Coastal Natural Resources in Texas:

Report to the Governor and the 68th Legislature

Texas Energy and Natural Resources Advisory Council

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Coastal Natural Resources in Texas: Report to the Governor and the 68th Legislature

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All programs and information of the Texas Energy and Natural Resources Advisory Council are available without regard to race, ethnic origin, religion, sex or age.

TEXAS ENERGY AND NATURAL RESOURCES ADVISORY COUNCIL
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☆ ☆

Dr. Milton L. Holloway
Executive Director

Honorable William P. Clements, Jr.
Governor of Texas
State Capitol
Austin, Texas 78701

Dear Governor Clements:

I am pleased to submit this report, Coastal Natural Resources: A Report to the Governor and the 68th Legislature, in accordance with the requirements of the Coastal Coordination Act of 1977.

The report summarizes a study of problems and issues affecting the coastal natural resource areas, presents recommendations for action on identified problems, and contains a policy position statement from the Council.

A preliminary draft of this report was reviewed by the Texas Energy and Natural Resources Advisory Council's (TENRAC) Advisory Committee on Natural Resources Policy on May 18, 1982. Several changes to certain proposed recommendations were made as a result of the Advisory Committee's review, and the report was forwarded to the Council for its consideration. Following the Council's review of the report at its June 9, 1982 meeting, a resolution containing general policy recommendations was prepared. This resolution was adopted by the Council on September 15, 1982. A copy is included in this report on pages ii-iv.

This report reflects the efforts of TENRAC's staff. Staff from other State agencies, universities, and the Texas Legislature assisted in identifying issues and reviewing early drafts of the document, as did representatives of the private sector. The report does not necessarily reflect the views of the Council. The resolution alone has received formal approval, and is the official statement of TENRAC's policy regarding coastal natural resources. The report is being transmitted to you as background to the issues addressed in the Council's resolution.

I hope this report is useful in the identification and evaluation of important issues of State policy in the coastal area of Texas.

Sincerely,

Milton L. Holloway
Executive Director

MLH:erb

ACKNOWLEDGEMENTS

Many individuals deserve thanks for their role as invaluable sources of information and guidance for this report. Legislative staff and those at many state agencies gave generously of their time and talent, as did numerous individuals at state universities. Local government officials, industry representatives and those in the environmental field also contributed to this effort. These individuals are simply too numerous to name.

The report would not have become a reality without the help of Meri Mehrens, who prepared the final manuscript, and Margaret Sanders, Marney Dunlap, Eric Bodenschatz, and Corrine Gorrell, who all helped prepare and revise earlier drafts. Their work merits special thanks.

TENRAC's Executive Director, Milton L. Holloway, provided general guidance in preparation of the report. Melissa Pitts Gaskill contributed her time and effort as editor of the report. Members of the Natural Resources Division staff who prepared the report are: J. Mark Lawless, Director; Wm. Mark Thompson; Melissa Pitts Gaskill; Jeanette Norris; and R. Clay Kincaid.

Coastal Natural Resources in Texas

Table of Contents

Resolution iii

Preface vii

Executive Summary ix

Introduction 1

Issues

- Offshore Energy Production and Onshore Impacts 3
- Marine Commerce in Texas 11
- Aquaculture 17
- Waste Disposal 21
- Beach Access/Erosion 27
- Freshwater Inflows 31
- Wetlands 35
- Dunes 43

References 47

RESOLUTION

of the

TEXAS ENERGY AND NATURAL RESOURCES ADVISORY COUNCIL

Regarding

Coastal Natural Resources

WHEREAS, the Coastal Coordination Act (V.T.C.A., Texas Natural Resources Code, Section 33.202, et seq.) declares that it is the policy of the State of Texas to make more effective and efficient use of public funds and public facilities in coastal natural resources areas, and to better serve the people of Texas by:

- continually reviewing the principal problems of State concern, the performance of State coastal programs, and the measures required to resolve identified coastal problems; and

- making the State's many existing coastal management processes more visible, accessible, and accountable to the people of Texas; and

WHEREAS, in order to better implement this policy, the Texas Energy and Natural Resources Advisory Council, as successor to the Natural Resources Council, is directed to prepare and submit to the Governor and the Legislature in each even-numbered year a comprehensive report with recommendations for action on problems and issues affecting the coastal natural resources areas of the State; and

WHEREAS, the staff of the Texas Energy and Natural Resources Advisory Council has prepared such a comprehensive report;

NOW, THEREFORE, BE IT RESOLVED, that the Texas Energy and Natural Resources Advisory Council recommends that the following actions be taken by the State of Texas to promote improved management of the State's coastal natural resources areas:

1. **OFFSHORE ENERGY PRODUCTION** -- The Legislature should act in a timely fashion to resolve the issue of Gulfward annexation by coastal home rule cities. The State should also examine the costs and benefits of offshore energy development to the State as a whole and to coastal communities in particular, and should give special attention to identifying alternative sources of funding available to coastal communities to mitigate any adverse onshore impacts of offshore energy development. In keeping with previously established TENRAC policy, sharing of federal revenues from the Outer Continental Shelf should be supported as a source of revenue. Texas should also continue to monitor the effectiveness of its procedures for regulating coastal energy development and should fully explore the merits of expanding the use of general permits.

2. **MARINE COMMERCE** -- The State should continue to assess the implications of federal legislative and regulatory initiatives for marine

commerce in Texas, giving special attention to the potential impacts of user fees and other cost-sharing proposals on smaller ports and shipping interests. A review of State policy toward port management and financing should also be conducted. In keeping with existing policies and laws, the State should renew its efforts to assume full non-federal sponsorship of the Gulf Intracoastal Waterway. A State-sponsored port forum should also be established to facilitate discussion of permitting and compliance issues.

3. **AQUACULTURE** -- A State-sponsored forum should be established to provide communication among all parties affected by aquaculture and to promote the exchange and coordination of ideas and information. The Texas Department of Agriculture should be designated as the State agency primarily responsible for coordination of and support for aquaculture activities and should serve as a central source of information and assistance.

4. **WASTE DISPOSAL** -- Texas should continue to take all actions necessary to receive full delegation of responsibility under the federal Resource Conservation and Recovery Act, subject to continued federal funding. The Texas Department of Health and the Texas Department of Water Resources should review their existing criteria concerning the siting of waste disposal facilities and should report to the Legislature any needs for improvement that are identified. Both agencies should receive adequate funding to continue emergency response and remedial action at abandoned waste disposal facilities, and they should also continue their efforts to compile a complete inventory of abandoned disposal sites. The State should encourage the use of alternatives to land filling of wastes by providing economic and regulatory incentives.

5. **BEACH ACCESS/EROSION** -- The Attorney General's Office should advise coastal communities of restraints on their ability to develop and enforce beach access and management plans. Local requests for funding under the Beach Cleaning Act should be considered by the Legislature in light of the State's overall budget priorities. The Legislature should appropriate funds to TENRAC to conduct a comprehensive study of shoreline erosion along Texas bays and the Gulf. Through appropriate means, the public should be made aware of the data relevant to coastal hazards, including shoreline erosion.

6. **FRESHWATER INFLOWS** -- 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.

7. **WETLANDS** -- Texas should examine alternatives to traditional forms of wetlands regulation, including the use of economic incentives and the acquisition of coastal wetlands. State efforts at wetlands protection should not duplicate the efforts of the federal government. Texas should continue to seek assumption of federal permitting authority under Section 402 of the Clean Water Act, subject to continued availability of federal funds to administer the program.

8. **DUNES** -- The Legislature should review the State's existing mechanisms

for protection of important coastal dunes and should take such action as is necessary to ensure that important dune areas are protected, giving due consideration to the rights of private landowners.

AND BE IT FURTHER RESOLVED, that approval of this resolution does not constitute approval of any specific recommendations or narrative contained in the staff report.

Approved this 15th day of September, 1982

William. P. Clements, Jr.
Governor
Co-Chairman

William P. Hobby
Lieutenant Governor
Co-Chairman

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.

Several factors emphasize the need for the investigation of coastal natural resource issues and the search for their resolution. 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 for decision making 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.

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 staff 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.

Preparation of the Report

In addition to state-initiated activities and programs, 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. A draft document was also reviewed by the staff of various state agencies.

A revised draft was then considered by TENRAC's Natural Resources Policy Advisory Committee on May 18, 1982. The staff made revisions in accordance with the Committee's comments, and submitted the report to the full Council on June 9, 1982.

The Council discussed the report, but delayed action on the recommendations contained in it. At the September 15, 1982 Council meeting, the members passed a resolution based on the staff report. This resolution is found on pages ii through iv of this document. The actual report, which begins on page 1, stands as a staff document, intended for use as a background to and reference on the issues addressed in the Council resolution.

Executive Summary

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.

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 staff of the Texas Energy and Natural Resources Advisory Council has developed recommended actions or responses to the needs identified.

This report is prepared in accordance with the directive of the Coastal Coordination Act of 1977 (V.T.C.A., Natural Resources Code § 33.201 et seq.). The Coastal Coordination Act lists major concerns to be addressed in the report, including: changes in federal coastal policies, principal problems of state concern, the effectiveness of current state programs, and research and data acquisition priorities.

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

The issue areas addressed and recommendations are:

OFFSHORE ENERGY PRODUCTION AND ONSHORE IMPACTS

1. The Legislature should seek a timely resolution to the question of gulfward annexation by coastal home rule cities.

The 67th Legislature considered various proposals to resolve the issue of gulfward annexation by coastal home rule cities, but no final resolution was reached. At issue are the effects of gulfward annexation on the development of offshore oil and gas reserves and the financing of city attempts to deal with the onshore impacts of offshore energy development. Until this issue is resolved, offshore energy development will take place in an atmosphere of regulatory uncertainty and cities will not be confident of the security of their financing for mitigation of adverse onshore impacts.

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 funding.

The issue of financing of city efforts to mitigate onshore impacts of offshore energy development has grown more acute as federal budget cuts have reduced the amount of funding available to cities for this purpose. Congress is presently considering various proposals to share a portion of the federal government's income from OCS development with the states, and it is important that Texas monitor these proposals. TENRAC endorsed these proposals in concept in a resolution adopted March 12, 1982. Any funds that are made available to the states for the mitigation of onshore impacts may be used to relieve coastal cities of the necessity to finance mitigation efforts through avenues such as annexing and taxing offshore areas.

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

The state is properly concerned with protecting the marine environment from pollution due to offshore energy development. Where this concern is expressed in the form of numerous regulatory programs, it is equally the state's responsibility to insure that the users of these programs are aware of the procedures and other requirements that they contain.

