

FINAL DRAFT: PART I

Coastal Natural Resources Report

Report to the Governor and the 68th Legislature:

**Issues for Action as Recommended by the
Natural Resources Policy Advisory Committee**

by the

Texas Energy and Natural Resources Advisory Council

June 1982

This final draft is provided for review by the Texas Energy and Natural Resources Advisory Council at its June 9, 1982 meeting. Until such time as this report is formally approved by the Council, it is not to be cited as an official TENRAC publication.

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**Issues for Action as Recommended by the
Natural Resources Policy Advisory Committee**

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PREFACE

This report was prepared in response to the mandate of the Coastal Coordination Act of 1977.¹ Section 33.204 of the Act requires the Natural Resources Council, created by the Natural Resources Council Act of 1977,² to study problems and issues affecting the coastal natural resources areas of the state and, further, that a comprehensive report recommending action on those problems and issues be submitted biennially to the Governor and the Legislature. The Texas Energy and Natural Resources Advisory Council, as successor to the Natural Resources Council, has assumed this responsibility.

Other factors emphasize the need for the report's investigation of coastal natural resource issues and the search for resolution of those issues. The Texas coastline contains some of the state's most productive and valuable lands and waters, and a great part of the population has chosen to live and work along the coast. Energy development, long present in the coastal area, has accelerated in recent years, not only on the land near the shore, but also in the coastal waters offshore. Development of industries related to energy production has increased in the area. Our ports have grown and are substantial contributors to the Texas economy. As more people move into the area, demand increases for necessary services and goods required by the lifestyle of modern society. Agriculture and fisheries are economically important industries on our coastlines, and people participate in numerous recreational activities in the coastal area, accounting for major contributions to local economies and the state's tourism industry. This increasing use and development of our coastal area, and the resultant increase in the competition for limited resources, has created many resource allocation problems that demand attention and require action.

This demand has been addressed by extensive efforts at all levels of government. Coastal resource management to allow development while providing resource protection has occurred at the national, state, and local levels. Federal activities in this area have now begun to diminish as the Federal government reviews and redefines its role, and as economic exigencies bring about withdrawal from many programs and assistance activities by Washington. Revitalization of the economy is the first priority of the present Administration, and it has become national policy to allocate more responsibility to the states.

One example of such succession of responsibility is in the area of coastal management. In Texas, the state owns much of the coastal resources and areas and has a responsibility to manage these as a public trust for the benefit of all Texans. As federal programs and funds are cut, and development and population pressures continue to increase, state responsibility may be more needed than ever. This report indicates the state's independent commitment to addressing those coastal issues that have been determined to be of substantial importance at this time or in the foreseeable future.

Preparation of the Report

In addition to state-initiated activities and program, Texas was involved for approximately seven years in an effort to develop a comprehensive state program under the federal Coastal Zone Management Act.³ Texas withdrew from participation in the federal program as of May 1981, and TENRAC would like to emphasize that this report has no connection to the Federal Coastal Zone Management program. It is an independent state effort in response to a state Legislative mandate.

To provide a thorough and up-to-date assessment of current issues, and to assist TENRAC in developing sound and effective recommendations for action, a series of meetings was held in the fall of 1981. After identifying major coastal

issues, the TENRAC Natural Resources Division staff contacted numerous groups, agencies and individuals to compile informal advisory groups for each issue. These groups were composed in an attempt to delineate the issues in each subject area. Initial meetings were held to gather information from the members and their comments were later solicited on the draft sections of this document.

The staff also met with and solicited comments from various other organizations and individuals with an interest or expertise in the coast. The draft document was also reviewed by the staff of various state agencies.

Purpose of the Report

State management of coastal resources can be not only adequate, but superior in many ways to federal attempts. The problems and needs of the state's coast, both those national in impact and those more restricted to the state's borders, can be recognized quickly and clearly at the state and local levels. This report is the result of just such recognition. It pulls together background and information on important coastal issues of significance in Texas, and enumerates facts and viewpoints on those issues. Based on these facts, needs are then identified and recommendations presented for responding to those needs.

Intended as a tool for decision-makers, the report provides access to relevant information and delineates possible solutions to the problems identified. The reader should recognize, however, the complex nature of and varied subtle influences on many issues that involve the coast and coastal natural resources. While the report attempts to provide background and analysis of each issue, the reader will in some cases be expected to supplement with other sources his or her knowledge of an issue. To provide all the nuances and controversies of some issues would require a document much more voluminous than is practical for the purposes of the present task. In cases where supplemental information will be helpful to those unfamiliar with an issue or area, references have been supplied to enable the

reader to expand his or her knowledge of the subject. In this way, the report provides a succinct yet thorough treatment of current coastal issues that is at the same time neither too lengthy nor forbidding.

INTRODUCTION

The Texas coastline stretches for 373 miles along the Gulf of Mexico. This area contains valuable resources, and makes a significant contribution to the state's economy and quality of life.

Major economic activities in the coastal area include energy production and related industries such as petrochemicals and manufacturing, fishing and seafood processing, marine commerce, recreation and tourism. Natural features of the coast are many and varied. An almost continuous barrier island system runs from the Brownsville area to the east end of Matagorda Bay, including Padre Island, Mustang Island, San Jose Island, Matagorda Island, and the Matagorda peninsula. Further north on the coast are two other barrier island environments, Galveston Island and Bolivar Peninsula. Behind this system are bays and estuaries that are highly productive in terms of fish and wildlife resources. Passes between the open Gulf and the bay system serve as migratory routes for many marine species dependent on the bays and estuaries during some part of their life cycle, are important for water circulation in the bays, and provide routes for waterborne transportation. The beaches on the islands and the mainland are often characterized by dynamic sand dune systems, which provide not only a rich habitat for various species of wildlife, but also a first defense against hurricanes for the human population and man-made development. Marshes, wetlands and flats provide a necessary environment for numerous species of waterfowl and commercially-important finfish and shellfish.

The coastal plain landward of the shore has attracted extensive development, including agriculture, industry and urban development. The Texas coastal area contains seven major population centers: Port Arthur, Beaumont, Houston,

Galveston, Victoria, Corpus Christi, and Brownsville. The continuing shift of population to the "Sunbelt" area is likely to result in steady and long-term growth in these metropolitan areas. This extensive growth and activity in the coastal area and the concomitant increase in demands on its resources are a cause of concern to many.

Several interests may compete for a single resource, or uses of different resources may be spatially incompatible. In these cases, and in order to protect and preserve valuable natural resources, a balance must be struck. It is the responsibility of state decision-makers to achieve that balance, allowing progress and prosperity without sacrificing the natural resources on which the coastal economy depends.

Important coastal concerns facing decision-makers in Texas are covered in this report to the Governor and the Legislature. Each issue is presented in concise factual summary, and the Texas Energy and Natural Resources Advisory Council has developed recommended actions or responses to the needs identified. The report is a tool for decision-makers to use in striking a balance between competing uses of coastal natural resources.

The Coastal Coordination Act lists major concerns to be addressed in the report, including:

- (1) changes in federal coastal policies;
- (2) principal problems of state concern;
- (3) the effectiveness of current state programs; and
- (4) research and data acquisition priorities.

The purpose of the report is to identify significant problems and recommend action where needed. Since the coastal area is by nature an area where many public and private sector interests are in conflict, this is not an easy task. The major areas covered in the draft report are as follows.

Changes in Federal Coastal Policy

Much of the discussion contained in the draft report concerns current or anticipated changes in federal coastal policy. In some cases, federal policy within a single issue area is changing, calling for a state response. For example, the Administration proposes to rapidly accelerate the leasing of OCS lands, raising the possibility that increased demands will be placed on state-provided services. In other instances, changes in fundamental federal policy may also affect the state's coastal areas. Such changes include federal budget cuts and the "New Federalism" program. In its efforts to balance the federal budget, the Administration is proposing to reduce funding in a number of areas. For example, the federal government is considering proposals to reduce its financial commitment to port maintenance and development, placing a heavier financial burden on state governments and their subdivisions. The federal government is also encouraging the use of present and proposed statutory authorities to transfer many of its coastal responsibilities to the state. The Clean Water Act's effluent discharge and dredge and fill programs are examples of the types of responsibilities the federal government wishes to pass on to the state.

The draft report identifies areas in which changes in federal coastal policies are having or may have significant impacts on the state's management of its coastal resources. The report recommends state action to either address existing federal coastal policies that are unmet or to prepare the state to respond to anticipated changes in federal coastal policies.

Principal Problems of State Concern

Not all of the recommendations in the report relate to federal coastal policies. Certain coastal issues are primarily state concerns. These issues may reflect changes in state coastal policies or may identify problem areas in which state policy is nonexistent. For example, the state does not have a clear policy

concerning the promotion of aquaculture. For this reason, the report recommends the creation of a forum to identify state concerns relating to aquaculture and to work with state government on a continuing basis to address problems confronting this industry. Similarly, the report examines problems caused by the erosion of the state's shoreline and recommends policy changes to respond to these problems. Finally, the report recommends the creation of various programs and forums to facilitate information exchange, thereby encouraging the continued identification and assessment of principal coastal problems of state concern.

Effectiveness of Current Programs

Texas currently has in place a number of natural resources programs that affect the coastal area. Realizing that a periodic review of these programs is necessary to identify areas in which state coastal policy is not being adequately implemented, the Coastal Coordination Act requires that the report include an assessment of the effectiveness of the state's programs. In most cases, these programs are working well. In some cases, however, it appears that certain programs are not meeting their goals. For example, most counties have failed to implement the state's Dune Protection Act, creating a situation where the state's policy encourages dune protection but little is being done to actually protect coastal dune systems. The maintenance of these systems is essential to hurricane and flood protection and maintenance of the bays and estuaries. Similarly, the Coastal Wetlands Acquisition Act contains a policy statement endorsing the acquisition of coastal wetlands that are essential to the public interest, yet no wetlands have been acquired because the state has not followed through on its commitment to provide funds for acquisition. The question to be answered is whether any acquisitions should be implemented and, if so, how high priorities should be identified.

Research and Data Acquisition Priorities

Many of the coastal issues identified in the draft report cannot be resolved using currently available information. In such cases, additional research and data acquisition is necessary. Such information may be required to more fully understand the state-level social and economic impacts of changes in federal coastal policy, to identify additional areas of state concern, or to more fully evaluate the progress of the state's existing programs towards stated objectives. Consequently, the draft report recommends specific research and data acquisition programs for consideration by the governor and the legislature. The information gained through these programs will help state decision-makers identify areas in which further action is necessary, thereby promoting more efficient use of the state's administrative resources. For example, the draft report recommends a study of shoreline erosion. The information developed during the course of such a study will assist the state in focusing its efforts to minimize the adverse effects of shoreline erosion on those areas where the problem is most severe. Similarly, the draft report recommends that the need for improvements to the Gulf Intercoastal Waterway be examined. If needs for improvement are identified, the state will be able to provide additional assistance in the areas where it is most needed without spending state funds on unnecessary projects.

The report is not presented as an exhaustive treatment of all issues concerning the state's coastal natural resource areas. It includes issues that are of general current concern, and that present a possible opportunity for appropriate and productive action.

The staff draft of this report was considered by the Natural Resources Policy Advisory Committee on May 18, 1982. After reviewing the staff draft and making several changes to certain proposed recommendations, the Committee approved six (6) sections of the draft report and voted to forward them to the full Texas Energy

and Natural Resources Advisory Council for final action. These six sections are: Offshore Energy Development and Onshore Impacts, Marine Commerce in Texas, Aquaculture, Waste Disposal, Beach Access/Erosion, and Freshwater Inflows. These sections are contained in the first part of this final report.

Two sections of the staff draft, Wetlands and Dunes, were considered by the Committee but were neither approved nor disapproved. Instead, the Committee voted to forward these two sections to the Council for further discussion and action. These two sections are found in the second portion of this final draft.

SUMMARY OF RECOMMENDATIONS

Offshore Energy Production and Onshore Impacts

1. The Legislature should act in a timely fashion to permit coastal home rule cities to annex into the Gulf of Mexico out to a maximum of one mile from the line of mean high tide.

2. The Legislature should carefully consider alternative sources of funding available to coastal communities to mitigate the onshore impacts of offshore energy development, giving special attention to sources of federal funds.

3. TENRAC should develop an informational program on the permitting process and make this service available to all interested parties.

4. All state agencies should cooperate to the fullest extent possible with federal agencies that are developing general permits. Additionally, the Texas Legislature should consider the appropriateness of authorizing state agencies to issue general permits.

Marine Commerce in Texas

1. The state should seek clarifying federal legislative revisions which would allow state assumption of non-federal sponsorship of the Gulf Intracoastal Waterway.

2. The Legislature should assess the current need for improvements to the Gulf Intracoastal Waterway. If a need is determined, then the Legislature should authorize and appropriate necessary funding for improvements to the GIWW consistent with federal and state policies and laws.

3. The Legislature should investigate and hold hearings on the state's historical policy toward navigation districts, the GIWW, and port authorities; determine what, if any, measures would be necessary in order to extend financial

assistance, including oversight authority; and develop a policy position regarding this issue.

4. TENRAC should establish a forum for appropriate state agencies and port officials to discuss permitting and compliance issues.

Aquaculture

1. TENRAC should establish a forum for appropriate state agencies, the academic community, the aquaculture industry, and other affected parties to discuss policies, programs, and permitting requirements related to aquaculture.

2. The Legislature should designate the Texas Department of Agriculture as the state agency in Texas responsible for coordination and support of aquaculture activities.

Waste Disposal

1. The Legislature should continue to support the state's efforts to receive Federal approval for management of hazardous waste disposal under RCRA, and encourage expeditious completion of Federal rulemaking and program authorization under the Act.

2. The Texas Department of Health and the Texas Department of Water Resources should review the amount and types of siting criteria present in existing regulations, and report to the Legislature any changes in those regulations that may be needed to improve or add to such criteria.

3. The Legislature should continue to appropriate sufficient funds for the state Disposal Facility Response Fund to provide the state ten percent "Superfund" match and should appropriate additional funds to deal on a state level with emergency situations at abandoned disposal sites.

4. The Texas Department of Water Resources and Texas Department of Health should continue efforts to compile an inventory of abandoned waste disposal facilities both off-site and on-site.

5. The Legislature should encourage the use of alternatives to landfilling through regulatory and economic incentives.

Beach Access/Erosion

1. The Attorney General's Office should communicate to coastal cities and counties the authority they possess for developing access/beach management plans for public beaches and of the planning processes that are acceptable to that office.

2. The Legislature should consider local requests for funding under the Beach Cleaning Act in light of the state's overall budget priorities, and encourage coastal cities and counties to make full use of these funds for beach cleaning and patrol and lifeguard services.

3. The Legislature should appropriate to TENRAC funds for shoreline erosion studies, specifically a bay and estuary erosion study and an up-to-date Gulf shoreline erosion study. The Attorney General's Office should continue to discourage the construction of structures on the public beach in violation of the Open Beaches Act.

4. The Legislature should require that purchasers of property or structures (including condominiums) on the Gulf or bay shorelines receive notice of the historic rate of erosion in the area and an explanation of the possibility that property can change to beach or submerged lands and thus revert to public ownership.

Freshwater Inflows

1. The Texas Department of Water Resources should continue to study the freshwater needs of Texas estuaries and should develop additional information on the relationships between various levels of freshwater inflow and the overall health of these estuaries, giving special attention to the use of innovative approaches to preserving estuarine health.

OFFSHORE ENERGY PRODUCTION AND ONSHORE IMPACTS

Offshore energy production and the accompanying onshore support facility development play an important role in the Texas Gulf coast economy. Increased development in both state and federal waters, in conjunction with proposed accelerated leasing policies in the Federal Outer Continental Shelf (OCS), has created growing environmental and socio-economic concerns. Among those concerns are issues relating to onshore and nearshore impacts of offshore activity, annexation of state owned submerged lands by coastal cities, multiple use of coastal resources, oil spills and permitting.

