United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

APR 18 1985

Dear Reviewer:

The Coastal Barrier Resources Act (16 U.S.C. 3509) (CBRA), enacted in 1982, established the Coastal Barrier Resources System (CBRS), a network of 186 units along the Atlantic and Gulf of Mexico coasts, within which most Federal expenditures are no longer available to promote growth or development. Section 10 of the Act directed the Secretary of the Interior to provide a report to Congress regarding the CBRS within three years of passage of CBRA.

The draft report is enclosed for your review. Copies of the draft maps that accompany the report were made available in early March.

The draft report is descriptive not prescriptive; that is, it does not contain recommendations at this time. The alternative means of conserving the natural resources of the CBRS discussed in the report are not final options but rather, concepts that might be chosen for more in-depth analysis and public discussion.

The law requires that the recommendations included in the final report be developed in consultation with the Governors of the affected coastal states. It also requires the Department to allow for and to take into consideration public comment. The public comment period is now underway and will end on July 15, 1985. Following the comment period, the Secretary will develop his recommendations to Congress regarding the CBRS.

We urge you to consider this report carefully, and to provide comments regarding its content to the Coastal Barriers Study Group, National Park Service, P.O. Box 37127, U.S. Department of the Interior, Washington, D.C. 20013-7127.

Sincerely,

J. Craig Potter

J. Craig Potter
Acting Assistant Secretary
for Fish and Wildlife and Parks

Coastal Barrier Resources System

Draft Report to Congress

United States
Department of the Interior

DRAFT REPORT TO CONGRESS

ON

THE COASTAL BARRIER RESOURCES SYSTEM

AS REQUIRED BY

SECTION 10 OF P.L. 97-348:

THE COASTAL BARRIER RESOURCES ACT OF 1982

This is a draft report to Congress considering conservation alternatives for the fish and wildlife and other natural resources of the Coastal Barrier Resources System prepared pursuant to section 10 of the Coastal Barrier Resources Act of 1982 (16 U.S.C. 3809).

April 1985

Assistant Secretary for Fish and Wildlife and Parks

United States Department of the Interior

Washington, D.C. 20240

PREFACE

This draft report has been prepared in accordance with Section 10 of Public Law 97-348, the Coastal Barrier Resources Act of 1982, which states:

Sec. 10. Reports to Congress.

(a) In General.---Before the close of the 3-year period beginning on the date of the enactment of this Act, the Secretary shall prepare and submit to the Committees a report regarding the System.
(b) Consultation in Preparing Report.---The Secretary shall prepare the report required under subsection (a) in consultation with the Governors of the States in which System units are located and with the coastal zone management agencies of the States in which System units are located and after providing opportunity for, and considering, public comment.

(c) Report Content.---The report required under subsection (a) shall contain---

1) recommendations for the conservation of fish, wildlife and other natural resources of the System based on an evaluation and comparison of all management alternatives, and combinations thereof, such as State and local actions, (including management plans approved under the Coastal Zone Management Act of 1972 (16 U.S.C. 1451 et seq.) Federal actions (including acquisition for administration as part of the National Wildlife Refuge System), and initiatives by private organizations and individuals;

2) recommendations for additions to, or deletions from, the Coastal Barrier Resources System, and for modifications to the boundaries of System units;

3) a summary of comments received from the Governors of the States, State coastal zone management agencies, other government officials, and the public regarding the System; and

4) an analysis of the effect, if any, that general revenue sharing grants made under section 102 of the State and Local Fiscal Assistance Amendments of 1972 (31 U.S.C. 1221) have had on undeveloped coastal barriers.

Under the direction of the Assistant Secretary for Fish and Wildlife and Parks, the draft report has been prepared by the Coastal Barriers Study Group, a task force of professionals representing the National Park Service, Fish and Wildlife Service, U.S. Geological Survey, and other Departmental offices. Several other Federal agencies have participated in this effort, including the Army Corps of Engineers, the Department of Commerce (NOAA), the Department of Treasury and the Federal Emergency Management Agency.

This draft report is descriptive not prescriptive. No recommendations to the Congress have been developed at this time. Recommendations will be developed following the close of the public comment period.

Comments should be directed to:

The Coastal Barriers Study Group
Department of the Interior
National Park Service
P.O. Box 37127
Washington, D.C. 20013-7127

DRAFT REPORT TO CONGRESS ON THE COASTAL BARRIER RESOURCES SYSTEM

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EXECUTIVE SUMMARY

Introduction

The Coastal Barrier Resources Act (16 U.S.C. 3509) (CBRA) enacted in 1982, established the Coastal Barrier Resources System (CBRS), a network of 186 units along the Atlantic and Gulf of Mexico coasts, within which most federal expenditures are no longer available to promote economic growth or development. The stated purposes of the Act are to minimize the loss of human life, reduce the wasteful expenditure of federal revenues, and reduce the damage to fish and wildlife and other natural resources that can occur when coastal barriers are developed. Section 10 of the Act directed the Secretary of the Interior to provide a report to Congress regarding the CBRS within three years of passage of CBRA. Specifically, section 10 requires that this report shall contain:

1) recommendations for the conservation of fish, and wildlife and other natural resources of the System based on an evaluation and comparison of all management alternatives, and combinations thereof, such as State and local actions, (including management plans approved under the Coastal Zone Management Act of 1972 (16 U.S.C. 1451 et seq.), federal actions (including acquisition for administration as part of the National Wildlife Refuge System), and initiatives by private organizations and individuals;

2) recommendations for additions to, or deletions from, the Coastal Barrier Resources System, and for modifications to the boundaries of System units;

3) a summary of comments received from the Governors of the States, State coastal zone management agencies, other government officials, and the public regarding the System; and

4) an analysis of the effect, if any, that general revenue sharing grants made under section 102 of the State and Local Fiscal Assistance Amendments of 1972 (31 U.S.C. 1221) have had on undeveloped coastal barriers.

This draft report is descriptive not prescriptive. No recommendations to the Congress have been developed at this time. The draft report includes a statement of the CBRA limitations on federal expenditures and their implementation, a general physical and ecological characterization of coastal barriers, a discussion of the possible alternative concepts that might conserve the natural resources of the CBRS, and an analysis of the effects of general revenue sharing on coastal barriers. The alternative means of conserving the natural resources of the CBRS discussed in the report should not be considered as final options but only as concepts that might be chosen for more in-depth analysis and public discussion.

CBRA: The Limitation of Government Expenditures

With certain exceptions, CBRA prohibits new federal expenditures and financial assistance for development within the units of the CBRS. Section 3(3) of the Act defines "financial assistance" as "any form of loan, grant, guaranty, insurance payment, rebate, subsidy, or any other form of direct or indirect federal assistance" other than certain specified exceptions. This definition also specifically includes federal flood insurance.

CBRA eliminates new federal expenditures or new federal financial assistance in CBRS units for such items as buildings, airports, roads, bridges, causeways, piers, jetties, seawalls, water supply systems, utility lines, flood insurance, and VA or FHA loans. The expenditure limitation does not prohibit private financial transactions or the construction of facilities and structures with private funds or funds provided by state and local governments. The prohibition on new federal expenditures and financial assistance in CBRS units is broad and covers all federal programs unless specifically exempted by CBRA.

All exceptions to the CBRA limitations are discussed in the report. Some examples include general revenue sharing, social programs, and a list of activities which may be excepted after consultation with the Secretary of the Interior. Energy projects, channel and road maintenance, military activities and Coast Guard station construction are all potentially valid exceptions in this last category. Scientific research, emergency actions, non-structural beach stabilization projects, such as beach nourishment, and fish and wildlife management activities can also be excepted after DOI consultation if they are consistent with the purposes of the Act.

Several questions have arisen as each federal agency has attempted to assure compliance with the CBRA prohibitions. For example, can federal monies be used to support a project that is not located in a CBRS unit but might have substantial impact on it, i.e., can a bridge to a coastal barrier be constructed with federal revenues if it terminates outside the CBRS unit even though it might substantially improve the accessibility and, therefore, improve the development potential of the CBRS unit?

This and other implementation questions are discussed in the report.

A Physical Characterization of Coastal Barriers

The coastal barriers of the Atlantic Ocean and Gulf of Mexico make up one of the largest and best defined chains of coastal barriers in the world. The physical processes responsible for shaping and forming these barriers include waves, tides, sediment supply, sediment source and sea level change. Wave-dominated barriers are long and narrow while tide-dominated barriers are short and stubby. Some barriers form as sediments are eroded from delta headlands while others formed from ancient beach ridges. It is important to recognize that regardless of how or when a barrier formed, each coastal barrier is part of a larger sand-sharing system. Changes at any one place in the system will have effects on the entire system. In a given locality, shorelines erode or accrete (grow) according to local shoreline profile and wave energy.

Global sea level has undergone significant changes as a result of glacier formation and melting. Since the last glacier melted about 15, 000 years ago, sea level has risen about 100 meters, and continues to rise. Coastal barriers respond to rising sea levels in one of two ways. They either continuously move landward by erosion or they drown.

The coastal barriers in the CBRS show a high degree of diversity in form (e.g., wave-dominated, tide-dominated, delta formed, etc.), and function (e.g., eroding or accreting). There is also a wide range of susceptibility to hurricanes for different regional coastlines. The report discusses the physical characteristics of each region of the CBRS in some detail.

An Ecological Examination of Coastal Barriers

The unique and valuable habitat found on coastal barriers supports a tremendous variety and quantity of living organisms. The report describes five interrelated ecosystems which make up the coastal barrier landform. These are the coastal marine ecosystem (coastal waters and barrier beach), the maritime ecosystem (dunes, shrub zone, and maritime forest), the estuarine ecosystem (bays, marshes, mud flats, mangroves), the freshwater ecosystem (ponds, lakes or rivers) and the upland ecosystem (coastal mainland). Numerous fish and shellfish live in the coastal marine ecosystem as adults but produce young that migrate into the estuary during their early life stages. Well over 80% of the commercially important fish and shellfish caught along the Atlantic and Gulf of Mexico coasts are dependent upon healthy estuaries for food and protection as juveniles. Millions of birds depend on all five ecosystems for vital feeding, nesting, and resting (when migrating) habitat. The report discusses the fish and wildlife associated with each coastal barrier habitat and each geographic region of the CBRS in some detail.

Coastal barriers are intimately tied to their associated aquatic habitats. The coastal barrier protects estuaries, wetlands, and lagoons from direct wave attack. In many cases, the extensive aquatic habitats behind coastal barriers formed only after the barrier appeared and would be quickly destroyed if the barrier were lost. Water, nutrients and sediments are freely exchanged between rivers, marshes, bays and the ocean. This linkage means that any disturbance in one part of the coastal "biosphere" can affect the survival of the entire system.

Often the highest diversity of wildlife on coastal barriers is found at the "edge" between marshland and upland or land and water. People too seem to prefer this land-water interface. Studies have shown that wetlands rank high in aesthetic appeal in comparison to other landscapes. The competing pressures for the use of coastal habitats can mean that coastal barrier resources are inadvertently destroyed. Construction and development, alteration of primary dunes, beach stabilization measures, maintenance of navigation channels and ground water extraction and contamination are examples of the human activities that can disrupt the coastal process and destroy the ecological well being of coastal barriers and even the barriers themselves. These are discussed in more detail in the report.

Coastal barriers, however, provide more than just an aesthetically appealing landscape for the people who choose to live and work there. Coastal barriers and beaches provide the first line of defense against storms and hurricanes. Coastal barriers in their natural state are able to absorb the wave surges that accompany storms. Human settlements can interfere with this ability and in the process expose themselves to severe hazards.

At the present time there are over seven million people exposed to potential hurricane storm surges and flooding along the Atlantic and Gulf coasts (Kusler, 1983). Populations in these areas are growing rapidly, at a rate of well over three to four times the national average. Average annual property losses due to hurricanes have risen from $250 million during the decade of 1951-1960 to over $400 million in the decade between 1961-1970. Following Hurricane Alicia in 1983, Galveston, Texas, incurred over $686 million in damages to commercial, residential and public facilities: 2,088 housing units were destroyed, with 7,978 additional housing units receiving major damage (McCloy, Huffman, 1985). New construction in Galveston has increased from $30 million in 1983 to $150 million and is rising in 1985. (Miller, 1985).

Alternatives for Conservation of CBRS Natural Resources

When developing guidelines for this report, Congress specifically requested that it contain recommendations for conserving the natural resources of CBRS. This request appears to reflect concern that removing direct federal financial assistance alone may not be sufficient to protect these resources.

The draft report discusses conceptual alternatives that might be applicable to conservation of the CBRS. This report discusses several alternatives in detail, including possible changes in the definition of coastal barriers that could include more areas in the System, possible changes in tax policy and regulatory programs that could serve conservation purposes, and acquisition.

For instance, the present definitions of coastal barriers are not all inclusive. Presently, only undeveloped barriers on the Atlantic and Gulf of Mexico are included in CBRS, however, coastal barriers exist on all coasts of the United States and its territories, including the Great Lakes, Alaska, Hawaii and the Virgin Islands. By law, areas held for conservation purposes, such as parks or refuges, are specifically excluded from the CBRS. In 1982, the Secretary of the Interior recommended to Congress that these "otherwise protected" coastal barriers be included in the CBRS. Another possibility discussed is inclusion of the landward aquatic habitat behind coastal barriers and the entire sand-sharing system of a barrier. Other possible changes discussed include modifying the physical composition requirements, including otherwise protected areas, and including areas rendered undeveloped by storms at the time they become "undeveloped".

Changes in the Internal Revenue Code that could foster conservation of the CBRS are also addressed in the report. Existing tax subsidies for development financing, investment tax credits, accelerated depreciation, and casualty loss provisions are some of the concepts considered. A tax policy that placed conservation in a favored position with regard to sales, exchanges and gifts of coastal barrier lands is also discussed. Capital gains is one example. Sales for purposes inconsistent with the objectives of CBRA could be denied capital gains treatment, and sales for a conservation purpose could be given preferred treatment. These and other concepts are discussed in the report.

Local and federal regulatory requirements are also addressed in terms of conservation of CBRS resources. Most states have permitting programs for wetlands, and some have addressed coastal development specifically through regulatory mechanisms such as construction control lines.

Acquisition is a proven conservation strategy. However, budgetary constraints limit its application. Monies for federal acquisition come primarily from the Land and Water Conservation Fund and the Migratory Bird Conservation Fund. Lands become part of the National Wildlife Refuge System and are administered by the Fish and Wildlife Service. The process for disposing of excess federal lands is also discussed as an aspect of acquisition.

General Revenue Sharing

In response to a specific Congressional request, the report ends with an analysis of the effects of general revenue sharing on development in CBRS, based on a limited survey focusing on CBRS units adjacent to significant development. General revenue sharing disbursement procedures result in relatively small amounts of money going to any one rural locality (as undeveloped barriers are). Even if general revenue sharing funds helped divert other movies to development, the amounts would be small. Nevertheless, the use of these by localities could continue to be monitored.

Recommendations

This draft report has been developed in response to the Congressional mandate to provide recommendations for the conservation of the fish, wildlife and other natural resources of the Coastal Barrier Resources System. This mandate also requires the Department to prepare this report in consultation with the Governors of the affected coastal states and to provide for and consider public comment. Therefore, a broad range of alternatives have been developed for consideration by the States and interested public. The Secretary will request an official response from the Governors on this issue, which will be included in the final report. Comments received from other interested individuals will also be incorporated into the final report. Recommendations will be developed following the close of the public comment period and the final report will be transmitted to Congress thereafter.

CHAPTER I

INTRODUCTION

The United States shoreline bordering the Atlantic Ocean and Gulf of Mexico contains one of the longest and best defined chains of coastal barriers in the world. The chain contains over 400 barriers and totals approximately 2,700 miles of shoreline. These coastal barriers contain and protect resources of extraordinary scenic, scientific, recreational, natural, historic and economic value which can be damaged by development on and adjacent to them. In recognition of this fact, the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3509) was enacted in October, 1982. This Act established the Coastal Barrier Resources System (CBRS), a network of 186 coastal barrier units covering 751 miles of shoreline along the Atlantic and Gulf coasts. These units represent tracts of currently undeveloped and otherwise unprotected lands within which most federal revenues are no longer available to promote economic growth or development.

The philosophy behind CBRA is that the risk associated with new development in these areas should be borne by those who choose to live and work along the coast, and not by the taxpayer with public revenues. By restricting federal expenditures and financial assistance on specific undeveloped coastal barriers, the Federal Government can minimize the loss of human life, reduce the wasteful expenditure of federal revenues, and reduce the damage to fish and wildlife and other natural resources that can accompany development of these fragile areas. These are the stated purposes of the Coastal Barrier Resources Act. Section 10 of CBRA directed the Secretary of Interior to study the CBRS and prepare for Congress a report which makes recommendations for changes in the CBRS and suggest management alternatives that would foster conservation of the natural resources of the System. This requirement for further review and analysis reflects the sense of Congress and the public concern that removing direct federal financial assistance in certain undeveloped coastal areas alone may not be sufficient to solve the problems associated with coastal development. In essence, it requires the Secretery to ask: "By what means can the Federal, state and local governments, in addition to private organizations, further contribute to the conservation and protection of these areas?"

This draft report is intended to meet the statutory requirements of CBRA. It begins by discussing the provisions of CBRA and the issues encountered since the Act was signed into law. It then moves to a discussion of the physical, geological, and ecological functions and values of the CBRS, as enacted by Congress. While coastal barriers are also widely distributed along the Pacific and Alaska Coasts, the Caribbean, and the Great Lakes, these areas are not discussed here. The next section of the report addresses the conservation alternatives which are available for CBRS. Possible changes in the definitions of coast barriers that would enlarge the System itself are included in this section because, in most cases, the changes serve a conservation purpose. The section also addresses tax policy, regulatory programs, and acquisition as conservation alternatives for the CBRS. Finally, the report concludes with an analysis of the effects of general revenue sharing grants on undeveloped coastal barriers, as required by the Act. An appendix to this report provides descriptions of all CBRS units, an overview of recent efforts to apply tax policy to conservation of natural areas, and a state by state profile of state and local efforts to conserve barrier resources.

CHAPTER II

CBRA: THE LIMITATION OF GOVERNMENT EXPENDITURES ON COASTAL BARRIERS

This chapter describes CBRA's limitations on federal expenditures, the exceptions to these limitations, implementation of CBRA, and consultation required by CBRA. Issues encountered during implementation are identified and briefly discussed. No recommendations regarding these issues have been developed at this time.

Prohibited Federal Expenditures

With certain exceptions, CBRA prohibits new federal expenditures and financial assistance for development within the units of the Coastal Barrier Resources System (CBRS). Section 3(3) of the Act defines "financial assistance" as "any form of loan, grant, guaranty, insurance payment, rebate, subsidy, or any other form of direct or indirect federal assistance", other than certain specified exceptions. This definition also specifically included federal flood insurance.

Section 5(a) of CBRA contains the broad prohibition on new federal expenditures or new financial assistance for any use that would encourage development within System units. Section 5(b) states that expenditures or financial assistance are "new" and therefore prohibited if no money for construction or purchase was appropriated by Congress before CBRA was enacted on October 18, 1982. If a contract or legally binding commitment establishing an enforceable right by an individual or entity to federal funds was entered into by both the government and the recipient prior to the enactment date, these monies were not considered new. The only exception to the October 1982 effective date for

CBRA's limitations was for federal flood insurance. The applicable date of the prohibition on flood insurance was set at October 1, 1983.

CBRA eliminated the expenditure of new federal revenues or new federal financial assistance in CBRS units for such items as buildings, airports, roads, bridges, causeways, piers, jetties, seawalls, water supply systems, utility lines, flood insurance, and VA or FHA loans. The expenditure limitation does not prohibit private financial transactions or the construction of facilities and structures with private funds or funds provided by state and local governments. The prohibition on new federal expenditures and financial assistance in CBRS units covers all federal programs unless specifically exempted by CBRA.

Federal flood insurance

CBRA explicitly states that the term "financial assistance" includes federal flood insurance. Section 11 of CBRA amends section 1321 of the National Flood Insurance Act, which prohibited the sale of new federal flood insurance in coastal areas designated by the Department of the Interior (DOI) according to the provisions of the Omnibus Reconciliation Act (OBRA). The CBRA amendment did not change the basic intent and effect of section 1321 but merely specified that the prohibition covered the undeveloped coastal barriers identified by CBRA instead of OBRA. As a result of the CBRA amendment, new flood insurance has not been available under the authority of the National Flood Insurance Act since October 1, 1983, for any new construction or substantial improvements of structures located within the CBRS. The amended section also reiterates that federally insured financial institutions may make loans secured by structures not eligible for flood insurance due to this prohibition.

Dwellings within CBRS units presently covered by federal flood insurance continue to be covered even if the dwelling is sold to another owner since CBRA only prohibits new flood insurance coverage for any new construction or substantial improvements of structures. The meaning of "substantial improvements" is explained by the legislative history as an improvement, on or after October 1, 1983, which increases the value of the residence by fifty percent or more. Regulations issued by the Federal Emergency Management Agency on August 16, 1983, detail implementation of this provision.

Other Restricted Programs

Section 5(a) of CBRA states that the limitation on new expenditures or new financial assistance includes, but is not limited to:

* construction or purchase of any structure, appurtenance, facility or related infrastructure;
* construction or purchase of any road, airport, boat landing facility on, or bridge or causeway to, any System unit; and
* assistance for erosion control or other stabilization of any inlet, shoreline, or inshore area, except in certain emergencies.

The Department of the Interior has interpreted CBRA's restrictions to include, but not be limited to, the following programs:

Department of Agriculture

Farmers Home Administration

Loans for rural disaster relief, water systems, wastewater systems, commercial development, community services, and subdivision development.

Rural Electrification Administration

Loans for new or expanded electrical systems that would encourage development programs.

Soil Conservation Service

Assistance grants

Department of Commerce

Economic Development Administration

Grants for planning and administering local economic development programs.

Department of Defense

United States Army Corps of Engineers

Construction and financial assistance involving beach erosion control, hurricane protection, flood control works, and new or expanded navigation projects.

Department of Energy

Energy development programs.

Department of Housing and Urban Development

Block grants for community development.
Mortgage insurance, housing assistance or rehabilitation subsidy programs.
Urban Development Action Grants.

Department of the Interior

National Park Service
Grants for historic preservation, survey, and planning, land acquisition and development of protected areas, and for preparation of State Comprehensive Outdoor Recreation Plans through the Land and Water Conservation Fund.

Department of Transportation

Federal Aviation Administration
Grants for airport planning and development.

Federal Highway Administration
Federal assistance to states for highway construction.

Urban Mass Transportation Administration
Capital improvement and operating grants.

Environmental Protection Agency

Grants for wastewater treatment construction (Sec. 201 grants), water quality management planning (Sec. 208 grants).

Federal Emergency Management Agency

National Flood Insurance Program.
Disaster Assistance Program (except as allowed under CBRA).

Federal Home Loan Administration

Guaranteed housing loans.

General Services Administration

Construction or reconstruction of federal property for development purposes.

Small Business Administration

Loans to small businesses for disaster relief, upgrading of water treatment systems, and other purposes.

Disaster assistance to homeowners.

Veterans Administration

Guaranteed housing loans.

Note: This list may not be all inclusive. Each federal agency is responsible for review of its programs to assure compliance with CBRA.

The Conference Report (House Report 97-928) notes that the prohibitions in CBRA cover structures or facilities within the CBRS, as well as other publicly financed facilities as bridges or causeways that would extend into a System unit. Expenditures outside the System are not affected by CBRA.

A number of questions regarding the limitation of revenues have arisen since enactment of CBRA in 1982. The first CBRA-related question concerns the availability of federal support for facilities such as water and sewer systems, roads or erosion control projects extended into CBRS units with private funding. For instance, according to an official at the Rural Electric Administration, a federal loan has been secured by one of the rural cooperatives in North Carolina to build a transmission line outside a CBRS unit that will be extended into the CBRS unit by a private developer. A similar situation has been identified by the Environmental Protection Agency regarding a request from a developer inside a CBRS unit to hook up to a waste water treatment plant outside the boundaries of the unit.

Can, under CBRA, a water or sewer system be built with federal assistance up to the boundary of a CBRS unit and then completed with state, local or private funding? Although federal funds would not technically be expended within the CBRS, the federal subsidy outside the unit would provide substantial benefits to development of the unit. The Federal Highway Administration (FHWA) has addressed this issue in its CBRA guidelines by stating that FHWA policy generally precludes the building of a road or bridge to the boundary of a CBRS unit since federally aided highway projects must connect logical termini and not depend on further expansion.

Another question arises concerning federal support of a project that, although not located in a CBRS unit, may result in impacts on the unit. For example, if a causeway or bridge to a coastal barrier terminated on a part of the barrier that is not within a CBRS unit, even though a large part of the island may be a designated unit, would the federally subsidized access route therefore represent a federal subsidy in the CBRS unit? Are measures needed to address such a situation? Should such federal expenditures be eliminated or prorated to benefit only that portion of the population not in the CBRS unit, or could guidelines be developed by federal agencies to minimize the impacts of such expenditures on CBRS units?

Another issue concerning the prohibition on federal assistance contained in CBRA is whether the term "indirect financial assistance" includes tax benefits derived from tax deductions such as casualty loss, capital gains, depreciation or mortgage or loan interest expenses. Witnesses at the Congressional hearings on CBRA suggested that such tax provisions help make development of coastal barrier property, including areas within CBRS units, attractive investments. Federal tax policy is discussed in Chapter VII of this report.

Finally, some commentators on CBRA have asked whether technical assistance is included in the prohibition on federal expenditures and federal assistance. The Army Corps of Engineers has concluded that their technical assistance program for floodplain management is not prohibited by CBRA. The Corps believes that the definition of financial assistance and the activities specifically enumerated in section 5(a) emphasize financial and not technical assistance. In a letter to the Department of the Interior, the Corps has stated that:

> "The purpose of this type of technical assistance is to evaluate the flood hazard problems to determine the best use of an area, including measures that can be taken by non-federal interests to mitigate flood losses or prevent unwise improvements. Frequently, the solutions recommended include flood warning systems, evacuation plans, relocations, and other non-structural solutions to flood hazard problems. In carrying out the technical assistance activities, we would ensure that our recommendations would not be contrary to the CBRA."

Should other forms of technical assistance be addressed? Among the alternatives that could be considered are specific exclusion of technical assistance from CBRA's prohibitions, or as one recent study has suggested, authorizing only that type of technical assistance that neither results in resource damage nor promotes development, that is technical assistance consistent with the purposes of CBRA (Kuehn, 1984).

Financial Assistance Allowed Under CBRA

CBRA explicitly excludes some forms of federal assistance from the general prohibition on federal spending in CBRS units. These exceptions can be classified in four categories: those excluded by the definition of financial assistance in section 3 of CBRA; certain instances of erosion control as described in section 5(a)(3); those enumerated in section 6(a)(1) through 6(a)(5) that can be made available after consultation with the Secretary of the Interior; and those listed in section 6(a)(6) that may be made available after consultation and only if they are consistent with the purposes of CBRA. These four categories are briefly discussed below.

Section 3: Exceptions in the definition of financial assistance

General revenue sharing

General revenue-sharing grants under section 102 of the State and Local Fiscal Assistance Amendments of 1972 are excluded from the definition of financial assistance. This program disburses federal funds to state and local governments to use according to their own needs without restrictions from the Federal Government. Almost 40,000 general purpose governments, Indian tribes, and Alaskan native villages receive funds at quarterly intervals. On average, more than $4.5 billion is distributed each fiscal year.

Funds are allocated according to interstate and intrastate formulas administered by the Treasury Department's Office of Revenue Sharing. Primary determining factors include population, per capita income, and the general tax effort of recipient governments. Allocations of general revenue sharing funds, therefore, tend to be concentrated in areas with large populations and high adjusted taxes. For example, in 1981-1982 approximately 39 percent of the disbursements went to 217 local governments with populations over 250,000, while 18,747 local governments with populations below 1,000 received less than two percent of the total funds.

Section 10 (c)(4) of CBRA specifically directs the Secretary to assess the effects of general revenue sharing on CBRS units. General revenue sharing is discussed in Chapter X of this report.

Bank insurance (Ginnie Mae, Fannie Mae, Freddie Mac)

Another exception is "deposit or account insurance for customers of banks, savings and loan associations, credit unions, or similar institutions". In addition, the purchase of mortgages or loans by the Government National Mortgage Association (Ginnie Mae), the Federal National Mortgage Association (Fannie Mae), or the Federal Home Loan Mortgage Corporation (Freddie Mac) is not included in prohibited forms of financial assistance. These programs do not subsidize individual mortgages and thus are different than VA and FHA loans, which are prohibited.

Environmental studies

Section 3 also excludes environmental studies, planning and assessments that are required incident to the issuance of permits or other authorizations under federal law. This means that under CBRA, assistance for environmental studies, planning and assessments is allowed for activities required by the National Environmental Policy Act, and for the processing of permits such as those required under section 404 of the Clean Water Act or section 10 of the Rivers and Harbors Act of 1899.

Programs unrelated to development

Finally, the term "financial assistance" does not include assistance pursuant to programs entirely unrelated to development of coastal barriers, such as any federal or federally assisted public assistance program or any federal old-age survivors or disability insurance program. This exemption includes student loans, Social Security benefits, Medicare and Medicaid, food stamps, and other similar social programs.

Section 5(a)(3) - Certain erosion control projects

CBRA prohibits federal assistance for stabilization or erosion control projects except in two situations. Section 5(a)(3) states that, in general, erosion control or stabilization projects are prohibited except "in cases where an emergency threatens life, land, and property immediately adjacent to that unit." This means a stabilization project in a CBRS unit (other than in Louisiana) is permissible only if an emergency threatens a non-System coastal barrier or mainland area and only if the area to be protected is "immediately adjacent" to the coastal barrier landform and associated aquatic habitats which comprise the CBRS unit.

Section 5(a)(3) also contains a special exception addressing the serious erosion problem along the Louisiana coast. For the units in Louisiana, stabilization and erosion control projects may be carried out for any purpose other than encouraging development, that is, to protect fish and wildlife or prevent erosion of the State's seaward boundary.

Section 6(a)(1)-(5) -
Exceptions requiring consultation but not consistency

Section 6(a)(1)-(5) list federal expenditures that are permitted in the CBRS after consultation with the Secretary of the Interior. Consultation is required to determine whether an expenditure is an exception to the prohibitions of CBRA. Expenditures in the first five categories listed in the section need not be consistent with the purposes of CBRA. Expenditures pursuant to section 6(a)(6) require consultation as well as a determination that they are consistent with the purposes of CBRA. The consultation process is described more thoroughly later in this chapter.

Energy Projects

CBRA allows federal expenditures and financial assistance for energy activities. Section 6(a)(1) allows expenditures or financial assistance for "any use or facility necessary for the exploration, extraction, or transportation of energy resources which can be carried out only on, in, or adjacent to coastal water areas because the use or facility requires access to the coastal water body." The legislative history (House Report 97-841) states that "this provision is intended to be read broadly in terms of energy projects. However, the provision should not be interpreted to allow assistance for projects primarily designed to encourage development but which might be carried out in the guise of energy development." In addition, the language requires the project to be water dependent and therefore would not provide, for instance, for the siting of a powerplant not dependent upon access to a coastal body of water.

Channel Improvements and Related Structures

Maintenance of existing channel improvements and related structures, such as jetties, can continue under section 6(a)(2). CBRA provides for neither the construction of new channels nor the enlargement of existing channels. However, the legislative history does state that, due to the unstable nature of coastal barriers, existing channels within CBRS units can be relocated periodically if necessary.

Section 6(b) stipulates that channel improvements or related structures shall be treated as "existing" only if at least a portion of the money for such improvement or structure was appropriated before enactment of CBRA on October 18, 1982. The House report explains that:

> The criterion for determining whether federal assistance would or would not be precluded is the existence of the channel at the time of enactment of the legislation. If it is in existence, or if money has been appropriated for its construction, then any federal financial assistance for activities to maintain it, including, for example, the complete reconstruction of jetties or other structures, would be permitted.

The use of disposal sites for dredge materials is included under this exception, as long as the sites are related to, and necessary for, the maintenance of an existing project. It does not appear that CBRA requires disposal sites to have been in existence at the time of enactment, nor is there a requirement that the location and use of the site be consistent with CBRA's purposes. Thus, consultation with the Department of the Interior is limited to a determination as to whether the activity is in fact maintenance and not a new project; consistency with the purposes of CBRA is not required. The action agency is free to determine how and when maintenance is to be done and where the spoil will be dumped within the unit. Inadequate procedures could result in needless loss of valuable fish and wildlife habitat on coastal barriers. One issue for consideration is whether consultation procedures should include discussion and agreement on placement of dredged material, or whether other procedures to maximize environmental protection should be developed.

Roads, Structures or Facilities

Maintenance, replacement, or repair, but not expansion, of publicly owned or publicly operated roads, structures, or facilities that are essential links in a larger network or system can continue after consultation with the Department of the Interior. This exception differs from that contained in section 6(a)(6)(F), which pertains to maintenance of roads, structures or facilities that may not be essential links in a larger system or network but which must be consistent with the purposes of CBRA.

The legislative history indicates Congressional intent to include drains, gutters, curbs and other related roadworks under this exception. "Structures or facilities" is also interpreted to include public utilities and, thus, could allow federal assistance in replacing deteriorating water or sewer systems or wastewater treatment works.

At least two issues have arisen with regard to this provision. One concerns the meaning of the word "essential." Where maintenance, replacement or repair of public infrastructure is not consistent with the purposes of CBRA, this infrastructure must be an essential link in a larger network in order to receive Federal financial assistance. The Federal Highway Administration has interpreted "essential" as meaning all existing roads and highways in the Federal-aid System. Another option could be development of standards for determining essentiality and an examination of the facts of each case. This examination could take into account elements such as whether service to any areas, particularly residential areas, might be eliminated; the availability of alternative services; and the experience since service ceased.

The second issue relates to roads, structures or facilities that may be built by a private developer but are subsequently transferred to a public agency, thus making them eligible for federal assistance should maintenance or reconstruction be needed. Unlike channel improvements, public roads or facilities need not have been in existence when CBRA was enacted in order to be maintained with federal funds. It is common practice for private developers to construct roads and other such improvements as part of a subdivision development and then dedicate them to a governmental entity for future maintenance. However, long-term maintenance of such improvements can be very costly. Whether this public facilities exception, without limitation on date of construction or transfer, results in so many excepted projects that the potential fiscal and resource savings of CBRA may be diminished is also an issue that should be considered.

Military Activities

Concern for national defense, like the concern for continued development of domestic energy sources, led to an exemption for national security. Section 6(a)(4) exempts "military activities essential to national security" from CBRA's expenditure limitations. The Conference report (House Report 97-928) states that the standard for determining the essentiality of military activities is "existing law and procedure." Department of Defense (DOD) officials have the responsibility to consult with the Department of the Interior prior to making expenditures within the system under this exception. There has been generally good cooperation between the two Departments in planning use of CBRS lands. For instance, based on discussions with officials at Tyndall Air Force Base in Florida, a consultation agreement has been developed to govern essential day-to-day DOD operations, such as training exercises, in designated units. Nevertheless, the concern has been expressed by some observers that military activities excepted from the prohibitions of CBRA must meet a strict standard of being indispensable to national defense and that the definition of essential activities and their relationship to potential resource damage or federal expenditures within a CBRS unit should be carefully considered.

Coast Guard Facilities

Section 6(a)(5) contains an exception for the "construction, operation, maintenance, and rehabilitation of Coast Guard facilities and access thereto." This provision allows essential Coast Guard facilities such as search and rescue stations to be constructed and maintained as necessary.

Section 6(a)(6)–

Exceptions requiring consultation and consistency with the purposes of CBRA

Section 6(a)(6)(A) through (G) includes seven additional exceptions to CBRA's limitation on new expenditures or new financial assistance for projects consistent with the purposes of CBRA. Federal expenditures or assistance for actions or projects under this section are permitted only after consultation with DOI and "only if the making available of expenditures or assistance therefor is consistent with the purposes of this Act." As detailed in section 2(b), the purposes of CBRA are to minimize loss of human life, wasteful expenditure of federal revenues and damage to fish, wildlife and other natural resources associated with coastal barriers. Thus, the consultation required for these expenditures contains two elements: a determination if the proposed expenditure is a valid exception and if it is consistent with the purposes of CBRA.

Fish and Wildlife Resources

Section 6(a)(6)(A) contains a broad exemption for fish and wildlife resources and habitats:

> "Projects for the study, management, protection and enhancement of fish and wildlife resources and habitats, including, but not limited to, acquisition of fish and wildlife habitats and related lands, stabilization projects for fish and wildlife habitats, and recreational projects."

The legislative history explains that this provision recognizes the value of CBRS units as fish and wildlife habitats as they are in complete conformity with the purposes of the legislation. The full range of federal financial assistance authorized for protecting and managing fish and wildlife habitats will continue to be available, including funding for acquisition of important habitat under authorities not mentioned, such as the Migratory Bird Treaty Act or the Pittman-Robertson Act. It also includes, where necessary, assistance for stabilization projects to protect valuable habitats. Federal funds for projects involving facilities for fish and wildlife-related recreation would also be allowed. However, as with all of the exceptions under section 6(a)(6), any development of recreational facilities in CBRS units must be consistent with the purposes of CBRA.

Navigational aids and devices

Assistance for the establishment, operation, and maintenance of air and water navigation aids and devices is exempted under section 6(a)(6)(B). Assistance is limited to aids and devices for navigation and does not include airport terminals or runways, or boat landing facilities or marinas.

Land and Water Conservation Fund and Coastal Zone Management Act

Section 6(a)(6)(C) exempts projects under the Land and Water Conservation Fund (LWCF) and the Coastal Zone Management Act (CZMA) from the funding prohibitions of CBRA.

The LWCF provides money for the acquisition of lands for federally administered parks, wildlife refuges, and recreation areas, and for matching grants for state recreation planning, state and local land acquisition, and state and local development of public outdoor recreation areas and facilities. The role of federal acquisition in conserving coastal barriers is further discussed later in this report.

Under the CZMA program, coastal barriers along the Atlantic and Gulf Coasts have received significant attention by states in the development and implementation of their coastal zone management programs. Many of these participating states have placed restrictions on further development of their coastal barriers. These actions were encouraged by the 1980 amendments to the Coastal Zone Management Act which explicitly recognized the need to preserve the natural protective features of coastal barriers. The exceptions for federal expenditures under LWCF and CZMA offer opportunities for federal-state cooperation to enhance protection of the CBRS.

Scientific Research

Scientific research is exempted under section 6(a)(6)(D) provided it meets the consistency requirement. This includes, but is not limited to, aeronautical, atmospheric, archeological, space, geologic, marine, fish and wildlife research, development, and applications.

Emergency Actions

Section 6(a)(6)(E) contains an exception for assistance for emergency actions essential to the saving of lives and the protection of property and the public health and safety, if such actions are performed pursuant to sections 305 and 306 of the Disaster Relief Act of 1974 (42 U.S.C. 5145 and 5146) and section 1362 of the National Flood Insurance Act of 1968 (42 U.S.C. 4103) and are limited to actions necessary to alleviate the emergency.

Section 305 of the Disaster Relief Act authorizes the President, in a declared emergency, to provide such emergency services as is deemed necessary to save lives and protect public health and safety where a disaster either threatens or is imminent.

Section 306 of that Act authorizes federal agencies, in a major disaster or emergency, to provide assistance on the direction of the President to state and local governments and to help distribute medicine, food, and other consumable supplies or emergency assistance.

Section 1362 of the National Flood Insurance Act authorizes the Federal Government to purchase flood damaged structures in flood-risk areas if the property has been repeatedly damaged or is damaged beyond repair, or if a local ordinance precludes rebuilding the flood damaged structure or makes the cost of rebuilding prohibitive.

In summary, emergency assistance for lives and property is available within the CBRS only for the purchase of flood damaged structures under the National Flood Insurance Act or for relief in a declared emergency under the Disaster Relief Act, provided such assistance is consistent with the purposes of CBRA. It should be noted, however, that the Federal Emergency Management Agency (FEMA) can also provide assistance within CBRS units for repair or replacement of publicly-owned facilities under sections 6(a)(3) and 6(a)(6)(F).

Roads, Structures or Facilities

The maintenance, replacement, reconstruction, or repair, but not the expansion, of publicly owned or publicly operated roads, structures, or facilities is allowed by section 6(a)(6)(F) if such actions are consistent with the purposes of CBRA. While section 6(a)(3) provides for maintenance and reconstruction of publicly owned roads or facilities whether or not it is consistent with CBRA, that provision is limited to essential units in a larger network or system.

Non-structural Stabilization Projects

The final exception under section 6, section 6(a)(6)(G), allows assistance for non-structural projects that are designed to mimic, enhance, or restore natural stabilization systems. This includes such activities as planting dune grass or beach nourishment which seek to reproduce the natural process through non-structural means.

CBRA thus provides for non-structural stabilization projects under section 6(a)(6)(G) to protect the unit itself if the project is consistent with the purposes of CBRA. Structural projects intended solely to protect unit property from erosion, in areas outside Louisiana, are generally not authorized under CBRA except as permitted under section 6(a)(6)(A) to protect fish and wildlife habitats.

Implementation

Federal agency compliance

Compliance with the funding prohibitions of CBRA rests with each federal agency. The innovation of CBRA's concept and the large number of federal agencies involved have made establishment of policy, guidance and regulations a slow process. It appears that all affected agencies have prepared policy guidance, although several have not completed final regulations.

Particularly difficult to implement is the prohibition against block grants such as community development block grants. These often involve no-year appropriations that give broad disbursement discretion to states and local governments. Such federal expenditures could encourage development of CBRS units. The Department of Housing and Urban Development is implementing CBRA by requiring recipients of community development block grants to assume responsibility for compliance with CBRA. The recipient must undertake any consultation required and certify that it has complied with the requirements of CBRA. Another option could be to establish coordinated tracking systems by federal agencies to further monitor and ensure compliance.

OMB certification

Section 7 of CBRA requires the Director of the Office of Management and Budget (OMB) to make annual certification, on behalf of federal agencies, that each agency has complied with the provisions of CBRA during that fiscal year. The certification is submitted by OMB to the House of Representatives and Senate pursuant to the schedule required under the Congressional Budget and Impoundment Control Act of 1974.

The Office of Management and Budget's annual Circular A-11 instructions on preparation and submission of budget estimates describes the procedure to be followed by the agencies to assist OMB in its certification requirements. The instructions state that budget estimates should not include any assistance prohibited by CBRA. They also direct each agency to include a statement in its budget estimates certifying that no funds were obligated in the past year for purposes prohibited by CBRA. Relying on these agency statements, OMB makes annual written certification to Congress that each agency has complied with the provisions of CBRA. Thus, OMB's procedure requires that agencies address CBRA at two stages of the budget process: at the formative stage when they prepare their budget proposals and at the end of the fiscal year when the agency reviews its previous expenditures.

Consultation

As discussed previously, section 6 requires that a federal agency consult with the Secretary of the Interior before making funds available for some excepted expenditures. The consultation process provides an exchange of ideas and opportunity for the Secretary to provide an opinion as to whether a proposed expenditure falls within an exception to the prohibitions of CBRA and, for those exceptions described in section 6(a)(6), whether the proposed action is consistent with the purposes of CBRA. The consultation responsibility has been delegated to the U. S. Fish and Wildlife Service (FWS). Procedures for federal agency consultation were published by FWS as final Advisory Guidelines in the Federal Register on October 6, 1983 (48 Federal Register, No. 195). These guidelines direct federal agencies proposing federal expenditures or financial assistance for excepted activities within CBRS units to consult with FWS and allow that agency the opportunity to provide written comments prior to making the expenditure.

Generally, the consultation process is carried out at one of two operational levels. Proposed federal projects identified in an agency's budget proposal are submitted to FWS for comment at least 45 days prior to transmittal to OMB. FWS reviews the project, consults with the initiating agency as necessary, and provides a written response. Consultation requests for projects such as channel maintenance or highway repair or other expenditures that are managed by agency field level officials are made through the appropriate Regional Director of FWS. Most activities fall in this category.

There are exceptions to this general rule. The requirements of sections 305 and 306 of the Disaster Relief Act make prior consultation impractical in responding to a national disaster. Instead, FWS participates in regional task forces for disasters and emergencies. However, permanent replacement activities related to section 6(a)(6)(E) require consultation prior to commitment of funds. In addition, DOI and DOD have agreed on an aggregate consultation procedure for essential day-to-day military operations within the CBRS.

Compliance with CBRA's consultation requirements rests on the federal officer responsible for the proposed expenditure. FWS responds to a consultation request by providing technical information and a written opinion. While this opinion can influence an agency to reconsider its proposal and may result in modifications to minimize adverse impacts to the CBRS unit, it is important to note that the final determination of whether an action is permitted rests with the consulting federal agency. DOI has no enforcement authority.

The consultation process developed between FWS and affected federal agencies is in place and generally working well. The FWS Ecological Services Division has a long history of working with federal and state agencies to resolve problems related to impacts of development on fish and wildlife resources. Through their field offices located in coastal states most consultations are quickly completed. However, this does not provide for formal notice to the public of proposed expenditures under the section 6 exceptions; as a result, it may be difficult for the public to monitor proposed actions. To provide the opportunity for public participation, without compromising the ability to complete consultations in a timely manner, FWS will, upon request, advise any interested party of ongoing consultations and will welcome their comments.

CHAPTER III

A PHYSICAL CHARACTERIZATION OF COASTAL BARRIERS ALONG THE ATLANTIC OCEAN AND GULF OF MEXICO COASTLINES

As might be expected of the world's longest chain of coastal barriers, a high degree of regional diversity is observed within the chain of coastal barriers that extends from Maine to Texas. This diversity is controlled by spatial changes in the physical processes shaping barrier shorelines. The dominant physical factors responsible for molding coastal landforms appear to be (1) tidal range, (2) wave energy, (3) sediment supply from riverine sources and (4) the distribution of older, pre-existing coastal sand bodies which act as sources for barrier island sand. The history of local sea level change is also of profound significance. This chapter will attempt to explain in a semi-quantitative way the observed regional variations in the geological features of the Atlantic Ocean and Gulf of Mexico coastlines.

Several geologists (Nummedal and Fischer (1978), Hayes (1979), and Davis and Hayes (1984)), have suggested that an initial coastal barrier classification can be established on the basis of the relative magnitude of tidal and wave energies (Figure 3-1). Consequently, depositional coastlines can be classified as wave-dominated, mixed, or tide dominated. Other important attributes can be expressed as qualifiers of these terms.

The difference in the landform of a tide-dominated and wave-dominated coastline reflects the ability of the tidal currents to transport sediments versus the ability of wave-generated longshore currents to transport sediments. Along wave-dominated coasts, the longshore currents produce long, continuous barriers with small ebb-tidal deltas (sand bodies) seaward of inlets because of rapid dispersal of sediment by waves. Sediment carried landward into inlets by tidal currents accumulate in large back-barrier flood-tidal deltas because these areas are sheltered from wave dispersal.

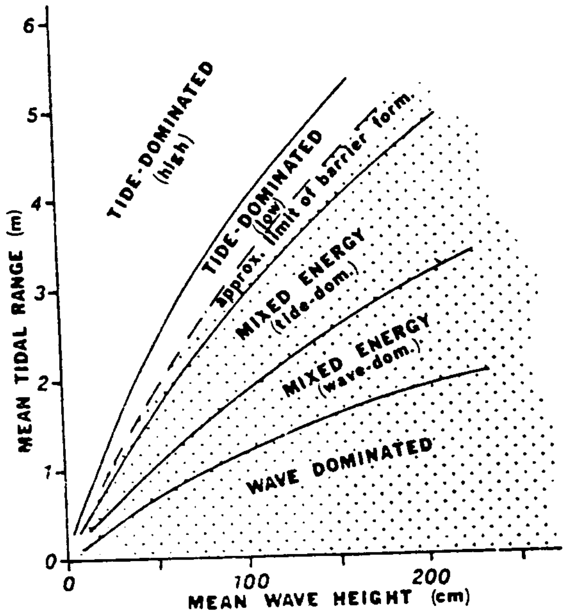


Figure 3-1. Barrier classification as a function of the tide range and mean wave height. Nineteen barrier island shores in North America and Western Europe were used as a basis of this diagram. From Davis and Hayes, 1984.

With an increase in tidal range, the tidal currents through the inlets increase in strength. Consequently, they can support larger ebb-tidal deltas against the destructive influence of the waves. These ebb-tidal deltas in turn supply sediment to the downdrift beaches. As the sediment moves from the updrift tidal delta "source" towards the downdrift tidal inlet, the intervening beach serves as a conveyor belt, transferring sediment from one tidal delta to another. If more sediment enters this conveyor belt than leaves it, the beach will accrete. If the opposite is true, it will erode.

The capacity for onshore-offshore sediment transport increases with the tidal range. In areas of high tidal range, the wave energy is distributed across a wide intertidal-zone during the tidal cycle. The result is that tide dominance is strong enough to completely eliminate barrier islands in some locations, apparently regardless of the level of wave energy. On a worldwide basis, barrier islands generally do not exist along coasts where the tide range is more than 4 meters. Such coastlines are not found along the continental United States, but are common in Alaska and other parts of the globe.

Islands along the south Texas coast typify the wave-dominated coastline: they are long, generally narrow, and cut by widely separated tidal inlets with large sand accumulations in the back-barrier bays (flood-tidal deltas), and small or nonexistent seaward shoals (ebb-tidal deltas). The mean tide range along this coast is about 0.5 m, the mean annual breaker height is about 60 cm. Similar wave-dominated barrier islands are also the rule for parts of Louisiana, the Florida panhandle and southeast Florida, North Carolina's Outer Banks, the south shore of Long Island, and the Cape Cod segment of the Massachusetts coast.

Islands along the Georgia coast typify a tide-dominated coastline: they are relatively short and stubby and separated by stable tidal inlets with an average spacing of 15 km. All inlets are associated with large ebb-tidal deltas. The mean tide range along the Georgia coast is about 2 m, the nearshore mean annual breaker height is about 30 cm. A tide-dominated coastline also is found adjacent to Georgia in northeast Florida, most of South Carolina, along the Delmarva Peninsula and in Massachusetts. Some Louisiana and upper Texas coast barriers also have a tide-dominated shape (Galveston Island, Grand Isle) in spite of a tidal range less than 50 cm. The tide dominance in these areas is due to the large volume of water being exchanged between the Gulf of Mexico and such major embayments as Galveston and Barataria Bays.

It is important to recognize that barriers are continuously evolving components of a large-scale coastal "sand-sharing" system. Changes in the system at one place have effects down the entire barrier chain. This linkage between barriers is most readily observed near tidal passes where sand from an updrift beach is transferred to the downdrift island via a series of complex wave-current interaction mechanisms. A disturbance in an inlet invariably has effects on the stability of the adjacent beach .

Barrier Formation, Sea Level Rise and Barrier Adjustment

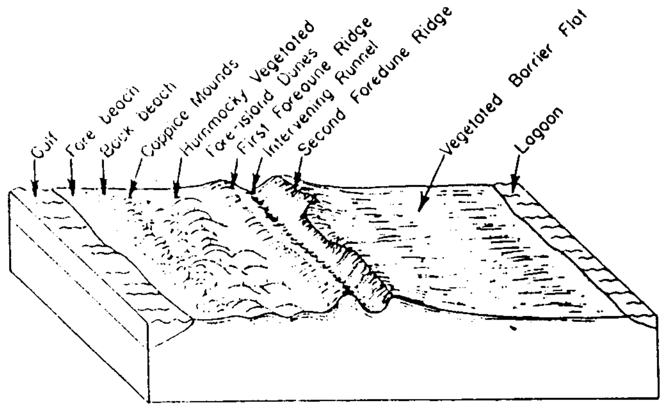
This section of the chapter specifically addresses the Gulf of Mexico coast. The principles and processes discussed, however, have nationwide applicability.

Figure 3-2 identifies the major sources of sand for barrier island development along the Gulf of Mexico coast. In Texas and Louisiana all sand sources are derived from ancient or modern deltas. Sand sources in Mississippi and Alabama are less known. In part, the sand for these barriers appears to be derived from ancient beach ridge plains. These beach ridge plains are now being "mined" through erosion along the coastline.

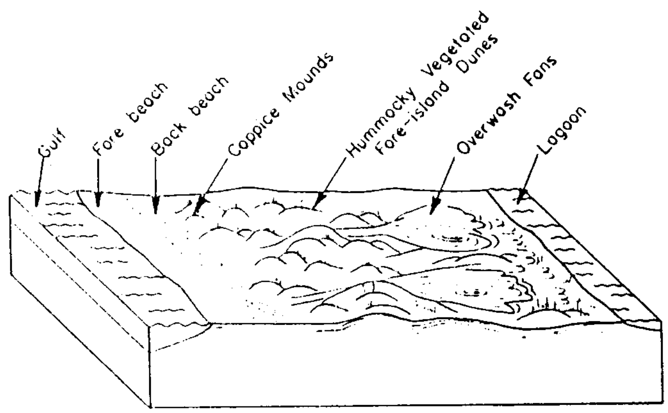
About 4000 years ago, when the general Gulf sea level rose to nearly present levels, the coast appears to have consisted of a series of deltaic "headlands" that enclosed interdeltaic bays (Figure 3-2). Waves striking this coast generated longshore currents transporting sand from the deltaic headlands laterally into both adjacent embayments. The headland retreated, continuously releasing new sand from the eroding shoreface and delivering this material to the shoreface of the interdeltaic barriers. As a result, barriers between deltas along the Gulf coast are wide and accreting (growing). Commonly, accreting barriers consist of sets of beach and dune ridges parallel to the shore reflecting the episodic nature of their growth.

Two greatly contrasting barrier landforms have developed as a consequence of this evolutionary pattern: the low-profile and the high-profile barrier (Figure 3-3). Low-profile barriers are found along the erosional headlands. Most of the sand which is being mined by the waves along these shorefaces is transferred downdrift, out of the local area. Only minor amounts of sand are piled up into a narrow and thin washover sheet during storms and generally erosion rates are high (Figure 3-4).

Figure 3-2. Major sand sources along the Gulf of Mexico coast. Along the central and western coast the available barrier sand sources are deltas. Along the eastern Gulf coast, sand is derived by erosion of sand ridges, and abandoned deltaic deposits.



High-Profile Barrier Island



Low-Profile Barrier Island

Figure 3-3. Comparative cross-sectional sketches of high-and low-profile barrier islands. From White et al., 1978.

Along the Caminada headland in Louisiana the narrow barrier migrates landward at the same rate as the eroding headland (50 feet, year). The instability of the sand prevents the establishment of vegetation. Grass covered sand dunes or coastal forests are absent from such systems.

The underwater habitats also differ depending on barrier type. Lagoons, sounds, bays or marshes behind low-profile barriers are subject to rapid influx of large quantities of sand washed across the barrier from the seaward side during major storms (Figure 3-5). In contrast, the high-profile barriers prevent storm-induced overwash. Dunes are washed away by storm waves, but the island is not generally breached (Figure 3-6).

High profile barriers are formed between deltas. The best examples of this category are Mustang and San Jose Islands along the central Texas coast. These islands have received sediment from the Rio Grande delta to the south and the Brazos-Colorado delta complex on their north side. Galveston Island is another example, situated between the Brazos-Colorado delta and the Trinity delta to the east. On high-profile barriers, the wildlife habitats are much more varied than on low-profile ones. High-profile barriers along the northeastern Gulf coast (Alabama and Mississippi) have developed the "classical" zonation of the maritime ecosystem, including dune, shrub and maritime forest communities.

Since the melting of the last ice sheet some 15,000 years ago, global sea level has been steadily rising. As a consequence, the entire United States shoreline has been displaced landward up the gentle slopes of the Atlantic and Gulf coastal plains to its present position. 15,000 years ago, the shoreline was located near the edge of the continental shelf. Over the ensuing 10,000 years, global sea level rose about 100 meters. The shoreline today is as much as 150 km further landward than its previous position. Whereas local, short-term shoreline erosion is a function of shoreline profile and wave energy, long-term net shoreline retreat is a function of sea level rise.

Scientists originally thought that sea level rise had been negligible for the last 4000 years, but it is now clear that this is not the case. Along the United States coast, not only has sea level continued to rise, but there appears to have been large sea level oscillations about this rising average. Sea level may have gone up and down as much as 2-3 meters during a few hundred years. Ancient people on the south Atlantic and Gulf coasts adjusted to the associated shoreline change. In fact, their moving sites of

Figure 3-4. Marsh outcrops on the beach at Sargent Beach, Texas, on the flank of the Brazos-Colorado Deltaic headland. This is an extreme case of a low-profile barrier island. Photo courtesy of R.A. Morton, December, 1981.

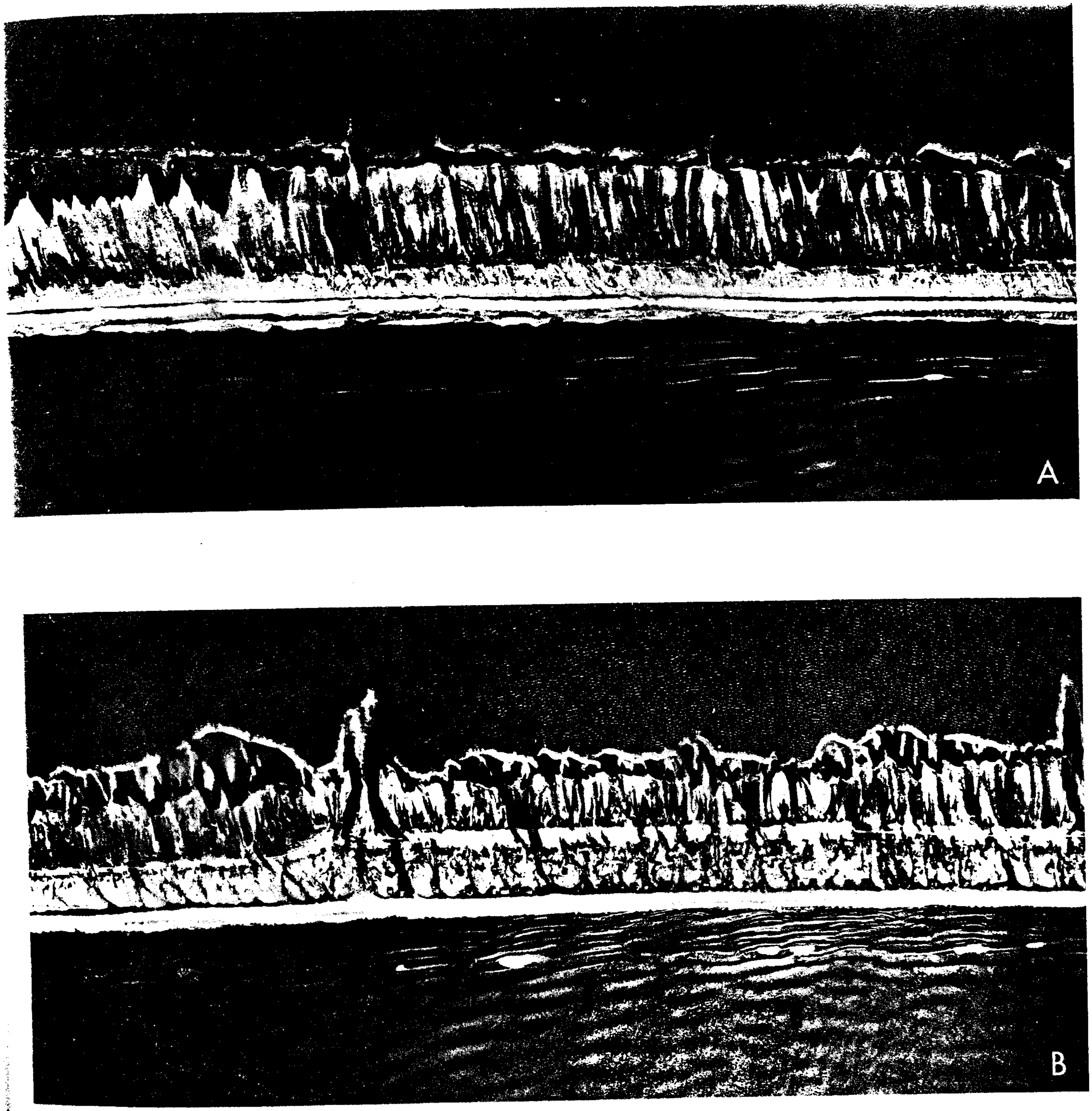


Figure 3-5. Vertical airphotos of Dauphin Island, Alabama, taken on September 22, 1979, only 9 days after the landfall of Hurricane Frederic. (A) Undeveloped western section of the island, CBRS Unit no. Q02. (B) Developed central part of the island. The pattern seen here is the typical storm-response on low-profile barrier islands. Note the channels formed near many of the beach-front homes, and the scourpools and sand deposits along the Mississippi Sound side of the island (top). Airphotos obtained through the courtesy of the U.S. Army Corps of Engineers, Mobile District.

