be helpful in El Paso County. They pledged IAF voter support to efforts to provide for the development of infrastructure systems within the state's Colonias, and to provide funds which allow households to access these systems.

Mr. Ben Winston Cook, appeared on behalf of Bob Bullock, Comptroller. Mr. Bullock has developed a proposal that would call for up to $500 million in state-issued bonds that would be used to construct water treatment facilities and install distribution lines in the Colonias. To implement the bond program at a cost affordable to Colonia
residents will require the help of the federal government to pay certain costs. Current legislation before Congress clearly indicates federal interest in helping Texas meet this need. The Comptroller urges the passage of this current legislation by Congress, and also suggests that an additional $200 million in federal grants and loans be made to cover the costs of the residents' minimal needs.

Testimony concluded with Eric Morels, representing the County Attorney for El Paso. Mr. Morels urged the Committee to work for change in the local government code, Chapter 232, which regulates subdivision developments in Texas counties. He proposed detailed revisions to current law which could address many of the issues raised at the hearing. The Committee Chair suggested, in light of the extensive research needed, that the County Attorney attempt to work these suggestions into the draft of S.B. 600, and submit it to the Natural Resources Committee for review.

Information presented by witnesses and discussion among Committee members reflected growing awareness of the problem at the state and national level. General consensus was reached as to the need for a two-pronged approach which will inhibit future expansion of the illegal subdivisions and provide water to the existing communities.
Widespread sentiment indicated the need for legislative changes to existing statutes concerning county zoning authority. Numerous proposals were suggested, targeting the essential infrastructure needs of the communities. The overriding constraint in all of these proposals is funding limitations. The scope of the problems, and the potential costs involved, will require government participation at the county, state and federal level.
Border State Counties with Colonias

Source: Congressional Research Service

(Based on Information Provided to CRS)
Colonias in Texas

EL PASO COUNTY: An estimated 80 "colonia" settlements with about 15,000 people occur outside of the City of El Paso. The El Paso City-County Health Department is conducting a study to assess these "colonias" that is expected to be completed by the summer of 1988.

HUDSPETH COUNTY: There are about eight "colonias" with about 1,000 people living here. The largest community is outside Sierra Blanca, with about 75 people.

CULBERSON COUNTY: An estimated 500 people live in eight to ten "colonias." Many live outside Van Horn, with a smaller grouping around Lobo.

JEFF DAVIS COUNTY: There are about three "colonia" settlements that support 500 people. The largest is outside Valentine, with about 350 people.

PRESIDIO COUNTY: There are about seven "colonia" communities with an estimated 1,000 people all along the Rio Grande River. Some of these communities are outside the towns of Candelaria, Indio, Redford, and Casa Piedra.

BREWSTER COUNTY: There are fewer "colonias" here because Big Bend National Park covers most of the land along the border. There are two "colonia" settlements further north, outside Alpine (about 300 people) and Marathon (about 100 people).

TERRELL COUNTY: This county has relatively few clusters of "colonias." A "colonia" outside Sanderson supports about 120 people, and the Dryden region has about 30 people.

VAL VERDE COUNTY: This county has about ten "colonias" supporting over 2,000 people, many of which are outside Del Rio.

KINNEY COUNTY: This arid county is largely a retirement community. About 150 seasonal workers make up the population in the "colonia" outside Bracketville.

MAVERICK COUNTY: The largest number of "colonias" is at Seco Mines, with 3,000 to 4,000 people. Quemando has about 400 people inhabiting the "colonias," El Indio has about 150 people, and Normandy has about 100 people.

WEBB COUNTY: According to the Laredo-Webb City-County Health Department, Webb County has three groups of subdivisions on the outskirts of the incorporated city of Laredo with a total of about 6,500 people. They are not referred to as "colonias" in this area, but as subdivisions. Despite differences in nomenclature, conditions are believed to be the same as in "colonias" located elsewhere. Rio Bravo is the largest and oldest subdivision, and consists of about 4,000 people. It is three to four years old. El Cenizo is the next largest subdivision, housing about 1,500 people. Both of these unincorporated developments are about seven miles outside of the city of Laredo. The third largest is Pueblo Nuevo, which is home to about 1,000 people. This subdivision is only about one mile from Laredo. It is estimated that there are an additional 3,000 people that live in "colonias" immediately outside of Laredo, apart from these subdivisions.

ZAPATA COUNTY: There are about 15 "colonias" with about 1,000 people in this county.

STARR COUNTY: It is thought that the 8,000 to 10,000 people inhabiting the "colonias" outside Rio Grande City have the worst living conditions along the Texas border. They are possibly the poorest and the least employed people in this region.

The Texas Water Development Board suggests that 20 to 30 subdivisions with about 3,200 people exist in Starr County.

The following three counties have had the most recent and the most thorough studies. In many cases, the housing units and the "colonias" have actually been counted in field visits by the Texas Water Development Board.

HIDALGO COUNTY: In 1986, about 51,800 people lived in 11,500 housing units that made up 366 "colonias." The total population of the county is 365,900.

CAMERON COUNTY: Approximately 17,000 people live in 3,786 housing units within 65 "colonias." The total population of the county is 257,300.
WILLACY COUNTY: A total of 2,600 people live in 586 housing units within four "colonias." The total population of the county is 19,100.

The total for the three-county study (Hidalgo, Willacy and Cameron) is 435 "colonias," with 15,872 housing units supporting a total population of about 71,000 individuals. The population is projected to grow to 159,000 persons by the year 2010.

According to a 1981 study for the Texas Department of Community Affairs undertaken by the Texas Water Commission, 135 "colonias" existed in the three counties (Hidalgo, Cameron and Willacy). An estimated 88,000 people lived within the 135 subdivisions. The January 1987 update of this study reported 240 "colonias" accounting for 120,000 people.

According to the Texas Health Department (Region VIII), Hidalgo County consists of about 80 "colonias" amounting to an estimated 25,000 people.

It is obvious there are discrepancies in the reported number of persons living in "colonias." While it may not be possible to determine the exact numbers, it is apparent that "colonias" exist in nearly every United States county along the border with Mexico.
AQUACULTURE
I. OVERVIEW

Aquaculture, the controlled cultivation and harvest of fish and other aquatic species, has been practiced in various forms for centuries. It has achieved commercial success abroad, particularly in those parts of the world where the population's food needs are not met by other forms of agriculture and where labor intensive operations are feasible. In the United States, the aquaculture industry has mushroomed dramatically since 1980, with a 25 percent increase in annual fish production; and it is projected to double again by the 1990s.

Health-conscious consumers are largely responsible for fueling aquaculture's rapid expansion. For example, the average consumer ate 1.3 pounds of fish and shellfish in 1980; now, the figure is closer to 15 pounds per person. According to government forecasts, during the next two decades, per capita fish consumption is expected to increase at a faster rate than the consumption rate of beef, pork, vegetables, cereal and milk.
Many different species of fish and shellfish are being commercially cultivated today, but catfish production is by far the largest aquacultural enterprise in the United States. Producers harvested approximately 50 million pounds of channel catfish in 1987—nearly half of the nation's total aquaculture output. Catfish ponds cover some 135,000 acres in the southern states. The Mississippi Delta, alone, accounts for nearly one-third of the production acreage and 85 percent of the total production. The average catfish farm contains 160 acres and a good farmer can net between $60,000 and $80,000 a year.