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

In recent years, the federal government has increased its use of general permits to cover an entire category of similar activities. Using general permits for these categories allows the federal government to focus its regulatory resources on those areas and activities where an individual permit review is necessary. In order to insure that its general permits do not conflict with or hamper state requirements, the federal government coordinates their development with affected state agencies. Consequently, state agencies should cooperate to the fullest extent possible with the federal government to promote maximum use of general permits. Additionally, the Legislature should study the appropriateness of authorizing state agencies to issue general permits. Where a category of activities can be treated as a single unit for permitting purposes, the efficient use of state resources may demand a general permit. The use of state

general permits corresponding to those issued by the federal government may also increase the overall efficiency of the regulatory system from the perspective of the permittee.

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.

The state has been designated as the non-federal sponsor of the GIWW. In order to assume formal sponsorship, the state must agree to release the federal government from responsibility for any future damages incurred from the construction and/or maintenance of a navigation project. It has been determined that the Texas Constitution will not permit the state to make such an agreement, however. In order to remove this impediment, Congress must relieve the state of the requirement that it execute this agreement.

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.

It has been claimed that the present width of the Texas GIWW precludes the use of large barge tows, thereby reducing the economic incentive to use the GIWW as an avenue of marine commerce. The Legislature should investigate such claims, and any corresponding needs for improvement in the GIWW. Recognizing that the federal government is proposing to cut back its financial support for the construction and maintenance of navigation projects such as the GIWW, the Legislature should fund any improvements it determines to be necessary to the state's interests.

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.

Texas has historically left the development and operation of navigation projects to local governmental subdivisions. Given the potential decrease in federal funds available to these entities, it may be that the state will need to assume a greater burden in promoting port development. The state's smaller ports especially may be hurt by proposed federal user fees, and it is important that the state reassess its level of involvement in the development and operation of these ports.

4. TENRAC should establish a forum for appropriate state agencies and port officials to discuss policies, programs and permitting requirements relating to ports.

As was noted above, the state has historically had a low level of involvement in port matters. Recognizing the increasing importance of ports to the state's economy, a forum should be created in which port issues may be discussed between port representatives and state agencies whose activities impact port development.

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.

Aquaculture is one of the youngest marine industries in Texas. Although several federal agencies have worked together to develop a national aquaculture program, most state agencies have not yet made a concerted effort to identify issues associated with aquaculture in Texas. The recommended forum could assist the state in establishing research and development priorities and in resolving any state-level restrictions on aquaculture development in the state.

2. The Legislature should designate the Texas Department of Agriculture as the state agency responsible for coordinating and supporting aquaculture activities.

One aquaculture issue that has been identified is the lack of a single point of contact with state government. While the development of the state's aquaculture industry will require the involvement of numerous state agencies, it is important that a single agency be identified to coordinate state-level activities, to represent the state in its contacts with the federal government, and to direct research and data acquisition projects. After examining the potential of several state agencies to serve in this capacity, the Texas Department of Agriculture has been identified as the agency best suited to the task.

WASTE DISPOSAL

1. The Legislature should continue to support the state's efforts to receive federal approval for

management of waste disposal under RCRA, and encourage expeditious completion of federal rulemaking and program authorization under the Act.

At the present time, both the state and federal governments regulate aspects of waste disposal. The federal law, RCRA, does authorize delegation of federal responsibility for waste disposal regulation to states, provided certain conditions are met. Texas has in the past sought delegation of this responsibility in order to eliminate the duplicative regulatory scheme that exists when both the state and the federal government regulate the same activities, and TENRAC supports these state efforts. To the extent that further legislative action is necessary to make complete delegation to the state possible, the Legislature should continue to support the state's efforts to assume full responsibility under RCRA.

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.

The use of siting criteria adds a degree of certainty to the waste disposal industry by identifying in advance the characteristics of sites where disposal facilities may be constructed with the least amount of regulatory review. Use of such criteria is also an additional reassurance to a public already concerned about the locating of waste disposal sites. Finally, siting criteria can make the regulatory process for waste disposal less subject to legal attack outside the constraints of the administrative process. In order to assess the adequacy of existing state siting criteria, the identified agencies should review their regulations and identify any needs for legislative action.

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.

Under the federal "Superfund" law, the state is required to provide a ten percent match in order to participate in the federal clean-up of abandoned waste disposal sites. Since this federal funding is available to the state only if the state makes a financial contribution to the program, the Legislature should continue to provide the necessary match. The Legislature should also appropriate such funds as are necessary to clean up abandoned disposal sites that endanger the public health, safety, and welfare, but for which no federal funds are available.

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

The Texas Department of Water Resources and the Texas Department of Health are currently working to identify abandoned waste disposal facilities in the state. Since an abandoned facility can present a significant danger of environmental contamination and human injury, it is important that these efforts continue.

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

Landfilling of wastes is generally regarded as one of the least satisfactory disposal methods. Given the state's interest in the safe disposal of wastes, it is only proper that the state encourage the development of more adequate technologies.

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.

The Open Beaches Act and other state laws restrict activities that could deny public access to the state's beaches. In order to more effectively implement these laws, it is essential that local authorities understand what can and cannot be done. To better facilitate the development of beach management plans consistent with state law, the Attorney General, as the state's chief legal officer, should work with local governments to inform them of the requirements of applicable state laws.

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.

Texas has an existing program for beach cleaning. This program is not effective in many cases, however, since the funding dedicated by local communities for this purpose is often not adequate. Consequently, the state should follow through on its commitment to fund these 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.

Erosion of the state's shoreline often results in the loss of private property and the destruction of valuable fish and wildlife habitat. In order to make decisions concerning necessary state actions to mitigate the effects of such erosion, the state must have current information identifying areas of high erosion and projecting future erosion rates. Such information does not exist with respect to erosion in the state's bays and estuaries, and information on the erosion of Gulf shorelines is also becoming outdated.

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 the explanation of the possibility that property can change to beach or submerged lands and thus revert to public ownership.

Under most circumstances, property that erodes and becomes submerged is owned by the state. While it is appropriate to take measures to protect the shoreline from erosion, it is also essential that the property owner understand the risks associated with the ownership of shorefront property. Only when all facts are known can the prospective purchaser of shorefront property make an informed decision concerning the purchase of such lands.

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 esturarine health.

The state has already recognized the necessity of investigating the relationships between various levels of freshwater inflow and the overall health of the state's estuaries. The Texas Department of Water Resources has completed preliminary studies on these relationships, but the complexity of the estuarine systems makes additional research and data acquisition necessary. Until additional information is obtained, it will be difficult to evaluate the effects of the state's policy regarding management of freshwater inflow to Texas bays and estuaries. Innovative approaches to estuarine management, such as interbasin transfers of fresh water, restriction of tide inlets, and interconnections between bays, should also be explored.

WETLANDS

1. The Legislature should study the use of economic incentives to private owners of coastal wetlands as an alternative to regulatory control to preserve the natural values of these areas.

Private owners of coastal wetlands can be important participants in the proper management of these areas. In some cases, preservation of private wetlands may require the owner to forego certain economic benefits that could be realized through their development. The Legislature should study ways to encourage private wetland owners to preserve important areas, including the use of economic incentives to offset the economic gain that may be lost by nondevelopment. Where such incentives are possible, the public and private interests in a wetland area will more nearly equal one another.

2. The General Land Office should identify coastal wetlands whose acquisition is a high priority, and the Legislature should consider funding the acquisition of these wetlands in light of the state's overall budget priorities.

3. The Legislature should recognize that the certification and acquisition of coastal wetlands is an on-going process, and it should continue to fund the related activities of the General Land Office and the Texas Parks and Wildlife Department.

4. The Legislature should alter the definition of "coastal wetlands" used in the Coastal Wetland Acquisition Act so that valuable brackish and freshwater wetlands, identified through use of the criteria already present in the Act, may be acquired, and should require that the same protections accorded private landowners in the present Act shall apply when such wetlands are acquired.

5. The Legislature should amend the Coastal Wetland Acquisition Act to clarify the fact that the degree to which a coastal wetland is in danger of being altered, damaged or destroyed, and the imminence of that danger, relates only to the assigning of a priority for acquisition and does not relate to the certification of wetlands essential to the public interest.

Each of these recommendations relates to the effectiveness of the state's wetlands acquisition program. Given the possibility that federal funds for wetlands acquisition may be decreasing, the protection of wetlands essential to the public interest may become primarily a state responsibility. In order to effectively meet this responsibility, the state must appropriate funds for wetlands acquisition. The state must also commit to an ongoing process of wetlands certification, and should amend the state's wetlands acquisition

authority to better facilitate the acquisition of coastal wetlands that are essential to the public interest. The Coastal Wetlands Acquisition Act continues to contain sufficient safeguards to insure that the state's power to acquire wetlands is not abused.

6. The state of Texas should continue to seek delegation of federal authority under Section 402 of the Clean Water Act.

Both the state and federal governments currently regulate the discharge of effluent to the state's waters. Federal authority under Section 402 can be delegated to the state, thereby eliminating duplicative regulation. While the state and the regional EPA office have coordinated their activities to the maximum extent possible, the state should move to eliminate the remaining duplication by assuming the federal authority.

7. If Section 404 of the Clean Water Act is not amended, the state should not change its existing policies concerning the regulation of discharges of dredged and fill material into state waters. If Section 404 is amended, the state should review the nature of the amendments and respond in accordance with existing state policy.

In keeping with state policy, the state will not seek to regulate dredge and fill activities in such a way as to duplicate the efforts of the federal government. If federal policy changes, however, the state will need to assess the nature of these changes and respond in accordance with existing state policy. Since Congress is currently considering several proposals to amend Section 404, it is important that the state be aware of the issues involved and prepare to act, should action become necessary.

DUNES

1. The Legislature should amend the Dune Protection Act to require counties to establish a dune protection line and to implement a permitting procedure for activities within the designated dune areas.

2. The Legislature should expand the Dune Protection Act to cover the entire Gulf of Mexico shoreline, and all geographic exclusions should be removed from the Act.

3. The Legislature should clarify that the county commissioners court has the authority to adopt a dune protection line for the county's entire Gulf shoreline, including those areas in incorporated cities.

4. The Legislature should eliminate the distinction between the standards applicable to areas north of Aransas Pass and those south of Aransas Pass by prohibiting any unpermitted activity that may damage, destroy, or remove a dune or kill, destroy, or remove any vegetation growing on a dune.

In its Dune Protection Act, the state has articulated a policy favoring the protection of coastal dune systems. After several years of experience with this statute, it is apparent that certain changes are required so that the state policy can be most effectively implemented. These changes relate to the geographical scope of the program, the clarification of the authority of the county commissioners court, and the types of activities subject to the provisions of the Act.