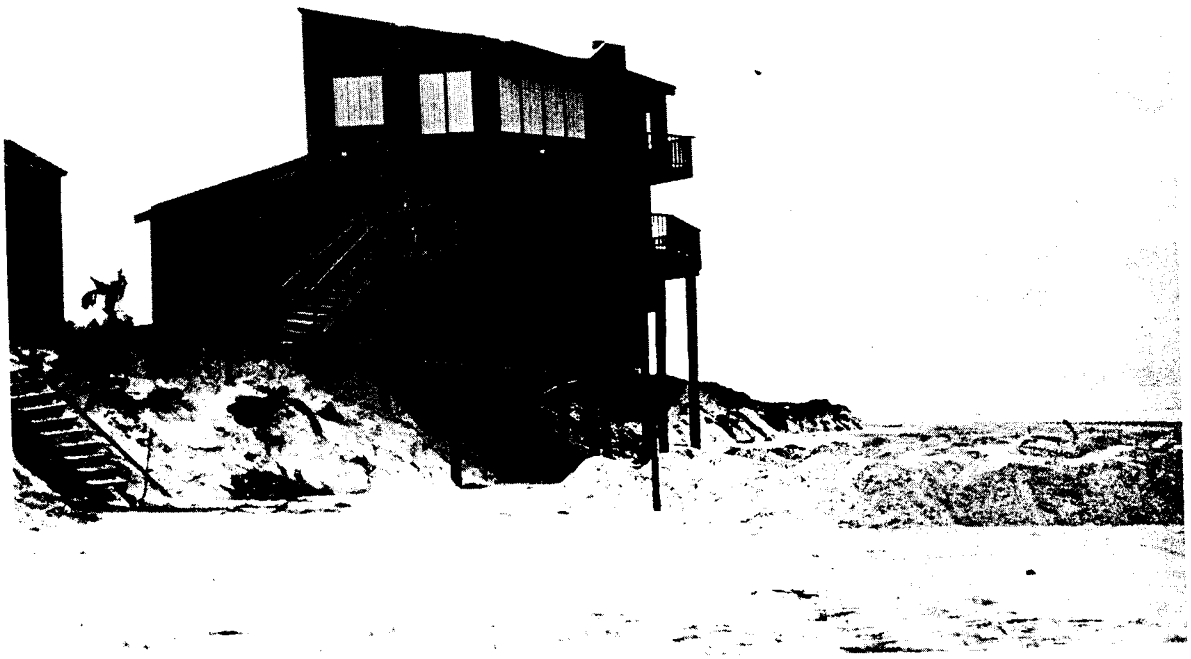


Figure 3-6. Undermining by Hurricane Allen of one of the units at the "Lost Colony" condominiums at Mustang Island, Texas. This illustrates that dune-scrap retreat is the typical storm response on a high-profile barrier island. Picture taken on August 15, 1980, five days after landfall of Allen. Mounds of sand on the right have been dumped there by truck after the storm. Contrast this with the storm-response of a low-profile barrier as seen in Figure 2-6.

occupancy help us determine the sea level history. Modern people will have to adjust also.

At present, sea level appears again to have entered a period of increasing rate of rise. Since medieval time, sea level has risen about 1 meter. This rise may only be the latest in a series of oscillations. Over the last 100 years fairly accurate sea level records have been maintained in many harbors throughout the world. These records indicate that global sea level has risen about 12 cm over the last century, implying an annual global rate of 1.2 mm.

If this was the total observed rise there would hardly be reason for alarm. However, along many parts of the United States coastline, the apparent sea level rise is much higher because the land is sinking. Along the central Gulf coast, where the weight of the Mississippi delta muds, withdrawal of groundwater from shallow aquifers and extraction of oil and gas cause sinking of the land surface, the present apparent sea level rise is already as high as 1 cm/year (Baumann, 1980, Nummedal, 1983). Moreover, climatic models indicate increased global warming due to the release of carbon dioxide into the atmosphere. This warming trend, in time, will accelerate the worldwide (eustatic) sea level rise. Presumably, the eustatic sea level could rise by as much as 1 cm/year over the next 40 years, a rate nearly an order of magnitude higher than what is currently experienced (Barth and Titus, 1984).

Coastal barriers may respond in two fundamentally different ways to rising sea level: (1) they may continuously move landward by erosion along the shoreface or (2) they may drown beneath the rising sea. Although still a controversial subject, it appears that most barrier islands along the Atlantic coast of the United States are moving landward by shoreface erosion, whereas at least some Gulf coast barriers appear to be drowning (Nummedal et al., 1984).

Regional Discussion of Physical Characteristics

Before beginning this discussion, some of the physical data used to characterize each region are presented. Wave and tidal data are fundamental for classifying the barriers in each region according to the classification scheme presented at the beginning of the section. Tidal data are available over the complete geographical range of CBRS at a very high level of resolution. Table 3-1 presents tidal range data on a state by state basis from Maine to Texas. Mean annual wave energies for the continental shelves of the United States can be derived from ship wave observations within designated data squares (SSMO-data; see Nummedal and Stephen, 1979, for computational procedures). The data squares are large, however, extending seaward beyond the shelf break and covering from 150 to 300 miles of adjacent coastline. The results of these energy computations are summarized in Table 3-2.

Wave data based on continuously recording nearshore wave gauges are becoming increasingly available. This kind of data, obtained by the wave measurement program of the United States Army Coastal Engineering Research Center and published by Thompson (1977), is presented in Table 3-3. Data on the probability of hurricane landfall for a given area is a partial indication of a barrier's stability and also another general measure of wave energy. These data are available for each 50 mile segment of the coast and are presented in Table 3-4 and Figure 3-7.

The regionalization used in this section is based strictly on coastal physical and geological characteristics. The geographical boundaries of the regions are similar to those of the regionalization of coastal ecosystems in use by the United States Fish and Wildlife Service (FWS) (Terrell, 1979). Because the FWS system, used in Chapter IV of this report, is based on biogeographic factors, rather then geological ones, the unit boundaries do not exactly coincide. The regions used in this section are are delineated in Figure 3-8.

1. Eastport to Cape Elizabeth, Maine.

The United States' east coast south to Staten Island, New York, was glaciated during the last ice age. As a consequence, it has a character distinct from the remainder of the Atlantic coast. Nowhere has the glacial sculpture left more of a direct imprint than along the coastline of Maine. Glacial scour of valleys has produced the present deeply embayed coastline; many embayments are scoured down almost to the bedrock.

Most sedimentary material of the right grain size for barrier formation was moved far to the south during the glaciations, and modern rivers supply little sand to the open coast. Such sand as there is comes mainly from wave erosion of local cliffs. Small pocket

TABLE 3-1. Tide Range at Open Coast Stations Along the Atlantic and Gulf Coast of the United States (From: NOS Tide Tables, East Coast of North and South America).

	NOS Sta. #	Feet Mean	Feet Spring
Maine			
Cutler	655	13.6	15.5
Prospect Harbor	685	10.5	12.1
Bass Harbor	717	9.9	11.3
Isle Au Haut	736	9.3	10.7
Tenants Harbor	779	9.3	10.6
Boothbay Harbor	809	8.8	10.1
Fort Popham	829	8.4	9.7
Kennebunkport	887	8.6	9.9
York Harbor	889	8.6	9.9
Massachusetts			
Merrimack River entrance	915	8.3	9.5
Rockport	923	8.6	10.0
Manchester Harbor	927	8.8	10.2
Marblehead	933	9.1	10.6
Deer Island	943	9.3	10.8
Boston	949	9.5	11.0
Hull	987	9.3	10.8
Scituate	991	8.8	10.2
Gurnet Point	993	9.2	10.7
Cape Cod Canal (east)	997	8.7	10.1
Barnestable Harbor	999	9.5	11.0
Provincetown	1003	9.1	10.6
Cape Cod Lighthouse	1007	7.6	8.8
Chatham (outer coast)	1011	6.7	7.8
Monomoy Point	1017	3.7	4.3
Hyannis Port	1031	3.1	3.7
Falmouth Heights	1039	1.3	1.6
Siasconset, Nantucket Island	1043	1.2	1.4
Off Chilmark Pond, Martha's Vineyard	1065	2.9	3.5
Woods Hole (WHOI)	1093	1.8	2.2
Rhode Island			
Sakonnet	1147	3.1	3.9
Pt. Judith	1179	3.1	3.9
Block Island	1183	2.9	3.6
Watch Hill	1185	2.7	3.2
Connecticut			
Mystic River entrance	1189	2.3	2.7
Saybrook Point	1201	3.2	3.8
Sachem Head	1220	5.4	6.2
New Haven	1227	6.0	6.9
Bridgeport	1235	6.7	7.7
South Norwalk	1241	7.1	8.2
Greenwich	1249	7.4	8.5
Mamaroneck (N.Y.)	1255	7.3	8.6

TABLE 3-1 (continued)

	NOS Sta. #	Feet	
		Mean	Spring
New York			
Long Island - North Side			
Port Washington	1335	7.3	8.6
Eatons Neck Pt.	1347	7.1	8.2
Mount Sinai Harbor	1367	6.0	6.9
Mattituck Inlet	1371	5.2	6.0
Plum Gut Harbor	1377	2.6	3.1
Sag Harbor	1389	2.5	3.0
Long Island - South Side			
Montauk Pt. (north side)	1407	2.0	2.4
Shinnecock Inlet	1409	2.9	3.5
Moriches Inlet	1415	2.9	3.5
Democrat Point	1421	2.6	3.1
Jones Inlet	1449	3.6	4.3
Coney Island	1493	4.7	5.7
New York (The Battery)	1511	4.5	5.4
Upper Bay	1571	4.5	5.4
New Jersey			
Perth Amboy	1601	5.2	6.3
Porth Monmouth	1621	4.8	5.8
Sandy Hook	1625	4.6	5.6
Sea Bright	1637	4.4	5.3
Sea Girt	1647	4.3	5.2
Barnegat Inlet	1667	3.1	3.8
Little Egg Inlet	1681	3.7	4.5
Absecon Inlet	1699	3.6	4.4
Great Egg Harbor Inlet	1713	3.8	4.6
Townsend Inlet	1735	3.8	4.6
Hereford Inlet	1743	4.1	5.0
Cape May pier	1755	4.3	5.2
Delaware			
Rehoboth Beach	1897	3.9	4.7
Fenwick Island light	1907	3.7	4.5
Maryland			
Ocean City	1909	3.4	4.1
Virginia			
Chincoteague Inlet	1917	3.0	3.6
Metomkin Inlet	1931	3.6	4.4
Smith Island	1947	3.5	4.2
Virginia Beach	2441	3.4	4.1
North Carolina			
Currituck Beach	2443	3.6	4.3
Kitty Hawk	2447	3.2	3.8
Cape Hatteras	2451	3.6	4.3
Hatteras	2453	3.4	4.1
Cape Lookout	2461	3.7	4.4

TABLE 3.1 (continued)

	NOS Sta. #	Feet	
		Mean	Spring
Captiva Island	3059	--	2.6
Venice Inlet	3017	--	2.1
Egmont Key	3074	--	2.1
Clearwater	3105	1.8	2.6
Anclote Key	3109	2.1	3.0
Bayport	3115	2.4	3.4
Cedar Key	3119	2.6	3.5
Pepperfish Keys	3123	2.4	3.4
Deadman Bay	3125	2.4	3.4
Ancilla River entrance	3133	2.4	3.3
St. Marks River entrance	3135	2.4	3.3
Dog Island	3141	--	2.6
West Pass	3151	--	1.4
St. Andrews Bay entrance	3155	--	1.3
East Pass, Destin	3171	--	0.6
Pensacola Bay entrance	3177	--	1.1
Alabama			
Ft. Morgan	3193	--	1.2
Ft. Gaines	3194	--	1.3
Mississippi			
Horn Island Pass	3201	--	1.7
Cat Island	3209	--	1.7
Louisiana			
Chandeleur Light	3217	--	1.2
Breton Island	3219	--	1.3
Pass a Loutre entrance	3223	--	1.2
Port Eads, South Pass	3225	--	1.1
Southwest Pass	3227	--	1.3
Empire Jetty	3232	--	1.3
Quatre Bayou Pass	3235	--	1.3
Barataria Pass	3237	--	1.2
Caminada Pass	3245	--	0.9
Timbalier Island	3247	--	1.2
Wine Island	3251	--	1.3
Raccoon Point	3255	--	1.7
Point Au Fer	3259	--	2.0
South Point, Marsh Island	3263	--	1.8
SW Pass, Vermilion Bay	3266	--	1.6
Mermentau River entrance	3269	--	2.5
Calcasieu Pass	3270	--	2.0
Texas			
Sabine Pass jetty	3271	--	2.8
Galveston Bay entrance	3275	--	2.0
Galveston Pleasure pier	3290	--	2.1
San Luis Pass	3291	--	1.2
Pass Cavallo	3295	--	1.4
Aransas Pass	3301	--	1.4
Padre Island, south	3303	--	1.4

TABLE 3-1 (continued)

	NOS Sta. #	Feet Mean	Spring
Atlantic Beach	2469	3.6	4.3
New River Inlet	2473	3.0	3.6
Wilmington Beach	2479	4.0	4.7
Cape Fear	2481	4.5	5.1
Shallotte Inlet	2503	4.6	5.4
South Carolina			
Myrtle Beach	2511	5.1	6.0
Pawleys Island	2514	4.8	5.6
North Santee River Inlet	2541	4.5	5.3
Cape Romain	2547	4.7	5.5
Capers Inlet	2563	5.2	6.1
Sullivans Island	2569	5.2	6.1
Folly Island	2613	5.2	6.1
Edisto Beach	2635	5.9	6.9
Fripp Inlet	2667	6.2	7.3
Daufuskie Landing	2703	7.2	8.5
Georgia			
Savannah River entrance	2709	6.9	8.1
Blackbeard Island	2757	6.9	8.1
St. Simons Sound Bar	2779	6.5	7.6
Jekyll Point	2797	6.6	7.7
St. Marys entrance	2821	5.8	6.8
Florida			
Fernandina Beach	2833	6.0	7.0
Nassau Sound	2839	5.4	6.3
St. Johns River south jetty	2853	4.9	5.7
St. Augustine Inlet	2885	4.5	5.3
Daytona Beach	2889	4.1	4.9
Cape Canaveral	2893	3.5	4.1
Sebastian Inlet	2894	2.2	2.6
St. Lucie Inlet	2899	2.6	3.0
Jupiter Inlet	2901	2.0	2.4
Palm Beach	2907	2.8	3.3
Hillsboro Inlet	2909	2.3	2.7
Fort Lauderdale	2911	2.3	2.8
Miami Harbor entrance	2921	2.5	3.0
Key Largo	2938	2.2	2.6
Tavernier	2953	2.1	--
Vaca Key	2973	1.5	1.9
Bahia Honda	2979	1.2	--
Key West	2993	1.3	1.6
Dry Tortugas	3007	1.1	--
Cape Sable	3023	2.9	3.8
Everglades City	3037	2.0	2.6
Cape Romano	3045	2.6	3.5
Naples	3047	2.1	2.8

TABLE 3.2a. Distribution of wave power along the United States' Atlantic and Gulf coasts. Computed from data provided by the National Climatic Center (SSMO-data). Wave power is in units of 10^3 W/m. Direction indicates where the wave orthogonals are coming from.

Atlantic Coast

Data Square / Direction	Boston	Quonset Point	New York *	Atlantic City	Norfolk	Cape Hatteras
N	1.64	1.83	.49	2.19	2.51	4.20
NE	1.02	1.67	.90	2.14	1.60	2.50
E	.75	1.25	.53	1.04	.49	1.22
SE	.86	.47	.38	.53	.31	.97
S	.88	.65	.78	1.17	.91	1.64
SW	1.54	1.58	1.10	1.79	1.43	2.51
W	1.88	3.76	1.14	3.41	1.34	2.68
NW	2.88	3.95	1.70	4.81	2.73	7.01

Atlantic Coast

Data Square / Direction	Charleston	Jackson-ville	Miami
N	2.74	2.23	1.71
NE	3.02	2.86	2.11
E	1.57	1.95	2.13
SE	1.11	.97	.94
S	1.69	1.11	.92
SW	2.33	1.25	.57
W	2.77	1.64	.64
NW	2.14	2.04	1.32

* The New York data square is much smaller than the others and includes observations only relatively close to shore within the New York Right apex.

TABLE 3.2 a (continued)

Data Square ---------- Direction	Gulf Coast Key West	 Fort Meyers	 Apala-chicola	 Pensacola
N	.54	1.30	1.60	1.32
NE	1.26	1.66	3.16	1.37
E	2.80	2.74	3.72	2.00
SE	.97	1.47	1.81	1.51
S	.21	.52	.79	.65
SW	.10	.25	.37	.28
W	.09	.22	1.17	.36
NW	.31	.96	1.81	1.26

Data Square ---------- Direction	Gulf Coast New Orleans	 Galveston	 Corpus Christi
N	1.69	1.87	2.32
NE	2.00	1.69	1.29
E	2.23	1.60	1.24
SE	2.06	2.06	2.69
S	1.09	1.26	1.58
SW	.28	.25	.23
W	.36	.21	.08
NW	.99	.95	.55

TABLE 3.2b. Total, and onshore-directed, annual wave power for SSMO data squares along the United States' Atlantic and Gulf coasts. Onshore wave power has been calculated with respect to the regional shoreline trend in that data square. Within broad embayments more than one shoreline trend commonly occur within a data square.

Data Square Subregion	Power (10^3 W/m) Total	Onshore	Regional Shoreline trend
BOSTON	11.45		
Maine		3.77	NE
New Hampshire, North Mass. & Cape Cod		3.89	N
South Mass. Bay		4.27	NNW
QUONSET POINT	15.16	3.95	ENE
ATLANTIC CITY	17.08		
N. New Jersey		5.39	N
S. New Jersey		4.88	NNE
Delaware		5.39	N
NORFOLK	11.32		
Maryland, Virginia		4.12	N
Currituck Spit		4.91	NNW
CAPE HATTERAS	22.73	6.34	NE
CHARLESTON	17.32	7.05	NE
JACKSONVILLE	14.05		
Georgia		6.89	NNE
NE Florida		8.01	NNW
MIAMI	10.34		
Central Florida		6.89	NNW
South Florida		6.96	N
KEY WEST	6.28		
Upper Keys		4.08	ENE
Lower Keys		2.73	E
FORT MEYERS	9.12	1.95	NNW
APALACHICOLA	14.44		
East Apalachee Bay		4.15	NW
East Apalachicola Delta		6.69	ENE
West Apalachicola Delta		4.15	NW
PENSACOLA	9.03		
Fla, Ala, Miss		3.78	E
Chandeleur Islands		5.87	N

TABLE 3.2b (continued)

Data Square Subregion	Power (10^3 W/m) Total	Onshore	Regional Shoreline trend
NEW ORLEANS	10.70		
Grand Isle region		5.66	ENE
Terrebonne barriers		5.17	E
GALVESTON	9.89		
La. Chenier Plain		5.28	E
Galveston Island		5.17	ENE
CORPUS CHRISTI	9.98		
Upper Coastal Bend		6.27	NE
Central Coastal Bend		7.17	N
South Padre Island		7.54	NNW

TABLE 3.3. Wave climate at selected stations along the United States' Atlantic and Gulf coasts. One set of data is based on (nearly) continuously operating wave gages (in somewhat different water depths), published by Thompson (1977). The other data set is based on visual estimates of wave height near breaking, observed by coastguardmen at shore stations and published in CERC's Shore Portection Manual (1973).

State	Station	Wave gage data Mean ht. (ft.)	Wave gage data Years of record	Visual obs. Mean ht. (ft.)
MAINE				
	Moose Peak			1.5
NEW HAMPSHIRE				
	Hampton Beach			1.4
MASSACHUSETTS				
	Cape Cod			2.5
	Nauset	1.8		
	Buzzards Bay	2.9	1	
RHODE ISLAND				
	Point Judith			1.8
	Misquamicut			1.4
NEW YORK				
	Southampton			1.9
	Westhampton			2.6
	Jones Beach			2.6
	Short Beach			1.7
NEW JERSEY				
	Monmouth			1.7
	Deal			2.3
	Toms River			2.0
	Brigantine			2.2
	Atlantic City	2.8	10	1.9
	Ludlam Island			1.9
MARYLAND				
	Ocean City			1.8
VIRGINIA				
	Asseteague			2.6
	Virginia Beach	2.1	4	2.0
NORTH CAROLINA				
	Nags Head	3.1	5	3.9
	Wrightsville	2.5	3	2.3
	Oak Island			1.2
	Holden Beach	2.1	2	1.7
GEORGIA				
	Savannah Light	3.1	2	
	St. Simon Island			0.4

TABLE 3.3 (continued)

State	Station	Wave gage data Mean ht. (ft.)	Wave gage data Years of record	Visual obs. Mean ht. (ft
FLORIDA				
	Daytona Beach	2.2	2	
	Ponce de Leon			2.2
	Palm Beach	2.1	2	
	Lake Worth	2.2	2	
	Boca Raton			1.9
	Hillsboro			1.3
	Naples	.95	7	
	Cape San Blas			0.7
	Panama City			1.7
	Greyton Beach			1.7
	Destin	1.7	1	
	Navarre Beach			2.3
	Santa Rosa			1.4
LOUISIANA				
	Grand Isle			1.4
TEXAS				
	Galveston			1.4

TABLE 3.4. Probability for a hurricane strike in any one year for consecutive 50 mile segments (numbered 58 to 1) along the Atlantic and Gulf Coasts.

Hurricane: winds $>$ 33 m/s
Great Hurricane: winds $\geq$ 56 m/s

	Hurricanes (%)	Great hurricanes (%)
Maine		
58	5	--
57	6	--
56	4	--
New Hampshire		
55		
Massachusetts		
54	--	--
53	6	--
52	7	1
Rhode Island/Connecticut and New York (Long Island)		
51	6	1
50	6	--
New Jersey		
49	1	--
48	--	--
Delaware/Maryland/Virginia		
47	1	--
46	2	--
45	2	--
North Carolina		
44	2	1
43	8	4
42	11	2
41	5	--
40	6	2
South Carolina		
39	6	2
38	5	--
37	8	--
Georgia		
36	7	1
35	2	1
Florida (east coast)		
34	1	--
33	1	--
32	2	--
31	5	--

TABLE 3.4. (continued)

	Hurricanes (%)	Great Hurricanes
30	8	2
29	15	7
28	16	7
27	12	5
26	13	2
Florida (west coast)		
25	13	4
24	9	2
23	5	1
22	4	2
21	6	1
20	8	--
19	6	--
18	7	--
17	6	--
16	7	--
15	14	--
14	13	--
Alabama/Mississippi		
13	6	1
Louisiana		
12	9	4
11	13	2
10	9	--
9	6	--
8	6	1
7	8	4
Texas		
6	12	4
5	14	4
4	9	4
3	7	4
2	7	5
1	8	2

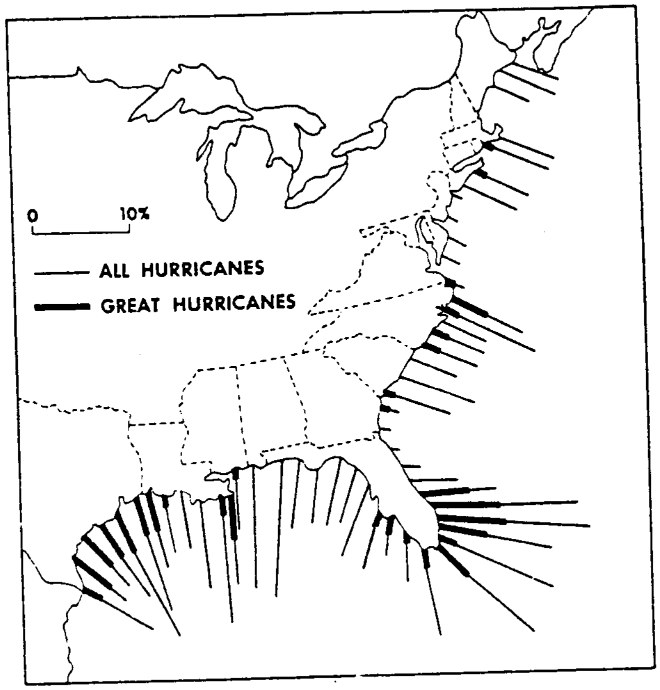


Figure 3-7 Annual hurricane landfall probabilities in the U.S. Compiled from data in Simpson and Lawrence 1971. Figure from Nummedal, 1983b.

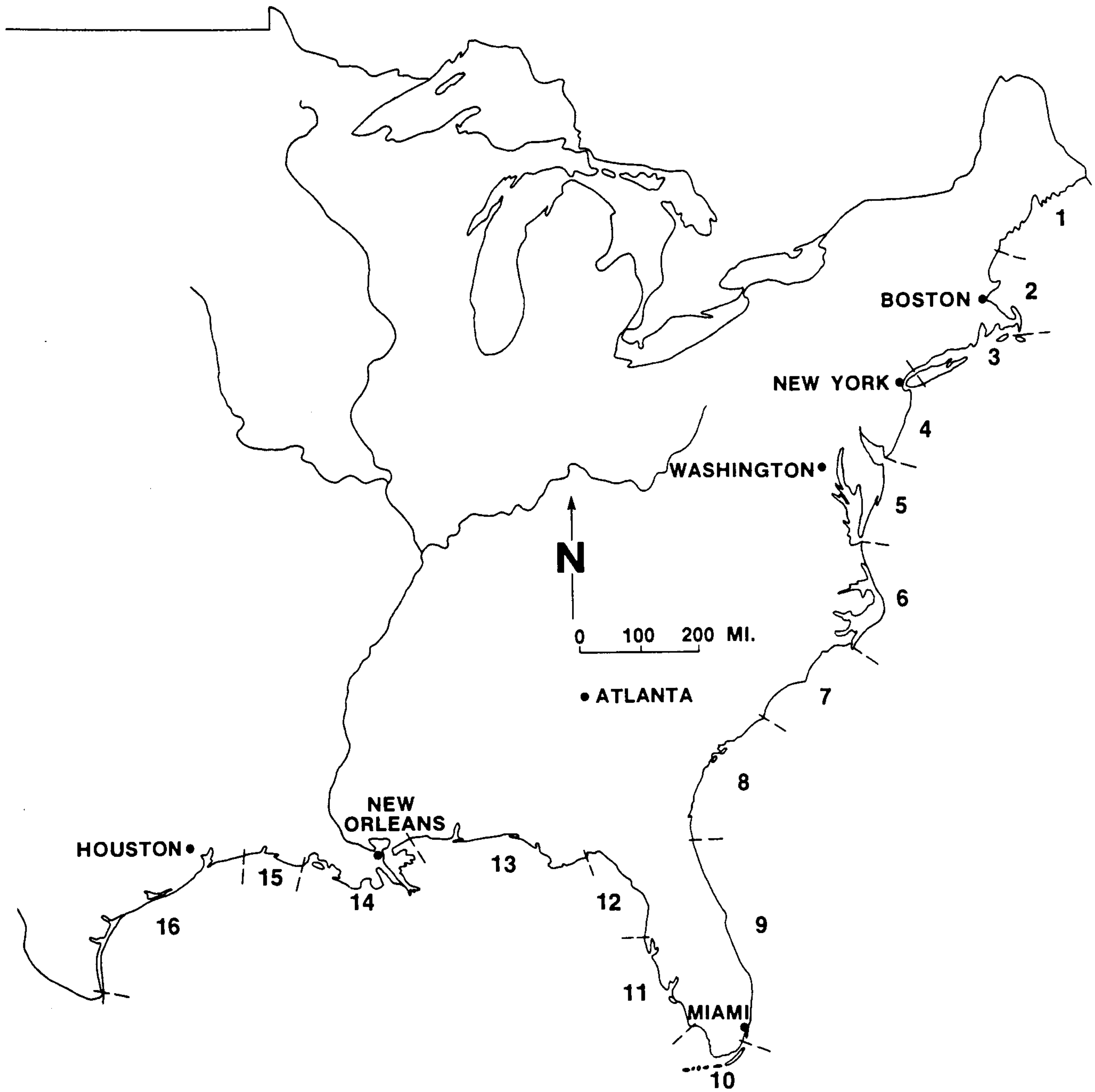


Figure 3-8. Map of the United States showing the coastal regions discussed in this chapter.

beaches and local baymouth spits do occur, but more commonly, the coast consists of cliffs of igneous rocks sometimes bordered by extensive tidal mud flats. Fine grained sediment (silt and clay) is abundant in this glaciated region, both on the offshore sea floor and in the river valleys. Strong flood-dominance of the tides in bays makes the mud accumulate along the shore, and a large tide range is responsible for extensive mudflat exposures at low tide.

Along this section of coast, the tidal range decreases from a mean of 13.6 feet in the east to 8.5 feet at Portland (Table 3-1). The rapid eastward increase in tide range is due to the influence of the entrance to the Bay of Fundy. The mean annual wave energy on the coastline is relatively low due to its southeastward facing orientation and its sheltered location on the north side of the Gulf of Maine. The mean annual wave height at Moose Peak is only 1.5 feet, and the regional mean annual, onshore-directed wave power is among the lowest levels anywhere along the United States coast (Table 3-2).

It is important to note that the same coastal orientation which shelters Maine from the common northeasterly winter storms, makes it highly exposed to Atlantic hurricanes. Hurricane landfall frequencies are higher in Maine than in northeast Florida (Figure 3-7).

2. Cape Elizabeth to Monomoy Pt. (Cape Cod), Maine/New Hampshire/Massachusetts.

This is a very diverse region consisting of extensive coastal barrier beaches, spits and islands. Barriers are numerous because of the availability of coarse-grained sediments of both glacial and modern river origin.

The area of Kennebunk is typical of southern Maine. It consists of frequently alternating rocky headlands and sandy or gravelly beaches. Most of the beach sediment has been derived from wave erosion of exposed glacial deposits. Farther south, along the coast of New Hampshire and Massachusetts north of Cape Ann, the extensive barrier island system owes its origin both to these glacial deposits and sand delivered to the coast by the Merrimack River. Plum Island is a typical tide-dominated barrier. The island is 8 miles long, 1 mile wide, and bordered by two deep tidal inlets with associated ebb- and flood-tidal deltas. With a tide range of 8.3 feet and a mean annual wave height at the nearest recording station (Hampton Beach, New Hampshire) of only 1.4 feet, Plum Island falls well within the tide-dominated category on Figure 3-1.

Massachusetts Bay provides a fascinating case study of the interplay between sediment sources, physical process variability and resultant coastal shape. Exposed headlands at the north flank of the bay consist of erosion resistant rocks, producing only enough sediment for short pocket beaches and tombolos (see page VI-9 for definition). In Boston Harbor, in the center of the bay, one encounters the only coastal drumlin field along the United States' shoreline. Drumlins are elongated hills of glacial debris. They provide an abundant source of sediment for the beaches at Nantasket and Winthrop. The sediment that wave erosion released from the drumlins was redistributed by longshore currents to form Nantasket Beach. Historical charts of Boston Harbor demonstrate that Nantasket Beach has grown in width and length since early colonial times.

Cape Cod is composed of ridges of rock debris and sand that the last glacier carried down to its southern edge, and then dropped when it melted. This ridge system extends eastward to Long Island and westward to Georges Bank. The outer cape from Nauset north to Race Point near Provincetown consists mainly of sand and gravel washed off the glacier as it melted. Rapid shoreline retreat has been the norm for the central section of the outer cape. According to Zeigler, et al., (1964), the central cliffed coast has retreated at an average rate of 2.5 feet/year. These cliffs, which are locally as much as 120 to 180 feet high, have released large volumes of sediment to the longshore sediment transport system. The high waves associated with New England's famous storms , often called "nor'easters", transport large quantities of sand. From the central part of the cape northward, the direction of this longshore sediment transport is generally to the northwest. Consequently, the northwest shore of Cape Cod (Race Point) has grown rapidly.

Shoreline changes at Nauset Inlet, near the outer cape community of Nauset Highlands, have been rapid, dramatic and very complex. (Shepard and Wanless 1971). The reasons for the complexity of change are (1) the high wave energy (visually estimated mean wave height at the cape is 2.5 ft.) and (2) the location of Nauset Inlet at the divergence zone between northward and southward net longshore transport.

Nauset Spit and Monomoy Island, which form the southeast segment of Cape Cod, are subject to consistent southward sediment transport. They are both about 8 miles long, about 1 mile wide and separated by a tidal inlet at Chatham Harbor. Both Chatham Harbor and Nauset Inlets have well-developed flood-tidal deltas (sand bodies on the landward side of the inlet) and relatively small ebb-tidal deltas (sand bodies seaward of the inlet). Furthermore, the whole outer coast of Cape Cod is characterized by well-developed, often multiple, longshore bars in the surf zone. In accordance with the classification scheme of section 2.2, these barriers should be classified as mixed-energy (wave-dominated). Increasing wave dominance towards the south is associated with a rapidly decreasing tide range, from 7.6 feet at Cape Cod light to 3.7 feet at Monomoy Point.

3. Nantucket Island to the west end of Long Island Sound, Massachusetts/ Rhode Island/Connecticut/New York.

Except for the Rhode Island shore west of Narraganset Bay, this section of coast is devoid of sizable barrier islands and spits, hence its categorization as a separate physical unit. The lack of extensive barriers along this coast is largely due to the low wave energy, rather than lack of sediment supply. The southern shore of mainland Massachusetts is sheltered behind Nantucket Island, Martha's Vineyard and their associated extensive shoals; the Connecticut shore is sheltered by Long Island. Only the Rhode Island coast is exposed to the Atlantic via Rhode Island Sound; and this is where most coastal barriers are.

The mainland shore consists of two large glacially scoured bays, Buzzards and Narragansett Bays, and two major estuaries, the Connecticut River and the nearby Thames. The surrounding coastline is characterized by glacial hills and outwash with pocket beaches and tombolos connecting small islands (e.g., Watch Hill Point, Rhode Island). A distinct longshore change in grain size is commonly observed along Connecticut beaches, with coarse cobbles and boulders near glacial deposits grading into sand farther downdrift.

As mentioned, the relatively high wave energy on the Rhode Island shore makes it distinctly different from the neighboring coasts. The coastal barriers west of Narraganset Bay are long, thin and of a wave-dominated form. Glacially scoured, erosion resistant rock dominates the coast east of Narraganset Bay. An extremely irregular coast with a series of closely spaced estuaries was left after the glacier melted. Wave scour of this bedrock and some local cliffs has now produced sufficient sediment to close off these estuaries with a series of baymouth barriers, many of which are breached by small tidal passes.

4. Montauk Point to Cape May - New York Bight, New York/New Jersey.

From Montauk Point south, the Atlantic coastline consists of an essentially continuous sequence of barrier islands, spits, marshes and lagoons. The shorelines of the New York Bight form a natural unit as they constitute the nearly symmetrical flanks of a broad embayment with its apex at New York harbor. The tidal range is maximum at the apex.

Wave energies are relatively high in the New York Bight. The total mean annual wave power in the Atlantic City area is exceeded only by that in the Cape Hatteras data square. Maximum onshore wave energy arrives from the northeast and east, exposing the upper New Jersey shore to the highest wave power. Numerous studies conducted by the Army Corps of Engineers provide a fairly clear picture of longshore sediment transport along the New Jersey shore. The highest transport rates are found in northern New Jersey, nearly 0.5 million yards per year at Sandy Hook. Longshore transport is oriented northward from about Point Pleasant to Sandy Hook; sand moves to the south between Pt. Pleasant and Cape May. There is a similar divergence in longshore transport on the south shore of Long Island. Sand moves eastward from Southampton to Montauk Point; it moves to the west from Southampton to the entrance of New York harbor (Coney Island).

The modern Long Island barriers probably have their origin both in material eroded from the present bluffs on Long Island and in sand derived from older (7000 years) barriers where present on what is today the continental shelf south of the modern barrier system. The coastal barriers along the Long Island south shore vary in length from 48 miles for Fire Island to only 12 for Rockaway Beach. This westward decrease probably reflects the decreasing influence of waves as compared to tides in coastal sediment transport. The coastline would be classified as wave-dominated in eastern and central areas and as mixed-energy (wave-dominated) to the west of Fire Island Inlet. The barriers are extremely narrow, an average of 0.5 miles wide, and subject to overwash and inlet breaching, particularly towards the east. Moriches and Shinnecock Inlets have had histories of multiple openings and closures--some of which were aided by human interference.

The northern 35 miles of the New Jersey shore consist of bay mouth barriers and mainland beaches, as well as Sandy Hook, which is a northward building spit probably deriving its sediment from erosion of preexisting barriers seaward of the Navesink and Shrewsbury Rivers. (Shepard and Wanless, 1971). Subsequent stabilization of the eroding shores at Sea Bright and Monmouth has cut off modern sediment supply to the spit causing a series of problems of sand supply for the Sandy Hook National Recreation Area.

Continuous coastal barriers extend from Manasquan Inlet south to Cape May. From Manasquan to Beach Haven Inlet the barriers are long and narrow (average 20 miles by 0.63 miles). From there southward they are much shorter (average length 6.6 mi) and generally wider and "drumstick-shaped". The reason for this sudden change is unknown. The wave energy is only slightly lower and the tide range only moderately higher on the southern New Jersey coast compared to the central segment where the long barriers are. Nevertheless, the southern barriers have an unmistakeable tide-dominated morphology; drumstick shaped, closely spaced inlets and large ebb-tidal deltas.

Within this shoreline segment, hurricane landfall frequencies are high on the southern shore of Long Island (6% annual probability per 50 miles of shore) but insignificant along the New Jersey shore (Figure 3-7).

5. Cape Henlopen to Cape Charles, Delaware/Maryland/Virginia.

The Delmarva peninsula shows the following repetitive sequence of barrier shape and type from north to south: (1) a northern spit, formed by northward (or "reverse") longshore sediment transport, (2) an eroding mainland beach section, (3) a southern segment of long spits or barrier islands, and (4) a downdrift terminal segment consisting of a chain of relatively short, stubby, barriers. The other coastal compartments with a similar sequence of barrier landforms include Cape Cod, Long Island (sequence from northeast to southwest), New Jersey and North Carolina's Outer Banks.

Cape Henlopen was built into the southern margin of Delaware Bay by longshore currents carrying sediment from the eroding Atlantic shore of Delaware from Bethany Beach north. The cape consists of multiple high beach ridges and is well vegetated in the interior. Although the erosion rates along the Atlantic shore of the cape are relatively modest, the cape continues to retreat landward on its outer shore, growing into Delaware Bay on the northwest.

Segment 2 of the Delmarva "compartment" consists of an erosional headland from Bethany Beach north. Small bay mouth barriers, with active and abandoned tidal inlets, have sealed the entrances to the Indian River, Rehoboth and Isle of Wight Bays. These bay mouth barriers are eroding, low in profile, and frequently subject to extensive washovers during strong winter storms.

The third segment of this coastal compartment, essentially the Maryland sector, consists of one long barrier, Assateague Island, which extends south from Ocean City to Fishing Point, Virginia. Halsey (1979) argues that Assateague Island attained its present extensive length (35 miles) by linking earlier, shorter barriers with abundant sediments. Along the Maryland shore, strong longshore currents have carried sediment southward to the north jetty of Ocean City Inlet. Ocean City's beaches have widened while the beaches downdrift on Assateague Island have starved. The northern end of Assateague suffered severe erosion and overwash during the great Ash Wednesday storm of March, 1962, and is very low in profile and subject to frequent washovers.

From Chincoteague Inlet to Cape Charles in Virginia, the coastal barriers are short (average 4.8 miles), narrow (average 1.25 miles) and commonly drumstick shaped. This configuration reflects the moderately strong tidal influence and the lack of sediment supply. Most sediment moving south along the Delmarva shore is presently trapped in the large accretionary spit complex at Fishing Point. Beach ridges on Chincoteague Island, landward of the southern tip of Assateague Island, diverge and curve towards the northeast, suggesting their formation by longshore currents coming from the southwest.

6. Cape Henry to Cape Lookout, Virginia/North Carolina.

This is the southernmost of the similar coastal compartments of the mid-Atlantic Bight. The northernmost segment of this compartment consists of a northward-building foreland, Cape Henry, built into the southern margin of Chesapeake Bay. The second segment of this compartment, the eroding mainland beach, is of limited lateral extent, including only about 10 miles of the Virginia Beach oceanfront. From this location, Currituck Spit extends 69 miles south and terminates to the south at Oregon Inlet, North Carolina. Hatteras Island extends the next 52 miles south to Hatteras Inlet. From Hatteras Inlet south, the North Carolina coast barriers gradually become shorter.

For its length, Currituck spit is exceptionally narrow; the average width is only 0.63 miles, but in many places on the sound side, old flood-tidal deltas which formed behind temporary island breaches widen the spit. The spit is still washover-prone in many northern areas, however, high dunes have developed on the southern sections of the islands. In spite of its long-term history of breaches to the north, the average rate of shoreline retreat along Currituck Spit is currently only 0.6 m/year.

The southern part of Currituck Spit and Hatteras Island are part of the Cape Hatteras National Seashore. An elaborate attempt to stabilize the Seashore included planting vegetation on an artifically enlarged dune ridge. While controversy still lingers over the success of this stabilization program, historical map studies suggest that the islands are now retreating both on the sound and the ocean side. The ultimate fate of the islands may be one of drowning in response to rising sea level, rather than continued landward retreat.

Cape Hatteras is one of four Carolina Capes which are globally unique. The origin of these capes has been hotly debated for decades, they are, however, convergence zones of longshore sediment transport, and probably owe their location to the pattern of pre-existing river valleys and drainage divides.

The convergence of longshore currents at the capes leads to strong offshore-directed currents frequently visible in high altitude photographs and satellite imagery. These currents have molded extensive sandy shoals off each of the capes. These extensive shoals, combined with frequent storms, have made the shelf off North Carolina's Outer Banks the "graveyard of the Atlantic".

The tide range along the Outer Banks is low, only about 3.5 feet and the wave energy is the highest observed along the east coast. The mean annual wave energy in the Cape Hatteras area is more than twice the energy level of the Boston area and nearly three times as high as the mean annual energy off south and southwest Florida.

7. Cape Lookout to Cape Romain, North Carolina/South Carolina.

Point Lookout divides the Outer Banks coast, characterized by exceptionally wide lagoons, and long continuous barriers, from the coastline to the south where the barrier islands are close to the mainland (southern North Carolina) or entirely absent (Myrtle Beach, South Carolina). Cape Lookout itself was formed by southward longshore sediment transport. Prior to human stabilization measures, the Cape had grown southward about 3 miles beyond the adjacent western island shoreline of Shackleford Banks. In contrast to the low, overwash-prone Core Banks to the north, the Cape itself is relatively high in profile.

Beaufort Inlet, 10 miles west of Cape Lookout, is fairly typical of the tidal inlets on the southern North Carolina coastline. The main channel in the inlet is relatively shallow and unstable. The sand associated with the inlet is divided about evenly in thirds: a flood-tidal delta in the lagoon, a set of shoals in the inlet itself, and a moderate ebb tidal delta on the seaward side of the inlet. This sand distribution is characteristic of inlets where tidal transport and wave-induced sediment transport are of about equal importance. These "mixed-energy" inlets on the southern North Carolina coast cause notoriously unstable barrier island ends. The western 2 miles of Shackleford Banks will continue to be susceptible to sudden breaches due to shifts in the inlet channel. Westward growth of this island end does not imply permanent creation of new land, rather, it signifies the temporary attachment of some of the inlet sand bodies to the island. Floods, storms or progressive channel migration will inevitably reshape this island end into subtidal sand flats or intertidal bars.

The major coastal barrier along this coastal segment, Bogue Banks, is 25 miles long, some 2 to 3 miles wide, and with much higher average elevation and individual dune ridges than generally found on the Outer Banks. Barriers farther south, between New River and Cape Fear, are much shorter, have numerous mixed-energy tidal inlets, and are of moderate height. Their average dimensions are 5.3 miles long and 2 miles wide. There are a total of 19 inlets along 110 miles of coast, perhaps the closest spacing of tidal inlets along the entire United States coast. The frequent opening and closing of inlets along this coast in historical time demonstrate their inherent instability.

Cape Fear, like Cape Lookout, is at a sediment convergence zone. It too has migrated southward over time, but the accretion has largely been in the form of a beach ridge set parallel to the south-facing shore. The trend of these ridges suggests that Frying Pan Shoals, off the cape, have been the primary source of sediment for this fairly recent growth. The implications of this interaction between the offshore shoal and the adjacent shoreline are extremely important. Offshore sands clearly can be important sources for maintaining, or accreting shorelines. These offshore sand bodies can be large shoals, like Frying Pan or Cape Lookout Shoals, linear sand ridges along the New Jersey and Delmarva Peninsula, or ebb-tidal deltas along the South Carolina and Georgia coast. In all cases, maintenance of the sand body itself, and the avoidance of interruption of the sand transport path between the offshore source and the shoreline, are imperative in order to avoid accelerated shoreline erosion.

From Cape Fear to Cherry Grove Beach Inlet, 6 miles south of the North Carolina-South Carolina border, the barriers are similar to those north of Cape Fear. For 25 miles southward from Cherry Grove Beach, past Myrtle Beach, there are no barrier islands, lagoons, or coastal marshes, an unusual condition along the southeast coast of the United States. The ease of road-building, access and housing construction behind this mainland beach has led to the development of one of the largest beach-oriented tourist centers north of Florida. The shore, however, is continuously eroding causing numerous problems with the disappearing beach. A mainland shore, as at Myrtle Beach, is frequently no less erosive than a barrier shore.

The wave energy along the Carolina shore decreases dramatically from the north to south. Mean wave height at Nags Head, North Carolina is 3.9 feet (highest along the east coast); at Holden Beach, 10 miles east of the South Carolina state line, the mean wave height is only 1.7 feet (Table 3-3). The rapid decrease in wave height is a function of both of the south-facing shore to the west of the capes, the widening shelf and the southward steady decline in Atlantic deep-water wave energies. Concurrent with this wave energy reduction there is a rapid increase in tide range (Table 3-1), from 3.7 feet at Point Lookout to 5.1 feet at Myrtle Beach. As a consequence, the shoreline changes from wave dominated features in the north, to tide-dominated characteristics in the south (Nummedal et al., 1977).

This coastal region is highly vulnerable to tropical storms and hurricanes. The annual hurricane landfall probability within a 50 mile coastal segment surrounding Cape Lookout is 11%, the highest along the United States Atlantic coast north of Cape Canaveral. The significance of hurricanes in modifying these coastal landforms is demonstrated by Hurricane Hazel, which, on October 15, 1954, opened three new inlets, disrupted the southward-building spit at Cape Fear and developed many temporary washovers (Shepard and Wanless, 1971).

8. Cape Romain to St. Johns River Entrance, South Carolina/Georgia/Florida.

This area can be referred to as the "Sea Islands" section of the Atlantic coast. It is characterized by stubby barrier islands and a mainland shore of marshes and tidal creeks. Numerous coastal plains and a few piedmont streams supply fine-grained sediment to the estuarine systems. The barriers have an average length of 6.9 miles, and a width of 2.9 miles. Their lengths gradually increase towards the south. They generally show a high-profile beach ridge system.

Because of low wave energies, low hurricane landfall frequencies, and a rather high tidal range, the inlets along this coastal segment have large ebb-tidal deltas on their seaward side, and deep, and stable main inlet channels. Sand from these ebb-tidal deltas is supplied to the next downdrift barrier island, producing the characteristic "drumstick" or "humpbacked" barrier shoreline configuration. The barriers are backed by extensive salt marshes. Water flow out of the salt marsh system is stronger than that into it, preventing sand in the littoral transport system from entering the back-barrier environment.

Beach erosion rates along the entire South Carolina coast are among the highest on the Atlantic coast. Dolan, et al. (1982), determined the average retreat rate to be 2 miles per year, about three times as high as the average rate in North Carolina. Thus, although the topographically high South Carolina barriers are less likely to produce overwash than the Outer Banks, their shorelines retreat at a faster rate.

While the updrift end of each barrier goes through rapid shoreline fluctuations, the central barrier shoreline segment functions essentially as a zone of longshore sediment bypass, maintaining a fairly stable location. The southern, or downdrift end generally is a recurved spit and highly unstable. Such spits are frequently subject to cut-offs during storms and floods, or by tidal creek migration. The history of periodic relocation of Captain Sam's Inlet, between Kiawah and Seabrook Islands, is an excellent example. Cognizant of these changes, the developers of Kiawah Island have set aside the south spit as a nature area.

The Georgia "sea islands", nine in number, are generally somewhat larger than the South Carolina barriers. The deep estuarine indentations, frequent, deep and stable tidal inlets, and large ebb-tidal deltas are characteristic of a tide-dominated shoreline. The tide range at Daufuskie Landing, a few miles north of the mouth of the Savannah River, is 7.2 feet, the highest along the coast south of Cape Cod. The tide range is more than 5 feet along the entire coastal segment from Cape Romain to the mouth of the St. Johns River.

9. St. Johns River Entrance to Key Biscayne, Florida.

In sharp contrast to the sea islands coastal segment, the Florida east coast is characterized by long, continuous barriers, few inlets and narrow shore-parallel lagoons. These longer islands have formed in response to the relatively high wave energy, the low tidal range and the sparse river inflow. On the average, the barriers are 26 miles long and about 1 mile wide, suggesting wave dominance. More importantly, the southward succession of barrier types is essentially the same as that seen in the compartments of the mid-Atlantic Bight. From the St. Johns River entrance to 13 miles south, the coastline is an erosional mainland beach. Farther south a thin barrier separates the Atlantic Ocean from narrow shore parallel lagoons. Partially cemented bedrock appears along the beach at numerous places, and is deeply scoured by the Matanzas Inlet. This formation provides a sediment source for many Florida east coast barriers in a manner analogous to the bedrock sources along the northern shoreline segments of the coastal compartments of the Mid-Atlantic Bight. South of this eroding headland segment is a 78 mile long coastal barrier which extends from Ponce de Leon Inlet past Cape Canaveral to Sebastian Inlet. This is the longest coastal barrier along the United States east coast. (The dredged entrance to Port Canaveral which breaks the barrier, is not a natural inlet.) Farther south, the barriers become progressively more frequently broken by tidal inlets.

North of Cape Canaveral the barriers consist of a mixture of quartz sand derived from the Carolinas and Georgia, and carbonate shell fragments eroded from the bedrock. A belt of low vegetated dune ridges up to half a mile wide are commonly found. Abandoned, vegetated flood-tidal deltas are occasionally observed attesting to episodic breaching and healing of these coastal barriers. Some storm-induced washover deposits are observed.

The Cape Canaveral region consists of a series of modern beach ridges (Cape Canaveral proper) in front of the much wider, pre-existing, beach-ridge barrier and strand plain complex of Merritt Island. Merritt Island was also a cape like Canaveral but centered farther north. Both Cape Canaveral and False Cape have extensive offshore shoals, similar to those found off the Carolina Capes. Much of the sediment building Cape Canaveral and its shoal is probably derived from erosional retreat of shorelines to the north. By implication, any future attempt to halt this erosion would in all probability be followed by shoreline retreat at Cape Canaveral.

Historical map studies show an interesting spatial sequence of erosion and deposition. Erosion has prevailed north of False Cape. Recent erosion rates, according to Dolan, et al. (1982), have been up to 1 m/yr. False Cape itself and its offshore shoals appear to have grown. Recent rates of accretion fall in the range of 0-1 m/yr. To the south, at the northeast flank of Cape Canaveral, one observes retreat rates of about 1-3 m/yr. The southeast flank of Cape Canaveral is growing at rates of 1-3 m/yr and the associated shoals are probably also accreting. This pattern of alternating zones of erosion and accretion is typical of the Florida east coast, even where capes as distinct as those of Cape Canaveral do not exist. As a consequence, the average retreat rate of the entire Florida east coast is quite moderate.

The coastal barrier chain along Florida's southeast coast consists of barriers typically 10 to 20 miles long, 0.5 to 1.5 miles wide and are covered with ten story hotels and condominiums behind an exceedingly narrow, or nourished, beach. Miami Beach is a typical example for the region. According to Army Corps of Engineers data, the Miami Beach shoreline retreated 500 ft between 1884 and 1944. Erosion continued in spite of the construction of an extensive groin system. By the early 1970's, Miami Beach had no beach at high tide and only a narrow swash-zone in front of the hotel seawalls at low tide. A major nourishment project undertaken by the Army Corps of Engineers in the late 70's has now restored wide beaches. The sand was obtained by offshore dredging. It should be recognized that beach nourishment, although useful, is not a permanent solution. The processes that removed the original beach at Miami Beach are still at work and will progressively remove the artificial one. Plans will be necessary for periodic renourishment. The frequency of needed repairs will depend on the frequency of significant storms.

Two belts of older limestone rock underlie the modern sediments of the southern tip of Florida. In the Miami area, both trend north-south. The inner belt is composed of cemented granular limestone and forms a platform some 10 feet above sea level. Miami sits on top of this belt. Farther seaward the second belt is composed of a dead coral reef. This belt underlies Miami Beach and continues farther south. The deeper-water depression between the first and second belts is today's Biscayne Bay.

Sand moving southward along the beaches of eastern Florida began encroaching on the northernmost tip of the second belt once sea level had risen high enough to submerge the ridge, probably some 3000 years ago. The sandy barrier spit of Miami Beach continued growing south all the way to Cape Florida at the southern tip of Key Biscayne. Cape Florida is the southern terminus of a sandy coastal barrier system which extends continously from Montauk Point on Long Island, New York, a distance of 1420 miles. This is the longest continuous coastal barrier system in the world.

Southeast Florida is exposed to a moderate wave climate. The tidal range is also low because the narrow continental shelf provides no amplification of the deep-water Atlantic tide. In fact, the southward decrease in tidal range follows the progressive narrowing of the shelf. At St. Augustine Inlet the mean tidal range is 4.5 feet, and at the entrance to Miami Harbor it is only 2.5 feet (Table 3-1).

South Florida does, however, have the highest hurricane landfall frequencies in the United States (Table 3-7). The area of Palm Beach has an annual landfall frequency per 50 miles of shore of 16%. Even great hurricanes (wind speeds above 56 m/s) have an annual landfall probability of 7%.

10. The Keys and S.W. Florida South of Cape Romano, Florida.

The Florida Keys are built of the same two limestone belts discussed above for the Miami region. The long linear keys from Key Largo to Bahia Honda Key consist of reef limestone. The much more irregular, generally north-west trending Keys from Big Pine Key to Key West consist of grandular limestone. The shape of the Keys partly reflects the original shape of the reef-tract and the limestone. Sand is very limited in the Keys and most of what is there is deposited in a series of small tidal-deltas which have formed on both sides of the many tidal passes which separate the individual Keys. Small pocket beaches exist between limestone headlands. All sand is calcium carbonate.

A tract of living reef runs parallel to the Keys, about 2 to 5 miles offshore. The shallow Florida Bay, filled with carbonate mudflats and small mangrove islands, separates the Keys from the south Florida mainland at the Everglades.

The Florida Keys are not coastal barriers in the strictest definition of the term. Nevertheless, these linear, cemented limestone islands provide habitats for unique local flora and fauna and provide for the quiet-water environment of Florida Bay. Functionally, they act as barriers. While no CBRS units now exist in this region, many areas identified in the coastal barrier inventory are found here.

The impact of major storms on the Keys is well documented. The most dramatic storm to hit the Keys was the 1935 hurricane, which hit while the railroad extension from Miami to Key West was under construction. This hurricane was one of the most violent in United States history with a recorded barometric pressure as low as 26.35 inches (Shepard and Wanless, 1971). The storm destroyed all man-made structures, including the railroad, and killed some 400 people. The railroad was abandoned; later the railroad route was reconstructed as a highway. The extremely level topography of the Keys make human structures on them as vulnerable to destruction in hurricanes as those on the lowest profile, washover-prone sandy coastal barriers.

Geologically, however, the Keys respond differently to hurricanes than do sandy barriers, as documented in a study of the effects of Hurricane Donna in 1960. The active reefs are broken down to produce large amounts of rubble, and sandy material is moved across and between the Keys to accumulate on flats in Florida Bay. Because of the hard limestone, however, there is little physical change in island shape during storms.

Hurricane landfall frequencies are very high in the Keys and the Everglades. The mean annual offshore wave energy, however, is the lowest of any sector along the United States coast (Table 3-3). The combination of generally placid waters with occasional hurricanes is particularly dangerous because the islands, the inhabitants and the visitors are not generally prepared for the potential hazards of storms there.

Cape Sable is the only barrier along the Everglades section of Florida's southwest coast. Cape Sable is actually three capes built by sand and gravel-sized shell fragments and extending for about 10 miles along the coast.

11. Cape Romano to Anclote Key, Florida.

This coastal segment includes all of the barriers along the Florida west coast. In a pattern reminiscent of the coastal compartments of the Mid-Atlantic Bight there are three successive barrier sequences, each consisting of eroding headlands, flanking spits and adjacent barrier islands. In contrast to the Mid-Atlantic coast, however, the compartments along Florida's west coast are more symmetrical. Rather than a short spit north of the eroding headland, as seen along the New Jersey and Delmarva shores, the Florida systems have spits and islands extending in a symmetrical fashion in both directions away from the headland.

In succession from south to north the three barrier systems are: (1) Cape Romano to Estero Island, with the central headland north of Naples, (2) Sanibel Island north to Anna Maria Key, with the central headland at Venice, and (3) Mullet Key at the entrance to Tampa Bay north to Anclote Key, with the central headland at Indian Rocks Beach in Pinellas County.

This symmetrical distribution of barriers on opposite flanks of a central headland is characteristic of the whole United States Gulf of Mexico coast. This difference between the Gulf and Atlantic coasts is probably due to the difference in direction of dominant incoming waves. The Atlantic coast is strongly dominated by waves from the northeast causing prevailing southward longshore sediment transport along the Atlantic seaboard. Waves in the Gulf of Mexico, in contrast, are generally of local origin and frequent reversals in longshore sediment transport are common.

Recent studies on these barrier islands document that the larger ones, including Sanibel Island, have sets of beach ridges ranging in age from 3,500 years to the present. Truncations of many older beach ridge sets by younger ones indicate that the growth has been far from uniform and continuous. Moreover, differences in elevation of many ridge sets suggest that erosion, and subsequent beach ridge accretion, were responses to rapid fluctuations in sea level. As discussed earlier, sea level during the late Holocene appears to have risen and fallen a couple of meters on time-scales of a few hundreds of years. The southwest Florida coastal barriers responded by shoreline retreat of hundreds of meters followed by accretion, often in a different location. These rates and scales of change are still at work on southwest Florida's barriers. Shoreline stabilization in this region is a struggle against the basic principles of natural coastal evolution. Southwest

Florida has the highest percentage of shoreline protection structures of any United States coastal segment south of northern New Jersey, and yet, many of the much-praised sugar-white sandy beaches of southwest Florida are gone.

Most of the southwest Florida barriers are short, narrow and of low topographic profile. In spite of the low profile, they do not have many washovers due to generally low wave energy conditions. However, hurricanes, have fragmented barriers. For example, Redfish Pass across Captiva Island was opened by a major hurricane in 1926. Tidal currents have subsequently maintained this pass, and have now built two symmetrical tidal deltas, one into Pine Island Sound, one into the Gulf.

The tidal range along the Florida west coast is quite low, 2.6 feet at Cape Romano and 2.1 feet at Anclote Key. Nevertheless, the large open-water lagoons, sounds and estuaries account for large discharges of water and strong currents through most of these tidal passes. Consequently, some of the inlets have attained great natural depths; Boca Grande Pass between Lacosta and Gasparilla Islands is more than 50 feet deep.

Hurricane landfall frequencies on the southwest coast of Florida are only half of what they are across the peninsula on the southeast coast (Table 3-4). The reason, of course, is that most hurricanes approach the United States from the southeast. Residents of southwest Florida, however, as their neighbors in the Keys, are often unprepared for hurricanes because the average daily wave energy level is so low.

12. Anclote Key to Ochlockonee River, Florida.

The northwest coast of peninsular Florida is dramatically different from any other Atlantic and Gulf shoreline because it is essentially devoid of modern unconsolidated sediment to make the barriers, deltas and bars seen elsewhere. Except for the Suwannee oyster reef, which is a largely intertidal deposit west of the mouth of the Suwannee River, there are no coastal barriers.

Cedar Keys and Pepperfish Keys, however, are nearshore limestone islands which offer significant storm protection for the adjacent mainland. Also, a series of small oyster shell berms in the shallow nearshore waters are effective barriers, attenuating the incoming waves. The mainland fringe, which consists of low-lying marshy plains cut by thousands of little streams and springs, is exposed to calm seas most of the year.

Although there are no long-term wave records from this area, random observations suggest that this coast is exposed to the lowest wave energy of any major coastal segment in the United States. Because of the low wave energy, the tidal currents become major agents of sediment transport even though the tide range is only 2.4-2.6 feet.[12]

Although this coast is less susceptible to shoreline retreat than the sandy southern shore, it is extremely vulnerable to hurricanes because of the low-lying, easily flooded, coastal plains. And it should be noted that hurricane landfall probabilities are equal to, or greater than, those along the southwest Florida coastline (Table 3-4).

13) Ochlockonee River to Cat Island, Florida/Alabama/Mississippi.

The shoreline changes dramatically at the Ochlockonee River, the easternmost of the Florida rivers which drains the sandy and muddy deposits of the adjacent panhandle. The large Ochlockonee Bay estuary, like Mobile, Galveston and Corpus Christi Bays, and many other Gulf coast estuaries, are all drowned river valleys. Also, characteristic of most northern Gulf coast barriers, most of the sand is largely eroded from pre-existing headlands and then carried longshore (sometimes in both directions) to form a succession of barrier spits and barrier islands.