Mississippi's success has not been by accident; it has been developed by careful state and industry design. In 1987, production grew by more than 30 percent as fish farmers, thanks to the benefit of state support and a $1.5 million ad campaign. A successful drive to expand traditional markets ensued and now catfish are served in the most sophisticated restaurants under such gourmet entrees as "Catfish Aurore" and "Catfish Meuniere." A study in Mississippi shows that for every 10 million additional pounds of catfish produced, 220 jobs were created in the industry, and 1100 jobs were created in related industries.

Millions of dollars were spent in Mississippi to construct catfish processing plants to keep up with sky-rocketing demands. The catfish
industry's impact goes far beyond the farmer and his pond. Unlike other agricultural products, virtually every consumer dollar paid for a catfish remains in the state where it is raised because every operation, from growing the feed, to processing the fish, to marketing the finished product, takes place in that state.

Texans consume approximately 52 million processed pounds (USDA figures) of catfish per year, leading the nation in catfish consumption. This represents 40 percent of the total processed catfish in the entire nation. In 1987, the $55 million crawfish industry produced more than 100,000,000 pounds of product, creating more than 15,000 jobs in rural America.

II. FISH FARMING IN TEXAS

Two types of fish production are being developed in Texas: aquaculture and fish farming. Aquaculture is a broad term applied to the cultivation of the natural products of water, fish and shellfish. It can be done anywhere—offshore, in bays, estuaries, lakes, bayous or other similar environments. Fish farming is the land based, controlled management of the environment for the cultivation of fish.
or shell fish. Both aquaculture and fish farming are regulated by the Texas Parks and Wildlife Department under Chapter 48 of the Texas Parks and Wildlife Code.

There are 441 commercially licensed fish farmers in Texas producing from approximately 500 acres; but currently there are no processing plants. Several species of fish, including catfish, redfish, crawfish, shrimp and tilapia are being raised by Texas producers.

Rice, wheat, sorghum, corn, soybeans, and cotton, all crops grown by the Texas agricultural community, are primary ingredients in the food for farm-raised fish. A significant increase in fish farming could provide a new and constant market for the agricultural farmers of Texas. For example, for every acre of catfish produced, four acres of soybeans are required to provide food stuffs for adequate feed requirements (USDA Extension Service, Washington, D.C.).

These readily-available farm commodities for food stuffs, coupled with a moderate year-round climate, provide Texas fish farmers a competitive edge over other states and countries. As world demand for fishery products escalate, imported fish products will become more
costly. By then, Texas farmers will be ready to provide their products to a ready market in the state, the country and the world.

III. LEGISLATIVE HEARING

The Senate Committee on Natural Resources held a public hearing in Galveston, on September 30, 1988, to allow interested parties to express concerns and recommendations regarding aquaculture.

Mr. James T. Davis, fisheries specialist of Texas Agriculture Extension Service of the Texas A&M System, informed the Committee of the availability of resources in Texas for the expansion of aquaculture, its potential economic impact and its relativity to nutrition and over-fished species. But, according to Davis, legal restraints in Texas are excessive and require the approval of nine state and federal agencies, while some states only require the approval of one agency. Furthermore, Davis contended that Texas must assist private sources with funding and research of aquaculture and designate a single agency to oversee the operations if expansion in this area is desired.
Mr. Jeffrey E. Boies, President of Sysco Food Services, testified that his company currently markets 17 million pounds of catfish (mainly out of Mississippi). He reported that the aquaculture market is growing at a rate of 30-40% per year and will continue to grow as the shortage of game fish continues. Boies stated that Texas has many advantages over other states which could help produce superior harvests. In addition, Boies stated that it makes sense for Texas to be competitive in the field.

Mr. Paul C. Barrett, President of Fish Management Incorporated, presented the Committee with some impressive statistics outlining the potential for aquaculture in Texas. According to Barrett, Mississippi reports yearly catfish sales in excess of $300 million, a payroll for the processing of $76 million (most of which were unemployed upon hiring), and expects a 70 million pound shortfall in the Spring of 1989. Barrett stated that Texas consumes 32.2 percent of all farm raised catfish produced in the U.S. and 7.6 percent of all seafood and fish produced and brought into the U.S. Furthermore, Barrett recommended that the Texas Department of Agriculture oversee the operations of aquaculture and fish farming.
All public testimony favored expansion of aquaculture in Texas and most indicated support for:

* defining aquaculture as an agriculture endeavor,
* eliminating many regulations,
* defining oversight under one agency and
* establishing framework for continued state government support.

However, a representative from a Houston sportsmen's club believed that scrutinized regulation of the aquaculture industry was necessary to protect the state's natural resources.
BEACH EROSION
BEACH EROSION
I. OVERVIEW

Coastal geologists peering into the dark side of erosion are discovering that because of this dynamic process, an astonishing amount of acreage that used to be onshore, is now submerged a considerable distance offshore. Daily scouring by wave action, frequent pounding by storms and relative sea level changes, coupled with a variety of human activities, have dramatically changed the configuration of our nation's and our state's shorelines. Texas beaches, especially those located on the Gulf side of the barrier islands, are a valuable asset to the State's economy, but the State has no program to manage or protect them. Management of coastlines, and their protection from erosion, has become a highly controversial and emotional issue, and is a problem the state must ultimately address.

II. BACKGROUND

Shorelines can be defined as the general region where sea level intersects land and represent the interaction between marine and land
environment. The most familiar characteristic feature of a shoreline is the sandy beach area. Beaches are highly visible, ever changing features, defined by scientists as areas of high wave energy where accumulations of sand, shell fragments, pebbles and other similar material, are deposited along the seaward side of the shore. In Texas, the width of the beach is measured from the mean low tide line, shoreward to some natural physiographic change, such as a dune, a sea cliff, or to the part where permanent vegetation is established (Fig. 1). According to this definition, almost all of the Texas shoreline that fronts the waters of the open Gulf can be classified as beach.

Beaches are being constantly changed by the natural processes of erosion. Erosion can be explained as the net loss of land that occurs when more material is removed from a shoreline area than is deposited. Major causes of erosion can be natural cyclic phenomena, man-made activities, or a combination of both. Wave action, tides, relative sea-level changes, availability of sediment supply and storms, are the natural phenomena that create beach erosion. Except during storms accompanied by high winds and wave surge, these natural processes are usually calm, slow, and mild mannered. Continuous wave action transports and deposits sediment along beaches, playing a major part in determining their configuration.
A major long-term cause of erosion is the gradual rise in sea level. During the past 100 years, the ocean has risen more than a foot, a rate faster than any time in the past 1,000 years, and the resulting erosion is damaging. Sea-level fluctuations are part of a natural cycle, but some scientists believe the current rise is magnified by a fundamental change in world climate called the greenhouse effect. This is the theory that carbon dioxide and other industrial gases are trapping heat in the atmosphere and warming the earth as if it were a greenhouse. Another possible cause of sea-level rise is subsidence or the sinking of the land surface. Withdrawal of groundwater and hydrocarbons from the subsurface for industrial and municipal use may be causing compaction of formations. The slow, day-to-day processes are considered minimal, but they are cumulative, and they are damaging.