The first offshore oil well, drilled in 1897 off a pier in the Santa Barbara Channel in California, began a controversy over ownership of submerged lands that was not to be settled until well over half a century later.¹ By the late 1920s, offshore exploration for oil and gas had spread to Texas and Louisiana. Offshore production in the Gulf of Mexico began in 1933 when the first offshore well was drilled successfully in the Creole Field off Louisiana, a joint venture by the Pure Oil Company and Superior Oil Company.

As interest in exploration of submerged land grew, the question of ownership became pressing. The Truman proclamation and Supreme Court ruling in 1945 affirmed that the federal government, not the states, had ownership of and jurisdiction over submerged lands from the low tide mark to the three-mile limit--the traditional boundary of a nation's offshore authority. By Executive Order No. 9633, the President placed management of certain resources of the OCS under the jurisdiction of the Secretary of the Interior.

In 1947, Kerr-McGee Oil Company drilled the first commercial offshore well out of sight of land, off the Louisiana coast in the Ship Shoal area of the Creole

Field. The platform was serviced by an onshore facility 52 miles away. Following the success of this operation, the use of offshore platforms and onshore support facilities became the standard procedure in offshore development.

On June 5, 1950, in companion cases involving Louisiana and Texas, (United States vs. State of Louisiana, 70 S. Ct. 914, and United States vs. State of Texas, 70 S. Ct. 918), the Supreme Court held that the United States has dominion over submerged lands, including the oil thereunder, in the area extending from the coastline seaward for 27 miles. Louisiana had formerly claimed a 27-mile limit. In Texas, the same ruling denied state claims to all offshore lands.

In 1953, two significant pieces of federal legislation were passed. The Submerged Lands Act (43 USC § 1301-1315) reversed the effect of the Truman Proclamation, giving the states jurisdiction to the three-mile limit, or (importantly for Texas) further if an historical boundary could be shown to be present. The Outer Continental Shelf Lands Act (43 USC §§ 1331 et seq.) gave the Department of the Interior responsibility for managing and leasing the subsurface of the OCS seaward of the three-mile limit. This act became the basic policy instrument for development of OCS resources.

In 1958, the United Nations Convention on the Continental Shelf defined the term "continental shelf" as that portion of the seabed and subsoil seaward of the three-mile limit to a point at which the sea depth is 200 meters, or beyond that to a point where the sea depth will allow exploitation of resources.

In 1960, the U.S. Supreme Court held that Texas and Florida had satisfactorily demonstrated an historical boundary of three marine leagues (10.5 miles) from the coastline (U.S. vs. States of Louisiana, Texas, Mississippi, Alabama and Florida, 364 U.S. 502 (1960)). Thus, the Federal OCS off Texas now extends beyond the outer limits of state-owned waters (10.5 miles from Texas coast) seaward to a water depth of 200 meters and beyond (see Map 1).

Distinction Between State/Federal Submerged Lands

This discussion illustrates the important legal distinction between those submerged lands called the Outer Continental Shelf (OCS), exclusively owned by the federal government, and those called the state territorial seas, exclusively owned by the states. This distinction is important especially in the consideration of gulfward annexation, which is discussed later, because coastal cities are political subdivisions of the state and have the authority to annex and tax oil and gas activities in the state's territorial seas all the way to the edge of the state/federal boundary. On the other hand, coastal cities cannot annex or tax activities in the Federal OCS. Oil and gas activities are found in both state and Federal waters and have some direct and indirect impact on coastal communities.

Environmental Regulation of the Submerged Lands

Protection of the coastal environment has received priority attention from federal and state regulatory agencies, but coastal communities and other concerned entities sometimes question the adequacy of existing regulations. It is important, therefore, to examine the extent to which state and federal agencies regulate activities in that portion of the Gulf of Mexico within the state's boundaries, and the principal authorities pursuant to which they act.

Almost all activities in the Gulf will require a permit from the Army Corps of Engineers (COE) under Section 10 of the Rivers and Harbors Act of 1899 (33 USC § 403) and/or Section 404 of the Clean Water Act (33 USC § 1344). The COE issues these permits in accordance with its public interest review procedures, taking into consideration the proposed activity's effects on factors such as conservation, economics, fish and wildlife values, recreation, navigation, and water quality. A permit may not be issued unless it is found to be in the public interest.

For the discharge of any pollutant, Section 402 of the Clean Water Act (33 USC § 1342) requires a permit from the Environmental Protection Agency (EPA).

This discharge must meet technological effluent standards promulgated under the Clean Water Act and must satisfy federal guidelines designed to prevent the unreasonable degradation of the waters of the territorial sea. These latter guidelines, promulgated pursuant to Section 403 of the Clean Water Act, (33 USC § 1343), address factors such as the effect of the discharge on human health and welfare, its impacts on marine life, and its effects on esthetic, recreational, and economic values.

Additionally, no federal permit resulting in discharges to navigable waters may be issued under Sections 402 and 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 unless the state certifies to the appropriate federal agency that the proposed discharge is consistent with all applicable water quality standards. This requirement is imposed by Section 401 of the Clean Water Act (33 USC § 1341). The Texas Railroad Commission issues such certification for oil and gas activities in the state.

Many other federal permitting requirements apply to activities taking place in the Gulf of Mexico. Air quality for onshore activities is protected under the provisions of the Clean Air Act (42 USC §§ 7401 et seq); air emissions offshore are regulated by the Outer Continental Shelf Lands Act (43 USC 1801 et seq), which states that conditions offshore must not significantly affect the air quality of any state. The Pipeline Safety Act (49 USC §§ 2001 et seq) regulates the construction of pipelines. Discharges from marine vessels must meet standards imposed under Section 312 of the Clean Water Act (33 USC § 1322).

All of these regulatory activities are affected by the requirements of the National Environmental Policy Act of 1969 (NEPA) (42 USC §§ 4321 et seq) and the Fish and Wildlife Coordination Act (16 USC §§ 661 et seq). Under NEPA, federal agencies must consider the environmental impacts of their activities and must complete environmental impact statements in some cases. The Fish and Wildlife

Coordination Act requires all federal agencies to consider the impacts of their activities on fish and wildlife resources, and permits the Texas Parks and Wildlife Department to have input to the federal permitting process.

Section 311 of the Clean Water Act (33 USC § 1321) addresses liability for oil and hazardous substances pollution in the waters of the United States; liability in the oceans is addressed by the Outer Continental Shelf Lands Act (43 USC § 1801). Except as is permitted under other statutes, all discharges of oil or hazardous substances into waters of the United States are prohibited. The Clean Water Act also establishes monitoring requirements and provides for abatement of any condition presenting a hazard to the public health or welfare.

Texas law also provides for extensive regulation of activities in the state-owned portion of the Gulf. Authority over these activities is divided among several state agencies. The School Land Board, whose support staff is the General Land Office, leases Gulf lands for oil, gas, and mineral development and may impose certain restrictions through these leases. The General Land Office issues easements for pipelines, permits for geophysical surveys, and surface leases for certain platforms and production facilities. General Land Office and School Land Board rules are comprehensive in their approach to environmental protection.

The Railroad Commission regulates the drilling, operation, and plugging of offshore wells in state waters and is authorized to prevent pollution from these activities. Under Chapter 26 of the Water Code, it also administers a permitting system for discharges associated with oil, gas and geothermal development.

The Department of Water Resources is the state's principal water quality agency. It establishes state water quality standards and administers a permitting system for discharges other than those regulated by the Railroad Commission. It is also the state's lead agency in dealing with oil spills.

As the state's principal fish and wildlife agency, the Parks and Wildlife Department is authorized to enforce the state's water quality laws in state waters insofar as they relate to fish and wildlife resources. The agency also administers various other laws protecting these resources.

The Air Control Board serves as the state's principal agency for protecting air quality.

Offshore Activity/Onshore Impacts and Gulfward Annexations

1. RECOMMENDATION: The Legislature should act in a timely fashion to permit coastal home rule cities to annex into the Gulf of Mexico out to a maximum of one mile from the line of mean high tide.

An important factor in the assessment of onshore impacts resulting from oil and gas activity is the distinction between production in state versus federal waters. Historically, the majority of drilling off Texas shores has occurred in state-owned waters, with most activity located in the bays and estuaries. Currently, there are 1,482 producing wells in state-owned waters; 1,210 of these are located in bays and estuaries (see Figure 1).

Figure 1

	Total Producing Wells - Oil & Gas	Production (1980)	
		Oil (Thou Bbls)	Gas (MMCF)
Bays and Estuaries	1,210 ²	5,700	156,000 ⁵
Texas Gulf	272 ³	1,962	208,570 ⁶
Texas OCS	186 ⁴	9,113	510,638

OCS activity off the Texas coastline has developed rapidly and, even though there are fewer producing wells located in the OCS than in the Texas Gulf, OCS production is considerably higher (see Figure 1). This production level has not been

achieved without extensive cost. Even with improved seismic, magnetometry, and gravimetric technology and processes, exploration drilling is subject to considerable risk. From a total of 1,409 OCS wells drilled at an average cost of \$2.7 million for an oil well and \$2.8 million for a gas well, 1,223 were dry. This compares to 593 dry wells of the 864 wells drilled in the Texas Gulf. (Texas Gulf figures do not include totals for bays and estuaries.) Oil production from state-owned waters (bays, estuaries, and the Texas Gulf) in 1980 amounted to 7,662 thousand barrels, compared to 9,113 thousand barrels from the OCS. Natural gas production from state-owned waters was 364,570 million cubic feet, compared to 510,638 million cubic feet from the OCS. Oil and gas production from state-owned waters is expected to decline. As it declines, production from small, marginal wells will become more important to the maintenance of long-term production levels.

In contrast, OCS production is expected to increase (see Map 2). About nine percent of the total U.S. oil and condensate production and 23 percent of the natural gas production in 1980 came from the OCS, and the bulk of that production was from the Gulf of Mexico.⁷ Proven reserves in the Gulf of Mexico alone stand at 3.5 billion barrels of oil and 40.2 trillion cubic feet of gas, with undiscovered reserves estimated at 6.5 billion barrels of oil and 71.9 trillion cubic feet of gas, as compared to total U.S. offshore undiscovered reserves of 28 billion barrels of oil and 167 trillion cubic feet of gas.⁸

The Reagan Administration has set a policy for accelerated OCS development in the proposed five-year lease plan, which will make more area available for leasing and give industry greater choice in tract nominations. The plan calls for 42 lease sales to be held between 1982 and 1986, with fourteen (nearly 1/3) scheduled for the Gulf of Mexico. For Texas, this is of special significance. Interest has steadily increased in the Texas OCS, especially in the southern region off the Padre

Island National Seashore and South Padre Island. This trend is expected to continue. Some concern exists regarding the onshore impacts of OCS activity on Brownsville and surrounding area communities owing to the lack of a mature infrastructure for the storage and the refining and processing of petroleum products. However, it would be misleading to mention only the impacts in the South Texas OCS "frontier" region. Cities all along the coast will be impacted by accelerated offshore oil and gas production.

An extensive infrastructure has developed, particularly around Houston and Galveston, but also in the Beaumont, Port Arthur, Texas City, and Corpus Christi areas. Major support facilities required by the oil and gas industry include supply and service bases for offshore rigs, production platform construction, pipe laying, terminal and storage facilities (including tank farms, oil/gas separation, etc.), platform maintenance, and processing facilities (refineries, petrochemical, etc.).⁹

Clearly, energy development has both environmental and economic impacts in coastal communities. These can be positive and negative. Environmental impacts may include any of the following: dredging and dredge material problems resulting from expansion of harbor facilities; damage to sensitive ecosystems through the laying of pipelines or leakage of oil during transport and/or offloading; loss of wetlands through development; air, water, and noise pollution during processing procedures; and the damage caused by an oil spill during production. Studies regarding environmental issues of the coastal zone have been conducted by the Bureau of Economic Geology, Environmental Geologic Atlas of the Coastal Zone, Vol. I-VII; and the General Land Office, Offshore Oil: Its Impacts on Coastal Communities, among others. While it is generally agreed that many environmental impacts occur as a result of energy development, good baseline data directly linking energy development with environmental impacts are not available.

Coastal cities are often concerned with the effectiveness of state agencies in overseeing oil and gas operations near the coastline, including bays and estuaries. The tourist industry is a major part of the coastal economy, and the aesthetic and environmental conditions of the coastline serve as a major tourist attraction. Coastal cities maintain that because of their proximity to the oil and gas operations in the bays, estuaries, and the Gulf, they are better equipped to manage those operations while ensuring the use and preservation of their beaches and barrier islands.¹⁰

Fiscal impacts are perhaps the most pronounced effects of offshore production on coastal communities. These are the result of a unique characteristic of offshore production: the oil and gas reserves as well as the equipment required to extract hydrocarbons in state waters and the federal OCS--rigs, platforms, pipelines, and more--are often beyond the taxing jurisdiction of local governments. However, the people who operate that equipment consume government services just as they would if those activities were within cities' taxing jurisdiction. While the onshore developments related to offshore activities generate tax revenues, coastal governments nevertheless incur service costs at a faster rate than they accrue revenue, particularly during the upswing part of the development cycle. To compensate for these increased costs, some home rule cities have annexed state-owned submerged lands in order to tax the oil and gas reserves and production and transport structures there. Even though a portion of these impacts are from activities in the federal OCS, facilities and reserves within state-owned waters are forced to pay the entire tax bill where annexation has occurred.

While annexation offers a source of income to home rule cities, it may represent a loss of revenue to the state, and it increases the cost to industry for oil and gas production. The additional tax could be a disincentive to production in the Gulf, and could decrease the bonuses and royalties bid on state tracts, resulting in

lowered revenues to the Permanent School Fund. Increased taxes might also encourage producers to abandon marginal wells at an earlier date than would occur in the absence of such tax.

In considering the question of annexation, it must be recognized that cities experience economic growth stimulus as a result of offshore energy production. Offshore activity creates jobs, increases real estate value, expands the tax base (sales and property), and generally increases economic activity in an area.¹¹ The healthy state of the Texas coastal economy is largely due to oil and gas activities, both onshore and offshore. Nevertheless, it must also be recognized that fiscal deficits may be experienced by coastal communities. Critical planning issues facing local governments are identified as water supply, social infrastructure (particularly housing, roads, and health-care and education facilities), and industrial facility siting. Sudden increases in population because of increased offshore activity exert a strain on local communities. Equally important, although not as common, is the impact of completed or declining offshore production with attendant departure of personnel.

Congress has recognized the fiscal impacts experienced by local governments resulting from OCS-related activity. In an attempt to ameliorate this problem, the Coastal Zone Management Act of 1972 (16 USC §§ 1451 et seq.) authorized financial assistance to coastal states affected by energy development. This was done through the provisions of the Coastal Energy Impact Program (CEIP). Throughout the duration of this program (1976-1981), CEIP loans and grants were a source of \$34,281,022 in funding for Texas communities impacted by energy development (Figure 2). However, because of 1981 Congressional budget cuts, and because Texas is no longer working toward the development of a federally approved coastal program, CEIP funds are no longer available.

Figure 2
Coastal Energy Impact Program Funds Received in Texas

Name/Purpose	Type	1977	1978	1979	1980	1981	Totals
308 (c) (1) State/Local Planning	80/20	193,231	223,361	-	-	260,168	676,760
(c) (2) OCS Participation	70/30	-	-	-	208,000*	260,000	468,000
308 (d) (4) Environ/recreational losses	100%	55,622	141,000	**	-	-	-
308 formula (b) (4) (B) Environ/recreational losses	100%	993,554	2,413,833	-	-	5,447,843	9,051,852
308 (d) (1) Public Services/Facilities	Loans	4,078,296	10,293,437	-	6,599,903	4,000,000	24,084,410
(d) (2)							

*First year available.