The Florida panhandle is characterized by offshore barrier islands around the Apalachicola delta, a series of mainland beaches and spits between Cape San Blas and Destin, followed by long coastal barriers west towards the Alabama state line. The Alabama coast has a major spit extending from Perdido Bay on the Florida state line to Ft. Morgan at the entrance to Mobile Bay. West of Mobile Bay is Dauphin Island, which extends to the Mississippi state line. The Mississippi mainland coast is fronted in its entirety by a series of offshore coastal barriers. From east to west these are: Petit Bois, Horn, East and West Ship and Cat Islands.

Five barrier islands and spits with an average length of 13 miles and a width of .75 miles front the Apalachicola delta. The extensive barriers demonstrate that Apalachicola is no longer an active delta. The barriers, in fact, are the result of redistribution of sand from older deltaic and river sand deposits. The modern Apalachicola River has a tiny delta at the head of Apalachicola Bay, just east of the town of the same name. No significant amount of sand is carried from this delta to the modern sandy barriers of St. George or

St. Vincent Island. Because there is no net sediment supply to these islands from the river, they will erode unless the shoreline retreats elsewhere to release sand for their nourishment.

Cape San Blas, on the west flank of this old deltaic headland, is associated with offshore shoals extending 15 miles to the south of the Cape. A smaller system of shoals also exists off Cape St. George. These shoals, like their counterparts off the Carolina Capes or Cape Canaveral, play a significant, yet incompletely understood, role in the development, stability and ultimate destiny of the Apalachicola delta barriers. Basic questions about sediment dynamics in this region are still unresolved. Assessments of shoreline stability and long-term changes in island configuration are hazardous guesses at best, and thorough engineering and geologic studies should precede development to avoid costly construction in the areas found most prone to storm destruction or rapid beach retreat.

Dauphin Island, Alabama, consists of an eastern core against the entrance into Mobile Bay, and a younger, long, low-profile western spit, undoubtedly built by sediment moving westward in longshore transport from the older core. On the eastern core, the island is fronted by dunes up to 30 feet high along most of its seaward shore. The ground elevation within much of the core is well over 10 feet. The historical settlement on Dauphin Island was located on the bay side of this core. This is believed to be the most stable part of the island. The western spit of Dauphin Island, in contrast, was breached and separated from its eastern core by a hurricane in 1916. The breach was initially more than 5 miles wide and began at the immediate western end of the older core. By the early 1940's, the breach had healed. A smaller hurricane breached the island again, within the same area, in 1947, but this time the break healed very quickly. When Dauphin Island was connected to the mainland of Alabama by a causeway in 1955, the scars of the former breaches were only evident to trained observers, and development of vacation homes on the western spit began. Hurricane Frederic, which made landfall on the Alabama coast in 1979, completely devastated this western development and also blew down the causeway. Maximum damage and beach erosion occurred exactly within the developed segment on the western low-profile spit. In spite of historical documentation of repeated damage, and good understanding of the physics of a system that focuses storm wave energy on the western spit, some $35 million of National Flood Insurance funds were expended to assist in rebuilding the vacation homes in exactly the same location, and an equivalent amount of public funds were expended to rebuilt the causeway.

Most of Mississippi's coastal barriers are part of the Gulf Islands National Seashore. Much of those barriers that are not part of the Seashore became incorporated in the CBRS in 1982. These islands are all relatively young. They are well vegetated by a southern maritime climax forest of pine and palmetto. The islands generally have high beach ridges yet may be overwashed by strong storms. Hurricane Camille, which struck the Mississippi coast in 1969, cut Ship Island into two segments. The breach Camille cut has as of yet shown no sign of healing. The same hurricane produced extensive washover fans on Horn Island.

All the barriers are moving towards the west at a rapid rate through erosion of their eastern ends and accretion on the west. In this way, Horn Island has migrated over 1.5 miles westward during the last century. In a natural system, such migration would cause no problems, but dredged channel entrances into various Gulf coast harbors create limits to the tolerance for barrier migration. A minimum of housing structures exist on the Mississippi coastal barriers, which may be why they have the widest and best maintained beaches along the entire Gulf coast. In the absence of housing and stabilization measures, beaches may change their location over time, but will not disappear.

14. The Mississippi delta coast, Louisiana.

The Mississippi River deltaic plain extends from the Louisiana-Mississippi state line in the east to Marsh Island and Vermilion Bay in the west. About three-fourths of the Louisiana coastline flanks the Mississippi delta. The term Mississippi River delta as used in this report refers to the entire delta complex, in other words, that part of coastal Louisiana which has been built by the Mississippi River over the last 6000 years. At present, only the tip of the Mississippi delta in lower Plaquemine Parish, and the Atchafalaya delta at the head of Atchafalaya Bay, are actively building. Other, older "lobes" of the delta complex are being eroded and inundated by locally rising sea level.

The cycle of Mississippi delta lobe evolution is as follows: (1) a delta lobe forms in one location and large quantities of sand are deposited near the river mouth, (2) the main branch of the Mississippi River changes course to a new and shorter route to the sea, (3) waves and longshore currents redistribute the abandoned river mouth sand deposits, building barrier spits and bars, (4) the abanadoned delta front rapidly sinks into earlier delta deposits, the sea gradually separates the barrier chain from the adjacent mainland,

(5) the barrier drowns, forming an inner shelf shoal. This evolutionary cycle for Louisiana's barrier islands is probably not that different from the evolution of some other barrier systems along the United States coastline, but because of the more rapid sinking of the delta plain in Louisiana, the barriers change faster than barriers in most other coastal states.

Bayou Lafourche was the main channel of the Mississippi River until some 500-700 years ago. At its maximum size the Lafourche delta extended a few miles seaward of the present shoreline at Fourchon and Grand Isle. Sand from the LaFouche delta (headland) were transported laterally to build the eastern Caminada spit and Grand Isle and the western islands of East Timbalier and Timbalier. This pattern is very similar to that observed in southwest Florida: a central headland erodes into symmetrically distributed spits and barrier islands. The fact that in Louisiana, the headland sand source is a delta, whereas in Florida it is not, makes little difference to the resulting barrier pattern. As the LaFourche delta began to sink, the beaches began to retreat.

Louisiana has the most rapidly retreating beaches in the nation. The average retreat rate for the Fourchon beach over the last 100 years has been in excess of 60 feet/year. The statewide average according to Dolan et al. (1982) is in excess of 12 feet per year. The consequences of barrier island retreat are observed at Isles Derniers in Terrebonne Parish and at the Chandeleur Islands in St. Bernard Parish. These barrier islands once flanked central headlands like the central headland at Fourchon, but both have subsequently become separated from the mainland. The St. Bernard delta lobe, the older of the two, is about 3,500 years old and the associated islands, the Chandeleur Islands, are farther from the mainland than any other barrier island system in Louisiana, or anywhere else in the nation. Delta lobes older than the St. Bernard do not have associated barrier islands any longer. There are reasons to believe, however, that some of the sandy shoals on the Louisiana continental shelf are older, now drowned, barrier islands.

Most of Louisiana's barrier islands are hardly developable as vacation resorts because of the low aesthetic quality of the Louisiana coastal plain, their inaccessibility, and their extremely high rates of migration. Thorough documentation of their patterns of change, however, is already proving to be of help in developing predictive models for barrier island evolution elsewhere. Even the rates of change observed in Louisiana may be of nationwide applicability if the anticipated acceleration in global sea level rise should become a reality.

15. Vermilion Bay to the Sabine River, Louisiana.

The Chenier Plain of the Louisiana coast between Vermilion Bay and the Sabine River is geologically unique along the United States coastline. It owes its origin to the vast quantities of fine-grained (muddy) sediments issued by the Mississippi River and the moderate wave climate of the north-central Gulf of Mexico.

The Chenier Plain is separated from the deltaic plain to the east by Southwest Pass, which is 150 feet deep. Deep tidal passes are not uncommon along the Louisiana coast. Although the tidal range is small, only 1.6 feet at Southwest Pass (Table 3-1), the tidal discharge through this pass is very large, both because of the size of Vermilion Bay and the pattern of wind-driven circulation in the bay which causes frequent transport of Atchafalaya Bay water into Vermilion Bay and out through Southwest Pass. The depth of the pass is probably more a reflection of these storm-events than the volume of daily exchange of tidal waters.

Mud from the Mississippi River outlets has always been transported to the west by the prevailing westward flowing coastal currents off Louisiana. For the last 3000 years the Chenier Plain has been a site of rapid coastal accretion in response to this mud supply. The growth, however, has not been uniform. Periods of rapid accretion of mudflats have alternated with periods of coastal retreat. During phases of retreat, the coarser sediment, primarily shell-hash, has been concentrated and deposited as linear ridges or "Cheniers". These ridges attain local elevations above 10 feet and constitute the only high, and relatively dry ground in Cameron and Vermilion Parishes. The land in between the ridges is at or only a few feet above sea level and permanently wet.

The Chenier Plain is fronted by mudflats instead of the usual sandy beaches. Fluid mud, with a consistency like yogurt, extends from the seaward edge of the marsh grasses to a few hundred yards offshore. The mud is an extremely effective wave absorber; the mainland shore is rarely exposed to any wave action except during storms.

Technically, the Chenier ridges do constitute barriers protecting the wetlands on their landward side. The danger of inhabiting the Chenier ridges is fully comparable to that of living on barrier islands, as was amply demonstrated when Hurricane Audrey flooded most of Cameron Parish in 1957 and killed an estimated 500 people.

16. Sabine River to the Rio Grande, Texas.

The Texas coast is a continuous barrier shoreline. The barrier spits and islands were formed from sediments supplied from three deltaic headlands: the Trinity delta in Jefferson County immediately west of the Sabine River, the Brazos-Colorado Rivers delta complex in Brazoria and Matagorda Counties, and the Rio Grande delta in southernmost Cameron County.

The Texas barriers are arranged symmetrically around these erosional deltaic headlands. Because the shoreline has been straightened by this process, the longshore currents flowing northward have now reversed, and net sediment transport along the entire upper Texas coast today is towards the southwest.

Climate is another important variable that greatly affects Texas coastal barriers. Texas is the only Atlantic or Gulf coastal state with a significant climatic range; the coastal zone is humid subtropical in the east and semiarid in the south. South of Corpus Christi the annual evaporation exceeds the precipitation and the landscape has an arid appearance outside the irrigated valleys. On high-profile, southern barriers, vegetation is sparse, and continuous winds have built high dunes.

The rapidly advancing developments along the Texas barrier coastline are faced with problems similar to many other states, yet the length and variability of coastline offers greater possibilities for planning development scenarios consistent with natural processes. These processes, the rates of shoreline retreat, the high frequency of hurricane landfalls (Table 3-4), and the effects of winter storms, are all well known.

CHAPTER IV

AN ECOLOGICAL EXAMINATION OF COASTAL BARRIERS ALONG THE ATLANTIC OCEAN AND GULF OF MEXICO

Section 2 of CBRA recognizes the importance of coastal barriers as habitat for a variety of fish and wildlife. This chapter explores the ecological relationship between living organisms and their coastal barrier habitat. In a given area, different types of plants, fish, wildlife, and other living resources make up a unique "community" that functions together with the non-living environment as an "ecosystem." Thus, the ecosystem consists of an interdependent network of physical and biological components. No single component can be altered without affecting others since no component functions independently. Recognition of this concept is essential if management efforts are to maximize natural resource values and avoid emphasizing one component at the expense of another.

The Ecosystems

Coastal barriers can, very generally, be divided into five interrelated ecosystems for the purposes of this report. These are: 1) coastal marine, 2) maritime, 3) estuarine, 4) freshwater (riverine, palustrine, lacustrine), and 5) uplands on mainland (Figure 4-1). Each ecosystem is characterized by a unique combination of geological, botanical and biological features, knitted together by the common physical influence of coastal processes. Physical forces shaping these ecosystems include wind, waves, tide, currents, precipitation, river flow and temperature. Good examples of each ecosystem can be found throughout the CBRS, but only occasionally are all represented in a single CBRS unit.

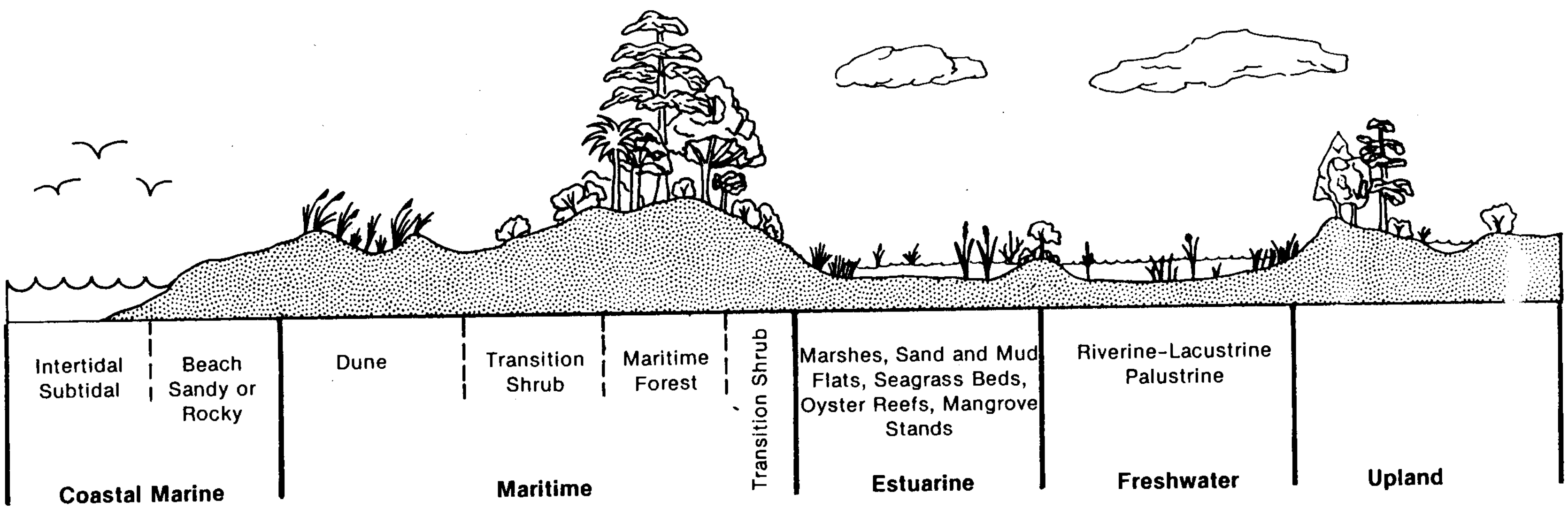


Figure 4-1. Generalized cross-section of coastal barrier ecosystems.

Coastal Marine Ecosystem

For the purposes of this report, the coastal marine ecosystem can be described as beginning just seaward of the beach dunes and continuing seaward to a somewhat arbitrary 3-mile limit offshore (Figure 4-1). The substrate is typically sandy, although some rocky shores are also included in the CBRS. Physical factors including winds, waves, tides, and currents are primarily responsible for shaping this system. Coastal marine waters are typically rich in the nutrients needed for biological production. These nutrients, supplied both by river and estuarine runoff and by coastal upwelling of deep ocean waters, provide for a highly productive ecosystem.

The primary energy source for the coastal marine ecosystem, as for almost all ecosystems, is the sun. The sun provides the basic energy for the synthesis of organic carbon molecules from carbon dioxide (CO_2) through the process of photosynthesis. The organic carbon synthesized by these primary producers (plants) provides the basic energy for nearly all other life forms. Most of the primary production in coastal marine ecosystems is accomplished by microscopic plants called phytoplankton.

The coastal marine habitat can be a harsh environment, but many animals have adapted to living there. Coastal waters are used by some fish species for their entire life cycle. These species must adapt to the rigors of widely fluctuating changes in turbidity, current velocity and bottom movement. Many other fish species found there are transients, spawning offshore, migrating to estuaries as juveniles and returning to oceanic waters as subadults or adults. Like some shrimp species, such fish link the marine and estuarine environments.

Marine turtles utilize the coastal marine ecosystem system for mating and feeding. They are of particular interest because of recent alarming decreases in their abundance. Turtle nesting on coastal beaches occurs from North Carolina to Texas, although several species may be seen offshore as far north as Maine. Mature females mate in coastal waters and then move on to sandy beaches where they nest. Later, hatchling turtles emerge from the beach nesting sites and move into the sea, apparently leaving coastal waters. The turtles typically reappear in the coastal waters as juveniles and feed there during the warmer months.

The abundant marine life found in nearshore coastal waters provides an important food source for numerous species of birds. In New England and the middle Atlantic states, species numbers will vary seasonally while in the southeast and gulf states, large numbers of year-round residents as well as seasonal migrants are found.

The birds in this ecosystem feed on a variety of other marine organisms. Some birds feed on the abundant microscopic animals called zooplankton that are found in nearshore waters. Diving ducks consume animals living on the bottom such as mollusks, crustaceans, and worms. However, many birds that utilize the coastal marine waters are fish-eaters. Fish are taken by aerially diving birds (terns, pelicans, ospreys), swimming birds (cormorants, some diving ducks), and surface feeders (skimmers, some gulls). Numerous shorebirds feed on small crustaceans, clams, and worms living in the beach sands. The peregrine falcon feeds almost exclusively on small birds found on intertidal beaches.

Mammals utilizing the coastal marine ecosystem which rely either directly or indirectly on coastal barriers do not comprise a large group. Small cetaceans such as porpoises and blackfish are the most prominent marine mammals living around coastal barriers. They are found in coastal and estuarine waters and are most likely attracted by the large schools of fish which inhabit these areas. Foraging raccoons, rodents, and even deer occasionally come to the beaches to feed at night.

Maritime Ecosystem

The maritime ecosystem is generally defined as all upland areas on coastal barriers, including those areas not classified as wetlands or aquatic systems by the FWS. This ecosystem is bounded on the oceanside by the extreme spring high tide mark and the landward side by tidal marshes, creeks, or rivers. It can include a dune community behind the ocean beaches, a transitional shrub zone, and a maritime forest (Figure 4-1).

A distinct zonation of plants often characterizes the maritime ecosystem. Salt spray, affected by wind and wave interaction, is the major controlling factor in this distribution. The more salt tolerant plant species will tend to locate closer to the ocean's margin, while less tolerant plants will locate towards the landward margin. Each plant zone harbors wildlife adapted for exploiting its unique habitats.

The primary producers in this system are the dune grasses, the shrubs, and the forest trees. Much of this primary production is not directly consumed by the insects, amphibians, birds, and mammals found here, but enters a decomposer's food chain on the forest floor or is exported by wind and water to surrounding ecosystems.

Dune community. Coastal dunes are formed by wind blown sand. Salt-tolerant dune grasses help stabilize accumulating sediments, promoting dune growth. The maritime dune field is a harsh environment for animals. Stress from salt spray, limited vegetation, wind, shifting sand, drought, occasional flooding, and high temperatures must all be contended with. Because of this, relatively few animals are permanent dune residents. Most are transients which are also found in other terrestrial habitats.

A limited number of snakes and lizards can be found in dune areas and even some frogs and toads under certain conditions. Because birds are more mobile than other animals, they are free to exploit this habitat when conditions are most suitable. Some species forage here, some nest here, and others are seasonally permanent residents depending on the availability of ground cover. The relatively seed-rich environment of the dune area attracts numerous seed-eating songbirds, some of which nest in the grasses and shrubs. Insect-eaters such as warblers and swallows are visitors as are some raptors such as sparrow hawks and great-horned owls. Shorebirds, gulls, and terns occasionally nest in great numbers in the dune habitat while feeding in coastal marine areas.

Beaches are also essential migratory habitat for hundreds of thousands of birds moving along the Atlantic and Gulf coast flyways biannually. These migrants rely on beaches for feeding and resting sites. In addition, many marine birds utilize coastal barriers for breeding, either on the coastal beaches (gulls and terns), in the maritime forest (ospreys), or in wetlands (pelicans, many ducks).

Under favorable conditions, a few mammals permanently reside in the dune areas. These include beach mice, rats, and moles. However, as in the coastal beach area, most other mammals found here are nocturnal foragers such as rabbits, raccoons, and deer. Other visitors may simply be traversing this area from forest to beach in their nightly search for food.

Transition shrub zone. This zone is a distinct and dense but generally narrow band between the maritime forest and dune community on the oceanside, and between the maritime forest and landward marsh, creek or estuary on the landward side of a barrier island where both forest and shrub zones exist (Figure 4-1). The zone is characterized by a low diversity of plant species, extremely dense structure with little or no understory, and total height between 10 and 13 feet. The location of the shrub zone depends to a large degree on the intensity of salt spray and that is a function of the angle of the beach with respect to the prevailing winds and the height of the fore and back dunes.

Shrub communities are commonly found in three habitats on barrier islands: 1) in the transition zone between beach dunes and maritime forest communities; 2 in the transition zone between high marsh and maritime forest communities; and 3) in interdune depressions (Sandifer, et al. 1980).

The shrub zone between the front dunes and the seaward margin is noted for its characteristic sheared or "espaliered" canopy. It was originally thought that the shape of the canopy was due to wind intensity as is the case in mountain systems. Salt spray is now considered the primary cause of this feature along the coast.

Shrub habitats offer greater protection from the harsh physical environment, so greater numbers of amphibians and reptiles are found there than in the adjacent dunes. The low plant height and lack of understory mean bird numbers are low. The species which do inhabit this community are principally insect and seed-eating passerines with an occasional predator such as a sparrow hawk or sharp-shinned hawk. A number of passerines or songbirds utilize this habitat for nesting while foraging elsewhere. As in the dune and coastal beach areas, most mammals occurring in this zone are not considered permanent residents.

Maritime forest. Precise limits of the maritime forest are difficult to define. Once again the distribution will be influenced by the effects of salt spray from the oceanside of the barrier island. As one moves inland, away from intense salt spray, both the number of species of trees and structural diversity increase. Where all signs of salt spray disappear the fullest forest is found. This may not occur until one has left the barrier and moved inland and so it should be pointed out that maritime forests are a relatively uncommon feature within the CBRS.

When it is present, the maritime forest is the favored habitat for most of the non-marine reptiles and amphibians found on coastal barriers. Lizards, snakes, frogs, toads, salamanders, and turtles are all common inhabitants. Forests are favored because the most protected and stable freshwater habitats occur here, food is abundant, and physiological stress is reduced. The maritime forest also supports most of the non-marine birds found on barriers. The forest understory provides a variety of habitats. Although the dominant species are insect-eaters such as warblers, flycatchers, and swallows, numerous other bird groups are found as well. There are no species unique to maritime forests, however, and species diversity is usually much greater in mainland forests.

Mammals are generally uncommon compared to mainland forest habitats. A variety of species are considered permanent residents though none are exclusive to coastal barriers and most can be found foraging in barrier habitats other than maritime forests. Herbivores are represented by mice, squirrels, rabbits, and even deer, while predators range from the diminutive moles, shrews, and bats, to the larger mink, otter and even bobcats. Variety and number is largely determined by the size of the barrier, the nearness of the barrier to the mainland, and the availability of suitable habitat.

Estuarine Ecosystem

The estuarine ecosystem has been defined by the FWS as deepwater tidal habitats and adjacent wetlands semi-enclosed by land but having open, partially obstructed, or sporadic access to the open ocean. Estuarine waters must also be diluted, at least occasionally, by freshwater runoff from the land. Boundaries between estuarine and adjacent marine and freshwater ecosystems are roughly determined by water salinity, distribution of certain aquatic plants, and local geography. The estuarine system includes many different habitats such as mud and sand flats, seagrass beds, oyster reefs, mangrove stands, and tidal marshes.

Estuaries are extremely important to both commercial and recreational fisheries and shellfisheries. NMFS estimates that over 90 percent of the U.S. commercial catch in the Gulf of Mexico and more than 80 percent of the commercial harvest on the Atlantic coast are comprised of species dependent on estuaries during some stage of their life cycle (Lindall and Thayer, 1981). Familiar species such as white and brown shrimp, blue crab, seatrout, black and red drum, and menhaden all rely on estuaries as nursery grounds. Young fish migrating from estuaries often become food for larger offshore species such as mackeral, bluefish, and striped bass. Estuaries also provide habitat for anadromous fish species (migrating from salt to freshwater to spawn) such as striped bass, alewife, American shad, and Atlantic sturgeon, and for permanent residents such as clams, oysters, and anchovies. Coastal barriers protect these estuaries from erosion and reduce the effects of waves and so indirectly protect the estuarine-dependent fisheries. There is some evidence that passes between coastal barriers are a preferred spawning area for certain fishes.

Much of the productivity attributed to estuarine ecosystems is related to the extensive marshes and in some areas, seagrass beds, found there. Only a fraction of the vast amount of plant food is consumed directly by primary consumers, however. The bulk of the plant material dies annually and decomposes as particulate organic detritus in the marsh or on the extensive mud flats. Nutrients from this detritus are transferred through the estuarine food chain to higher trophic levels largely by bottom-dwelling invertebrates and detritus feeding fishes. Detritus feeders obtain their nutrition primarily from the bacteria, fungi, and protozoa attached to the detrital particles rather than from the relatively resistant plant material. These "detritovores" form the base of a food chain for secondary and higher consumers which include numerous fishes and birds and are thus an essential component of the estuarine biological community.

One reason why marsh, seagrass, and phytoplankton primary production in the estuary is so high is that the concentration of organic nutrients is so high. Concentrations of nutrients are higher in the estuary than in either coastal marine waters or freshwaters. Both physical processes (clay particle adsorption of nutrients) and biological processes (pelletization of nutrient rich particles in the water by suspension-feeding animals, preventing washout) help make the estuary a nutrient trap.

Two of the most common fishes species in the estuary are mullet and menhaden. These fish feed primarily on detritus and phytoplankton in the water. Many bottom-feeding fishes (including croaker, spot, drum, and hake) are very abundant in estuaries. These fish are feeding on the tremendous numbers of small invertebrates living in estuarine sediments.

Estuaries boast a very prolific assemblage of birds. Subtidal or open water areas are utilized for feeding and resting. Species feeding in these areas include scavengers such as certain gulls, fish-eaters such as terns, pelicans, and ospreys, and bottom-feeding waterfowl. Egrets and herons, by virtue of their size and abundance, are the dominant avian predators in the estuarine marsh on a year-round basis. Small fishes, shrimp, and crabs are the principal food of these wading birds. Other fish eaters nesting in the marsh include some terns and black skimmers. Numerous shorebirds such as sandpipers and dowitchers probe for food in shallow and intertidal areas while larger ibises, willets, and rails probe muddy bottoms in somewhat deeper areas. A tremendous variety of ducks exploit estuaries. Some are summer residents, nesting and feeding, while others, including many seaducks, utilize estuarine areas as overwintering habitat.

In the marshes, blackbirds, sparrows, marsh wrens, and swallows feed and nest. Several species of hawks and owls make use of marshes as hunting grounds. Also in the marsh, muskrat and nutria are important furbearers, providing a valuable commodity for trappers in Louisiana, Texas, and the Carolinas. Introduced from South America to Louisiana for its fur, the nutria is twice the size of the muskrat but ecologically similar. Both prefer freshwater marsh though they are often found in estuarine areas. Both feed extensively on marsh grasses and sedges.

Aquatic mammals include several species of porpoise which can be found in virtually every accessible bay and river mouth along the coast. Prey consists of a variety of fishes especially mullet and menhaden. Manatees are more restricted in habitat and occur primarily in quiet estuarine waters along the coast of Florida, where they feed on rooted and floating vegetation. Seals are common in estuarine waters along the north Atlantic coast but only occasionally range as far south as South Carolina-Georgia.

Freshwater Ecosystems

Coastal freshwater ecosystems are designated by salinity, or the concentration of salts in the water column. Freshwater environments have been defined by FWS as all wetland systems where the average salinity is less than .5 parts salt by weight per 1,000 parts water or .5 parts per thousand (average seawater is about 35 parts per thousand). Swamps, bays, marshes, ponds, lakes, and rivers meeting this criteria are considered freshwater ecosystems.

The ecology of freshwater ecosystems is complex due to an almost limitless variety of habitat types present. A reduction in the environmental stresses associated with salinity and tidal fluctuations also contribute to an increase in plant and animal diversity when compared to structurally simpler coastal wetlands such as brackish and salt marshes.

However, because freshwater environments are not restricted to coastal areas, the biological assemblages associated with them are not necessarily unique to coastal regions.

The three fish families with the most species and individuals in freshwater habitats are the minnow-shiner-carp family, the sunfish-crappie-bass family, and the catfish family. While a relatively large proportion of the catfish and sunfish populations extend into tidal freshwater areas, this is not the case for the minnows, which as a group, are more common in non tidal regions. Sport fisheries in tidal freshwater rivers include the striped bass, largemouth bass, white perch, several species of catfish, sunfish, crappie, pickerel, and yellow perch. Each of these species spends at least a part of its life in freshwater habitats.

In the southern states, alligators are frequently found in freshwater wetlands. The alligator's diet includes birds, fish, turtles, snakes, and small mammals. Many of the same bird species found in neighboring estuarine habitats can be found in freshwater wetlands also, but a high diversity of other bird life can be found as well. Low marsh and adjacent exposed mudflats are used by shorebirds and rails. The grasses and sedges characteristic of higher elevations in the marsh are similar to grassland and savannah habitats and support an abundance of seed-eating species. Tidal channels and pools provide habitat for wading birds. Waterfowl use the open water areas in addition to the marsh surface itself. Shrubs and trees found in the high marsh and the upland marsh edge provide habitat for a large number of passerines which are often found feeding over the marsh proper, and for raptors such as the osprey which nest in large trees near palustrine (pond) areas and on dead snags, channel markers, and power line poles in the riverine system. However, because of the great similarity between lacustrine, palustrine, and riverine habitats and because birds are so mobile, the avifauna of all three habitats are similar. Birds from each area are often interspersed with the others, and the individual trophic relationships for each are not well defined.

Upland Ecosystem

The upland ecosystem includes all non-maritime coastal uplands. From Maine to Texas, upland areas illustrate a tremendous variety of geographic and vegetative conditions. However, a detailed characterization of the upland ecosystem is unnecessary for the purposes of this chapter. Upland ecosystems are not restricted to coastal areas and while many of the species described previously can be found in upland areas the fauna of coastal uplands are, for the most part, not uniquely coastal species. Coastal uplands harbor a greater variety of habitat types and, therefore, a correspondingly greater diversity of terrestrial mammals, birds, reptiles, and amphibians than that found in other coastal habitats.

Summary

This discussion of coastal barrier ecosystems has focused on the physical factors limiting plant and animal distributions; however, biological factors can play an equally p a role. The distribution, and particularly, the abundance of many organisms within an ecosystem are also controlled by biological processes such as competition between functionally similar species, predation, and mutualistic relationships between species. For example, competition for space and light helps determine which plant species are found in the maritime shrub zone and forest. Predation by birds, fishes, whelks, and crabs can control the abundance of many benthic invertebrates, including commercially important shellfish. The presence of one organism in a particular habitat may make it unsuitable or more suitable for other organisms. For example, seagrasses allow higher densities of many benthic invertebrates and fishes by protecting them from other predators. High densities of sediment disturbing animals like burrowing clams and shrimp may exclude other animals which need a stable substrate. Mobile species such as birds, fishes, and mammals play the important role of transferring energy from one ecosystem to another. For example, juvenile fish incorporate much of the production of the estuary into their growing bodies. When these fish leave the estuary and join the coastal marine system, this biomass is passed into that food web as these fish fall prey to their oceanic predators.

Five interrelated ecosystems have been described. The operative word in this case is "interrelated." Each of these systems contributes something to the other and no single system is independent of the others. Many species occupy more than one ecosystem on either a daily (birds moving from roosting sites to feeding areas), seasonal (migratory waterfowl), or annual (certain fishes moving into estuaries and rivers to spawn) basis. In some cases the distinction betweeen ecosystems is difficult to determine, in others it is sharply defined. Regardless of ecosystem boundaries though, the fish and wildlife present are part of a complex interacting system of natural resources linked to the marine environment and, in numerous instances, preserved and maintained by the regional coastal barrier geography.

Regional Presentation of Fish and Wildlife Resources

This section will briefly describe fish and wildlife resources within the CBRS on a regional basis. Table 4-1 presents an overview of the most common ecosystems and special features found in each region. The following discussions highlight the species, habitats, and CBRS units of special significance. Tables 4-2 and 4-3 are a compilation of fish and wildlife species occurring within the CBRS that have been designated as either endangered or threatened species, pursuant to the Endangered Species Act (Federal), or listed as "National Species of Special Emphasis" (NSSE) by the FWS. The NSSE species have been selected according to biological, political, social, and economic criteria from the total range of species for which the FWS has legal responsibility. The FWS list of NSSE species is constantly updated to reflect changes in management emphasis and species status. The selection of individual species is guided by the overall mission of the FWS to: "Provide the federal leadership to conserve, protect and enhance fish and wildlife and their habitats for the continuing benefit of the people." Table 4-2 lists the ecosystems discussed in the previous section and indicates the species that are most commonly associated with them. Table 4-3 indicates the region of the country where each species is likely to occur.

For the purposes of this section the CBRS units have been classified into 17 different coastal regions based on various physical and ecological factors (Figures 4-2 and 4-3). This classification scheme has been adopted to simplify discussion of fish and wildlife resources within the CBRS. CBRS units within the same coastal region will generally have a similar complement of natural resources. These CBRS units are discussed as a group, while CBRS units with special significance are considered individually. A slightly different regional classification system was used in the previous chapter. Figure 4-4 compares that system to this one so that corresponding coastal sections can be identified.

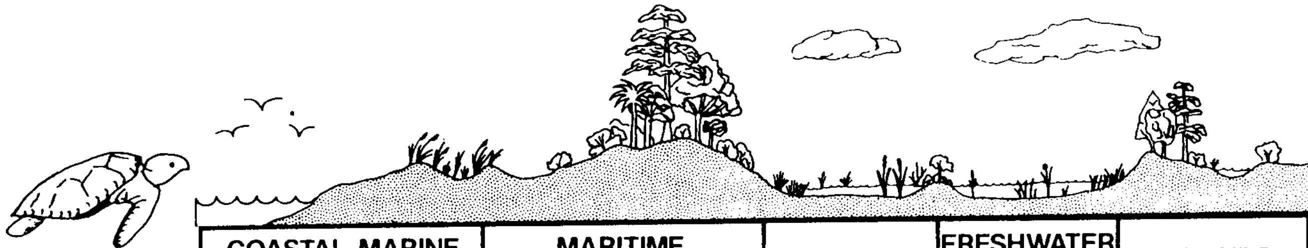
Table 4-1. Common ecosystems and special features found in each region along the Atlantic and Gulf of Mexico coasts.

REGION	COMMON ECOSYSTEMS					COMMENTS AND SPECIAL FEATURES
	COASTAL MARINE	MARITIME	ESTUARINE	FRESH-WATER	UPLAND	
Northern Gulf of Maine	X		X	X		Tide-pool communities on rocky shores common. Extensive bogs in freshwater ecosystem.
Southern Gulf of Maine	X		X	X		Few rocky, more sandy, or cobble beaches. Wide intertidal flats in estuaries, bogs.
Southern New England	X	X	X			Sandy beaches, dune system on barriers, marsh behind.
New York Bight	X	X	X	X		Dune systems on islands, extensive marshes.
Delaware Bay			X	X		Extensive marshes, some oyster reefs.
Delmarva Shore			X	X	X	Extensive marsh, oyster reef, well developed dune community in northern NC, long, narrow barriers.
North Carolina Coast	X	X	X	X		Extensive marshes, well developed dune community, oyster reef.
Sea Islands	X	X	X	X	X	Shorter, thicker barriers, extensive maritime forest, oyster reef, very extensive marshes.
East Florida	X		X			Low beaches, less extensive marshes, very extensive seagrass beds.
Biscayne Bay	X		X	X		Mangroves and seagrass beds extensive.
Central Barrier Coast	X		X	X		Extensive marshes, swamps, mangroves.
Big Bend Drowned Karst	X		X			Wide shallow zone, extensive seagrass beds, marshes, oyster reefs.
Apalachicola Cuspate Delta	X		X			Extensive flats, little seagrass, oyster reefs.
North Central Gulf Coast	X	X	X	X	X	Sandy beaches with well developed dune community, marshes and pine savannah common.
Mississippi Delta	X		X	X	X	Most extensive marsh system (salt and fresh), extensive shallow areas, bottomland hardwood.
Strandplain-Chenier Plain System	X		X	X		Very extensive marsh systems.
Texas Barrier Island System	X		X			Marshes upper coast, seagrass beds and mangroves lower coast.

Table 4-2. U. S. Fish and Wildlife Service's National Species of Special Emphasis and Endangered and Threatened species and their associated coastal barrier ecosystems. (Adapted and expanded from M.D. McKenzie and L. A. Barclay 1980. Ecological Characterization of the Sea Island Coastal Region of South Carolina and Georgia, Executive Summary. FWS/OBS-79/45.)

SPECIES	COASTAL MARINE		MARITIME			ESTUARINE	FRESHWATER	UPLANDS	NATIONAL SPECIES OF SPECIAL EMPHASIS	ENDANGERED/ THREATENED
	SUBTIDAL INTERTIDAL	BEACH	DUNES	TRANSITION SHRUB	MARITIME FOREST		RIVERINE-LACUSTRINE PALUSTRINE			
AMERICAN PEREGRINE FALCON	X	X				X	X		X	X
BALD EAGLE	X				X	X	X	X	X	X
AMERICAN BLACK DUCK	X					X	X		X	
ATLANTIC BRANT	X					X			X	
CANADA GOOSE						X	X		X	
CANVASBACK						X	X		X	
EASTERN BROWN PELICAN	X	X				X			X	X
LEAST TERN	X	X	X			X			X	X
MALLARD						X	X		X	
OSPREY	X	X			X	X	X		X	
PIPING PLOVER		X	X			X			X	
REDHEAD						X			X	
ROSEATE TERN	X	X	X			X			X	
SNAIL KITE							X		X	X
GREATER SNOW GOOSE	X					X	X		X	
TUNDRA SWAN						X	X		X	
WHITE-FRONTED GOOSE						X	X		X	
WHOOPING CRANE						X	X		X	X
WOOD DUCK						X	X		X	

Table 4-2. (continued)



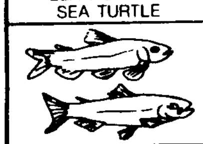
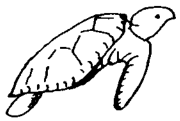
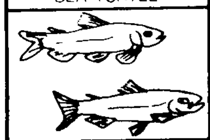
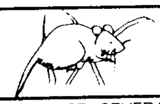
SPECIES	COASTAL MARINE: SUBTIDAL INTERTIDAL	COASTAL MARINE: BEACH	MARITIME: DUNES	MARITIME: TRANSITION SHRUB	MARITIME: MARITIME FOREST	ESTUARINE	FRESHWATER: RIVERINE-LACUSTRINE PALUSTRINE	UPLANDS	NATIONAL SPECIES OF SPECIAL EMPHASIS	ENDANGERED/ THREATENED
ATLANTIC LOGGERHEAD SEA TURTLE	X	X							X	X
GREEN SEA TURTLE	X	X							X	X
KEMP'S RIDLEY SEA TURTLE	X	X							X	X
LEATHERBACK SEA TURTLE	X	X							X	X
										
SHORT-NOSED STURGEON	X					X	X			X
STRIPED BASS	X					X	X		X	X
										
BEACH MICE (SEVERAL SUB-SPECIES)		X	X							X
COYOTE		X	X	X	X			X	X	
CUMBERLAND ISLAND POCKET GOPHER			X							X
DELMARVA FOX SQUIRREL					X			X		X
WEST INDIAN MANATEE						X	X		X	X
										
AMERICAN ALLIGATOR						X	X		X	X

Table 4-3. U. S. Fish and Wildlife Service's National Species of Special Emphasis and Endangered and Threatened species and their occurrence within the coastal sections of the Coastal Barrier Resources System.

SPECIES	NORTHERN GULF OF MAINE	SOUTHERN GULF OF MAINE	SOUTHERN NEW ENGLAND COAST	NEW YORK BIGHT	DELAWARE BAY	DELMARVA SHORE	NORTH CAROLINA COAST	SEA ISLANDS	EAST FLORIDA	BISCAYNE BAY	CENTRAL BARRIER COAST	BIG BEND DROWNED KARST	APALACHICOLA CUSPATE DELTA	NORTH-CENTRAL GULF COAST	MISSISSIPPI DELTA	STRANDPLAIN-CHENIER PLAIN SYSTEM	TEXAS BARRIER ISLAND SYSTEM	NATIONAL SPECIES OF SPECIAL EMPHASIS	ENDANGERED/ THREATENED
AMERICAN PEREGRINE FALCON	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X
BALD EAGLE	X	X	X	X	X	X	X	X			X	X	X	X				X	X
AMERICAN BLACK DUCK	X	X	X			X	X								X	X	X	X	
ATLANTIC BRANT	X	X	X	X	X	X												X	
CANADA GOOSE	X	X	X	X	X	X									X	X	X	X	
CANVASBACK		X	X	X	X	X										X		X	
EASTERN BROWN PELICAN						X	X	X	X		X		X	X	X	X		X	X
LEAST TERN		X	X	X		X	X	X			X	X	X	X	X	X		X	
MALLARD		X	X			X	X	X							X	X	X	X	
OSPREY	X	X	X	X	X	X	X	X			X				X			X	
PIPING PLOVER	X	X	X			X						X						X	X
REDHEAD						X	X								X	X	X	X	
ROSEATE TERN		X	X															X	
SNAIL KITE									X		X							X	X
GREATER SNOW GOOSE				X	X	X	X								X	X	X	X	
TUNDRA SWAN				X	X	X	X								X	X		X	
WHITE-FRONTED GOOSE															X	X	X	X	
WHOOPING CRANE																	X	X	X
WOOD DUCK			X		X										X	X		X	

Table 4-3 (continued)

 SPECIES	NORTHERN GULF OF MAINE	SOUTHERN GULF OF MAINE	SOUTHERN NEW ENGLAND COAST	NEW YORK BIGHT	DELAWARE BAY	DELMARVA SHORE	NORTH CAROLINA COAST	SEA ISLANDS	EAST FLORIDA	BISCAYNE BAY	CENTRAL BARRIER COAST	BIG BEND DROWNED KARST	APALACHICOLA CUSPATE DELTA	NORTH-CENTRAL GULF COAST	MISSISSIPPI DELTA	STRANDPLAIN-CHENIER PLAIN SYSTEM	TEXAS BARRIER ISLAND SYSTEM	NATIONAL SPECIES OF SPECIAL EMPHASIS	ENDANGERED/ THREATENED
ATLANTIC LOGGER-HEAD SEA TURTLE							X	X	X		X	X	X	X				X	X
GREEN SEA TURTLE									X									X	X
KEMP'S RIDLEY SEA TURTLE																	X	X	X
LEATHERBACK SEA TURTLE									X									X	X
																			
SHORT-NOSED STURGEON			X	X	X	X	X	X	X										X
STRIPED BASS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
																			
BEACH MICE (SEVERAL SUB-SPECIES)			X								X	X							X
COYOTE								X								X	X	X	
CUMBERLAND ISLAND POCKET GOPHER								X											X
DELMARVA FOX SQUIRREL						X													X
WEST INDIAN MANATEE								X	X		X	X	X					X	X
																			
AMERICAN ALLIGATOR							X	X	X	X	X	X	X	X	X	X	X	X	X

Northern Gulf of Maine

Among the most significant wildlife associated with Maine's eight CBRS units in this section are bald eagles and ospreys, both of which nest in and among several of the northern Maine CBRS units. Both species are uncommon birds and the bald eagle is endangered and, therefore, receives special protection under the Endangered Species Act. The sensitivity of these birds to environmental degradation has brought them to symbolize ecological good health. The remote and largely undeveloped character of the coast of northern Maine is well suited to support such birds. Other resources present include shellfish such as soft clams and lobsters, and migratory shorebirds including plovers sandpipers and whimbrels.

Southern Gulf of Maine

Many of the 18 CBRS units within this region are seasonally populated by a variety of birds. Summer residents include snowy and great egrets, blackcrowned night herons, glossy ibises, and nesting colonies of common, Arctic, roseate, and least terns. Sandy Neck (C09), on Central Cape Cod is attractive to a variety of migratory waterfowl as well as several northern passerine species that prefer sparsely vegetated, windswept areas. These include larks, pipits, and snow buntings. Two other noteworthy species occurring at Sandy Neck are the rare Ipswich sparrow which occasionally winters in this area and the increasingly threatened piping plover.

Striped bass and alewife, both anadromous, are locally important fishes and the northern diamond back terrapin is also found along this section of the coast.

Southern New England Coast

Fifty-nine separate CBRS units have been designated within the southern New England coastal section, more than three times as many as any other coastal section. Although many of these areas are very small in size, their number and variety is an indication that even in one of the most densely populated areas in the country some undeveloped and unspoiled areas remain. The fish and wildlife associated with these barriers is nearly as varied as the barriers themselves.

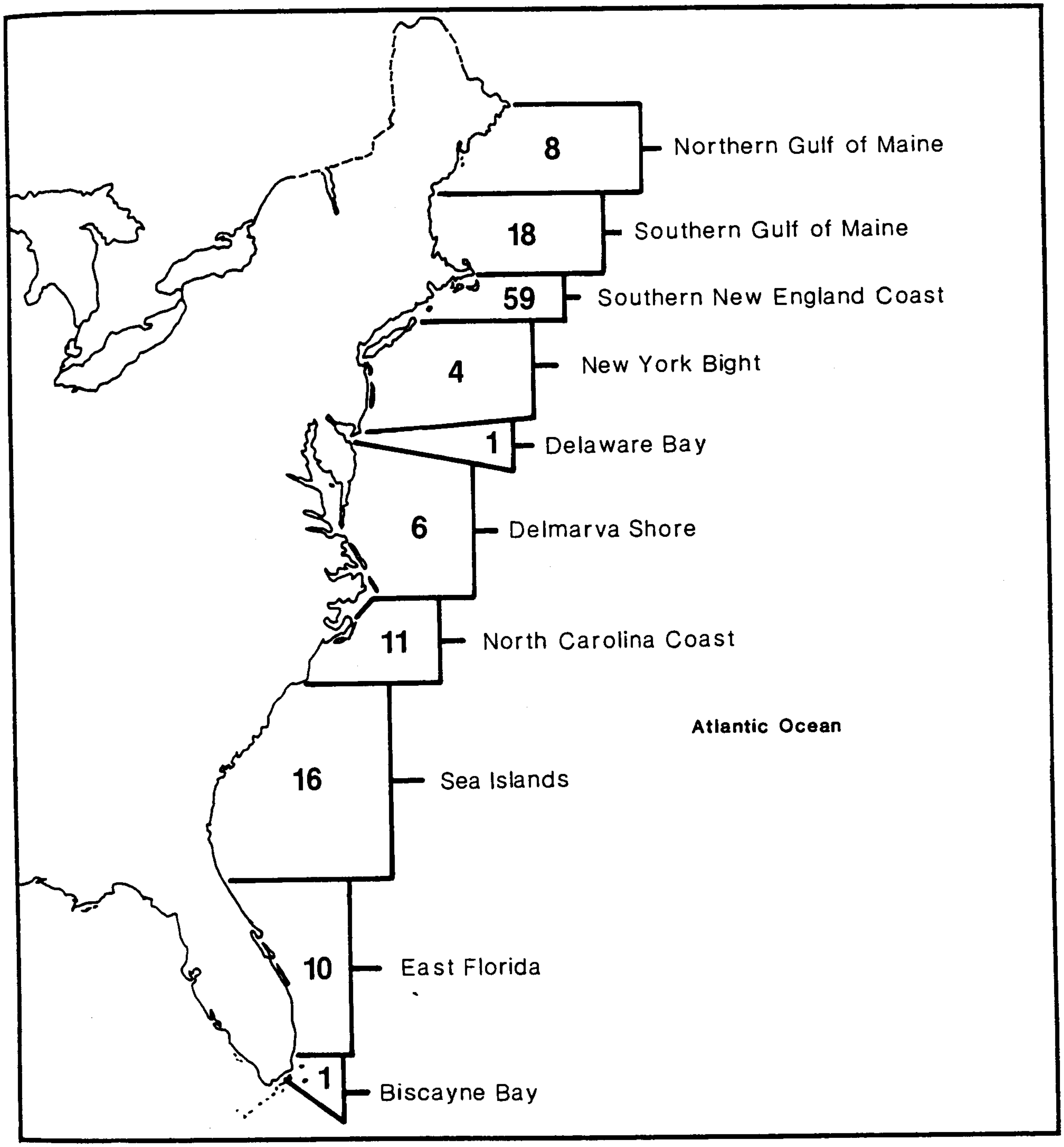


Figure 4-2. Atlantic Coast of United States showing various coastal regions described in this chapter. Numbers within brackets indicate the number of CBRS units found in that region.

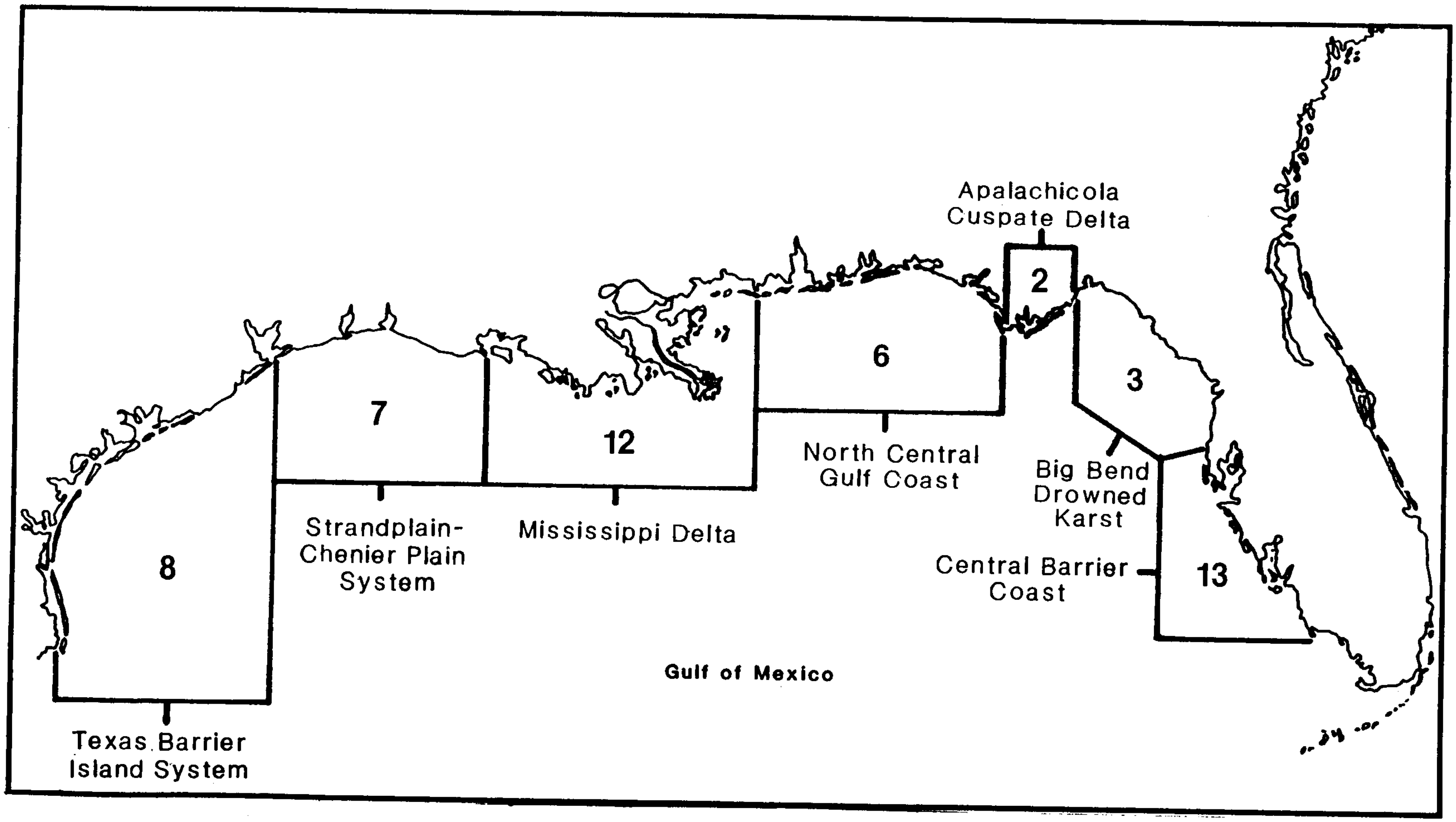


Figure 4-3. Gulf Coast of United States showing various coastal sections described in this chapter. Numbers within brackets indicate the number of CBRS units found in that region.

A COMPARISON OF THE PHYSICAL AND ECOLOGICAL REGIONAL CLASSIFICATION SYSTEMS

ECOLOGICAL CLASSIFICATION

PHYSICAL CLASSIFICATION

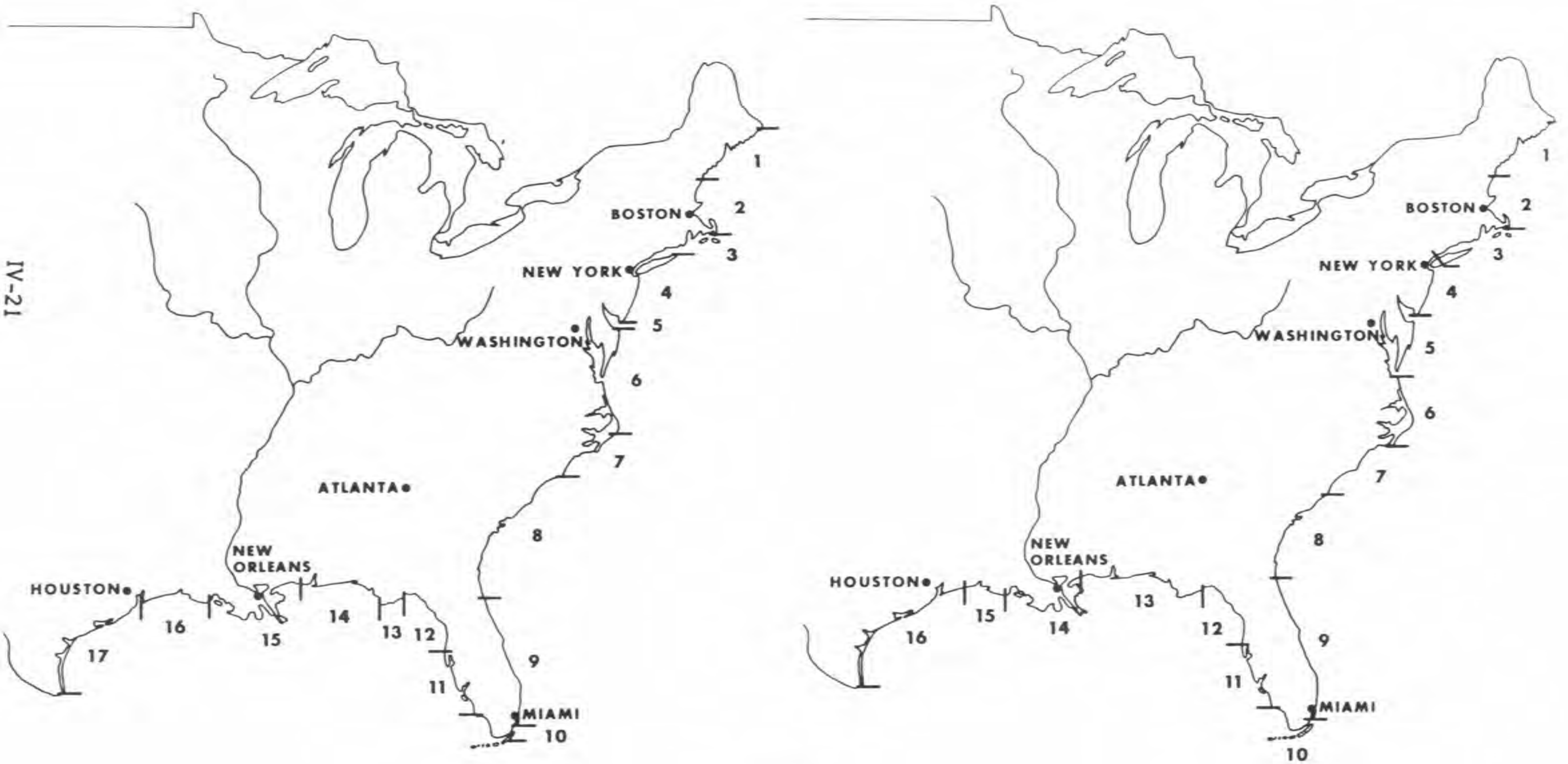


figure 4

As is the case with each section of the CBRS, the most conspicuous wild life present are the birds. Familiar coastal species of terns, gulls, herons, and egrets are abundant. Most of the continental population of roseate terns nest in this region. But more importantly, the coasts of Massachusetts, Rhode Island, Connecticut, and New York all lie along the migratory route of tens of thousands of birds that rely on these areas for food and shelter during their semiannual migrations. Large populations of waterfowl including Canada geese, blackducks, canvasbacks, and redheads utilize coastal marshes while shorebirds such as yellowlegs, whimbrels, piping plovers, and spotted sandpipers frequent mudflat and beach areas during migration. Large portions of Martha's Vineyard (C26-C29B), Nantucket Island (C20, C25), the Elizabeth Islands (C31), and Block Island (D09) included in the CBRS contain habitat important to migratory birds. Milford Point (E07) contains one of the few known nesting sites for the threatened piping plover. Futhermore, remote and undisturbed areas of these and other islands in this section are occasionally but regularly used by migrating peregrine falcons and resident bald eagles. Gardiner's Island (F09) has a large population of nesting ospreys.

Fisheries in this section include clams and scallops as well as bluefish and the anadromous striped bass and alewife. All of these are prized by recreational fishermen and are important commercially.

One of the unique species occurring in the region is the gray seal. The only known breeding site for these uncommon seals south of Canada is at Muskeget Island (C25), near Nantucket in Massachusetts, where the entire island is included in the CBRS. This island was once the site of the largest tern colony in New England, but the colonies have now been entirely overrun by seagulls.

New York Bight

For the most part, the barrier system in this section is extensively developed and, therefore, only four CBRS units are designated. All of these are on the seaward side of Long Island. Napeaque (F10) is probably the most significant of these in terms of wildlife. A well developed dune system provides habitat for numerous small animals such as mice and rabbits and, as a result, raptors use this area for hunting. Napeaque is an important stop over point for hawks, owls, and falcons migrating to and from New England. In particular, peregrine falcons, northern harriers, and short-eared owls have been observed in the area. Other resources include shellfish beds of scallops, clams, and mussels and some fishing for bluefish and striped bass.

Delaware Bay

The Broadkill Beach Complex (HOO), located near the mouth of the Bay on the southwest shore, is the only CBRA unit designated within this coastal section. The marshes included in this unit are populated by a variety of shorebirds and waterfowl, as well as northern harriers and ospreys, and mammals such as the raccoon, red fox, and whitetail deer.

Delmarva Shore

The Delmarva Shore Section includes parts of Delaware, Maryland, Virginia, and North Carolina. Six undeveloped areas have been designated as CBRS units within this coastal section.

The tidal flats of all the islands from Assateague to Fisherman Island attract many thousands of shorebirds during their spring and fall flights and the numerous creeks and channels in between these islands serve as refuge for multitudes of migratory ducks and geese. Beach and dune areas are important habitat for colonially nesting terns and gulls, some migratory shorebirds, and raptors.

Cedar Island (K03), which is entirely within the CBRS, contains a variety of habitat types and is representative of the CBRS units within this coastal section. Colonial nesters include common, gull-billed, royal, Forester's and least terns, as well as laughing and herring gulls, and willets. Brown pelicans reach the northern extent of their range in this region and coastal habitats here are also attractive to ospreys and bald eagles. Seasonally present in the marsh areas and open channels are waterfowl such as Canada and snow geese, brant, pintail, mallards, gadwalls, green-winged teal, and many others. These birds, as well as migratory shorebirds such as whimbrel, dowitchers, sanderlings, and plovers, attract peregrine falcons that also migrate along the coast and feed almost exclusively on small to medium sized birds.

Other resources present in this section of the coast include mice, moles, shrews, and rabbits in dune and shrub areas, and oysters and clams in shallow water areas. Sport fishing for species such as bluefish and croaker is also important.

North Carolina Coast

The most significant addition to the fish and wildlife in this section are the sea turtles. Although several species occur in the coastal waters, the loggerhead is the principal species utilizing this area's relatively remote coastal beaches for nesting. Sea turtles have been much reduced in range and numbers due to human exploitation and destruction of habitat. The protection of these animals by state and federal legislation has led to some hope that their numbers will return to historic levels. Preservation of nesting habitat such as the beaches of North Carolina represents an important step in this direction.

Another denizen of coastal habitats that first appears in this region is the American alligator. Like the sea turtles, alligator populations have been reduced throughout their range and are, therefore, also protected. This protection has begun to pay off as populations in coastal and other areas have slowly increased. Although they prefer freshwater habitat, alligators can often be found in brackish marsh and even occasionally in salt marsh. Examples of each of these areas can be found landward of North Carolina's barrier islands and beaches.