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 staff 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 decisionmakers 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 Intracoastal 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.

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[2], 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[3] 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[4] 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[5]. 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.

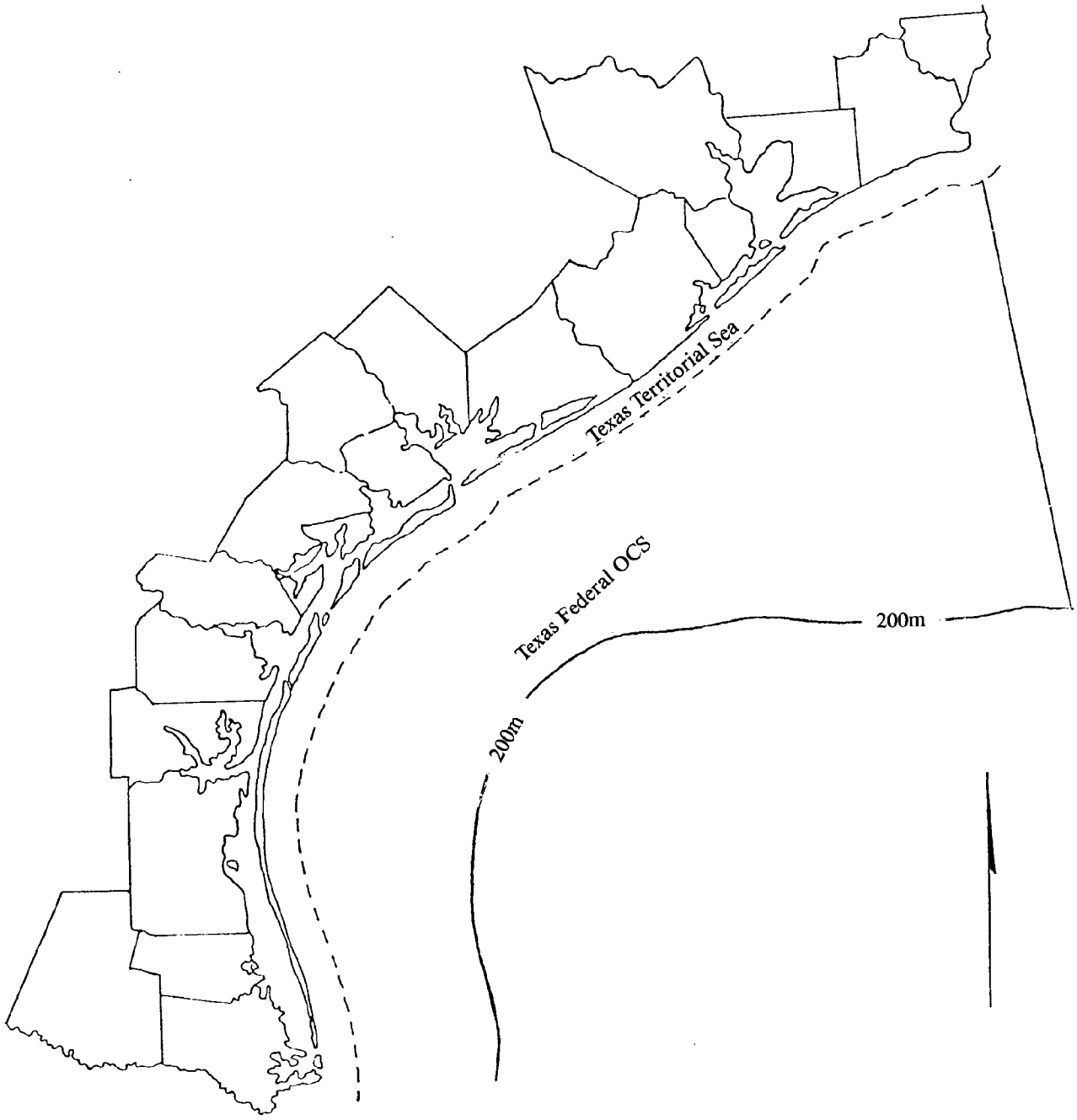
Environmental Regulation of the Submerged Lands

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[6] and/or Section 404 of the Clean Water Act[7]. 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

Map 1
Texas Federal OCS



Clean Water Act[8] 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[9], 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[10]. 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[11]; air emissions offshore are regulated by the Outer Continental Shelf Lands Act[12], which states that conditions offshore must not significantly affect the air quality of any state. The Pipeline Safety Act[13] regulates the construction of pipelines. Discharges from marine vessels must meet standards imposed under Section 312 of the Clean Water Act[14].

All of these regulatory activities are affected by the requirements of the National Environmental Policy Act of 1969 (NEPA)[15] and the Fish and Wildlife Coordination Act[16]. 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[17] 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[18]. 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

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1. RECOMMENDATION: The Legislature should act in a timely fashion to resolve the issue of gulfward annexation by coastal home rule cities.

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[19]	5,7000	156,000[22]
Texas Gulf	272[20]	1,962	208,570[23]
Texas OCS	186[21]	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, magnatometry, 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.[24] 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.[25]

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.

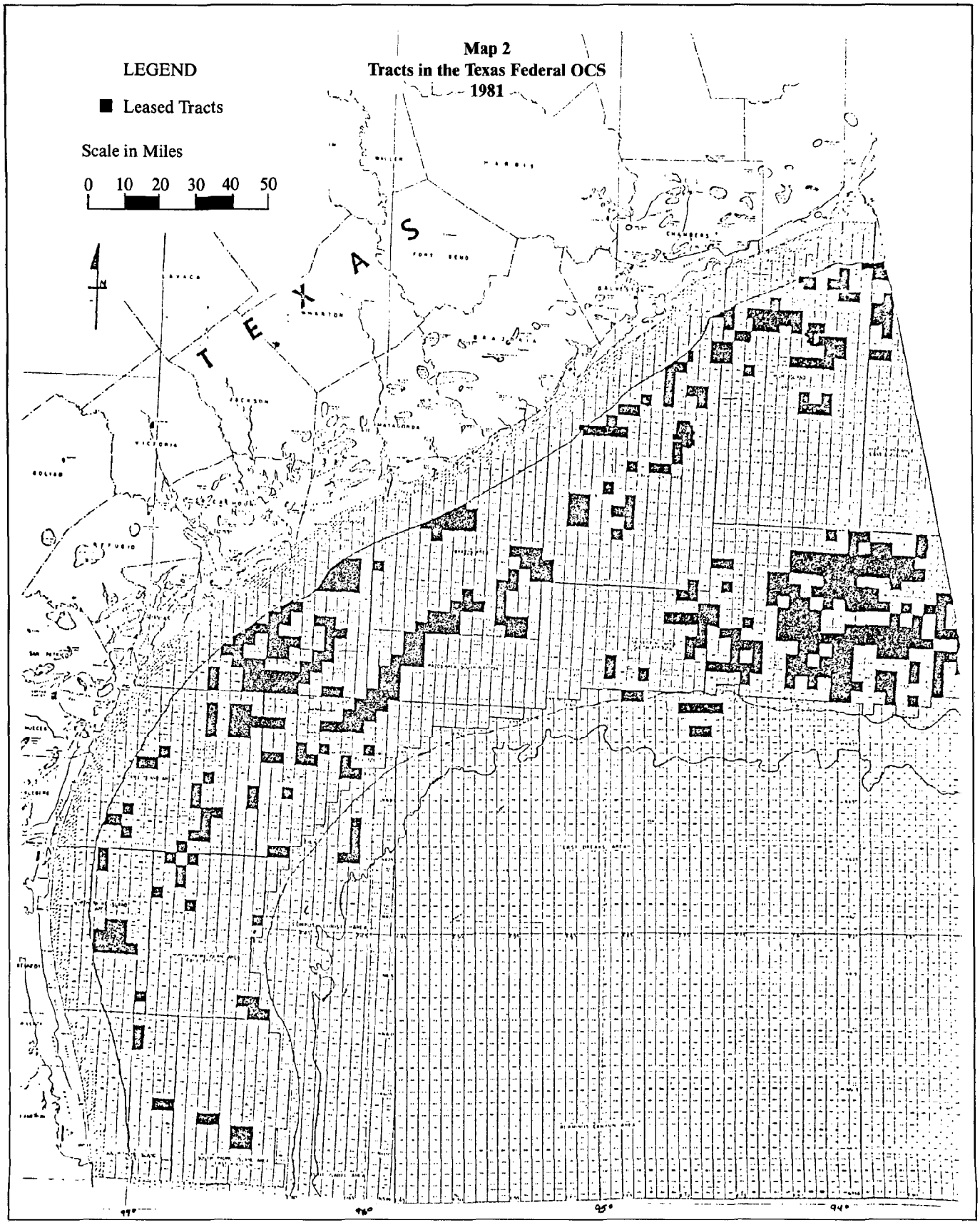
An extensive infrastructure has developed, particularly around Houston and Galveston, but also in the Beaumont, Port Arthur, Texas City, and Corpus Christi areas. Major support facilities required by the oil and gas industry include supply and service bases for offshore rigs, production platform construction, pipe laying, terminal and storage facilities (including tank farms, oil/gas separation, etc.), platform maintenance, and processing facilities (refineries, petrochemical, etc.).[26]

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.[27]

Fiscal impacts are perhaps the most pronounced effect 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


Map 2
Tracts in the Texas Federal OCS
1981
LEGEND
Leased Tracts
Scale in Miles
0 10 20 30 40 50
TEXAS
99°
96°
95°
94°

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 is argued 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.[28] 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.

The issue of gulfward annexation by home-rule cities has been complicated by a recent court decision, however. On September 16, 1982, a United States District Court invalidated certain annexations of submerged lands in the Gulf of Mexico by the city of Port Arthur[29]. The Court held that these annexations violated the rights of holders of leases in the annexed area under the 14th Amendment of the United States Constitution. In reaching this conclusion, the Court found that the annexations had no relation to the traditional purposes of municipal government and its legitimate powers. The ultimate disposition of this ruling will be critical in determining how onshore impacts from offshore oil and gas development may be managed.

Congress has recognized that fiscal impacts resulting from OCS-related activity may be experienced by local governments. In an attempt to ameliorate this problem, the Coastal Zone Management Act of 1972[30] 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.

In order to determine the extent of the 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?

TENRAC recommends that the 68th Legislature act in a timely fashion to resolve the issue of gulfward annexation by coastal home rule cities. In so doing, the Legislature should consider all factors regarding the benefits and costs experienced by local communities as a result of offshore oil and gas activity. Where possible, a determination should be made as to the extent to which these impacts are related to activities in state waters versus federal waters. The Legislature should also consider the impacts of recent court rulings in reaching a decision regarding the issue of gulfward annexation by home-rule cities.