**Texas not eligible for 308 (d) (4) funds beginning in 1979.

Source: Governor's Office of Budget and Planning, Austin, Texas, 1982.

In order to determine the extent of fiscal deficits and their sources, further information from the cities may be required. Further study of the impacts is needed to answer questions such as: what is the financial need of each particular city? What is the basis for determining that need? Has landward annexation of industrial facilities been considered? What amount of revenue do cities expect from annexation? What amount of revenue could be obtained from an increased tax base? What is the extent of economic growth stimulus?

On December 10, 1980, the Texas Energy and Natural Resources Advisory Council adopted a resolution encouraging the Texas Legislature to limit annexation by coastal home rule cities to one mile gulfward of the state's Gulf shoreline. This resolution is based upon the conclusions that coastal home rule cities provide no normal city services to activities on submerged lands beyond this limit and that annexation and taxation of state oil and gas producing properties will decrease the income to the state's Permanent School Fund. Since no new information disputing these conclusions has become available since the TENRAC resolution was adopted, TENRAC recommends that the Legislature should act in a timely fashion to permit coastal home rule cities to annex into the Gulf of Mexico out to a maximum of one mile from the line of mean high tide.

Annexation of the Bays and Estuaries

One issue which has received much less attention than Gulfward annexation is the issue of annexation of the bays and estuaries. It is important to point out that bays and estuaries are unique in their relationship to the coastal ecosystem. It is very difficult to treat the bays and estuaries and the remainder of the submerged lands alike. Environmental concerns are much different, and yet oil and gas activities exist in both. However, the Legislature has been addressing coastal

cities' annexation for some years now, and it is likely that a decision will need to be made eventually concerning establishment of a limit to annexation, if at all, in the bays and estuaries.

2. RECOMMENDATION: The Legislature should carefully consider alternative sources of funding available to coastal communities to mitigate the onshore impacts of offshore energy development, giving special attention to sources of federal funds.

In addition to determining the needs of coastal cities, TENRAC believes that it is necessary to explore alternate sources of revenue now that federal funds for dealing with onshore impacts of offshore development have been terminated. Several methods by which communities could attain income have been suggested: user fees, whereby the user of a service would be assessed an established amount for that service; per barrel landfall charges; state revenue sharing; annexation with ad valorem taxing authority; a state trust fund with an attendant CEIP program; and federal OCS revenue sharing. Of the alternatives suggested, only state revenue sharing, federal OCS revenue sharing, or annexation offer the needed assurance of a predictable income to the cities. TENRAC recommends that the Legislature carefully consider alternative sources of funding available to coastal communities to mitigate the onshore impacts of offshore energy development, giving special attention to sources of federal funds.

Federal OCS revenue sharing is a revived concept designed primarily to replace the coastal states' loss of CEIP funds, and to combat the existing plus the anticipated impacts from the increased OCS activity as a result of the accelerated five-year leasing plan. It should be noted that inland states receive federal revenues to mitigate impacts of mineral extraction from federal lands contained within the state. These provisions are set forth in the Mineral Leasing Act of 1920.

Coastal states argue that social, economic, and environmental impacts are definitely experienced by coastal communities during offshore oil and gas operations and they should also receive mitigating funds. In recognition of the validity of these arguments, TENRAC adopted a resolution endorsing OCS revenue sharing at its March 12, 1982 meeting. The state should closely monitor the progress of current efforts to share federal revenues from the OCS with the states and should consider the results of these efforts in its study of alternative sources of funding available to coastal communities.

Permitting

3. **RECOMMENDATION:** TENRAC should develop an informational program on the permitting process and make this service available to all interest parties.

State agencies have a responsibility for the management and protection of the coastal environment. This is accomplished through regulatory or proprietary authority granted by the Legislature to each agency in its specific area of responsibility. Often state regulations are promulgated pursuant to federal legislative mandates with which the state must comply. State and federal permitting procedures and requirements, however, are not always coordinated, with the result of unnecessary delays experienced by permit applicants. Some of these delays are caused by multiple and sometimes conflicting permit requirements. Others are caused by the lack of expertise of the applicant. TENRAC believes it is in the best interest of both the state and industry to develop communication channels whereby many of the problems can be discussed and possible solutions found.

As a first step toward this goal, TENRAC and the Wetlands Energy Producers Association, a group of independent coastal oil and gas producers, co-sponsored a seminar entitled, "How to Improve the Regulatory Permitting Process for Oil and

Gas Operations in Coastal Wetlands." It was well attended by both industry and state and federal regulatory agency personnel who concluded this approach could be of significant assistance in working toward improvement of the Gulf Coast permitting process. TENRAC should continue such efforts and should develop an informational program on the permitting process, making such services available to all interested parties.

4. RECOMMENDATION: All state agencies should cooperate to the fullest extent possible with federal agencies that are developing general permits. Additionally, the Texas Legislature should consider the appropriateness of authorizing state agencies to issue general permits.

The federal government recognizes that certain categories of regulated structures or work are substantially similar in nature, cause only minimal adverse environmental impacts when performed separately, and will have only minimal adverse cumulative effect on the environment. Rather than process permits for each of these activities individually, the federal government has authorized the issuance of general permits covering entire categories. These permits may be restricted to a small geographical area or may be national in scope. Where a general permit has been issued, the permitting process for individual activities is greatly simplified. The individual or company engaging in the activity need only comply with the requirements of the general permit in order to come under its coverage.

The Environmental Protection Agency (EPA) and the Army Corps of Engineers (COE) have recently moved to simplify permitting of certain oil and gas-related activities in Texas waters through use of general permits. On April 29, 1981, EPA issued two general permits (Permit Nos. TX0085642 and TX0085651) under the authority of Section 402 of the Clean Water Act. These permits apply to operators of lease blocks in the Offshore Subcategory of the Oil and Gas Extraction

Point Source Category and authorize the discharge of various effluents into the Gulf of Mexico. Certain areas identified as having significant environmental values are excepted from these general permits. The EPA is currently working on additional general permits for other subcategories of the Oil and Gas Extraction Point Source Category.

The COE is also attempting to use general permits to simplify its permitting requirements. On September 1, 1981, the Galveston District of the COE issued a public notice for a proposed general permit to cover certain oil and gas-related activities in the Gulf of Mexico off South Padre Island. The COE intends to eventually issue similar general permits covering all Gulf waters within the Texas boundary.

TENRAC recommends that all state agencies cooperate to the fullest extent possible with the EPA, the COE, and all other federal agencies in the development of general permits. This cooperation should include sharing of information, assistance in establishing permit conditions, and coordination of related state activities to make the permitting process more efficient.

Additionally, TENRAC recommends that the Texas Legislature consider the appropriateness of authorizing state agencies to issue general permits where there are categories of activities that merit this approach. For example, the Department of Water Resources might be able to identify certain categories of waste discharges that could be covered under a general permit. If the Legislature finds that general permits could be used effectively by state agencies, it should enact the laws necessary to this end.

Outlook

Clearly, oil and gas production impact the Texas coast. Many of those impacts are beneficial, indicated by the healthy state of the Texas coastal economy. Other impacts pose problems for local governments, which they have

difficulty solving. Chief among these problems are lack of adequate time for planning and lack of funding for provision of necessary services.

Coastal annexation is one attempt by local governments to solve funding problems. This has resulted in uncertainties for industry and for local and state governmental entities as well. This situation requires speedy resolution.

Permitting uncertainties impact the oil and gas industry. More efficient channels of communication between the industry, state agencies, local communities, and interested public need to be made available.

It is important to ensure to all interests the appropriate access to vital coastal resources. To this end, care must be taken to explore the issues thoroughly and to act responsibly to manage these resources.

MARINE COMMERCE IN TEXAS

Texas ports* play a dynamic role in maintaining a vibrant state economy. As a mixture of public and private endeavor, they provide a means of linking water and land transportation systems, thereby giving inland markets access to world commerce. Their importance is also marked by their function as promoters for industrial and economic development.

The general condition of Texas ports is considered healthy and is expected to remain so. Nevertheless, recent governmental policies and proposed legislation indicate forthcoming changes in port financing and in operational methods. Transition problems may be experienced.

The waterborne transportation system in Texas has three principal components:

- the Gulf Intracoastal Waterway;
- many shallow draft ports; and
- ten deep draft ports.

The Gulf Intracoastal Waterway (GIWW) is a shallow draft channel extending approximately 426 miles along the Texas coast. It was dredged to its present dimensions, 12 feet deep by 125 feet wide, in 1949 and provides access for barge transportation between Texas ports from Brownsville to the Sabine River. Barge transportation is energy efficient and economical, providing a means for economical shipping of low-cost liquid and dry bulk products as well as high-cost goods.

*"Port" is defined as a body of water or as a harbor town or city where ships may take on or discharge cargo. Navigation districts and port authorities are political subdivisions of the state and function as a management entity to promote and foster commerce in their own districts. Landside facilities may be publicly or privately owned. For purposes of this report, the term port is used generically and may include any of the above definitions, depending upon the context.

In 1979, almost 68 million tons of cargo were moved on the GIWW in Texas, compared to 66 million tons in 1978 and 62 million tons in 1976. The dominant products transported on the GIWW are crude petroleum, petroleum products, chemicals, non-metallic minerals, and sand and gravel. Total waterborne commerce for Texas ports in 1979 was a record 347 million tons.¹

Although variously categorized, shallow draft ports are generally defined as those with channels less than 30 feet deep. Most of the Texas shallow draft ports have depths less than 15 feet. There are 11 public shallow draft ports and numerous private docks located along the Texas coast. The public shallow draft ports are located at Liberty, Anahuac, Bay City, Palacios, Victoria, Rockport, Aransas Pass, Port Aransas, Raymondville, Harlingen, and Port Isabel. These ports are used primarily for fishing and recreational uses, although a few small industrial complexes are scattered among them.

There are now 10 major deep draft ports on the Texas coast that annually move cargo volumes in excess of one million tons (Figure 1). Channel depths range from 30 to 45 feet. With the exception of the municipally-owned public port of Galveston and the privately-owned Port of Texas City, all other deep draft ports are owned and operated by navigation districts or port authorities. These ports include the ports of Beaumont, Port Arthur, Orange, Houston, Freeport, Port Lavaca, Corpus Christi, and Brownsville (Figure 2).

The delegates to the 1875 Constitutional Convention firmly believed in the limitation of governmental taxing powers. They provided for only three entities that could collect and expend public monies: the state, counties and cities. Even these were severely limited in the tax rates they could levy.² Without a broad tax base, local entities were unable to finance large improvement projects such as port development. Recognizing this, provisions for the establishment of navigation districts with taxing powers and the ability to issue bonds of indebtedness were set

Figure 1
 Waterborne Commerce on Deep Draft Ports in Texas
 1979

<u>Port</u>	<u>Tonnage (short tons)*</u>
Orange	1,499,507
Beaumont	58,136,896
Port Arthur	32,773,346
Texas City	35,954,301
Galveston	8,982,285
Houston	117,550,908
Freeport	19,983,837
Matagorda Ship Channel (Port Lavaca, Port of Pt. Comfort)	4,562,702
Corpus Christi	46,422,792
Harbor Island	9,384,532
Brownsville	2,508,076

*Figures include commerce from the following sources:

Foreign: import and export

Domestic: coastwise receipts and shipments
 (domestic traffic receiving carriage over the Gulf)

internal receipts and shipments
 (inland waterways)

local
 (movement of freights within the confines of a port)

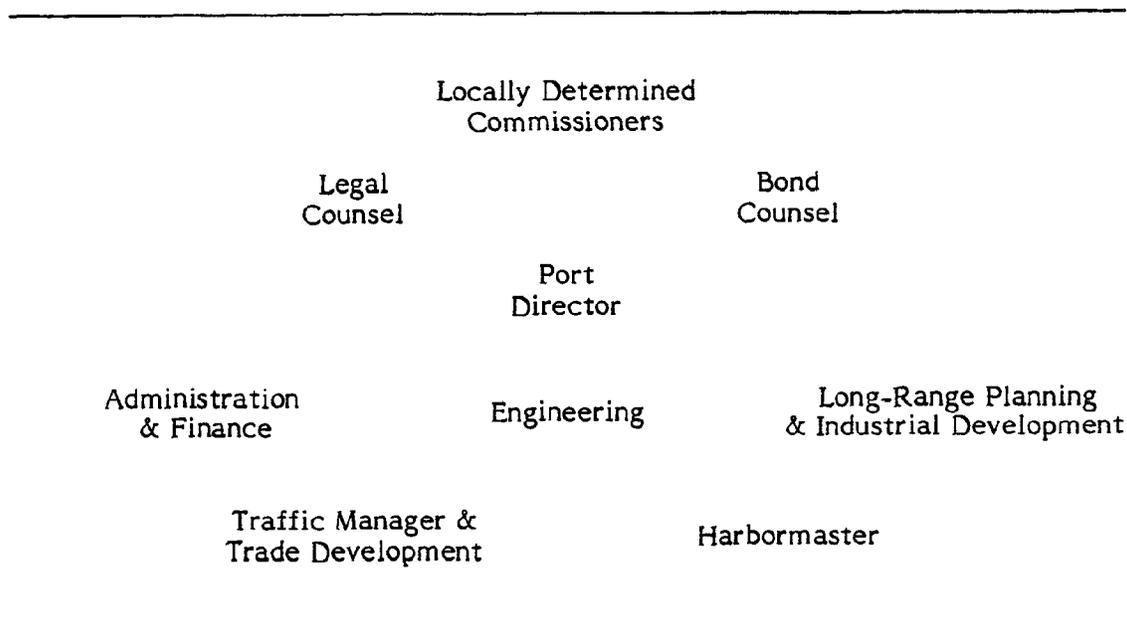
Source: Waterborne Commerce, U.S. Army Corps of Engineers, 1981.
 (unpublished)

forth in the Texas Constitution (Article III, Section 52 and later Article XVI, Section 50). A district may also be created by a special legislative act. General enabling acts passed in 1909, 1921, 1925, and 1932 as codified in chapters 61, 62, and 63 of the Texas Water Code provide the procedures which local communities may use to establish navigation districts.³

Navigation districts and port authorities are political subdivisions of the state and have broad powers to develop and maintain channels and port facilities and all other facilities incidental to or useful in the operation, promotion, and development of water-oriented industries and waterborne traffic, and to navigation and commerce and foreign trade. Districts and port authorities may also improve, preserve, and conserve coastal water for navigation. Specific powers generally relate to control of district-owned facilities and regulated traffic that is not federally controlled, and to human activities within the port facilities.⁴ The general organization of most Texas deep draft ports is depicted in Figure 3. The ports are run by commissions that are either elected or appointed by local elected officials, as determined by statute. The port director serves at the pleasure of the commission.⁵

The state has contributed to the economic growth of Texas ports by maintaining a healthy climate for business expansion. To encourage the construction of waterways and navigation channels, in 1930 Texas provided that navigation districts could acquire from the state submerged lands for \$1.00 per acre for purposes authorized by law, with the right to dredge out or fill in and reclaim the lands (Acts 1930, 41st Legislature, 4th C.S. p. 47, Ch. 27, § a). Amendments in 1973 provided for lease rather than outright sale of the lands (Texas Water Code, Sec. 61.116(a)), but not before the navigation districts had used the provision to acquire substantial acreage (Figure 4).

Figure 3. Typical Port Organization



Source: Texas Coastal and Marine Council, Marine Commerce, January 1979.