Other wildlife present include a variety of shorebirds, nesting populations of least terns, and black skimmers as well as familiar coastal raptors such as marsh hawks, ospreys, and bald eagles. Brown pelicans are present, feeding on coastal fish, and migratory peregrine falcons are occasional but regular visitors. Oysters and clams are found in quiet back-bay areas, while anadromous alewife, shad, and herring as well as spotted seatrout, menhaden and flounder are locally important fisheries.

Sea Islands

The Sea Islands section of South Carolina and Georgia features smaller and more numerous barrier islands than the North Carolina and Delaware sections. Many of the islands are covered by maritime forest and have very extensive adjacent marshes.

The change in physical features in this coastal section does not have an appreciable effect on bird populations. In fact, numerous species of shorebirds are permanent residents of this coast as the climate is generally very mild. Resident shorebirds include dunlins, dowitchers, willets, and oyster catchers. A number of herons and egrets are resident as well. These include great blue, Louisiana, and little blue herons, and snowy and great egrets. In contrast, a number of waterfowl are considered winter residents only, moving north in the spring to breed. These include scaups, mergansers, scoters, canvasbacks, redheads, and goldeneyes. Brown pelicans, bald eagles, and ospreys frequent CBRA areas within the Sea Islands section.

As in the North Carolina section, the loggerhead turtle is the only marine turtle nesting in this region, and it utilizes most of the barrier island beaches, including nearly all of the CBRS units designated in this region. Females may nest as many as five times during a nesting season that generally extends from mid-May through mid-August. Alligators, inhabiting fresh and brackish marsh areas, are another important reptile found along the Sea Islands coast.

Some of the locally important estuarine fishes and shellfishes associated with CBRS units in this section include oysters, blue crab, spotted seatrout, red drum, and bluefish. In addition, the short-nosed sturgeon, a species with special status due to its depleted numbers, is also present. These fisheries are enhanced by the relatively large inflow of freshwater from the numerous medium-sized rivers entering the ocean here. The estuaries created by these rivers are important nursery grounds not only to the primarily estuarine fisheries mentioned above, but also to coastal marine species migrating in and out of estuaries during their life cycles.

Another estuarine inhabitant is the manatee. These slow moving, aquatic mammals are more common in Florida but can be found in quiet estuaries throughout the Sea Islands section. Manatees have suffered major population reductions due to loss of habitat and recreational and commercial boating. They are closely protected in their range and their presence within CBRS units in this area demonstrates the importance of preserving these areas in their undeveloped state.

East Florida

The most dramatic wildlife resources located within CBRS units in this section are probably the nesting colonies of herons and egrets found at Vero Beach (P10) and Hutchinson Island (P11). Great blue, little blue, and Louisiana herons, snowy egrets, and wood storks, as well as black skimmers, least terns, double-crested cormorants, and brown pelicans all can be found nesting in marsh and mangrove habitats at these two

CBRS units. Although the total number of breeding species is relatively small, winter concentrations are often extremely large. In the winter, the lesser scaup and the American coot are the most abundant waterfowl.

Loggerhead sea turtles that nest on beaches in the Sea Island section also nest throughout the East Florida coast, as do green and leatherback sea turtles, although to a lesser degree. It is estimated that up to 20,000 loggerhead nests occur in Florida each year by approximately 14,210 females, comprising 90 percent of the total U.S. population. For the Atlantic coast, the green sea turtle nests only in Florida, where its population is estimated at about 50 native females. Leatherback turtle nests along the Atlantic coast are rare, but some 10 to 12 nests occur annually, and all are located in east Florida. The area extending from Cape Canaveral to West Palm Beach (P09A, P10, P10A, P11, P12) and, in particular, Hutchinson Island and Jupiter Island (P11, P12), on the seaward side of the Indian River, is the major sea turtle nesting area along the Atlantic coast.

A major portion of the Florida manatee population in the U.S. (750 to 850 individuals) is in East Florida where some 400 to 500 individuals occur. The center for the manatee population in East Florida is in the St. John's River and between Ponce de Leon Inlet (P08) and Hobe Sound (P12).

Clams, blue crab, and oysters are locally important commercial and recreational fisheries although white and brown shrimp are the most valuable commercial shellfish in this section. King and spanish mackeral and snappers are the most valuable finfish although menhaden is the major commercial species harvested by volume.

Biscayne Bay

North Beach (14A) is the only CBRS unit designated within the Biscayne Bay coastal section. Noteworthy wildlife found at North Beach include manatees and nesting loggerhead sea turtles. Other species that may occasionally be found at North Beach are bald eagles, ospreys, migrating peregrine falcons, and alligators. Fishery resources are similar to those in previous Florida coastal sections and include spiny lobsters, the most valuable fishery in this region, and stone crabs.

Central Barrier Coast

Wildlife found on the larger CBRS units in this section, Sanibel Island (P18), North Captiva Island (P19) and Cayo Costa (P20), while not strictly representative of the Central Barrier Coast, illustrate the variety of species one might encounter within the CBRS in this section.

The extensive shallow marsh and mangrove areas are particularly attractive to numerous birds. These include waders such as wood storks, white ibises, roseate spoonbills, and great white herons; fish-eaters such as white pelicans, double-crested cormorants, ospreys, and bald eagles; and scavengers such as the magnificent frigate bird. Many species of waterfowl overwinter in these areas including pintails, northern shovelers, blue-winged teal, and lesser scaups. Numerous resident and migrating shorebirds are present as well, feeding either on the beaches or in tidal flats behind beach areas.

The loggerhead turtle has received a lot of publicity, but green, hawksbill, and Kemp's-Ridley sea turtles are also present, as are terrapins. Manatees are widespread in this coastal section and alligators are abundant also.

Shellfish important in the region include pink shrimp, stone crab, blue crab, scallops, and quahogs. Stone crabs are a unique commercial fishery in Florida although pink shrimp are the most important in terms of yield and value. The Sanibel shrimp grounds located off Charlotte County yield almost thirty percent of west Florida's commercial pink shrimp catch. Many of the shrimp in this fishery are nurtured in the Charlotte Harbor estuary nursery grounds.

Other estuarine-dependent commercial fisheries include drum, mullet, and gulf flounder. Sport fisheries include tarpon, snook, king and spanish mackeral, and bluefish.

Big Bend Drowned Karst

Atsena Otie Key (P25), one of three CBRS units in this section, is adjacent to Cedar Keys National Wildlife Refuge. This refuge boasts one of the largest nesting colonies of herons, egrets, brown pelicans, and other waterbirds in the south with up to 200,000 nesting birds. Almost certainly, Atsena Otie, which is completely undeveloped, supports populations of these and other birds. Similarly, Pepperfish Keys (P26) are completely undeveloped and adjacent to a wildlife management area. It seems safe to assume that many of the birds found in the refuge, including shorebirds, herons, and egrets, are to be found on these islands as well. The Ochlocknee Complex (27A) is noted as a breeding area for bald eagles and as an occasional stopping point for migratory peregrine falcons.

Fishery resources associated with these CBRS units include oysters, blue crab, stone crab, pink, brown, and white shrimp, several drum species, and sport fish such as mackeral, snapper, and bluefish.

Apalachicola Cuspate Delta

Two relatively large CBRS units have been designated in this section. These are Dog Island (P28) and Cape San Blas (P30). Dog Island, much of which is included in the CBRS, is utilized by a variety of birds. These include great blue, and little blue herons, brown pelicans, and the Cuban snowy plover. Alligators are present and the beaches are nesting grounds for loggerhead sea turtles. Cape San Blas is a relatively large sand spit to the west of the Apalachicola River. About half of the spit is included in the CBRS. Bald eagles and migratory peregrine falcons frequent this area as do piping plovers, black skimmers, the magnificent frigate bird, and royal, sandwich, caspian, and least terns. Numerous mammals can also be found on this spit such as bobcats, white-tailed deer, gray fox, raccoons and skunks.

The fishery resources present are, to a large degree, influenced by the Apalachicola River, the largest Florida river system emptying into the Gulf of Mexico. This river system is one of the most productive estuaries on Florida's west coast and is protected by the coastal barrier features associated with it. Estuarine dependent species present include pink, brown, and white shrimp, scallops, drum, spotted seatrout, and menhaden. In addition, this estuary is the primary spawning area of blue crab in west Florida and provides over ninety percent of Florida's oyster production.

North Central Gulf Coast

Although the extent of marsh and other wetlands in this coastal section is small compared to the extensive marsh areas of adjacent Louisiana and Florida, significant fish and wildlife resources are present. Birds remain the most conspicuous fauna and a number of familiar coastal species are present. These include nesting black skimmers, American oyster catchers, snowy plovers, reddish egrets, and great blue herons. Less common bald eagles, brown pelicans, and peregrine falcons are also present. In addition, three species of tern--common, gull-billed, and least--nest on various CBRS units within this section. Waterfowl winter in great numbers in the lower Mobile estuary. Duck populations average 26,000 birds annually with one of the largest wintering canvasback populations outside of Louisiana and Chesapeake Bay.

Up to a dozen mammals can be found along this section of the Gulf coast including river otters, nutria, white tailed deer, red fox, and beach mice. Beach mice are closely related to non-coastal mice but are unique because they have adapted to a life within the narrow zone of dune habitat along coastal barriers and beaches. The range of these animals has been much reduced due to habitat degradation and alteration.

Nearshore and estuarine waters provide habitat for over a dozen fisheries of commercial and recreational importance. These include pink, brown, and white shrimp, blue crab, spotted seatrout, and flounder. The numerous estuaries serve as important nursery grounds for estuarine dependent fish. Furthermore, the anadromous Atlantic sturgeon and Alabama shad pass through these waters on their upstream and downstream spawning migrations.

Mississippi Delta

This section is, of course, greatly influenced by the presence of the Mississippi River. Discharge from the Mississippi not only contributes to the shape of the coast by providing sediments for the development of marshes and barrier islands, but is also an important source of nutrients that contributes to the very high biological productivity nearshore.

Twelve different CBRS units have been designated within this section. Four are in the Mississippi Sound to the northeast of the Mississippi River delta. These include Round Island (R01), Deer Island (R02), and Cat Island (R03). The birds associated with these barrier islands include ospreys at Round Island, wintering peregrine falcons at Cat and Deer Islands, and nesting bald eagles at Cat Island. Deer Island is also an excellent habitat for transient songbirds, including flycatchers, vireos, and warblers. Cat Island has a resident population of whitetailed deer. Fishery and shell fishery resources of the Mississippi Sound area include estuarine dependent species such as white and brown shrimp, blue crab, oysters, and menhaden.

The eight remaining CBRS units in this coastal section are located west and north of the Mississippi delta and are more closely associated with the vast coastal marshes of Louisiana. Landward of these barrier features is the largest marsh area in the U.S. These marshes cover thousands of acres and supports not only a tremendous variety of migratory and resident birds and other wildlife, but also one of the most productive fisheries in the world. The loss of these barriers, by either natural or human actions, would subject these marshes to the direct erosional forces of the Gulf of Mexico, severely affecting their biological diversity and productivity as well as devastating the highly developed commercial and recreational industries that depend upon the natural resources these marshes provide.

The fish and wildlife of Louisiana's coastal barriers and their associated habitats are prolific. More than 25 species of herons, gulls, and terns nest by the thousands along the barriers and nearby wetlands in this coastal section with several important colonies located on Timbalier Island (S05) and the Isles Dernieres (S06). In addition, more than 150 species of migratory and resident shorebirds, songbirds, and waterfowl are abundant in mudflat, coastal dune, and wetland habitats in this coastal section at various times during the year.

The marshes of the Mississippi Delta section support a number of commercially and recreationally important wildlife. For instance, they are one of the most important waterfowl wintering areas in the U.S., providing food and protection for millions of ducks and geese annually. Important geese include the snow goose and the Canada goose while the most common ducks are pintails, teal, mallards, and gadwalls. Muskrat and nutria are the most abundant furbearing mammals in this coastal section, and they support a multi-million dollar fur-trapping industry in which Louisiana has led the Nation for many years. Other furbearers present along the coast include river otter, raccoon, opossum, mink, bear, red fox, gray fox, and bobcat, all of which may occur within the designated CBRS units in this section. Alligators are found in wetland areas from North Carolina to Texas but are probably nowhere as common as in the coastal marshes of Louisiana. In 1979, a controlled harvest of wild alligators in Louisiana resulted in the taking of over 16,000 alligators worth about $1.7 million.

The Mississippi Delta section leads the Nation in volume of commercial fishery landings with Gulf menhaden and brown and white shrimp being the major fisheries although more than 100 species of fish and shellfish utilize these coastal waters. One quarter of the nation's total annual catch is landed in Louisiana that, in 1983, had a dockside value of $225 million. The seagrass beds, numerous estuaries, and vast tidal marshes, especially immediately around the Mississippi River Delta from Chandeleur Sound to Atchafalaya Bay, provide prime nursery grounds for shrimp, blue crab, oysters, spotted seatrout, menhaden, and other fish and shellfish.

Strandplain-Chenier Plain System

This coastline contains extensive brackish and freshwater marshes often partitioned by stranded beach ridges or Cheniers. Over one hundred species of birds are found here, with at least 18 species of waterfowl utilizing marsh areas either included within or adjacent to designated CBRS units. The lesser snow goose is the most prominent goose in the Chenier Plain while the gadwall, at peak times, is the most abundant duck species. Bolivar Peninsula (T03a) is home to a number of other birds including least terns, great blue herons, roseate spoonbills, and American avocets. Less common species present in this coastal section include bald eagles, brown pelicans, and occasionally, migratory peregrine falcons. In addition, many migrating songbirds crossing the Gulf of Mexico utilize coastal hardwood areas along the crests of Chenier ridges. Mammals present in this coastal section include whitetailed deer, and furbearers such as mink, river otter, raccoon, nutria, and muskrat. The Strandplain-Chenier Plain System is at the western edge of the Mississippi Delta and yields large numbers of finfish and shellfish, especially brown and white shrimp and menhaden. Other major recreational and commercial estuarine-dependent fisheries, among over one hundred and fifty species present, include blue crab, spotted seatrout, drum, croaker, spot, sheepshead, and flounder. The Cheniers and beach ridges along the coast of this section limit saltwater intrusion into the marshes. As a result, the coastal marshes of the section are generally of low salinity and they serve as important nursery areas for several freshwater species as well.

Texas Barrier Island System

Texas has over 540 species of birds, more than any other state. Three hundred and eighty species have been recorded in the coastal zone where large numbers of migratory waterfowl and over 30 species of fish-eating birds and shorebirds are the most prominent. Practically all the diving ducks that migrate to Texas, including one-half million redheads, winter on the coast. In addition, one-half million snow and blue geese winter in the Texas lagoons and marshes as do 50-100,000 white-fronted and Canadian geese. Migratory songbirds use trees along the edge of the Gulf of Mexico before moving south to Central and South America in autumn, and north to Canada and the United States in the spring. Other important birds occurring here are brown pelicans, ospreys, bald eagles, whooping cranes, and peregrine falcons.

The Texas coast, in particular the extensive tidal mudflats on the landward side of the barrier islands, are important staging areas for migratory peregrine falcons. During fall and spring migration peregrines are possibly more abundant along the Texas coast than anywhere else in the U.S. The reason for this is not completely understood, but it is related to the abundance of food supply, shorebirds, ducks, etc., and the wide open, uninhabited spaces that make predation easy. The fact that this endangered and environmentally sensitive bird is attracted to the Texas coast because of its large undeveloped areas is strong justification toward maintaining these areas as they are.

Alligators are present along much of the Texas coast in marshes included within the CBRS and in associated areas as well. Another reptile present is the Kemp's Ridley Sea Turtle, the only sea turtle known to have nested along the Texas coast in the recent past and one of the rarest sea turtles in the world. Efforts have been made to reestablish colonies on the Texas coast, where protective measures can be better enforced than in Mexico, the other known nesting area.

Mammals present in barrier habitat in Texas are primarily rodents, including rice and cotton rats, squirrels, and rabbits. Other species present in upland and marsh areas are raccoons, nutria, muskrat, whitetailed deer, and predators such as red fox, bobcat, and coyotes.

Fisheries along the Texas coast are very important commercially and recreationally. The estuaries and their associated grass beds and marshes act as nursery grounds and adult feeding and harvesting areas for such estuarine-dependent species as brown and white shrimp. The coastal Gulf of Mexico waters throughout this section have some of the highest commercial yields of brown and white shrimp in the entire Gulf of Mexico. Other estuarine-dependents include blue crab, spotted seatrout, drum, croaker, kingfish, and mullet. The nursery areas generally are confined to the bay shallows, seagrass beds, and surrounding marshes.

Tidal passes, as in Louisiana and other areas, serve as major migratory routes for the movement of estuarine-dependent species to and from estuarine nursery grounds. Adult fish tend to concentrate around oyster reefs and artificial structures in the deeper portions of the estuaries and, with the exception of snapper and grouper, most fishing in this section occurs in the estuaries.

Summary

The CBRS, spanning from Maine to Texas, represents a highly varied chain of undeveloped coastal landforms collectively born from similar physical processes. This system directly or indirectly supports a tremendous variety of fish and wildlife, many species that are economically important to people and found nowhere else. Although the species associated with coastal barriers may change with latitude, the ecological significance of the barrier and its associated habitats remains extremely high. Species dependent upon quiet lagoons, isolated beaches, shallow surf, and protected marshes flourish in the presence of coastal barriers. And, although a barrier along coastal Maine may be quite different from a barrier along coastal Texas, both protect landward areas from the erosional forces of the ocean and both provide unique undisturbed habitat for coastal fisheries and wildlife.

The Value of Coastal Barriers and Associated Aquatic Habitats

CBRA defines coastal barriers to include "all associated aquatic habitats, including adjacent wetlands, marshes, estuaries, inlets, and nearshore waters". As will be discussed in Chapter 6, the draft revised definition and delineation criteria would extend "all associated aquatic habitat" to include not just the contiguous aquatic habitat immediately behind the barrier, but all aquatic habitat to the seaward limit of upland vegetation on the mainland. Expansion would be limited to a maximum of five miles of continuous aquatic habitat landward of the mean high water line on the seaward margin of the coastal barrier.

The inclusion of associated aquatic habitats is consistent with the purposes of CBRA and is essential to the ecology of the coastal barrier system. Section 2(b) of CBRA states that CBRA's purpose is "to minimize the loss of human life, wasteful expenditure of

Federal revenues, and the damage to fish and wildlife and other natural resources associated with the coastal barriers." Since much of the fish and wildlife traditionally associated with coastal barriers depends not only on the barrier itself, but also upon nearby aquatic areas such as marshes and estuaries for food and habitat, the protection of these areas would seem consistent with CBRA's mandate. Similarly, the characteristics of the coastal barrier substantially determine the characteristics of adjacent fish and wildlife habitat and other natural resources.

The purpose of this section then is to provide a sound basis for a broader definition of associated aquatic habitat, based upon the inherent interdependent nature of coastal barriers and their associated aquatic habitats. It will emphasize the inseparability of the barrier from its associated wetlands. This interdependent relationship is examined from three different perspectives: physical, ecological, and recreational/aesthetic. The value of both the barriers and their associated aquatic habitats to the coastal communities they protect, to the fisheries they support, and to the millions who enjoy the public recreation they provide, has been implied in Section 2 of CBRA. These values are also discussed in this section.

Physical Relationship

The physical link between coastal barrier and wetland is, in many cases, forged during the genesis of the barrier feature itself. Figure 4-5 illustrates one common way barrier beaches are formed. A sand spit grows out from the end of the shoreline, supplied with sediments from the mainland and transported by longshore littoral currents. As the spit grows, the waters behind the spit are protected from wave energy. Protection from waves is the most important function a coastal barrier provides for associated aquatic areas. By slowing water currents, barriers allow suspended mud and silt in the water to settle and accumulate. These stable, muddy sediments are quickly colonized by marsh grasses. In turn, the grasses then act as a "sediment trap" catching even more sediment from even slower moving waters, further enhancing marsh growth. As the marsh grows, it becomes more complex as different kinds of plants and animals take advantage of newly created habitat. Eventually, an entire community is established with hundreds of plant and animal residents. If the protective barrier spit, or island was lost, these low-lying marsh communities would be exposed to the direct erosional forces of the ocean, and would be much reduced in size if not destroyed altogether.

Tides are another important physical influence on the coast affecting barriers and wetlands. Although there is significant variability in both tidal range and frequency along the U.S. coast, in all regions, tides serve the vital function of flushing marsh areas and providing nutrients. The presence of a coastal barrier influences the pathway of the tidal currents and, therefore, influences the distribution of fresh, brackish, and salt marsh habitat.

Perhaps the most significant benefit the public realizes from coastal barriers is the mitigating effect they have on wind and waves generated at sea. Like the marshes, heavily populated or developed areas landward of a barrier system are also protected from waves and erosion. This buffering capacity is especially critical during times when storms and hurricanes could cause inestimable damage to buildings and property without the protection these landforms provide. Man-made protection against these forces has had only limited success compared to the ability of these naturally resilient and durable landforms to survive the full fury of oceanic storms.

Ecological Relationship

Aquatic habitats associated with coastal barriers are strongly coupled to their surrounding ecosystems. Water, nutrients, and sediments are freely exchanged between rivers, coastal estuaries, bays, and the ocean. Much of the fish and wildlife found in wetlands utilize neighboring habitats as well. These ecological linkages between aquatic areas and coastal barriers are extremely important to the functioning of the entire coastal biosphere.

Ecologists have noticed that there is very often a tendency for increased variety and density of animal species in the transition zone between two habitat types (Odum, 1971). This is commonly termed the "edge effect", and it is especially apparent in coastal marshes and estuaries. Often these habitats contain a density of animals that is found nowhere else.

The most obvious "edge" along a coast is that between the water and the land. Although the marsh itself can be considered a transition zone between land and water, within the marsh there is another, more subtle "edge", between salt and fresh water. Numerous

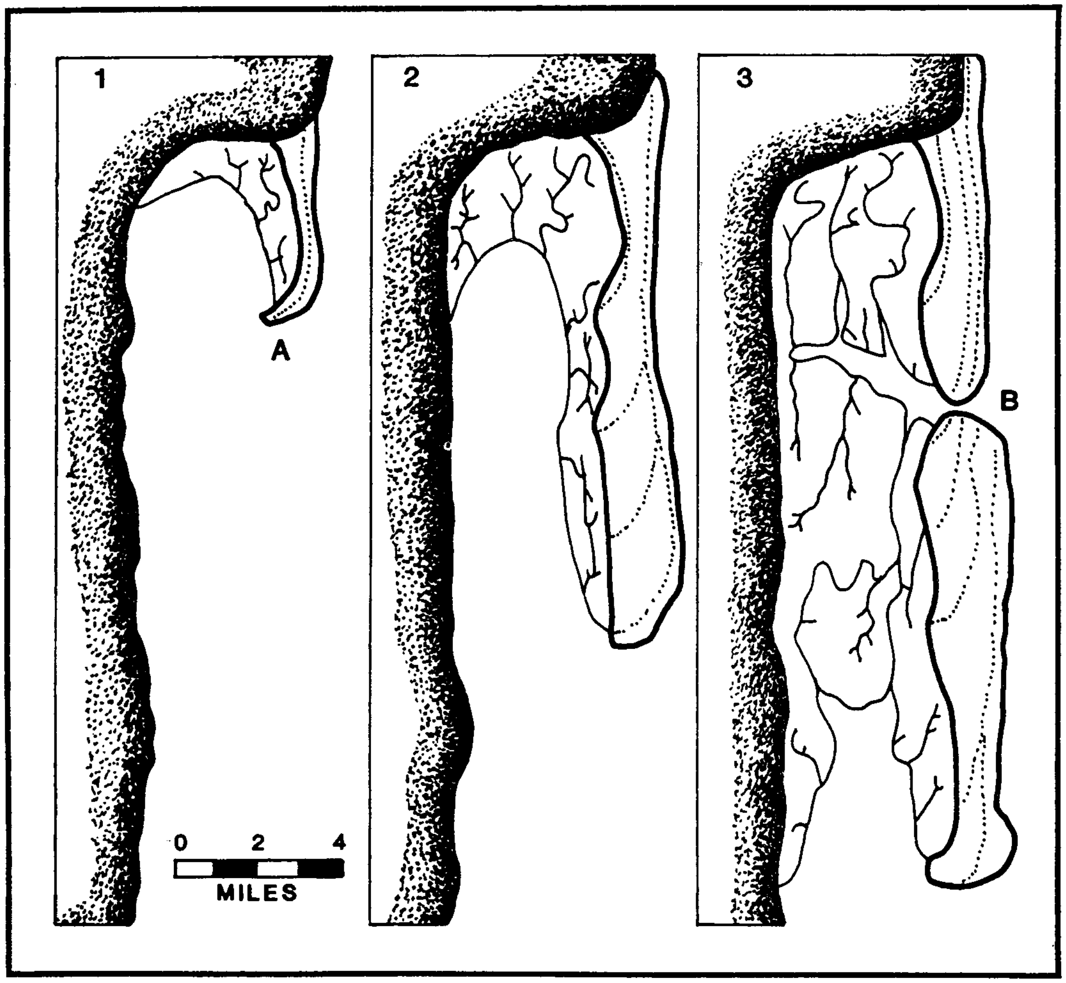


Figure 4-5. Barrier island formation by sand spit accretion from the mainland (A) and eventual breaching of the spit by waves and/or storm erosion at (B) to form the barrier island. Dark lines represent extent of sand deposits. Dotted line represents possible historic sand/water boundaries. (Adapted from J. H. Hoyt 1967. Barrier Island Formation. Geol. Soc. Am. Bull. 78:1125-1136.)

species of fishes and shellfishes inhabit estuarine areas where the water is a mixture of fresh and saltwater. In fact, more than two-thirds of the major U.S. commercial fishes and shellfishes depend on these areas during some stage of their life cycles. One advantage to species utilizing estuarine marshes for spawning or nurseries is that both truly marine and truly freshwater predators are excluded. Another important benefit is the abundance of available food such as organic detritus, plankton, small mud-dwelling invertebrates, and larval and juvenile fish. Where extensive marsh and estuarine areas are present, the productivity of coastal fisheries is often increased (Turner 1977). In fact, recent studies have demonstrated a direct correlation between coastal marsh and fisheries production. The National Marine Fisheries Service has estimated that estuarine marsh losses between the years 1954 and 1978 cost approximately $208 million in annual fisheries losses. Without the presence of an intact coastal barrier system these losses could have been much greater.

The inlets between coastal barriers connect nearshore waters with marshes and estuaries. A great variety of fishes and shellfishes pass through these inlets in various stages of their life cycles. The inlets control the exchange of water between marshes and the ocean, limit wave energy reaching marshes areas, and focus fisheries movement. Such passes are often important commercial fishery locations.

A different kind of use is exhibited by a number of bird species that move daily in and out of marshes to feed. Wading birds, for example, often nest on adjacent coastal barrier and upland habitat, but feed along the many miles of marshes and marsh ponds during the day. Gulls, terns, skimmers, pelicans, and many other birds also rely upon barriers for nesting habitat, while feeding in nearby marshes and estuaries. Many of these birds are fish-eaters, feeding on the same estuarine-dependent fishes described above. Thus, like some fish species, certain birds display a preference for transition areas. In this case, the "edge" is between uplands or coastal barriers and the marsh. The mobility of birds gives them the ability to exploit both habitats.

Mammals that utilize coastal barrier and wetland habitats, being less mobile than birds, are most common directly along the "edge" between the two. Mammal community differences between CBRS units typically result from the differences in the vegetation. For example, a barrier that consists entirely of dunes and grasses will not support the same fauna as a barrier that contains a well established maritime forest. In addition, barriers connected to the mainland (bay-mouth barriers and spits) are more likely to be exploited by mammals on a daily or seasonal basis than barriers islands.

Those mammals that depend to some degree on both fastland and marsh include foragers such as deer, rabbits and mice, predators such as foxes, bobcats and coyotes, and omnivores such as opossums, skunks, and racoons. Local populations of these animals have, in some cases, undergone evolutionary and behavorial adaptations in order to survive in such a dynamic environment and exploit available food resources.

Thus, the presence of a coastal barrier in association with coastal wetlands can have an important influence on the diversity of wildlife by creating a marsh/upland interface for those animals that prefer this transition area. Coastal barriers have a less direct influence on the fishes and shellfishes utilizing coastal marshes. However, the presence of a coastal barrier, as discussed earlier, is often responsible for creating and maintaining the vast acres of highly productive wetlands and estuaries that are habitat for these fish and shellfish. Along the Gulf of Mexico and Atlantic coasts these barrier-dependent coastal wetlands nurture stocks of finfish and shellfish vital to commercial and recreational fisheries. Furthermore, coastal barriers provide habitat for over 20 Federally-listed endangered or threatened species. These include birds such as the bald eagle, peregrine falcon, whooping crane, and brown pelican; mammals such as manatees and beach mice, and reptiles such as sea turtles and the American alligator. Finally, large populations of migratory waterfowl and shorebirds depend on coastal barriers and their associated wetlands for food and protection during spring and fall migrations.

It is important to begin to think of coastal barriers and their associated wetlands as a "biosphere", or "a large, self-sustaining, well protected ecosystem containing an inexhaustible archive of information for the future benefit of people...information contained in ecological relationships and genetic codes...information waiting to be unlocked through scientific study and put to use through enlightened management" (U.S. Man and the Biosphere Program). Coastal biospheres will inevitably consist of a series of neighboring, interacting ecosystems. Physical, chemical, and biological process are all involved in linking these ecosystems together. It is imperative that the entire biosphere is considered as a unit because it functions as a unit. Human alteration in one part of the unit can often affect the equilibrium of the entire system. While these impacts may not be readily apparent, they nevertheless occur. In order to perpetuate the ecological values of coastal ecosystems, we must understand and appreciate this functional relationship.

Recreational/Aesthetic Relationship

For the many people who utilize the coastal zone for boating, fishing, sunbathing, or just a relaxing walk, the association between barrier and aquatic areas is an important part of the scenic and recreational quality of the coast. Much of the recreational activity in coastal areas is non-consumptive, involving aesthetic or intrinsic values. For this reason the justification for protecting wetlands and other environmentally sensitive areas from development pressures has often focused on the importance of the "ecological services" or resource values that wetlands provide, that are more scientifically and economically demonstrable than intrinsic qualities. Intrinsic values are nontheless very important. For example, in 1980 alone, 28.8 million people (17% of the U.S. population) took special trips to observe, photograph, or feed wildlife. Moreover, in that same year, about 47% of all Americans showed an active interest in wildlife around their homes. These statistics give some indication of the relative importance Americans place upon their environment.

Various studies have found that coastal wetlands rank high in aesthetic quality in comparison to other landscapes. One particular value of wetlands is the attraction of the land-water interface. It seems that people, as well as fish and wildlife, find the edge between land and sea to be especially appealing. The appeal undoubtably includes the numerous birds and other wildlife present.

Recreational activities in coastal areas include fishing, camping, boating, and hunting. Hunting is focused primarily on the waterfowl that make extensive use of coastal marshes for food and protection during migration. In Louisiana alone, where a large percentage of North America's waterfowl winter, 115,000 hunters enter the coastal marshes each year. In 1979, nearly 10 million sport fishermen traveled to the Atlantic and Gulf of Mexico coasts to catch over 20 million fish. A large majority of these fish are estuarine.dependent during some stage of their life cycle. With the exception of certain recreational beaches on Cape Cod, Massachusetts, all nine Atlantic ocean and Gulf of Mexico coastal units of the National Park System are located on coastal barriers and spits. These areas supported 22.5 million visits in 1981. In addition, 19 of the 25 most visited National Wildlife Refuges have substantial wetland components. A number of these refuges are located along the Atlantic and Gulf coastlines. Although none of these Federally managed areas are currently included within the CBRS, these figures are an indication of the heavy use coastal areas receive.

There are, of course, many individuals who would support the idea that unaltered natural areas, including wetlands and coastal barriers, are valuable in and of themselves, regardless of the many tangible benefits or ecological services society might receive from them. There are many reasons why people value an environment that has remained essentially untouched by man's presence. Whether it is the love of wilderness or simply the peaceful solitude, the reasons defy expression in quantitative or economic terms and are therefore often overlooked in a society where decisions are frequently based upon numerical cost-benefit analyses. The reassurance that these areas will exist for both present and future generations, regardless of quantifiable values, can be a strong motivation in itself to preserve coastal barriers and wetlands in their undisturbed state.

Human Impacts on Coastal Barrier Ecology

Undeveloped coastal barriers are rich in ecological, recreational, and commercial values. Unfortunately, because of these riches, coastal barriers are subject to numerous competing pressures for the use of their valuable resources. These inevitable conflicts threaten to seriously degrade coastal barrier environments both in their role as ecosystems and as sites for potential human development and activity. In its undisturbed state, the coastal barrier system is highly resilient, but despite this capacity to adjust, the system can be easily damaged by human activity. This section of the chapter will review how human activities can directly or indirectly disrupt the natural processes that maintain the physical and ecological well being of the CBRS.

Coastal Barrier Processes

As was discussed in the previous chapter, the general characteristics of coastal barriers are shaped by 1) the energy regime, including wind, waves, storms, and tides, 2) the dynamic equilibrium of sediment deposition and erosion, 3) world-wide sea level fluctuations, and 4) subsidence of the continental margin. The interaction of these processes influences both the shape and location of coastal barriers. Evidence of these processes may be observed in the daily, seasonal and storm alteration of coastal barrier profiles, in the landward migration of barrier features, in the shifting formation and migration of coastal sand dunes and inlets, and in the loss of coastal wetlands. When allowed to function naturally, these processes ensure the continued maintenance of the coastal barrier system. However, when people alter these coastal processes they reduce the system's ability to adjust to daily, seasonal and storm processes, that in turn can destroy the human structures located on a barrier, the wildlife utilizing the barrier and the coastal barrier itself (Brower, et al. 1976).

Process Disturbing Activities

The human activities that threaten to disrupt coastal barrier processes can be grouped into five categories:

1. Construction and development

   Since 1950, development on coastal barriers has increased from about 10% of the available real estate (about 250 miles of coastal barrier shoreline) to about 40% today (about 1050 miles.) In 1980, it was estimated that about one third of the developable land acreage of our coastal barriers had been developed. (DOI, FES on Undeveloped Coastal Barriers, May 1982).

2. Alteration of primary dunes

   This includes both artifical dune stabilization and dune leveling.

3. Beach protection and stabilization, and the maintenance of navigation channels

   The U.S. Army Corps of Engineers estimates 44% of the total Atlantic Ocean and Gulf of Mexico Coast shoreline is experiencing significant erosion of beaches and dunes due to shoreline stabilization projects.

4. Maintenance of navigation channels

   For the period 1945-1955 through 1972-1975 the rate of loss of wetlands due to dredging to construct and maintain channels is estimated at about 3100 acres per year. While current rates are probably lower, they are still significant (DOI, FES on Undeveloped Coastal Barriers, May 1982.)

5. Groundwater extraction and contamination

Demand for freshwater on barriers is usually greater than supply and soils are ill-suited for septic fields.

Examples of each activity are discussed below in terms of their potential impact on the component environments of the coastal barrier system.

The Beach

The beach is shaped by the repetitive onshore movement of waves, by longshore currents generated when waves hit the beach at an angle, and by sea level rise. These three processes insure that the various grades and sizes of sediment that compose the beach are in constant movement. The shape and location of the barrier beach is directly related to the direction and intensity of water movement. The beach is inherently a dynamic system and any attempts to make it "stable" by altering water flow or sand supply are almost always self-defeating. Sometimes beach stabilization efforts work in the short run, but in the long run, stabilizing attempts at saving a beach usually end up in destroying it (Brower, et al., 1976).

The erection of groins, seawalls, bulkheads, and other engineering devices designed to impede natural oceanic currents and sand transport are good illustrations of this dilemma. They are constructed in order to protect beachfront development located in unstable coastal areas. As the shoreline retreats or changes shape, owners of beach property often lobby for publicly funded beach restoration projects to protect their private holdings. In most cases, these structures should never have been built there in the first place; if stabilization measures are taken, they only begin the cycle of erosion and temporary engineering solutions that become more and more expensive as the situation continues to worsen.

Inlets

Inlets link the ocean, coastal sounds and back-bay areas. Inlets are shaped not only by longshore currents, sea level rise, and normal wave action, but also by daily tidal currents. The interaction of longshore and tidal currents often results in broad, continually varying fans of sand deposition on both the landward and ocean side of an inlet. As discussed earlier, the inlet serves as a migratory route for marine species. It allows in sediments that form the physical substrate for the marshes and enables salt and freshwater to mix to form the estuarine-lagoon environment.

Dredging, jetties, sand bypass systems, and other artificial stabilization strategies are used to maintain navigation channels through inlets and protect commercial and recreational development. However, these also are often only temporary solutions. Tampering with inlet dynamics can endanger the natural deposition of sand, the migratory patterns of marine species, the self maintenance of barrier features, and the very existence of the marsh.

Dunes

Sand dunes are a major storage center for beach sediments and play a vital role in absorbing high winds and waves during storms. Natural dunes constantly shift position in response to wind and water. Where the shoreline is retreating landward, natural dunes migrate inland as well.

Leveling and/or relocation of primary dunes reduces the island's resiliency to oceanic forces. When dunes are leveled, structures are directly exposed to storm waves. When structures are located on dunes or within the natural migration path of the dune, it not only eliminates the dunes responsiveness to storm events, but exposes buildings and property to unnecessary hazards such as burial. Vehicular or foot traffic on dunes can kill stabilizing dune vegetation. Where dunes are broken, sand blows back into the shrub zone and maritime forest, burying and killing the plants. Five species of threatened and endangered sea turtles require isolated dune or high beach habitat for nesting. Dune loss and dune occupation and disturbance by people are a severe threat to their continued survival. Finally, introduction of exotic plants to artifically stabilize and build dunes can instead thwart their migration and reduce their ability to absorb storm surge. On Hatteras, Pea, and Bodie Islands, (North Carolina) extensive dune building and dune stabilization efforts have resulted in serious erosion of the beaches on both sides of the islands.

Maritime Shrub and Forest Vegetation

Maritime shrubs and forests sometimes develop on the widest portions of coastal barriers. They are different from their inland counterparts because of adaptations they have had to make to the high winds, salt spray and sandy soils characteristic of the coastal environment. Unfortunately, because maritime forests are located on the most stable sections of coastal barriers, they are often under intense development pressures. Extensive development in maritime forests means large numbers of trees and shrubs are cut which reduces the sand and water holding capacity of the area. Without the protective "wind screen" of forest vegetation, relic dunes may become active again and migrate over remaining vegetation or newly located human structures. Demand for freshwater in the forest is usually greater than the rate of replenishment, which lowers the water table and allows saltwater intrusion into wells. Septic drainage in porous, saturated soils often means waste discharge pollutes the water supply. This is particularly important on coastal barriers far from water supplies on the mainland.

Aquifers

An aquifer is a naturally occurring mass of water-retaining rock, sand, or gravel. On coastal barriers, aquifers are shallow. A lens-shaped body of freshwater floats on saltwater that has intruded into deeper sediments. The extent of the freshwater table varies considerably, with greatest supplies found in maritime forests and lesser pockets occurring in the dune system.

Excessive groundwater extraction for public water supply resulting from over-development lowers the water table and may kill stabilizing vegetation. Septic tank contamination of groundwater in overly dense developments is a particular problem because coastal barrier sediments are mostly highly porous sands. Finally, the destruction of vegetation and/or construction of impervious surfaces such as paving can significantly retard the recharge of the water table.

Wetlands

Wetlands include the wide variety of marshes, swamps and bogs associated with and protected by coastal barriers. Each year almost half a million acres of our nation's wetlands are lost. Wetlands are lost when they are permanently converted to open water or dry land. Wetlands can also be converted from one form to another, for example, from freshwater to saltwater marsh. This can have devasting consequences for wildlife.

While natural forces do act in a variety of ways to modify wetlands, human activities play a much greater role in determining their fate. Many human activities either directly destroy wetlands or reduce their quality. Drainage for crop or timber production or mosquito control changes wetland to dryland. Draining accompanied by filling is often used to convert wetlands to drylands for road construction, industrial development, or residential development. Extensive dredging takes place in and around wetlands to maintain navigational channels, to provide access for oil and gas drilling and for pipelines, to control floodwater drainage, and for marinas. Such dredging can both destroy wetland and allow saltwater intrusion into freshwater wetlands. Saltwater intrusion destroys freshwater marshes by killing the plants. If the intrusion is gradual enough, the freshwater marsh may become a salt marsh, but it will no longer support the waterfowl and mammals requiring freshwater.

The sediments removed while dredging (dredge spoil) can be deposited on wetlands, changing them to drylands, or spoil islands or banks can be created. These spoil banks can alter or prevent natural waterflow through wetlands. In the same way, levees, dikes, dams, and reservoirs prevent water from reaching wetlands. Subsidence (sinking) is the natural fate of coastal wetlands as sediments are compacted and sink under open water. Sediments carried downstream and into wetlands by riverflow and floodwater flow are necessary to offset this loss and maintain coastal wetlands. By preventing sediment-laden waters from reaching wetlands, levees, dams, and reservoirs contribute to subsidence. Dams on the Ohio, Missouri, Tennessee and other rivers have reduced the sediment carried by the Mississippi by half. The levees on the Mississippi prevent natural flooding and cause the river's still substantial sediment load to be flushed directly into the Gulf of Mexico.

Extraction of groundwater, oil, gas, and minerals such as sulfur, salt and phosphate can also cause subsidence. These activities caused most of the Galveston Bay area's wetland loss. Mining of wetland soils for peat, sand, phosphates, coal, and other materials is also highly destructive to wetlands. Wetlands can filter out some of the pollutants that are released into them. However, pollution from urban and agricultural runoff and industrial waste frequently overload the wetland's filtering capacity. Water quality is reduced, killing marsh plants, killing fish and shellfish or contaminating them for human consumption, and limiting wildlife abundance.

Summary

Enactment of CBRA in 1982 was, in part, due to recognition of the impacts that people have on the fragile coastal barrier system and its associated fish and wildlife resources. In order to maintain and enhance the valuable natural resources associated with coastal barriers, uncontrolled development must be prevented. Development in these areas can be undesirable when it intrudes into unique scenic areas, disturbs highly prized fish and wildlife habitat and, depending on the size of a project, alters the natural processes that sustain the coastal barrier. Artificial stabilization to counter natural barrier processes and protect development projects can interfere with the ability of wind and water to transport sediments, severely affecting maintenance of the natural equilibrium between landform and ocean energies. It threatens not only the loss of the barrier and its unique assemblage of natural resources, but also the exposure of previously protected areas to the open sea, potentially upsetting the ecological balance of an entire region. Such consequences are not unimaginable. For instance, the coast of Louisiana already suffers from wetland losses of over 40 square miles annually due to saltwater intrusion, subsidence and intensive dredging activities such as those for oil and gas development. Should a barrier island, such as Grand Terre or Timbalier, disappear due to some combination of canal dredging and storm damage, thousands of acres of adjacent marsh would be exposed to the erosional forces of the ocean. These marshes are among the most productive in the world, and their loss would have a severe impact on the fish and wildlife of Louisiana and the entire Gulf of Mexico.

CHAPTER V

AN OVERVIEW OF THE ALTERNATIVES FOR CONSERVATION OF THE FISH AND WILDLIFE RESOURCES OF THE COASTAL BARRIER RESOURCES SYSTEM

Introduction

The enactment of CBRA in 1982 represented a significant step towards the establishment of a consistent federal policy on undeveloped coastal barriers. The effect of CBRA was to break the cycle of federal expenditures used to encourage development and redevelopment of undeveloped coastal barriers. CBRA seeks achievement of conservation goals by withdrawing most of the federal subsidies that may distort the economic equation involved in development decisions. This is important because the fish and wildlife resources associated with the CBRS are dependent upon the availability of undisturbed coastal habitat for food and protection. This habitat is also an attractive location for residential and commercial development, and developers may not take into account compatibility with fish and wildlife and the hazards such coastal areas are often experience.

The next several chapters of the report address conservation of coastal barrier resources pursuant to the requirements outlined in section 10 of CBRA.

Federal Stewardship

There are numerous alternatives within existing authorities that offer potential for useful application in the conservation of the CBRS. Some of the more traditional alternatives include: fee-simple acquisition of sensitive areas; acquisition of conservation easements in privately owned areas without purchasing the land outright; limited access to sensitive areas; regulation of usage through the issuance of permits containing performance standards; implementing management programs for enhancement of endangered or threatened species; habitat management or alteration for the enhancement of priority species; zoning areas for recreational or other low intensity usages. Combinations of one or more of these management techniques are currently being utilized throughout the CBRS.

In certain instances, fee-simple acquisition is the most effective management strategy in a gross sense as it places the resources under the indisputable control of the Federal Government. Access is relatively easy to control and impacts are relatively easy to monitor. But, although acquisition can be especially useful in protecting priority areas and, therefore, has considerable merit as a management tool, it cannot be expected to provide for the protection of the entire CBRS. Coastal real estate comes at a premium price that is increasingly difficult to justify in terms of taxpayer's expense given the variety of other resource management tools available.

Regulations are another vital component of a comprehensive conservation strategy. For example, many of the birds associated with the CBRS are partially protected from human depredation by the various migratory bird laws administered by the FWS. Endangered and threatened species are protected by the Endangered Species Act. Section 404 of the Clean Water Act requires permits for any dredge and fill activities in navigatable coastal waters, and many key coastal areas including wetlands, beaches, and coastal barriers are protected by a variety of state and local land use regulations enacted to prevent development from encroaching upon high priority natural areas.

Traditional conservation practices, together with increased public awareness, have resulted in several dramatic conservation successes in coastal areas. The resurgence of the American alligator is an outstanding example. Once on the verge of extinction due to loss of habitat and intensive poaching for their hides, these animals have staged a comeback of such proportions that, in some areas, controlled harvesting of wild alligators for hides and meat is permitted. This would have been impossible without aggressive habitat management and law enforcement. The brown pelican is another good example. Pelican populations declined rapidly during the 1960's and early 70's due primarily to the accumulation of toxic pesticides in their food supply, namely, coastal fishes. Regulatory control of these pesticides and a carefully planned schedule of introducing pelicans back into previously occupied areas has resulted in the re-establishment of this species throughout most of its former range. Other examples include sea turtles, manatees, and migratory waterfowl. In each case careful management through a combination of habitat acquisition and/or regulatory protection has resulted in improvement of the resource.

Another conservation strategy for coastal barriers and their associated resources involves coordinated planning, such as the Regional Resource Planning (RRP) process recently initiated by the FWS. This effort will provide a more direct link between national policy direction and on-the-ground FWS activities by distilling the numerous broad and complex national desires into meaningful guidance applicable to specific geographic areas. RRP provides an analytical base that each region can use to prioritize it management activities and a means to coordinate implementation of those activities within FWS, with other agencies, and with the interested public. RRP planning is based upon anticipated circumstances at least 5 years ahead. Integration of such planning with coastal barriers planning could help insure that the management requirements of coastal barrier resources are included in regional management plans. Including coastal barriers in RRP would also provide a periodic and comprehensive review of the resource status and requirements compared with other resource needs within each FWS administrative region.

State Coastal Conservation Programs

All Atlantic and Gulf coastal states have in place some form of coastal management program. All states along these coasts, with the exception of Virginia, Georgia and Texas, participate in the NOAA Coastal Zone Management Program (CZM). The Coastal Zone Management Act of 1972, as amended, is administered by the Secretary of Commerce. It was enacted to encourage states to exercise their authority to provide balanced management of their coastal resources. One principal function of CZM is to review and evaluate state coastal zone management programs in those states which choose to participate in the federal program. Another function is the allocation of federal financial assistance among eligible states for the administration of the approved state coastal management programs. A brief summary of state coastal management programs along the Atlantic and Gulf Coast follows. More detailed discussions of each state's programs are included in Appendix D.

Maine - The Coastal Management Program in Maine was approved in 1978 with the State Planning Office as the lead agency. The Departments of Environmental Protection and Marine Resources administer the majority of the 11 core laws that outline the program. The program addresses several major issues including harbor and port development, fisheries management, wetlands protection, and shoreline zoning.

New Hampshire - The New Hampshire Coastal Program (NHCP) approaches coastal management through networking of the management functions of state agencies. Rather than implementing new legislation to create a plan, the program relies mostly on existing state laws, regulations, and agency programs. The Dredge and Fill in Wetlands Act (R5A483A) is the primary tool for controlling development in the coastal zone.

Massachusetts - The Massachusetts Coastal Zone Management Program (MCZMP) was implemented in 1978 following enactment of the Wetlands Protection Act. Additional regulations administered by the Executive Office of Environmental Affairs include Wetlands Restriction Program; Waterways Program; Ocean Sanctuary Program; and Energy Facility Siting. The major issues addressed by the MCZMP include public access, coastal erosion, and critical area planning. Two Executive Orders were issued by the Governor in 1980 and 1981. Executive Order 181 (Barrier Beaches) was signed in 1980 and includes the following provisions: highest priority for disaster assistance funds will be towards relocating willing sellers from storm damaged barrier beach areas; state and federal funds will not be used to encourage development on barrier beaches; no publicly funded development will be permitted in or on primary dunes; and structures will be used only for maintaining navigation at inlets and only if mechanisms are employed to supply downdrift beaches with sediment. Executive Order 190 (Regulation of Off-road Vehicle Use on Public Lands containing Coastal Wetland Resources) limits ORV use in sensitive environmental areas, specifically dunes, salt marshes, and tidal flats.

Rhode Island - The Rhode Island Coastal Management Program (RICMP), approved in 1978, is based on the Rhode Island Coastal Resources Management Council Act enacted in 1971. This Act created a 17 member council which has direct permitting authority over activities which directly affect the shore and tidal waters. Additional state regulations concerning beaches and barrier beaches (1975); coastal wetlands (1975); flood hazard areas (1977): and erosion control measures (1977) strengthen the program. Regulations enforced by the Council have proven very effective in managing and protecting the coastal zone, particularly coastal barriers.

Connecticut - The Connecticut Coastal Management Program (CCMP), approved in 1980, is based on the Connecticut Coastal Area Management Act of 1979. This Act designated municipalities in the coastal zone to undertake coastal site plan reviews by incorporating policies and standards defined in the legislation. The State has the ability to intervene if locally approved projects fail to adhere to the policies and standards outlined in the Coastal Area Management Act. The CCMP addresses several major issues which include administration of the Tidal Wetlands Act; the development of local coastal management plans; and protection of critical coastal resources (wetlands, public access, fisheries).

New York - The State coastal program is based principally on two pieces of legislation passed in 1981, the Waterfront Revitalization and Coastal Resources Act and the Coastal Erosion Hazards Area Act. These, in addition to the Tidal Wetlands Act and 44 other policies relating to management of the State's coastal resources, provide the regulatory framework for the State's coastal management program. The Waterfront Revitalization and Coastal Resources Act provided the legal authority to establish a coastal program, established a coastal boundary, provided for optional local government waterfront revitalization programs, and established a process for coordination of state actions and programs. The Coastal Erosion Hazards Area Act provided for setback requirements in highly hazardous areas. This Act required that maps be prepared delineating hazardously eroding areas for public review. Implementation of these hazardous area boundaries will create controversy because it will prevent new development or redevelopment (if over 50% of a given structure is destroyed) within the boundaries.

New Jersey - The New Jersey Coastal Management Program (NJCMP) received federal approval in 1980. The program is administered by the Department of Environmental Protection (DEP) through the Division of Coastal Resources. The Division of Coastal Resources is divided into several sections which include the following: Bureau of Coastal Project Review; Bureau of Coastal Planning; Bureau of Tidelands; Bureau of Coastal Enforcement and Field Services; and the Bureau of Coastal Engineering. The regulatory powers for the NJCMP are derived principally from three laws: the Waterfront Development Law; the Coastal Area Facilities Review Act (CAFRA); and the Wetlands Act. All three laws provide permitting authority to DEP for design location, construction, and wetlands filling activities in the New Jersey coastal zone. The serious problem of limited acreages of wetlands and public access beach areas as well as the extensive quantity and nature of development in the coastal zone are reflected in coastal management legislation and the large number of agencies responsible for enforcing these regulations.

Delaware - The Delaware Coastal Management Program (DCMP), approved in 1979 by the Office of Coastal Zone Management, is administered by the Department of Natural Resources and Environmental Control. The state laws which serve as the basis for this Program include: the Coastal Zone Act; the Wetlands Act; the Beach Preservation Act; and the Submerged Lands Act. These Acts directly regulate development in dune, beach, and wetland areas through a permitting system.

Maryland - The Coastal Management Program, approved in 1978, is based on existing state laws and authorities. The State directly regulates coastal development activities with both the Beach Erosion Control District Act (1981) and the Wetlands Act of 1970.

Virginia - The State of Virginia is presently developing a Coastal Management Program for consideration by the Federal Government. Most coastal construction, however, is regulated at the local level. The State has a wetlands law, has established guidelines for local regulation of wetland areas and passed a Coastal Primary Sand Dune Protection Act in 1980.

North Carolina - The State enacted the Coastal Area Management Act (CAMA) in 1974 which subsequently served as the basis for approval of the North Carolina Coastal Management Program in 1978. The Coastal Resources Commission (CRC) is principally responsible for implementation of CAMA. This Act requires local planning for hazardous areas and authorizes the State to directly regulate areas if local governments fail to adopt and administer regulations fulfilling state standards for dunes, beaches, wave action areas, erosion areas and other hazardous zones. Permits and setback lines for major and minor developments are administered under CAMA for areas of environmental concern (AEC). CAMA required all coastal counties to develop land-use plans. By 1976, all 20 coastal counties and over 50 coastal municipalities had adopted land-use plans. These plans must be updated every five years and represent one of the greatest accomplishments of the CAMA program.

South Carolina The South Carolina Coastal Management Program, approved in 1979, is based largely on the South Carolina Coastal Management Act of 1977. The Act established the Coastal Council whose main function is to develop and administer the

Coastal Management Program. This Program established a permitting process for activities in "critical areas" of the coastal zone (tidelands, coastal waters, beaches, and primary oceanfront sand dunes) as well as providing for state and local agency consistency with the State's Coastal Management Program. While the Coastal Council does not have permitting authority outside the coastal zone critical areas, it has the authority to certify the permits and actions of other state agencies in areas of the coastal zone outside the Council's jurisdiction. The Coastal Council does review these projects and actions to insure compliance with the Coastal Management Program.

Georgia - At present, the State of Georgia does not participate in the Coastal Zone Management System at the federal level. The Coastal Resources division of the Department of Natural Resources is charged with the protection and management of coastal marshlands, ocean beaches, and sand dune systems. A Coastal Marshlands Committee (CMP) issues permits under the Coastal Marshlands Protection Act of 1970 and a Shore Assistance Committee (SAC) handles permits under the Shore Assistance Act of 1979. Probably in response to this low development pressure along the coast, the State of Georgia does not have as comprehensive a coastal management program as other states.

Florida - The Florida Coastal Management Act, passed in 1978, did not include any new regulations but rather served to coordinate enforcement of existing ones. Florida joined the Federal Coastal Zone Management Program in 1981. The Florida Coastal Management Program (FCMP) is based on approximately 25 statutes and is administered by 16 state agencies. Most of the FCMP activities are based in the Department of Environmental Regulation (DER), the Department of Natural Resources (DNR), and the Department of Community Affairs. The Governor designated 1980 as "The Year of the Coast" in Florida and created the Interagency Management Committee to coordinate efforts in the State's coastal management programs. Coastal Construction Setback Lines (SBL) were mandated in 1972. These SBL's establish boundaries seaward of which no construction is allowed without a variance from the State. Since 1978, Coastal Construction Control Lines (CCCL), located more inland than SBL's have been adopted. Any construction seaward of the SBL or CCCL requires permits from the DNR.

In 1981, the Governor signed Executive Order 81-105. This Order included the following directives:

1) High priority will be given to acquisition of coastal barrier properties.

2) Development subsidies to hazardous coastal barrier areas will be limited.

3) The State government will cooperate with local governments in managing growth in coastal barrier areas.

Implementation of this program includes four major elements:

1. The issuance of E.O. 81-105.

2. A $200 million bond issue to purchase beaches and adjacent areas.

3. Completion of certain Federal and State projects, such as beach nourishment.

4. The development of a comprehensive legislative program focused on improved resource management, hazard mitigation and evacuation procedures.

Alabama - The State's efforts to regulate coastal activities began with creation of the Coastal Area Board (CAB) in 1975. This was followed by enactment of the Alabama Coastal Management Act in 1976. The CAB was directed to develop a comprehensive management program. In 1979, following approval of this plan by the Governor, the Alabama Coastal Area Management Plan (ACAMP) received federal approval. The Alabama Department of Environmental Management (ADEM) was created in 1982. One of its principal duties was the development of an environmental policy for the State. Act 82-612 created a Coastal Resources Advisory Committee to advise the ADEM and the Office of State Planning and Federal Programs on all issues relating to the coastal zone. The Act also abolished the Coastal Area Board. With the establishment of ADEM, all permit, regulatory, and enforcement functions of the CAB were transferred to those offices. The ADEM functions as the principal coordination and review agency for matters relating to the protection and management of the coastal zone. Prior to establishment of ADEM, an Act (81-563) to protect dunes and beaches was passed in 1981. This Act prohibits motor vehicles on beaches and dunes.

Mississippi - The Coastal Wetlands Protection Law (1973) established a state policy for preservation of coastal wetlands and ecosystems and served as the foundation for the federally approved Coastal Zone Program implemented in 1980. The Bureau of Marine Resources within the Mississippi Commission on Wildlife Conservation is responsible for administering the Wetlands Protection Law while daily administrative management of the Coastal Program. The majority of beaches are in public ownership.

Louisiana - The Louisiana Coastal Resources Program (LCRP), designed as a program to enhance and restore coastal wetlands and barriers, was approved in 1980. The LCRP is largely based on the State and Local Coastal Resources Management Act of 1978. The Louisiana coast is losing approximately 50 square mile of shoreline per year to erosion and wetland disintegration. Act 41 of 1981 established a $35 million Coastal Protection Trust Fund to be used for research, pilot projects, and establishment of a state coastal protection task force. This task force was given the job of designing a program to enhance and restore coastal barriers and wetlands. A legislative report accompanying passage of Act 41 recommended that the State begin reconstruction activities in three barrier areas subject to critical erosion. The projects are progressing on schedule.

Texas - The State of Texas does not participate in the Federal CZM Program. The Texas Open Beaches Act (1959) serves as an affirmation of the public right to Texas beaches. In 1973, the Coastal Public Lands Management Act was implemented and served to protect submerged lands by only allowing leasing of coastal public lands rather than selling them for $1 per acre as had been done previously. The Coastal Wetlands Acquisition Act, passed in 1977, authorized the Texas Parks and Wildlife Department to acquire, by purchase or condemnation, coastal wetlands most essential to the public interest. No money has yet been appropriated for these acquisitions. A Sand Dune Protection Act was passed by the legislature in 1973 and authorized counties with coastal barriers to establish dune protection lines 1000 feet landward of the mean high tide line. Once these lines are established, permits must be obtained for disturbances seaward of the line. So far three counties have adopted dune protection lines. The authority for implementation of state and federally funded programs, regulation of coastal activities, and studies of coastal issues are distributed among many state agencies. These include the General Land Office, the Texas Coastal and Marine Council, the Parks and Wildlife Department, and several others.

CHAPTER VI

EXPANSION OF THE DEFINITION AND DELINEATION OF COASTAL BARRIERS AS CONSERVATION ALTERNATIVES

Evolution of the Definition and Delineation of Coastal Barriers

In recent years, there has been a growing demand by coastal managers for coastal scientists to provide more information about natural coastal systems, particularly data on how these systems are affected by development, and thus, to participate in the planning process for our shorelines. One specific focus of policy-related research has been a major effort to define and describe coastal barriers, identify them on the ground, categorize them according to their level of development and protective status, and delineate them on maps. This emphasis reflects the early recognition that any coastal barrier policy would have to be applied to specific sites.

The federal definition of coastal barriers has evolved gradually since 1977. With every iteration of the definition, the growing scientific understanding of these systems, especially regional and local variation in barriers and barrier use by people has been incorporated. While understanding improved continuously, a truly rigorous definition with appropriate amplification was not required until enactment of the Omnibus Budget Reconciliation Act in 1981 (OBRA). On January 17, 1982, a draft definitions and delineation criteria document prepared by the Department of the Interior (DOI) was circulated for public comment. The most recent and comprehensive statement of the statutory definition was published by the DOI in the Federal Register on August 16, 1982 (47 Federal Register No. 157). This chapter begins by outlining the development of the current federal definition of coastal barriers and the delineation criteria used to distinguish undeveloped, developed and protected portions of these landforms. It then discusses how these definitions and delineation criteria could be expanded.

Coastal Barrier Landforms

On the basis of the scientific literature and communication with individual scientists, it has been possible to develop a good perspective on the most relevant compositional and functional characteristics that identify coastal barriers. Certain characteristics are universally recognized by knowledgeable authorities, while others remain controversial. An effort was made to use only those characteristics that would definitively and consistently identify coastal barriers. These include:

1. all coastal barriers are subject to the impacts of coastal storms and are, in varying degrees, hazardous for permanent human use and occupancy;

2. all coastal barriers buffer the mainland from the impact of storms;

3. many coastal barriers protect and maintain productive estuarine systems which support the Nation's fishing and shell fishing industries;

4. all coastal barriers consist of unconsolidated sediments;

5. all coastal barriers are subject to wind, wave, and tidal energies; and,

6. all coastal barriers include associated landward aquatic habitats which the fastland portion of the coastal barrier protects from direct wave attack.