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

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)	Environmental/ recreational losses	100%	55,622	141,000	—**	5,447,843	9,051,852	
308 formula	(b) (4) (B) Environmental/ recreational losses	100%	993,554	2,413,833	—			
308 (d) (1) (d) (2)	Public Services/Facilities	Loans	4,078,296	10,293,296	—	6,599,903	4,000,000	24,084,410

* 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.

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.

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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. As discussed above, the continued availability of annexation as a source of revenue has been cast into doubt by a recent federal court ruling invalidating gulfward annexations by the city of Port Arthur. 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 and to recent court rulings that may affect its decision.

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

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

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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.

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.

The delegates to the 1875 Texas 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 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 2. 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.[6] Amendments in 1973 provided for lease rather than outright sale of the lands,[7] but not before the navigation districts had used the provision to acquire substantial acreage (Figure 3).

* "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.

Figure 1
Waterborne Commerce on Deep Draft Ports in Texas
1979

Port	Tonnage (short tons)*
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)

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.[8]

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.[9]

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.

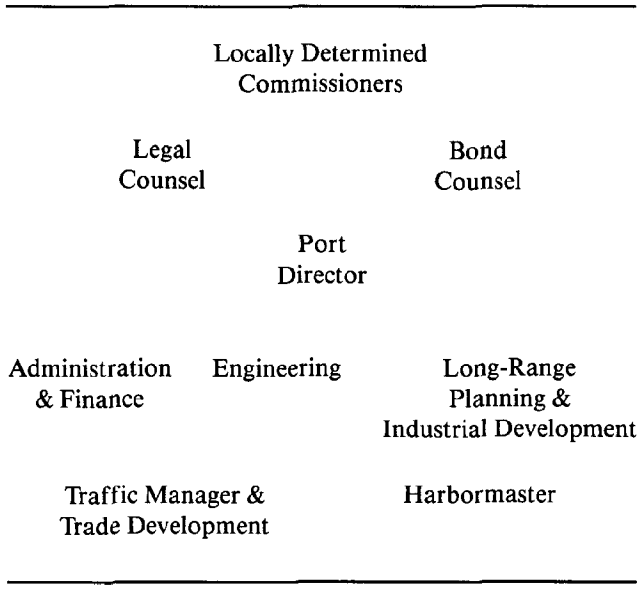
The state does not engage in direct management of Texas ports, but does apply indirect influence in the form of authorizing legislation, environmental regulations, and control of submerged lands. In many cases, the relationships between state government and Texas ports are limited and even strained. 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.[10]

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

Figure 2. Typical Port Organization



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

Figure 3. Submerged Land Acquired by Navigation Districts Under Article 8225 at $1.00/acre*

Navigation District	Acreage
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.

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[11] authorized the state to act as local nonfederal 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. 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. 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[12] 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.[13]

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 is continuing its responsibilities in the GIWW while further study is conducted and the legal conflict is resolved. Dredging of major waterways, which is necessary for continued safe

navigation, is still being done by the Corps at this time.[14] The Corps cannot, however, obtain new areas required for spoil disposal and widening, deepening, or relocating the GIWW.

As existing spoil disposal sites are filled, the need for State participation as non-federal sponsor of the GIWW will become more acute. The State will most likely be required to finance the acquisition of all or a significant part of the land necessary for use as new spoil disposal sites. Should the GIWW be widened, deepened, or relocated in any part, the State will also be responsible for acquiring the necessary lands for such a project.

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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.[15] 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.[16]

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:[17]

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 × 12 feet, 250 feet × 14 feet, 250 feet × 16 feet, 300 feet × 12 feet, 300 feet × 14 feet, and 300 feet × 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 4). It further presented a breakdown of federal and state shares based on current laws and practices (Figure 5).[18]

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.[19]

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; encumberances; 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 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 require-

Figure 4. Cost Summary for Channel Improvements

Channel	Construction	50-Year Maintenance*	Total Project*
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 5. Cost Distribution for Channel Improvements

Channel	Federal Cost*	State Cost	Total Project*
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 Coast Intracoastal Waterway in Texas,* 1978.

ments 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.[20] 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.

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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.[21] 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 Christ 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, redfish (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.

Aquaculture Development Needs

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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 comprise 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

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

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.

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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 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 (SWDA).[3] 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. Texas was one of the first states to receive Phase I 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(RCRA).[4] Under Phase I, the State developed a regulatory framework for a hazardous waste permit program. Interim authority to administer this permit program was granted as Phase II by EPA in March 1982.[5] This permit program will operate in lieu of the federal program previously administered by EPA.

Disposal methods include landfilling (burial), incineration, deep-well injection, chemical treatment, and land application or "landfarming."[6] Landfilling and deep-well injection are the most common in Texas. Recycled or reused hazardous wastes are subject to somewhat less regulation under the Resource Conservation and Recovery Act. 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.[7]

The Railroad Commission of Texas also regulates disposal of wastes.[8] 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.[9]

Regulation of the Solid Waste Disposal Industry

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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 reproposals 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. Under Phase II interim authorization, Texas can issue permits for containers, tanks and waste piles (Component A facilities), and incinerators (Component B). EPA retained responsibility for permitting land disposal facilities, but once specific guidelines for land disposal are developed by EPA, Texas will likely be able to secure this portion of the permit program.[10]

As the Federal government trims back or eliminates programs and regulations at the Federal level, there may be further need for state agencies to assume such responsibilities. 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.[11] 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 ususally 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.[12]

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.[13] 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.[14] 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.[15] 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

* 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.

of the 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.[16] Flooding and other natural events can result in the release of waste materials, which may be toxic or hazardous, into surface waters and groundwater.[17] 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.[18] 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."[19] 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.[20] 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.[21]

Abandoned Disposal Sites

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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.

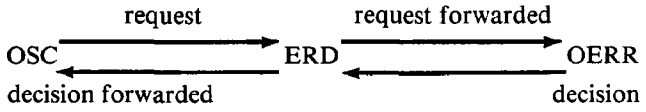
The Federal government released in the latter months of 1981 a ranked list of abandoned dumps, using a system for assigning priority called the Mitre system. This ranking is to provide some guidance for assigning clean-up money provided by the Comprehensive Environmental Response, Compensation and Liability Act of 1980,[22] 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.[23]

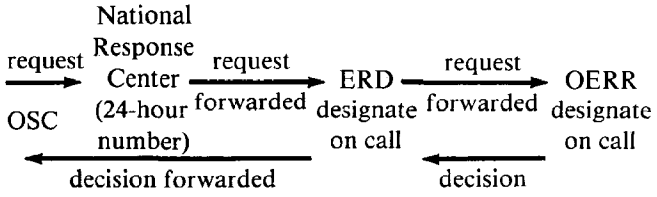
In the future, however, funds for the state's match of Superfund money may need to be provided by some other means. Legislative appropriations are temporary in nature and can only occur once every two years. An unforeseen emergency could consume in a short time an appropriation intended to cover a biennium. 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 Superfund 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."[24] At issue is the extent Superfund 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 Superfund totally preempts industry support for such state efforts.[25] 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.[26] The TDH is currently also involved in a survey of potential problem sites.[27] 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.[28] 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 more scarce and more expensive, wastes are being burned in rotary kilns.[29] 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

Method	Cost/Ton
Chemical/Biological Treatment	$2-25
Incineration (land based)	$75-2,000
Secure Landfilll	$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

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

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 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."[30] 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.[31]

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).[32]

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.[33] 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[1] 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."[2] State laws subsequent to the Open Beaches Act, culminating in the Coastal Public Lands Management Act of 1973,[3] have recognized access rights to other public coastal areas such as bay-front beaches, bay waters and Gulf waters.[4]

Entities with regulatory authority on Texas beaches include cities and counties,[5] 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 licenses.[6] Many coastal areas are extremely popular for waterfowl and whitewing dove hunting;[7] 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.[8] "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

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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 of access to and the public safety on the beaches.[9]

An issue related to access is regulation of beach traffic.[10]

* In the 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.

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.[11] 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.

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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[12] 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;[13] 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).[14] That year there were 4,151,085 trips to Galveston from outside the county.[15] 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.[16] 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.[17] 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.[18] Placement of such structures may also encourage further development in an eroding area. The state allows cities and counties to build erosion control structures; 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]

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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 eco-systems. 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.

WETLANDS

Wetlands are generally considered to be among the Texas coast's most valuable natural resources. Widely regarded as a vital component of the coastal environment, wetlands may be described as " . . . lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface."[1] Wetlands are also areas that are frequently called upon to support human activities such as waterfowl hunting, commercial and sport fishing, recreation, mineral production, agriculture, livestock grazing and navigation. The recognized importance of these areas and the potential for conflicts between the varying uses that may be made of them have led to significant public involvement in wetlands management.

Texas does not have a single, clearly articulated policy concerning wetlands management, however. Instead, state law contains various relevant expressions of policy regarding wetlands and other natural areas. These expressions of state policy are found primarily in the Texas Constitution, the Texas Water Code, and the Texas Natural Resources Code.

In 1917, Article 16, Section 59 was added to the Texas Constitution. Often referred to as the "conservation amendment," this section declares the conservation and development of the state's natural resources to be public rights and duties. While recognizing the need to conserve and preserve the natural resources of Texas, Section 50 expressly identifies the reclamation and drainage of overflowed lands as a part of the state's natural resources management program.[2]

Like the Constitution, the Texas Water Code recognizes the reclamation and drainage of the state's overflowed lands to be a part of the public policy concerning natural resources.[3] However, the Water Code also recognizes the maintenance of a proper ecological environment in the bays and estuaries of Texas to be an equally important component of this public policy.[3] It further sets out the state's policy to maintain the quality of water in the state consistent with the public health and enjoyment, the propagation and protection of terrestrial and aquatic life, the operation of existing industries, and the economic development of the state.[4]

Finally, the Texas Natural Resources Code identifies certain policies that are important in the management of state-owned lands in the coastal area. The general policy section of the Coastal Public Lands Management Act of 1973 (codified as Texas Natural Resources Code Chapter 33) declares it to be the policy of the state to preserve the natural resources of the surface estate in these lands, including their value in a natural state.[5] The Coastal Wetland Acquisition Act, also a part of Chapter 33, recognizes it to be the state's policy to acquire and protect coastal wetlands that are essential to the public interest and to manage these areas in a manner that will preserve and protect their productivity and integrity.[6] However, the Act also provides that the rules and regulations governing lands acquired under its provisions must include provisions for mineral exploration, development, and production,[7] and it exempts those wetlands used only for farming and ranching activities from acquisition by condemnation.