The most rapid erosion of beaches is produced by hurricanes and tropical storms. Waves accompanying high velocity winds can erode and transport huge quantities of sand, completely changing the character of a beach area or causing it to disappear altogether. These major storms can do more damage in a few hours than the day-to-day processes can do in years.

The natural processes of erosion have been intensified in some areas by human activities. Man has both directly and indirectly caused
beach erosion through processes which restrict the free and uneven exchange of sediments. The damming of rivers for municipal, industrial and recreational use has cut off sand supply which normally nourishes beaches. Dredging of harbors and channels to aid in commercial shipping and naval operations has robbed shorelines of sand supply. Construction of beach homes, lodging and dining facilities, and recreational and municipal buildings in sensitive areas along the beach has contributed to erosion. The building of jetties and seawalls has blocked or changed the natural flow of sediments contributing immeasurably to erosion. Lastly, continuous vehicular and pedestrian traffic on beaches has interfered with the effectiveness of natural protection against erosion.

III. TEXAS PROBLEMS

The Texas coastline stretches approximately 400 miles along the Gulf of Mexico from Port Arthur to Brownsville. Paralleling the main coastline for more than 300 miles is a series of long, narrow strips of land called barrier islands and peninsulas. Composed of a complex system of endlessly shifting sand dunes, beaches and submerged bars, these islands and peninsulas serve as the front line of defense for the mainland against hurricanes and other tropical storms. The sand dunes bordering the Gulf side of these islands act as a natural
seawall absorbing and dissipating the forces of wind-driven waves and thus preventing or reducing inland flooding. The dunes also store sand that replenishes the beaches after storms. The movement of these islands is dynamic, and when left alone, experts say they gradually move up the broad, sloping coastal plain and redeposit. Development practices that do not consider the natural processes peculiar to barrier island dynamics can upset the natural balance of the entire coastal ecosystem.

As areas of natural beauty, these islands and peninsulas offer a variety of recreational opportunities to man: boating, swimming, surfing, fishing, hiking, picnicking, camping, and nature study. As convenient port sites, they house facilities for commercial fishing and shipping operations. And in recent years, they have become increasingly popular as sites for second homes, permanent residences, hotels, and other types of tourist development. These human activities have contributed to the changes and imbalances in the natural movement of the sediment along the shoreline, significantly increasing erosion on the Texas coast.

The most severe erosion on these islands occurs along the Gulf side where approximately 60 percent of the shoreline is experiencing continuous long or short term erosion. At least 100 acres of beach front and 300 acres of bay front are wrested away each year resulting
in multi-million-dollar losses to landowners and tax rolls. Dozens of houses that were on the third and fourth rows back from the beach twenty years ago are now beach front property; and twenty years from now, they will be long gone, and the property where they now are located will be hundreds of feet out in the Gulf.

In the central Gulf Coast community of Sargent Beach, 20 miles south of Freeport, between the years of 1852 and 1987, more than 2000 feet of beach front land was eroded from the seaward side of the barrier island. In 1952, this island was 2037 feet wide; today, natural wave action and currents, eroding at the rate of 100 feet per year, have reduced it to a strip only 600 feet wide. Engineers estimate that in six to ten years, the Gulf will breach the Island into the Texas Intracoastal Waterway, blocking barge traffic which, according to Ron Dansby, President of the Texas Waterways Operators Association, could create a disaster that might be worse for the Texas economy than the oil and gas bust of the early 80s. In 1987, property lots on Sargent Beach tax rolls were appraised at only $250 each, while just 18 miles down the coast on Matagorda Beach, similar 50-by-150-foot lots were valued at $10,000. Erosion continues to swallow up this island, decreasing the value of the remaining property.

Slower, but continuous erosion rates are causing concern in several other communities along the Texas Coast. Experts report that beach
front property along a 28-mile stretch on Bolivar Peninsula from High Island to Port Bolivar, is washing into the Gulf at rates of 8 feet per year, causing residents much concern. Beach front property has been lost on South Padre Island, where the annual erosion rate averages between 8.25 feet and 9.24 feet. These two areas, plus Sargent Beach, are the principle points in Texas where the shoreline, from the geological past to the recent times, has been continuously eroding with no replenishment. Also, there are reports that, since 1945, one ranch in Calhoun County has lost more than 1200 acres to erosion.

Galveston Island is the most heavily developed of the barrier islands. It is protected by a 17-foot, 10-mile long seawall, completed more than 61 years ago. At the completion of the construction, an Army Corps of Engineers report showed that the beach extended as far as 300 feet on the Gulf side of wall; however, there are few signs of that sandy vista today. The portions of the city directly behind the wall are protected, but the beach in front of the wall is gone, and that on either end of the wall is rapidly eroding away.

Hurricane and storm erosion losses can be tremendous. One of the more macabre manifestations of such erosion was the loss of a dozen graves at San Leon Cemetery during Hurricane Carla in 1961. After Hurricane Alicia in 1983, coastal homeowners discovered that the storm had moved
the vegetation line inland hundreds of feet, resulting in a significant amount of private property sitting on the beach areas with open access to the public. A number of law suits ensued.

When trying to understand the causes of erosion along Texas beaches, and looking for ways to preserve them, one must consider a philosophy adopted by the state in 1959: that the use of the Texas beaches is open to all citizens of the state and all visitors. The Texas Open Beaches Act (TEX. NAT. RES. CODE Sec. 61,011 et seq.) designates the area between the mean low water line to the line where permanent vegetation is established as public property, and that any structure that impedes public access or use of the area is subject to removal by order of the Attorney General of Texas.

When hurricane and storm erosion occurs, problems of erosion relative to the Open Beaches Act take on a new significance. Within a few hours, private land and structures can suddenly be standing on the protected areas of the public beach and thus become property of the state. Controversy is inevitable and numerous law suits have been filed.
IV. **BEACH MANAGEMENT**

Management of Texas' coastlines and the protection from erosion has become a highly controversial and emotional issue. The public's right to access and use of the beaches collides head on with the normally accepted rights of private property owners, especially when that property is located on a dynamic beach.

The erosion control issue has been debated by experts throughout the world and rarely has a consensus been reached by the two opposing factions—those that believe that beaches can be rehabilitated by combining modern technology and engineering skills with understanding of the forces of nature, versus those who believe that people should accept nature's forces, learn to live with the dynamic changes of the coast, and avoid any physical changes to the coastal areas to meet human needs.

Coastal experts and residents who encourage rehabilitation and restoration, are trying everything from constructing seawalls to replenishing beaches with new sand in their attempt to stabilize transient shorelines. Some of these projects have solved the local community problems temporarily, but they are expensive. If a community has enough money, they can slow erosion in the short run,
but in the long run, this is not the answer. In the end, the sea usually wins.