Barrier islands, barrier spits, bay barriers, and tombolos all share these characteristics and, therefore, represent variations in coastal barrier landforms.

The first three characteristics in the list above, the functional characteristics, largely determine the value of undeveloped coastal barriers to society and are crucial in establishing the national interest in protecting them. However, the functional characteristics of coastal barriers are not easily measured, and, therefore, are of limited usefulness in delineating them on the ground. Reliable scientific methods and information are not available to assess the degree of hazard for development, buffering capacity and the ecological productivity and economic value of aquatic habitats consistently, accurately, and at reasonable cost for more than 200 specific areas from Maine to Texas.

A definition of coastal barrier landforms based upon structural and compositional characteristics that could be observed with a minimum of interpretation on maps and aerial photographs, as well as on the ground seemed the most practical and cost-effective. The CBRA definition, therefore, focused on the last three characteristics listed above, which, with relatively little amplification, proved sufficient to identify coastal barriers on the ground. These characteristics have consistently been incorporated into the various definitions of coastal barriers prepared by the DOI since 1977.

As DOI attempted in 1981 and 1982 to incorporate the variations in coastal barriers in different geographic regions into its criteria, a number of clarifications and amplifications were made to improve its ability to segregate coastal barriers from other landforms. The principal amplifications were:

1. Local surface deposits of beach rock (formed by the cementing of beach sediments by calcium carbonate left as sea water evaporated) as well as consolidated material, such as coquina, located below mean sea level, are acceptable in a coastal barrier.

   These clarifications were adopted to address features that occur in a few areas in Florida, are easily identified, and do not significantly alter the functions of the coastal barrier.

2. The landform must be subject to direct attack by wave energy originating in the open sea.

   This provision was incorporated relatively late in the policy formulation process in recognition of the fact that otherwise qualified structures located in open embayments should be included as coastal barriers.

3. Associated aquatic habitats must be protected by the fastland portion of the coastal barrier to such an extent that, if the fastland portion were breached during a storm, these habitats would undergo immediate and rapid physical and ecological change.

   In practice, for an area to be identified as part of a coastal barrier, there must be evidence on the ground that an aquatic system exists in reasonable proximity to the beach and is maintained and protected from direct wave attack by the barrier. A direct connection between the aquatic habitat and open marine waters does not have to exist at present, although this is a typical situation.

Delineation Criteria

The definitional criteria for coastal barrier landforms are primarily scientific. On the other hand, the delineation criteria, while scientifically based, are also pragmatic. Procedures for boundary delineation, above all, must be concise, related to features on the ground and applicable consistently over the full range of coastal barrier variation. Based on the scientific understanding of coastal barriers, the delineational criteria provided for inclusion of all associated aquatic habitats, particularly wetlands, adjoining the fastland on the landward side of barriers. Equally important, these delineational criteria also were written to include the sand-sharing system (i.e., the offshore bars and littoral drift zone) on the seaward side of the barrier and adjacent inlets which are "associated aquatic habitats", critical portions of the coastal barrier system important in maintaining natural coastal barrier functions and are subject to human manipulation.

The delineation criteria adopted relied almost exclusively on features observable on the ground as well as on maps and aerial photographs. Notable among these features were changes in the land surface at the juncture of bay barriers and spits with the mainland, the deepest portion of channels and inlets, and continuous natural and less often, artificial channels closest to the fastland portion of the barrier on the landward side. A difficulty arose in delineating the seaward boundary of coastal barriers because of uncertainty over the physical dimensions of the sand-sharing system for most, if not virtually all, units. For this reason, the seaward boundary was not delineated in DOI's maps of potential units.

One of the most important results of DOI efforts to delineate undeveloped coastal barriers was the development and application of visual indicators of these landforms and their development status. Research scientists indicated that a linear or curvilinear beach had to be present for the landform to be considered a coastal barrier. This kind of beach provides evidence that sufficient wind, tidal, and wave energies, and an adequate supply of sediment exist to satisfy the statutory definition. Mudflats, exposed marshes, and other emergent coastal features lacking this linearity are thus clearly distinguished from coastal barriers. The requisite associated aquatic habitats--open water, wetlands, and other landward aquatic habitats of all sorts--are readily recognizable on topographic maps, aerial photographs and on the ground.

Development Status

The difficulty in distinguishing developed from undeveloped coastal barriers lies in the fact that relatively few are pristine. Many have been visibly altered and others that may seem undeveloped contain some structures, such as state highways or other facilities. In addition, only a portion of a coastal barrier may be developed. Hence, determining whether a coastal barrier is developed requires the establishment of several thresholds. Under the federal definition this involves the application of three tests:

1. Does the area contain few man-made structures (few defined as less than one structure per five acres of fastland)?

2. Do any structures and human activities significantly impede geologic and ecological processes (i.e., is the area able to function naturally)?

3. Is the undeveloped area large enough (i.e., include at least one-quarter mile of shoreline on the ocean and extend from beach to bay)?

As with the definition of the coastal barrier landform, the definition of development has been refined and clarified in several respects since 1977 in response to a growing understanding of the effects of coastal barrier development. It was not until 1979, for instance, that establishing a transitional category of coastal barrier development became desirable. When undeveloped coastal barrier units were identified for reference in CBRA, phased development was recognized as a special class of developing coastal barrier. Under this concept minimally developed or undeveloped portions of coastal barriers were excluded if they were planned from the outset for a continuous program of multi-stage developement by a single developer, the first stage of which was required to be complete. Because phased development was claimed by a large number of landowners during the 1982 DOI effort to designate undeveloped coastal barriers for OBRA purposes, this concept subsequently received a great deal of attention and clarification.

A number of criteria have evolved to delineate the undeveloped portions of coastal barriers, three of which were central: 1) that undeveloped coastal barriers should extend from the beach across the barrier to the landward aquatic habitat, 2) that each unit should encompass at least a quarter-mile of ocean facing shoreline, and 3) that this minimum shoreline length should be determined from the "break in development" on the fastland. The "beach to bay" and minimum shoreline length criteria reflect an understanding that coastal barriers are interrelated and dynamic systems, which are adversely affected by the stabilization of adjacent areas. To avoid intrusive impacts from adjacent development on the barrier, the undeveloped portion should exceed the minimum size of 1/4 mile beach length. In addition to these three criteria, the definitions provided in OBRA and CBRA indicated that both geomorphic and ecological impacts should occur before an area can be considered for exclusion on the basis of impacts of human activities, and that structures should be present for human activities to be considered in assessing impacts.

Completed development on coastal barriers is obvious on aerial photographs, large-scale maps drawn since the development was completed (such as recent USGS 7.5 minute quads), and on the ground. For a partially developed coastal barrier, however, determining where that development ends and the undeveloped portion begins (particularly in terms of human impact) was sometimes difficult. Usually, the boundary line was simply drawn along the "break" in structural development. Determining whether a coastal barrier is beginning to develop, i.e., has a full complement of infrastructure or is part of a phased development, is even less straightforward. Because water and sewer lines (and sometimes electric and telephone lines) are placed in the roadbed, the existence of improved roads laid out in a pattern similar to roads in developed areas in the vicinity was found to be a fairly reliable indicator that a coastal barrier, or portion thereof, was undergoing development. This indicator can be readily observed on aerial photography. Conversely, if the roads were unimproved and/or were revegetating, it was highly questionable as to whether the area was actively being developed. There are no reliable visual indicators of phased development. However, recent aerial photographs, as well as on the ground inspection, were used to verify the completed phases of a phased development which was otherwise fully documented.

Protected Status

According to the law, a protected coastal barrier, or portion thereof, which is undeveloped and within an area established under federal, state, or local law, or held in perpetuity by a qualified conservation organization (as defined in Section 170 (h)(3) of the Internal Revenue Code of 1954), for conservation or recreation purposes, is not considered an undeveloped coastal barrier.

The only recommendation in the Secretary of Interior's August 1982 Report to Congress as required by OBRA was that the statutory definition of undeveloped coastal barriers be modified so that such "protected" areas could be included. This recommendation reflected concern that areas currently considered protected could become available for future development, as occurred in 1980 when the portion of Texas' Padre Island National Seashore south of Mansfield Cut was deauthorized by the Congress. If other such areas currently classified as protected become available for residential/urban development, it would be desirable to preclude federal expenditures within such areas in order to be consistent with CBRA.

Definition of Coastal Barriers for Purposes of This Report

This section presents expanded definitions of coastal barriers in response to the Congressional request in Section 10(c)(2) of CBRA for this report to include suggestions for additions to, or deletions from CBRS and modifications to the boundaries of the system. These definitions are based on guidance provided by Section 3 and are supported by definitions used previously by the Department of the Interior as well as the legislative history of CBRA (47 Federal Register No. 157, August 16, 1982; Final Environmental Impact Statement: Undeveloped Coastal Barriers, May 1983). For the purposes of this report, these definitions have not been applied to the CBRS as enacted in 1982.

General Definition

Coastal barriers are found on all coastlines of the United States and its territories, including the coastlines of the Great Lakes. Therefore, a possible conservation alternative for the CBRS could be to expand the scope of the CBRS to include undeveloped coastal barriers on all coastlines.

Based on the definition of a coastal barrier previously presented and contained in Section 3 of the CBRA, a coastal barrier is a depositional geologic feature (such as a bay barrier, tombolo, barrier spit, or barrier island) which:

1. consists of unconsolidated sedimentary materials;

2. is subject to wave, tidal, and wind energies; and,

3. protects landward aquatic habitats including the adjacent wetlands, marshes, estuaries, inlets, and nearshore waters.

Types of Coastal Barriers

Coastal barriers may be described generally as in the statutory definition with respect to their relationships to the mainland as bay barriers, tombolos, barrier spits, and barrier islands. The "mainland" includes the continental landmass as well as large islands such as Long Island, New York, and Martha's Vineyard, Massachusetts. The accepted scientific classification of major coastal barrier landforms includes:

1. Bay Barriers - coastal barriers that connect two headlands, and enclose a pond, marsh, or other aquatic habitat (Figure 6-1a). The term bay mouth bar, or bay bar are considered to be synonomous with bay barrier.

2. Tombolos - sand or gravel beaches which connect one or more offshore islands to each other or to the mainland (Figure 6-1b). Coastal barriers of this type occur principally in New York and New England. The terms connecting bar, tie bar, and tying bar are synonomous with tombolo.

3. Barrier Spits - coastal barriers which extend into open water and are attached to the mainland at only one end (Figure 6-1c). They can develop into bay barriers if they grow completely across a bay or other aquatic habitat. On the other hand, bay barriers can become spits if an inlet is created.

4. Barrier Islands - coastal barriers completely detached from the mainland (Figure 6-1d). Barrier spits may become barrier islands if their connection to the mainland is severed by creation of a permanent inlet. The barrier island represents a broad barrier beach, commonly sufficiently above high tide to have dunes, vegetated zones, and wetland areas.

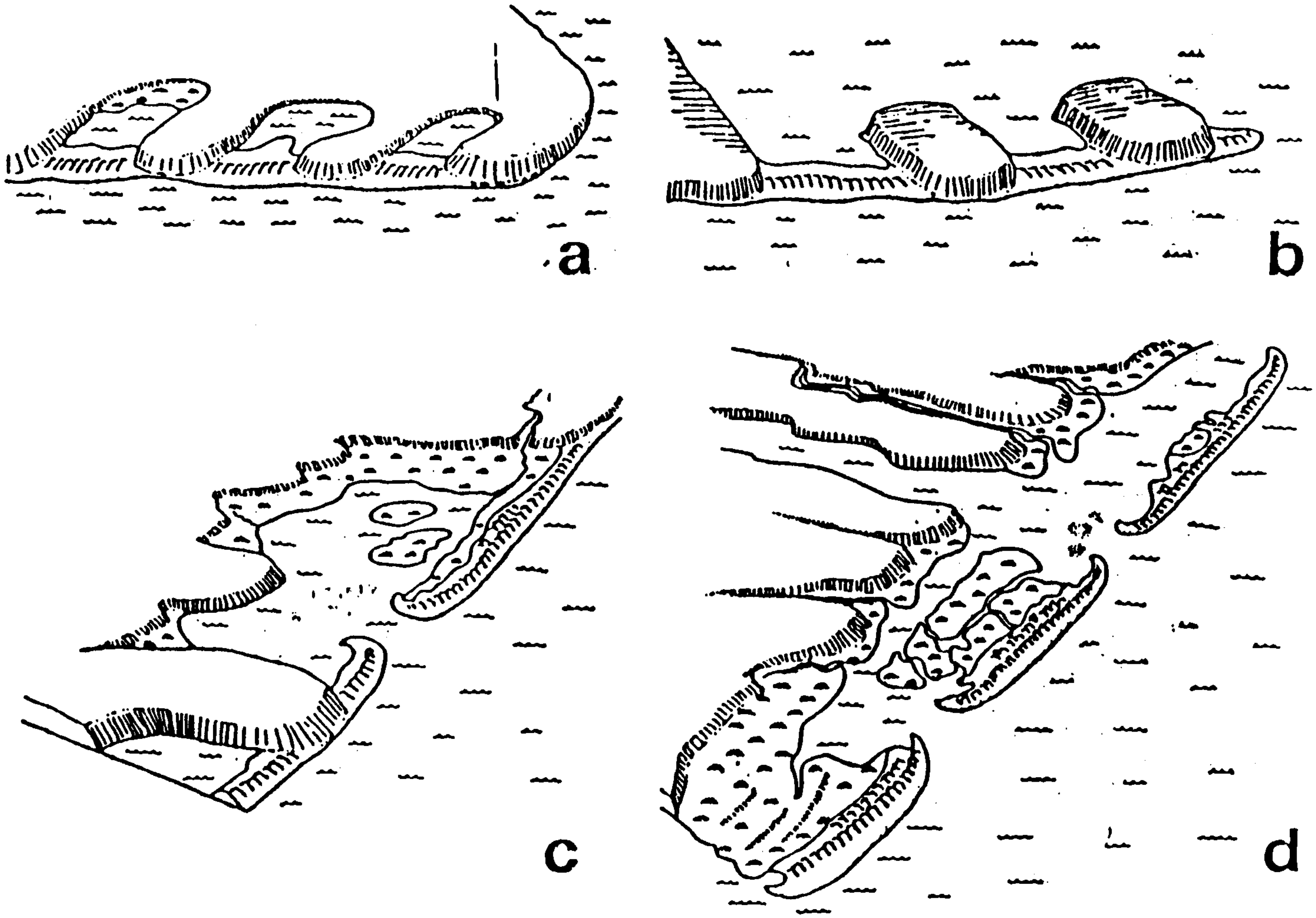


Figure 6-1. Four Examples of Coastal Barriers along the Atlantic and Gulf Coasts of the United States: a. Bay Barriers; b. Tombolos; c. Barrier Spits; d. Barrier Islands.

Composition of Coastal Barriers

Generally, coastal barriers consist entirely of unconsolidated sediment, composed of sand or gravel, but sometimes sediments include silt, cobbles, or larger rocks or are consolidated. For the purposes of this report, additional areas that function as coastal barriers are also included. These other classes are:

1. Areas containing carbonate-cemented deposits, such as:

   a) Local deposits of beach rock - found in tropical and semi-tropical regions, consisting of carbonate-cemented gravel and/or beach sand underlain or overlain by unconsolidated sediment occurring on a coastal barrier.

   b) Cemented dunes - found as local features in Puerto Rico where a carbonate-cemented dune line is located immediately seaward of a more or less typical coastal barrier, consisting of a beach (which may extend seaward to the cemented dune), dune and mangrove.

   c) Limestone islands in the Florida Keys, that are particularly subject to the wind, wave, and tidal energies of major storms and protect extensive and significant landward aquatic habitats.

2. Areas consisting primarily of silt and clay:

   a) Fringing mangroves - nearshore deposits of silt and clay stabilized by mangroves as islands (a.k.a. overwash mangroves) and bands of mangrove along subtropical or tropical mainland shores in areas of low wave energy. Many of these areas are located behind coral reefs, which together with the mangroves themselves, afford significant protection for the mainland from storm impact.

b) Cheniers - narrow wooded beach ridges generally following the shoreline and parallel to and enclosing marsh and mud-flat sediments on the landward side. Fine-grained shoreline sediments are typically seaward of the chenier. The plain extending along the coast of southwestern Louisiana is characterized by a series of these cheniers.

3. Areas containing glacial and bedrock deposits consisting of discontinuous outcrops of bedrock and coarse glacial deposits that comprise less than 25 percent of the coastal barrier landform above mean high water.

Factors that Shape Coastal Barriers

Wind, waves, and tides are the immediate forces which maintain and modify coastal barriers. The action of wind, wave (directly and by creating littoral, onshore-offshore or other currents), and tidal energy on unconsolidated sedimentary materials generally results in continuous linear or curvilinear features--a beach ridge or berm located along the unprotected side of the coastal barrier. Irregularities in the shape of the beach and breaks in the continuity of the linear/curvilinear features are admissible under these expanded definitions. Such breaks in linearity are found most often in coastal barriers located in embayments, tide dominated barrier systems, and chenier shorelines.

Where a suitable sediment source and sufficient wind, wave, and tidal energy exist, secondary coastal barriers occasionally develop on the mainland side of large bays or lagoons behind coastal barrier systems. These secondary coastal barriers are included in this report.

Associated Aquatic Habitat

Associated aquatic habitat includes all wetland (e.g., tidal flats, swamps, mangroves and marshes), lagoons, estuaries, coves between the barrier and the mainland; inlets; the nearshore waters seaward of the coastal barrier, including the sand sharing system; and, in some tropical areas, the coral reefs associated with nearshore mangroves. Under normal weather conditions, only aquatic habitats immediately adjacent to the coastal barrier are under any threat of wave attack. However, major coastal storms routinely affect the entire landward aquatic habitat, which the coastal barrier protects in varying degrees during these events. Therefore, for this report, the protected area is considered to comprise the area subject to diminished wind, wave, and tidal energy due to presence of the coastal barrier during a major storm.

This is an expanded definition reflecting the specific conservation purposes of CBRA to protect the fish, wildlife, and other natural resources of coastal barriers. All such associated aquatic habitats are inseparable parts of the coastal barrier ecosystem. All aquatic habitat between a coastal barrier and the mainland is protected by the coastal barrier from direct wave attack. Protection of this habitat and the mainland itself from wave attack during major storms has long been recognized as a fundamental function of coastal barriers.

Fringing mangroves and associated coral reef systems are considered as coastal barriers in tropical and subtropical areas because the protection afforded the associated aquatic habitat and mainland are comparable to coastal barriers that contain a linear or curvilinear beach.

"Undeveloped"

A coastal barrier is considered undeveloped if it contains less than one structure per five acres that is "roofed and walled" and covers at least 200 square feet. Once a coastal barrier has been identified, the development status of the unit is determined utilizing such terms included in CBRA as follows:

1. Few man-made structures:

A unit is considered undeveloped if it contains fewer than one structure per five acres of fastland. A man-made structure is defined as a walled and roofed building constructed in conformance with federal, state, or local legal requirements, with a projected ground area exceeding 200 square feet.

2. The structures and man's activities do not significantly impede geomorphic and ecological processes:

If a unit contains fewer than roughly one structure per five of fastland, it is considered undeveloped except when geomorphic and ecological processes are altered to the extent that the long-term perpetuation of the coastal barrier is threatened by one or more of the following:

a) extensive shoreline manipulation or stabilization,

b) pervasive canal construction and maintenance,

c) major dredging projects and resulting sedimentary deposits, and

d) intensive capitalized development projects, such as condominiums, which effectively establish a commitment to stabilize an area, even though there are few actual structures.

3. Any portion thereof:

CBRA does not require an entire coastal barrier to be included, and specifically allows for inclusion of undeveloped portions of coastal barriers. An undeveloped portion of a coastal barrier is included if there exists a minimum of approximately one-quarter mile of shoreline on the unprotected (seaward) side of the coastal barrier. Each unit must include an undeveloped area extending through the fastland from the beach to the associated landward aquatic habitat, and must independently satisfy the definitional criteria in Section 3 (1)(A) of CBRA. However, at the request of Rhode Island and Connecticut, certain areas in these states with a beach length less than one-quarter mile have been included in the draft inventory. Because of the massive scale of coastal barrier systems and the small scale of available topographic maps in Alaska, the minimum shoreline length for coastal barriers there is one mile.

"Otherwise Protected"

In accordance with the Secretary of the Interior's recommendation in the August 15, 1982 Report to the Congress under the requirements of the Omnibus Budget Reconciliation Act of 1981, coastal barriers held for conservation purposes are identified for the purposes of this report. A coastal barrier, or portion thereof, is defined as "otherwise protected" if it has been withdrawn from the normal cycle of private development and dedicated for conservation, wildlife management, public recreation, or scientific purposes. Protected status requires that there be evidence of an intent on the part of the administrator to protect the coastal barrier. This definition includes:

1. areas established under a federal, state, or local law which stipulates the purpose(s) of protection, or

2. areas established by a Presidential Proclamation under the Antiquities Act of 1906, or under a federal, state, or local executive directive which has its basis in law, or

3. areas subject to deed restriction or a conservation easement which withdraws it from the normal development cycle and establishes the purposes of protection, or

4. areas administered by an agency of the federal, state, or local government under a lease which stipulates the purposes of protection, or

5. areas held by an organization within the scope of Section 170 (h)(3) of the Internal Revenue Code of 1954, primarily for wildlife refuge, sanctuary, recreational, or natural resource conservation purposes, or

6. areas where the owner has established the intent to protect the area through a master plan or similar document establishing the purposes of the area, or

7. areas where the owner has provided a written statement documenting the intention to protect the area.

Delineation of Coastal Barriers for Purposes of This Report

Once a coastal barrier has been identified according to the expanded definition, presented above, boundary delineation of the draft coastal barrier units is made in the manner discussed below. For the purposes of this report, these criteria have not been applied to the CBRS as enacted in 1982.

Delineation of the landward boundary

On the landward side, the boundary is a line which encompasses the fastland core of the coastal barrier itself as well as associated aquatic habitat consisting of wetland (including tidal flats), shoals, islands, channels, and open water landward of the fastland portion of the coastal barrier.

In general, the landward boundary of coastal barriers, as defined to include associated aquatic habitats, follows some natural or cultural feature within or landward of the aquatic system. Such features should be recognizable on available maps or aerial photographs as well as on the ground.

Two basic types of aquatic environments, or combinations thereof, occur landward of coastal barriers. Each requires a somewhat different application of the general "landward boundary delineation" rule. These aquatic environments and the specific applications of the "landward boundary delineation" rule are as follows:

1. General case

The landward boundary is a continuous line which follows the interface between the aquatic habitat and the mainland, as defined on topographic maps and/or aerial photographs by a change in vegetation. The boundary is drawn not more than five miles landward of the mean high water line on the unprotected side of the coastal barrier (Fig. 6-2a).

2. Special conditions

a) Landward aquatic habitat

* Open water body greater than one mile wide landward of coastal barrier.

The boundary is drawn through the open water approximately one mile landward of the farthest landward extent of wetlands on the protected side of the coastal barrier (Figure 6-2b). If a discernable natural channel, man-made channel, or political boundary exists in the open water approximately one mile landward of the coastal barrier it is used as the landward boundary. For natural and man-made channels, the boundary is drawn along the side nearest the coastal barrier.

Exception: Because only small-scale topographic maps were available for the entire coast of Alaska, and because of the very large size of coastal barriers in this area, the boundary through open water was drawn as far

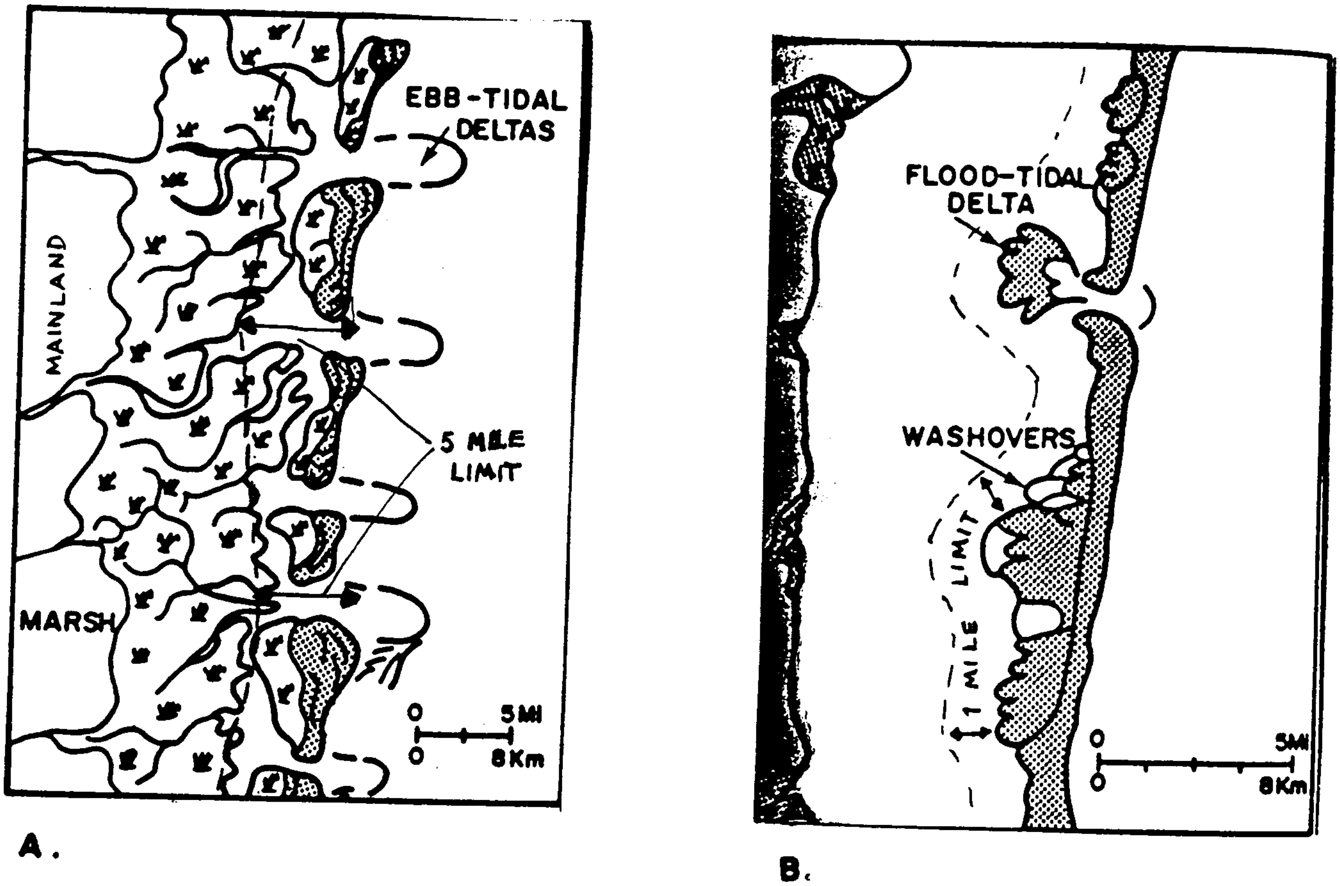


Figure 6-2. Landward boundary delineation in common coastal barrier settings. A. Typical case along shorelines where the landward boundary is drawn within the associated aquatic habitat approximately five miles from the mean high tide line on the unprotected side of the coastal barrier. B. Typical case along shorelines where the landward boundary is drawn through open water approximately one mile landward of the emergent wetlands on the protected side of the coastal barrier.

as five miles landward of the mean high water line on the unprotected side of the coastal barrier (i.e., general case criterion applied).

* Continuous wetlands that extend more than five miles landward of the coastal barrier.

  The boundary is generally drawn through the wetlands along an identifiable natural channel, artificial channel, or political boundary nearest to the five-mile limit in the manner described in (1). If such features are lacking, the boundary is drawn through the wetland generally parallel to and five miles landward of the mean high water line on the unprotected side of the coastal barrier.

* Watercourses that flow into the aquatic habitat from the mainland.

  The boundary is drawn at the first natural or artificial constriction with the drainage landward of the coastal barrier.

* Coastal barriers within large embayments and secondary coastal barriers within bays and lagoons.

  Because of limited energy affecting these coastal barriers, the boundary is drawn as described in the General Case above, but at not more than one mile landward of the mean high water line on the unprotected side of the coastal barrier.

b) Other coastlines

* Steep coastal topography (Pacific Coast, Great Lakes, Puerto Rico)

  In areas of tectonic uplift or glacial rebound, the wetland-mainland boundary is normally drawn not to exceed an elevation of 20 feet above the mean high water level of the system. In a few instances in the Great Lakes states, where continuous landward aquatic habitat extends to a higher elevation, the boundary is locally extended to as much as 40 feet above mean high water, where this allows for inclusion of the entire aquatic habitat. In Alaska, available 1:250,000 scale topographic maps generally have a resolution of 50 feet. The boundary was drawn along the 50-foot contour in cases where no other natural or artificial boundary could be used.

* Coastal barriers located at the mouths of intermittent streams (Pacific coast).

  In areas of intermittent stream flow, sand plugs frequently form during periods of low flow. These plugs may divert the stream for some distance parallel to the shoreline, creating a landward aquatic habitat. The boundary is drawn along the 20-foot contour on the mainland side of the aquatic habitat, as defined by the maximum documented extent of the stream channel or natural impoundment.

Delineation on seaward side

The unit contains the entire sand-sharing system, including the beach, shoreface, and offshore bars. The sand-sharing system of coastal barriers is normally defined by the 30-foot bathymetric contour. In the Great Lakes and in large coastal embayments (e.g., Chesapeake Bay, Delaware Bay, Narragansett Bay, Puget Sound), the sand-sharing system is more limited in extent. In these cases, the sand-sharing system is defined by the 20-foot bathymetric contour or a line approximately one mile seaward of the shoreline, whichever is nearer the coastal barrier.

Undeveloped coastal barriers, or portions thereof, are delineated using U.S. Geological Survey topographic quadrangle maps and, when available, recent aerial photography. For the purposes of this report, development status is determined solely on the basis of the density of visible structures. The following delineation criteria are used:

1. Undeveloped area adjoins continuous development

   The boundary is generally drawn perpendicular to the unprotected shoreline across the entire coastal barrier and the associated landward aquatic habitat at the break in development.

2. Undeveloped area contains isolated clusters of structures

   Clusters of approximately 10 or more structures are specifically excluded from the unit where the impact of the development on geological and ecological processes is local and confined primarily to the fastland on which the structures are located. A boundary is drawn around the cluster of development to exclude it from the unit.

3. Partially undeveloped coastal barriers: inclusion of associated aquatic habitat

   The entire associated aquatic habitat is included in cases where the coastal barrier is 50 percent or more undeveloped, as determined by the perpendicular projection of developed versus undeveloped portions on the unprotected shoreline. The boundary of the associated aquatic habitat is delineated in accordance with criteria in the previous section, except that the boundary on the landward side of the developed portion(s) is drawn along the interface between the aquatic habitat and the fastland portion on the coastal barrier. In cases where the coastal barrier is less than 50 percent undeveloped, the boundary is drawn as in (1) above.

4. <u>Undeveloped area adjoining intensively capitalized areas</u>

The undeveloped area immediately adjoining condominiums and similar intensively capitalized sites is excluded because it is considered committed to stabilization. The boundary is drawn to exclude the intensively managed or modified area immediately adjacent to these developments.

<u>Delineation of "otherwise protected" coastal barriers</u>

Once a coastal barrier or portion thereof has been identified as protected in accordance with one of the previous criteria, boundary delineation of undeveloped coastal barriers is made for the purposes of this report as follows:

1. <u>Size</u>

A protected area is included if its area is 10 acres or more, excluding submerged areas.

2. <u>Location</u>

A protected area is included anywhere on a coastal barrier, provided the minimum acreage is satisfied. Protected areas may comprise an entire coastal barrier, a strip through a coastal barrier, or an area on the landward shoreline, the seaward shoreline, in the interior of the coastal barrier, or in wetlands landward of the coastal barrier. Protected areas containing minor portions on the adjacent mainland may be included in their entirety for administrative convenience.

An exception is made for state and municipal beaches fronting on developed coastal barriers. Where protection is limited to the beach and berm, these are not included. Where such beaches front on an undeveloped coastal barrier, they are included.

3. Development

The development threshold of one walled and roofed structure per five acres of fastland applies. An exception is made for certain protected coastal barriers, or portions thereof, that contain within their legal boundaries both developed and/or undeveloped private tracts which are not protected by their owners. For purposes of delineating these protected units, the legally authorized boundaries of the "otherwise protected" areas were used without regard to the nature or level of development.

4. Boundaries

The administrative boundaries of many proposed areas shown on the U.S. Geological Survey topographic maps used in the draft delineations of coastal barrier units are in the draft inventory of coastal barriers prepared as a component of this report. However, the boundaries of other protected areas within the units are not shown, except in cases where these boundaries extend the normal boundaries of the coastal barrier units. Information from various sources on the boundaries of protected areas is available in the files of the Coastal Barriers Study Group.

Delineation of areas that become undeveloped at some point in the future

In the event that a natural disaster, such as a hurricane or tropical storm changes a previously developed coastal barrier into an undeveloped and unprotected coastal barrier in accordance with the previous criteria, boundary delineation would be made as follows:

1. Size

   An area that meets the definition of an undeveloped coastal barrier at some point in the future would be included if its area is 10 acres or more, excluding submerged areas, and its beach length is greater than 1/4 mile.

2. Location

   An area would be included anywhere on a coastal barrier provided the minimum acreage and beach length is met.

3. Development

   In an area where more than 50% of the structures existing prior to the storm or other natural disaster are destroyed, or more than 50% damaged and requiring substantial improvement/reconstruction, the area will then be considered undeveloped.

4. Boundaries

   Boundaries for this category are drawn in accordance with the delineation criteria for undeveloped coastal barriers.

A Comparison of the Report Criteria and Those Published by the Department of the Interior in 1982

The following summary section compares the definitions and criteria published by DOI in 1982 and used to delineate the original 186 CBRS units to the expanded alternatives discussed in this report. A rationale for each alternative is also briefly stated.

1. Distribution of coastal barriers

   Previously published: Atlantic and Gulf marine coastlines.

   Conservation Alternative: Along all coastlines and coastal embayments of the United States and its territories and including the Great Lakes.

   Rationale: Wind, wave, and tidal energies and rising sea level affect all United States shorelines. Coastal barrier landforms found on all United States shorelines perform similar functions. They all protect important landward aquatic habitats and provide the first line of defense for the mainland from the impacts of major storms.

2. Composition of coastal barriers

   Previously published: Unconsolidated sediments plus beachrock, and local bedrock/glacial deposits.

   Conservation Alternative: Unconsolidated sediments plus expanded definition of carbonate-cemented deposits, vegetationally stabilized sediments (mangrove islands and cheniers), and bedrock/glacial deposits.

   Rationale: Coastal barriers in tropical and subtropical regions commonly contain substantial amounts of carbonate sediment, which is prone to cementation. Cemented deposits may be local, as in the case of beachrock, or extensive, as in the case of emergent portions of the Florida Keys. These regions also contain extensive areas of mangrove-dominated shoreline. Both the carbonate-cemented and mangrove-dominated areas function as coastal barriers in protecting the mainland, especially during periods of storm activity. The amount of bedrock/glacial deposit allowed has been increased to as much as 25 percent of the coastal barrier unit. This is because substantial wave energies in the areas where glacial deposits occur (primarily New England, the West Coast, and the northern Great Lakes) frequently move sediments and change their composition.

3. Wave, tidal, and wind energies

Previously published: Linear or curvilinear shoreline required; waves of oceanic origin necessary.

Conservation Alternative: Generally linear or curvilinear shoreline, with some irregularities in the shape of the beach or breaks in the continuity of the linear/curvilinear feature allowed; waves may be either of oceanic or internal (bay or lake) origin.

Rationale: This change allows for inclusion of coastal barriers in coastal embayments, the Great Lakes, and along certain shorelines of fine-grained sediment. Although normal wind, wave, and tidal energies are not sufficient to maintain strongly linear beach features, these coastal barriers nevertheless provide substantial protection for the mainland during major storms.

4. Infrastructure

Previously published: Coastal barriers, or portions thereof, with fewer than one structure per five acres of fastland are excluded if there is a full complement of infrastructure, per definition below:

> "A full complement of infrastructure requires that there be vehicle access to each lot or building site plus reasonable availability of a water supply, a waste water disposal system, and electrical service to each lot or building site" (47 Federal Register 158, August 16, 1982).

Conservation Alternative: The only criterion used to determine whether a coastal barrier or portion thereof is developed is evidence of walled and roofed structures identified on the most recent topographic maps and/or aerial photographs available as well as assistance of State CZM technical personnel in some states. Exclusion of a coastal barrier unit or portion thereof on the basis of infrastructure is retained, but information required for documentation must be provided by the owner(s) of the land.

Rationale: The draft inventory of undeveloped coastal barriers comprises 1,335 units, totalling approximately 4,795 miles of coastal barrier shoreline and 9,184,362 acres of land. Detailed assessment of the status of infrastructure was not possible, given limitations of available information and resources. However, in view of the legislative history and administrative precedent documenting infrastructure as a legitimate basis for exclusion, the infrastructure criterion is retained.

5. Phased development

Previously published: Coastal barriers, or portions thereof, with fewer than one structure per five acres of fastland or lacking a full complement of infrastructure are excluded if they are part of a phased development, provided that the first phase of the development has been substantially completed. A phased development exists when commitments or legal arrangements necessary for and leading toward construction of either structures or infrastructure have been provided in a publicly documented plan being carried out in a diligent manner in general agreement with the schedule outlined in the original plan. Burden of proof for documentation rests on the owner.

Conservation Alternative: Eliminate this criterion.

Rationale: The exclusion of coastal barriers or portions thereof which lack any evidence of on-the-ground development appears inconsistent with the purposes of CBRA. This criterion was administratively developed under OBRA by the Department to allow for exclusion of presently undeveloped areas which are part of a long-term program of incremental development involving substantial capitalization. The criterion results in economic benefits for the developer, but may contribute to the degradation of the coastal barrier values identified in Section 2(a)(1) and (2) of CBRA.

6. Any portion thereof

Previously published: Portions of coastal barriers are subject to delineation if there exists a minimum shoreline length on the unprotected side of one-quarter mile.

Conservation Alternative: Retained, except in Alaska where a minimum shoreline length of one mile is suggested.

Rationale: Because of the massive scale of Alaskan coastal barriers and the limited availability of large-scale topographic maps and aerial photography, the one-mile minimum is the smallest area which can be delineated with reasonable accuracy.

Revision of this criterion to allow for inclusion of coastal barriers or portions thereof smaller than one-quarter mile in length was considered. Considerable support for this modification exists in New England where substantial numbers of small coastal barriers occur. However, this modification was not included because of difficulties in mapping these areas for the entire United States shoreline and the limited incremental benefits to be gained relative to the total United States coastal barrier shoreline included in a possible expansion of the Coastal Barrier Resources System. Only in instances where a State specifically requested that such areas be included, was an exception made.

7. Inclusion of otherwise protected areas

Previously published: Excludes otherwise protected areas.

Conservation Alternative: Include otherwise protected areas.

Rationale: Section 3(1)(B)(ii) of CBRA excludes areas established under federal, state, or local law, or held by a qualified organization as defined in Section 170(h)(3) of the Internal Revenue Code of 1954, primarily for wildlife refuge, sanctuary, recreational, or natural resource conservation purposes. These areas were also excluded under Section 341(d) of OBRA, which referred to them as "otherwise protected". In his August, 1982, Report to the Congress under OBRA, the Secretary of the Interior recommended that otherwise protected areas be included by legislative amendment. The report cited the difficulty in determining whether protection is actual and permanent, the significant problems associated with development of private inholdings within otherwise protected areas; and the unreasonable inconsistency in the treatment of undeveloped coastal barriers created by the exclusion. In accordance with this recommendation, and to reinforce the protection of areas administered for conservation purposes, coastal barriers or portions thereof are included if they have been withdrawn from the normal cycle of private development.

Differences in Delineation of Coastal Barrier Units

1. Delineation of the landward boundary

Previously published: Unit includes only associated aquatic habitats immediately adjacent to the coastal barrier.

Conservation Alternative: Unit generally includes all associated aquatic habitats between coastal barrier and the mainland.

Rationale: All associated aquatic habitats are inseparable parts of a single geological and ecological system. During a worst case storm event, coastal barriers reduce the effects of wave and tidal energies, but the entire aquatic habitat is affected by both the flooding during the storm surge and the subsequent withdrawal of water during the storm swash. All of the associated aquatic habitat is protected to some degree, but no part is immune to these processes. OBRA's prohibition on federal flood insurance for development was focused on the fastland portion of the coastal barriers where development primarily occurs; inclusion of large expanses of wetland was not considered necessary to implement that prohibition. The broader mandate of CBRA with regard to protection of coastal barrier ecosystems implicitly recognizes the extent of the entire system.

2. The boundary on the unprotected (seaward) side

Previously published: Unit includes the sand-sharing system.

Conservation Alternative: Thirty-foot bathymetric contour along oceanic shorelines; in lakes and coastal embayments, 20-foot bathymetric contour or one mile from mean high water, whichever is nearer the coastal barrier.

Rationale: This criterion could articulate more clearly the spatial extent of the unit; the extent of the sand-sharing system may vary with season or wave regime.

3. Isolated clusters of development

Previously published: Undeveloped areas must consist of continuous sections of coastal barrier between the unprotected shoreline and the landward aquatic habitat.

Conservation Alternative: Criterion is retained, except that dense clusters of isolated development are excluded from areas which otherwise qualify as undeveloped if effects on the prevailing geological and ecological processes are local and confined primarily to the fastland.

Rationale: Dense clusters of structures (10 or more) having local effects on the fastland, and occupying small areas in relation to the total area of the coastal barrier, are not considered to adversely affect the function of the entire coastal barrier system. Such clusters typically occur along roads. The exclusion of these areas, while retaining the remaining larger undeveloped portions, is considered consistent with the purposes of CBRA.

4. Landward aquatic habitat behind partially developed coastal barriers

Previously published: Landward aquatic habitat delineated as a narrow zone and only behind undeveloped coastal barriers or portions thereof.

Conservation Alternative: The entire landward aquatic habitat associated with the coastal barrier system is included in cases where the coastal barrier is 50 percent or more undeveloped as determined by the perpendicular projection of developed versus undeveloped portions on the unprotected shoreline.

Rationale: The emphasis of delineation under CBRA is on protection of functional coastal barrier systems. Conservation of a given parcel of landward aquatic habitat is dependent more on the general condition of the entire coastal barrier, including other surrounding aquatic habitat, than on the condition of narrowly defined zones of development on the adjacent fastland. The objective of this alternative would be to maintain the integrity of all aquatic habitats, including wetlands, associated with the coastal barrier, if the barrier is substantially undeveloped. As a rule of thumb, we have defined partially undeveloped coastal barriers as those which are 50 percent or more undeveloped.

5. Boundary criteria for otherwise protected coastal barriers

Previously published: Not applicable

Conservation Alternative: Include (a) all "otherwise protected" areas 10 acres or more in area regardless of their location on the coastal barrier, (b) "otherwise protected" areas anchored on the coastal barrier including detached wetlands, open water, and minor portions of the adjacent mainland, and (c) private inholdings, regardless of their development status, within the boundaries of "otherwise protected" areas.

Exception: State and municipal beaches fronting on developed coastal barriers are excluded.

Rationale: In accordance with the provisions of CBRA and the conservation objectives of the "otherwise protected" properties, these areas are included regardless of their location on coastal barriers provided that they are 10 acres or more in size. Inholdings within "otherwise protected" areas are included in order to reduce the federal participation in development of these tracts that could have an effect on the protective and ecological functions of the coastal barrier. Minor portions of "otherwise protected" areas on the adjacent mainland are included for administrative convenience. Municipal beaches confined totally to the beach and berm in front of developed areas are excluded because they are not considered subject to the normal cycle of private development.

6. <u>Areas that may meet the definition at some point in the future</u>

<u>Previously published</u>: This criterion has not previously been used.

<u>Conservation Alternative</u>: This criterion would address those coastal barriers that currently are developed according to the definition, but that, as a result of severe storm damage at some time in the future, qualify as undeveloped coastal barriers. During periodic review or following a Presidentially declared emergency resulting from a natural disaster on a coastal barrier, a previously developed area that meets the definitional criteria of an undeveloped coastal barrier would be delineated and recommended for inclusion in the CBRS.

<u>Rationale</u>: Inclusion of previously developed areas rendered undeveloped by natural causes could be consistent with the conservation, fiscal and health and safety goals of CBRA

CHAPTER VII

TAX POLICY ON COASTAL BARRIERS AS A CONSERVATION ALTERNATIVE

The existing Internal Revenue Code alters market signals and provides subsidies and incentives for development within CBRS units. Indeed, much of the intensive construction presently occurring, or that may occur, within the CBRS units appears to be directly subsidized by the existing provisions of the Code. The following scenario, while not perfectly applicable to any specific CBRS unit, describes the economic dynamics of development. As previously stated, the coastal zone is one of the fastest growing areas of the United States. The majority of the undeveloped and unprotected coastal barriers are or will be subject to development pressure within this century.

Prior to World War II, more than 90% of the coastal barriers of the Atlantic and Gulf of Mexico coastlines were undeveloped and largely inaccessible to the public. Following the war, coastal barriers underwent rapid and extensive residential development. This growth began in the urbanized Northeast in the 1950's and 1960's; involved Florida, North Carolina and Texas intensively during the 1970's; and today encompasses most of the remaining area suitable for development, focusing most intensively on the Sun Belt States. Today, approximately 29% of the Atlantic and Gulf coastal barriers are undeveloped and unprotected.

The reasons why coastal barrier real estate became so desirable lie in the increased affluence, mobility and leisure time of a progressively larger part of the American population. For many people, construction of a second home on a coastal barrier has come to mean a comfortable place for an annual vacation, considerable rental income, and various tax deductions for mortgage interest, depreciation and casualty loss in the event of storm damage.

In recent years, joint ownership, such as condominium and time-sharing concepts, has provided a way for people of modest means to experience the social and recreational benefits of owning a home or condominium at the beach. The ability to purchase a portion of a larger unit or shares in a corporation that develops and finances beach property and entitles the shareholder to occupy the unit for a specified time has lowered the cost and spread the risk associated with beach property ownership. The rapidly increasing population of young people who are relatively affluent has played a major role in creating the growing demand for residential development in coastal communities, particularly in the Sun Belt. In addition, a growing population of senior citizens has become more willing and able to invest in retirement communities in the year-round congenial climates of Florida and other southern states. The market for coastal barrier real estate created by young professionals and senior citizens augments traditional demand.

Interest in developing an undeveloped area arises for several reasons. For example, an improved transportation network will make a previously inaccessible location accessible by bringing small rural towns within commuting distance of a growing metropolitan area. For some this will mean extended commutes, for others a place to escape for weekends or vacations. Or, the traditional limitation for rural lands -- the carrying capacity of individual septic tanks and fields and the ability of an area to "perc" -- will be eliminated if the construction of EPA subsidized or privately funded waste water treatment facilities occurs in the area. As a result of either of these actions, property values will edge up and small farms will be purchased. Assessed values also will increase.

At this point several large tracts, most likely the beachfront or waterfront property, will be purchased by speculative buyers. Carrying charges will be low and it may be several years before the development itself begins since dredge and fill permits may be required and financing must be arranged. Financing may also be time-consuming but there are many options available. For instance, a local government eager for growth may assist with tax free bonds for the commercial aspects of the development or for low interest mortgages or for both (Miller, 1985).

For the individual purchaser in the development, interest on the loan and the property taxes can be deducted from income taxes. For the business purchaser, accelerated depreciation to offset income being generated elsewhere in the business and all of the ordinary and necessary business expenses that go into running and using such a facility will also be deductible. And, of course, both the individual purchaser and the business investor will be assured of at least a hedge against inflation and at best a significant gain on their investment. In any event, the gain realized will be a long term capital gain that will be taxed at a significantly lower rate than ordinary income. And, should storm damage occur, the casualty loss provisions of the Tax Code will cover most of the investment.

When land values increase, capital gains begin to appear attractive to the original residents of the area. Property taxes will also go up, however, and may be difficult to meet on a rural income level. The pressure to sell then increases. Eventually, the inevitable rise in local property taxes can force more and more land into the market place and the cycle will continue to gain strength.

Some residents will object and may organize for the purposes of protecting and conserving their community. But this can be an uphill battle as they have little to offer against the incentives provided by the developer. There will be no money with which to compete for the purchase of the large tracts that begin to sell. There will also be no real incentive for an eager seller to seek them out or sell to them. This will be particularly true if the seller has a stake in the continuing rise in property values; another tract to sell, for example.

Some individuals may consider a tax-deductible gift to a conservation organization but unless the owner has a very large income, the gift of a valuable tract of land may never be fully utilized as a federal tax deduction. Such a deduction is available as an offset against a portion of adjusted gross income only for a limited number of years. The land rich, cash poor, rural landowner will realize little advantage from such a gift. The gift of a conservation easement that would permit the owner to remain on the land will also be discouraged by the difficulty of establishing a valuation that the Internal Revenue Service can accept or the difficulty of adjusting local taxes to reflect the gift of an easement. The argument that the conservation not-for-profit land trust now owns most of the value of the tract may not be persuasive to the tax collector.

Conservationists may convince some of the long time property owners not to sell for awhile. These lands may eventually end up in probate as a part of a modest estate. At that point, the executor will probably find that the only way to pay the estate tax will be to sell the tract. Under a fiduciary duty to maximize the return to the estate, the land will eventually be sold to the highest bidder. The conservationist will have little to offer and the cycle will continue on.

Application of Tax Policy on Coastal Barriers

The language of CBRA and its legislative history provide no specific guidance as to whether the term "indirect financial assistance" was intended to include tax provisions such as casualty loss, capital gains, depreciation or mortgage and/or loan interest deductions under the Internal Revenue Code. Witnesses at the Congressional hearings on CBRA noted that continuation of such tax treatment helps make ownership of coastal property an attractive investment. They suggested that Congress clarify its intent towards the tax system.

The United States income tax was enacted in 1913. It was originally imposed at low rates and applied to fewer than 400,000 individuals with very high incomes. The need to finance World War II and expanded non-defense expenditures turned the individual income tax into a levy paid by most Americans. In 1954, the Internal Revenue Code was enacted. While it was a relatively simple, economically neutral system, even then some tax analysts experts criticized the fact that certain activities were accorded preferential tax treatment. During the last three decades, there has been enormous erosion in the tax base as tax-exempt actions have increased. For example, accelerated depreciation and deduction of interest expense combine to eliminate most taxes on income from debt-financed investments in real estate. Exclusions, itemized deductions and deduction value of credits offset about 34 per cent of personal income in 1982 as opposed to 18 per cent in 1954. Today over 90 million individual tax returns are filed. (Tax Reform for Fairness, Simplicity and Economic Growth, The Treasury Report to the President, November 1984.)

Exclusions and deductions mean that tax law, along with the market, has become a major force determining how economic resources are used. Over the years, the tax system has exerted a pervasive influence on the behavior of private decisionmakers. In coastal communities, tax-induced distortions have severe costs in terms of lost human lives, property, public revenues and natural resources.

Federal tax policy appears to have a major effect on the protection or development of the units of the CBRS. As stated in the Treasury Department's 1984 Report to the President:

> "The United States income tax is not used simply to raise revenue. Instead it is used to subsidize a long list of economic activities through exclusions from income subject to tax, adjustments to income, business deductions unrelated to actual expenses, deferral of tax liability deductions of personal consumption expenditures, tax credits and preferential tax rates."

A tax policy that is neutral toward development decisions on coastal barriers could reduce impacts on the fish, wildlife and other natural resources of the CBRS. Adjustment in federal tax policy could result in conservation by allowing development of the units of the CBRS to be based on market signals, unaltered by Tax Code provisions. Currently, major tax subsidies exist to encourage development. Repeal or reductions in these provisions could increase tax revenues and foster conservation.

A tax policy approach to conservation of CBRS resources could be relatively efficient to administer and could avoid governmental management of the units of the system, either directly or indirectly. Further, landowners could remain free to utilize their property as they wished, basing their investment decisions strictly on market prices.

Tax Policy as a Conservation Tool

The Tax Code has been scrutinized as a possible approach for natural resource conservation for many years (See Appendix S). It has not been successfully directed at the protection of any specific natural resource area for two fundamental reasons: inconsistency of such protection with established tax policy and lack of specifically identified and therefore quantifiable resources. Neither argument is applicable to the CBRS.

According to the Treasury Department,

> "Most of the exclusions, adjustments, itemized deductions, and credits currently found in the income tax are not required for the accurate measurement of income or ability to pay taxes. Rather, they are simply subsidies for private activities that are administered through the tax system." (Treasury Department 1984)

The Treasury Department has stated that for the past seven decades they have resisted manipulation of the Tax Code for achieving social goals, no matter how worthwhile. It is not surprising, therefore, that the Treasury Department has been reluctant to support the use of tax policy for conservation purposes. Revenue generation is only one of several important objectives typically considered on any major tax policy issue, however, and in recent years, policy implications of tax manipulation have become more obvious. An array of tax amendments have been proposed in Congress to address a variety of social and economic issues: Japanese auto imports, condominium conversions, revitalization of areas such as the South Bronx, and historic preservation.

Existing tax policy seeks to eliminate unnecessary tax subsidies and to increase tax revenues. As applied to the CBRS, such a policy might also protect natural resources.

Identification

Identification of natural areas worthy of federal attention has been the second issue in applying tax policy to the conservation of important natural resources simply because it is technically and politically difficult to authorize protection of non-specific areas. For example, without the creation of a strong identification process and the specific identification of areas that would serve a conservation purpose, the existing program to encourage the donation of conservation easements has been frustrated. Without a definitive listing of those areas truly worthy of protection, the specter of abuse has tended to offset the potential advantages.

Tax Policy Options

This section provides a discussion of tax policy options that is based, in part, upon the array of possibilities previously considered by the Congress. Appendix S chronicles these proposals and provides background information and citations. The concepts discussed in this section could neutralize Tax Code provisions that have the effect of altering market signals, and misallocating resources by encouraging the development and subsequent destruction of the CBRS units. The options have been grouped into two categories: tax options that reduce incentives to develop coastal barriers and tax options that increase incentives to conserve coastal barriers. No recommendations regarding the adoption of these concepts have been developed at this time.

A review of the dynamics of these concepts completes this section. The discussion concerns the manner in which these options could be applied; effective dates, grandfather provisions, sunset dates, and long-term versus short-term ownership questions all fall within this final category. In this regard, careful consideration must be given to any proposal that would affect development that predates the passage of CBRA.

Tax Options that Reduce the Incentive to Develop Coastal Barriers

1. Restrict the deductibility for casualty loss.

Under the Internal Revenue Code, all taxpayers, including owners of structures that are or may in the future be located on a CBRS unit are authorized to deduct any loss from fire, storm, shipwreck, or other casualty, or from theft, sustained during the taxable year and not compensated by insurance or otherwise. The only limitation is that the aggregate amount of all such losses sustained by an individual is limited to the amount that exceeds 10 percent of the adjusted gross income of the individual (section 165 of the Internal Revenue Code). This provision reduces the risk of financial loss for those individuals who build on CBRS units.

New development or redevelopment could be discouraged by removing or reducing the casualty loss deduction for losses incurred to such properties within CBRS units. This would both reduce tax expenditures and increase the cost of locating extensive development on units of the System.

2. Restrict depreciation allowances.

The Accelerated Cost Recovery System (ACRS) was established by the Economic Recovery Tax Act of 1981 and generally governs depreciation allowances for tangible property placed in service after 1980. ACRS assigns all "recovery property" to a class with a specified recovery period and depreciation schedule. In general, recovery property is define to include all depreciable property placed in service after 1980, except intangible property, property subject to amortization, and property for which the taxpayer properly elects a method of depreciation, such as the units of production method, that is not expressed in terms of years.

The pre-ACRS depreciation rules remain in effect for property placed in service by a taxpayer prior to 1981. In general, these rules allow taxpayers to recover an asset's original cost less salvage value over its estimated useful life. Taxpayers can elect among several rates of recovery ranging from straight line to methods that are substantially accelerated. Certain taxpayers can elect to depreciate assets under a system employing prescribed industry-wide class lives, with additional rules for salvage values, retirement, repair deductions, and other matters (the ADR system). (Treasury Report to the President, 1984).

If only a straight line method of depreciation for depreciable property located on a CBRS unit were permitted, the level of depreciation write-offs available for businesses locating on CBRS units would be reduced, thereby discouraging new development or redevelopment. This idea was initially discussed in the The First Nationwide Outdoor Recreation Plan with regard to wetlands preservation and was the subject of a legislative proposal in the same year (1973, introduced as H.R. 5584.)

3. Treat capital gains on sales of structures in the CBRS as ordinary income.

Currently, gains or losses from the sale or exchange of capital assets held for more than six months (one year for assets acquired before June 23, 1984) are treated as long-term capital gains or losses. Long-term capital gains receive preferential tax treatment. For individuals and other noncorporate taxpayers, 60 percent of net capital gain is excluded from income, with the balance of 40 percent taxable at ordinary rates. Thus, a taxpayer in the maximum 50 percent tax bracket has a marginal tax rate on net capital gain of 20 percent. For corporations, the regular maximum tax rate of 46 percent is reduced to 28 percent on net capital gain if the tax computed using that rate is lower than the corporation's regular tax.

A capital asset is defined generally as property held by a taxpayer other than (1) inventory, stock in trade, or property held primarily for sale to customers in the ordinary course of the taxpayer's trade or business, (2) depreciable or real property used in the taxpayer's trade or business, (3) rights to literary or artistic works held by the creator of such works, or acquired from the creator in certain tax-free transactions, (4) accounts and notes receivable, and (5) certain publications of the government (Treasury Report to the President, 1984).

If the Internal Revenue Code were amended to require any gain on the sale of structures or facilities constructed (or reconstructed) on CBRS units after the passage of CBRA to be treated as ordinary income, it would eliminate the use of the less costly capital gains tax rate, which in these situations would ordinarily be lower than the applicable income rates. Once again, this idea was initially discussed in The First Nationwide Outdoor Recreation Plan with regard to wetlands preservation and was included in H.R. 5584 (1973).

4. Disallow deductibility for certain business expenses.

If a provision were developed to disallow a business expense deduction for any draining, dredging, or filling within a CBRS unit, based upon the premise that draining, dredging and filling are inconsistent with the purposes of CBRA, it would prevent a business from writing off the cost of such activities conducted within a unit of CBRS. This was again a part of the 1973 discussion.

5. Restrict deductibility on interest expenses.

Currently, interest expenses on loans to finance purchase of residential or investment property may be fully deducted. If a program were developed that would deny deduction of interest expenses for loans used to finance the purchase or construction of structures on lands within a CBRS unit, it could foster conservation of coastal resources by neutralizing the economic equation involved in development and investment decisions.

Under the Treasury Department proposal, the home mortgage interest deduction would be retained for a taxpayer's principal residence. Certain other interest deductions, including consumer interest and interest on second homes would be allowed up to $5,000 in excess of investment income. This proposal could result in some conservation of resources in the CBRS.

6. Permit interest expense and tax deductions only for net income derived from CBRS lands.

A variation on the denial of interest expense deductions approach would be to permit interest and tax deductions attributable to land located on a CBRS unit only to the extent of net income derived from these lands. A similiar approach would be to limit the federal deduction for state or local property taxes paid on lands developed within a System unit. Under this option, state and local property taxes paid on lands that are either undeveloped or developed in a manner compatible with the protection of the natural resources of the System would be deductible at the federal level, but only to the extent of net income derived from these lands. State and local property taxes on incompatible development could be non-deductible on federal income tax.

Tax Options that Increase the Incentive to Conserve Coastal Barriers

7. Allow donation of federal income tax refund.

Under this approach, federal taxpayers would be offered the opportunity to donate all or a portion of their available federal tax refunds for the federal purchase of lands within a CBRS unit. These funds would then be provided to the agency most capable of acquiring and managing the particular lands in question. Priority could be given to the acquisition of lands under the greatest immediate threat with regard to the conservation of the fish, wildlife and other natural resources of the CBRS. This program could be modeled after the state income tax refund contribution system adopted by the State of Colorado in 1978 for funding its non-game animal program. As of 1982, seventeen states had passed similar legislation and others were actively considering it.

8. Allow tax exempt financing for CBRS protection purposes.

Presently, non-profit, conservation organizations have to obtain a revenue ruling from the Internal Revenue Service in order to utilize tax-exempt bonds to finance the acquisition of lands under the authority of the exempt activities portion of the industrial development bond section of the Internal Revenue Code (Section 103(b)(4). If this procedure were clarified to automatically include CBRS units, it would eliminate the need for following the highly complicated and technical revenue ruling process, which can be expensive and cumbersome. Tax-exempt financing for coastal barrier protection purposes would improve the natural resource capabilities of the not-for-profit conservation organizations and foster private initiatives. Private acquisition protection followed by limited resale could assist in the retirement of the bonds. While provision would result in a tax expenditure, Industrial Revenue Bonds presently represent a significant tax expenditure program that is not directed toward identified federal objectives.