It might be argued that these various policy statements, when viewed collectively, constitute a policy of "multiple use" of wetlands. Such a statement is correct only if it is considered in its broadest terms. Clearly, Texas law does not support a categorical presumption favoring either development or preservation of wetlands in general. However, it is equally clear that specific wetland areas may not be able to accommodate all of the uses implicit in these policy statements. For example, draining a wetland is inherently inconsistent with maintaining the natural integrity of that area. Similarly, preservation of a wetland area that has little or no value in its natural state may unnecessarily prevent other beneficial uses of that land. It appears instead that Texas law anticipates that decisions concerning the proper use of wetlands will be made on a "wetland-by-wetland" basis, giving equal consideration to the wetland's natural value and to the contribution that development of the area can make. If a wetland area can accommodate a number of uses, "multiple use" is appropriate. If the proposed uses of a wetland are inconsistent with one another, however, these uses must be ranked in terms of their importance to the state. Since such a ranking necessarily depends upon the resolution of various factual issues unique to the area and activity in question, it is not advisable to attempt a "once-for-all" ranking of uses.

This "wetland-by-wetland" approach to wetlands management is preferable for several reasons. Initially, it must be recognized that not all wetlands function in the same way. In general terms, a wetland provides habitat and nutrient materials for wildlife and marine life, serves as a natural storm buffer for inland areas, and filters inflows to bays and estuaries to remove fine sediments and pollutants.[8] It is, however, difficult to quantify the extent to which these functions are performed by a specific wetland area. Some wetlands are simply more valuable in their natural state than others. The Coastal Wetland Acquisition Act, for example, recognizes this fact by providing for state acquisition of only those wetlands certified as essential to the public interest.[9]

Secondly, it is sometimes difficult to precisely define a wetland. It has been observed that there is no single, correct, indisputable, ecologically sound definition of wetlands.[10] The definition used in any specific instance will usually reflect the reasons or needs requiring it. It may be based on considerations of the biological, hydrological,

and/or chemical characteristics of the wetland, or it may focus on the function of the wetland in terms of the larger coastal system. Consequently, it is perhaps impossible to put forward a definition of wetlands that is appropriate in every case.

Finally, not all human activities affect wetlands in the same way.[11] The filling of a wetland obviously destroys its natural function as a part of the coastal environment. Other activities may only marginally inhibit this function, if at all. Once again, decisions concerning the acceptability of an activity in a defined wetland area must be case specific, taking into consideration both the value of the wetland and the need for the activity.

Drawing back for a moment from problems associated with specific wetland areas, available research does indicate that the state's wetlands system is of great importance. For example, it has been estimated that over 90 percent of the commercial and 70 percent of the recreational fisheries catch are dependent on wetlands.[12] The estimated value of the state's commercial catch in 1979 was $172.3 million,[13] and the contribution to the state's economy of the recreational finfish catch in that same year has been estimated to be $700 million.[14]

Wetlands also provide important habitat for segments of the state's waterfowl population. During the 1975-1977 Texas Coast mid-winter waterfowl counts, about 51 percent of the ducks and 58 percent of the geese were surveyed in marshes and bays.[15] The U.S. Fish and Wildlife Service has also stated that endangered whooping cranes wintering on Matagorda Island feed in wetlands on the mainland side of the island.[16]

The Texas Energy and Natural Resources Advisory Council recognized the significance of wetlands in a resolution adopted March 12, 1981. The resolution states that coastal wetlands are of critical importance to the state's economy and environment. In furtherance of the policy expressed in this resolution, TENRAC will undertake a study on coastal wetlands use, giving special attention to the economic value of coastal wetlands in a natural state.[17]

Activities in wetlands are addressed under a number of state laws. Discharges of wastes and other pollutants into wetlands are regulated under Texas Water Code Chapter 26. The Texas Parks and Wildlife Department also has certain non-regulatory responsibilities involving wetlands as areas vital to wildlife and marine life. State-owned wetlands are managed by the General Land Office and the School Land Board under the provisions of the Texas Natural Resources Code. Wetlands management was also an important element of the now-abandoned state efforts to develop a program under the Coastal Zone Management Act.[18]

It is difficult to monitor the effectiveness of the state's wetlands management efforts since current information concerning changes in the extent and composition of Texas wetlands is frequently lacking. The last comprehensive inventory of alterations to Texas wetlands was done in 1966,[19] and any changes in these areas are difficult to measure using information available today. The Bureau of Economic Geology at the University of Texas at Austin, however, has done a detailed inventory of the amount of wetlands as a part of its Environmental Geologic Atlas of the Texas Coastal Zone. It is possible that national statistics on the current status and trends of wetland gains and losses, to be provided by the U.S. Fish and Wildlife Service in the spring of 1982,[20] will fill in some of these information gaps.

Despite certain deficiencies in current data concerning wetlands, several important facts are known. To begin with, it appears fairly certain that the total area of Texas coastal wetlands (defined as salt-water marsh, brackish-to-fresh-water marsh, closed brackish-water marsh, and contiguous fresh-water marsh) is approximately 400,000 acres.[21] Additionally, human activities may cause significant wetlands loss. In Galveston Bay, for example, about 25 percent (25,000 acres) of the bay's marsh area has been lost.[22] Finger canals on Galveston Island have destroyed nearly 15 percent of the island's wetlands.[23] Spoil disposal from the proposed deepening of the Corpus Christ Inner Harbor may claim 138 acres of productive wetlands along the south shore of Nueces Bay.[24]

Of course, not all wetland loss is attributable to human activities. Erosion, subsidence, storms, hurricanes and other natural phenomena may claim significant amounts of wetlands each year. However, such natural forces can also create new wetland areas. For example, subsidence of upland areas or a rise in the level of the Gulf may lead to the creation of saturated soil conditions characteristic of wetlands.[25] Even if these natural forces result in a net loss of wetland area, though, this loss is aggravated by the generally uncompensated loss of wetlands due to human activities.

It is this last fact that has led to significant governmental involvement in the management of human activities in wetlands. This governmental involvement will usually take one of two forms: public acquisition or regulation. These two forms of governmental involvement, as well as the role of the private landowner, are discussed below.

Role of the Private Landowner

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1. RECOMMENDATION: The Legislature should study the use of economic incentives to private owners of coastal wetlands as an alternative to regulatory control to preserve the natural values of these areas.

Only about 25 percent of the state's coastal wetlands are publicly owned. The remaining 75 percent that are privately owned may be used for a variety of purposes, including private wildlife refuges, agricultural production, and industrial or commercial development. Generally speaking, the property rights of the owners of these lands are limited only by prohibitions against creating nuisances or by valid governmental regulations.[26] Notwithstanding

the private ownership of wetlands, however, these areas may still be important to the public.

Despite the fact that the general public may have a strong interest in privately owned wetlands, there is often little incentive for the owners of such areas to maintain them in their natural state. In many instances, significant economic returns can be realized through development of these wetlands. Sometimes, the interplay of private interests involved in development of a wetland area will lead to appropriate decisions concerning the use of this natural resource. In other cases, though, these private decisions fail to reflect consideration of all of the costs of development, and thereby encourage economically irrational uses of the area. Costs that are frequently not considered are the so-called "externalities"; that is, costs that are not borne by a party involved in the private transaction. For example, consider a situation in which the owner of an undeveloped wetland and an industrial concern agree to develop that wetland as a facility site. Because development of the area may significantly affect coastal fisheries or may render other upland areas more susceptible to storm damage, the cost-benefit questions raised by this situation cannot be dealt with by private market mechanisms. The parties to the transaction will generally only consider their private costs and benefits and the public interest in the area will go unrecognized.[27]

In its attempts to secure the consideration of such external costs in private transactions, the government has usually adopted regulatory procedures that put it in the position of balancing private interests and public costs. This approach is particularly appropriate where it is difficult to quantify these public costs and to include them in a market equation. There are, however, occasions upon which it may be more appropriate to assign values to these costs and to structure them in such a way that they take on meaning to the private parties to a transaction. One way in which this approach can be implemented is to provide economic incentives to the private owners of wetlands to preserve their natural values. At a minimum, such incentives may include reduced property taxes on natural wetland areas.

If the discussion to this point seems a bit general, it is because little research has been done into the policies involved in this approach. Texas law really doesn't recognize the approach as a means of preserving natural areas. The use of economic incentives as a means of preserving natural areas is drawing more interest, however, and other states are beginning to study it. For example, Wisconsin is currently studying the factors influencing individuals to drain wetlands and the full range of benefits and costs of using the drained area for agriculture.[28] While the Texas Legislature may determine that this approach is not suited to the state, it should study the use of economic incentives to private owners of wetlands as an alternative to regulatory control to preserve the natural values of these areas.

While it is important that private landowners not be hindered in decisions concerning the proper management of their property, private market mechanisms cannot always adequately protect the public's interest in these lands since they fail to take into consideration costs that are not borne by parties to the private transaction. Governmental involvement in decisions affecting the use of these lands is necessary in order to protect the public interest and to insure consideration of *all* costs associated with development of coastal wetlands. Where appropriate, the government's involvement may be limited to the provision of economic incentives to private landowners to encourage them to consider public costs in their management decisions. Where these costs are extremely large or cannot be assigned an objective economic value, however, governmental involvement through acquisition or regulation will continue to be necessary.

Public Acquisition

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2. RECOMMENDATION: The General Land Office should identify coastal wetlands whose acquisition is a high priority, and the Legislature should consider funding the acquisition of these wetlands in light of the state's overall budget priorities.

The public acquisition of wetlands is perhaps the most complete approach to managing the public interest in coastal wetlands. In addition to giving the public proprietary control over a wetland area, this approach avoids problems inherent in the use of the state's police powers as a means of controlling activities that might damage the resource. Since title is acquired outright and fair compensation is paid, there is no issue concerning the point at which a regulation becomes an unconstitutional taking of private property.

The attractiveness of acquisition as a wetlands management approach is illustrated by the federal government's purchases of wetlands. The federal government may acquire bird refuges and waterfowl production areas under two separate statutes: the Migratory Bird Conservation Act[29] and the Hunting and Conservation Stamp Tax Act (also known as the Duck Stamp Act).[30] State approval is required prior to the acquisition of migratory bird refuges,[31] but it is not required for purchases of "waterfowl production areas" under the Duck Stamp Act.[32]

Pursuant to these authorities, the U.S. Fish and Wildlife Service, working in conjunction with the Texas Parks and Wildlife Department and the General Land Office, has acquired 70,000 acres of Texas coastal wetlands since 1978.[33] These acquisitions have also been coordinated with the Governor's office since they have all required state approval. Secretary of the Interior James Watt has stated his commitment to continued acquisition of wetlands under these programs.[34]

Two state statutes provide authority for acquisition of wetlands. The Texas Waterfowl Stamp Act[35] empowers the Texas Parks and Wildlife Department to acquire, lease, or develop waterfowl habitat in the state. The funds for such

activities are to come from the sale of state waterfowl stamps to hunters of wild ducks, wild geese, wild brant, and wild coot. It is anticipated that a portion of these monies will be used to acquire coastal wetlands that are valuable as waterfowl habitat.