The other faction believes that erosion is nature's process, that it will continue no matter what actions are taken to impede it. Their feelings are that the impetus for shoreline stabilization, touted by the other faction, comes mainly from owners of beach front buildings and from sympathy generated by the loss of private property. It is their contention that shoreline erosion and the advancing ocean is not the problem for beaches, only for the buildings and the people that own them. Taxpayers, increasingly aware of the facts, are beginning to resist paying for expensive stabilization.

Any attempt to reach a middle ground between these two opposing factions must include long-term coastal management planning done with a healthy respect for the dynamic natural resources at work.

Texas is the only one of 30 coastal states in the nation that has not adopted a coastal zone management plan. Over the years, the legislature has conducted numerous studies of Texas shoreline issues and related problems, but many of the seemingly sound recommendations from these studies were never implemented; perhaps because of lack of funding or the absence of a continuous coordinated effort by the state.
Currently, there is no single state agency charged with the responsibility for management of one of the state's most valuable resources. There are at least 18 state and federal agencies involved in Texas coastal matters, including: the Texas General Land Office, Texas Parks & Wildlife Department, Texas Bureau of Economic Geology, Texas Department of Health, Texas Highway Department, Texas Water Commission, Texas Water Development Board, Texas Railroad Commission, Texas Air Control Board, Texas Antiquities, Attorney General of Texas, U.S. Corps of Engineers, Environmental Protection Agency, U.S. Soil and Conservation Service, United States Geological Survey, U.S. Fish & Wildlife Service, Mineral Management Service and National Marine Fisheries Service.

As development increases and erosion continues, clashes between public and private entities, affected by this natural phenomena, will continue. The only way to avoid escalating problems is to develop state policies and guidelines for long term coastal planning. Even though federal assistance in coastal planning exists, planning and management is ultimately the problem the State of Texas must address.
Texas has attempted to protect its coastal lands since the turn of the century. In 1911, the Legislature passed laws regulating the disturbance of bay bottoms by dredging or filling. In 1959, the Texas Open Beaches Act (Tex. Nat. Res, Code Sec. 61.011) was passed in response to an attempt by private landowners to close some of Galveston Island's beaches to the public.

The Open Beaches Act guarantees the public's right to unrestricted access and use of the state owned portion of Gulf beaches below the line of mean high tide and the larger area extending from the mean low tide to the line of vegetation bordering the Gulf, in all areas where the public has an easement through prescription, dedication or continuous rights.

Other major legislative protection of Texas beaches came late in the late 1960s and early 1970s. In 1968, the Texas Sea Grant Program was established as a partnership between universities, government and industry to encourage the wise use and conservation of the coast. In 1973, the Legislature revised the navigation district laws requiring that any commercial use of public coastal land be limited to marine commerce and navigation. It allowed navigation districts to lease, rather than purchase, state owned land, and prohibited navigation
districts from selling the land they had previously bought, except to the State of Texas. The 63rd Legislature passed the Coastal Public Land Management Act, which granted the School Land Board the power to use and protect coastal lands. Provisions of this Act allow cities and counties to lease coastal public lands for recreational uses, educational institutions for research, the Parks and Wildlife Department to create and maintain estuarine preserves, and other tax-exempt groups to manage wildlife refuges. Also, this Act legalizes and regulates the activities of the owners of the littoral coastal public areas.

Other legislation passed includes the establishment of the Gulf Coast Waste Disposal Authority, 1969; the Texas Coastal and Marine Council, 1971; Public Right to Freshwater Inflow, 1971; the Dune Protection Act, 1971; the Wetlands Protection Act, 1973; and the Texas Energy and Natural Resources Council, 1978.

Despite the enormous amount of research conducted and legislation passed for the protection of public coastal lands, many of the same problems remain. The difficulty in legislating solutions to the problems of coastal erosion, and its effect on land owners and the public, stems from the differing characteristics of the coast. The focus of future legislation may need to be more localized as the state
continues to work toward the preservation and management of its coastal lands.

VI. LEGISLATIVE HEARING

The Senate Committee on Natural Resources held a public hearing on September 30, 1988, in Galveston. The hearing was held to allow the public to express their concerns and recommendations on the subject of beach erosion.

The Honorable Jan Coggeshall, Mayor of the City of Galveston, discussed erosion problems in the Galveston area and asked the Committee to consider assisting local communities with beach renourishment programs as a solution to beach erosion in Texas.

Dr. Robert A. Morton, Senior Research Scientist with the Texas Bureau of Economic Geology, informed the Committee that there are three areas in Texas that have been eroding at very high rates for a long period of time. They are the beach area from Sabine Pass to Rollover Pass, the strip from Freeport to Matagorda Peninsula, and the seaward side of South Padre Island. In addition, Morton said that Galveston Island has recently shown high rates of erosion. He concluded that erosion is inevitable due to decreasing sediment supply and sea level rise;
but that costly temporary solutions, such as the implementation of hard structures and renourishment, are available.

Ms. Sharron Stewart, Coastal Resources Chairman of the Texas Environmental Coalition, testified that the organization she represents favors nonstructural methods of erosion control. She stated that in 1979, Texas was eligible for $1.3 million to initiate a Coastal Management Program. She indicated that the money from these funds is still available and could help mitigate the cost of erosion control if the state would reapply for the funds. Stewart made the following recommendations: (1) that the Dune Protection Act be extended to Cameron and Willacy counties; (2) that a dune vegetation nursery be established for the revegetation of all state beaches; and that instruction be given to individual citizens and counties. Ms. Stewart realizes that the programs and plans she proposes are expensive, but that the returns on such investments would be high also.

Mr. Joe Faggard, Constable of Bolivar Peninsula, testified that three rows of houses have disappeared from beach front property due to storms in the many years that he has resided on the Peninsula, and that 12-15 feet of beach disappeared during the one-day siege by hurricane Gilbert in September, 1988. He stated that the people of
the Peninsula need the state's assistance to mitigate the losses which have taken place over the years due to erosion.

Dr. Craig Everts, a coastal geophysicist with Moffatt & Nichol Engineers of Longbeach, California, discussed the advantages, disadvantages and economics of hard structures used for erosion control. He stated that beach replenishment should involve a two-step process that first places sand on a beach and then periodically renourishes it to maintain a specific beach width. Everts added that every hard structure solution should be accompanied by beach replenishment.

Mr. Lee Otis Zapp of Lee Otis Zapp Insurance Agency, Inc., explained that the state's beaches are a tourist attraction which can help the sagging economy of the state. He recommended and suggested that the best interest of all Texans could be served if the State would: enact a program to replenish beaches lost to erosion, allow private land owners to recharge beaches to some degree, and compensate land owners whose property become public access as designated by the Open Beaches Act.

Ms. Sally Davenport, Director of the Coastal Division of the General Land Office, discussed the agency's roll in the management of coastal public lands. She also informed the Committee that Galveston Bay was
recently declared an estuary of national significance by the EPA and that Texas received federal funding for its protection. Davenport stated that in the future, such funding will not be available to coastal states that have not established a Federal Coastal Zone Management Program (Georgia and Texas). Moreover, according to Davenport, Texas would have more authority in coastal matters if it has a coastal management program because federal agencies' actions must be consistent with individual state Federal Coastal Zone Management Programs.