9. Permit deductions for maintenance of compatible uses on CBRS units.

The tax options discussed above generally assume that a present landowner on a CBRS unit will develop that land unless discouraged from doing so. This is not always the case. There are owners who wish to maintain uses compatible with conservation goals such as hunting camps, summer camp sites, natural areas, etc. In some situations, however, a booming market, encouraged by the existing tax structure will strongly encourage development. For instance, the cost of paying state and local property taxes often makes low-intensity, compatible uses economically infeasible. Once development begins to occur on a CBRS unit, the increase in the assessed value of similar property and the subsequent increased property taxes become a driving force toward further development.

Property taxes are imposed at the state and local levels, and a number of ideas exist to address the issue of economic neutrality at that level. The general emphasis has been to provide some means of avoiding these increasingly high property taxes for uses determined to be important by state and local governments, i.e., conservation uses. There are at least three types of reduced assessments presently used by the various states to encourage conservation uses: 1) favorable assessments; 2) deferred taxation; 3) restrictive agreements. From a CBRA or conservation perspective, the critical goal for state and local government programs is the assurance of permanent resource protection. Without very rigorous provisions for recapture of tax deductions together with a significant penalty, or some form of continuing restrictions, these provisions may delay development, but will not avoid it. Given permanent protection, however, there are a number of possibilities for using the Internal Revenue Code to reinforce state and local reduced assessment programs. For example, state and local governments that encourage maintenance of existing compatible uses could be compensated for their revenue loss (a payment in lieu of taxes approach). Under this approach, recapture, together with a substantial penalty, could then be accomplished at the federal level to ensure continuity of protection.

10. Permit deductions for restoration of CBRS features.

The conservation of the fish, wildlife, and other natural resources of the System inherently includes the conservation of the ecological and geomorphic processes of these areas as well. If a barrier were added to the CBRS by Congress following a major storm, tax options for restoration could be made available. There may be a need to encourage short-term restoration of traditional coastal barrier features following major storm activities or to repair the effects of other human activities.

11. Permit deductions for appropriate siting of structures and facilities.

The siting, density and method of construction of structures and facilities on or adjacent to CBRS units has a significant effect on the conservation of their natural features. Therefore, an investment tax credit could be provided for development proposals that the Secretary of the Interior determines to be consistent with the conservation of the natural features of a CBRS unit. The investment tax credit concept presently available for an approved historic building rehabilitation is one example.

This approach could serve to encourage consolidation of ownerships and development of mainland construction sites that would permit CBRS units to be utilized for their natural features. A tax credit could provide major developers with an incentive to obtain a tract that extended from the mainland behind the dune line to the ocean and to dedicate in perpetuity the coastal barrier portion for a conservation purpose. This would again be a tax expenditure program. In many cases, this approach could complement and extend state and local efforts to manage coastal development through "set-back", "open-beach" or "dune-line" controls.

12. Preferential tax treatment on sales and exchanges.

In situations where a landowner is contemplating the sale or exchange of land located within a CBRS unit, for the most favorable price, and is not interested in making a tax-deductible gift, a number of tax options could be retained or provided to encourage the landowner to sell the property to a conservation organizations. While this tax-preferred approach would clearly continue or expand existing tax subsidies, it is included at this time as an option for discussion. There are two considerations: which conservation organizations could be targeted for preferential purchases; and what incentives could be utilized to encourage such sales.

The most cautious and clearly the most expensive approach to the United States would be to encourage sales only to federal agencies. Another approach would be to encourage sales or exchanges to state and local governments. A third alternative would be to provide these incentives to a landowner who sells to a qualified conservation organization, perhaps as defined in accordance with section 6 of the Tax Treatment Extension Act of 1980 concerning the donation of property for conservation purposes.

a. Allow preferential tax treatment on capital gains on sales or exchanges.

There are several ways to modify existing capital gains taxes to promote sales and exchanges to conservation organizations for a conservation purpose. These include a complete non-recognition of gain on the transaction; a deferral on the recognition of the gain and the payment of the tax and, a lowering of the maximum capital gain tax to be paid.

From a resource perspective, the strongest approach to encourage sales for conservation purposes would be to eliminate the capital gains tax for sales or exchanges to qualified conservation organizations. Such an option could be patterned after the non-recognition of gain provided for the sale of a residence by owners over age 55. An alternative would be to defer the payment of a capital gains tax if the owner reinvests the proceeds of the sale within 3 years or exchanges the property for other real property holdings. Such an exchange need not necessarily be for the same type (like kind) of property.

The maximum applicable capital gains tax on sales to conservation groups could also be lowered by changing the applicable percentage of the capital gains tax. Alternatively, the more favorable valuation rules with regard to estate taxes might be applied to these types of transactions. These provisions permit lands used in farming or closely-held businesses to be valued for estate tax purposes at their actual use rather than their highest and best use (which would reflect their development value). Under this approach, a property with an existing use compatible with the conservation of a CBRS unit that is sold or exchanged to a conservation organization for a conservation purpose would be valued for capital gains tax purposes at its actual use value.

b. <u>Preferential tax treatment on estate taxes.</u>

The tax option applicable to sales and exchanges generally could also be applicable to a sale or exchange by an estate. Estates could be provided with these incentives to sell or exchange key natural areas for a conservation purpose. In addition, the existing requirement on estates to pay estate taxes within 9 months of death could be modified when a sale for a conservation purpose was being negotiated. Some outside time limit would appear to be necessary. A Congressional initiative,H.R. 2871 (See Appendix S) proposed that in the event that a qualified conservation organization certifies that it intends to acquire a property for a conservation purpose from an estate, the estate tax attributable to such property shall be postponed for a period of 6 months after the sale (or until the decision is made not to acquire the property).

c. <u>Preferential tax treatment on settlements.</u>

A final approach that could be developed regarding sales and exchanges concerns the settlement of actions with the United States. At the present time, the Federal Government has no authority to accept title to property, on behalf of any federal agency, in the settlement of an action with a taxpayer. If the IRS were allowed to accept property as part of a taxpayer's settlement, and the taxpayer owned property within a CBRS unit, this authority could permit the United States additional flexibility in resolving such conflicts and in seeking to protect the CBRS.

<u>13. Specifically address CBRS units with regard to donations.</u>

Section 6 of the Tax Treatment Extension Act of 1980 provides the present authority for donations of conservation interests in land. There are currently no final regulations implementing this provision. Accordingly, it is difficult to determine whether or not properties within CBRS units will be routinely considered to serve a conservation purpose. One possible resolution of this uncertainty could be a legislative amendment that states that the various units of the System specifically serve a conservation purpose. Such a provision regarding property in National Scenic Trails was recently included in amendments to the National Scenic Trails Act by Public Law 98-11.

A second uncertainty with the donation of conservation interests to protect a CBRS unit is the difficulty of determining the degree of protection required to qualify. Section 170(h)(5) of the Internal Revenue Code provides that the conservation purpose of a qualified contribution must be protected in perpetuity. There is no definition, however, as to what that means with regard to coastal barriers and there is no automatic applicability to CBRS units. One resolution of this situation would be to legislatively require that the Department of the Interior certify that the donation establishes a level of protection that is adequate to conserve the fish, wildlife, and other natural resources of the System. This could be modeled after the historic preservation rehabilitation program, also administered by the Department. Alternatively, this certification responsibility could be delegated to the qualified conservation organization actually accepting the donation.

14. Increase incentives to donate property on CBRS units.

The possibility of increasing incentives for donations that serve a conservation purpose has been widely considered. Incentives could apply to both partial and total donations. At the present time, donation of an owner's entire interest can typically be made to any qualified charity. No protection of the fish, wildlife and other natural resources of a CBRS unit would necessarily be provided by such a donation. The program could provide distinctive treatment for the donation of an owner's entire interest in CBRS lands to a qualified conservation organization for a conservation purpose. Increased incentives for the donation of partial interests for a conservation purpose could also be established. Tax credits have generally been considered with regard to estate taxes and are discussed below.

Three types of increased incentives are addressed: 1) tax credit for a donation; 2) longer carry-forward period within which a donor can utilize a donation, and 3) change in the percentage of adjusted gross income that can be deducted in any one year. Changes in the valuation of gifts could also be appropriate.

a. <u>Provide carry forward and percentage of adjusted gross income tax credits.</u>

The general limitation under present law is that a deduction for contributions of appreciated property in any one year may not exceed 30% of adjusted gross income. The value of a gift exceeding this limit in the year of transfer may be carried forward for no more than 5 years. Proposals under consideration in the Congress would raise the maximum amount of such a deduction to 50% of adjusted gross income and permit an unlimited carry-forward thereafter. The application of this approach to properties located within a CBRS unit would be an incentive for conservation through donations.

In this way, the Federal Government would allow owners that do not have a significant yearly income to participate in the program. A farmer operating a marginal farm on a valuable parcel of land has little incentive to donate a conservation easement under the existing restrictions. Modifying these provisions could increase the number of beneficiaries, thereby increasing the probability that valuable resources could be protected.

b. <u>Provide credits against estate taxes.</u>

The relationship between a donation by a living property owner and the taxes that will be borne by that owner's estate is critical. The donation opportunities provided the executor of the estate are equally important. Both of these factors have been considered in several of the proposed conservation tax bills.

With regard to prior gifts, these bills have proposed a credit against estate taxes otherwise due in a variety of different ways. One approach would be to permit the application of any unused portion of a gift deduction arising from a conservation donation as an offset against estate taxes. This could apply to either a partial or an entire interest donation as long as it serves the requisite conservation purpose. The provision could include gifts to qualified conservation organizations for a conservation purpose, or merely gifts to the Federal Government.

A second option relates to donations made directly by the estate. The approach would allow the executor of an estate to make a conservation purpose donation and receive a credit against the applicable estate tax. The Deficit Reduction Act of 1984, section 805, contained an authorization for donations to the U.S. Forest Service to serve as a payment in kind for estate taxes in the case of two specified private estates.

c. Permit donations of CBRS property to be valued at pre-disaster valuations.

A corollary problem concerning all donations, but particularly important for donations of conservation interests, is valuation. Unrealistically low valuations of donations for a conservation purpose serve to undercut significant private conservation efforts. Low appraisals occur for two reasons. First, the ideal time to encourage the gift of property on a CBRS unit will be after a major storm. At that point property may be at its lowest value because of storm damage. Second, gifts of conservation easements may not appear to convey any value because the donor often remains in possession of the area. At the time of donation the donor may not appear to be foregoing any value. Often the donation simply continues a situation that has existed for years. The result can be a low or nonexistent valuation. That valuation will then discourage other donations and leave an incentive for development.

With regard to storm damage, a possible approach would be to permit conservation donations to be valued at pre-disaster prices. This could be true for real property alone or it could also apply to previously existing improvements in some reasonable manner. Such an approach could also be applicable to both total and partial donations, or it could be limited to the donation of an owner's entire interest. In either case, however, it would apply only to donations that provide conservation protection in perpetuity.

The second concern -- that conservation donations may not appear to convey any value -- is also resolvable. Statutory recognition of the importance of conservation easement donations for the long term is one possibility. Under this approach, the value of the reservation of a life estate or term for years would be disregarded. Of course, no reservation inconsistent with the conservation purpose of the gift could be permitted.

A simple approach with regard to donations that convey only a partial interest would be to apply the "scope of the project" rule. This standard appraisal practice insulates property values from the direct effect of a governmental program when that property is acquired by the United States. As applied to a federal program to encourage the protection of the CBRS units, such an approach could establish that this federal program would not diminish the value of conservation donations.

The value of the donation of a conservation easement represents the difference between the highest and best use before and after the donation. Prior to the government's recognition of the conservation value of these areas, their highest and best use would probably be for development. Accordingly, the value of the donation of a conservation easement would typically be great because the development rights being donated establish the highest value.

With the advent of a federal conservation program, however, the highest and best use would probably change to a conservation or recreation purpose. Those persons interested in owning an interest in a conservation or recreation area would be encouraged to purchase and the value of that interest would increase. The result of this change would be to diminish the difference in value before and after the donation and, therefore, make the value of a conservation donation insignificant. The government's conservation program would have diminished the value of the conservation easement not by changing the overall value of the property but by changing the nature of the highest and best use that would establish that value. Under the "scope of the project concept" this diminution in the value of the donation could be disregarded.

Enhancement in overall value resulting from a conservation program that may be adopted by the government could also be removed from the appraisal process. Typically, however, project enhancement does not make a coastal barrier valuable. It is valuable because of its location. Governmental protection efforts may merely change the nature of the use that creates that value and thereby diminish the difference in value of the property before and after the donation of the conservation interest.

Dynamics of Tax Options

The timing of tax changes may be as important as the changes themselves. The following discussion addresses these administrative concerns.

Sunset Provisions

A sunset provision on all incentives for conservation would have two significant effects. First, it would put an outside limit on the duration and, therefore, the cost of a tax incentive program. Second, it would encourage landowners to act quickly rather than delay a decision concerning the ultimate use of their property within a CBRS unit.

Effective Dates

The effective date of these types of provisions would also appear to be very important as well. If the effective date is related to the passage of the CBRA in 1982, and not to the enactment of any tax changes themselves, then developers would not be encouraged to build immediately in order to avoid possible disincentives in the future. The possibility of a rush to development is also an important consideration with regard to the need for a balance between incentives and disincentives. A law containing both incentives and disincentives would create less immediate developmental pressure than an approach that just discourages non-compatible development.

Grandfather Provisions

A corollary to the issue of effective dates is the question of providing certain continuing rights to owners in place at the time of the effective date. Continuation of traditional and compatible uses by original owners may be desirable. Accordingly, it may be appropriate to waive tax changes that would discourage these traditional and compatible uses. Such a grandfather provision would leave these owners in a status quo situation relative to the disincentives, but provide further incentives for conservation during the term that they are generally available.

The possibility of storm damage or destruction of existing development should also be considered. While it may be initially appropriate to exclude some previously existing development, it would be consistent with CBRA to discourage reconstruction in CBRS units.

It would also be possible to grandfather those eligibile for any tax benefits in the nature of an anti-speculation provision. The net effect would be to provide only original owners, i.e., those subject to the grandfather provision, with the incentives for conservation. This could discourage speculators from seeking to buy land within a CBRS unit in the expectation of receiving a substantial tax windfall. In this case, the incentives for conservation would only apply to those traditional owners that have actually conserved the natural resources of their property in the past. The disincentives would, of course, be applicable to all future purchasers.

State Tax Policies

Many states have tax provisions that are comparable to federal tax provisions, and these are not discussed here. Georgia, North Carolina, Maryland and Florida all allow donation of some form of conservation easement for tax credits to individuals or corporations who make qualified donations of interests in real property for conservation purposes. For example, Florida allows a property owner to surrender development rights for 10-year period. Renewable at the option of the owner, no property taxes are levied against the land and it is categorized as a nature preserve. Of course, this approach may only defer development.

Some states allow the donation of tax refunds towards acquisition of fish and game preserves. This is accomplished by providing a check box on the tax returns for the use of the taxpayer.

CHAPTER VIII

REGULATORY PROGRAMS ON COASTAL BARRIERS AS A CONSERVATION ALTERNATIVE

Federal Regulatory Authority

Regulatory programs, another important aspect of federal authority and intervention, are neither included nor addressed in CBRA. Several federal agencies, including the Army Corps of Engineers, the Environmental Protection Agency (EPA), and the United States Coast Guard administer regulatory programs that affect coastal barriers and their associated natural resources. Other regulatory requirements, such as those imposed by Executive Order 11988, Floodplain Management (May 24, 1977), apply to actions undertaken by any federal agency. All of these programs have the potential for limiting or modifying development on coastal barriers.

Section 9 of the Rivers and Harbors Appropriation Act of 1899 (33 U.S.C. 401) prohibits the construction of any bridge, dam, dike, or causeway over or in any navigable water of the United States without approval of the plans by the Army Corps of Engineers, and without the consent of Congress. This approval process is administered by the Army Corps of Engineers, except that authority for bridges and causeways was transferred to the Coast Guard by section 6(g)(6)(A) of the Department of Transportation Act, (49 U.S.C. 1655(g)(6)(A).) Section 10 of the Rivers and Harbors Act, (33 U.S.C. 403) prohibits the obstruction or alteration of any navigable water of the United States unless the work is recommended by the Corps of Engineers and approved by the Secretary of the Army. Covered activities include construction of any structure in or over any navigable water of the United States, the excavation from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters.

Section 404 of the Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. 1344) authorizes the Corps of Engineers to issue permits for the discharge of dredged or fill material into the waters of the United States. The selection and use of disposal sites must, pursuant to section 404(b)(1), be in accordance with guidelines developed by the EPA in conjunction with the Corps of Engineers. These guidelines are published in the Code of Federal Regulations (40 CFR Part 230) and are generally designed to avoid unacceptable adverse impacts on aquatic ecosystems and degradation or destruction of special aquatic sites. If the selection or use of a proposed disposal site would be prohibited by the guidelines, the Corps of Engineers shall in addition consider the economic impact on navigation of such a prohibition. The EPA may prohibit or restrict the use of an area as a disposal site if such use would have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas, wildlife, or recreational areas.

Sections 401 and 402 of the Clean Water Act (33 U.S.C. 1341 and 1342) are administered by the EPA. Section 401 requires that federal licenses or permits for activities involving any discharge into navigable waters may not be granted unless the state in which the discharge would originate certifies that the discharge will meet the applicable effluent limitation or other applicable limitation or standard. Section 402 establishes the National Pollutant Discharge Elimination System, under which permits are required for the discharge of any pollutant or combination of pollutants. Such permits may be issued only upon the condition that the discharge will meet the applicable effluent limitation, other limitation, or standard established under the Clean Water Act. Authority to issue section 402 permits has in most cases been transferred to the states.

Executive Order 11988, Floodplain Management, requires federal agencies proposing to support or allow an activity that will be located in a floodplain to consider alternatives that would avoid adverse effects and incompatible development in the floodplain. An agency may, however, approve or support an activity in a floodplain if that is the only practicable alternative and if the activity is modified to minimize potential harm to or within the floodplain. Executive Order 11990, Protection of Wetlands, directs federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative to such construction and harm to wetlands from the construction is minimized to the extent practicable. In carrying out this responsibility, agencies must consider the public health, safety and welfare, maintenance of natural systems, and other uses of wetlands in the public interest.

All of these regulatory programs have the potential to limit, modify, and even prevent development of coastal barriers. For instance, these programs require permits for the construction of causeways, bridges and docks, which may be the means of access to coastal barriers that are physically isolated. Permits are also required for many components of the infrastructure necessary for development, such as utility crossings and wastewater discharges.

Since the passage of CBRA in October 1982, over 250 federal permits for various types of construction activities on and/or adjacent to coastal barriers both within and without the CBRS have been issued. While these permits have authorized a number of different types of structures and activities, the greatest number have been issued for the construction of boat docks for individuals or marinas. The effects of these structures and their usage on coastal barrier resources and the extent to which these effects can be considered during the permit application evaluation process, illuminate the effect of federal regulatory program on coastal barriers.

Boat docks on or adjacent to coastal barriers are frequently associated with the construction of condominium complexes, and are often viewed as essential to the overall success of these types of development. Marinas usually require a combination of dredging, filling, and bulkheads and thus require a section 404 permit.

Dredging is required to provide adequate water depth so that boats may have access to and berth at the docks. However, dredging, especially in shallow waters, can have significant effects on natural resources. As discussed previously, the shallow waters found landward of the coastal barrier system, particularly those of the estuaries, embayments, and lagoons, are essential for the continued viability of the commercial and recreational fishing industries. When these areas are filled for buildings or dredged to depths adequate for navigation, biological productivity is greatly reduced or destroyed.

The bulkheading of the shoreline is often accompanied by backfilling to provide space for parking, boat slips, restaurants and other development. This eliminates the habitat value of the filled areas. In addition, the proliferation of the small boats that accompanies dock construction can create problems. For instance, marinas may not have facilities for pumping-out wastes from boats, or provisions for the disposal of boat waste oil in the vicinity of the marinas. In some areas the boats themselves can be a threat to wildlife, such as the endangered manatee, which has suffered injuries and mortalities from boat propellers. In addition, bulkheads are vertical, relatively smooth surfaces that reflect, rather than absorb, wave energy. The reflected energy, whether generated by wind or boat wake, often passes along the shoreline onto adjacent unprotected shoreline areas, thereby increasing their erosion rate. Moreover, depending on the type of bottom, the natural vegetation may be uprooted. Frequently, the installation of an individual bulkhead results in the eventual bulkheading of extensive reaches of shoreline with the further potential for adverse natural resource impacts.

Activities on coastal barriers that require federal permits can thus have far-reaching impacts. Several issues have emerged in our review that have implications for the future effects of these programs on coastal barrier development.

The first important issue is the scope of the Corps of Engineers' jurisdiction under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. The jurisdiction of the Corps under section 10 of the Rivers and Harbors Act is limited to "navigable waters of the United States," which is defined in 33 C.F.R. 322.2(a) and 33 C.F.R. 329 generally to include waters subject to the ebb and flow of the tide shoreward to the mean high water mark and/or waters used, presently or in the past, or susceptible to use to transport interstate or foreign commerce. The jurisdiction of the Corps under section 404 of the Clean Water Act is limited to "navigable waters," which is defined in turn by section 502(7) of the Act, (33 U.S.C. 1362 (7)), as "waters of the United States." As interpreted by the courts and implemented by the Corps in 33 C.F.R. 323, the scope of the Corps' jurisdiction under section 404 is significantly broader than that under section 10 of the Rivers and Harbors Act. It includes, for instance: 1) interstate wetlands (33 C.F.R. 323.2(a)(2)); 2) "All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce," (33 C.F.R. 323.2(a)(3)), and 3) wetlands adjacent to waters of the United States (33 C.F.R. 323.2(a)(7)).

Since wetlands are defined generally to include swamps, marshes, bogs and similar areas, and adjacent wetlands are defined to include "wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like," the Corps' section 404 jurisdiction might be interpreted to include wetlands behind and among the dunes on coastal barriers. However, the Corps has not generally, asserted section 404 jurisdiction over such coastal barrier wetlands. The general position of the Corps on this issue has been that wetlands under its jurisdiction must be used by interstate or foreign travelers for recreational or other purposes or be the source of fish or shellfish taken and sold or used in interstate commerce. This interpretation of the Corps' jurisdiction over wetlands means that section 404 permits are not always required for the dredging or filling of wetlands among and behind dunes on coastal barriers.

The extent to which the Corps asserts jurisdiction under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act is particularly important because of the general policies adopted by the Corps for evaluating applications for permits. These policies require attention to such public interest issues as flood hazards, recreation, water quality and safety, and require particular attention to wetlands and fish and wildlife concerns. (See 33 C.F.R. 320.4.) The Corps also consults with such agencies as the Fish and Wildlife Service and the National Marine Fisheries Service -- agencies with fish and wildlife conservation missions -- with respect to permit applications. The Corps' regulatory program thus requires consideration of two of the main purposes of CBRA -- protection of human safety and of fish and wildlife and other natural resources -- when any permit under the jurisdiction of the Corps is evaluated. To the extent, then, that the Corps interprets its jurisdiction as extending to coastal barriers, those areas may receive protection under the Corps' regulatory programs that would also be extended by CBRA.

As noted previously, the Corps of Engineers, in reviewing a section 404 dredge and fill permit application, uses the section 404(b)(1) guidelines promulgated by EPA at 33 C.F.R. Part 230 and its own policies set forth at 33 C.F.R. 320.4. The Corps' wetlands policy, for example, generally prohibits issuance of a permit for an activity that would involve alteration of wetlands unless the Corps determines that the benefits of the proposed alteration outweigh the damage to the wetland resource (33 C.F.R. 320.4(b)(4)). The manner in which this analysis is performed can have a significant impact on the usefulness of the permit evaluation process in protecting coastal barrier resources. Of particular importance are the identification and valuation of the costs, both environmental and economic, of altering the wetlands, and the extent to which the benefits calculation considers indirect costs that may be involved.

The wetlands permit evaluation policy also requires attention to the cumulative effects of numerous individual alterations of wetlands, because "the cumulative effect of numerous such piecemeal changes often results in a major impairment of the wetland resource" (33 C.F.R. 320.4(b)(3)) The requirement to consider the comulative effects of individual activities clearly has the potential for ensuring comprehensive protection of the wetlands resources of coastal barriers from the adverse effects of activities subject to section 404. However, the Congressional Office of Technology Assessment (OTA) noted on page 174 of its report, Wetlands: Their Use and Regulation (March 1984), that section 404 permits for activities in wetlands are rarely denied, unless substantial individual impacts are shown.

Executive Order 11988, Floodplain Management, also offers the potential of ensuring that federal agencies no longer support or allow activities within flood prone areas such as coastal barriers where there are practicable alternatives. Most federal agencies have issued regulations that implement the requirements of the Executive Order. The OTA wetlands report indicates, however, that these regulations have had little detectable effect on the issuance of federal permits for activities on or adjacent to coastal barriers.

State Regulatory Programs

A number of states, such as New Hampshire or Florida, have created a focus for coastal policies and actions through the networking of agencies and functions. Other states, such as Rhode Island, have created councils or agencies to specifically address and coordinate coastal actions. In 1971, Rhode Island created the Coastal Resources Management Council as the principal mechanism for management of the State's coastal zone. The Council has direct authority over the entire shoreline and those activities which will significantly affect the shore and tidal waters. It has direct permitting authority over all activities between the mean high water mark and the outward limits of the State's territorial sea, coastal wetlands, physiographic features and all directly associated areas continguous to and necessary to preserve the integrity of such areas and features. It also has direct permitting authority over a number of specific activities wherever they occur in the State. All Rhode Island state agencies are required to cooperate and act consistently with the Council's plans and programs for the coastal region. In addition, the Council's plans for the coastal region are an elaboration of, and fully consistent with the State Guide Plan. New comprehensive municipal plans must conform with the State Guide Plan. The Council has a detailed permit review process and is the last step for an in-state permitting procedure. It acts formally on an application only when all local and other state approvals have been obtained. Persons proposing alterations along the shoreline are informed by Council staff or by local authorities when a Council permit is required. Relevant proposed federal activities are channeled to the Council for review by staff at the Statewide Planning Program, the State's A-95 clearinghouse for coordinating state responses to federal proposals or actions. Applications for any activities that may come under Council jurisdiction are forwarded by other state agencies to the Council for review.

Most states have in place some sort of wetlands protection, which also serves coastal barrier conservation. For example, in 1978, Massachusetts enacted the Wetlands Protection Act, specifically including barrier beaches and dunes within its jurisdiction. Many other acts designed to protect and regulate activities on the coast followed. This movement culminated on August 8, 1980, when the governor issued Executive Order No. 181 on Barrier Beaches. This was the first order of its kind in the country and in effect created a state policy discouraging further government funding of new or old development on barrier beaches in the State. In 1981, the governor also issued Executive Order 190 - Regulation of Off-Road Vehicle Use on Public Lands Containing Coastal Wetland Resources, to exclude ORV use in sensitive environmental areas, specifically, dunes, salt marshes, and tidal flats, which support significant public interests.

Construction control lines are another way state governments conserve coastal barrier resources. The States of Florida and North Carolina, for instance, have established limits that are based on data such as longshore drift rates, 100-year storm surge levels, and elevations. These limits are not consistently reenforced at the local level. In some counties in Florida, however, the construction lines are more restrictive than the state limits.

An early act of some significance to Texas coastal dune protection was the 1970 decision to require permits from the county commissions for removal of sand, marl, gravel and shell within 1500 feet of any public beach. In 1973, the Texas State legislature passed the "Sand Dune Protection Act" which authorized those counties with jurisdiction over coastal barriers to establish a dune protection line 1000 feet landward of the mean high tide line. Once a county has established such a dune protection line, a permit must be obtained from the county commission to disturb dunes or vegetation seaward of the line. If a dune area under consideration for some alteration is judged as critical to the protection of state-owned lands, then the General Land Office may comment on the proposed activities. There is no required state permit, however, nor can the Land Office comment if the county has not adopted a dune protection line. A unique approach to dune protection has been taken in Port Aransas, Texas, where the builders together with city government, county and the local water district decided to impose deed restrictions against development in the first row of unstabilized dunes. The restrictions also prohibit seawall or bulkhead construction.

Regulations pertaining to post-storm construction provide another alternative for conservation. In New York, the Coastal Erosion Hazards Act has provided both set-back requirements and reconstruction policies for areas defined as coastal erosion hazard areas. In these locations, no new development may occur and further, no redevelopment may occur if more than 50% of a structure in these areas is destroyed by a storm. On Fire Island, the local communities, in cooperation with the National Park Service have implemented zoning regulations that make it impossible to rebuild in front of the primary dune line.

Conservation Alternatives

Various federal regulatory programs cover activities on and adjacent to coastal barriers. As discussed above, whether these programs cover all parts of coastal barriers, such as wetlands with no clear connection with interstate or foreign commerce, is questionable. Moreover, while all these programs require at least general consideration of the impacts of proposed activities on such natural resources as wetlands and fish and wildlife, none require specific consideration of whether the CBRA purposes -- minimization of loss of human life, wasteful expenditures of federal funds, and damage to fish, wildlife and other natural resources associated with coastal barriers -- will be met. As a result, federal agencies continue to issue permits for activities that are on and adjacent to coastal barriers and which adversely affect coastal barrier resources, despite the enactment of CBRA. The following alternatives affecting federal regulatory programs could help insure that permits are only issued for activities consistent with CBRA purposes.

1. Amend CBRA to require consistency with CBRA in federal permitting activities.

Legislation to require federal agencies to consider whether the CBRA purposes will be met prior to issuing permits for activities on or adjacent to coastal barriers is the most obvious alternative. The legislation could require that no such permit shall be issued unless the permitting agency first finds that the proposed activity would be consistent with the purposes of CBRA. An alternative formulation would be to impose a balancing test similar to that in the Corp of Engineers wetlands permit evaluation policy under which the permit could be issued despite inconsistency with the CBRA purposes if warranted by the benefits to be derived from the proposed activity. Still another alternative would be simply to require explicit consideration of the CBRA purposes prior to issuance of the permit. To each alternative could be added the requirement that the federal permitting agency consult with the Fish and Wildlife Service prior to issuing the permit, a role that the Service has already assumed regarding some exceptions to the prohibition on federal expenditures under section 6 of CBRA.

2. Impose a federal fee on federal permits in or affecting CBRS units.

A federal application fee could also be imposed upon anyone seeking federal permission to dredge or fill any wetland area within or adjacent to a CBRS unit. This charge could represent a percentage of the estimated enhancement in value that would occur should the permission be granted. Funds collected could be provided for land acquisition to the agency most capable of acquiring and managing those lands determined to be under immediate threat of development within a unit of the System. This program could be modeled after the local land transfer tax system that has recently been adopted in five eastern states. Several communities in Massachusetts and New York have addressed the problem of protecting coastal and recreation areas by buying and maintaining undeveloped land with the revenue from a tax on real property transfers. This is in essence the same approach as the fee option.

CHAPTER IX

ACQUISITION ON COASTAL BARRIERS AS A CONSERVATION ALTERNATIVE

Section 10 of CBRA directs that this report address acquisition for administration as part of the National Wildlife Refuge System as a conservation alternative. Accordingly, this section describes the goals of the National Wildlife Refuge System. This chapter also addresses unneeded federal property as a factor in the issue of acquisition.

The Land and Water Conservation Fund (LWCF)

Funding for federal land acquisition by the National Park Service, Fish and Wildlife Service, Bureau of Land Management, and the Forest Service, is derived primarily from the Land and Water Conservation Fund (LWCF). Under the administration of the National Park Service, the LWCF also provides funding for a state assistance program with 50-50 matching grants for the acquisition and development of outdoor recreation areas and facilities. The law authorizes deposits to the Fund of $900 million per year through September 30, 1989. All monies coming into the Fund remain available for appropriation in subsequent years. Not less than 40 percent of actual appropriations in any given year must be used for federal land acquisition. Since 1982, Congress has specified use of federal land acquisition monies on a site-by-site basis. Funds appropriated from the LWCF are without fiscal year limitation and remain available until expended.

LWCF funds come from recreation fees collected by the National Park Service, Forest Service, Bureau of Land Management, and the Fish and Wildlife Service; net proceeds of surplus federal real property sales to non-federal entities; and motorboat fuel taxes not to exceed $1 million. Any difference between the sum of these deposits and $900 million is provided by deposits of Outer Continental Shelf (OCS) oil revenues. About 82 percent of all deposits for the 21-year life of the Fund have come from OCS revenues.

The National Wildlife Refuge System

The National Wildlife Refuge System is a network of lands and waters in the United States acquired and managed by the U.S. Fish and Wildlife Service for the conservation of fish and wildlife resources. Over 400 refuges, encompassing nearly 90 million acres in 49 states and five territories make up the refuge system. They range in size from less than an acre to nearly 20 million acres.

In 1903, President Theodore Roosevelt signed an executive order protecting egrets, herons and other birds on Florida's Pelican Island from capture for the millinery trade. This made Pelican Island, located behind a coastal barrier and comprising part of a coastal barrier ecosystem, the first national wildlife refuge. There are now approximately 60 national wildlife refuges located, at least in part, in coastal barrier ecosystems on the Atlantic and Gulf coasts.

Today, the Fish and Wildlife Service undertakes land acquisition using two major sources of funding: the Migratory Bird Conservation Fund (MBCF) and the Land and Water Conservation Fund (LWCF). The Service also acquires land by donation and exchange and through excess federal property procedures.

The MBCF is principally composed of revenues from the sale of Migratory Bird Hunting and Conservation Stamps (duck stamps) and advance appropriations against future duck stamp sales authorized by the Wetlands Loan Act of 1961. The MBCF has historically been the backbone of FWS acquisition efforts and is reserved for the acqusition of waterfowl habitat in two programs. The first of these involves the purchase of major refuges for migratory birds carried out under the authority of the Migratory Bird Conservation Commission, comprised of the Secretaries of Interior, Agriculture and Transportation, and two members appointed from both the House and Senate. The second involves the acquisition of waterfowl production areas (small natural wetlands located mainly in the pothole region of the upper midwest) which are essential as breeding habitat for waterfowl. To determine acquisition priorities for MBCF, the Service has identified nine waterfowl species of special emphasis. The resource needs of these species have been translated into habitat categories, with primary emphasis placed on nesting habitat in the prairie potholes and wintering habitat in the Central Valley of California, the Mississippi Delta bottomland hardwoods, and along the Atlantic coast. Possible acquisition lands are reviewed by determining their importance in meeting these identified needs, the threat of conversion to other uses and the availability of the land for sale.

To illustrate, FWS is currently involved in an acquisition project to protect a coastal barrier using the MBCF on Currituck Banks in North Carolina. On August 2, 1983, the Migratory Bird Conservation Commission approved establishment of the Currituck National Wildlife Refuge to preserve an important segment of wintering habitat for the black duck. Here, the barrier beach protects marsh that not only provides valuable habitat for waterfowl, but also serves as a nursery for almost 50 species of fish and home for many other marsh and estuarine animals. This newly approved refuge is not entirely included in the CBRS.

The Fish and Wildlife Service is authorized to use the Land and Water Conservation Fund in support of a number of other established Service program objectives. Land acquisition can be an important recovery tool for species federally listed as endangered or threatened, since a majority of them have been listed due to habitat degradation or loss. Section 5 of the Endangered Species Act gives the Secretary of the Interior authority to acquire lands and water to conserve endangered or threatened species. The FWS considers acquisition only if a species recovery plan suggests habitat protection as a recovery measure and alternative protection strategies are not feasible.

The Fish and Wildlife Act of 1956 authorizes the Secretary to acquire refuge lands to assure the perpetuation of remaining examples of nationally significant habitats. For instance, in FY 1985, FWS is acquiring some of the last remnants of native brushland habitat in the Lower Rio Grande Valley, Texas. In an example more to the point of this report, Bon Secour NWR, located in a coastal barrier system in Alabama, was originally identified under this program and subsequently received special Congressional authorization in 1980. Part of the proposed acquisitionis within the CBRS.

The Refuge Recreation Act of 1962 authorizes FWS to acquire habitat that also may be used for fish and wildlife-oriented education, interpretation or recreation. For example, the Service has acquired properties adjacent to existing refuges to provide access where it might not otherwise be available for public use programs.

Finally, the Land and Water Conservation Fund Act also authorizes appropriations for refuges established by special legislation. For example, on October 26, 1984, the President signed P.L. 98-584, which authorized the establishment of the Connecticut Coastal National Wildlife Refuge over four sites along the Connecticut Coast. This refuge will provide nesting habitat for two birds which are candidates for lising under the Endangered Species Act, the roseate tern and piping plover. In addition, the refuge will provide wintering habitat for brant and black ducks, both species of special concern to FWS. With the exception of Falkner Island (currently owned by the Coast Guard), all of these islands designated for inclusion in the refuge are designated under CBRA. In this instance, however, Congress believed that CBRA would not provide adequate protection against development pressures in the densely populated Northeast, and that additional management actions not afforded by CBRA would be necessary to protect and enhance the wildlife resources. In this case, competition between the gull populations and the shorebirds of concern needs to be evaluated and controlled. Management of barrier use by boaters and sunbathers will also be necessary to prevent adverse impacts on beach-nesting birds.

FWS funding priority under LWCF has generally been given to areas which support endangered species and to specially legislated areas, in each case taking into account threat to the habitat and its availability. In addition, basic FWS policy is to acquire land only when other means of achieving program goals and objectives are not appropriate, available, or effective. When lands are to be acquired, the minimum interest necessary to reach management objectives is acquired and full consideration is given to extended use reservations, exchanges, or other alternatives that will lessen the impact on the owner. To carry out this land acquisition policy, a land protection plan is developed with public participation to consider, among other factors, the socio-cultural impacts of acquisition.

In summary, unless a refuge is specifically authorized by Congress, FWS acquires land only in support of specific program objectives and priorities, and according to specific statutory authorities. While donations are encouraged, FWS can accept them only in support of existing programs due to the management costs and needed efficiencies. (FWS acquisition of excess federal property is discussed in the next section of this chapter). For areas identified as priorities in meeting program objectives, designation in the coastal barrier resources system will be considered in determining threat to the habitat. To the extent that the elimination of federal assistance by CBRA is expected to encourage habitat conservation, habitat within a designated unit might be considered less vulnerable than habitat not designated and therefore given a lower acquisition priority. However, there may be some situations, such as the Connecticut Coastal NWR situation, where additional protection or management measures are required to conserve targeted natural resources.

Any evaluation of acquisition as a possible management tool must include a consideration of overall budgetary constraints. For example, in order to meet the challenge of reducing the federal deficit, the President's FY 1986 budget proposes a three-year moratorium on new acquisitions using the Land and Water Conservation Fund and requests no appropriations except for deficiencies, emergencies and administrative costs. Annual revenues to the MBCF from duck stamp sales average approximately $16 million per year; however, there is a current backlog of Commission-approved projects totalling approximately $80 million.

State and Local Acquisition

Clearly, acquisition of coastal barrier land by state and local governments is a conservation alternative for the CBRS. Much of the 4,164,844 acres identified in the draft coastal barrier inventory as "otherwise protected" are managed by state and local governments. All states have some sort of land acquisition program. Some states are aggressively focusing their acquisition programs on critical coastal habitat. For example, Florida's "Save Our Coast" program represents a state-wide effort to protect and preserve coastal resources. Implementation of this program has involved a $200 million bond issue in addition to placing a greater emphasis on the state's regular acquisition program.

Many undeveloped coastal barriers could benefit from state or local management in coordination with the attendent zoning or regulatory activities critical to conservation of coastal resources, such as fish and game management, that occur at the state level. Decisions relating to post-storm redevelopment generally occur at the state level and therefore provide a unique opportunity for conservation of coastal barriers.

Excess Federal Property

Disposal of unneeded federal property on coastal barriers may also be considered more specifically in the the context of CBRA purposes. At present, very little federal land exists within the CBRS. Federal lands presently in the System include parts of Camp Lejeune (North Carolina), Eglin and Tyndall Air Force Bases (Florida), and some Coast Guard stations. If, at some future date, any of this federal land should be declared excess, it may be desirable for disposal guidelines to take the purposes of the Act into consideration. Disposal of excess lands on coastal barriers outside the System should receive equal consideration.

The process of disposing of excess and surplus federal properties is spelled out in regulations issued by the General Services Administration (GSA), Federal Property Resources Board. Basically, when a federal agency determines it owns property that is no longer needed, it notifies GSA, which in turn, issues an excess property notice describing the available excess property. This notice is transmitted to every federal agency to determine the federal interest in acquiring the property at market value determined by GSA. If interest in acquiring the property is expressed by any federal agency, a statement justifying the federal interest in the property is prepared and submitted to GSA. GSA evaluates the agency's request and, if a legitmate federal need is established, the property is transferred to the requesting federal agency which reimburses GSA for the property's fair market value.

The transfer of excess properties between federal agencies at fair market value is in accordance with Executive Order 12348. However, the agency interested in acquiring an excess federal property can request transfer of the property without reimbursement at fair market value by asking GSA for a waiver of the requirement of Executive Order 12348. In such cases, the parcel must be shown to have "exceptional merit" for continued public use when utilized for recreation, conservation or preservation purposes. For example, DOI guidelines list property on, or eligible for inclusion in, the National

Register of Historic Places; wetlands, coastal barriers, or other fragile natural resources; habitat for endangered species; and property already utilized for or adjacent to an existing recreation/wildlife conservation area, as types that the Department would consider forwarding an application for exceptional merit. The proposed use of the property must represent its highest and best use.

If no federal agency expresses an interest to GSA in an excess federal property, the property becomes "surplus" to federal needs and is made available to states, counties, cities and certain nonprofit institutions. Federal surplus properties can be acquired by these entities for uses as parks, recreation areas, and wildlife refuges. These uses are eligible for a discount from the property's fair market value. In addition to the general authorities for transfer of property by GSA, special authorities exist allowing GSA to transfer properties for particular purposes such as for airports, schools or wildlife at discounts or for no payment. Such no-cost transfer must meet the "exceptional merit" criteria of Executive Order 12348.

The Fish and Wildlife Service, which is specifically mentioned in CBRA as playing a role in protecting barrier islands as a part of its programs, may apply for excess federal property under one of two laws.

1. Public Law 80-537, (16 U.S.C. 667b-667d), as amended: This statute states that when the Administrator of GSA determines that real property is no longer needed by a federal agency, it can be transferred to the Secretary of the Interior without reimbursement if the land has particular value for migratory birds and meets the exceptional merit tests.

2. Federal Property and Administrative Service Act of 1949 40 U.S.C. 471-535), as amended: This is the basic authority for the transfer of excess federal land to other federal agencies and is used to apply for property for other FWS programs. If the transfer is to be requested without reimbursement, a certificate that no funds are available or that funds would have to be diverted from other programs, and a case for exceptional merit must be furnished to GSA with the application. Under this same law, surplus property may be transferred to the states, also at no cost, if the lands have value for wildlife other than migratory birds.

Cape Charles NWR is an example of an area recently transferred at no cost to the Fish and Wildlife Service under P.L. 80-537, after meeting the "exceptional merit" criteria consistent with Executive Order 12348. This former air force parcel located on the Atlantic Coast is of value to migratory birds, contains habitat to support endangered species, augments existing national wildlife refuges, and is part of a larger study area delineated by the FWS for possible acquisition from private parties.

A Conservation Alternative for Surplus Property in CBRS Units

In keeping with the Administration policy of reducing federal spending and encouraging the optimum use of federal real property (E.0. 12348), GSA has published regulations requiring 100 percent reimbursement on the transfer of excess and surplus properties, with limited exceptions. Applications by federal or state agencies for such properties may be considered to have "exceptional merit" for continued public use when utilized for recreation, conservation, or preservation purposes. DOI policy gives priority to coastal barriers, among other areas, in determining those areas that may be forwarded to GSA for exceptional merit status. Existing GSA regulations could be modified to ensure that reimbursement would not be required when federal, state, local or private non-profit conservation agencies demonstrate a need for such tracts.

Another approach to consider is that GSA could notify prospective buyers when property is declared surplus that it is included in CBRS and subject to restrictions on future federal funding. Deed restrictions placed by GSA on any transfer of coastal barrier property, similar to the restrictions that may be placed on wetlands declared surplus federal property is also in keeping with the Executive Order. Restrictions providing for conservation or appropriate use of surplus federal property on a coastal barrier could reinforce the goals of CBRA and ensure that the Federal Government does not encourage development of coastal barriers through its excess property procedures. This concept could be applied to all federal property on coastal barriers, both in and out of the CBRS.

CHAPTER X

THE IMPACT OF FEDERAL GENERAL REVENUE SHARING FUNDS ON UNDEVELOPED COASTAL BARRIERS

CBRA exempts activities undertaken with general revenue sharing funds. These funds have been used for various purposes by local governmental jurisdictions since revenue sharing began in 1972. One philosophy behind general revenue sharing was to increase the freedom of local jurisdictions in making spending decisions, while at the same time lessening the burden of federal requirements that often came with other forms of financial aid. Therefore, the State and Local Fiscal Assistance Act of 1972 did not restrict the use of funds to specific functional categories or purposes. However, Section 10 (c)(4) of CBRA requires an analysis of the effect, if any, of general revenue sharing grants on undeveloped coastal barriers.

Since 1972, the State and Local Fiscal Assistance Act has resulted in considerable unrestricted federal payments to states (until 1980) and localities. Currently, almost 40,000 governments, Indian tribes, and Alaskan native villages receive funds at quarterly intervals. More than $4 billion is distributed each fiscal year. Money is divided according to interstate and intrastate formulas administered by the United States Treasury Department's Office of Revenue Sharing. Primary determining factors include population, per capita income, and the general tax base of recipient governments. Allocations of general revenue sharing funds, therefore, tend to be concentrated in those localities with large populations and high adjusted taxes. For example, in 1981-1982, approximately 39 percent of the disbursements went to 217 local governments with populations over 250,000, while less than two percent of the total funds went to 18,747 local governments with populations below 1,000. Some coastal barrier jurisdictions believe that they should receive larger shares of general revenue sharing because of their large populations of seasonal vacationers, which are not counted in Office of Revenue Sharing computations.

Purpose of Survey

The purpose of this analysis is not to assess the equity or success of the general revenue sharing formulations and allocations, but to analyze the effect, if any, that general revenue grants have had on undeveloped coastal barriers, as stipulated in Section 10 of CBRA. While the sums of money expended for general revenue sharing are vast (e.g., New York State has received about $8 billion since 1972), it appears that the impact of these funds as expended on undeveloped coastal barriers within coastal communities has been relatively minimal.

Of the 186 units in the Coastal Barrier Resources System, aerial photography revealed that 22 areas in six states have sufficient development (existence of physical structures) for general revenue sharing conceivably to have had an impact. These areas, identified by state and county, are listed below:

1 Shelter Islands, Suffolk County, New York
2 Napeaque, Suffolk County, New York
3 Broadkill Beach, Kent and Sussex counties, Delaware
4 Bethany Beach, Sussex County, Delaware
5 Topsail Beach, Onslow County, North Carolina
6 Wrightsville Beach, New Hanover County, North Carolina
7 Talbot Islands, Duval County, Florida
8 Usinas Beach, ST. Johns County, Florida
9 Matanzas River, St. Johns County, Florida
10 Ormond-by-the-Sea, Volusia County, Florida
11 Coconut Point, Brevard County, Florida
12 Blue Hole, Indian River and St. Lucie counties, Florida
13 Hutchinson Island, St. Lucie County, Florida
14 North Beach, Broward County, Florida
15 Cape San Blas, Gulf County, Florida
16 Four Mile Village, Walton County, Florida
17 Moreno Point, Walton and Okaloosa counties, Florida
18 Mobile Point, Baldwin County, Alabama
19 High Island, Chambers, Galveston, and Jefferson counties, Texas
20 Bolivar Peninsula, Galveston County, Texas
21 Follets Island, Brazoria County, Texas
22 Boca Chica, Cameron County, Texas

It should be emphasized that these CBRS units are undeveloped segments of coastal barriers adjacent to, or interspersed among developed coastal barrier segments.

Methods of Study

To assess the impact of general revenue sharing funds on these areas, officials of county and community governments with jurisdiction on coastal barriers were contacted. Usually these officials were finance directors or public works directors, but on occasion the county or city manager was interviewed. At other times, the knowledgeable individual was a special assistant to one of the top officers. These spokespersons were asked whether their government had used general revenue sharing funds for development activities on undevloped coastal barriers at any time since the aid program began in 1972. Development was defined as the placement or alteration of any physical facilities which would affect the natural processes of the coastal barrier.

Findings

The survey revealed that two jurisdictions out of the twenty-two surveyed-iVolusia County (Ormond-by-the-Sea) and the City of Fort Pierce (part of the city occupies the northern portion of Hutchinson Island), both on Florida's Atlantic coast --had used their federal funds for development, as defined. Coastal barrier jurisdictions proved to be similar to the rest of the nation in expending this assistance primarily for public health and safety. (Data source was annual reports filed with the Census Bureau.)

The governments differed in the nature of their commitments regarding general revenue sharing money. Some preferred to address immediate and temporary needs, while others spent their allocations for the same long-term programs year after year. An example of the former was St. Lucie County in Florida which saved its general revenue sharing fund for a new jail, presumably an immediate problem. An example of the latter was Broward County, also in Florida, which has used its funds in a long-term mass transit program for many years.

The two CBRS jurisdictions that made general revenue outlays for development did so for two very different purposes. For the nation's bicentennial, Volusia County opened the Ormond-by-the-Sea Bicentennial Park and used $50,000 of general revenue sharing funds in fiscal year 1975-1976 to construct a quarter-mile shell road from the main highway into the two-acre park. The county has spent no other revenue sharing money for coastal barrier development. The City of Fort Pierce, on the other hand, began a long range road paving program on Hutchinson Island in 1973, and has used nearly all of its general revenue sharing funds for this purpose since that time. When the program began, Fort Pierce, a city of 37,000 people, was receiving about $500,000 annually from general revenue sharing. Today that figure is about $390,000. City general funds and state revenue sharing money also were used in the project, which also included storm drainage work and utility improvement.

The Hutchinson Island section of Fort Pierce consists of new condominium projects mixed with older, single family houses and commercial buildings. According to the City Manager, the paving program is nearing completion, but intersection improvements and traffic studies which could draw upon general revenue sharing funds probably will continue. Construction of a one-way traffic loop in Fort Pierce is under consideration; however, most of the development on Hutchinson Island has occurred in the unincorporated portion, under St. Lucie County jurisdiction. The county has been saving its general revenue sharing funds for a new jail, as noted above, and is studying various means of financing bridge and road improvements which are needed to facilitate structural and population growth on the island. Adequate bridge access is deemed imperative to further growth on the 22-mile long island, which is hurricane prone and the site of a nuclear power plant. Private developers are prepared to participate, and are applying legal and other forms of pressure.

Analysis

In analyzing the impact of general revenue sharing funds at the two sites where local governments have drawn upon them for development projects, it was considered important to determine whether the projects would have been undertaken in the absence of revenue sharing. If so, the impact of the federal program would then perhaps be less than meets the eye.

According to a Fort Pierce official , the city was "absolutely committed," by a resolution passed in late 1972, to the road paving program. This implies that Fort Pierce would have found other means of revenue to attain its goals, perhaps financing through borrowing, increasing taxes or charges, or eliminating or reducing one or more existing programs. Without general revenue sharing funds, therefore, the paving program might have been undertaken anyway, although "maybe not as quickly." At the time, the roads in question were dirt arteries which moved traffic from residential areas of Hutchinson Island to the main highway.

By contrast, the Ormond-by-the-Sea Bicentennial Park and the road leading to it owe their existence to federal money, according to an official of the Volusia County Department of Public Works. The bicentennial park was the idea of a group of county citizens to honor the Nation's 200th birthday celebration. The park has a children's playground, basketball court, and tennis court, but general revenue sharing funds were used only for the road leading from the coastal highway to a point slightly inside the park entrance. The park is about a half block from the beach.

In sum, limited research revealed only one quarter-mile shell road leading to a small bicentennial park in Florida that owed its creation to the federal general revenue sharing program. However, the infusion of general revenue sharing funds may have freed up other money to be used for development. Documentation of this possibility would be difficult, but at least one local finance officer indicated that this may have happened. Some jurisdictions, however, stressed that their policies were to protect coastal barriers and discourage development there.

Conclusions

With two examples of the use of general revenue sharing funds for development purposes among the 22 areas studied, out of a total of 186 CBRS units, the impact of the federal aid program since its inception in 1972 appears relatively minor. And of the two examples, apparently only one of the developments, a small bicentennial park with a short entrance road made of shells, would not have occurred without federal financial support. Even if general revenue sharing funds helped divert other monies to development, it is unlikely that this impact is significant, given the relatively small amounts of general revenue sharing funds going to most coastal barrier jurisdictions containing CBRS units and the philosophy of many of these governments to discourage development on coastal barriers.

Nevertheless, the use of these funds by localities could continue to be monitored, because a potential impact may remain. The 22 more heavily developed coastal barrier jurisdictions could be contacted periodically about their most recent plans for or uses of general revenue sharing money. If new developments are planned or occur on the other coastal barriers, finance officers could be contacted regarding the sources of funding. If a trend is detected toward increased use of general revenue sharing funds in development activities a recommendation to restrict this federal funding outlet could be considered. At present, by the time general revenue sharing funds are divided almost 40,000 ways, the amount going to any one jurisdiction, especially the lesser populated ones that were typical of coastal barrier regions, are relatively small.

DRAFT REPORT TO CONGRESS

ON

THE COASTAL BARRIER RESOURCES SYSTEM

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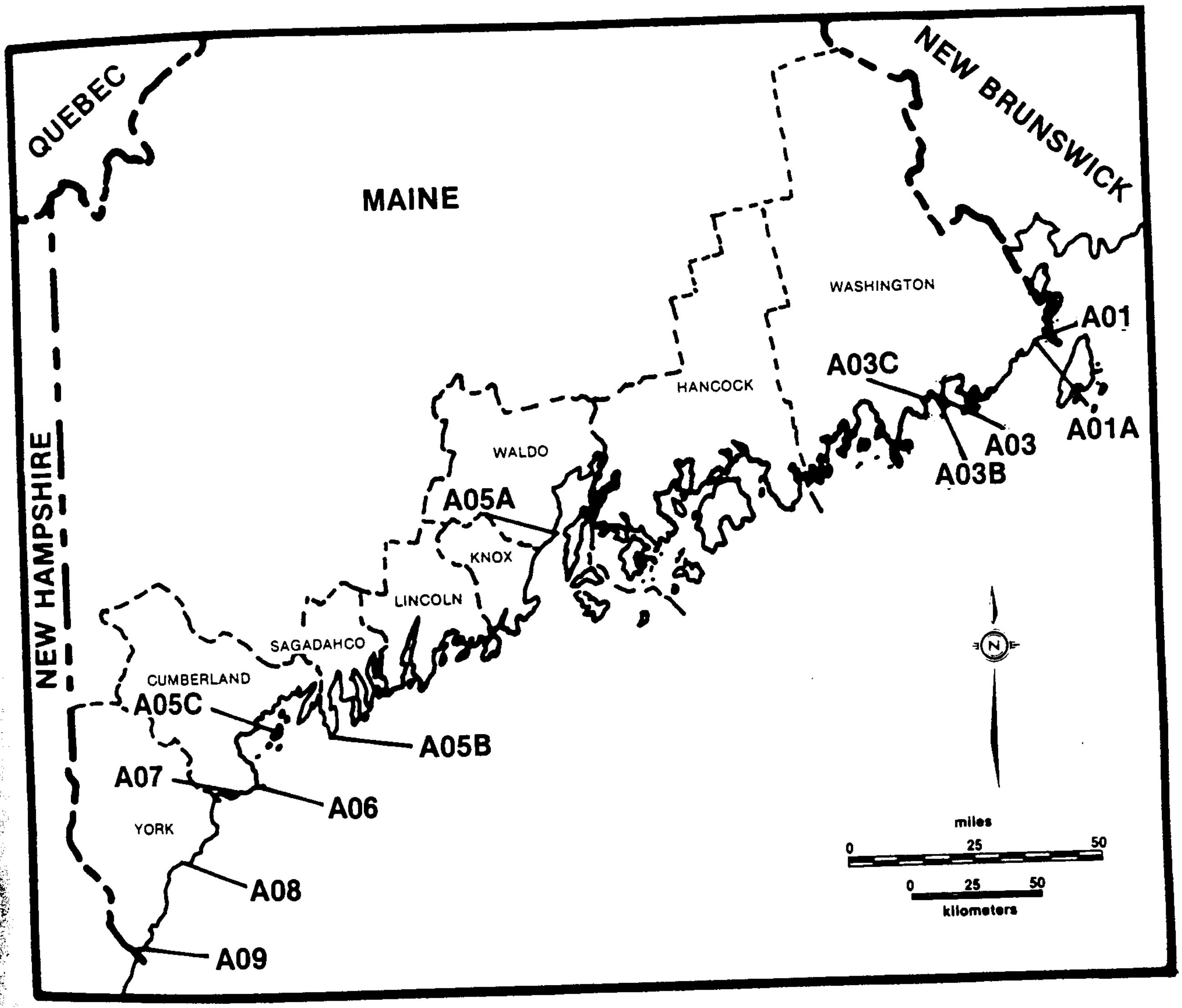
COASTAL BARRIER RESOURCES SYSTEM
MAINE UNITS



MAINE

Lying at the northeastern point of the conterminous United States, Maine contains 33,215 square miles, including 2,295 square miles of water, an area that accounts for nearly one-half of New England. It also has the largest coastal area in New England (3,400 miles) and is famed for its more than 3,000 coves, bays, fiords, and islands.

Maine's population is just over 1 million; of that, 47 percent are located in coastal towns that cover only 11.5 percent of Maine's total area. Much of the population is located in the major cities of Bangor, Waterville, Augusta, Auburn, and Portland which are located near the coast or on coastal rivers.

The natural resource base of Maine continues to be its extensive forest land and coastal environments. The primary resources are timber, sand, gravel, limestone and building stone, shellfish and oceanic fish. Peat is mined for horticultural uses, and there is growing interest in using peat for fuel.

The state has a wide range of topography ranging from the mountains (Mt. Katahdin being the highest at 5267 feet) and deep forests of central and northern Maine to the picturesque coves and bays of the coast. Its wildlife is equally diverse, including animals no longer or rarely seen elsewhere in the Northeast. Sea birds and mammals are particularly numerous along the coast. Maine has a wealth of lakes, rivers, and streams which provide excellent sources of recreation. Its rivers provide a means of transportation and power (38 percent of Maine's electricity comes from hydroelectric stations). The extensive estuary conditions associated with the Kennebec River is unique among rivers on the Atlantic Coast as the river supplies enough sediment from inland sources to create barrier beaches - the Reid, Popham, and Small Point beach systems - at its mouth (Trudeau, 1979).

The coastal area supports a diverse industry which still includes Maine's oldest and most traditional industry - fishing. In 1975, fishing contributed $249 million to the state's economy. Aquaculture is a growing industry and includes oyster, blue mussel and lobster culture, along with hatcheries for salmon and trout. Farming still continues along the coast, but has declined in recent years. Blueberries, dairy products, and poultry make up the agricultural mainstay.

Recreation continues to provide a major source of income for coastal communities. This has been especially important along the easily accessible southeastern region between Kittery and Bar Harbor. It is estimated that 5.5 million people visit Maine yearly, and two-thirds of these people go to the coastal region. Over 15 percent of all houses along the coast are seasonal homes. Nearly 77 percent of Maine's recreation related employment occurs in the coastal zone.

Mineral development includes the quarrying of rock (the coastal mines of Stonington are most notable) for export and limestone for use in cement and fertilizer plus sand and gravel for fill. Oil is imported at Portland and Searsport because of their deep harbors. There is growing interest in developing more deep water ports along Maine's coast. Most manufacturing is done in the five counties of York, Cumberland, Androscoggin, Sagadahoc, and Kennebec; four of which are coastal.

CBRS Units

Unit Name	Unit #	County	Beach Length (mi)
Lubec Barriers	AOI	Washington	0.3
Baileys Mistake	AOIA	Washington	1.5
Jasper	A03	Washington	0.2
Starboard	A03B	Washington	0.2
Popplestone Beach/ Rogue Island	A03C	Washington	1.8
Seven Hundred Acre Island	A05A	Waldo	1.2
Head Beach	A05B	Sagadahoc	0.7
Jenks Landing-Waldo Point	A05C	Cumberland	0.8
Cape Elizabeth	A06C	Cumberland	0.8
Scarborough Beach	A07	Cumberland	0.8
Crescent Surf	A08	York	1.0
Seapoint	A09	York	

A brief description of CBRS unit in Maine is provided below. Each unit is identified by its number, name, and the country in which it is located.

AOI-Lubec Barriers (Washington): This unit consists of two main parts: a tombolo beach connecting West Quoddy Head State Park with the mainland, crossed by an improved road to the park, and a long, thin linear barrier spit which runs southward from South Lubec toward West Quoddy Head in Lubec Bay. The spit has a sand road running its entire length and contains small dunes and strand vegetation. The spit protects a narrow bay and mud flat. A third part of this unit is a very thin spit running westward on West Quoddy Head just west of the Coast Guard Station on the north side. The unit is located in the Town of Lubec.