Texas' most general policy statement concerning wetlands acquisition is set out in a second statute, the Coastal Wetland Acquisition Act. Adopted in 1977, the Act directs the General Land Office to identify coastal wetlands that are essential to the public interest. Fee title or lesser interests in these wetlands are then subject to acquisition by the Texas Parks and Wildlife Department through gift, purchase, or condemnation. Wetlands acquired under this procedure are to be managed to preserve and protect their productivity and integrity, with provision being made for activities conducted in conjunction with mineral exploration, development and production. Wetlands used only for farming or ranching activities are exempt from condemnation under the Act.

While the Coastal Wetland Acquisition Act does establish a clear state policy favoring public acquisition of vital wetland areas, there are several problems with the Act that make the implementation of this policy less than effective.

To date, no coastal wetlands have been acquired by the state under the Coastal Wetland Acquisition Act. This failure to follow through on the commitment made in the Act is primarily due to the fact that no funds to acquire wetlands have been included in the Texas Parks and Wildlife Department's appropriations.

The veto of program funds for fiscal year 1980-81, the low priority given to wetland acquisition in state appropriations, and the failure of the state to complete work on a Texas Coastal Program have also combined to delay the certification of essential wetlands by the General Land Office. Since this certification is a necessary first step in the acquisition process, it must be accomplished if an effective wetlands acquisition program is to be undertaken. As a prelude to actual certification of essential wetlands, the General Land Office should identify coastal wetlands whose acquisition is a high priority.

Identification of essential wetlands will be a hollow accomplishment, however, unless the Texas Parks and Wildlife Department has adequate funding to acquire these areas. The Legislature should consider funding the acquisition of these wetlands in light of the state's overall budget priorities.

The foregoing recommendation presumes that the Texas Legislature is still committeed to public acquisition of coastal wetlands that are essential to the public interest. In the course of its appropriations process, the Legislature may wish to re-examine this issue. Should such a re-examination lead to a change in the state's policy concerning wetlands acquisition, that change should be clearly set forth. However, TENRAC recommends that the state continue its present commitment to wetlands acquisition.

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3. RECOMMENDATION: The Legislature should recognize that the certification and acquisition of coastal wetlands is an on-going process, and it should continue to fund the related activities of the General Land Office and the Texas Parks and Wildlife Department.

If the Legislature follows through on its commitment to acquire essential wetlands, it must recognize the fact that a one-time appropriation is not adequate to protect the public's interest in these areas. Because the coast is a dynamic system, wetlands will always be changing. In addition, the size of the financial commitment to wetland acquisition is such that it must be spread out over several years. For these reasons, TENRAC recommends that the Legislature recognize that the certification and acquisition of coastal wetlands is an ongoing process, and that it continue to fund the related activities of the General Land Office and the Texas Parks and Wildlife Department.

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4. RECOMMENDATION: The Legislature should alter the definition of "coastal wetlands" used in the Coastal Wetland Acquisition Act so that valuable brackish and freshwater wetlands, identified through use of criteria already present in the Act, may be acquired, and should require that the same protections accorded private landowners in the present Act shall apply when such wetlands are acquired.

Since the Texas Parks and Wildlife Department may acquire only "coastal wetlands," the definition of this term is important to the implementation of the Coastal Wetland Acquisition Act. At present, "coastal wetlands" are defined as areas of high biologic productivity where seawater is present at times other than during storms and hurricanes.[36] If this definition is to be construed as assuming that only tidally-influenced saltwater wetlands are essential to the public interest, it is incorrect. Other wetland areas, such as fresh-water wetlands on barrier islands, may provide critical habitat for waterfowl or serve in important flood control or drainage capacities. These wetlands may be every bit as essential to the public interest as tidally-influenced saltwater wetlands, but they cannot be acquired under the Act. Consequently, TENRAC recommends that the Legislature should alter the definition of "coastal wetlands" used in the Coastal Wetland Acquisition Act so that valuable brackish and freshwater wetlands, identified through use of the criteria already present in the Act, may be acquired, and should require that the same protections accorded private landowners in the present Act shall apply when such wetlands are acquired.

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5. RECOMMENDATION: The Legislature should clarify the fact that the degree to which a coastal wetland is in danger of being altered, damaged or destroyed, and the imminence of that danger, relates only to the assigning of a

priority for acquisition and does not relate to the certification of wetlands essential to the public interest.

Natural Resources Code Section 33.237(a) sets out the criteria that must be considered in the process of certifying coastal wetlands as essential to the public interest and establishing priorities for the acquisition of these areas. Section 33.237(a)(4) requires that the certifying agency consider the degree to which a coastal wetland is endangered and the imminence of that danger. It is not clear, however, whether this requirement relates to the certification process itself or is a factor to be considered only in assigning priorities for acquisition of essential wetlands.

The degree to which a coastal wetland is in danger of alteration or destruction does not relate to that area's importance to the public. This importance stems from the biological, geological, and/or physical characteristics of the wetland. This factor is also not legally relevant to the use of the state's powers of condemnation, since the Texas Constitution and related statutes require only that the property acquired through condemnation be acquired for a public use.[37] However, it is logical that prudent use of the state's financial resources will require that a high priority be assigned to acquiring coastal wetlands that are in danger of alteration or destruction. Other essential areas can be acquired after these critical wetlands are secured. Although these considerations are probably implicit in the law as it now stands, TENRAC recommends that the Legislature clarify the fact that the degree to which a coastal wetland is in danger of being altered, damaged or destroyed, and the imminence of that danger, relates only to the assigning of a priority for acquisition and does not relate to the certification of wetlands essential to the public interest.

Regulation

In discussing the role of the private landowner in wetlands management, this report noted that private decisions concerning uses of wetland areas often fail to include consideration of all of the economic costs associated with these proposed uses. These costs, commonly known as "externalities," are not borne by the parties to the private transaction but are instead imposed on other parties or on the public in general. If private decision-makers do not take these external costs into consideration, their actions may well be economically irrational.

In some cases, a government may encourage private parties to consider the external costs of their actions. Such encouragement may take a number of forms, but it will generally try to assign to these costs a value that will have personal meaning to the parties to the transaction. It may not always be possible to resolve the issue through use of incentives, however. The external costs may be so large as to make it impossible for the government to provide adequate incentives. Similarly, these costs may not be quantifiable. In such cases, the government may choose to actually acquire the property in question, compensating the private owner for his loss.

Public acquisition of wetlands may not always be the preferred approach to managing the resource, however. If a wetland is so important as to be considered essential to the public interest, its preservation must be the principal concern governing its use. It is likely that even a marginal loss of the wetland's natural function will significantly impair the public's interests. Certain other uses of the area may be precluded for this reason. Where a wetland is considered important but may not be characterized as essential, however, it may be best to leave the area in private hands, subject to certain reasonable limitations on its use. The range of uses that may be made of the wetland will be broader, and local taxing authorities will not lose any of their tax base. In such cases, management through governmental regulation is the most appropriate way to accommodate the competing demands placed on the wetland.

The regulatory approach to wetlands management involves the designation of a public entity as the party charged with identifying the various private and public interests associated with a proposed activity and balancing these interests to secure the most appropriate use of the resource. Of course, it is well recognized that the decision of this regulatory entity may not go so far as to constitute a taking of private property without compensation.[38]

Of all regulations affecting activities in Texas wetlands, those governing the discharge of various substances into a wetland area are perhaps the most significant. Such discharges are incidental to most activities that can take place in or near a wetland area. Certain of these discharges are currently regulated under Texas law while others are not. The remainder of this section will discuss these discharges, the current status of state and federal efforts to regulate them, and the potential need for changes in the state's approach to their regulation.

Discharge of Wastes and Other Pollutants

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6. RECOMMENDATION: The state of Texas should continue to seek delegation of federal authority under Section 402 of the Clean Water Act.

The discharge of wastes and other pollutants into the state's waters, including its wetlands, can affect the chemical and biological balance of the natural system. The introduction of such discharges into a wetland may affect the area's ability to supply nutrients to the coastal environment. In extreme cases, it may also destroy the plant life in the area, thereby destroying the wetland itself. Finally, such pollutants may enter into the natural food chain and thereby impact subsequent consumers of the life forms that spawn in or inhabit such areas.

Recognizing the necessity of regulating discharges of

wastes and other pollutants, the Texas Legislature has enacted laws designating the Texas Department of Water Resources as the state's principal authority in matters relating to the quality of water in the state. The Department is also directed to prevent the unauthorized discharge of such substances. The Railroad Commission is charged with the responsibility for controlling discharges and preventing pollution resulting from activities associated with the exploration, development and production of oil, gas, and geothermal resources. The Parks and Wildlife Department and the Department of Health also have certain responsibilities with respect to the protection of the state's waters.

In regulating discharges of wastes and other effluents, the state recognizes several policies. Among these policies is the goal of protecting terrestrial and aquatic life and the public health.[39] The Department of Health is authorized to make recommendations to the Department of Water Resources concerning the health aspects of matters relating to the quality of water in the state,[40] and the Parks and Wildlife Department is empowered to enforce the laws regulating discharges insofar as they affect aquatic life and wildlife.[41]

The permitting programs established by the state duplicate in many respects the procedures followed by the federal government under Section 402 of the Clean Water Act (CWA).[42] Although Section 402 responsibilities can be delegated to the state, Texas has not yet assumed this program. It has, however, adopted alternative versions of certain state laws that will become effective if and when the Section 402 program is delegated. Until such time as full authority under Section 402 is delegated, however, discharges of wastes and other pollutants will be regulated by both the state and the federal government.

At the present time, persons seeking permits to discharge waste and other pollutants must secure a permit from both the state and federal government. Although the state and federal governments have coordinated their permitting processes to reduce many areas of duplication, two permits are still required. State assumption of Section 402 responsibilities will eliminate the duplication that still remains in the permitting of discharges of wastes and other pollutants. For this reason, the state should continue to seek delegation of the program and should identify and resolve all impediments to such delegation, including any pending litigation.