Mr. Ken Cross, Assistant Attorney General of Texas in the Environmental Protection Division, explained that Texas has some of the most publicly accessible beaches in the country making them a very strong component of our tourist economy. These beaches provide relatively inexpensive recreation areas not only for in-state residents, but for numerous out-of-state visitors as well. However, Cross stated that a lawsuit is often the end result when erosion occurs, and the land on which a privately-owned structure is located transgresses seaward of the vegetation line.

Because of this, Cross recommends legislation that:

--requires that future beachfront construction follow a set-back rule where structures can be built only in pre-approved locations according to some kind of annual erosion rate calculation;
--forbids the construction of hard structures, such as seawalls and bulk heads, since they appear to cause additional problems; and,

--legislation that encourages soft approaches under certain guidelines, such as nourishment.

In addition, Cross proposed that a grandfather clause mentioning a specific time period be initiated when houses transgress past the vegetation line, and that a fund be created for the clean up of hazardous waste when property is abandoned.

The majority of public testimony came from property owners who support the introduction of legislation to aid in the resolution of beach erosion problems.
Geomorphological profile of a generalized beach as defined by the TCMP (adapted from Bird, 1968; King, 1972; and Komar, 1976—with modifications).
Index map of the Texas Gulf shoreline.
WETLANDS
I. OVERVIEW

Wetlands occur throughout the United States and comprise approximately five percent of the contiguous states. According to federal statistics, about 95 percent of the wetlands occur in a freshwater environment and the remainder occurs in a coastal saltwater environment. There are numerous definitions of wetlands and they generally agree that the land must be, to some degree, water saturated. Examples of wetland environments interpreted from some of the available definitions include swamps, bogs, marshes, estuaries, tundra, bottomland hardwoods, riparian wetlands and even potholes and playa lakes.

Texas is basically a wetlands-poor state with only five percent of state land located in wetland environments. The major wetland ecosystems in Texas include coastal marshes and estuaries, bottomland hardwoods, and other forested lands concentrated in the Pineywoods region, and playa lakes concentrated in the Panhandle. These ecosystems are very important to the North American waterfowl because Texas is the primary overwintering area for these birds in the Central Flyway (Texas Parks & Wildlife Department, 1988).
Since the early settlement of the American continent, wetlands have been considered by some people to be wastelands, areas that breed disease-carrying insects, and impediments to travel and agriculture. Over the years, through man's attempt to convert these lands by drainage, fill, construction, or conversion to other uses, numerous acres of wetlands have been lost. Natural resource specialists have made several estimates of wetland losses, the most recent published by the U.S. Fish and Wildlife Service (FWS) in 1984. This estimate, published in "Wetlands of the United States: Current Status and Recent Trends", states that, since colonial times, 54 percent of the original wetland acreage in the lower 48 states has been lost. The FWS estimates that 87 percent of recent wetland losses have been caused by agriculture, while urban and other development are responsible for the other 13 percent. Although the accuracy of these statistics has been questioned, the net-loss trend has not.

Resource managers, conservationists, sportsmen, preservationists, and others, generally agree that wetlands are very important, and that wetland acreage is indeed declining. As a result, both the public and private sectors have increased initiatives to protect wetlands habitat. Following major changes in the federal administrative role during and since the 1970's, private sector reaction to the methods
and effects of some wetlands policies and programs have made wetlands a highly controversial issue.

In 1972, Congress passed the Federal Water Pollution Control Act to restore the biological, chemical, and physical integrity of the Nation's waters. Following passage of the Act (now commonly known as the Clean Water Act), the U.S. Environmental Protection Agency (EPA), the principle administrative agency for the Act, assumed regulatory control over wetlands as "waters of the United States". In 1974, the Fish and Wildlife Service initiated the National Wetlands Inventory (NWI) project to inventory all U.S. wetlands, and developed new wetlands definitions and classifications for that purpose. The major element of the NWI is the mapping of the entire United States for wetlands. Created under the new definitions, the NWI maps show numerous land and water features, both natural and man made, which could not have been considered wetlands under previous descriptions. Through various Federal Court actions, wetlands have been added to the jurisdictional scope of "waters of the United States".

In 1985, the EPA administratively determined that any water feature, including wetlands, which could be used by migratory birds crossing state lines, is subject to federal Clean Water Act regulatory jurisdiction, regardless of ownership, by virtue of the interstate commerce powers of Congress. This position was accepted as regulatory policy by both the U.S. Army Corps of Engineers (Corps) and the Fish
and Wildlife Service. Since Texas land is over 90 percent privately owned, this ruling has become a focal point in attempts to resolve wetlands issues—especially in terms of private lands and waters. Probably the strongest debate is over the matter of defining wetlands, both as a resource and as jurisdictional waters. Because wetlands are actually lands in a particular condition (as opposed to a use), and because almost all lands are wet to varying degrees of frequency and duration, the question really is, 'How wet is wet?'

II. WETLANDS DEFINITIONS

"In general terms, wetlands are lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface." ("Classification of Wetlands and Deepwater Habitats of the United States", Fish and Wildlife Service, 1979).

Wetlands serve several unique functions, the most important of which is probably habitat for various dependent wildlife species, such as waterfowl. Wetlands essentially include swamps, marshes, bogs, and other such lands which have a water-dominated condition or plant population. Depending on size, character, and location, wetlands can sometimes affect surface and groundwater quality and volume, downstream sedimentation, and other ecological factors. Wetland
environments offer certain plant and/or animal habitat possibilities not available in other land conditions. While there are certain species of plants and animals that live solely in a wetland environment, some species cannot routinely survive under these conditions.

Although wetlands seem to be clearly perceived by specialists and non-specialists alike, they have apparently been difficult to define. Most definitions suggest that the essential wetland characteristic is water. Beyond this, however, there seems to be little agreement on how wetlands should be distinguished from non-wetlands or simple water concentrations. For example, there are at least eight different definitions currently used by federal agencies: The Fish and Wildlife Service uses three definitions, one for the National Wetlands Inventory mapping project, one for descriptive literature, and one for various other purposes; the 1985 Food Security Act and the 1986 Emergency Wetlands Resources Act use a different definition; pursuant to the Clean Water Act, the EPA and the Corps still developed another definition of wetlands; the Bureau of Land Management uses its own definition, as does the Federal Emergency Management Administration; and, finally, the U.S. Forest Service and the U.S. Farmers Home Administration yet use a different one.

The least discerning of these is the administrative definition used by the FWS for the NWI mapping project. Like most of the others, this
definition considers plants, soils, and hydrology (water regime). However, unlike most others, it identifies a land site as a wetland if even a single positive indicator for any of these factors is found. Furthermore, national lists of "wetland indicator" plants and soils have been developed for this definition; the list for Texas includes about 40 percent of all plants native to the State. Many critics of this approach, including the U.S. Soil Conservation Service (SCS) in Texas, believe that this definition and the national indicator lists lead to the classification and mapping of many non-wetlands as wetlands. Field reviews by the Texas General Land Office and the Texas Water Commission indicate that all land depressions which could either collect or hold water, even temporarily, are normally mapped as wetlands under the NWI definitions.