Figure 4. Submerged Land Acquired by Navigation Districts Under Article 8225 at \$1.00/acre*

<u>Navigation District</u>	<u>Acreage</u>
Port of Beaumont	66.547
Chambers & Liberty Co.	28,013.830
Matagorda No. 1	116.287
Matagorda No.2	1,885.580
Calhoun County	47,765.000
West Side Calhoun County	2,347.600
Jackson County	1,082.630
San Patricio No. 1	229.505
Aransas County	1,787.836
Port of Corpus Christi Authority	20,022.140
Willacy County	3,997.340
Brownsville	3,362.640
Port Isabel - San Benito	1,644.410

*In addition, various tracts were granted directly to the districts by the Legislature, e.g., virtually all submerged lands in Harris County were granted by the state to the Harris County-Houston Ship Channel Navigation District (Acts 1927, 40th Legislature, Regular Session, Ch. 29, p. 437), to be used for the purposes of navigation, harbor aids, or wharves.

Source: David French, Comments on Navigation Districts of Texas, Texas Transportation Institute, Texas A&M University, May 28, 1973; Unpublished Research Report.

In many respects, the ports in Texas manage themselves more like private corporations than public agencies. They are competitive with one another and operate on the basis that their revenues will be adequate to meet their expenses and their debt obligations.⁶

Investment financing for port facilities owned by navigation districts is obtained chiefly from four sources: (1) general obligation bonds, (2) district (general and special) revenue bonds, (3) port revenue, and (4) Federal appropriations. Other sources of revenue include private investment in private facilities, local taxes and appropriations by state and city governments.⁷

Tax-free general obligation bonds are issued against future tax revenue from port-levied taxes on property within the navigation district. These require voter approval. District revenue bonds are issued against future operating revenues earned by the port. Federal appropriations, such as Economic Development Act (EDA) funds, have been available for development projects in a few of the ports.

Currently, the federal government pays for channel dredging and maintenance. However, Congress is examining this practice and, in the future, ports may be required to pick up a substantial portion of these costs.

The state does not engage in direct management of Texas ports, but does apply indirect influence in the form of authorizing legislation, environmental regulations, and control of submerged lands. In many cases, the relationships between state government and Texas ports are limited and even strained. This is usually a result of lack of communication and coordination. Although the following statements have been subject to some debate, in its report to the 65th Legislature, the Texas Coastal and Marine Council noted the following reasons for tensions which exist between the state and ports:

- Ports have historically dealt principally with the Federal government and have had minimal dealings with the state.
- Some state agencies apparently do not appreciate the broad, general purpose of ports to promote economic and industrial development, as well as to serve as an intermodal interface between land and water carriers.
- Some state agencies dealing with environmental matters often cite ports as the cause of ecological damage in the area, when a port usually has no control over the entity that may be causing the particular problem.
- Ports believe themselves autonomous and independent of state agencies.
- Some state agencies may believe ports have abused their privilege to acquire the use of state lands, which in the past could be acquired for \$1.00 an acre.⁸

Gulf Intracoastal Waterway

Ports today are faced with numerous, complex problems ranging from complying with federal and state regulations and meeting current economic and development problems to preparing for change certain to come in the wake of congressional action reflecting the current Administration's policies. While most of the issues can be resolved only at the federal level, the major issues selected for discussion in this report reflect areas in which state involvement is necessary in finding solutions to problems, and, in the case of pending federal legislation, where an awareness of the anticipated changes may assist in preparing the state Legislature for future action.

1. **RECOMMENDATION:** The state should seek clarifying federal legislative revisions which would allow state assumption of non-federal sponsorship of the Gulf Intracoastal Waterway.

The Texas Coastal Waterway Act (1975, 64th Legislature, Article 5415e-2) authorized the state to act as local non-federal sponsor of the GIWW in Texas. The 64th Legislature concluded that the GIWW can be maintained in such a way as to prevent waste of both publicly and privately owned natural resources, avoid or minimize adverse environmental impacts, and in some cases realize beneficial environmental effects. The Legislature therefore determined that it was in the best interest of all citizens to accomplish the policy of the state of Texas--that being to support the marine commerce and economy of the state--by providing for shallow draft navigation of the state's coastal waters in an environmentally sound manner. To do so, the Legislature elected to allow assumption of the responsibilities associated with non-federal sponsorship of the GIWW as provided by federal law.

The non-federal sponsor has responsibility for right-of-way easements, spoil disposal areas, and utilities relocation. Under the Texas Coastal Waterway Act, the State Department of Highways and Public Transportation was designated as agent for the state. The role of the state as non-federal sponsor is complicated by a conflict between federal statutes and the Texas Constitution. The Federal Flood Control Act of 1970 (P.L. 91-611, Sec. 221) requires the non-federal sponsor to have full authority and capability to pay damages, if any, incurred by an improvement project. This has been amended, however, in individual contracts between the U.S. Army Corps of Engineers and local sponsors to make the federal government liable for damages which the latter causes. It is argued that this requirement, in effect, pledges the credit of the state, which is a violation of the

Texas Constitution (V.A.T.C., Article 3, § 50). The non-Federal sponsor is also required to construct or pay for all levees, weirs, and drainage ditches required for the containment of dredged materials.

TENRAC recommends that the state seek clarifying federal legislative revisions to allow state assumption of non-federal sponsorship of the GIWW. An alternative to federal legislative action (although not a preferred one) would be to seek an amendment to the Texas Constitution allowing the state to assume the liability required of local sponsors for GIWW improvement projects.

In the past, the major costs for construction, maintenance, and operation of the GIWW have been borne by the Corps of Engineers. The Corps of Engineers has chosen to continue its responsibilities in the GIWW until further study is conducted and the legal conflict is resolved. Dredging out of major waterways, which is necessary for continued safe navigation, is still being done by the Corps at this time.⁹

2. RECOMMENDATION: The Legislature should assess the current need for improvements to the Gulf Intracoastal Waterway. If a need is determined, then the Legislature should authorize and appropriate necessary funding for improvements to the GIWW consistent with Federal and state policies and laws.

The importance of the GIWW to Texas ports and the state economy as a whole has been well documented.¹⁰ As noted previously, the dimensions of the GIWW are 12 by 125 feet. Many of the important markets of other states served by Texas barge traffic can handle tows of 20 to 40 barges, mainly because their channel widths are 200 feet or more. The narrow 125-foot width of the Texas GIWW restricts the number of barges per tow to a small number. As a result, barge transportation costs in Texas are higher than in areas with more favorable channel dimensions. These higher costs create an unfavorable competitive position for Texas waterborne commerce. Barge tow size is additionally restricted because of

the sharp curvature on certain bends of the GIWW. Widening and straightening the GIWW in Texas would reduce transportation time, save on fuel, and generally increase carrying capabilities.¹¹

These improvements cannot be accomplished, however, before addressing the questions of dredged material disposal and possible habitat alteration resulting from improvement projects. Other concerns that must be addressed include bank erosion, saltwater intrusion, and increased turbidity.

Containment, as opposed to open water disposal, is generally considered the best method of dredge material disposal, although not in all cases. Containment procedures require the identification and acquisition of dredge material disposal sites. This may conflict with wetlands protection policies and could involve taking of valuable habitat areas if those areas were deemed necessary for use in the national interest. (For additional information on wetlands acquisition and the taking issues, see the Wetlands section of this report.)

In its 1978 report to the 66th Legislature on the GIWW, the State Department of Highways and Public Transportation estimated the area required for disposal of dredge material resulting from improvement of the GIWW. For purposes of the study, the waterway was divided into five segments:¹²

1. Sabine-Neches Waterway to the Houston Ship Channel
2. Houston Ship Channel to the Freeport Harbor Channel
3. Freeport Harbor Channel to the Matagorda Ship Channel
4. Matagorda Ship Channel to the Corpus Christi Channel
5. Corpus Christi Channel to the Brownsville Ship Channel

For each segment, estimates were calculated for the following six dimensions: 250 feet x 12 feet, 250 feet x 14 feet, 250 feet x 16 feet, 300 feet x 12 feet, 300 feet x 14 feet, and 300 feet x 16 feet. The estimates included not only the area required for the improvement project but for 50 years of maintenance as well.

The study developed project cost estimates in 1978 dollars for the initial construction and the 50-year maintenance program (Figure 5). It further presented a breakdown of federal and state shares based on current laws and practices (Figure 6).¹³

An improvement project of the GIWW from New Orleans to the Houston Ship Channel was authorized by Congress in 1966 in the following dimensions:

- (1) channel 16 feet deep and 150 feet wide from the Mississippi River, via Algiers Canal and a bypass route at Houma, Louisiana to Atchafalaya River;
- (2) channel 16 feet deep and 200 feet wide through the reach from Atchafalaya River to the Sabine River; and
- (3) channel 16 feet deep and 150 feet wide through the reach from the Sabine River to the Houston Ship Channel.¹⁴

The Corps of Engineers (COE) is conducting a feasibility study on this project. Since the study was authorized, tonnage transported on this segment of the GIWW has more than doubled, creating some concern as to the adequacy of the above dimensions. The anticipated condition of many of the locks is also being considered.

Concerns being addressed by the COE include questions of responsibility, for example, for relocating existing pipelines; matters of rights of way; encumbrances; repairs due; financing; local erosion policies; and assessment of environmental impacts. The COE expects to complete its evaluation in FY86.

The GIWW improvement project described above does not address improvement of the Texas GIWW as a whole, and therefore TENRAC recommends that the Legislature should assess the current need for improvements to the GIWW. If a need is determined, then the Legislature should authorize and appropriate necessary funding for improvements to the GIWW consistent with federal and state

Figure 5. Cost Summary for Channel Improvements

<u>Channel</u>	<u>Construction</u>	<u>50-Year Maintenance*</u>	<u>Total Project*</u>
250' x 12'	\$172,647,000	\$269,686,000	\$442,333,000
250' x 14'	247,183,000	272,926,000	520,109,000
250' x 16'	327,025,000	275,816,000	602,841,000
300' x 12'	244,865,000	274,338,000	519,203,000
300' x 14'	333,718,000	276,801,000	610,519,000
300' x 16'	427,923,000	276,083,000	704,006,000

*Includes estimated federal cost for maintenance dredging during 50-year period of \$235,801,000. This cost may be deducted to determine required initial cost of project.

Source: The State Department of Highways and Public Transportation, The Gulf Coast Intracoastal Waterway in Texas, 1978.

Figure 6. Cost Distribution for Channel Improvements

<u>Channel</u>	<u>Federal Cost*</u>	<u>State Cost</u>	<u>Total Project*</u>
250' x 12'	\$402,041,000	\$40,292,000	\$442,333,000
250' x 14'	472,694,000	47,415,000	520,109,000
250' x 16'	546,345,000	56,496,000	602,841,000
300' x 12'	468,543,000	50,660,000	519,203,000
300' x 14'	549,544,000	60,975,000	610,519,000
300' x 16'	633,620,000	70,386,000	704,006,000

*Includes estimated federal cost for maintenance dredging during 50-year period of \$235,801,000.

Source: The State Department of Highways and Public Transportation, The Gulf Intracoastal Waterway in Texas, 1978.

policies and laws. Once Texas is able to assume its role as non-federal sponsor, it is likely the state will be required not only to provide the disposal sites, but also to construct and maintain containment levees. These requirements are compatible with Texas' commitment to maintaining a healthy economy, and with the state's concern for the protection of wetlands.

Federal Legislative Initiatives

3. **RECOMMENDATION:** The Legislature should investigate and hold hearings on the state's historical policy toward navigation districts, the GIWW, and port authorities; determine what, if any, measures would be necessary in order to extend financial assistance, including oversight authority; and develop a policy position regarding this issue.

Accurate assessment of the needs of Texas ports is difficult at this time given the uncertainty associated with federal legislative actions. Therefore, it is generally believed that specific recommendations regarding state involvement must necessarily be contingent upon that final outcome. If, however, legislation in its proposed form is passed, the Texas Legislature should be aware that shallow draft ports will probably look to the state as an alternate financial source. Decisions must be made either to offer that funding or allow the principles of the free market system to work. The outcome of the latter option would likely result in the demise of some of the smaller shallow draft ports. Smaller ports continue to play an important role in the commercial fishing, sport fishing and other recreational industries of Texas. TENRAC recommends that the Texas Legislature investigate and hold hearings on the state's historical policy toward navigation districts, the GIWW, and port authorities; determine what, if any, measures would be necessary in order to extend financial assistance, including oversight authority; and develop a policy position regarding this issue.

Several bills have been introduced in Congress providing for "fast track" dredging permits (time-specific scheduled decision requirements on various

federal/state agencies which approve permits) for deep water ports, and requiring local ports to pay a sizable portion of costs incurred from construction, maintenance and operations of the waterway. According to Rep. Mario Biaggi (D-N.Y.), the goal is to establish a national policy of authorizing, promoting, financing, and facilitating--on a priority basis--the operation, maintenance, and improvement of deep draft commercial ports in the U.S.¹⁵ For Texas, these particular legislative measures may have far-reaching significance. Some of the proposals under consideration favor those ports with considerable business and activity. These ports will be better able to absorb the increased costs. It is likely, however, that smaller ports will be negatively affected by the proposed user fees. Texas should examine its historic policy towards ports to insure that it is prepared to respond to changes in Federal law.

4. **RECOMMENDATION:** TENRAC should establish a forum for appropriate state agencies and port officials to discuss permitting and compliance issues.

Texas ports are highly independent and competitive, and operate individually on almost all concerns. The Texas Port Association represents the diverse interests of the various ports.

Communication between state agencies and ports has in the past been sporadic and generally limited to environmental issues. Better cooperation among regulatory agencies that impact upon ports and the ports themselves would be beneficial to marine commerce in the state.

Permit requirements present many problems for Texas ports. The water is shallow in Texas bays and estuaries and in the Gulf near shore. As a result, dredging is necessary for all new navigation projects--i.e., channels, turning basins, and harbor development--and for routine maintenance of existing facilities. These activities raise questions of competing uses for wetlands and of environmental

concerns regarding dredging and dredged material disposal, oil and hazardous materials handling, and waste disposal. A number of separate permits from federal and state agencies are required. State regulations and requirements affecting ports are generally promulgated pursuant to federal mandates; therefore, until those mandates are altered, action at the state regulatory agency level is difficult.

There is little doubt, however, that ports are affected by a number of permitting requirements. It is recommended that TENRAC establish a forum for the discussion of permitting and compliance issues affecting Texas ports and state agencies. As discussed previously, financing may be a problem in the future, especially for shallow draft ports. This forum may also be useful in identifying alternate sources of income for such ports.

Outlook

Texas ports are vital to the health of the Texas economy. The Gulf Intracoastal Waterway, shallow draft ports, and deep draft ports each contribute to a system of marine commerce that ships almost 75 percent of the state's goods to world-wide markets.

Throughout their history, Texas ports have responded to changing world trade conditions. As crude oil imports increased during the 1960s and '70s, larger vessels were designed to transport that crude more efficiently. The average tanker of the 1950s was 19,000 dead weight tons (DWT), requiring a channel depth of 32 feet. The supertanker, or Very Large Crude Carrier (VLCC) of the '60s and the average tanker of today is 120,000 DWT, requiring a 50/55-foot draft channel.¹⁶ Since there are no ports on the Gulf Coast with a channel depth of 50/55 feet, lightering is necessary in order to offload the crude.

Plans have been underway to expand Texas port facilities to accommodate VLCCs since the early 1970s. Several proposals have been made; some have been discarded. Currently, there are five proposals for crude oil offloading ports

designed to accommodate partly-laden VLCCs. Two of them are in offshore waters. The proposed Gulf Coast Transshipment Terminal (GTT), would be located 18 miles east of Corpus Christi in waters 120 feet deep, and would provide lightering services with three stationary buoys and one permanently anchored vessel. This facility could accept VLCCs of 500,000 DWT, carrying 3.5 million barrels of crude.

The other offshore proposal is the Texas Offshore Port (TOP). The TOP would be located 12 miles off Freeport in 71 feet of water and would be owned by Phillips, Conoco, Dow Chemical, and Seaway Pipeline. The facility would have a pipeline link to shore, ultimately allowing up to 500,000 barrels per day to be discharged.