Discharge of Dredged and Fill Material

Texas' coastal waters, particularly its bays and estuaries, are generally shallow and are not suitable for use by large ocean-going vessels. Nonetheless, the coastal economy is heavily-dependent upon waterborne transportation. The need for water access to on-shore facilities has led to reliance on dredging as the principal means of providing necessary water depths. Associated with this dredging is the disposal of large amounts of spoil. For example, it was estimated in 1976 that if all authorized new dredging work was completed in the next ten years, nearly 400,000 acre-feet of disposal space would be required to accommodate spoil from the new dredging and all maintenance dredging during that period.[43]

The Texas coast is also an area of extensive development, and available land is at a premium. In an effort to open more land to development for commercial, industrial, residential, and recreational use, low-lying and submerged areas are sometimes filled to higher elevations. Pipeline construction and oil and gas exploration and development may also involve the discharge of dredged or fill materials. Discharges of dredged and fill materials onto state-owned lands are regulated by the General Land Office and the School Land Board.[44] The state does not have regulatory procedures governing the discharge of dredged and fill materials onto privately-owned lands, including wetlands, although such discharges may still significantly affect the public's interests in such areas.

At the present time, the public's interest in protecting Texas wetlands from unreasonable damage due to the disposal of dredged and fill materials is addressed under the provisions of Section 404 of the federal Clean Water Act,[45] which prohibits the discharge of dredged or fill materials into any of the nation's waters unless the discharge first secures a permit from the U.S. Army Corps of Engineers. Pursuant to this authority, the federal government exercises broad control over many activities in the Texas coastal area. With a goal of restoring and protecting the chemical, physical, and biological integrity of the nation's waters, Section 404 has become perhaps the most well known testimonial to the federal presence on the Texas coast.

In 1977, Section 404 was amended to provide for establishing state permit programs for controlling the disposal of dredged and fill materials. However, a state program established under these procedures could not extend to traditionally navigable waters and their adjacent wetlands. This exception from the permissible scope of a state program, coupled with the very demanding regulations promulgated to govern the transfer of authority from the federal government to the state, has discouraged states from pursuing assumption of Section 404 responsibility. To date, no state has been able to successfully assume this authority.

In a resolution adopted March 12, 1981, TENRAC endorsed current congressional efforts to restrict *all* jurisdiction under Section 404 to the traditionally-recognized navigable waters. In adopting this resolution, TENRAC also stated its commitment to protect and manage any coastal wetland areas removed from federal jurisdiction through amendments to Section 404.

The congressional action recognized in the TENRAC resolution is currently the focus of considerable attention. Briefly stated, proposed legislation would restrict the jurisdiction under Section 404 to waters seaward of the line of mean high tide, leaving it to the states to decide whether or not regulation of dredged and fill material disposal landward of that line should take place. In response to this position, several coastal states are proposing that Congress

give the states more incentive to assume federal permitting responsibility under Section 404. This incentive may be provided by increasing the area subject to state assumption to include either all waters or, at the least, wetlands adjacent to navigable waters. It may also be provided by simplifying the procedures governing transfer of authority from the federal government to the state and giving the states flexibility to design programs suited to their own special circumstances. Finally, increased incentive may be provided by making funds available to the states to help support the development and implementation of these programs.

At the present time, it is unclear whether Congress will amend Section 404 at all. If it chooses to do so, the precise nature of the amendments cannot be predicted at this time. Until Congress does act, however, the discharge of dredged and fill materials into Texas wetlands will continue to be regulated by the federal government.

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7. RECOMMENDATION: If Section 404 of the Clean Water Act is not amended, the state should not change its existing policies concerning the regulation of discharges of dredged and fill material into state waters. If Section 404 is amended, the state should review the nature of the amendments and respond in accordance with existing state policy.

In 1977, the Legislature set out a state policy concerning the regulation of the discharge of dredged and fill materials and the assumption of Section 404 permitting authority.[46] The Legislature stated its desire that the state regulate the discharge of dredged and fill material *only* if it could do so in lieu of the Corps of Engineers. In establishing this policy, the Legislature made it clear that there should be no state regulatory duplication of federal activities regarding dredged and fill material disposal.

Although this same policy statement endorsed state assumption of Section 404 permitting authority, the state has not yet sought this authority. Since the majority of Section 404 permits issued in the state concern activities taking place in waters that are not subject to state assumption, it has been deemed inadvisable to put together an entire state program to handle a very few permits. If, however, Section 404 is amended, the state should review these amendments and determine if state action is appropriate. The Legislature has stated its preference for state regulation over federal regulation, and, if the scope of a state program will be broad enough to justify the expense involved in setting it up, this policy argues for state assumption.

If Congress should approach the issue in a different way and simply restrict federal authority over dredge and fill activities to traditionally navigable waters, the state should respond in accordance with the policy set forth in the March 12, 1982 TENRAC resolution. Should the Congressional action take some other form, the state should assess the nature of any changes which are made and respond accordingly. Consequently, TENRAC recommends that if Section 404 of the Clean Water Act is not amended, the state should not change its existing policies concerning the regulation of discharges of dredged and fill material into state waters. If Section 404 is amended, the state should review the nature of the amendments and respond in accordance with existing state policy.

Outlook

Texas coastal wetlands will continue to be considered a valuable part of the state's coastal environment. The need to balance the public's interests in these areas with the rights of private landowners and other requirements of the state's coastal economy will continue to be an issue in the state, either in the context of a state or federal regulatory program or in the Texas Legislature. While future research will aid decision-makers in the discharge of their responsibilities, important policy questions remain to be answered by the state. The answers to these questions must be found in the state's overall policy for its coast.

DUNES

Dunes are mounds, ridges, or hills of sand, either bare or vegetated, which can be built, moved, or destroyed by the wind.[1] They may appear as isolated mounds, or they may be part of a complex system that contains a variety of dune types. Dunes are also a major part of a larger coastal system. In particular, dune and beach areas function together as a unit to protect the state's shoreline. The preservation of a healthy dune system also depends upon the maintenance of state beaches. Although beaches are discussed elsewhere in this report (see "Beach Access/Erosion"), it is important to note at this point that any attempt to discuss dunes without reference to beaches is necessarily arbitrary. TENRAC's recommendations concerning state beach management should be considered along with the recommendations contained in this section.

Coastal dunes function in a number of different ways. For example, a dune area may absorb the impacts of storm tides and waves, thereby reducing damage to inland areas.[2] In an assessment of the impacts of Hurricane Allen on South Texas, it was noted that sand dunes on barrier islands are essential to the safety of Corpus Christi during storms and hurricanes, and that sand dunes along Padre Island and Mustang Island offered some natural protection during Hurricane Allen.[3] Sand carved from coastal dunes by storm waves is deposited immediately on the submerged, near-shore portion of the beach where it helps to break storm waves, thereby dissipating their energy and weakening their attack on the beachfront.[4] Following a storm, a natural dune area will generally restore itself as new beach sand is carried to it by the wind and is trapped by dune vegetation.[5] In this way, coastal dunes may also mitigate shoreline erosion.

The degree of protection afforded by a dune area is dependent upon a number of factors. High, stable dunes offer the best protection against storms and hurricanes and are of the greatest value in storing and supplying sand to impede erosion. Dunes of lower elevation, discontinuous dunes, or dunes not stabilized by vegetation offer less protection, but they are still important.[6]

Many birds and small animals nest, rest, or feed in dune areas, and other animals may range into them from their primary habitats.[7] By trapping windblown sand, dunes may also prevent the filling of shallow vegetated flats in adjacent lagoons, estuaries, and bays, thereby protecting valuable spawning grounds and wintering areas.[8]

Much of the state's coastal dune area is privately owned. As discussed elsewhere in this report,* private decisions concerning the use of natural resources frequently do not include consideration of all costs associated with the proposed use. Excluded from consideration are the costs that are borne by persons who are not parties to the private transaction. Nonetheless, these costs are real costs associated with the activity, and they should be considered if the ultimate decision on resource use is to be economically rational. In some cases, private consideration of these external costs may be encouraged through the use of governmentally provided incentives. Where this approach is possible, its use should be encouraged. Where the public costs are prohibitive or are not quantifiable, however, governmental action to prevent a person from taking a benefit not paid for may be necessary.

In 1973, the Texas Legislature evidenced its recognition that coastal dunes are important and that the government has a proper role in managing their development by enacting the Dune Protection Act.[9] In this Act, the Legislature concluded that the barrier islands and peninsulas of Texas and the adjacent mainland areas contain a significant portion of the state's human, natural, and recreational resources; that these areas are wholly or in part protected by the coastal dune complex; that human activities in these dunes constitute serious threats to the safety of adjacent property, to public highways, to the taxable basis of adjacent property, and to the health, safety, and welfare of persons in the area; and that these dunes should therefore be protected.[10]

Under the Act, the commissioners court of any coastal county north of the Mansfield Ship Channel may establish a dune protection line on any barrier island or peninsula located within that county, provided that the island or peninsula is accessible by public road or common carrier ferry facility. The dune protection line may not be located more than 1000 feet landward from the Gulf of Mexico. Once a dune protection line has been established, a permit is required from the commissioners court before dunes seaward of that line may be damaged, destroyed, or removed. A permit is not required for grazing livestock, oil and gas production, and recreational activities other than the operation of a recreational vehicle. No permit may be issued for use of recreational vehicles, as defined in the Act, seaward of this line.

Activities and uses that may require permits include geophysical and other surveys; pipelines; building and road construction and construction of bulkheads and seawalls; dredging and deposition of dredged materials; and construction of jetties, groins, piers, and similar structures. In determining whether or not to grant a permit, the commissioners court must consider the height, width, and slope of the dune and the restoration of protection afforded by the new construction and the restoration of vegatation. A littoral owner aggrieved by a decision of the commissioners court may appeal the decision to the district court in the county in which the land is located. The Commissioner of the General Land Office may also appeal any decision he determines to be a violation of the Dune

* See: "The Role of the Private Landowner," Wetlands section.

Protection Act. Finally, the Commissioner may designate as "critical dune areas" any dunes included within a dune protection line that are essential to the protection of state-owned lands, shores, and submerged lands. He may review and comment upon any application for a permit within such an area. The General Land Office has adopted rules[11] establishing guidelines for assessment of these areas.

The state's experience with implementation of the Dune Protection Act indicates that, while it establishes an acceptable framework for dune protection, it is less than effective in securing the public's interest in coastal dunes. The remainder of this chapter identifies and discusses specific problems with the Dune Protection Act and recommends some potential approaches to resolving these problems.

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1. RECOMMENDATION: The Legislature should amend the Dune Protection Act to require counties to establish a dune protection line and to implement a permitting procedure for activities within the designated dune areas.