III. THE NATIONAL WETLANDS INVENTORY (NWI)

In 1974, under no particular statutory or regulatory direction, the Fish and Wildlife Service designed the National Wetlands Inventory project to map all wetland areas of the United States so that information would be readily available to make quick and accurate resource decisions. Preparation of status and trends reports on all U.S. wetlands were to be included as a part of the program. Inventory maps were produced from interpretation of high altitude photographs of the land surface. Initially, the most extensive mapping activity
focused on the arid southwestern states (Arizona, New Mexico, and Texas). The first status and trends report was published in 1984 and included dramatic statistics on wetlands losses. This report served as part of the basis for the Emergency Wetland Resources Act (EWRA) draft of 1985. As Senate Bill 740, the 1985 EWRA draft basically provided for state and federal management and acquisition of wetlands and directed completion of the NWI mapping project.

Several Texas organizations reviewed some of the NWI maps for the State and expressed serious concerns about the use of the NWI wetland definition in Senate Bill 740. As a result of these concerns, the bill was amended in committee and the FWS definition was replaced with one which closely follows the definition jointly recommended by Ducks Unlimited, the International Association of Fish and Wildlife Agencies, the National Rifle Association, the Texas and Southwestern Cattle Raisers Association, the National Wildlife Federation, the National Cattlemen's Association, the Wildlife Management Institute, and the Texas General Land Office (copy in pocket). The amended version passed as the Emergency Wetlands Resources Act of 1986. The FWS has not yet adopted this statutory definition for NWI mapping purposes.

The U.S. Soil Conservation Service (SCS) reviewed some of the NWI mapping in Texas and field tested some of the areas. The following shows the agency's concerns with the project results:
In 1980, the SCS evaluated NWI wetland maps of the Panhandle and South Plains. SCS field checks reported map error rates ranging from 48 percent to 100 percent. The summary opinion questioned the accuracy of NWI and stated that it was not reliable for use in long range planning.

In 1982, the SCS conducted national field tests of the NWI system. SCS in Texas recommended that the system not be adopted.

In 1984, the SCS conducted field tests of the NWI classification system using the national lists of wetland indicator plants and soils. The agency concluded that the FWS system was not applicable for Soil Conservation Service field office use.

In 1985, after reviewing draft NWI maps for El Paso and Hudspeth counties (Texas), the Texas General Land Office (GLO) conducted wetland map field evaluations of 56 of the approximately 3000 designations in Hudspeth county. The GLO concluded that, except for seven SCS flood control structures and irrigation district facilities, none of the mapped sites should have been classified as wetlands under the NWI definitions. The study resulted in a field review with the Fish & Wildlife Service, the General Land Office and Texas Southwestern Cattle Raisers in which the FWS acknowledged that the only basis for mapping these features was that they collected water during rainfall events.

In 1986 and 1987, The Texas Water Commission (TWC) reviewed statewide NWI wetland map samples and concluded that all chemical, industrial, municipal, and agricultural wastewater treatment facilities had been
mapped as wetlands, even though many were in fact non-wetlands. This review resulted in correspondence with Clean Water Act agencies and the U.S. Congress over concerns that such classifications potentially impaired the Commission's ability to carry out the Texas water quality and water rights programs.

In addition, a number of Texas private sector organizations have studied the NWI mapping project. Since 1985, formal resolutions calling for a U.S. statutory definition of wetlands and congressional oversight of the NWI project have been adopted by the Texas Section of the Society for Range Management, the Texas Association of Soil and Water Conservation Districts, the Texas Farm Bureau Federation, and the Texas & Southwestern Cattle Raisers Association. Essentially the same concerns have been expressed in letters from the General Land Office, the Texas Water Commission, and the Texas Wildlife Association.

The Fish and Wildlife Service has maintained that the NWI is a purely scientific project, both in process and purpose, and that political concerns are unwarranted. However, in 1985, an internal FWS document entitled National Wetlands Briefing Book FY 85 stated "There are probably 100 different uses of the wetland maps. The following is a list of documented uses:
...regulatory and jurisdiction, permit review, legislation, litigation, waste treatment (solid and water), oil-spill planning, environmental assessment, environmental impact statements, land-use planning, town planning, highway design and planning, land acquisition, watershed planning, river basins planning, enforcement, project siting studies, rural electrification loans, soil and water conservation loans, zoning, ...

The NWI mapping is roughly 50 percent complete, nationally, and about 70 percent complete in Texas (See map in pocket).

V. LEGISLATIVE AND REGULATORY HISTORY

FEDERAL

The Clean Water Act (CWA) provides for federal regulation of discharges of pollutants into navigable waters of the United States. Navigable waters are defined by the Act as "the waters of the United States, including the territorial seas". Discharges of pollutants are basically regulated by federal permit under two sections of the CWA:

---The Section 404 permit, which deals mainly with earthwork activities, is administered by the U.S. Army Corps of Engineers (Corps). This permit is often called the "dredge and fill" permit and is required prior to depositing dredged or fill material in waters of the United States. Though the Corps issues the permits, the EPA has final authority over permit decisions.

---The Section 402 permit, which deals mainly with water discharges, is administered by the U.S. Environmental Protection Agency (EPA). This permit is required prior to discharging
pollutants into waters of the United States. The Section 402 permit is often called the "water quality" permit or the NPDES (National Pollutant Discharge Elimination System) permit.

—though permit jurisdiction has been administratively separated between the EPA and the Corps of Engineers, in 1986, the two agencies signed a Memorandum of Agreement to the effect that soil is solid waste for purposes of CWA permitting by both agencies.

The U.S. Fish and Wildlife Service (FWS) is assigned a consulting role in CWA permitting by the Fish and Wildlife Coordination Act.

Federal CWA permit jurisdiction over navigable waters was interpreted to include wetlands in rules developed by the EPA and the Corps following the CWA amendments of 1977. Federal jurisdiction under the Clean Water Act and the administrative rules is based on the power of Congress to regulate interstate commerce under the commerce clause of the U.S. Constitution. The authority of federal agencies to regulate wetlands as "waters of the United States" under the CWA was ultimately confirmed by the U.S. Supreme Court in 1985 when the Court agreed with the Corps that wetlands adjacent to waters of the United States were also waters for purposes of Section 404 permit jurisdiction.

The question of "isolated" waters and wetlands, coming under the federal commerce clause jurisdiction, was answered by the EPA in a 1985 legal opinion which held that any wetland or water body which could be used by migratory birds is in interstate commerce and, as such, a jurisdictional water under the commerce clause. Although this
position has not yet been tested in court, it has been adopted for CWA permitting purposes by the EPA, the Corps, and the FWS.

The matter of wetlands under federal jurisdiction was opened by administrative interpretations of "navigable waters", and subsequent rules which have been considered in several court cases where the court decisions have referred back to the rules themselves for guidance. At this time, no cases are known where the courts have had statutory guidance in defining wetlands. The following court cases have been instrumental in determining the regulatory/jurisdictional status of wetlands:

--1983, Louisiana; Avoyelles Sportsmen's League, Inc. v. Marsh (U.S. Fifth Circuit Court of Appeals). This case placed wetlands under the CWA Section 404 permit regulation and confirmed the EPA as the ultimate approval authority for permit decisions.