The three onshore terminal proposals are Deeport, proposed by the Nueces County Navigation District for Corpus Christi's Harbor Island; the Pelican Terminal Company (Pelco) at Galveston, backed by a consortium of Northville Industries, Chicago Bridge and Iron, and the Phillip Brothers; and a new 55-foot deep draft harbor and bulk terminal on the Brownsville ship channel backed by Petraco Valley Oil Refining Company and others.

The three onshore facilities are planned not only to accommodate partly-laden VLCCs, but to accept coal and bulk carriers as well, thus allowing Texas ports to compete in the expanding international coal market and provide transportation economies for some existing cargoes such as grain and ores.

The five proposals are in varying stages of obtaining necessary licensing and approval. TOP and Pelco have already obtained the required permits, but neither has completed its financial plans. These and the other proposals have the problem of securing throughput commitments from users to finance the projects. In addition, environmental concerns have not yet been adequately satisfied in some of the projects.

Clearly, Texas ports face operational and financial challenges in the future. Commerce must continue to be conducted in a manner that protects our valuable natural resources with a minimum of adverse environmental effects, while ensuring economic benefits to the citizens of Texas.

AQUACULTURE

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. Commercial ventures in the U.S., however, have been few in number and relatively limited in size, even though many parts of the country are highly suited for such activity. Commercial aquaculture production in the U.S. in 1978 was over 100,000 metric tons, with the retail value for the freshwater segment alone over \$1 billion.¹ In view of this potential, considerable effort has recently been devoted to aquaculture in the U.S., and in Texas, research at the state's universities in cooperation with state agencies and Federal entities has produced encouraging results. There is still much to learn and many impediments to overcome.

Over the past several months, the Texas Energy and Natural Resources Advisory Council has been meeting with many of the various parties interested in or involved in aquaculture in Texas, to exchange ideas and information and discuss problems. Such activity at the state level has become increasingly important as Federal support of aquaculture has become more uncertain.

The University of Texas and Texas A & M University have conducted aquaculture-related research for some years. Much work has been done under the aegis of the Sea Grant program of the Department of Commerce and by the Texas Agricultural Experiment Station and the Texas Agricultural Extension Service. In addition, research has been conducted by the Texas Parks and Wildlife Department, General Land Office, and the Texas Department of Water Resources, as well as by Federal agencies. This research has led to a fledgling industry for a few

freshwater species, and has provided basic knowledge to bring several species of finfish and shellfish to the brink of commercialization. Similar research has brought aquaculture to commercial status in locations outside of Texas, largely in production of freshwater species. There is limited commercial production in Texas* of catfish, crayfish, and largemouth bass.²

According to the United States Department of Agriculture Economics and Statistics Service's 1981 Outlook and Situation for aquaculture, farm-raised catfish production (the major segment of the freshwater farming industry) in 1980 totaled over 46 million pounds total live weight of fish delivered for processing. The Department reported that Mississippi produced 69 percent of this total, followed by Arkansas (14 percent), Alabama (12 percent), California (two percent) and Texas (one percent). Louisiana and Missouri also contributed one percent each, and Georgia less than one percent.

Processors received an average of \$1.66 a pound for dressed catfish in 1980. That year 27.8 million pounds were sold, bringing in \$46 million. Production continued its upward trend in 1981. Annual per capita consumption of fish and shellfish in the U.S. has shown a gradual increasing trend over the last 25 years. As domestic production increases, import levels decline. The import level for catfish has declined for the last three years.

Penaeid shrimp may reach commercial status in the near future in Texas.³ Other species with this potential are tilapia, baitfish, redbait (or red drum), and oysters. Solving the problems outlined in the next section could conceivably result in the commercialization of all or some of these species.

*This excludes government-supported activities such as Federal fish hatcheries, demonstration shrimp hatcheries, and Texas Parks and Wildlife Department pond-stocking activities.

Aquaculture Development Needs

1. RECOMMENDATION: TENRAC should establish a forum for appropriate state agencies, the academic community, the aquaculture industry, and other affected parties to discuss policies, programs, and permitting requirements related to aquaculture.

Aquaculture development in Texas, although promising, is hindered by several constraints. These are generally recognized as falling into one of three categories: technical, economic, and legal/institutional.⁴ Often more than one of these categories is involved, and synergistic effects are not uncommon.

Technical Constraints

Technical constraints are found largely at the research level, and are comprised of mostly biological and other science questions, such as problems of breeding, maturation, genetics, disease control, and nutrition. Technical constraints are also a factor at the commercial production level, although at that point they are more problems of implementation than unknowns to be explored in a laboratory environment. Through a limited yet excellent system of university facilities and personnel, satisfactory progress has been made on many technical questions to date. The major difficulties arise at the point of information exchange between researchers and practitioners, and in the area of public awareness and education, and extension-type activities. Although aquaculture is not a new subject, prior experience in commercial ventures is limited. A strong communication system between these groups would facilitate the flow of information from technical researchers to those in the field, ensuring that information gleaned in research labs is used in practical applications.

Economic Constraints

Obtaining the capital required to establish an aquaculture venture is a primary economic constraint. Clear definition of the business risks in aquaculture

is needed, as in any industry, to aid potential entrepreneurs deciding whether or not to enter the field. This information is also necessary in acquiring funds from private sources. Some public sector support of aquaculture development has proven beneficial elsewhere; joint public-private ventures in particular have been successful. For example, in Hawaii, state-supported hatcheries provide seedstock to prawn farmers.⁵

Legal/Institutional Constraints

In terms of developing an aquaculture industry in the state, legal/institutional problems probably comprise the greatest number and some of the most difficult to solve.⁶ This category covers a broad range of requirements and needs, from water rights disputes to Federal prohibitions on use of some chemicals. Resolution of two basic legal/institutional issues would answer many of the questions in this category: the status or identity of the aquaculture industry and the respective roles of the government, academic and private sectors.

Addressing Constraints

In order to address the constraints on development of the aquaculture industry, it is recommended that TENRAC establish a forum for appropriate state agencies, the academic community, the aquaculture industry, and other affected parties to discuss policies, programs, and permitting requirements related to aquaculture. Such a forum could serve several important functions.

1. The forum would provide a communication system between all affected parties, providing exchange of information and ideas. New information could be passed from the research community to industry, which could in turn make known its research needs. Consumers could communicate their needs and desires to the other groups.
2. A means for addressing technical, economic and legal/institutional constraints would also be provided. Exchange concerning policies,

programs and permitting requirements could occur. Recommendations for resolving constraints could be developed by concerted effort of all affected parties.

3. In addition, the forum would serve as a mechanism for coordinating research and development needs. Frequent exchange between researchers within the state and between those in Texas and other states would encourage maximum benefit from research efforts. Exchange between researchers and practitioners would help ensure that current research lends itself to practical application and answers those questions that most need answering.

2. **RECOMMENDATION:** The Legislature should designate the Texas Department of Agriculture as the state agency in Texas responsible for coordination and support of aquaculture activities.

As pointed out previously, development of the aquaculture industry in Texas suffers from several constraints. The major inhibition is the lack of an identity for aquaculture. Some view aquaculture as a segment of the fishing industry. There is, however, a growing recognition that aquaculture is an agricultural business. Whatever identity the industry is given, recognition of aquaculture as a viable industry for the state is the first step needed.

Regulatory permitting requirements have also been a major hindrance to aquaculture development in the state, and have impeded its growth. At the present, each application for any one of a number of required permits is new and unfamiliar to the permitting agency. Many times aquaculture is not even listed as a permissible use of the state's resources. This problem could be largely attenuated by a clear identity for the industry.

Several agencies are currently involved in regulation of aquaculture activities. Many state regulations affecting aquaculture are related to general laws concerning natural resource conservation.⁷ The state agency most involved in aquaculture activities at this time is the Texas Parks and Wildlife Department (TPWD). This agency requires licenses for private-pond rearing of fish and shellfish and for vehicles used in farming operations. Sources of broodstock are regulated by Parks and Wildlife, as is use of exotic (or non-native) species. In addition, removal from state waters of sand, gravel, marl or shell--which may be necessary in constructing a facility--requires a TPWD permit. Legislation that is designed to help the department regulate wildlife sometimes has unforeseen and unintended effects on aquaculture as well.⁸

Facilities for processing aquaculture products must be approved by the Texas Department of Health. A Texas Department of Water Resources permit is required to impound, divert, or use state waters, and for discharging into state waters. Both activities are inseparable from aquaculture development. The School Land Board grants easements on coastal public lands, and issues leases for use of submerged lands, although lack of explicit authority of the Board over aquaculture may make obtaining such a lease difficult.

The Texas Department of Agriculture (TDA) is responsible for enforcing agricultural laws; administering agricultural services; and protecting consumers through control of weight, measures, packaging labeling and marketing of products. The Agricultural and Environmental Sciences Division enforces pesticide, horticultural and quarantine control laws and keeps necessary records on these activities. The Marketing Division maintains and expands domestic and export markets for Texas products through the Texas Agricultural Products Program.⁹ Because fish farmers must use chemicals much like other livestock growers--in

feed and in disease control--and because they have as great or greater an interest in marketing their products, they have dealings with the Department.

The qualities needed for an agency to be designated as the "home" of Texas aquaculture are more difficult to describe. Obviously, the agency should have the capability to serve as a central source of permitting information for the industry and give the industry a "home." It should also make a concerted effort to promote aquaculture as a practicable industry for the state. It is not recommended that all permitting requirements be consolidated into this single agency, simply that the agency be responsible for providing industry with information about permits required by all other state agencies. Those wanting to learn more about the aquaculture industry would contact only the single agency, as opposed to extensive searching as is now required. It should also possess certain other characteristics such as: (1) a business orientation; (2) adequate size and organization to take on the task and perform it adequately; and (3) some logical connection to aquaculture. After assessing the capabilities of each of the above-named state agencies, TENRAC recommends that the Legislature designate the TDA as the agency in Texas responsible for coordination and support of aquaculture activities.

Business Orientation

There are few state agencies in Texas with a business orientation--most are under statutory mandates to manage and protect natural resources. Two possible exceptions are the Texas Industrial Commission (TIC) and the TDA. The TIC's primary purpose is to promote industrial growth in the state. It has, however, little or no past experience with aquaculture. The TDA has a lengthy history in promoting agribusiness in the state.

Adequate Size and Organization

Although a number of state agencies are large enough to accommodate aquaculture, the key to a successful program will be the agency's commitment. In

designating the "home" agency, the Legislature should consider available resources within the agency and make any adjustments needed to allow the agency to make the necessary commitment. The TDA is a large, well-established state agency staffed with personnel experienced in the development of agricultural industries.

Connection to Aquaculture

It is important that the public be able to identify aquaculture with the agency designated as its "home." The Texas Parks and Wildlife Department and the TDA both have some existing identity with aquaculture. TPWD, however, has been involved in the past primarily because fish are its responsibility; its statutory mandate generally limits its role to protection and management and not promotion or development of a particular industry.¹⁰ TDA has only limited experience with aquaculture, but does have a successful working relationship with the Texas Agriculture Extension Service, which could provide a means for dissemination of aquaculture information to the industry, the public and governmental bodies.¹¹ The Extension Service is currently serving an information-providing role, and the TDA's home agency designation should serve to enhance the availability of such information.

At the Federal level, the Internal Revenue Service currently classifies aquaculture as agriculture for tax purposes. Under the National Aquaculture Act, the Departments of Commerce, Agriculture, and Interior have agreed essentially to place all freshwater aquaculture within the U.S. Department of Agriculture.¹² These facts were also helpful in selection of the state agency.

Of course, no matter which agency is ultimately designated as the "home" for aquaculture, other agencies must of necessity remain involved. These would be the Texas Department of Water Resources in particular, in the regulation of water appropriation and discharges; the Texas Department of Health; Parks and Wildlife Department; the General Land Office, when state lands are involved; and any other

agencies whose jurisdiction covers some aspect of the industry. The purpose of the home agency is to centralize and coordinate all information and to thereby provide aquaculture with its own identity.

Outlook

There are many tangible benefits to the development of a profitable aquaculture industry in Texas. Aquaculture can provide more and diverse employment opportunities in an area, and can significantly supplement the income and food supply of small farmers. The industry can in fact create more diversification and stability for agriculture and the local economy. Aquaculture products can be an off-season crop for farmers and ranchers, creating more self-reliance in food supply and preserving rural lifestyles.

On a larger scale, aquaculture can be a significant source of protein in the American diet. The national balance of payments deficit, to which the import of fish and fish products significantly contribute, could be reduced through aquaculture development. In 1980, Ecuador exported 9,500 metric tons of shrimp, over half of it cultured. This represented a 50 percent increase over 1979 exports, indicating a strong world demand for shrimp.¹³ Ecuador's shrimp farmers realized earnings of \$66 million in 1980--a healthy profit by any standard.¹⁴ Such potentially lucrative export markets for domestic aquaculture products from the U.S. could possibly be developed. There is also the potential for enhancement of recreational activities. In short, there is ample incentive for the state of Texas to examine the opportunities aquaculture offers.

WASTE DISPOSAL

The disposal of industrial and municipal waste products is of particular concern on the Texas coast. Over half of the U.S. petrochemical industry's manufacturing capacity is located in this area, along with numerous refineries, utilities, and other industries, as well as several major metropolitan areas.¹ Nineteen of the 20 largest U.S. chemical corporations manufacture in Texas. The 53 largest U.S. chemical companies have 159 plants in the state.² The growing difficulty the nation is facing in safely and economically disposing of waste is magnified on the Texas coast.

Solid waste disposal sites are currently regulated by the state through the Texas Department of Water Resources (TDWR) and the Texas Department of Health (TDH), designated as co-regulators of waste disposal by the state Solid Waste Disposal Act (V.A.T.S. Article 4477-7). Authority is divided according to the source of the waste stream; industrial waste is under the purview of TDWR, while municipal and most mixed industrial-municipal wastes are managed by the Health Department. These agencies have interim regulatory authority from the U.S. Environmental Protection Agency, which has responsibility for hazardous waste disposal regulation under the federal Resource Conservation and Recovery Act of 1976 (42 USC 6901 et seq.). Disposal methods include landfilling (burial), incineration, deep-well injection, chemical treatment, and land application or "landfarming".³ Landfilling and deep-well injection are the most common in Texas. Recycled or re-used hazardous wastes are subject to somewhat less regulation under the Resource Conservation and Recovery Act (RCRA). Disposal facilities owned and operated by the generator and located within 50 miles of the site where the waste is generated are considered to be on-site and are subject to somewhat

different regulatory requirements from off-site facilities, unless the wastes are considered hazardous under RCRA. Within 40 C.F.R. Subpart D are the definitions of "hazardous" waste. Section 261.11 specifically gives the criteria for listing a solid waste as hazardous, including: characteristics of ignitability, corrosivity, reactivity and EP toxicity; studies showing that the waste is toxic to humans; and whether or not the wastes contain any of a list of nearly 400 chemicals and classes of chemicals. The EPA has listed over 700 solid wastes designated as hazardous by these criteria. This list is found in Subpart D of 40 C.F.R. part 261, Secs. 261.30-261.33.

In order for a state to receive authority to manage hazardous waste disposal under RCRA, a program "substantially equivalent" to the Federal program must be submitted to and approved by EPA. The TDH and TDWR have met the Federal equivalency requirement to date, and the Environmental Protection Agency, federal administrator of RCRA, has granted Texas' program interim approval. When all EPA rules and regulations under RCRA are complete, Texas will probably apply for final authority. Until then, new facilities must apply for a permit from the state agency with interim authority. Full public hearings are required when requested.⁴

The Railroad Commission of Texas, under Chapter 27 of the Texas Natural Resources Code, also regulates disposal of wastes. The RRC has authority over those wastes associated with exploration and production of oil and gas, such as saltwater and drilling muds. These wastes are usually deep-well injected; such disposal is regulated under the Texas Injection Well Act.⁵

Regulation of the Solid Waste Disposal Industry

1. **RECOMMENDATION:** The Legislature should continue to support the state's efforts to receive Federal approval for management of hazardous waste disposal under RCRA, and encourage expeditious completion of Federal rulemaking and program authorization under the Act.