Perhaps the greatest short-coming relating to the Dune Protection Act is the fact that few coastal counties have moved to establish dune protection lines and to regulate activities in the dunes.[12] Only Nueces County has made full use of the powers granted to it under the Act. Of the 18.5 miles of coastal dunes located in Nueces County, 13.5 miles are included in a dune protection area. The remaining five miles of dunes are included in state and county parks and therefore are excluded from the provisions of the Act. The General Land Office has also designated as "critical dune areas" all dunes included within the established dune protection line in Nueces County.

Galveston County has established a dune protection line running from the end of the seawall on Galveston Island to San Luis Pass. However, the line was fixed according to a metes and bounds description and does not move as the beach erodes. Since the dune protection line was only 50 feet from the line of vegetation when established, erosion of the beach has resulted in the line now being out on the beach, in front of any dunes. Although this dune protection line does exist in a formal sense, it is ineffective in protecting valuable dune areas in the county.

Finally, Matagorda County has established a dune protection line on the Matagorda Peninsula. The county has had little occasion to implement the Act's permitting provisions, however, since activities subject to regulation under its terms are rare in the areas covered by its dune protection line.

The Legislature has found that the state's dune system is an important part of the coastal environment, and its finding is supported by research results. The need to protect these areas is therefore recognized. It is questionable, however, whether the present means of implementing the Dune Protection Act satisfies the needs articulated in state policy.

The Dune Protection Act designates the county commissioners court as the governmental body primarily responsible for implementing its terms. The character and functions of dunes vary along the coast, and the county, in consultation with the state's technical experts, is in a good position to design is regulatory program to meet any requirements unique to a given area. The flexibility inherent in this approach should be retained.

It is a mistake to assume, however, that dune protection is exclusively a county concern. In enacting the Dune Protection Act, the Legislature recognized a broad public interest in coastal dune areas. Damage from storms and hurricanes is not usually confined to coastal counties, and residents of inland areas have a very real interest in the maintenance of a healthy dune system as a first line of defense against these events. The entire state also has an interest in preventing the loss of upland areas to erosion. Finally, the taxpayers who fund state and federal programs that assist storm-ravaged areas in their recovery have an interest in minimizing the damage caused by storms and hurricanes. The state's coastal counties have had nearly nine years in which to implement a dune protection program, and the time has come for the state to re-examine its decision to make such implementation an exclusively local question. By amending the Dune Protection Act to require that all coastal counties establish a dune protection line and implement a permitting program for activities within the designated dune areas, the Legislature will reaffirm the broader public interest in dune protection and will take a constructive step towards securing it.

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2. RECOMMENDATION: The Legislature should expand the Dune Protection Act to cover the entire Gulf of Mexico shoreline, and all geographic exclusions should be removed from the Act.

At present, the area south of the Mansfield Ship Channel, mainland areas, federal and state parks, and peninsulas and barrier islands not served by a public road or ferry are excluded from the jurisdiction of the Dune Protection Act. These areas comprise approximately 80 percent of the Texas Gulf shorefront.[13]

The exclusion of the area south of Mansfield Ship Channel is based in part upon a finding included in the Dune Protection Act:

> . . . the area bounded on the north by Mansfield Ship Channel and extending to the southern tip of South Padre Island is an area of irregular dunes, the vast majority of which are unvegetated, unstable, and migratory, and these dunes do not afford significant protection to persons and property inland from this area.[14]

More recent information, however, indicates that this finding is not completely correct. In a discussion of shoreline changes on Padre Island south of the Mansfield Channel, it is observed that sand washed offshore during storms and

hurricanes and stored in the submerged nearshore zone is eventually returned to the beach through normal wave action.[15] The author goes on to observe that whether or not the beach returns to its prestorm position depends primarily on the amount of sand available.[16] It is therefore a mistake to presume that just because dunes in this area provide only minimal protection from the initial impact of a storm or hurricane, they have no value at all. As repositories for sand necessary to the recovery of the area, coastal dunes on south Padre Island are important to the physical maintenance of the natural system. In this manner, they are also important to the protection of persons and property inland from this area. Such areas therefore should be a proper subject of state concern. TENRAC recommends that this geographic exclusion be removed from the Act.

This recommendation to include areas south of the Mansfield Channel in the coverage of the Dune Protection Act must be viewed in light of the earlier recommendation that counties remain responsible for implementing the provisions of the Act. Since dunes on the lower coast are not identical to dunes in other coastal areas, it is necessary to preserve the flexibility inherent in the state's present approach to dune management. Standards adopted for Willacy and Cameron Counties must reflect the unique nature of dunes in those regions so that the essential functions of these dunes are preserved.

The exclusion of dunes on mainland areas bordering on the Gulf of Mexico is probably the result of a preoccupation with barrier islands and peninsulas at the time the Dune Protection Act was passed. Where present, dunes on mainland areas fronting on the open Gulf can perform the same functions as dunes on barrier islands and peninsulas. Those dunes may be particularly important in preserving private property by mitigating the effects of shoreline erosion. For example, areas such as Surfside, Brazoria County can benefit from the presence of coastal dunes. Mainland areas excluded from the Dune Protection Act encompass nearly 20 percent of the Texas Gulf shorefront,[17] and the Legislature should extend the Act's provisions to these areas.

It is clear that at the time the Legislature passed the Dune Protection Act, it believed that park areas should not be subject to county management under the Act. While the basis of this belief is not clear in the Act, it probably reflects the conclusion that such areas are already managed in such a way as to preserve the value of coastal dunes. Many park related activities, however, may destroy or impair dune areas. Construction of park facilities and pedestrian or vehicular traffic in parks can all impair or destroy a dune system. At a more basic level, it is appropriate that a state-imposed requirement be applied to publicly owned land as well as privately owned land. Since over 20 percent of the state's Gulf shorefront is included in state and federal parks,[18] protection of dunes within these areas is critical.

Finally, the exclusion of inaccessible barrier islands and peninsulas is related to factors other than those associated with the structure and function of coastal dunes. Presumably, the Legislature felt that such dune areas were not in danger of alteration or destruction. Although the pressures on dunes associated with public use are absent, activities in these areas can significantly affect the degree of protection afforded by dunes. By extending the Dune Protection Act to these publicly inaccessible areas, the Legislature will evidence its recognition of the value of dunes located there.

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3. RECOMMENDATION: The Legislature should clarify that the county commissioners court has the authority to adopt a dune protection line for the county's entire Gulf shoreline, including those areas in incorporated cities.

The nature of dunes along the Texas Gulf Coast requires that a flexible approach to management of these areas be adopted. For this reason, the county commissioners court has been designated as the entity primarily responsible for implementing the Act. Some dispute has arisen, however, concerning the county's authority to establish a dune protection line within the limits of an incorporated city, town or village. In Nueces County, the county-established dune protection line includes areas within the city limits of Corpus Christi and Port Aransas. In other areas, however, cities have resisted the establishment of a dune protection line within their jurisdictional limits. The Dune Protection Act is not clear concerning a county's authority.

TENRAC recommends that the Legislature amend the Act to expressly authorize the establishment of a county dune protection line within the limits of an incorporated city, town, or village. The desire for uniform regulation suggests that one governmental entity should administer the dune protection program throughout the county, enforcing a single set of guidelines and procedures. Dunes within a city should be protected to the same degree as dunes outside the city's limits, and county government is the most appropriate level at which to establish a program to accomplish this objective.

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4. RECOMMENDATION: The Legislature should eliminate the distinction between the standards applicable to areas north of Aransas Pass and those south of Aransas Pass by prohibiting any unpermitted activity that may damage, destroy, or remove a dune or kill, destroy, or remove any vegetation growing on a dune.

Any unpermitted activity that may damage, destroy, or remove a dune or kill, destroy, or remove any vegetation growing on a dune is currently prohibited in the area north of Aransas Pass. However, a different standard is applied to areas south of Aransas Pass. A permit is required only if the activity will reduce a dune to an elevation less than that shown on the federal Special Flood Hazard Map for the

area in question, and dune vegetation may not be destroyed without a permit unless provision is made for dune stabilization to maintain the dune at the aforementioned elevation. It is unclear why this distinction was made, and there are several reasons why TENRAC recommends it be removed from the Act.

Initially, any reduction in the height of a dune will reduce its effectiveness as a storm barrier and will decrease the amount of sand available to the natural system. The Special Flood Hazard Maps reflect only minimum elevations necessary for flood protection, and do not take into account other factors associated with a dune's function.

Secondly, the Special Flood Hazard Maps contain only an approximation of dune heights and do not recognize the dynamic nature of coastal dunes. Dune configurations can change frequently in response to natural forces, and these changes may not be reflected on the Special Flood Hazard Maps for some time, if at all. Consequently, the height shown on these maps may not indicate the true importance of the dune in flood protection.

Adequate protection of the state's dune system requires that any alteration in coastal dunes be examined for its effects on the protective capacity of the dunes. This examination can best take place in the context of a permitting process established under the Dune Protection Act. A categorical presumption that certain activities will not affect the dunes should be avoided, and the Legislature should therefore require the application of a single standard for determining when a permit is required. This standard should provide that a permit will be required anytime an activity affecting the dunes takes place.

Outlook

Growth will continue on the Texas coast, bringing with it ever-increasing demands on the area's natural resources. The coast will remain a hazard-prone region, and all natural defenses for lives and property must be preserved if the state is to avoid a tragic loss of life and property to storms and hurricanes. As the coast's first line of defense against these natural forces, dunes must be managed in a manner that will protect their value as a barrier and will preserve them as areas critical to the well-being of the state. The role of these dunes in the slowing of coastal erosion must also be recognized and acknowledged through a full implementation of the sate's dune protection laws.

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[8]*Coastal Management Program: Preliminary Hearing Draft,* p. 65.

[9]V.T.C.A., Natural Resources Code §63.001 et seq.

[10]V.T.C.A., Natural Resources Code §63.001.

[11]31 TAC Sec. 15.41, et seq.

[12]The information concerning the implementation of the Dune Protection Act is based upon personal conversations with staff of the General Land Office during preparation of the Texas Coastal Program and this report.

[13]Texas General Land Office, "A Review of Statutes Affecting the Management of State-Owned Land in the Coastal Area," by Stephen Stubbs (December 1980), p. 23 (unpublished).

[14]V.T.C.A., Natural Resources Code §63.001(8).

[15]Robert A. Morton and Mary J. Pieper, "Shoreline Changes on Brazos Island and South Padre Island (Mansfield Channel to Mouth of the Rio Grande), An Analysis of Historical Changes of the Texas Gulf Shoreline," Bureau of Economic Geology Geological Circular 75-2 (1975), p. 29.

[16]Ibid.

[17]"A Review of Statutes," p. 25.

[18]Ibid.

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