--1985, Michigan; United States v. Riverside Bayview Homes, Inc. (U.S. Supreme Court). The Court held that wetlands adjacent to waters of the United States are under CWA Section 404 jurisdiction, even if the source of water making such lands wet is not the adjacent water. It also suggested that plant similarity over distances could establish adjacency.

--1986, California; United States v. Robert W. Akers (U.S. Ninth Circuit Court of Appeals). The court held that certain farming practices on man made wetlands represented "new operations" and, as such, fell outside the "normal farming" exemptions of the CWA. Case rationale and Corps testimony suggested that a Section 404 permit could be required to stop irrigation of a farm tract or to change from one wetland crop to another.

--1986, Florida; Florida Rock Industries, Inc. v. United States (U.S. Eleventh Circuit Court of Appeals); held that denial of a Section 404 permit to use property specifically held for that use does not necessarily amount to a "taking" under the Fifth
Amendment and that if a judgement is sought for such a taking, it can be considered only for that part of a property for which the permit was sought and denied (the Corps had refused to consider a permit for the complete tract in a single application).

—1987, Texas; National Wildlife Federation v. Alan W. Laubscher (U.S. District Court, Galveston). In this case, often called the Delta Lake Case, the Corps was sued for refusing to take CWA jurisdiction over an "isolated water and adjacent wetland" designated by the FWS as Pond 12. With a history of being fanned at least since 1944, the site was flooded by Hurricane Beulah in 1967, causing salt damage to the site. Later, drainage failed because of a blocked flume under a county road and cultivation was subsequently abandoned. In 1984, the Delta Lake Irrigation District extended a lateral drainage ditch into the site as part of an ongoing salinity control and reclamation project. The District and landowners were also named as defendants and damages were sought against them by the National Wildlife Federation, the Frontera Audubon Society, the Sierra Club, and a woman who said she had remained on a nearby county road to study the property for bird usage. Unknown to the District and landowners, since 1984, the FWS had urged the Corps of Engineers to take Section 404 jurisdiction and initiate enforcement. The Corps declined to do so on several occasions. The District and landowners learned of the FWS opposition to their activity only after the suit was filed in 1986, almost two years after the work was completed. The case was not tried, but in setting the action aside, the court indicated acceptance of the isolated wetlands/waters and migratory bird use doctrines.

The 1986 Final Rule for Regulatory Programs of the Corps for CWA permitting states that the Corps reserves the right, on a case-by-case basis to determine, if a particular waterbody within these categories of waters is a water of the United States. The EPA also has the right to determine on a case-by-case basis, if any of the following features are waters of the United States:

(a) non-tidal drainage and irrigation ditches excavated on dry land,
(b) artificially irrigated areas which would revert to upland if the irrigation ceased;

(c) artificial lakes or ponds created by excavating and/or diking dry land to collect and retain water which are used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing;

(d) artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating and/or diking dry land to retain water for primarily aesthetic reasons; and

(e) waterfilled depressions created in dry land incidental to construction activity, and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel.

STATE

Senate Bill 1000—During the 70th Legislative session, Senator H. Tati Santiesteban sponsored Senate Bill 1000, designed to regulate the acquisition of natural areas and wetlands. The bill would have added Chapter 84 to Subtitle E, Title 5, of the Parks and Wildlife Code, and would have provided a definition of wetlands and natural areas including characteristics and examples. The bill proposed a plan by which to assess, collect and administer funds for the acquisition and maintenance of natural areas and wetlands. The bill was left pending in Committee.

Wetlands Addendum to the Texas Outdoor Recreation Plan (TORP)—The federal Emergency Wetlands Resources Act (EWRA) of 1986 mandates the State to specifically address wetlands as an important outdoor recreation resource for the fiscal year 1988 and thereafter. Hence,
the state is required to prepare a wetlands addendum to the Texas Outdoor Recreation Plan (TORP) of 1985 and incorporate the information in the 1990 TORP. The addendum, which was prepared by the Texas Parks and Wildlife Department, was required to be submitted by January 1, 1988, in order for Texas to remain eligible to receive Federal Land and Water Conservation Fund (LWCF) monies. These LWCF monies, which are administered by the National Park Service, are provided to each state and to various federal agencies to assist in acquiring and developing public outdoor recreational areas.

In addition to the Texas Parks and Wildlife Department, several other state agencies, such as the Texas Railroad Commission, the Texas Water Development Board, the Texas Water Commission, the Texas General Land Office, the Texas Department of Highways and Public Transportation, and the State Soil and Water Conservation Board, may have to be concerned with wetlands management and policy in the future.

IV. POTENTIAL ISSUES

Texas has one of the largest reserves of fresh water in all the states, and unlike many others, it is virtually all man made. Almost all the water storage facilities, from windmill overflows to international reservoirs, have been classified as wetlands. As such,
they are exposed to federal Clean Water Act permit requirements. This includes both public and private facilities.

Citrus, forest, grain, vegetable, and fiber crops are very important to the Texas economy. Now, irrigated fields and many other croplands are included within the regulatory definition of wetlands. Moreover, although the Clean Water Act specifies an agricultural exemption for normal farming practices, the FWS in Texas has argued with the Corps of Engineers that if plowing changes the wetland character of a tract, it is not an exempt activity, and should be considered a non-exempt discharge requiring a Section 404 permit.

Texas municipalities and industrial operations are experiencing increased pressures for waste and wastewater treatment, primarily through regulation and enforcement by the Texas Water Commission. Under EPA and Corps rules, state-regulated waste control/treatment facilities are exempt from the CWA permitting process. The wastewater treatment system used by the City of Cactus, Texas, is subject to State regulation, but in 1986, the EPA served notice on the city that a Section 402 permit would be required to continue operation of their waste facility because of possible use by migratory birds. The inclusion of wastewater treatment facilities within the regulatory definition of wetlands appears to add at least one, and possibly two, layers of federal permit requirements before state waste control permits can be exercised.
In all cases, a major problem is that federal Clean Water Act permits are extremely expensive and time-consuming to pursue. Even if a permit would eventually be granted, the costs could be prohibitive, especially for individual applicants such as ranchers and farmers, small businesses, lesser units of government, such as rural counties and small cities, and irrigation, conservation, and flood control districts. Indiscriminate federal wetland classifications present many potential problems to all sectors and, while the full implications have not yet been demonstrated, certain possibilities can be anticipated. Some examples for which Section 402 and/or 404 permits could now be required are:

--construction of stormwater containment facilities such as stockwater ponds, reservoirs, and waste control ponds;

--cleaning, dike/dam and spillway repair, and other maintenance involving earthwork;

--tailwater capture by farm irrigation facilities using return-flow conservation;

--sediment traps, field terraces, waterways, and other soil conservation practices;

--plowing and other cultivation practices;

--irrigation of an existing crop;

--changing from one crop to another on "farmed wetlands";

--stopping irrigation on a man-made wetland;

--delivery of water through an irrigation supply system;
--implementing state-mandated waste/wastewater treatment and management plans for municipal, agricultural, and industrial operations;

--construction of PL 566 (U.S. Department of Agriculture) flood control and watershed conservation structures.