Among the many problems facing the industries and municipalities which must dispose of hazardous wastes is the delay in the implementation of Federal regulations under RCRA. Numerous repropoals and revisions of Federal rules have created uncertainty both at the state government level and within the industry, and have caused time lags in bringing hazardous waste disposal under regulatory control. Resulting unpredictability of regulation in the area of permitting is a major problem for industry. This has in turn caused much concern over the safety of citizens and natural resources.

Texas has submitted applications to receive all authority possible over permitting of hazardous waste disposal facilities, and the TDWR and TDH are attempting to eliminate the existing duplication of Federal and state permitting of facilities. There may be further need for state agencies to assume responsibility for authority as the Federal government trims back or eliminates programs and regulations at the Federal level. Senator David Durenberger of Minnesota, chairman of the Senate Intergovernmental Affairs subcommittee of the Governmental Affairs Committee, pointed out at a November 24, 1981 hearing of that committee that "when Federal grants funds are inadequate to support state administered programs, the states simply drop out of the process." Durenberger spoke in reference to RCRA. Such attenuation of programs and financing is the current trend in Washington. Texas, however, remains committed to proper management of all municipal and industrial wastes, regardless of Federal action. Therefore, TENRAC recommends that the Legislature continue to support the state's efforts to receive full Federal approval for management of hazardous waste disposal under RCRA, and encourage expeditious completion of Federal rulemaking and program authorization under the Act.

2. **RECOMMENDATION:** The Texas Department of Health and the Texas Department of Water Resources should review the amount and types of siting criteria present in existing regulations, and report to the Legislature any changes in those regulations that may be needed to improve or add to such criteria.

The State Solid Waste Disposal Act (SWDA) gives the Texas Department of Health and Texas Department of Water Resources authority to promulgate rules consistent with the general intent and purposes of the Act and to establish operating standards for the management and control of solid waste under each agency's respective jurisdiction.⁶ Such rules and standards are part of the general mandate to the agencies to "control . . . all aspects of . . . solid waste management by all practical and economically feasible methods consistent with the powers and duties given under this Act and other existing legislation." The departments have all "powers necessary or convenient to carry out (their) responsibilities." Each department has permitting authority over facilities for storing, processing and disposing of solid wastes under its jurisdiction.

The siting of disposal facilities for both industrial and municipal waste may be the single most pressing problem facing the waste disposal industry. Made difficult by the rising cost of both land and transportation, establishing a site and obtaining a permit have become more difficult as the public, alarmed by incidents such as Love Canal and other disasters, has turned against the siting of facilities close to where they live, work or play.

Selection of a site usually follows a process similar to:

- development of criteria for site selection;
- identification of actual sites meeting those criteria;
- review and evaluation of each site;
- selection of finalist sites and then ultimate site;
- application for permit; and
- public hearing.⁷

The criteria for site selection have usually included characteristics such as proximity to the place of generation, cost of the land, availability of transportation to the site, and some technical characteristics such as geology and hydrology to complement the type of waste. Ideally, the development of these criteria should be a cooperative effort between government, industry and the public, and should be based on compatibility, need, and risk assessment. Values of and consistency with other land uses in the area should be considered. While there is general agreement that there are certain land areas worth preserving, there is disagreement over who should choose these areas.

Currently, a permit application backed by sound technical data can be sidelined by a myriad of other considerations, largely related to community opposition. Site developers may enhance community acceptance of a site by providing incentives such as money or services.⁸ Involving the public from the very beginning of the process helps to establish trust and credibility and to avoid problems. Public opinion is proving to be the major obstacle to siting a facility, and where citizens cannot be forced to accept a site, they can perhaps be persuaded into such acceptance through involvement and incentives.

The concept of incentives or compensation for a site has been used before to accommodate public concern regarding the siting of facilities, for example, in the design of an Interstate Highway in Washington state, the siting of a Colorado metal recycling plant, and the location of several power plants in Washington. The concept has been adopted for low-level radioactive waste disposal in Texas (see the Low-Level Radioactive Waste Disposal Authority Act, Art. 4590f-1 Sec. 4.04 (a) and (b)). It is founded on the issue of social equity; the process generating a waste may benefit a great many people while only a few must bear the costs of having the disposal of that waste nearby. Compensation of those few gives the situation more equity. Pragmatically speaking, it may well be less costly to site developers than delays caused by local opposition to the site.

In addition, compensation brings the costs to the host community into the cost-benefit picture used to select a site. This may reveal which of several sites is truly most cost beneficial. Two methods used to determine the appropriate level of compensation are negotiation and auction. Negotiation has the side benefit of fostering communication between the developers and opponents, allowing identification and resolution of the latter's objections. Auction, where potential host communities submit their compensation requirements as a 'bid' for the site, provides a market to set the 'price' for a compensation package.* Both methods result in greater community participation in site selection, and therefore offer the possibility of greater acceptance.

Public trust and a perception of business and government credibility is important in the siting of waste disposal facilities. Citizens may lack the technical knowledge to distinguish good siting and disposal practices from bad, and may not possess sufficient information to distinguish between good and bad regulatory methods. Receiving news of mostly the bad, many citizens simply oppose any and all sites. A trusted and credible industry and government could possibly do a great deal to reassure the public and gain acceptance for a site. The Wall Street Journal recently reported that over the past two years, 20 states passed laws to govern creation of waste disposal facilities, most of these providing increased public participation in site selection.⁹ As one Illinois state official put it, "Local citizens have been left out of the process and they are mad." The TDH has guidelines for handling public input; however, the TDWR has no such guidelines.

More detailed analysis of the sites considered is also a characteristic of many of these laws, according to the report. Public hearings are more and more a part of the site selection process, while in Texas they have been a part of the

*For a further discussion of compensation, see Dyer, James S., "Report on the Siting of a Low-Level Radioactive Waste Disposal Facility," prepared for the Texas Energy and Natural Resources Advisory Council, March 1981.

permitting process for some time. A further step in the direction of gaining public acceptance involves use of siting criteria; credible, technically and politically defensible criteria for evaluating a site provide the public with some assurance that sites are safe and well managed. TENRAC recommends that the TDWR and the TDH review existing regulations and determine the amount and types of criteria related to siting that exist in those regulations. The agencies should then determine what, if any, changes need to be made in those regulations to better incorporate the concept of siting criteria.

General rulemaking authority in the regulation of waste disposal is granted by the Texas Solid Waste Disposal Act, as discussed earlier, and the Act does contain sufficient authority to support the adoption of siting criteria. (See, for example, testimony of Paul Seals, Texas Department of Water Resources, before the House Subcommittee on Toxic and Chemical Waste Sites, February 19, 1982.) The Departments of Health and Water Resources should investigate the use of siting criteria in the rules regarding disposal facility permitting.

Development of any siting criteria should take into account many different factors. Such criteria must first be reasonable, so as not to unnecessarily prohibit the siting of facilities. Because most of the industrial waste in Texas is generated in the coastal area, most of it is disposed of there. Some wastes from other parts of the state are brought to the coastal area as well because sites exist there. However, much of the coastal area is low-lying, subject to frequent flooding or other disasters, and there is controversy over the siting of disposal facilities in floodplains and areas prone to other natural disasters.¹⁰ Flooding and other natural events can result in the release of waste materials, which may be toxic or hazardous, into surface waters and groundwater.¹¹ Much of the coast is also heavily populated, which some feel should preclude siting of such facilities in the area. Transporting wastes to distant sites can prove prohibitively expensive and

transportation of some hazardous wastes presents dangers of its own. The Gulf Coast industries are a vital component of the state's economy and if they are hindered from profitable operation, the economy of the entire state may be affected. In addition, the Texas SWDA expressly directs the regulatory agencies to accomplish the Act's purposes through economically feasible methods (Sec. 3(a)-(b)). Should outright prohibitions against siting prove infeasible in some cases, the solution may be to require that an applicant prove that the facility is dependent upon the location, and that the location of the site at that place is in the public interest. Provision of adequate disposal capacity is obviously in the public interest and would presumably be taken into account. The burden, however, should be placed on the group desiring to place the facility. Primarily, siting criteria must include evaluation of physical characteristics of a site. Such evaluation serves to help reassure the public that a site has been carefully evaluated and chosen on a sound basis, particularly when public participation has been a major factor in the site-selection process. Use of some form of compensation to offset perceived risks and opposition by the community should also be considered. Such an approach can do much to resolve conflicts.

Recently, the Illinois Supreme Court upheld a lower court's conclusion that a chemical landfill constituted a nuisance (Village of Wilsonville v. SCA Service Inc. ___ Ill. ___ May 22, 1981). A common or public nuisance is "the doing or failure to do something that injuriously affects the safety, health or morals of the public or works some substantial annoyance, inconvenience or injury to the public."¹² The court balanced the disposal site's social utility against the plaintiffs' right to enjoy their property, which bordered the landfill, and found that the facility's general public benefit did not outweigh the individual right. Greater weight in the balance was given to the individual's right to use and enjoy property than to the public convenience of having a business operate at a particular

location. The court further found that an undertaking posing a threat to public health, such as the chemical landfill, must be located in a secure place where it will pose no threat to health or life, now or in the future. The company operating the landfill was ordered to exhume from the site the wastes and contaminated soil. The court rejected the defense's argument of due process, saying there was sufficient due process because nuisance law is not new, unpredictable or unreasonable.

The existence of siting criteria for the placing of disposal facilities could preclude the use of similar arguments against landfills in Texas. If the permitting agency does not consider siting issues in the course of its action on a permit application, it is possible that a Texas court may find that the agency action does not preclude a nuisance action with respect to these issues. Therefore, a permit issued without established criteria may be subject to attack should the site prove unsuitable later. The Texas SWDA does provide for amendment or revocation of a license based on land use considerations (Sec. 4(e)(8)). Implementation of siting criteria is therefore advisable in Texas.

Some segments of industry support the concept of siting criteria; it provides a measure of certainty within which they can operate when selecting a site. Industry does have several problems with siting criteria, however. One is the situation where a considered site is placed into violation of criteria through the actions of opposed parties or individuals, following its review. For example, once the public is aware that a site has been selected for consideration, some structure or activity proximal to which sites are prohibited may be placed on land adjoining the site. Evaluating a site at a set point in time and then disregarding subsequent events (such as construction of a home nearby) would avoid this problem. Such an approach is recommended, although it must be recognized that this principle will be acceptable only when the public is fully aware of corporate intentions. It is the

industry's responsibility to inform the public, and explain the criteria used, in order to avoid problems with the uninformed.

A second problem industry has with siting criteria is the lack of any assurance of public acceptance of a site even if it does meet the criteria. This latter problem would perhaps solve itself over a period of time as the public came to regard criteria as sound, and became assured that sites were being required to meet those criteria. Extensive public participation in the site evaluation process is therefore crucial. A formal process for such participation is one means of conflict resolution. In other states, and in Texas in the disposal of low level radioactive wastes, mediation is carried out between officials and formally selected delegates from the opposing community. (See the Low Level Radioactive Waste Disposal Authority Act, Art. 4590f-1 Sec. 3.07 (e)).

Abandoned Disposal Sites

3. RECOMMENDATION: The Legislature should continue to appropriate sufficient funds for the state Disposal Facility Response Fund to provide the state ten percent "Superfund" match and should appropriate additional funds to deal on a state level with emergency situations at abandoned disposal sites.

Sites that were used for waste disposal and are now abandoned present several problems. Many of these contain chemicals that are toxic or otherwise hazardous, and some may have been in operation at a time when technical expertise was less advanced than now. In addition, the existence of such sites may not become known until the environment or health of nearby citizens has been damaged.

The Federal government released in the latter months of 1981 a ranked list of abandoned dumps, using a system for assigning priority called the Mitre system. This ranking is to provide some guidance for assigning clean-up money provided by the Comprehensive Environmental Response, Compensation and Liability Act of

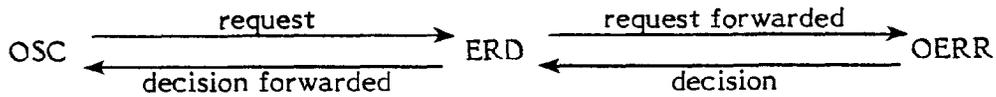
1980 (42 USC § 9601, et seq), known as the Federal "Superfund." Four sites in Texas were included on this list.

In order to receive Federal money for solving the problems at such sites, states must, among other things, provide a ten percent match to the funds received. In the 67th Session, the Texas Legislature passed a bill clearing the way for Texas to receive funds. A \$5.6 million match was appropriated.¹³

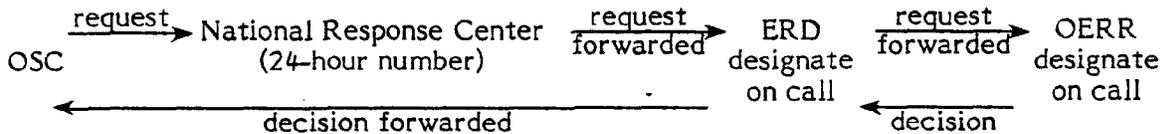
In the future, however, funds for the state's match of Superfund money may need to be provided by some other means. Legislative appropriations are temporary in nature and can only occur once every two years. An unforeseen emergency could consume in a short time an appropriation intended to cover a biennium. The funding source should therefore be continuing and able to respond to changing situations. TENRAC recommends that the Legislature provide such a source.

While there are several alternatives for providing this funding, some may be prohibited. For example, attempts to levy a state tax on certain industries to provide the match failed, because 42 U.S.C.A. § 9614(c) states: ". . . no person may be required to contribute to any fund, the purpose of which is to pay compensation for claims for any costs of response or damages or claims which may be compensated under this title." At issue is the extent Section 9614(c) permits a state to use a state-authorized and industry-supported spill fund to finance clean-up. The Chemical Manufacturer's Association maintains, for example, that Section 9614(c) totally preempts industry support for such state efforts.¹⁴ Should the government ultimately determine that the Federal law does preempt state taxation to help clean up waste sites, any attempts to change the law will meet stiff opposition from industry. Perhaps Texas should therefore seek some other approach.

Before Federal Superfund response to a problem at an abandoned disposal site can be obtained, certain steps must be taken. The state must provide detailed information to the EPA's Emergency Response Division (ERD), which relays the request and supporting rationale to the Office of Emergency and Remedial Response (OERR). That office makes a decision regarding action and relays that to the ERD, which communicates it to the designated Superfund on-scene coordinator (OSC). The process is illustrated graphically below.



This occurs during regular hours; during non-duty hours the sequence is more involved:



(Source: Interim Superfund Removal Guidance, EPA, July 1981.)

It is conceivable that delayed response could result in a problem that could have been prevented by expeditious action. The state should be prepared to respond to emergencies without the necessity of obtaining immediate Federal action. State appropriations for planned actions at abandoned sites are therefore not sufficient. TENRAC recommends that additional funds be made available to allow state level response to emergency situations at such sites. It should be noted that such funds may be recoverable from the Federal fund, but it is important to have the capability to respond immediately, without waiting for such funds to be available.

It is also important to have state funds available for clean-up at sites not likely to receive Federal attention in the near future. Although four Texas sites

are on the Federal priority list, that list contains over 100 other sites, and it is unlikely that all will receive immediate action. In some cases, it may be necessary to initiate action at the state level, using state resources. In addition, while four Texas sites made the Federal list, the state has identified seven sites at which to take action. The availability of funds above the ten percent match appropriation would allow response to occur at these sites, without having to depend on Federal recognition of the problems.