A01A-Baileys Mistake (Washington): This unit consists of a very small bay barrier protecting a small pond at the head of Baileys Mistake Bay, and a portion of shoreline around the north and east side of Baileys Mistake Bay.

A03-Jasper (Washington): This unit is also known as "Howard Cove Beach". It is a bay head barrier located between Seashore Mountain and Howard Mountain at the head of Howard Cove in the Town of Machiasport.

A03B-Starboard (Washington): This unit is a small spit jutting into Starboard Cove just south of the Village of Starboard in the Town of Machiasport. It includes a tidal flat and shoreline to the west of the spit. A light duty road runs out to the spit and a sand road crosses the tidal flat.

A03C-Popplestone Beach/Roque Island (Washington): There are two parts to this unit. One consists of a beach around the western side of Roque Island Harbor. The second is a short bay barrier called Popplestone Beach which protects a small pond. Both sections are in the Town of Jonesport.

A05A-Seven Hundred Acre Island (Waldo): This unit contains two thin bay barriers and associated salt marshes on either side of the south end of Seven Hundred Acre Island in Penobscot Bay in Isleboro.

A05B-Head Beach (Sagadahoc): This unit consists of a sand/cobble beach called "Head Beach" which connects Hermit Island to the western side of Cape Small in Phippsburg. Also included are tidal flats and low-lying portions on the south side of Hermit Island.

A05C-Jenks Landing/Waldo Point (Cumberland): This unit consists of two parts on the north and south sides of Johnson Cove on Great Chebeague Island in Casco Bay.

A06-Cape Elizabeth (Cumberland): Two sub units make up this unit in the Town of Cape Elizabeth. The eastern sub unit consists of a small cape behind Richmond Island protecting a small pond and wetland. The western sub unit contains a bay barrier just east of The Cod Rocks which protects a pond and marsh system.

A07-Scarborough Beach (Cumberland): This is a bay barrier protecting Massacre Pond and its associated marshes. Lands adjacent to both ends of the beach have residential developments, but the barrier itself is sparsely developed. Access to the area is primarily by two light-duty, paved roads. The beach is used for recreation by local residents. The area includes a freshwater pond, wetlands and barrier beach ecosystems. It is located in the Town of Scarborough.

A08-Crescent Surf (York): There are two spits in this unit both in the Town of Kennebunk. One extends east from a headland called Parsons Beach, the other extends westward and is called Crescent Surf. Between the two is an upland peninsula. The eastern spit borders on the Monson River Division and the western on the Upper Wells Division of the Rachel Carson National Wildlife Refuge. This area has a rocky intertidal region, a tidal creek/salt marsh ecosystem, and a pitch pine forest. Present development consists of at least four buildings which are serviced by private, light-duty roads. Access is by two private roads; one enters the northern end and runs south along the barrier until it meets a second road halfway along its length. The beach is used for recreation by local residents.

A09-Seapoint (York): This unit consists of two connected beaches on either side of a rocky headland called Seapoint; the northern beach is Seapoint Beach, and the southern is Cresent Beach. The unit is located in the Town of Kittery. Seapoint has a cobble beach backed by a storm ridge which has been modified by bulldozing for a road that is now closed. There is a freshwater marsh behind the barrier. Seapoint Beach receives moderate use by local residents. Access to the beach is by boat or by foot path down a dirt road closed to vehicles.

Coastal Resource Management

Maine's Coastal Program was established in 1969 and incorporated into the Coastal Zone Management Act of 1972 (CZM). Its jurisdiction includes islands, transitional and intertidal areas, salt marshes, wetlands and beaches, and extends, as required by the Act, seaward to the outer limit of the United States territorial sea. The coastal area extends inland to those areas which may have a direct and significant impact on coastal waters.

The State has passed at least 11 laws that address the coastal area. While the laws were passed to meet the requirements of CZM, other factors have helped to define Maine's coastal program such as:

An extensive inventory of natural resources including the development of over 200 maps;

The use of political limits to the area, rather than physical or cultural features to simplify implementation procedures and avoid inequities within a single town.

The use of the head of tide as a geographic and jurisdictional reference in a number of state laws

The eleven laws that make up the Maine Coastal Program and are administered by various agencies within the State system. They are the basis of a strong regulatory program for the coastal zone.

1. The Protection and Improvement of Waters Act protects the quality of state waters by classifying them and requiring licenses for proposed discharges. It is administered by the Board of Environmental Protection.

2. The Coastal Wetlands Act was passed in 1967 to protect the swamps, marshes, bogs, beaches, flats and other wetlands bordering coastal waters. It is administered by the Board of Environmental Protection.

3. The Shoreline Zoning Act requires municipalities to enact shore land zoning for areas within 250 feet of water. It is administered by the State Planning Office.

4. The Land Use Regulation Law promotes principles of sound land use planning in unorganized areas. It is administered by the Land Use Regulation Commission.

5. The Subdivision Law requires municipalities to review subdivisions according to minimum state criteria. It is administered by the Municipal Planning Board and Land Use Regulation Commission.

6. The Site Location Act controls large projects through permit procedures. It is

administered by the Board of Environmental Protection.

7. The Protection and Improvement of Air Law protects and enhances air quality by establishing standards and licensing proposed emissions. It is administered by the Board of Environmental Protection.

8. The Solid Waste Management Law promotes a coordinated state wide program regulating solid waste disposal. It is administered by the Board of Environmental Protection.

9. The Stream Alteration Act controls the alteration of flowing waters so that environmental quality is maintained. It is administered by the Maine Department of Inland Fisheries and Wildlife.

10. The Coastal Conveyance of Petroleum Act prevents, regulates, and expedites clean up of oil spills; regulates the transfer and conveyance of oil; and sets up a fund for effective clean up of spills. It is administered by the Board of Environmental Protection.

11. The Marine Resource Management Law provides for the conservation of marine resources through regulations. It is administered by the Maine Department of Marine Resources.

Local Actions

No information is available at this time.

Private Sector Initiatives

The Maine Coast Heritage Trust has been actively encouraging land owners to voluntarily restrict development on the coast, particularly on Parsons Beach and Jasper Beach in Machiasport.

The Maine Audubon Society has worked with the State to develop a "sand dune" statute and associated regulations.

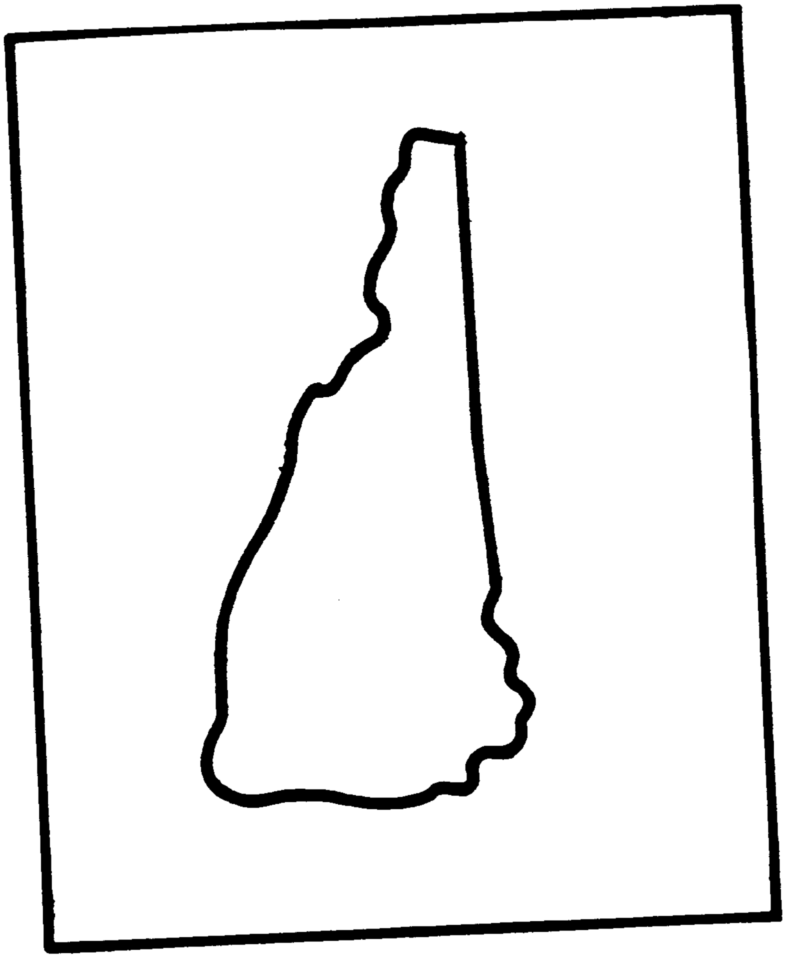
ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
A-05C	JENKS LANDING/ WALDO POINT	SAGAHADOCK	1	SOUTH HARPSWELL	N/A	N/A	NO CHANGE TO CBRS UNIT
ME-18	STOVER POINT	CUMBERLAND	1	FREEPORT ORRS ISLAND	0.38	18	UNKNOWN
ME-19	CRESCENT BEACH	CUMBERLAND	1	CAPE ELIZABETH	0.61	79	UNKNOWN
A-06	CAPE ELIZABETH	CUMBERLAND	1	CAPE ELIZABETH PROUTS NECK	N/A	N/A	NO CHANGE TO CBRS UNIT
A-07	SCARBOROUGH BEACH	CUMBERLAND	1	PROUTS NECK	N/A	N/A	NO CHANGE TO CBRS UNIT
ME-20	ETHERINGTON POND	YORK	1	BIDDEFORD	0.18	21	UNKNOWN
A-08	CRESCENT SURF	YORK	1	WELLS	0.72	370	ADDITION TO CBRS UNIT
ME-21	RACHEL CARSON	YORK	1	WELLS	N/A	1845	PROTECTED
ME-22	OGUNQUIT BEACH	YORK	1	WELLS	1.43	286	UNKNOWN
ME-23	PHILLIPS COVE	YORK	1	YORK BEACH	0.65	39	UNKNOWN
A-09	SEAPOINT	YORK	1	KITTERY	N/A	N/A	NO CHANGE TO CBRS UNIT
Totals:					20.56	5118	

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN MAINE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
ME-01	CARRYING PLACE COVE	WASHINGTON	2	HARRINGTON	0.42	151	UNKNOWN
ME-02	BIRCH POINT	WASHINGTON	2	EASTPORT	0.24	12	UNKNOWN
A-01	LUBEC BARRIERS	WASHINGTON	2	LUBEC	N/A	N/A	NO CHANGE TO CBRS UNIT
A-01A	BAILEYS MISTAKE	WASHINGTON	2	WEST LUBEC	N/A	N/A	NO CHANGE TO CBRS UNIT
ME-03	GRASSY POINT	WASHINGTON	2	CROSS ISLAND MACHIAS BAY	0.21	82	PROTECTED
ME-04	SEAL COVE	CUMBERLAND	2	CROSS ISLAND	1.70	56	UNKNOWN
ME-05	SPRAGUE NECK	WASHINGTON	2	MACHIAS BAY	0.70	70	PROTECTED
A-03	JASPER	WASHINGTON	2	MACHIAS	N/A	N/A	NO CHANGE TO CBRS UNIT
A-03B	STARBOARD	WASHINGTON	2	ROQUE BLUFFS	N/A	N/A	NO CHANGE TO CBRS UNIT
ME-06	BARE COVE	WASHINGTON	2	ROQUE BLUFFS	0.21	18	PROTECTED
ME-07	ROQUE BLUFFS	WASHINGTON	2	ROQUE BLUFFS	0.68	123	UNKNOWN

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
A-03C	POPPLESTONE/ROQUE ISLAND	WASHINGTON	2	JONESPORT	0.31	63	ADDITION TO CBRS UNIT
ME-08	FLAKE POINT	WASHINGTON	2	JONESPORT	0.31	25	UNKNOWN
ME-09	PETIT MANAN	WASHINGTON	2	BOIS BUBERT PETIT MANAN POINT	3.03	269	PROTECTED
ME-10	OVER POINT	WASHINGTON	2	PETIT MANAN POINT	0.32	20	UNKNOWN
ME-11	POND ISLAND	HANCOCK	2	CAPE ROSIER	1.00	23	UNKNOWN
ME-12	THRUMCAP	HANCOCK	2	MT. DESERT SWANS ISLAND	0.77	60	UNKNOWN
ME-13	STOCKTON HARBOR	WALDO	1	SEARSPORT	1.16	22	UNKNOWN
A-05A	SEVEN HUNDRED ACRE ISLAND	WALDO	1	CASTINE VINALHAVEN	N/A	N/A	NO CHANGE TO CBRS UNIT
ME-14	NASH POINT	KNOX	1	HEWETT ISLAND	0.52	14	UNKNOWN
ME-15	LITTLE RIVER	SAGAHADOC	1	BOOTHBAY HARBOR	1.49	415	MIXED
ME-16	HUNNEWELL BEACH	SAGAHADOC	1	SMALL POINT	2.49	663	MIXED
ME-17	SMALL POINT BEACH	SAGAHADOC	1	SMALL POINT	1.03	374	MIXED
A-05B	HEAD BEACH	SAGAHADOC	1	SMALL POINT	N/A	N/A	NO CHANGE TO CBRS UNIT

COASTAL BARRIER RESOURCES SYSTEM
NEW HAMPSHIRE



NEW HAMPSHIRE

New Hampshire, with a land area of 9,304 square miles, contains rugged mountain masses, upland plateaus, and hills, alluvial stream terraces, old lake bottoms, and a relatively narrow coastal plain. Within the 18 miles of Atlantic shoreline and 131 miles of tidal coastline, there are three discrete: the Atlantic seacoast, the Portsmouth Harbor/Piscataqua River area, and the tidal rivers and estuaries. The Atlantic shoreline includes public beaches, rocky shores and harbors and is committed primarily to fishing and tourism, with hotels and motels concentrated in the area of Hampton Beach. The Portsmouth Harbor/Piscatqua River area is a revitalized urban waterfront that caters to a mixture of tourism and water dependent industry. The remaining inland tidal estuaries are dominated by two estuarine systems: the Great Bay estuary and the Hampton Seabrook estuary - both relatively undeveloped.

The seven communities that border the Atlantic shoreline are located in Rockingham County, one of the fastest growing counties in the State. The population of these Seven communities has increased 14 percent between 1970 and 1980; an increase of 24 percent is projected by the year 2000. This growth has resulted in increased demands for housing, public services, employment opportunities, and recreation. The limited supply of land, water will continue to be under pressure to support growth and economic development.

CBRS Units

The CBRS as enacted in 1982 does not include any New Hampshire areas.

Coastal Resource Management

As early as 1927, the New Hampshire legislature began to study the feasibility of development in the Hampton-Seabrook marshes. A long range plan for development of Great Bay was initiated in 1941.

Beginning in 1971, the state planning office initiated a comprehensive program to study coastal area problems and alternative methods for managing coastal resources. Between 1974 and 1981, New Hampshire worked to develop a coastal program, supported, in part, by the federal Coastal Zone Management Act of 1972 and by state funds when federal development funds were no longer available. Comprehensive coastal legislation was defeated in 1977 and 1979. An advisory committee was appointed in 1979 to provide a forum for discussion of coastal issues and to assist in drafting legislation for consideration by the 1981 session of the legislature. When this bill, too, was defeated, the Office of State Planning reviewed the State regulatory system and developed a coastal program relying on existing state statutes rather than using a mew legislation approach. The New Hampshire Coastal Program: Ocean and Harbor Segment was approved by the Office of Ocean and Coastal Resource Management, Department of Commerce, in May 1982. Work is currently underway to extend the program to include the tidal rivers and the Great Bay estuarine system.

Coastal policies, including laws, ordinances, and regulations, are coordinated by the New Hampshire Coastal Program (NHCP) which is based on the concept of networking the management functions of state agencies, while relying exclusively on existing state laws, regulations, and agency programs. Seventeen coastal policies have been taken directly from statutes, regulations or procedures established by the State. Those dealing with coastal barriers are:

<u>State ownership of beaches and parks (RSA 12-A)</u>

<u>Dredging and Alteration of Terrain Permit (RSA-149)</u>

<u>Fish & Game Endangered Species Act (RSA 212-A)</u>

<u>Water Supply and Pollution Control Commission (RSA 148, 149)</u>

<u>Fish and Game Department.(RSA 211 212, 214)</u>

<u>Energy Facilities Siting Laws (RSA 162-H)</u>

<u>Department of Resources and Economic Development, Beach, Parks, Historic Sites and Fish Piers Management (RSA 12-A)</u>

<u>Port Authority Regulations and Operations (RSA 271-A)</u>

<u>The Dredge and Fill in Wetlands Act (RSA 483 A)</u> is the primary means for controlling development in the coastal zone. It requires that any person desiring to

"excavate, remove, fill, dredge or construct any structures in or on any bank, flat, marsh or swamp in or adjacent to any waters or wetland of the state" must first obtain a permit from the Wetlands Board. Adjacent areas include all lands submerged or flowed by the mean high tide and those areas that border tidal waters (such as salt marsh) whose surface is at an elevation not exceeding 3 1/2 feet above local mean high tide and upon which are capable of growing some, but not all, of sixteen types of wetlands vegetation enumerated in RSA 483-A: 1-a are capable of growing, and any sand dunes in the Town of Seabrook.

This law also established a Wetlands Board for the purpose of carrying out provisions of the law and to decide matters relative to resources of the state, including, but not limited to excavating, dredging and filling waters of the state. The jurisdiction of the Board covers both fresh and tidal waters and as a result has prevented the filling of salt marshes. The Wetlands Board has 17 members: 5 from the Water Resources Board, 3 from Fish and Game, 2 from Water Supply and Pollution Control, 1 each from Public Safety, Public Works and Highways, Resources and Economic Development, and State Planning; 3 representatives are appointed by the governor and must include a municipal conservation commission, a conservation district and an elected municipal official.

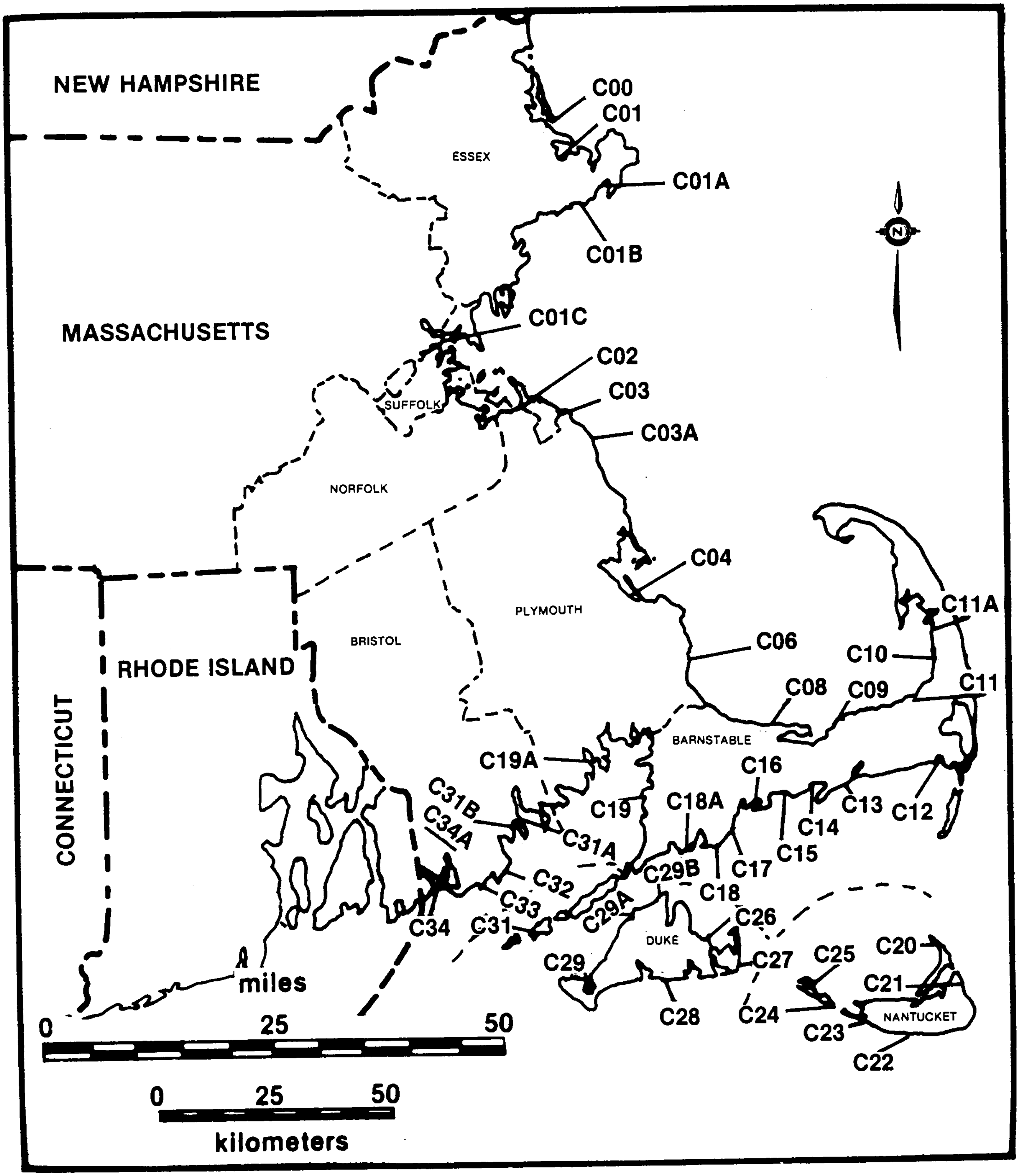
Local Actions

The New Hampshire Association of Conservation Comissions monitors the meetings of the Wetlands Board described above.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN NEW HAMPSHIRE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
NH-01	WALLIS SANDS BEACH	ROCKINGHAM	1	KITTERY, ME-NH	0.10	54	MIXED
NH-02	RYE HARBOR	ROCKINGHAM	1	KITTERY, ME-NH PORTSMOUTH, NH	0.82	103	MIXED
NH-03	EEL POND	ROCKINGHAM	1	HAMPTON	0.18	23	PROTECTED
NH-04	BASS BEACH	ROCKINGHAM	1	HAMPTON	0.30	43	PROTECTED
NH-05	HAMPTON BEACH	ROCKINGHAM	1	HAMPTON	0.35	43	PROTECTED
Totals:					1.75	266	

COASTAL BARRIER RESOURCES SYSTEM
MASSACHUSETTS UNITS



MASSACHUSETTS

The Commonwealth of Massachusetts occupies only 8,257 square miles, but with over 1,200 miles of coastline, its beach legnth ranks second in New England. Its population of over 6 million represents an amalgamation of many ethnic groups who have migrated to the state since 1620. Its major cities saw a population decline during the 1960's and 1970's, while the state grew by 10.5 percent as a whole. Most of the state's population is concentrated in the coastal strip between Cape Anne and Cape Cod with Boston and its suburbs containing the largest number of people.

The state's economy has long been based on manufacturing, fishing and farming. By the 1850's nearly 90 percent of the state's forests had been cleared for agricultural use. The Connecticut Valley was, and remains, one of the best agricultural areas in New England. Recently, "high-tech" industries have combined with traditional manufacturing. Education has been a major industry in the state with more colleges and universities per capita than any other region of the country.

Recreation and tourism are growing industries in the state, especially in the Berkshires and along the coast. Over 8.5 million people visit the state annually, adding over a billion dollars to the economy. Many visitors head for the coast - Cape Cod and the islands of Martha's Vineyard and Nantucket.

Like Maine and New Hampshire, the state contains mountains in the west (the Berkshires with Mt. Greylock at 3,491 feet the highest point), a major river valley (the Connecticut), uplands in the central region, and a coastal plain in the east and southeast made up of glacial deposits of sand and gravel. Offshore from the mainland are two large islands, Nantucket and Martha's Vineyard which share their glacial origins with Cape Cod. They are mostly sand and gravel and the wave action of the Atlantic has produced magnificent beaches, protected bays and harbors. The vegetation of Cape Cod and the Islands is similar - salt marshes, coastal dune strand, scrub thickets, oak-pine forests on the uplands and beech-red maple forests on old dunes and north facing glacial slopes. In the past, southeastern Massachusetts was covered by extensive heathlands. Today, only remnants of this coastal heath remain on Cape Cod and Martha's Vineyard, but Nantucket is still mostly covered in heathlands. The coastal region is extensive with many salt marshes, bays, sounds, rocky shores, beaches, dunes, and marine bluffs. Some of the largest salt marshes in the state are found behind Plum Island and Crane's Beach in the northeastern part of the state. Both barrier beaches and their associated wetlands resulted from erosion of the glacial ridges common in that region. Rocky shores are found between Cape Anne and Minot, and some areas look much like Maine and Nova Scotia. Most of the southeast coast, however, contains sandy or gravelly beaches, either on barriers or at the foot of eroding glacial uplands. The 1200 miles of coastline in the state contains at least 157 major barrier beaches that are affected by winter storms and/or hurricanes (Humphries and Benoit, unpublished manuscript 1980).

The great fishing fleets that sailed to the Grand Banks are largely gone, but fishing is still an important part of the resource base. Shellfishing is important for both commercial and private interests. The natural resource base that today brings the greatest source of income to the state today is unquestionably the coastal system.

CBRS Units

Unit Name	Unit #	County	Beach Length (mi.)
Clark Pond	COO	Essex	0.4
Wingaersheek	COI	Essex	0.4
Good Harbor	COIA	Essex	4.0
Brace Cove	COIB	Essex	0.3
West Head Beach	COIC	Essex	0.3
North Scituate Beach	C02	Plymouth	0.4
Rivermoor	C03	Plymouth	0.6
Rexhame	C03A	Plymouth	1.9
Plymouth Bay	C04	Plymouth	1.9
Center Hill Complex	C06	Plymouth	1.3
Scorton Shores	C08	Barnstable	0.8
Sandy Neck	C09	Barnstable	2.4
Freemans Pond	ClO	Barnstable	0.9
Namskaket Spits	Cll	Barnstable	0.7
Boat Meadow	CllA	Barnstable	0 4
Chatham Roads	C12	Barnstable	1.2
Lewis Bay	C13	Barnstable	1.7
Squaw Island	C14	Barnstable	0.9
Centerveille	C15	Barnstable	1.0
Dead Neck	C16	Barnstable	1.8
Popponesset Spit	C17	Barnstable	0.9
Waquoit Bay	C18	Barnstable	3.2
Falmouth Ponds	C18A	Barnstable	0.8
Black Beach	C19	Barnstable	0.6
Buzzards Bay Complex	C19A	Plymouth	2.8
Coatue	C20	Nantucket	2.3
Sesachacha Pond	C21	Nantucket	0.5

Cisco Beach	C22	Nantucket	0.5
Esther Island Complex	C23	Nantucket	5.7
Tuckernuck Island	C24	Nantucket	4.0
Muskeget Island	C25	Nantucket	0.7
Eel Pond Beach	C26	Dukes	1.1
Cape Poge	C27	Dukes	1.4
South Beach	C28	Dukes	6.7
Squibnocket Complex	C29	Dukes	4.7
James Pond	C29A	Dukes	0.5
Mink Meadows	C29B	Dukes	0.8
Elizabeth Islands	C31	Dukes	5.0
W. Sconticut Neck	C31A	Bristol	2.6
Harbor View	C31B	Bristol	0.3
Mishaum Point	C32	Bristol	0.4
Little Beach	C33	Bristol	1.9
Horseneck Beach	C34	Bristol	1.7
Cedar Cove	C34A	Bristol	0.3.

A brief description of each CBRS unit in Massachusetts is provided below. Each unit is identified by its number, name, and the county in which it is located.

COO-Clark Pond (Essex): This unit is a bay barrier on the east side of Great Neck connecting two hills (North Ridge and Plover Hill) which protect Clark Pond. It is located in Plum Island Sound just to the west of Plum Island State Park at the southern end of Plum Island in the Town of Ipswich.

COl-Wingaersheek (Essex): This unit is a small spit located south of Annisquam lighthouse and extending to Wheeler Point in Gloucester. It provides habitat for migratory birds and protects a salt marsh ecosystem. There are off-road vehicle trails on the barrier, and recreational use is heavy in the summer. Access to the area is by paved road or small private boats. There is a town owned public beach on the spit with parking facilities.

COlA-Good Harbor Beach (Essex): This unit consists of two parts and is on the western end of a bay barrier which protects a salt marsh along its north side. The unit is in East Gloucester.

COlB-Brace Cove (Essex): This unit is a bay barrier on the west side of Brace Cove protecting Niles Pond to the west. The barrier is a sand beach connecting Eastern Point with the uplands of East Gloucester and represents the eastern side of a tombolo system.

C01C-West Head Beach (Essex): This unit is a tombolo beach system on the southern end of Long Island in Boston Harbor which protects an aquatic habitat between the beaches. The unit also includes beaches of sand and cobble on Rainsford Island.

C02-North Scituate (Plymouth): This unit is a bay barrier located at the south end of Musquashcut Pond between the developed northern section of North Scituate Beach and Mann Hill Beach in the Town of Scituate.

C03-Rivermoor (Plymouth): This unit is a spit located on the north side of New Inlet, and is attached to a developed upland in Scituate. It protects a salt marsh system on the north side of North River, which has been designated a "Scenic River" by the Massachusetts Scenic Rivers Program. The Massachusetts Audubon Socitey manages a tern nesting colony on the spit. The beach has very limited access and is used mainly by local residents.

C03A-Rexhame (Plymouth): This unit is a portion of the Humarok Beach barrier spit which protects South River in the Town of Marshfield. It contains a dune ridge up to 10 feet high.

C06-Center Hill Complex (Plymouth): This unit is composed of three distinct coastal barrier systems in the Town of Plymouth. The most northerly is a bay barrier which shelters Ship Pond. The beach is low and composed of cobble stones. An off-road vehicle trail runs along the shore. South of this barrier is the Center Hill Pond bay barrier, also a low, cobble beach. Access to the barrier is by foot path only. Ellisville Harbor is the most southerly barrier in this unit. It is made up of two spits that run along the front of Salt Pond and are separated by a small tidal channel. The southern spit is attached to a headland called Harlows Landing. Salt Pond is mainly a salt marsh. There is a boat access site on the south side of Ellisville Harbor Beach.

C08-Scorton (Barnstable): This is a barrier spit that shelters a well-developed tidal creek and salt marsh system as well as a coastal forest in the Town of Sandwich. Access is by paved, light-duty road or by foot path.

C09-Sandy Neck (Barnstable): This unit is composed of two sections; one is a triangular section just west of Sandy Neck Beach which includes part of Scorton Neck Beach, and the other encompasses the eastern tip of Sandy Neck Spit. The entire spit is quite large for this region and it protects an extensive salt marsh system called the Great Marshes. Highly significant natural resources are found within this coastal barrier ecosystem, including rare plants, birds, sea turtles, and unique dune fields that reach elevations of 80 feet. The eastern tip of Sandy Neck is accessible by an off-road vehicle trail down the length of the spit, through the dunes. Easy boat access is available at the eastern tip. The area is heavily used for recreation. The western section is accessible by foot from the parking area in Sandy Neck State Park, and from residences on the nearby uplands. The unit is in the Town of Sandwich.

C10-Freemans Pond (Barnstable): This unit is located in the Town of Brewster and consists of three segments. The eastern part is a barrier spit protecting Freemans Pond and its salt marsh system. The central section includes Wings Island, a glacial deposit, and its beach. Also included are the marshes and tidal creeks associated with Stony Brook. The western segment is a barrier spit on the east side of Quivett Neck which protects Quivett Creek and its marshes. The beaches are used by local residents for recreation. Wings Island is part of the Cape Cod Museum of Natural History and has foot trails which are used by visitors studying local biota and coastal processes. The barriers are accessible only by foot. The Freemans Pond segment is accessible from two parking areas; one on the east side, and the other on the west side.

C11-Namskaket Spits (Barnstable): This unit consists of double spits flanking both sides of Namskaket Creek where it empties into Cape Cod Bay. The spits are attached to uplands on either side of the creek and protect a salt marsh system and estuary. Natural processes on this coastal barrier have not been altered by human activities. The spits are accessible by foot from developments on either side of Namskaket Creek. The area is used primarily for recreation by local residents. It is located in the Town of Brewster.

C11A-Boat Meadow (Barnstable): This unit is made up primarily of a salt marsh on the eastern side of Cape Cod Bay with a very narrow sand barrier island on the marsh edge. It is located in the corner on the western shore of Eastham where Cape Cod changes orientation from east-west to north-south and where the Herring River and Boat Meadow River meet the Bay in Eastham.

C12-Chatham Roads (Barnstable): This unit consists of two segments in the Town of Chatham. The eastern segment includes the western part of Harding Beach which protects the entrance to Bucks Creek and also fronts on Cockle Cove, a part of Nantucket Sound. It is a narrow spit with dunes and beach grass vegetation that has been growing eastward across the mouth of Bucks Creek toward the settlement of Harding Beach. Salt marshes and tidal creeks make up the wetlands behind the barrier. The western segment is known as Forest Beach. It includes Mill Creek and its associated marshes, but does not include Taylor Pond from which it flows. Access to both beaches is limited to foot traffic, and the areas are used for recreation by local residents. A few small groins exist on Forest Beach, and the end of this segment has a short jetty protecting the entrance to Mill Creek. Cockle Cove Beach is on the down-drift side of this jetty and thus shows the typical offset configuration. A WCC radio tower stands in the marsh behind Forest Beach. Uplands near both segments are heavily developed.

C13-Lewis Bay (Barnstable): This relatively large unit is part of a tombolo system. The main portion is a beach (Great Island Beach) connecting Great Island to the mainland along the south shore of Cape Cod on Nantucket Sound in Yarmouth. Also included are Pine Island, Cedar Point and Smith Point (small tombolo) on the north side of Great Island, and Fox Point, marshes between it and Great Island. Twenty groins on the south shore of Great Island and six on the northwest shore of Smiths Point have caused some redistribution of sediment on the beach.

C14-Squaw Island (Barnstable): This unit is located in the Town of Hyannis and fronts on Nantucket Sound. It contains two parts: tombolo connecting Sunset Hill with Squaw Island, and a western spit on the western side of Squaw Island that protects the entrance to and salt marshes of Halls Creek. Six groins are present on the spit east of Hyannis Point and are causing some redistribution of sand. A jetty on the west side of the inlet near the western boundary of the unit has caused accumulation of sand behind the jetty and possibly some landward recession of the eastern spit found there. A paved road runs along the eastern barrier to the developed part of the unit to the developed portions of Squaw Island.

C15-Centerville (Barnstable): This unit is near the Village of Centerville in the Town of Barnstable is also known as Long Beach. It runs along the southeastern mouth of the Centerville River where it empties into Nantucket Sound. The unit is accessible from Craigville Beach by road to the eastern end. There is limited use along the eastern section by local residents and people coming from Craigville Beach. The unit is located on the down-drift side of the jetty that is present on nearby Dowsed Beach.

C16-Dead Neck (Barnstable): This unit is also known as Oyster Harbor Beach. It is separated from Osterville Grand Island by a tidal channel known as Seapuit River on the north shore of Nantucket Sound. The eastern end flanks the entrance to West Bay, while the western end shows a recurving tendency into the entrance of Cotuit Bay. Littoral drift is predominately from east to west. The unit also contains a small sand bar called Sampsons Island. A short jetty exists on the eastern end of the island. There appears to be no appreciable effect of the jetty on the island. The unit is opposite the Village of Cotuit in the Town of Barnstable.

C17-Popponesset Spit (Barnstable): This unit is located mainly in the Town of Mashpee at the end of Popponesset Spit but also includes Thatch Island which recurves toward Meadow Point on the mainland and flanks the entrance to Popponesset Bay, and a small island behind the spit, called Little Thatch Island. The Thatch Islands are usually submerged except at very low tides. The beach is used by residents of an adjacent community known as Popponesset Beach. The barrier is downdrift from a series of groins in front of Popponesset Beach which has caused noticeable retreat of the shoreline.

C18-Waquoit Bay (Barnstable): This unit contains South Cape Beach in Mashpee, an east-west running barrier spit which protects Waquoit Bay and Sage Lot Pond on the north side of Nantucket Sound. Across the entrance to Waquoit Bay is Washburn Island which is also included. This island is shaped like an inverted "T" with its long axis oriented north-south. It consists of low dunes and two spits, the eastern one being longer and protecting the entrance to Waquoit Bay, while the eastern part is shorter and protects Eel Pond. Washburn Island also supports a well-developed coastal forest of oak and pitch pine. Access to Washburn Island is by boat only. There is moderate recreational use of South Cape Beach. The inlet to Waquoit Bay is stabilized by jetties which have produced an eroded shoreline at South Cape Beach and seaward accretion of the beach on Washburn Island.

C18A-Falmouth Ponds (Barnstable): This unit contains two bay barriers in the Town of Falmouth, and protects long, narrow coastal ponds behind Vineyard Sound. The western section has an inlet artifically stabilized with jetties on both sides. The eastern section has an improved road running along its entire length and several groins located along its beach. The eastern section protects Bournes Pond, the western section protects Green Pond.

C19-Black Beach (Barnstable): This unit is a double spit system protecting Great Sippewisset Marsh in Falmouth on the eastern shore of Buzzards Bay. The barriers consist of low dune fields, strand vegetation, and sand beaches. The salt marsh behind the barrier is a typical Spartina community. This marsh is well-known for the many ecological studies that have been done on nutrient cycling, marsh productivity, and the intertidal marine organisms living in it.

C19A-Buzzards Bay Complex (Plymouth): This unit consists of seven sub-units on the north shore of Buzzards Bay. The Aucoot Cove sub-section consists of a salt marsh with a narrow sandy beach at the head of Aucoot Cove and a small sandy island called Haskell Island. The second sub-unit is along Hiller Cove and consists mainly of salt marsh. The third sub-unit is a cape-like system containing Angelica Point and Strawberry Point - which contain salt marshes, sand flats, a coastal forest, and a narrow sandy spit enclosing Pine Island Pond on the north side of the cape. The fourth sub-ubit is a salt marsh with a very narrow beach fronting on Mattapoisett Harbor along the east side of Mattapoisett Neck. Other sections are located along the northeastern shore of Buzzards Bay near Wareham. The Sedge Cove and Nobska Point sub-units contain a marshland and thin sandy beaches. The eastern most sub-section is Bourne Point, a sandy spit which protects Little Harbor in Wareham.

C20-Coatue (Nantucket): This unit consists of three sections that are part of a large tombolo-spit system at the northern tip of Nantucket Island. The eastern section joins Wauwinet and Coskata and protects the eastern side of Nantucket Harbor (at the head of the harbor) and has been breached in the past by storm surges. The western section is part of a very long spit which runs southwestward from Coskata and fronts on Nantucket Sound. This spit protects the northern side of Nantucket Harbor, and is notable for its series of six almost equally spaced points which create a striking scalloped shoreline along the backside. The third section occupies most of Great Point at the very northern tip of Nantucket Island. The Great Point Lighthouse, lost in recent storms, was located just to the north of this section. Vegetation consists of typical dune strand and shrub thickets. Off-road vehicle trails run through the unit, and are the primary means of access to the area. Boats are also used to reach the section on Coatue Spit.

C21-Sesachacha Pond (Nantucket): This unit is a sandy bay barrier protecting Sesachacha Pond on the eastern shore of Nantucket Island fronting on the Atlantic

Ocean. It is contiguous with the Town of Quidnet to the north. The barrier connects two upland areas on either side of Sesachacha Pond and is occasionally breached by storms.

C-22-Cisco Beach (Nantucket): This unit is a single dune ridge bay barrier located near the small village of Cisco. Cisco Beach connects uplands that flank Hummock Pond and Clark Cove. At the western end of the beach is a low area which breaks open periodically, allowing an exchange of water between Hummock Pond and the Atlantic Ocean. The beach is reached by foot from either side, and is used for recreation by the local residents.

C23-Esther Island Complex (Nantucket): There are three sub-units in the Esther Island Complex; Eel Point, Esther Island and Madaket Harbor, and the western tip of Madaket. The unit is located at the western tip of Nantucket Island. The portion on Madaket consists of a sandy point (cape) along the south side of Madaket Harbor just west of a small settlement. Eel Point is a barrier spit on the north side of Madaket Harbor containing a series of dunes and associated strand vegetation with elevations above 10 feet. Behind the barrier are typical salt marshes. Esther Island is a sandy barrier island of low dunes and sparse vegetation containing a small pond on its eastern end.

C24-Tuckernuck Island (Nantucket): This unit consists of three sub-units located on the tall island of Tuckernuck. The first sub-unit is a bay barrier protecting North Pond and a recurving spit that is attached to the western end of the island; the second, on the northeastern side, is a narrow barrier spit protecting East Pond; and the third, on the southeast side, is a barrier spit that extends from Tuckernuck Island toward Esther Island. Several sandy shoals between Tuckernuck and Esther Island are also included in this unit. The sub-units on the south side of Tuckernuck face the Atlantic Ocean while the one on the northeast faces Nantucket Sound.

C25-Muskeget Island (Nantucket): Muskeget Island is one of the most significant coastal barriers in Massachusetts. The difficulty of access to the island has kept it in pristine condition. It is richly endowed with fish and wildlife populations, including an endemic rodent, the Muskeget Vole. It is the southernmost breeding area for the gray seal, and two endangered birds-the peregrine falcon and southern bald eagle-are occasional visitors. The island is used mostly for hunting, nature study, and scientific research. Access is by small boat or airplane, but the low elevation of the island and the extremely shallow water and shoals surrounding the island make either method difficult. The dune fields on Muskeget are up to 10 feet high and covered with dune grass and coastal shrub communities. Several spits recurve around the southern side of the island, creating a small sheltered cove and salt marshes. Small fresh water marshes are found in the dune field. Muskeget is located between Tuckernuck Island and Martha's Vineyard.

C26-Eel Pond Beach (Dukes): This unit is located on Martha's Vineyard and contains two barrier spits just east of Edgartown which front on the entrance to Edgartown Harbor. The north spit is very narrow and recurves around to the northwest thus protecting a small cove called Eel Pond. The southern spit is linear and widens at its southern end where it juts into Edgartown Harbor entrance just east of the Martha's Vineyard-Chappaquidick Ferry route. The Edgartown lighthouse is located at the end of this spit.

C27-Cape Poge (Dukes): This unit consists of four sub-units on the Cape Poge peninsula, a northward trending barrier spit on the east side of Chappaquidick Island. The barrier protects Pocha Pond and Cape Poge Bay. Two eastern sub-units consist of a linear sand beach with a single low dune ridge and back barrier flats supporting grass and shrub vegetation. The northern sub-unit is an upland area of dunes and glacial deposits reaching elevations of 20 feet and more. The highest portions are on the eastern side and contain glacially derived rock that is undergoing rapid erosion. The uplands here support a very dense shrub community and small stands of pine. The western portion consists of a long, gradually curving, very narrow beach of sand and gravel with a few low dunes. This section curves southward from Cape Poge and encloses the western side of Cape Poge Bay with a small inlet at its southern end called Cape Poge Gut.

C28-South Beach (Dukes): This unit consists of all the bay barriers protecting the coastal ponds along the south side of Martha's Vineyard facing the Atlantic Ocean. From east to west these barriers protect: Edgartown Great Pond, Jobs Neck Pond, Oyster Pond, Watcha Pond, Homer Pond, Tisbury Great Pond, Black Point Pond, and Chilmark Pond. The barriers are relatively low and contain a series of dunes in various stages of development. They are frequently breached and overwashed by coastal storms which push salt water into the ponds. Local residents have occasionally opened the barriers to allow more salt water exchange with the ponds. The ponds contain fresh to brackish water depending on storm activity and precipitation.

C29-Squibnocket Complex (Dukes): This unit contains five sub-units which are a series of bay barriers around Gay Head on the western end of Martha's Vineyard. The easternmost section is called Stonewall Beach and it protects Stonewall Pond; another section protects Squibnocket Pond on the southeastern side of Gay Head. An unimproved road runs along this beach to SquiBnocket Ridge. Long Beach and Squibnocket Beach combine to form a relatively wide bay barrier with dunes over 10 feet high. The barrier contains a dune ridge and dune fields with typical strand vegetation and shrub thickets with salt marshes behind. These beaches enclose the southwestern side of Squibnocket Pond and protect a small Pond called Lily Pond on the north end. A fourth section runs between Zacks Cliffs and the Gay Head Cliffs. It consists of a low beach and dune system with wetlands behind. The fifth and major section consists of a large spit with large dunes along the north side of Menemsha Pond. There is a dredged opening at the eastern end of this spit. The sub-unit contains an unimproved road called West Payson Road which runs to the end of the spit. The barrier contains dune fields and interdune ponds and marshes with salt marshes near the inlet.

C29A-James Pond (Dukes): This unit is a small bay barrier with a temporary inlet protecting Jakes Pond. It faces Lamberts Cove in West Tisbury on Martha's Vineyard. The barrier has a dune ridge reaching heights of 10+ feet. A small salt marsh is included near the inlet at the western end of the unit.

C29B-Mink Meadows (Dukes): This unit is low bay barrier bisected by a dredged and jettied inlet protecting Mink Meadows Pond and several smaller ponds. The unit is located at the north end of the Town of Vineyard Haven on Martha's Vineyard.

C31-Elizabeth Islands (Dukes): This unit contains several barriers on three islands of the Elizabeth Islands chain which stretches southwestward from the Woods Hole region of Cape Cod, dividing Buzzards Bay from Vineyard Sound. Robinson's Hole Beach is located on the eastern end of Pasque Island and it is a small tombolo system protecting a salt marsh. Quicks Hole Pond Beach is a bay barrier at the eastern end of Nashawena Island. Three other barrier systems are on Cuttyhunk Island: two sub-units are part of the Copicut Neck tombolo on the northeastern corner of the island; another tombolo beach system extends eastward from the village of Cuttyhunk to Canapitsit Channel. At the western end of the island, a pair of spits enclose a small bay and marsh called Western Pond.

C31A-West Sconticut Neck (Bristol): This unit consists of four sub-units on the mainland around Sconticut Neck and West Island near Fairhaven, Massachusetts. One section is a cape called North Point on the north end of West Island and contains a sandy beach and salt marsh system. The point juts into Nasketucket Bay and protects North Cove harbor. A second sub-unit consists of a barrier spit that is attached to Round Island and a small island called Fish Island in Round Cove. Salt marshes are found behind the spit. On the west side of Sconticut Neck are two other sub-units. One contains a small spit protecting a narrow bay and a bay barrier along the shore south of Silver Shell Beach. The other consists of a narrow bay barrier protecting a small pond just to the north of the Silver Shell Beach community.

C31B-Harbor View (Bristol): This unit is mainly a salt marsh with a very thin bay barrier beach on Buzzards Bay between Fairhaven (Harbor View section) and Pope Beach.

C32-Mishaum Point (Bristol): This unit is a narrow barrier spit extending westward from Salters Point toward Mishaum Point on Buzzards Bay in the Town of Dartmouth. It protects an unnamed bay with a small inlet at the western end of the spit. A sand road runs partway down the spit.

C33-Little Beach (Bristol): This unit is a bay barrier protecting Allen's Pond in Dartmouth. It drains into Buzzards Bay through a circuitous channel at the eastern end of the barrier. The beach is located just east of Horseneck State Reservation.

C34-Horseneck Beach (Bristol): This unit consists of two parts, each flanking the Horseneck Beach State Reservation which faces the Atlantic Ocean near the Rhode Island/Massachusetts state line in the Town of Westport. The eastern part, a bay barrier, is known as East Beach and provides the connecting link between the Reservation and the mainland. The western part, a barrier spit, is called Horseneck Point and extends out into the Westport River protecting Westport Harbor.

C34A-Cedar Cove (Bristol): This unit is a small double spit system that encloses Cedar Cove just south of the Town of South Swansea in Mount Hope Bay, an arm of Narragansett Bay, across the Taunton River from Fall River. Salt marshes fringe the inside of the sandy spits.

Coastal Resource Management

The Commonwealth passed its first wetlands protection legislation in 1963, but laws and regulations dealing with coastal issues go well back into the state's history, even to the founding of the Massachusetts Bay Colony in the 1600's. Many laws dealt with use of coastal resources, protection of sand dunes, creation of "public lands" and parks, and management of coastal resources. In the early days of Provincetown, a young man was required by law to plant a certain amount of beach grass before getting married. In the early 1900's, legislation was passed to provide funds for hiring a dune superintendent and developing a program to stabilize migrating dunes that were then threatening Provincetown (McCaffrey 1972.) The Commonwealth set aside a large portion of Cape Cod north of Provincetown as common lands in the 1700's. When dunes started moving because of excessive grazing and wood cutting, laws prohibiting such activities were passed. These lands became part of a state park and are now in the Cape Cod National Seashore.

With passage of the CZMA and approval of the state program in 1978, a unified plan for coastal management was put into effect. The Massachusetts program was the first to be approved on the Atlantic Coast. In 1978, the Wetlands Protection Act was enacted, and specifically included barrier beaches and dunes within its jurisdiction. Many other acts designed to protect and regulate activities on the coast followed. This movement culminated on August 8, 1980, when the Governor issued Executive Order No. 181 on Barrier Beaches. This was the first order of its kind in the country and created a state policy discouraging further government funding of new or old development on barrier beaches in the state. In 1981, the Governor also issued Executiver Order 190 Relocation of Off-Road Vehicle Use on Public Lands Containing Coastal Wetland Resources, to exclude ORV use in sensitive environmental areas, specifically, dunes, salt marshes, and tidal flats.

The Commonwealth of Massachusetts has a very active and effective Coastal Zone Management Program including 28 state laws and programs. These are coordinated by the CZM Office which is located in the Executive Office of Environmental Affairs. This office was established by Section 13 of the 1983 Acts and Resolves which amends Chapter 21A of the Massachusetts General Laws. The purpose of the legislation "shall be to secure for the inhabitants of the Commonwealth the objectives and benefits of the federal Coastal Zone Management Act, 16 USC 1451."

The following state laws apply to management and protection of coastal barriers:

Areas of Environmental Concern (MGLA Ch. 21a.) The Secretary of Environmental Affairs developed a process for designating Areas for Preservation Restoration (APRs), or in the nomenclature of Massachusetts, Critical Areas of Environmental Concern. As a result of this designation, the Executive Office of Environmental Affairs (EOEA) agencies attach a high degree of scrutiny to their activities in these areas. They do not proceed with activities that could impair characteristics cited in area designations, and administer programs consistently within CZM policies regarding acquisition, protection, and use of such areas.

The Coastal Wetlands Restriction Program (MGLA Ch. 130.) authorizes the Commissioner of the Department of Environmental Management (DEM), with approval of the Board of Environmental Management, to impose land use restrictions on wetlands "for the purpose of promoting the public safety, health and welfare and protecting public and private property, wildlife and marine fisheries." The act does not pertain to all wetlands within a particular community but only to those which best function in accordance with the above listed statutory interests. Wetlands are evaluated on a site-specific basis by local officials. Wetland areas not subject to restriction are not by implication considered unimportant. When an area is identified, all affected landowners are notified, a public hearing is held, and finally, the restriction order is recorded at the Registry of Deeds. A marginal reference on the deed of the landowner is made by Registry officials. Generally, large-scale activities involving dredging and filling operations are prohibited. No permits may be issued by other agencies for such activities within a restricted area. Allowable activities such as docks, piers, floats, wharves, boat houses, cultivation of shellfish, harvesting of salt hay, recreation, and limited access to unrestricted land are subject to approval by other permit issuing agencies. Presently, thirty-six coastal communities have been restricted.

The Historic District Act (MGLA Ch. 40c.) enables cities and towns to establish historic districts for the preservation and protection of historic sites. Within such districts, demolition, new construction and alteration to exterior architectural features cannot be carried out without a certificate of appropriateness or a non-applicability.

The Inland Wetlands Restriction Program (MGLA Ch. 131) is administered by the Department of Environmental Quality Engineering DEQE and is similar to the Coastal Wetlands Restriction Program except that it applies to inland freshwater areas.

The Massachusetts Environmental Policy Act (MGLA Ch. 30) (MEPA) is enforced by the MEPA Unit within the Office of Environmental Affairs. The MEPA program examines environmental impacts of state actions including permitting, approvals, and funding. Generally, an individual seeking a state permit, approval, or funding may be subject to the MEPA process. However, many state permits, approvals, and funding are exempt from MEPA either by their nature or because they fall below certain quantitative thresholds. These thresholds and exemptions appear in the MEPA regulations. Projects subject to review must circulate and file an Environmental Notification Form (ENF). A 20-day comment period ensues from publication of the ENF in the MEPA Monitor, a bi-weekly publication. Within thirty days after publication a decision is reached on whether an environmental impact report (EIR) is required. If the EIR is not required, state agencies are free to issue permits, approve funds, etc. If an EIR is required, a "scope" will be issued identifying issues which the EIR must address. Draft and final EIR's each go through 37-day review and comment periods. Projects that exceed thresholds (CMR 301: 10.32 (5)), automatically require an EIR, if they require any state permits whatsoever.

The Mineral Resources Regulatory Act (MGLA CH.21) empowers the Division of Mineral Resources in DEQE to license, following a public hearing, the exploration for sand, gravel and other minerals in Massachusetts coastal waters and the seabed, and grant leasing rights for extraction of such mineral resources as are discovered.

The Ocean Sanctuaries (MGLA Ch. 132a) program was created to protect all state waters except those from Lynn to Marshfield and those in Mt. Hope Bay. In general, such activities as the removal of sand, gravel, or minerals, or dumping of any new waste discharge are prohibited. However, a broad class of activities are exempt from these prohibitions. While the terms of the five designated Ocean Sanctuaries differ, laying of cables approved by the Department of Public Utilities, projects authorized under the Waterways Program or other improvements authorized by other State or Federal agencies are permitted. No permit is required to conduct an activity in an Ocean Sanctuary besides that which would be issued under the Waterways Programs. The Department of Environmental Management is responsible for insuring compliance.

The Scenic Rivers Act (MGLA Ch. 21) is enforced by the Department of Environmental Management (DEM) which designates certain rivers or streams as scenic resources and restricts or prohibits certain uses on the river and contiguous banks. A restriction order is recorded at the Registry of Deeds and a marginal reference is made on the landowner's deed. The order specifies permitted and prohibited uses. A group of local landowners sitting as an overseeing body reviews proposed uses, acts to enforce the order, and acts as an advisory group to owners along the river corridor.

The Waterways Program (MGLA Ch. 91) is administered by the Department of Environmental Quality Engineering, Division of Land and Water Use. A license is required for any structure built seaward of the high tide line in tidal areas and any structure involving government expenditures in or over great ponds and certain rivers and streams. The applicant must also obtain water quality certification from the Division of Water Pollution Control and a permit from the U.S. Army Corps of Engineers.

The Wetlands Protection Act (MGLA Ch. 131) is administered by the Massachusetts Department of Environmental Quality Engineering (DEQE). DEQE provides rules and regulations which local Conservation Commissions follow in administering the Act. A permit, called an Order of Conditions, is required for work in or within 100 feet of a wetland or floodplain, whichever distance is greater. However, current policy only provides for measuring 100 feet landward of the vegetated wetland, not the floodplain. Wetlands are defined by the presence of certain plant species inhabiting the area. The law prohibits those activities which would have a significant adverse impact on public and private water supply, groundwater supply, flood control, storm damage prevention, prevention of pollution, and protection of finfish and shellfish. Appeals are handled by DEQE.

Executive Order 181 (Barrier Beaches) recognizes the dynamic and important role that barrier beaches play in protecting the shore from storm damage and flooding, their sensitivity to damage by human interference, and their high degree of hazard from coastal storms. The order gives the highest priority for disaster assistance funds towards relocating willing sellers from storm damaged barrier beach areas. It specifies that state and federal funds will not be used to encourage development on barrier beaches; that management plans for state owned barriers will be prepared consistent with the state's wetland policy; that no development will be permitted in velocity zones or primary dunes; that structures on barriers will be used only for maintaining navigation at inlets and only if mechanisms are employed to supply downdrift beaches with sediment; and that dredged materials of suitable size will be used for beach nourishment.

Executive Order 190 (Relocation of Off-road Vehicle Use On Public Lands Containing Coastal Wetland Resources) recognizes the degrading impacts that off-road vehicles (ORVs) can have on coastal wetlands which include beaches, barrier beaches, dunes, salt marshes and tidal flats. The Executive Order directed all state agencies to balance the competing uses of the Commonwealth's public lands and minimize the degradation of its public coastal wetland resources. The Order specifically excludes ORV use in sensitive environmental areas, i.e., dunes, salt marshes, and tidal flats, which provide significant public interests. Its stated purpose is to assure that soil erosion and damage to vegetation are minimal; to assure that harrassment of wildlife and significant disruption of wildlife habitats are minimized; and to assure ORVs will not be excluded from public lands but will be channeled into environmentally acceptable areas.

Of the laws and executive orders listed above, the Wetlands Protection Act and the Executive Orders have played major roles in protecting and managing coastal barriers. The Wetlands Act includes coastal barriers as well as marshes, both tidal and fresh. It is enforced by local Conservation Commissions with final authority vested in the state's Department of Environmental Quality Engineering. The Executive Order on Barrier Beaches which prohibits the use of state funds to encourage or support development on coastal barriers is enforced by the Coastal Zone Manangement Office. Executive Order 190 preventing off-road vehicle use in sensitive coastal habitats is enforced by the Executive Office of Environmental Affairs along with the Department of Environmental Management and Fisheries, Wildlife and Recreational Vehicles.

Local Actions

The Martha's Vineyard Commission is charged by statute (MGLA, Chap. 831, 1977) to preserve and protect the unique cultural, historical, ecological, scientific and other values of Martha's Vineyard and to provide for the enhancement of sound local economies. The Commission has designated responsibility for the entire coastal district below the ten foot elevation contour, or within 500 feet of mean high water of a coastal water body exceeding 10 acres or the ocean, and all land within 100 feet of streams and wetlands that drain into coastal great ponds. Certain activities are allowed in this coastal zone, mostly recreation, conservation, agriculture, and fishing, but home construction is not permitted unless it is an addition to an existing family dwelling, and then only by special authorization. The Commission has worked closely with the Office of Coastal Zone Management regarding CBRA and has helped town boards understand CBRA.

The Town of Chatham has created a "Seashore Conservancy District" that includes areas within authorized boundaries of Cape Cod National Seashore and in which development is prohibited.

The Town of Orleans has included the only CBRS unit in the Town in its Conservancy District so that is is protected by regulations that prohibit development (i.e. landfills or excavations, drainage except for mosquito control, buildings or structures). The Town also has a "Seashore Conservancy District" which includes areas within the authorized boundaries of Cape Cod National Seashore.

The Town of Swansea dropped plans pursuant to enactment of CBRA to proceed with a "beach stabilization project" which had been authorized by various agencies. They are concerned about "continuing erosion" affecting a community center and parking lot.

The Town of Westport denied three applications for building permits on coastal barriers pursuant to enactment of CBRA. Also subsequent to passage of CBRA, two areas were purchased by a "Conservation Land Trust". The third site (location not disclosed) has received building permits from several agencies, and potential federal insurance.

Private Sector Initiatives

The Massachsuetts Audubon Society has long been a supporter of the barrier island initiatives, particularly CBRA.

The New England Sierra Club Chapter publishes a newsletter called "CUSP" - Citizen Update on Shoreline Policy.