In many cases, a no-permit-required determination might initially be made by the EPA and/or the Corps. However, even these determinations have proved to be expensive and lengthy. Also, as in the Delta Lake Irrigation District case, no-permit-required decisions are subject to judicial review, even after the project has been cleared by the Corps and the work completed, leaving landowners and sponsors in a position of uncertain liability.

In the fall of 1987, The United States Section of the International Boundary and Water Commission (IBWC) experienced difficulty in performing work along the Rio Grande River in an area known as Little Box Canyon. The Canyon is located on a segment of the Rio Grande in Hudspeth County, Texas, and is situated within the Commission's Boundary Preservation Project. Silt and debris had formed a plug in the Canyon causing the flooding of thousands of acres of farm land in Texas and Mexico. The Commission planned to remove the plug and widen the river in this area. However, the Texas Parks & Wildlife Department and the Texas General Land Office opinions held that the Commission's plans would affect 400 acres of wetlands, while the Commission felt that there were only 70 acres of wetlands in the area,
none of which would be affected by the proposed project. Ultimately, the General Land Office declined to grant a Right-of-Entry to state-owned land within the reach of Little Box Canyon, halting the work on channel widening. The Commission visited with the Texas Audubon Society and the U.S. Council for Environmental Equality regarding this problem and both groups indicated that it was, indeed, a wetlands problem.

Since International Boundary and Water Commission activities are affected by state-agency interpretations of wetlands, future operations could be further impeded by the lack of a uniform definition.

V. LEGISLATIVE HEARING

The Senate Committee on Natural Resources held a public hearing in Harlingen, on October 28, 1988, to allow all interested parties to voice their opinions and conceptions on the subject of wetlands.

Dr. Frank M. Fisher, professor of biology and director of Wetland Studies at Rice University, presented testimony demonstrating the various species of plants and animals that are dependent upon wetlands in the Texas area. According to Fisher, wetlands are an ecosystem utilized by many animals, including saltwater animals. He stated that
the state should enact a policy that identifies wetlands as functional providers of habitat for the animals that use them.

Mr. Harold Burgess, member of the Board of Directors of the Audubon Society, explained that wetlands are lands where the amount of water determines the soil types and the species of plants and animals that live in, on, or nearby its surface. He stated that the animals most commonly associated with wetlands are wintering waterfowl and migratory birds; however, many animals depend on wetlands year-round. Burgess believes that Texas wetland policy should strengthen existing national policies and be modified to meet Texas' unique wetland conditions.

Mr. Rollin MacRae, Wetlands Program Coordinator of the Texas Parks & Wildlife Department, contended that currently, Texas agencies do not regulate, but rather assume management and advisement roles. He said that no cohesive, comprehensive, unified state policy directs agencies regulating wetlands, which causes confusion and conflict among agencies and individuals. MacRae added that the amount of wildlife that exists can be related to the availability of wetlands.

The opinion of the U.S. Fish & Wildlife Service regarding the Wetlands Inventory Mapping (NWI) project was presented by Mr. Warren Hagenbuck, Regional Wetland Inventory Coordinator for the agency. He stressed that the USFWS NWI mapping process was designed mainly for the
protection of migratory birds. Hagenbuck testified that there are other values of wetlands, including hunting, fishing, the production of micro-organisms used as a source of food for many animals of the food chain, and as a source of drinking water for many other animals.

Mr. Homer Faseler, general manager of the Delta Lake Irrigation District, presented testimony reflecting the implications involved when the District was the subject of a wetlands lawsuit regarding Pond 12 in Willacy County. He stated that several federal agencies were involved in the approval and financing of a drainage canal, but his district was not notified of any wrongdoing until two years after the completion of the canal. The lawsuit was filed against his district, the Corps of Engineers, the EPA and the individual landowners.

The Honorable Narendra N. Gunaji, Commissioner of the International Boundary & Water Commission, stated that he has the responsibility of overseeing 200 miles of water shared by Texas and Mexico. He testified that the lack of a uniform definition of wetlands caused many problems when an excessive flow rate caused brush plugs to change the course of the Rio Grande River. Subsequently, all sediment material was placed on the Mexican side of the river because a U.S. wetland policy would not permit dredging. Furthermore, Gunaji encouraged Texas to establish a wetlands policy that is realistic and in the best interests of its citizens along the Rio Grande.
Mr. Arthur J. Mercer III, president of Ussery Engineering, Inc., explained the processes involved with subsurface drainage and its relation to wetlands. Mr. Mercer stated that it is erratic for Hudspeth County to have 3,000 NWI wetlands. He suggested that Texas needs to develop a common wetlands definition that protects our environment and recognizes the concerns of agricultural industry.

Mr. Steve Munday, administrative assistant for Media and Government Relations of the Texas and Southwestern Cattle Raisers Association, stated that his association is in a regulatory dilemma over wetlands because the authority is divided between various state and federal agencies implementing many different programs. He stated that we need a single definition based on common sense and not on emotion.

Ms. Susan Potts, environmental attorney for Booth and Newsom, testified that there is a need for consistency in a wetlands definition. According to Ms. Potts, the state could implement a wetlands program that is substantive and controlling over federal law. She stated that New Jersey has an agreement with the Corps of Engineers and implements its own 404 permit program, and Michigan may follow suit.

Mr. George Fore, a national wetlands issues specialist, presented slides of wetlands and explained the processes that USFWS went through to map the 3,000 wetlands of Hudspeth County. He recommended that a
definition exclude simple water impoundments from the wetland mapping process as well as man-made wetlands not constructed for wetland intentions.

Public testimony was presented by a variety of individuals, most of them advocates of natural resources. The major part of the testimony stressed the importance of wetlands as a natural resource and a source dependent upon by many fowl, including 90 percent of the redhead ducks in Texas.
Waterfowl habitat areas of major national concern (from U.S. Fish and Wildlife Service 1984).
Schematic diagram showing wetlands, deepwater habitats, and uplands on landscape. Note differences in wetlands due to hydrology and topographic location.

FIGURE I
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Wetland habitat utilization by several families of birds (from Weller and Spatcher 1965).

FIGURE II
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1. Municipal Sewage Treatment Lagoon
2. Sewage Disposal Pond
3. Wastewater Treatment Lagoon
4. Irrigation Tailwater Pit
5. Lake Texarkana
6. Lake Lavon
7. City Water Supply Pond
8. Industrial Gravel Pit Complex
9. Industrial Park
10. Sanitary Landfill
11. Irrigation Regulation Pond
12. Dry Wash
13. Road and Bridge Maintenance Gravel Pit
14. Livestock Watering Pond
15. Ash Cleaning Ponds
16. Sewage Treatment Lagoons
17. Swine Farm Waste Control Ponds
18. Limestone Quarries
19. Chemical Waste Treatment Lagoons
20. Dry Creek and Tributaries
21. Gravel Pit and Radio Tower Site
22. Irrigation Supply Canal System
23. Stormwater and Salinity Control Drain Canal Systems

Texas Water Commission
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