4. **RECOMMENDATION:** The Texas Department of Water Resources and Texas Department of Health should continue efforts to compile an inventory of abandoned waste disposal facilities both off-site and on-site.

Several disposal sites in the Texas coastal area pose problems; the TDWR has identified seven priority sites statewide on which there is agreement that clean-up is required.¹⁵ The TDH is currently also involved in a survey of potential problem sites.¹⁶ So far, the departments have uncovered only industrial sites in need of action under the Superfund. Some municipal sites have the potential for causing problems, and the TDH is currently working to prepare for such possibilities. Finding and investigating municipal and industrial inactive waste disposal sites with the potential for causing public health and safety problems is difficult and time-consuming, but to ensure the safety of the citizens it must be done.

The primary task is to collect all the data and assess the need. When the size of the clean-up job facing the state can be estimated, then it will be possible to determine how much money it will take. This information will indicate whether the present legislative allocation is sufficient. TENRAC recommends that TDWR and TDH continue efforts to compile an inventory of abandoned waste disposal facilities, both off-site and on-site, in order to ensure that problems are recognized and dealt with on a timely basis.

Alternatives to Landfilling

5. RECOMMENDATION: The Legislature should encourage the use of alternatives to landfilling through use of regulatory and economic incentives.

As mentioned earlier, one of the most prevalent methods in Texas for disposing of wastes involves use of landfills. More stringent regulations, permitting requirements, design standards, record-keeping and monitoring requirements have all increased the cost of this form of waste disposal to industry and regulatory agencies alike.¹⁷ Growing public sentiment against land disposal has also created difficulties for industry and for government. Phasing in use of new disposal methods is also costly, however. When two companies make the same product, the cost of disposing of the wastes may determine one company's relative advantage or disadvantage in the market place. Economic pressures require that a company find the least expensive disposal method available to it, and this can discourage the use of new and initially expensive techniques. On the other hand, this can also encourage efficiency and the search for new, better and cheaper means of disposal or methods for reusing wastes or reducing the volumes generated. Table I shows the relative average costs of the various disposal methods.

Technological advances have provided alternative methods of disposal which could all but eliminate the need for land disposal of wastes in the future, although it is an option that will likely be needed for some time. Small generators in particular require this usually more economical option. Some alternative methods are finding a much better market in areas other than the Texas Gulf Coast; for example, in the northeast, where land is both more scarce and more expensive, wastes are being burned in rotary kilns.¹⁸ Although it has become much more difficult to establish landfill sites on the Texas coast, largely because of public opinion, Texas industry has been slow to take the initiative and seek alternative

solutions. Economic incentives may be needed to encourage businesses to enter into initially expensive and sometimes unproven alternative methods.

TABLE I
DISPOSAL COSTS

<u>Method</u>	<u>Cost/Ton</u>
Chemical/Biological Treatment	\$2-25
Incineration (land based)	\$75-2,000
Secure Landfill	\$50-400
Chemical Fixation	\$5-500
Deep-well Injection	\$10-20
Recovery/Re-use	variable

Sources: EPA Hazardous Waste Information, June 1980, and Institute for Chemical Waste Management, April 1980. Costs can vary widely according to type and volume of waste handled.

The government could play a role in some activities directed at encouraging industry to make changes in the handling of its wastes. TENRAC recommends that the Legislature encourage the use of alternatives to landfilling through the use of regulatory and economic incentives. A few efforts have already been made in the state; TDWR has compiled and distributed a State of Texas Industrial Materials Recycling Directory to promote the re-use of waste products; the TDH is investigating methods of encouraging recovery of materials and energy from waste; and the Houston Chamber of Commerce administers a Waste Information Exchange, which provides industry a medium for exchanging materials potentially useful to other industries. A National Waste Exchange has also been established to make it possible for buyers and sellers to contact each other.* By providing these incentives and disincentives, the state could accelerate the movement into other methods of disposing of wastes or finding other uses for waste materials. Recovery can be promoted over landfilling, for example, by allowing tax credits or regulatory

*Contact NWX at P.O. Box 190, Silver Springs, Pennsylvania 17575.

exemptions. Direct funding of technical and market research and of demonstration projects for disposal alternatives is another positive step away from landfilling.

One disposal alternative where several industries are located in one particular area is the regional approach. This allows treatment and disposal at one central facility of varied wastes from several sources. The facility can make optimal use of economies of scale, using a variety of treatment and disposal processes.

"One man's garbage is another man's gold" can be applied to the realm of municipal and industrial wastes. A material or substance produced as a byproduct of one manufacturing process may prove quite useful as a raw material, fuel or feedstock for another process. The practice of such cross-exchange is supported by industry as an economical alternative to both waste disposal and acquisition of feedstock and fuel. Resource recovery from municipal wastes is one of the most attractive alternatives to landfilling, and can greatly reduce the volume of waste to be disposed. The problem arises in making the availability of such materials known, and in transferring them from one location to another. TENRAC recommends continuation of such efforts at providing resource recovery information as a means of encouraging the use of alternatives. Other alternatives should also be explored. An efficient system for information exchange (such as the privately-operated Houston Waste Exchange or the State Directory) could prove to be all the incentive necessary to induce active participation in this swapping of materials. The exemption of recycled materials from some Federal hazardous waste regulations is itself a powerful incentive that could be promoted.

The TDH in December 1981 created an advisory council to encourage the use of waste as fuel to generate energy. The Commissioner of Health pointed out that solid waste is an abundant fuel, inexpensive, and in renewable, continuing supply. The motivation for the Department's action was the search for "alternatives to

land disposal of our waste."¹⁹ TENRAC has been cooperating with the TDH in this activity and will continue to participate in whatever ways may be productive and feasible.

The ultimate solution to any future problems of waste disposal may be the development of new and more efficient processes which either reduce the amount of waste produced or eliminate the production of wastes altogether, both industrial and municipal. Economic and political incentives are already present for such development; these incentives could perhaps be increased or at least promoted.²⁰

Numerous other technological innovations may be feasible for industries on the coast. Some examples are landfarming, incineration at sea, controlled incineration (in kilns and fluidized beds, for example), fixation/solidification and breakdown by microbes (biological treatment).²¹

Outlook

When considering the increases in costs caused by the regulation of waste disposal, the benefits to public safety and environmental protection those regulations bring about must be considered as well, however difficult they may be to quantify. Another important factor is the cost of dealing with problems created by improper disposal practices prior to the regulations. Millions have been spent across the country and in Texas, and many more millions will be spent in the future to clean up old abandoned disposal sites which resulted in damage to the land, property or health of nearby residents. A \$4 million cleanup at Love Canal in 1952 could have prevented the current \$100 million estimate and the filing of over \$2 billion in lawsuits.²² Many of these incidents are familiar to the public, having been in headlines and on TV all too frequently in past months.

A number of other factors will affect the nature and ultimate cost of waste disposal activities and regulation of those activities in the future. Availability of sites for both industrial and municipal waste disposal facilities will have a major

effect on where and how such disposal takes place. That, combined with negative public sentiment and with government encouragement, is likely to push innovation in methods of disposal, re-use and waste reduction.

As advances are made, high technology disposal facilities will be designed and built on the site of many manufacturing operations. The large capital investments required for such advanced facilities will preclude smaller industries from such ventures, and as a result they will continue to experience disposal problems. The scarcity of safe, controlled off-site facilities will exacerbate the disposal problems faced by the moderate sized to smaller waste generators. The problems and needs discussed in this section indicate the importance of planning for the waste disposal requirements of Gulf coast industries and municipalities.

BEACH ACCESS/EROSION

Texas' beaches and coastal waters have provided recreational enjoyment to local and out of state residents for many years. Indeed, tourism has furnished the livelihood for numerous individuals and communities along the coast. Growth in population, increasing incomes and other factors have stimulated the demand for access to and recreational use of coastal resources, resulting in greater demands on decision-makers and managers of coastal areas and coastal resources.

Recreational uses of coastal resources can unfortunately conflict with other uses of importance to the state and its citizens, such as housing, industry and energy development. In addition, certain recreational activities can conflict with each other. Careful planning and management is necessary to ensure that future generations of Texans will be able to enjoy the same recreational opportunities. Currently, recreation is managed in a number of different ways; i.e., recreational areas can be managed, or the activities themselves and the equipment required for the activity can be subject to regulation.

A comprehensive viewpoint is necessary for management by recreational area, but the varied nature of the different coastal areas does not lend itself to a uniform policy for the entire coast. A case-by-case approach can, however, lead to some confusion and could potentially lead to litigation, particularly in regard to beach access.

The public uses the Gulf waters and shores for fishing, boating, swimming, picnicking and camping. The Texas Open Beaches Act (V.T.C.A., Natural Resources Code Sec. 61.011 et seq) protects public access to certain beaches bordering the seaward shore of the Gulf of Mexico. The beach, under Chapter 61

of the Texas Natural Resources Code, is any beach area extending inland from the line of mean low tide to the line of vegetation bordering on the Gulf of Mexico, to which the public has acquired the right of use or easement to or over the area by prescription, dedication, presumption or has retained the right by virtue of continuous right in the public since time immemorial, as recognized in law and custom.* The line of vegetation is defined as the extreme seaward boundary of natural vegetation which spreads continuously inland. It is, under the Act, an offense against the public policy of the state to obstruct or restrain "free and unrestricted access to the beaches" (V.T.C.A., Natural Resources Code Sec. 61.013). State laws subsequent to the Open Beaches Act, culminating in the Coastal Public Lands Management Act of 1973, have recognized access rights to other public coastal areas such as bay-front beaches, bay waters and Gulf waters.¹

Entities with regulatory authority on Texas beaches include cities and counties,² the state and the federal government. There are management areas such as city and county beaches, state parks and the Padre Island National Seashore on the Texas coast. The Texas Parks and Wildlife Department can acquire land, water and interests in land and water for recreation areas and facilities, and the U.S. Fish and Wildlife Service administers over 170,000 acres of wildlife refuges along the Texas coast.

Some management by activity, in addition to managing by areas, exists on the coast. The TPWD issues licenses for sportsfishing, hunting and boating. In 1977, there were 430,186 combination hunting and fishing licenses sold by the Department statewide along with 1,127,335 sport fishing licenses and 731,610 game

*In simplest terms, this means that if the public has used for a long time private lands for access to the beach or as beach itself and the landowner has not prevented such use in the past, then the public has gained the right to continue to use the land for that purpose. The landowner cannot suddenly start prohibiting such use. No formal recognition of this use is required—the use itself is sufficient to establish the right.

licenses.³ Many coastal areas are extremely popular for waterfowl and whitewing dove hunting;⁴ both Texas and out-of-state residents spend a great deal of money for services on the coast, including waterfowl and deer hunting leases. Recreational boating occurs primarily in the Intracoastal Waterway, the bay systems, and the open Gulf, and sportsfishing occurs in these areas as well.

There are 365 miles of beach along Texas' Gulf Coast, 173 of which are easily accessible and 120 accessible with difficulty.⁵ "Easily accessible" is defined as areas reached with a reasonable expenditure of effort; "accessible with difficulty" requires a four-wheel-drive vehicle, a walk of one mile or more or a boat. "Inaccessible" areas are those to which the public has no presumptive right of access to or use of. Some areas inaccessible except by boat are San Jose and Matagorda Islands and West Matagorda Peninsula. The state's most popular recreational beaches are on Galveston Island and Bolivar Peninsula, Surfside, Bryan Beach, Sargent Beach and on Mustang and Padre Islands.

Beach Access and Beach Traffic

1. **RECOMMENDATION:** The Attorney General's Office should communicate to coastal cities and counties the authority they possess for developing access/beach management plans for public beaches and of the planning processes that are acceptable to that office.

Protecting the public's guaranteed right of access to the beaches in Texas has involved providing the means of access, such as roads, and preventing any restriction of access, whether such restriction is in the form of structures, barriers or postings. The Attorney General is responsible for ensuring both the public's right to access to and the public safety on the beaches (TEX NAT RES CODE Chapter 61 Sec. 61.011).

An issue related to access is regulation of beach traffic.⁶ Heavy congestion of beaches has created safety problems and generated conflicts between drivers and pedestrians. Some cities and counties have restricted beach traffic on beaches within their jurisdiction. Such actions often generate controversy over the possibly-conflicting needs of protecting public safety and public right of access, and the success of many of these efforts has never been thoroughly determined. While the Attorney General does not actually have access rules or standards, the office can provide guidance and assistance in development of beach management plans.

Where traffic is banned on beaches, adequate and accessible parking for beach users is needed. Location and maintenance of parking areas may present problems, as may the decision of whether or not to charge parking fees. If not handled properly, traffic bans or restrictions may restrict public access to the beach. In addition, pedestrian traffic over dunes between off-beach parking and the beach can degrade the dune system.

In areas where beach traffic is not banned, other difficulties may arise. Bathers and pedestrians may be endangered by heavy traffic or fast-moving vehicles on the beach. Access roads that cut through the dunes, and vehicles driving over the dunes, can be destructive. Other environmental problems result from allowing traffic on beaches, such as contamination of sand and water from oil leaking from cars, and increased erosion from vehicular activity in soft sandy areas.

Beach traffic regulation or control is therefore needed to protect both the public and the environment. Alternatives to total restriction of traffic on the beaches include restricting traffic to lanes marked with barrels or pilings, setting speed limits and increasing patrols on crowded beaches. Constructing access roads to go over dune heights rather than cutting a low pass through the dunes can help

to preserve the protective feature of the dune system. Cities or counties with the desire to develop plans for controlling traffic on beaches within their jurisdiction may consult with the Attorney General's Office during plan development and possibly avoid later disputes. Beach management planning would be encouraged by an effort on the part of the Attorney General's Office to inform cities and counties of their authority to develop such plans. TENRAC recommends that the Attorney General's Office communicate to coastal cities and counties the authority they possess for developing access/beach management plans for public beaches and of the planning processes that are acceptable to that office.

Beach concessions, such as food and drink vendors and inner tube and surfboard rentals, are regulated outside city limits by the Texas Parks and Wildlife Department under Sec. 61.161 of the Texas Natural Resources Code; cities regulate those concessions within city limits.⁷ Mobile businesses must receive a permit from the TPWD, while fixed structures on the beach are prohibited since such structures are said to violate the Open Beaches Act. The provision of facilities such as public restrooms is therefore difficult. Generally, this problem may be avoided by seeking the counsel of the Attorney General's Office, which is responsible for enforcing the Open Beaches Act. The Attorney General can provide cities and counties with information concerning the Act, and TENRAC recommends that the Attorney General's Office do so routinely.

2. **RECOMMENDATION:** The Legislature should consider local requests for funding under the Beach Cleaning Act in light of the state's overall budget priorities, and encourage coastal cities and counties to make full use of these funds for beach cleaning and patrol and lifeguard services.

Heavy use of recreational beaches creates difficulties besides access needs and traffic problems. Congested areas become littered and conditions may threaten public safety and health. Accumulated trash can spread disease, and

scattered litter may injure bathers or pedestrians. Beach users require services such as restrooms, concessions, and camping areas. Where such services are not available, beach-goers often trespass onto private property seeking such services, and may even vandalize or unintentionally damage property. The Beach Cleaning Act of 1969 (TEX NAT RES CODE Sec. 61.061-.083) authorizes granting funds to city and county governments for the purpose of cleaning litter from Gulf beaches. In 1973, an amendment made the costs of patrols and lifeguard services reimbursable as well, although to date no funds have been appropriated for these purposes. Although cities and counties are authorized to raise funds through parking and user fees, many beach users are visitors from outside the cities and counties where the beaches are located, and state assistance is therefore appropriate. In 1978, there were 20,898,000 out-of-state visitors to Texas;⁸ doubtless many of these visited the coastal area, although figures are not available. Some data exist for coastal visits from within the state; for example, in 1974 there were 2,413,422 visitors (in terms of number of person trips) to Corpus Christi from other areas within Texas (specifically 1,954,872 visitors from Bee, Bexar, Brazoria, Dallas, Galveston, Harris, Hidalgo, Jefferson, Montgomery, Tarrant and Travis counties; and 458,550 from other counties).⁹ That year there were 4,151,085 trips to Galveston from outside the county.¹⁰ These figures illustrate that local authorities may require financial assistance, including state funds, in order to provide adequate services. Demand for services such as concessions regulation, restrooms, and camping or picnicking facilities is likely to increase in the future, requiring the provision of more areas at increasing expense. TENRAC recommends that the Legislature should consider local requests for funding under the Beach Cleaning Act in light of the state's overall budget priorities, and encourage coastal cities and counties to make full use of these funds for beach cleaning and patrol and lifeguard services.

Erosion

3. RECOMMENDATION: The Legislature should appropriate to TENRAC funds for shoreline erosion studies, specifically a bay and estuary erosion study, and an up-to-date Gulf shoreline erosion study. The Attorney General's Office should continue to discourage the construction of structures on the public beach in violation of the Open Beaches Act.

A net loss of shore land, or erosion, occurs when more material is removed from an area than is deposited. The rate of this process is severe along much of the Texas Coast, approaching 400 acres per year on the Gulf shore.¹¹ This is a problem from an environmental standpoint, because vital habitat is lost or changed, and from an economic and political one as well. Erosion affects accessibility by impeding traffic on beaches or eliminating beach areas altogether.¹² Beachfront property can end up underwater, and therefore become property of the state.

As pointed out, one consequence of erosion is restriction of the public right of access. Property owners may claim ownership of areas that once were behind the beach but have become beach through erosion, and such claims sometimes result in violations of the public access rights. Recognition of the changing or "rolling" nature of the beach is limited--many citizens instead view the very dynamic system as a stable one. Some Texas beaches, in addition, tend to erode or "roll" landward, taking land away from the coast, rather than rolling seaward and creating more land.

While some data exist on the erosion of Texas Gulf shores, the last study was completed in 1975, and some significant changes have been noted in spot checks by Bureau of Economic Geology staff. Surfside is one example. In contrast, data on erosion of bay shores are practically nonexistent, and there are indications that bay shore changes are accelerating. Erosion data would be valuable in terms of demonstrating the success or failure of current erosion abatement techniques,

identifying those practices that contribute to rather than help solve the problem, and indicating the magnitude of the problem on bay shores. Therefore, it is recommended that the Legislature appropriate to TENRAC funds for shoreline erosion studies, specifically a bay and estuary study, and an up-to-date Gulf shoreline erosion study.

The natural processes of erosion have been intensified in some areas by human activities, including erection of structures intended to prevent beach loss. These structures will sometimes increase the rate of loss. For example, a row of parallel groins along a beach can force sand to move further offshore, along the groin tips rather than close to shore, shunting sand away from the beach. Bulkheads create a scouring effect, reflecting wave force downward and back into the sand.¹³ Placement of such structures may also encourage further development in an eroding area. The state allows cities and counties to build erosion control structures (Sec. 61.023, NRC); however, individuals or communities that do so may be subject to court action under the open beaches concept. Construction of other fixed structures on the beach can be prohibited under the Open Beaches Act, and the Attorney General is responsible for ensuring that construction in violation of the law does not occur. TENRAC recommends that the Attorney General's Office should continue to discourage the construction of structures on the public beach in violation of the Open Beaches Act.

Other activities contributing to shoreline erosion include excavation of sand from beaches and grading of beaches. Cities and counties conduct such activities, such as grading beaches as a method of cleaning, although these practices are known to contribute to erosion. Destruction or degradation of dunes and vegetation also contribute to the loss. (See the section on Dune Protection in this report for further discussion of this subject.) Driving on the beach and drainage across beaches from parking lots or housing may also contribute to the problem.

The extent of the problem and the areas where it is worst have not been clearly defined, although such definition would help decision-makers ease the problem.

4. **RECOMMENDATION:** The Legislature should require that purchasers of property or structures (including condominiums) on the Gulf or bay shorelines receive notice of the historic rate of erosion in the area and an explanation of the possibility that property can change to beach or submerged lands and thus revert to public ownership.

The problems of property ownership as a result of the effects of erosion have been discussed, as has the need for current data on erosion rates and problems. The former could be alleviated if property owners were aware of the situation and could therefore not reasonably object when erosion affected their property. Any citizen purchasing or contemplating purchasing land or other property in erosion-prone areas should be fully aware of the possibilities of change in the ownership rights on that property. TENRAC recommends that the Legislature should require that purchasers of property or structures (including condominiums) on the Gulf or bay shoreline receive notice of the historic rate of erosion in the area and the explanation of the possibility that property can change to beach or submerged lands and thus revert to public ownership.

Outlook

Recreation on the Texas coast is likely to grow in importance to the state's economy and to the quality of life of its citizens. For several reasons, more and more people are seeking recreation close to home, and the Texas coast offers many ideal recreation sites. Growing demand on the existing resources will require prudent management in order to protect those resources for future users. Management needs to be such to ensure that visitors to Texas beaches receive the necessary services to maximize their enjoyment and safety. Congestion on the beaches, as well as problems with access, are likely to continue to plague coastal

cities, counties, and state officials. Erosion is certain to continue, if not accelerate. Care must be taken to ensure that all users of the coastal resources receive fair treatment, and that those resources can be enjoyed now and by future generations.

FRESHWATER INFLOWS

Among the most important features of the Texas coast are its seven major estuaries: Sabine-Neches, Trinity-San Jacinto, Lavaca-Tres Palacios, Guadalupe, Nueces Delta, Mission-Aransas, and Laguna Madre. These estuaries are generally defined as semi-enclosed coastal bodies of water having a full connection with the open sea and within which seawater is measurably diluted with freshwater derived from land drainage.¹

The Guadalupe and Laguna Madre estuaries do not strictly meet this definition. The Guadalupe estuary connects to the open Gulf of Mexico via the Lavaca-Tres Palacios and Mission-Aransas estuaries, and major parts of the Laguna Madre are not measurably diluted with freshwater. Nonetheless, the dilution of seawater with freshwater within these estuaries, as well as within the other estuaries along the Texas coast, is generally regarded as an important factor in their productivity. For this reason, certain minimal levels of freshwater inflow to an estuary must be maintained if the productivity of the area is to remain undiminished. However, other users compete with the estuaries for freshwater. Agriculture and a variety of industrial activities demand large quantities of freshwater as an integral part of their operations. Similarly, significant amounts of freshwater are diverted for municipal uses. Providing for all of the natural and human requirements for freshwater has proven to be a difficult problem, especially in times when freshwater is scarce. As further upstream water development takes place, perhaps reaching its maximum potential yield of freshwater sometime during this century, the conflicts among the various competing uses of freshwater will intensify and increasingly become state-wide management problems. The strong state interest in freshwater and its uses and in maintaining the health of Texas

estuaries has led to extensive public discussion concerning the adequacy of the state's management of freshwater inflows.

The inflow of freshwater is important to the productivity of Texas estuaries for several reasons. Initially, the amount of freshwater inflow determines the salinity of estuarine waters, thereby governing which species of plants and animals will be found in those waters.² For example, brown shrimp tend to be found in greatest concentration off the Texas coast, where bay salinity levels are relatively high, while white shrimp are more abundant off the Louisiana coast, where estuarine salinity levels are lower.³ Secondly, freshwater inflows bring with them vital nutrients used in the estuarine food chain, thereby creating a nutrient sink of sulfates, carbonates, phosphorous and nitrogenous compounds, and washing large amounts of detritus into the estuary.⁴ Thirdly, freshwater inflows influence the circulation patterns of estuarine currents.⁵ Finally, they maintain a delicate balance of sediment that prevents compaction and complete inundation of marsh areas.⁶

The timing of freshwater inflows to an estuary is important to the productivity of these areas. The time of year when "pulses" of freshwater enter an estuary seems to be critical in providing specific salinity requirements for estuarine larval and juvenile forms previously spawned in the Gulf of Mexico.⁷ For example, in an evaluation of the effects of the Toledo Bend Project on Sabine Lake, it was concluded that the reduction in the catch of brown and white shrimp in the area was attributable to the dam's operational procedures, which delayed the normal surge of freshwater into the estuary.⁸ Occasional extreme freshwater inflows due to flooding also flush pollutants from the estuary and scour tidal inlets, thereby ensuring continued free exchange of water, sediment, and biota.⁹

In general, then, Texas estuaries are adapted to a natural environment that includes both periods of extreme freshwater inflow and low-flow conditions.

During periods of drought, an estuary can maintain its viability provided that certain base flow requirements are met. However, if the amount of freshwater supplied to an estuary falls below this base flow rate, the estuary may be threatened.¹⁰ The salinity level of the estuary may change such that the area's biological productivity, including commercially valuable species, will be lowered. For example, at least one set of writers has concluded that human-caused changes in the Matagorda Bay System, resulting in the diversion of the natural flow of the Colorado River, have induced a decline in the bay's biological production and economic output.¹¹

The preceding discussion identifies several basic, general characteristics of an estuary. Each estuary is unique, however, and the relationship between these characteristics in a specific estuary cannot adequately be discussed in general terms. For example, research indicates that the Nueces Bay estuary is more affected by tidal incursions of higher salinity Gulf water than is the Mission-Aransas estuary.¹² Similarly, Laguna Madre does not have a free connection to the Gulf and frequently reaches hypersaline conditions.¹³ The unique conditions of each estuary necessarily determine its response to variations in the rate of freshwater inflow.

Additionally, there are wide variations of freshwater inflow, both seasonally within years and yearly as well as geographically. Freshwater inflow generally decreases and salinity increases from east to west. In each estuary, a unique ecosystem has developed. The productivity of eastern estuaries is dominated by shellfish species, while the productivity of western estuaries is dominated by finfish species. Different species may actually be in competition with each other due to the particular relationship between freshwater inflows and the life cycle of each species. Finally, the estuarine systems themselves are changing over time, and the biological balance within these systems is constantly adapting to such changes.

While the connection between freshwater inflows and fisheries production is complex, it is, nonetheless, real. Shellfish and finfish production depends upon the maintenance of proper salinity and nutrient conditions.¹⁴ The continued viability of the Texas shrimp industry is also dependent upon the health of the estuaries.¹⁵ In 1979, this industry produced approximately 42 million pounds of shrimp, which production was estimated through use of a multiplier factor to have an exvessel value of approximately \$500 million.¹⁶ It has been estimated that 97.5 percent of the coastal fisheries species are estuarine-dependent, and the total Texas harvest of estuarine-dependent seafoods averaged about 110 million pounds per year during the five-year period from 1972 to 1976.¹⁷

Freshwater inflows to Texas estuaries have received significant legislative attention during the last decade. The Texas Water Resources Study Committee, established by the 61st Legislature in 1969, found that there was substantial public concern for assuring adequate freshwater inflows to Texas estuaries, and recommended legislation to authorize the Water Rights Commission to allocate quantities of water necessary to maintain the health of the bays and estuaries.¹⁸ Although the recommended legislation was not adopted, the 62nd Legislature did require that the effects of upstream development on the bays and estuaries be given consideration in the development of a state water plan.¹⁹ Subsequent legislatures restated the need to maintain adequate freshwater inflows to Texas estuaries.²⁰ Finally, the 64th Legislature enacted Senate Bill 137,²¹ establishing the maintenance of the proper ecological environment of the bays and estuaries as part of the state's water policy,²² requiring the Water Commission to assess freshwater inflow needs when considering permit applications,²³ and providing for freshwater inflow studies by the Water Development Board.²⁴

Although the Water Commission has been petitioned to establish a policy on freshwater inflows and to promulgate procedural rules governing the admission of freshwater inflow data in permit hearings,²⁵ no administrative policies or rules

have been developed. While several permit hearings have included a discussion of freshwater inflows, the adequacy of the state's action on this issue has been questioned.²⁶

1. RECOMMENDATION: The Texas Department of Water Resources should continue to study the freshwater needs of Texas estuaries and should develop additional information on the relationships between various levels of freshwater inflow and the overall health of these estuaries, giving special attention to the use of innovative approaches to preserving estuarine health.

In 1976, the Texas Coastal Management Program observed that freshwater inflows are at best managed almost blindly.²⁷ This observation was based on the fact that very little was known about the relationships between the timing or amount of freshwater inflow and the maintenance of complex estuarine ecosystems. To a degree, this problem has been addressed by the Department of Water Resources studies on the influence of freshwater inflows upon the state's major bays and estuaries.²⁸ These studies provide valuable information concerning the dynamic characteristics of each major estuarine system and the importance of freshwater inflows to these systems. The Department of Water Resources studies do not, however, resolve many issues concerning the management of freshwater inflows. The data base used in the studies has been criticized as inadequate. If the data base has, in fact, shortcomings, it must be recognized that these studies were conducted under a legislatively-imposed deadline.²⁹ Additionally, the need for further study of the interrelationships between estuaries, such as water circulation patterns, has been identified.³⁰ Finally, the continuing need to refine existing data and to further define the dynamic characteristics of the estuaries will always be present.

It is also important that innovative approaches to maintaining estuarine health be considered. While proper management of existing impoundment structures will help maintain adequate freshwater inflows to the estuaries, other ideas

must be examined. For example, the effects of alterations in the floodplain of a river system should be investigated and strategies should be developed to address such matters.³¹ The Department may also examine restriction of tidal inlets, interconnections between bays, and interbasin transfers of fresh water as approaches to the preservation of estuarine health. The need for providing adequate freshwater inflows to Texas estuaries should be regarded as a major part of the state's water planning efforts and all future plans or recommendations should reflect a consideration of this need.

The lack of complete knowledge about the dynamics of the state's bay and estuary systems means that state inaction concerning freshwater inflows to these areas carries with it certain risks. There is, admittedly, a risk that upstream benefits from the use of freshwater may be foregone without achieving well-intentioned benefits to these coastal resources if the state acts without complete information. In light of the growing upstream demand for freshwater and the potential for full upstream development in the foreseeable future, however, state action to protect the productivity of Texas bays and estuaries cannot be deferred for too long. The risks of a loss of productivity in these areas will continue to increase, and it must be considered along with any risk of lost upstream benefits. For this reason, issues concerning the supply of freshwater to bays and estuaries must be a major focus of the state's efforts to revise the Texas Water Plan. Decisions on the relative priorities of various uses of freshwater need to be reached, where possible, within the time frame of the revision process.

The Department of Water Resources has ample authority to continue its studies of freshwater inflows. This topic is one of several which the executive director of the Department is required to study.³² Additionally, consideration of the effects of upstream development on the bays and estuaries must be included in the state's water planning efforts.³³ Given the needs for additional research on

freshwater inflows and the Department's statutory duties to study this matter, TENRAC recommends that the Department of Water Resources continue to study the freshwater needs of Texas estuaries and develop additional information on the relationships between various levels of freshwater inflow and the overall health of these estuaries, giving special attention to the use of innovative approaches to preserving estuarine health. The Department should allocate its budgetary and personnel resources to support such studies, should draw upon the expertise of other state agencies, academic institutions, and research centers, and should, if necessary, request additional legislative appropriations to fund this activity.

Outlook

Some people might argue that allocating freshwater to estuaries denies the benefits of that water to people. Such an argument is at best simplistic. Freshwater inflows support the Texas bays and estuaries, which in turn support fishing and recreational interests that employ large numbers of people and contribute significant sums to the state's economy. Water that flows into bays and estuaries is not wasted water. In order to protect the long-term productivity of these estuaries, the state of Texas must actively seek ways to provide for the freshwater needs of these areas. A failure to do so may result in significant changes in the coastal ecosystem that will adversely impact large numbers of Texas residents.

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