The Trustees of Reservations serves as a private conservation landowner and manages and protects many sites in Massachusetts considered ecologically sensitive, unique, or of high recreation value. The group owns several coastal barriers which fall into the undeveloped, otherwise protected category.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN MASSACHUSETTS

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MA-01	SALISBURY BEACH	ESSEX	6	NEWBURYPORT EAST	3.33	1498	PROTECTED
MA-02	PLUM ISLAND	ESSEX	6	NEWBURYPORT EAST IPSWICH	7.88	13372	MIXED
C-00	CLARK POND	ESSEX	6	IPSWICH	N/A	N/A	NO CHANGE TO CBRS UNIT
MA-03	CASTLE NECK	ESSEX	6	GLOUCESTER IPSWICH	2.98	3099	PROTECTED
C-01	WINGARSHEEK BEACH	ESSEX	6	GLOUCESTER	N/A	548	ADDITION TO CBRS UNIT
C-01B	BRACE COVE	ESSEX	6	GLOUCESTER	N/A	N/A	NO CHANGE TO CBRS UNIT
C-01A	GOOD HARBOR BEACH	ESSEX	6	ROCKPORT	0.56	68	ADDITION TO CBRS UNIT
MA-04	WEST BEACH	ESSEX	6	MARBLEHEAD NORTH	0.22	21	UNKNOWN
MA-05	DEVEREUX BEACH	ESSEX	6	MARBLEHEAD SOUTH	0.61	151	PRIVATE
MA-06	PHILLIPS BEACH	ESSEX	6	LYNN	2.32	1080	PRIVATE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MA-07	NAHANT BEACH	ESSEX	6	LYNN	1.72	110	PROTECTED
MA-08	SNAKE ISLAND	ESSEX	6	HULL	0.32	105	PROTECTED
MA-09	WOLLASTON BEACH	SUFFOLK	11	BOSTON SOUTH	0.22	166	PROTECTED
MA-10	MERRYMOUNT	SUFFOLK	11	BOSTON SOUTH	0.60	162	MIXED
C-01C	WEST HEAD BEACH	SUFFOLK	11	HULL	N/A	228	ADDITION TO CBRS UNIT
MA-11	PEDDOCKS ISLAND	PLYMOUTH	11	HULL	0.83	589	PRIVATE
MA-12	THE GLADES	PLYMOUTH	10	COHASSET NANTASKET BEACH	0.27	19	PRIVATE
C-02	NORTH SCITUATE	PLYMOUTH	10	COHASSET	N/A	16	ADDITION TO CBRS UNIT
C-03	RIVERMOOR	PLYMOUTH	10	SCITUATE	N/A	765	ADDITION TO CBRS UNIT
C-03A	REXHAME	PLYMOUTH	10	SCITUATE DUXBURY	N/A	70	ADDITION TO CBRS UNIT
MA-13	DUXBURY BEACH	PLYMOUTH	10	PLYMOUTH DUXBURY	3.85	7284	MIXED
C-04	PLYMOUTH BAY	PLYMOUTH	10	PLYMOUTH DUXBURY	1.80	1859	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
C-06	CENTER HILL COMPLEX	PLYMOUTH	10	SAGAMORE	N/A	N/A	NO CHANGE TO CBRS UNIT
MA-14	SANDWICH HARBOR	BARNSTABLE	10	SANDWICH	0.85	514	PROTECTED
C-08	SCORTON	BARNSTABLE	10	SANDWICH	N/A	108	ADDITION TO CBRS UNIT
C-09	SANDY NECK	BARNSTABLE	10	SANDWICH HYANNIS	3.69	3795	ADDITION TO CBRS UNIT
MA-15	GRAYS BEACH	BARNSTABLE	10	DENNIS HYANNIS	2.12	1398	MIXED
MA-16	NOBSCUSSET	BARNSTABLE	10	DENNIS	0.52	41	PRIVATE
C-10	FREEMANS POND	BARNSTABLE	10	DENNIS HARWICH	0.49	38	ADDITION TO CBRS UNIT
MA-17	WELLFLEET HARBOR	BARNSTABLE	10	WELLFLEET	5.45	7574	MIXED
MA-18	PAMET HARBOR	BARNSTABLE	10	WELLFLEET NORTH TRURO	1.00	496	MIXED
MA-19	PROVINCETOWN	BARNSTABLE	10	PROVINCETOWN NORTH TRURO	15.27	7135	MIXED
C-11	NAMSKAKET SPITS	BARNSTABLE	10	ORLEANS	N/A	N/A	NO CHANGE TO CBRS UNIT
C-11A	BOAT MEADOWS	BARNSTABLE	10	ORLEANS	0.60	265	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MA-20	NAUSET BEACH	BARNSTABLE	10	ORLEANS CHATHAM	14.20	10535	MIXED
MA-21	MONOMOY	BARNSTABLE	10	MONOMOY POINT CHATHAM	10.12	7825	PROTECTED
C-12	CHATHAM ROADS	BARNSTABLE	10	HARWICH CHATHAM	N/A	108	ADDITION TO CBRS UNIT
MA-22	RED RIVER BEACH	BARNSTABLE	10	HARWICH	0.59	26	PROTECTED
C-13	LEWIS BAY	BARNSTABLE	10	DENNIS HYANNIS	0.30	976	ADDITION TO CBRS UNIT
C-14	SQUAW ISLAND	BARNSTABLE	10	HYANNIS	N/A	74	ADDITION TO CBRS UNIT
C-15	CENTERVILLE	BARNSTABLE	10	HYANNIS	0.27	128	ADDITION TO CBRS UNIT
MA-23	DAVIS BEACH	BARNSTABLE	10	DENNIS	1.21	267	PROTECTED
C-16	DEAD NECK	BARNSTABLE	10	COTUIT	0.51	660	ADDITION TO CBRS UNIT
C-17	POPPONESSET SPIT	BARNSTABLE	10	COTUIT	N/A	228	ADDITION TO CBRS UNIT
C-18	WAQUOIT BAY	BARNSTABLE	10	COTUIT FALMOUTH	N/A	609	ADDITION TO CBRS UNIT

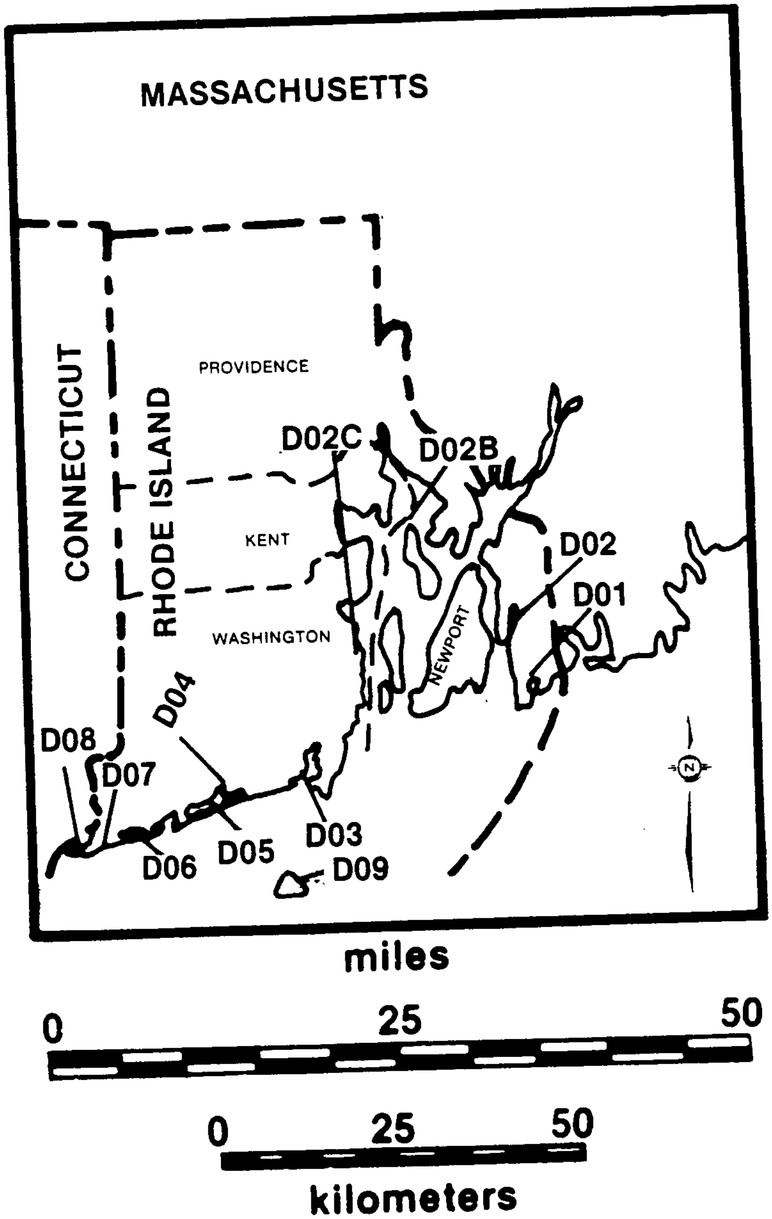
ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
C-18A	FALMOUTH PONDS	BARNSTABLE	10	FALMOUTH	N/A	276	ADDITION TO CBRS UNIT
C-19	BLACK BEACH	BARNSTABLE	10	WOODS HOLE	N/A	N/A	NO CHANGE TO CBRS UNIT
MA-30	HERRING BROOK	BARNSTABLE	10	WOODS HOLE ONSET	0.20	36	PRIVATE
MA-24	NAUSHON ISLAND COMPLEX	DUKES	10	WOODS HOLE NAUSHON ISLAND	2.46	181	PROTECTED
C-20	COATUE	NANTUCKET	10	GREAT POINT NANTUCKET SIASCONSET	5.91	8226	ADDITION TO CBRS UNIT
C-21	SESACHACHA POND	NANTUCKET	10	SIASCONSET	N/A	219	ADDITION TO CBRS UNIT
C-22	CISCO BEACH	NANTUCKET	10	NANTUCKET	N/A	156	ADDITION TO CBRS UNIT
C-23	ESTHER ISLAND COMPLEX	NANTUCKET	10	TUCKERNUCK ISLAND NANTUCKET	N/A	251	ADDITION TO CBRS UNIT
C-24	TUCKERNUCK ISLAND	NANTUCKET	10	TUCKERNUCK ISLAND	0.12	180	ADDITION TO CBRS UNIT
C-25	MUSKEGET ISLAND	NANTUCKET	10	TUCKERNUCK ISLAND	N/A	N/A	NO CHANGE TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
C-31	ELIZABETH ISLANDS	DUKES	10	CUTTYHUNK NAUSHON ISLAND	1.20	237	ADDITION TO CBRS UNIT
MA-25	PENIKESE ISLAND	DUKES	10	CUTTYHUNK	2.23	83	PROTECTED
C-29A	JAMES POND	DUKES	10	VINEYARD HAVEN	N/A	4	ADDITION TO CBRS UNIT
C-29B	MINK MEADOWS	DUKES	10	VINEYARD HAVEN	N/A	N/A	NO CHANGE TO CBRS UNIT
MA-26	HARTHAVEN	DUKES	10	EDGARTOWN	0.73	76	PRIVATE
MA-27	EDGARTOWN BEACH	DUKES	10	EDGARTOWN	2.04	907	MIXED
C-26	EEL POND BEACH	DUKES	10	EDGARTOWN	0.10	65	ADDITION TO CBRS UNIT
C-27	CAPE POGUE	DUKES	10	EDGARTOWN	3.24	1884	ADDITION TO CBRS UNIT
MA-28	NORTON POINT	DUKES	10	EDGARTOWN	3.16	1416	MIXED
C-28	SOUTH BEACH	DUKES	10	EDGARTOWN TISBURY GREAT POND SQUIBNOCKET	2.73	1802	ADDITION TO CBRS UNIT
C-29	SQUIBNOCKET COMPLEX	DUKES	10	SQUIBNOCKET	1.03	1116	ADDITION TO CBRS UNIT
MA-29	NOMANS LAND	DUKES	10	SQUIBNOCKET	4.43	541	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MA-31	SQUETEAGUE HARBOR	BARNSTABLE	10	POCASSET ONSET	0.50	95	PRIVATE
MA-32	BASSETTS ISLAND	BARNSTABLE	10	ONSET	0.57	156	PRIVATE
MA-33	PHINNEYS HARBOR	BARNSTABLE	10	ONSET POCASSET	1.39	241	PRIVATE
MA-34	LONG BEACH POINT	PLYMOUTH	10	ONSET	0.82	38	PRIVATE
C-19A	BUZZARDS BAY COMPLEX	PLYMOUTH	10	MARION ONSET SCONTICUT NECK	1.53	287	ADDITION TO CBRS UNIT
MA-35	PLANTING ISLAND	PLYMOUTH	10	ONSET MARION	0.80	161	PRIVATE
C-31A	WEST SCONTICUT NECK	BRISTOL	10	SCONTICUT NECK	1.98	160	ADDITION TO CBRS UNIT
C-31B	HARBOR VIEW	BRISTOL	10	NEW BEDFORD NORTH	N/A	N/A	NO CHANGE TO CBRS UNIT
MA-36	ROUND HILL	BRISTOL	10	NEW BEDFORD SOUTH	0.31	67	PRIVATE
C-32	MISHAUM POINT	BRISTOL	10	NEW BEDFORD SOUTH	N/A	N/A	NO CHANGE TO CBRS UNIT
C-33	LITTLE BEACH	BRISTOL	10	WESTPORT NEW BEDFORD SOUTH	N/A	241	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
C-34	HORSENECK BEACH	BRISTOL	4	WESTPORT	3.75	2700	ADDITION TO CBRS UNIT
C-34A	CEDAR COVE	BRISTOL	4	FALL RIVER	N/A	N/A	NO CHANGE TO CBRS UNIT
D-01	LITTLE COMPTON PONDS	BRISTOL	4	WESTPORT	N/A	N/A	NO CHANGE TO CBRS UNIT
Totals:					125.93	95812	

COASTAL BARRIER RESOURCES SYSTEM
RHODE ISLAND UNITS



RHODE ISLAND

Within the 1,028 square miles of Rhode Island is Narragansett Bay, a large bay/estuary that extends three-fourths (28 miles) of the way up its 48 mile length in the eastern part of the state. This arm of the sea gives Rhode Island a much longer shoreline than one would expect for a state of its size. The Bay has a very extensive shoreline and includes several large islands of which Rhode Island, Conanicut Island, and Prudence Island are the largest. Block Island, located some 10 miles south of the mainland in the Atlantic Ocean, is also part of the state. Most of the coastline consists of bay barriers, spits, and, at a few locations, rocky headlands. Within Narragansett Bay there are rocky shores, salt marshes, estuaries, and sand beaches.

Rhode Island is the most densely populated state (921 persons per square mile) after New Jersey in the nation. Even though the state has a high population density, most of its upland is rural and forested with a relatively sparse population except for the large urban area at the head of Narragansett Bay.

The economy of Rhode Island during its early years was based on subsistence agriculture and maritime commerce which continued into the 19th century. Once the primeval forest was cleared, agriculture dominated the economy with the best farms on the better soils of the coastal region. During the 20th century, Rhode Island became known for the manufacture of machine tools and precision measuring instruments and the fabrication of metal products and electrical equipment. After World War II, the state suffered a major economic decline as textile mills moved to the South. In 1950, textiles employed 41 percent of the work force, but by 1969 this figure had fallen to 6 percent.

The state's natural resource base has changed substantially over the centuries. The topography of the state includes low rolling hills in the north, and flat lowlands along the south coast. The state's highest point is Jerimoth Hill (812 feet) in the northwest corner near Connecticut. Soils are generally young and poorly developed having resulted entirely from the previous glaciation. In some areas the glaciers scraped the land clean, leaving, only bedrock. Even though Rhode Island is heavily urbanized, about 75 percent of its land area is undeveloped, open land. Forests have returned to many former farms. In recent years, some open lands have been reduced by the expansion of suburban complexes, and if the trend continues, much more area will be used for urban development. Wetland plant communities are rare in the state today, but were once very common, especially along the coast. Only 1.5 percent of the land area is classified as wetland. Significant amounts of wetland have been consumed by urban development. The most important natural resource in Rhode Island is Narragansett Bay with its extensive shoreline and its many coves and bays, tidal flats, and marshes. The habitats Narragansett Bay provides for finfish, shellfish, and waterfowl are extremely important, yet many have been abused. Salt marshes of cordgrass can be found behind the coastal barriers and along Narragansett Bay. The dune strand is typical of southern New England and dominated by beach grass, bay berry, beach plum, beach heather and other coastal shrubs.

Use of natural resources today includes a small forestry industry for firewood, a significant fishing industry, recreational hunting and fishing, and some mining.

The glacial history of the state and the extensive deposits of sand and gravel provided resources for a small mining industry. Much of the fill on which the urban expansion occurred, especially in wetlands, came from these deposits. These glacial materials also provided the source for the excellent coastal barrier system that fringes the Atlantic Shore. Block Island, just south of the mainland, owes its origins to the glacial period, just as does Martha's Vineyard and Nantucket further east. It has eroding bluffs of sand and gravel with several sandy beaches resulting from that erosion. The uplands on Black Island were farmed, but traits of natural shrub and heathland vegetation, and small woodlands of black oak and pitch pine also exist.

Commercial fishing, even though employing a very small proportion of the state's workforce, is still an important part of the coastal economy. In addition to fishing, other coastal industries include ship and boat building, tourism, recreation and marine research. Marine manufacturing is an important part of this industrial base.

CBRS Units

insert

A brief description of each unit in the CBRS is provided below. Each unit is identified by its number, name, and the county in which it is located.

DOl-Little Compton Ponds (Newport): This unit consists of a cape and four bay barriers fronting ponds of various sizes along the south shore of Little Compton (Rhode Island) facing the Atlantic Ocean. The cape is Sakonnet Point which extends into the Atlantic on the eastern shore of the Sakonnet River. The barriers are quite low and consist primarily of cobbles and gravel. A few have sand dunes, but most are without any substantial dune formations. From east to west these barriers are: South Shore Beach on Quicksand Pond; Briggs Beach and Briggs Marsh; Long Pond; and Round Pond.

D02-Fogland Marsh (Newport): There are two sub-units in Fogland Marsh. Both are located on the Sakonnet River, one on the north and one on the south side of High Hill Point near Tiverton Four Corners. The northern sub-unit, Fogland Point, in the Town of Tiverton, is a barrier spit with an internal wetland. The southern sub-unit, mostly in the Town of Little Compton, is a marshland and bay barrier at the entrance to Nonquit Pond. The barrier and marsh connect High Hill Point and Wind Hill.

D02B-Prudence Island Complex (Newport): This unit consists of a number of barriers including spits and bay barriers in Narragansett Bay near Bristol. Two sub-units are on the northern part of Prudence Island. One consists of a small cape protecting an interior pond called Sheep Pen Swamp opposite Patience Island in Sheep Pen Cove. The second is part of a tombolo system connecting sections of Prudence Island, and contains beaches protecting Jenny Pond and Nag Pond and their associated marshes. The other units are on Hog Island immediately south of Bristol. The one to the west consists of a spit and a smaller marsh island, and the one to the south is a marshland area behind a narrow beach and spit system just east of Southwest Point. The Marsh Point sub-unit is a small cape on the north side of the mouth of the Potowomut River. Narrow beaches protect marshes and a small pond.

D02C-West Narragansett Bay Complex (Washington): This unit contains two capes on the western shore of West Narragansett Bay Passage in North Kingstown. The southern cape is called Casey Point and protects a body of open water behind narrow beaches. The Northern cape is Greene Point which contains beaches, marshes and some open water.

D03-Card Ponds (Washington): This is a bay barrier known as Browning Beach on the east side of a narrow, temporary tidal passage and Moonstone Beach on the west side of the passage which protects the open water and marshes of Card Ponds. The unit faces the Atlantic Ocean and is near the village of Matunuck in South Kingstown. The barrier has a single dune ridge 10+ feet high.

D04-Green Hill Beach (Washington): This unit is a wide, low bay barrier that has been recently overwashed, and protects Green Hill Pond. It is located between developed uplands (Green Hill on the east, and Charlestown Beach on the west) in the Town of South Kingstown. Dunes are low and scattered over the beach as a result of overwashing during past storms. Washover deposits are found in Green Hill Pond. The unit also includes small islands and spits within the pond: Horseneck Point, Goose Island, Jacob Island, and Hog Hill Island, plus two small spits in Flat Meadow Cove.

D05-East Beach (Washington): There are two sub-units on the eastern end of East Beach, a substantial bay barrier consisting of a dune ridge, back-barrier flats and marshes which protect Ninigret Pond. The unit fronts the Atlantic Ocean and is located in Charlestown. A dredged and jettied inlet bisects the barrier at the site of an old natural inlet opposite the U. S. Naval Reservation. The western sub-unit contains beach, dunes, marshes and a portion of Governors Island. The eastern sub-unit includes beach, dunes and a series of marshes: Marshneck Point, Ward Island, and Heather Island behind the existing inlet into Ninigret Pond.

D06-Quonochontaug Beach (Washington): The unit is a large bay barrier connecting Weekapaug Point and Quonochontaug Point and protects Quonochontaug Pond. It is located mostly in the Town of Westerly, but a small portion is in Charlestown. The barrier consists of low dunes, grassy flats, and marshes with an improved road running along the barrier to a dredged opening called Quonochontaug Breachway, the site of a former natural inlet. The western part of the barrier is called Weekapaug Beach and the eastern part in Charlestown is called Quonochontaug Beach. This barrier, along with others on the south shore of Rhode Island, was severely overwashed during the 1938 hurricane with major damage to existing structures. Hurricances in the 1950's also went over these barriers. Today, natural dune vegetation and grasslands grow where houses once existed.

D07-Maschaug Ponds (Washington): This unit is a bay barrier with a single dune ridge 10 feet high that protects two ponds: Maschaug Pond to the west and Little Maschaug Pond to the east. It is located on the Atlantic shore between the villages of Misquamicut to the east and Watch Hill to the west. The unit is just to the west of Misquamicut State Beach.

D08-Napatree (Washington): This unit contains two sections; Napatree Island and Napatree Beach at the very southwestern corner of Rhode Island, just west of Watch Hill. Napatree Island is also known as Sandy Point, and lies between Napatree Beach and Stonington, Connecticut, protecting Little Narragansett Bay. The southeastern end of Napatree Island has shown substantial migration to the northeast during the past 20 years. In effect, it appears to be rotating northeastward with its northwestern end acting as a pivot. Napatree Beach is a tombolo which also protects Little Narragansett Bay. The tombolo is attached at its eastern end to Watch Hill Point.

D09-Block Island (Washington) : This unit consists of three sub-units on the north and northwest coasts of Block Island from Grove Point to Sandy Point and down to Gunners Hill (practically the entire coastal barrier system of Block Island). The unit contains bay barriers protecting Great Salt Pond, Sachem Pond, and Middle Pond. The barriers front on Block Island Sound. The northern part of the unit is a cape called Beach Plum Neck.

This area consists of a vegetated dune field with elevations between 10 and 20 feet. The southwestern part of the unit, Gunners Hill, consists of a spit with dunes up to 20 feet and salt marshes behind. This spit is separated from Harbor Neck to the south by a jettied inlet into Great Salt Pond. This area has been called Rhode Island's most magnificent natural area due to its significant ecological, geological, and historical resources. Rare and endangered plants and birds can be found here, including the peregrine falcon and osprey. It is regarded as one of the three most unique areas in North America for birdwatching during the fall migration period.

Coastal Resource Management

Until recent years, industrialization and development took precedence over conservation of coastal resources, particularly salt marshes and beaches. Even so, public use of the coastal resources has long been a tradition among Rhode Islanders. The original charter granted on July 8, 1633, by King Charles II gave all subjects in Rhode Island Colony the free right to fish along the coast. The Rhode Island Constitution of 1842 guaranteed this right, and it was further strengthened in 1970 when Section 17 of the Constitution was amended. The state has established a number of parks along the coast, some of them on prime coastal barrier locations. One in particular was created by Governor Chafee on Quonochontaug Beach (opposite Ninigret Pond) after the hurricanes of 1938 and 1954 destroyed its houses.

In 1965, two laws were passed by the state legislature to protect salt marshes. In 1971 the Coastal Resources Management Council Act was passed. This Act remains the state's most effective coastal law. The requirements of the Federal Coastal Zone Management Act (PL92-583) have been incorporated into this 1971 Act and the Coastal Resources Management Council Act: G.L.R.I. Title 46, Chapter 23, as amended, Sections 1-16. The Council administers the funds received through Section 306 of the Coastal Zone Management Act. It is directly responsible to the Office of the Governor and has all the authorities for the management, planning and operational functions of the CZM Act.

The Council is made up of 17 members appointed by the Governor, the Lieutenant Governor and Speaker of the House, and consists of a least four officials from connumities a various sizes

Rhode Island's coastal region is defined as including lands within approximately one mile of tidal waters (the inner boundary of the census tract bisected by a line drawn one mile inland from tidal waters). Several towns and cites therefore fall entirely in this zone. For permitting review, all coastal towns fall within the boundary.

The Council has directed authority over the entire shoreline and those activities which will significantly affect the shore and tidal waters. It has direct permitting authority over all territorial sea, coastal wetlands, physiographic features and all directly associated areas continguous to and necessary to preserve the integrity of such areas and features. It also has direct permiting authority over a number of specific activities wherever they occur in the state where it finds a reasonable probability that a proposal will:

(1) conflict with a Council management plan or program
(2) significantly damage the environment of the coastal region
(3) make any area unsuitable for any uses or activities to which it is allocated by a Council plan or program.

All state agencies are required to cooperate and act consistently with the Council's plans and programs for the coastal region. In addition, the Concil's plans for the coastal region are an elaboration of, and fully consistent witht the State Guide Plan. New comprehensive municipal plans must conform with the State Guide Plan.

The Council has a detailed permit review process and is the last step for an in-state permitting procedure. It acts formally on an application only when all local and other state approvals have been obtained. Persons proposing alterations along the shoreline are informed by Council staff or by local authorities when a Council permit is required. Relevant proposed federal activities are channeled to the Council for review by staff at the Statewide Planning Program, the state's A-95 clearinghouse. Applications for any activities that may come under Council jurisdiction are forwarded by other state agencies to the Council for review.

The Council's regulations and actions have been very effective in protecting the coastal zone, especially coastal barriers. Council regulations and policies have prevented both damage to coastal wetlands and new residential development on previously undeveloped barrier beaches. New structures on developed barrier beaches have only been permitted if stringent criteria are met. There has been no new building on sand dunes. The activities most frequently denied are requests to build individual homes.

The following state regulations are in place and fall within the jurisdiction of the Council:

Activities in tidal waters and coastal ponds, adopted Sept. 1977.
Sand Dunes, 1974, amended 1975.
Beaches and barrier beaches, 1974, amended 1975.
Cliffs, ledges, bluffs; Sept. 1977.
Coastal wetlands, 1975.
Flood hazard areas, Sept. 1977.
Erosion control measures, Sept. 1977.
Aquaculture, Sept. 1977.
Areas in or contiguous to public beaches and coastal parks and historic resources, Sept. 1977.
Areas in or contiguous to coastal conservation, fisheries or wildlife management areas, public rights of way and public view sites, Sept. 1977.

Local Actions

No information is available at this time

Private Sector Initiatives

Harbor Watch is a conservation group that monitors coastal issues in Rhode Island. Before CBRA was enacted, the group and the Town of Little Compton had not considered CBRS unit Sakonnet Harbor Beach as a coastal barrier. Since then, the Town passed an amendment to preserve the barrier, and the town condemned a 5,200 square foot lot slated for intensive development. Title to the site passed to the Town during the week of June 22, 1984 ($23,000 was raised by local residents to protect the barrier). Harbor

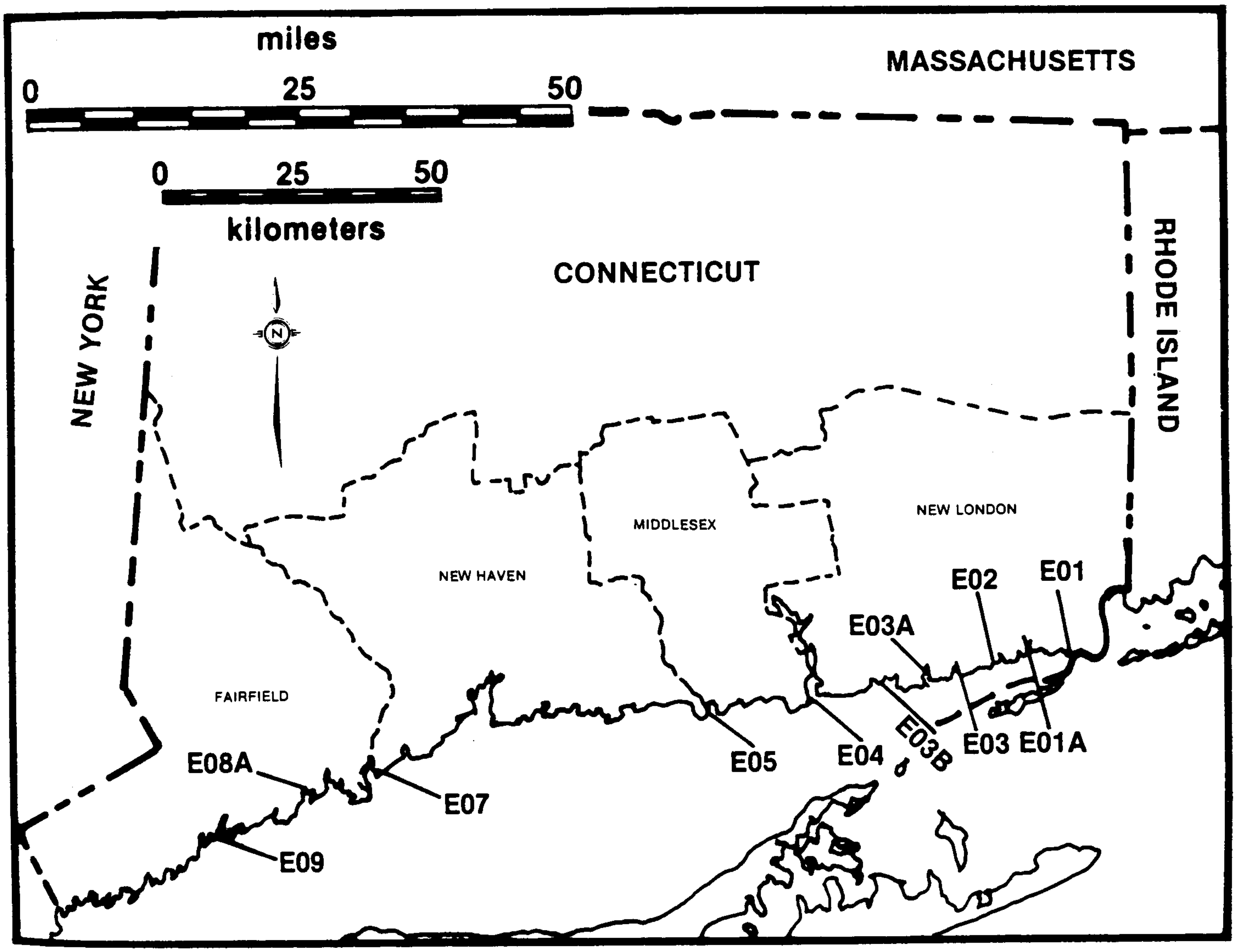
IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN RHODE ISLAND

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
D-01	LITTLE COMPTON PONDS	NEWPORT	1	SAKONNET POINT TIVERTON	0.56	75	ADDITION TO CBRS UNIT
RI-01	BROWN POINT	NEWPORT	1	TIVERTON	0.51	48	PRIVATE
D-02	FOGLAND MARSH	NEWPORT	1	TIVERTON	0.15	29	ADDITION TO CBRS UNIT
RI-02	SAPOWET POINT	NEWPORT	1	TIVERTON	1.65	477	MIXED
RI-03	SANDY POINT	KENT	1	TIVERTON	0.49	17	UNKNOWN
RI-04	SACHUEST POINT	NEWPORT	1	SAKONNET POINT NEWPORT	1.32	332	MIXED
RI-05	EASTON BEACH	NEWPORT	1	NEWPORT PRUDENCE ISLAND	0.57	287	PROTECTED
RI-06	ALMY POND	NEWPORT	1	NEWPORT	N/A	57	PROTECTED
RI-07	HAZARDS BEACH	NEWPORT	1	NEWPORT	0.17	41	MIXED
D-02B	PRUDENCE ISLAND COMPLEX	NEWPORT	1	PRUDENCE ISLAND BRISTOL EAST GREENWICH FALL RIVER	8.49	1016	ADDITION TO CBRS UNIT
D-02C	WEST NARRAGANSETT BAY COMPLEX	WASHINGTON	2	WICKFORD	1.10	44	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
RI-08	FOX HILL MARSH	NEWPORT	2	NARRAGANSETT PIER	0.63	185	MIXED
RI-09	BONNET SHORES BEACH	WASHINGTON	2	NARRAGANSETT PIER	0.36	119	PROTECTED
RI-10	NARRAGANSETT BEACH	WASHINGTON	2	NARRAGANSETT PIER	0.77	507	MIXED
RI-11	SEAWEED BEACH	WASHINGTON	2	NARRAGANSETT PIER	0.24	22	PRIVATE
RI-12	SAND HILL COVE	WASHINGTON	2	NARRAGANSETT PIER KINGSTON	0.33	298	PROTECTED
RI-13	EAST MATUNUCK	WASHINGTON	2	KINGSTON	0.68	400	MIXED
D-03	CARD PONDS	WASHINGTON	2	KINGSTON	0.97	233	ADDITION TO CBRS UNIT
D-04	GREEN HILL BEACH	WASHINGTON	2	KINGSTON	N/A	265	ADDITION TO CBRS UNIT
D-05	EAST BEACH	WASHINGTON	2	KINGSTON	3.06	1807	ADDITION TO CBRS UNIT
D-06	QUONOCHONTAUG BEACH	WASHINGTON	2	QUONOCHONTAUG WATCH HILL	0.39	740	ADDITION TO CBRS UNIT
RI-14	MISQUAMICUT BEACH	WASHINGTON	2	WATCH HILL	0.61	222	PROTECTED
D-07	MASCHAUG PONDS	WASHINGTON	2	WATCH HILL	N/A	N/A	NO CHANGE TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
D-08	NAPATREE	WASHINGTON	2	WATCH HILL MYSTIC	0.20	41	ADDITION TO CBRS UNIT
D-09	BLOCK ISLAND	WASHINGTON	2	BLOCK ISLAND	1.90	578	ADDITION TO CBRS UNIT
Totals:					25.15	7840	

COASTAL BARRIER RESOURCES SYSTEM
CONNECTICUT UNITS



CONNECTICUT

Like Massachusetts, much of Connecticut was cleared in the last century for agriculture, but now forests have returned to reclaim most of the undeveloped regions. The weather along the coast permits many southern coastal plants to exist a short distance from more northern species. Several southern bog plants, such as swamp magnolia and rhododendrons occur along the coast in southern white cedar swamps. The sandy areas along the shore support typical strand and salt marsh communities along with woodlands of pine-oak and cedar. Dune areas are relatively uncommon and restricted to a few major sand beaches.

The Connecticut shoreline with its warm waters, protected sound, and numerous harbors is heavily developed with summer cottages and year-round homes. The shoreline consists of rocky headlands, bluffs of sand and rock, numerous sandy or gravelly beaches, and many bays and small estuaries. The state had extensive salt marsh and tidal environments along this shoreline, but most of the wetlands were filled during past cycles of development. In recent years such destruction has been halted so that good examples of coastal wetlands remain along most of the shoreline.

Commercial and industrial activities in the state were once totally water-dependent and, thus, coastally oriented. Today the range of activities encompasses water-dependent and non-water-dependent uses. Commercial fishing, shellfishing and sportfishing, marina facilities and other tourist facilities exemplify-water dependent commercial uses. While historically of great economic importance, commercial finfishing and shellfishing activities are no longer major commercial uses of Connecticut's coast. Total finfish landings declined 75 percent in the twenty years between 1950 and 1970 (from 20 million pounds to 5 million pounds). The shellfish industry, which underwent a similar decline has been enjoying a slow resurgence since the mid 1970's. Sportfishing, commercial recreation and water-based tourism are, on the other hand, growing in importance.

Many older factories and industries located along the coast are no longer water-dependent yet occupy valuable coastal acreage. Shipbuilding, petroleum storage and mineral extraction (i.e., sand and gravel mining) are existing industrial uses of the coast. Manufacturing includes production of machinery, primary and fabricated metals, transportation equipment, chemicals and food products. Commercial and industrial activities beyond the immediate shorefront have greatly contributed to the economic growth of the thirty-six coastal municipalities. Between 1960 and 1970 there was an increase of 133 percent in commercial land use in the municipalities. Developments include shopping centers, office buildings, and other trade and service facilities.

Residential use accounts for 25 percent of Rhode Island's shorefront use. Rising land values and a lack of undeveloped shorefront land have stimulated more recent residential growth away from the waterfront. Within the thirty-six coastal municipalities, residential land acreage in the five years between 1970 and 1975 accounted for nearly one-half of the total newly developed land acreage.

While recreational and institutional uses have always occurred along the shorefront, they too have changed in character. Boating facilities are prominent along the coast. The state does not have extensive beach resources, however, the 78.6 miles of sandy beach are intensively utilized. Public ownership accounts for 30.2 miles of sandy beach; 32.1 miles are privately owned and 16.3 miles are owned by associations. Of the 30.2 miles of beach in public ownership, 7.52 miles are state owned and 22.65 miles are municipally owned. Furthermore, there are 5,599 acres of public campgrounds affording 1,332 sites within the 4 coastal counties. Within one mile of shore there are over 8,400 acres of recreation lands including some acreage attributable to small municipal parks and playgrounds.

CBRS Units

Unit Name	Unit #	County	Beach Length (mi.)
Wilcox Beach	EOl	New London	0.6
Ram Island	EOlA	New London	1.4
Goshen Cove	E02	New London	0.7
Jorden Cove	E03	New London	0.5
Niantic Bay	E03A	New London	0.5
Lynde Point	E03B	Middlesex	0.4
Menunketesuck Island	E04	Middlesex	0.5
Hammonasset Point	E05	Middlesex	0.3
Milford Point	E07	New Haven	0.4
Fayerweather Island	E08A	Fairfield	7.0
Norwalk Islands	E09	Fairfield	1.0

A brief description of each CBRS unit in the state is provided below. Each unit is identified by its number, name, and the county in which it is located.

E01-Wilcox Beach (New London): This unit is a broad, low spit just south of the Village of Quambaug fronting on Fisher's Island Sound.

E01A-Ram Island (New London): This is an island located in Fisher's Island Sound southeast of the Village of Noank.

E02-Goshen Cove (New London): The Goshen Cove unit, located on Long Island Sound in the Town of Waterford, contains two segments. The eastern part is a spit connected to Harkness Memorial Park and extends out across the entrance to Alewife Cove. A small tidal marsh is located behind the barrier. The western segment is also adjacent to the Park and is a bay barrier protecting a brackish water lagoon called Goshen Cove. The Cove drains into Long Island Sound through a narrow, temporary channel on the eastern side of the barrier. Goshen Point separates the two barrier segments.

E03-Jordan Cove (New London): This unit is a broad sand spit facing Long Island Sound with Jordan Cove behind. It is attached to the mainland just north of the Village of Pleasure Beach in the Town of Waterford.

E03A-Niantic Bay (New London): This unit is a small cape with marshlands behind it, including a small pond. It is located on the northeastern shore of Niantic Bay just south of the railroad and highway bridges at the entrance to the Niantic River. The barrier contains a dune ridge at least 10 feet high.

E03B-Lynde Point (Middlesex): The Lynde Point unit is a broad cape on the western shore of the Connecticut River entrance which partically protects South Cove and is located just east of the Village of Fenwick in the Town of Old Saybrook. The Saybrook Lighthouse is located in the unit, and a long jetty extends into Long Island Sound from the Point.

E04-Menunketesuck Island (Middlesex): This island is part of a developing tombolo system, and is mainly composed of an upland and tidal flats. The upland supports well developed grassy zones and shrub thickets. The barrier is oriented at right angles to the mainland and is just offshore in Long Island Sound from the Village of Hawks Nest.

E05-Hammonasset Point (Middlesex): This unit is a long spit extending northeastward from Hammonasset Point about three-fourths of the way across Clinton Harbor. The community of Cedar Island in the Town of Clinton is at the end of the spit. The barrier protects an extensive salt marsh system along its western half, as well as broad tidal flats and the entrance to the Hammonasset River. The unit is adjacent to Hammonasset State Park.

E07-Milford Point (New Haven): The Milford Point unit is a recurved barrier spit on the north side of the Housatonic River entrance to the Town of Milford. It protects an extensive salt marsh system which is owned by the State of Connecticut and managed as a wildlife sanctuary. A long jetty which protects the northeast side of the Housatonic River channel is attached to the Point.

E08A-Faverweather Island (Fairfield): This unit is a small tombolo system containing Fayerweather Island and a narrow beach which connects it to a coastal park in the City of Bridgeport on the east side of Black Rock Harbor. The unit protects the entrance to the Black Rock Harbor.

E09-Norwalk Islands (Fairfield): The unit consists of four major islands (Sheffield Island, Copps Island, Chimon Island and Goose Island) that are part of the Norwalk Island system in Long Island Sound just offshore from the City of Norwalk. The islands shelter the southeast entrance to Norwalk Harbor. They have been included in the newly approved Connecticut Coastal National Wildlife Refuge. Chimon Island is especially noted for its heron rookery, made up primarily of yellow-crowned night herons. It is the largest such breeding colony in Long Island Sound.

Coastal Resource Management

There have long been traditional public safety and welfare oriented coastal regulatory programs in existence at both the state and municipal level. Planning and zoning began in the early 1930's and the state's regulatory program for coastal structures began in 1940. The management of coastal resources first became part of the state's statutory mandate in 1969 with passage of the Tidal Wetlands Protection Act and creation of the Department of Environmental Protection in 1971. The Coastal Area Management Program developed a comprehensive program for implementation at both the state and municipal levels.

The state's coastal program is coordinated by its Coastal Area Management Program office within the Department of Environmental Protection. Of the various laws which apply to the coastal zone, including coastal barriers, the most important are P.A. 78-152, the Coastal Management Act (CMA), which established the Connecticut Coastal Area Management Plan; and P.A. 79-535 which amended the Coastal Management Act.

The Coastal Management Act (P.A. 78-152) provided the framework for establishing a coastal management program. It detailed nine goals and policies which concerned development, preservation and use of coastal and water resources; and specified the municipalities in the coastal zone. It also required the commissioner of environmental protection to prepare a report on the coastal management program, and established a legislative interim study committee to report to the 1979 General Assembly with recommendations for further legislative action. P.A. 79-535 contained 25 amendments. It expanded the goals and policies section of the earlier act, and spelled out specific procedures for implementing legislative policies and goals for the Coastal Management Program. It required towns to undertake coastal site plan reviews, and mandated the commissioner of environmental protection to answer questions for and provide maps and assistance to coastal towns. It also established a voluntary process for developing coastal programs in the towns and provided for allocation of funding for these programs.

Other Connecticut laws that can affect coastal barriers are described below:

The <u>Coastal Structures Law</u> (C.G.S. Sec. 25-7b to 25-7f) requires all structures, filling and related work in all tidal and coastal waters seaward of the mean high water mark to have a permit. It is enforced by the Dept. of Environmental Protection (DEP)- Water Resources Unit (WRU).

The <u>Coastal Dredging Law</u> (C.G.S. Sec. 25-10 to 25-18) requires a permit for taking and removing sand, gravel or other materials from lands under tidal and coastal waters seaward of the mean high water mark. It is enforced by the DEP-WRU.

The <u>Tidal Wetlands Law</u> (C.G.S. Sec. 22a-28 to 22a-35) requires a permit for all uses, except a) mosquito control ditching by the State Health Department under authority of C.G.S. Sec. 19-50 and 51, b) DEP conservation activities, c) construction and maintenance of navigation aids, and d) emergency health measures in all marsh areas at or below an elevation of one foot above local extreme high water and capable of growing salt tolerant flora. It is enforced by the DEP-WRU.

The Flood Control Law (C.G.S. Sec. 25-4a to 25-4f) requires permits for stream clearance or any form of flood control or flood alleviation measure within which any obstruction, encroachment or hinderance is placed along shorelines of any tidal or inland waterway or flood prone area (as determined by DEP). It is enforced by DEP-WRU.

The Water Pollution Control Law (C.G.S. 25-54) requires permits and is subject to pollution abatement orders for any source, actual or potential, of water contamination for all waters of the state including groundwater. It is enforced by DEP - Water Compliance.

The Fisheries Laws (Shellfishing) (C.G.S. 26-187 to 26-237) subject the taking of shellfish and lease and cultivation of all designated state shellfish beds to police power and proprietary controls. It is enforced by the Department of Agriculture - Aquaculture Division.

The State Assistance for Flood Control and Beach Erosion Law (C.G.S.Sec. 25-69 to 25-83a) authorizes the State to pay for the total cost of flood and erosion control projects (consistent with the Sec. 20 of the Coastal Management Act) benefitting state property, 66 percent of the cost of such projects benefitting municipal property and 33 percent of the cost of such project benefitting private property. It is administered by the DEP-WRU.

Executive Order 18 (June 10 1977, relating to flood control and beach erosion) requires State agencies to follow FEMA standards in undertaking development projects in flood plains.

The State Park and Recreation Laws (C.G.S. 22 to 26) provide the Commissioner of DEP with broad authority to purchase or condemn property for recreational uses (consistent with Sec. 20 of the Coastal Management Act). The Commissioner also receives and disburses federal funds for purchase of property by municipalities for recreational use. It is administered by DEP- Parks and Recreation Unit.

The State Open Space Conservation and Recreation Laws (C.G.S. Sec. 22 - 26) provide the Commissioner with broad authority to purchase or condemn land cultivated for conservation and research uses and to control uses of such lands and waters (consistent with Sec 20, CMA). It is administered by DEP.

The State Transportation Law (C.G.S. 236 to 242) authorizes the State Department of Transporation to plan and construct state highways (including interstate highways) consistent with Sec. 20 of CMA. It is administered by the Bureau of Highways.

The Connecticut Development Authority (C.G.S. 32-10 to 32-23m) provides The Connecticut Development Authority with broad authority to construct, purchase, manage or help finance development projects including explicit pollution control facilities, ferry boats, and recreation facilities (consistent with Sec. 20 of the CMA). It is administered by the Department of Economic Development.

Local Actions

In the City of Norwalk, the CBRS units have been zoned under "conservation" and are, or will be, owned by the City, the Nature Conservancy, or the Federal government.

Private Sector Initiatives

The Connecticut Audubon Society has been defending the Milford Point CBRS unit against development. They feel that the Unit will be developed if a builder has enough backing to proceed without federal insurance. The Milford Unit has been included in a proposal before Congress to create the Connecticut Islands National Wildlife Refuge. The Nature Conservancy has exercised an option it retained to purchase Chimon Island, part of the Norwalk Islands CBRS unit.

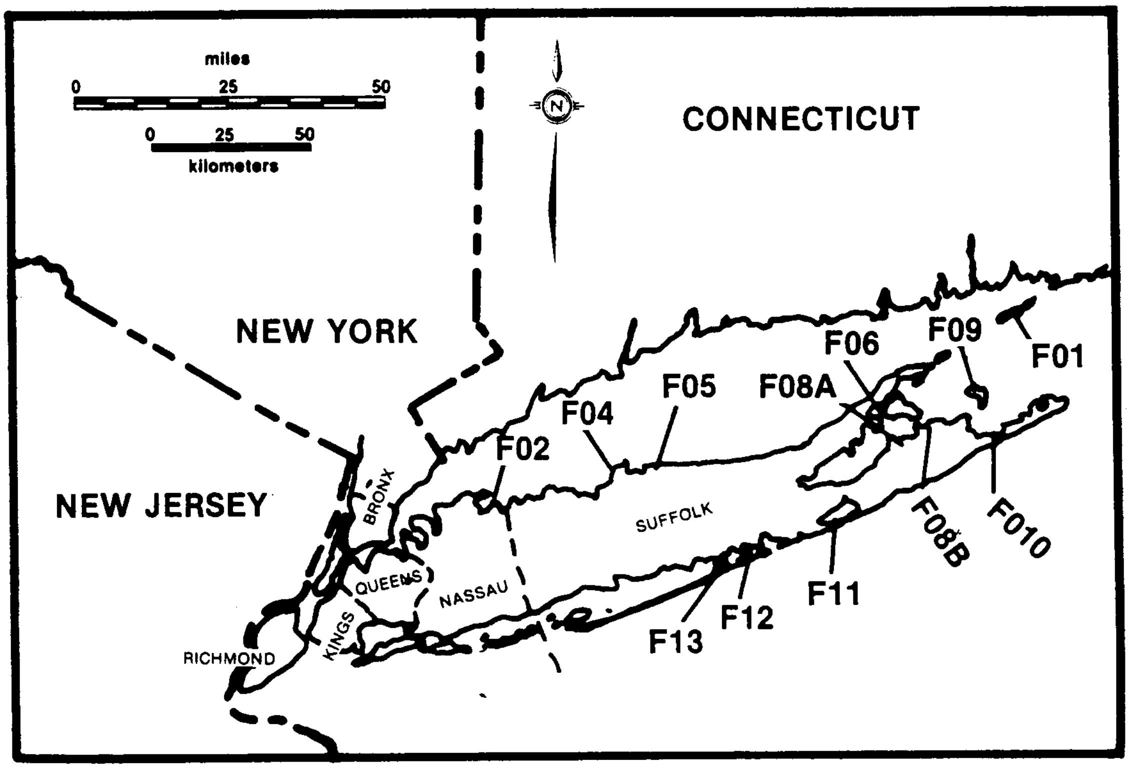
IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN CONNECTICUT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
D-08	NAPATREE	WASHINGTON	2	MYSTIC WATCH HILL	N/A	858	ADDITION TO CBRS UNIT
E-01	WILCOX BEACH	NEW LONDON	2	MYSTIC	N/A	8	ADDITION TO CBRS UNIT
E-01A	RAM ISLAND	NEW LONDON	2	MYSTIC	N/A	N/A	NO CHANGE TO CBRS UNIT
CT-01	MASON ISLAND	NEW LONDON	2	MYSTIC	0.53	61	PRIVATE
CT-02	BLUFF POINT	NEW LONDON	2	NEW LONDON	2.26	318	PROTECTED
E-02	GOSHEN COVE	NEW LONDON	2	NEW LONDON	0.38	36	ADDITION TO CBRS UNIT
E-03	JORDAN COVE	NEW LONDON	2	NIANTIC	N/A	41	ADDITION TO CBRS UNIT
E-03A	NIANTIC BAY	NEW LONDON	2	NIANTIC	N/A	N/A	NO CHANGE TO CBRS UNIT
CT-03	OLD BLACK POINT	NEW LONDON	2	NIANTIC	0.16	190	PROTECTED
CT-04	ROCKY NECK	NEW LONDON	2	NIANTIC	0.53	159	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
CT-05	HATCHETT POINT	NEW LONDON	2	OLD LYME	0.59	77	PROTECTED
CT-06	MILE CREEK	NEW LONDON	2	OLD LYME	0.22	63	PROTECTED
CT-07	GRISWOLD POINT	NEW LONDON	2	OLD LYME	1.05	1515	PROTECTED
E-03B	LYNDE POINT	MIDDLESEX	2	OLD LYME	N/A	N/A	NO CHANGE TO CBRS UNIT
CT-08	COLD SPRING BROOK	MIDDLESEX	2	ESSEX	0.09	21	PROTECTED
E-04	MENUNKETESUCK ISLAND	MIDDLESEX	2	ESSEX	N/A	N/A	NO CHANGE TO CBRS UNIT
CT-09	HARBOR VIEW	MIDDLESEX	2	CLINTON	0.42	105	UNKNOWN
E-05	HAMMONASSET POINT	MIDDLESEX	2	CLINTON	1.84	742	ADDITION TO CBRS UNIT
CT-10	HAMMONASSET	NEW HAVEN MIDDLESEX	3 2	CLINTON	0.34	114	MIXED
CT-11	SEA VIEW BEACH	MIDDLESEX	2	CLINTON	0.24	42	PROTECTED
CT-12	LINDSEY COVE	NEW HAVEN	3	BRANFORD	0.28	9	UNKNOWN
CT-13	KELSEY ISLAND	NEW HAVEN	3	BRANFORD	0.25	32	PRIVATE
CT-14	NATHAN HALE	NEW HAVEN	3	NEW HAVEN	0.24	8	PROTECTED
CT-15	NEW HAVEN HARBOR	NEW HAVEN	3	NEW HAVEN	1.17	592	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
CT-16	GULF BEACH	NEW HAVEN	3	MILFORD	0.22	47	PROTECTED
CT-17	CHARLES ISLAND	NEW HAVEN	3	MILFORD	0.50	59	PROTECTED
E-07	MILFORD POINT	NEW HAVEN	3	MILFORD	0.28	826	ADDITION TO CBRS UNIT
CT-18	LONG BEACH	FAIRFIELD	4	BRIDGEPORT	0.23	614	PROTECTED
E-08A	FAYERWEATHER ISLAND	FAIRFIELD	4	BRIDGEPORT	N/A	N/A	NO CHANGE TO CBRS UNIT
CT-19	SHERWOOD ISLAND	FAIRFIELD	4	SHERWOOD POINT	0.86	222	PROTECTED
E-09	NORWALK ISLANDS	FAIRFIELD	4	NORWALK SOUTH SHERWOOD POINT	0.92	376	ADDITION TO CBRS UNIT
CT-20	GREENWICH POINT	FAIRFIELD	4	STAMFORD	2.04	270	MIXED
Totals:					15.64	7405	

COASTAL BARRIER RESOURCES SYSTEM
NEW YORK UNITS



NEW YORK

New York State is the largest state in the Northeast and is one of the most complex in the country, in terms of its configuration, natural resources, population and economy. It covers 49,576 square miles of land and is 310 miles long from north to south boundaries and 330 miles from east to west.

Until the 1960s, New York was considered first in nearly all indexes - population, culture, or economic. Even though its growth rate slowed during the decade from 1960 to 1970, its population is greater than any other state except California, Florida and Texas, with nearly 18,000,000 people. Slightly less than half of all the people in New York live in the 320 square miles. The New York City area is within a few miles of the Atlantic Ocean, Hudson River and barrier beaches which fringe the south shore of Staten Island and Long Island. Thus, while most of the state is sparsely settled, the coastal areas are under substantial pressure from development interests and human use. Except for the Great Lakes shoreline of the state, Long Island has the majority of sand beaches to which the large population of New York City and its suburbs are attracted. Nearly four-fifths of New York can be considered urban or suburban.

A major, and growing, part of the state's economy is tourism. Outdoor recreation is an important part of the economy in central and northern New York especially in the Lake George and Lake Placid regions. Recreational use of the maritime environment on Long Island increases yearly.

Long Island, and the many smaller islands associated with this part of the state, owe their origins to the last glaciation. The northern side of Long Island represents the most southerly extent of the last glacier and is a terminal morraine (ridge deposit). Its landscape is therefore relatively high, hilly and very irregular. High bluffs have been produced along the north shore as waves from Long Island Sound erode this glacial deposit. The central and southern portions of Long Island contain outwash plains that developed as the glacier melted. The landscape here is relatively level and gradually sloping towards the south, although there are numerous depressions which formed as blocks of ice remained behind. The erosion of these outwash deposits produced the extensive chain of coastal barriers that define the south shore and extend westward over 80 miles from Southampton. Smaller barrier beaches have formed wherever waves have access to erodable glacial deposits on the north shore and around the many islands east of Long Island such as Shelter Island, Plum Island, and Gardiners Island. The very eastern part of Long Island fronting on the Atlantic consists of eroding glacial uplands with small barriers across salt ponds and small bays.

A southern type of forest occurs on Long Island. Here one can find a wide variety of vegetation ranging from a mixed beech, maple, tulip tree, elm, gum and oak forest in areas with plenty of water to a drier oak-hickory forest on uplands and finally a pitch pine and oak woodland on the driest and most well-drained uplands.

On some portions of eastern Long Island, a scrub woodland of dwarf oaks and pines exists, along with some heathland. The coastal marshes are dominated by cordgrass and are best developed behind the coastal barriers along the south shore. The typical strand community occurs on the long lines of dunes along the barriers - beach grass, bay berry, beach heather, beach plum, pitch pine, little blue stem, and reeds. Scattered maritime forests exist on the barriers. The best known example is the Sunken Forest on Fire Island where American holly, sassafras and black gum dominate the woodland.

The coastal resources of the State are extensive. Long Island alone has 1,475 miles of salt water shoreline (46 percent of the state's total coastline). The mainland coast along the Great Lakes runs for 700 miles, while that of its islands adds another 340 miles. The marine resources around Long Island include clam flats, oyster beds, salt marshes and estuaries, fin fishing waters - both commercial and sport, and bays that support a wealth of marine life and waterfowl. Clamming in Great South Bay is a major coastal industry. The Great Lakes shores have fewer beach resources, but have increasingly good fishing as the lakes are cleaned of past pollution problems. Because of its great geological diversity, mining and extraction of mineral resources has gone on for a long time.

As a result of its size, New York has the full array of wildlife that can be found in the Northeast ranging from large mammals in upstate areas to the more common smaller species found in most eastern woodlands. There are many species of birds, ranging from terns, skimmers, gulls, ducks, geese and herons along the coast to turkeys, ospreys, eagles and falcons in the mountains, and along rivers and lakes. Songbirds of every type that inhabit the eastern forests can be found in New York.

The State continues to be a leader in maritime commerce with the port of New York one of the major seaports in the world today. The fishing industry has always been an important part of the economy, although many New York markets depended on fish caught in New England waters. The commercial fishery of New York has fallen into a severe decline in recent years - only one commerical fishing boat uses New York City as its home port. There is an active fishing fleet on Long Island, but it is small compared to past numbers. The oyster industry was also very large in the past. In 1976, the value of New York's commercial fisheries was estimated to be $87.8 million, while that of sport fisheries was $222.5 million. In 1981, economic returns from sportfishing in fresh water were estimated at $405 million.

Development along the coast has been intensive for many years. Most of the 120 miles of Long Island's south shore, and much of the north shore, have been developed for seasonal and year-round residences. The concentrations of homes are greatest along the East Hampton and South Hampton shore down to Shinnecock Inlet. Between Moriches Inlet and Robert Moses State Park on the western end of Fire Island the only "natural" barrier remaining is now part of Fire Island National Seashore. Even within the Seashore there are developed inholdings such as Ocean Beach and Fire Island Pines. The remaining 38 miles of barrier are heavily developed, except for some state parks and a portion of Gateway Recreation Area at the end of Rockaway Beach. Development on these western barriers has produced urban complexes to the water's edge. The extent of this development is shown by 1971 estimates that over $750 million in damage would occur along the south shore of Long Island if the most severe hurricane likely for the area, such as the 1938 storm, were to hit.

CBRS Units

Unit Name	Unit #	County	Beach Length (mi.)
Fishers Island Barriers	F01	Suffolk	0.9
Eatons Neck	F02	Suffolk	0.8
Crane Neck	F04	Suffolk	0.7
Old Field Beach	F05	Suffolk	2.2
Shelter Island Barriers	F06	Suffolk	2.3
Sammys Beach	F08A	Suffolk	0.8
Acabonack Harbor	F08B	Suffolk	2.1
Gardiners Island Barriers	F09	Suffolk	6.9
Napeague	F10	Suffolk	0.9

Mecox	F11	Suffolk	0.6
Southampton	F12	Suffolk	1.4
Tiana Beach	F13	Suffolk	1.4

A brief description of each unit in the state is provided below. Each unit is identified by its number, name, and the county in which it is located.

E01-Fishers Island Barriers (Suffolk): This unit is located on the southeast coast of Fishers Island facing Block Island Sound in the Town of Southold. The unit consists of a double spit system protecting Beach Pond to the east and Island Pond to the west.

F02-Eatons Neck(Suffolk): This unit is a recurved spit that bends southward from Eatons Neck Point, just west of the Coast Guard station. The barrier protects a salt marsh and tidal flat and fronts on Long Island Sound.

F04-Crane Neck (Suffolk): The barrier spit which makes up this unit is attached to the eastern side of Crane Neck and protects Flax Pond. It is also called Flax Pond Beach. In addition to the pond, a substantial salt marsh system is protected by the barrier. This salt water pond drains into Long Island Sound through a narrow channel at the eastern end of the barrier. The unit is located just north of the Village of Old Field near Stony Brook.

F05-Old Field Beach (Suffolk): This unit contains two parts; an eastern spit attached to Mt. Misery Poind, and a western spit attached to Old Field Point. The barrier is a double spit system with a dredged and jettied inlet leading to Port Jefferson Harbor. The unit is located northwest of the Village of Port Jefferson in the Town of Brookhaven. The barrier spits contain dune ridges over 10 feet in height with marshes and tidal flats behind.

F06-Shelter Island Barriers (Suffolk): This unit contains two barriers which are part of a tombolo system connecting the Ram Islands to the main part of Shelter Island. Upper Beach is the larger of the two and runs from Shelter Island to little Ram Island. Lower Beach connects Ram and Little Ram Islands.

F08A-Sammy's Beach (Suffolk): This unit is a bay barrier at the mouth of Three-Mile Harbor fronting on Gardiner's Bay in Long Island Sound. The barrier is bisected by a dredged and jettied inlet which opens into Threemile Harbor. The western section, which is attached to Lafarges Landing, is called Sammys Beach. The eastern section is Maidstone Park Beach. The barrier has dunes up to 10 feet high that recurve into the Harbor and a large salt marsh behind it called The Flats. A small island in the inlet known as Dayton Island is also included in this unit.

F08-Acabonack Harbor (Suffolk): This unit contains two sections on part of a spit protecting Acabonack Harbor which trends southward from the Village of Gerald Park and fronts on Gardiners Bay in the Town of East Hampton. It also contains a smaller spit attached to Acabonack Cliff which recurves westward across the mouth of East Harbor. and several marsh islands and a one small wooded island in the Harbor.

F09-Gardiner's Island Barriers (Suffolk): This unit contains 5 barriers located on Gardiner's Island, a glacially derived island in Long Island Sound. Bostwick Point, on the north end of the island, forms a cape with barrier spits protecting Bostwick Creek, and its marshes. This is the largest barrier system on the island and consists of washover flats and low dunes. It is a major nesting area for shorebirds, terns and gulls. Cherry Hill Beach is a small barrier in front of Cherry Hill Pond on the western tip of the island. Just to the east of Cherry Hill is Home Pond Beach protecting Home Pond. This too is a bay barrier. On the east side of the island is Tobaccolot Pond Beach which is a bay barrier of low dunes and washover flats. The fifth barrier is a long spit which extends southward from Great Pond on the southern tip of the island towards Cartwright Island, to which it was once connected. This spit is a low washover feature with only scattered dunes. The beaches of Gardiner's Island are among the few in New York which remain in their natural state and are nesting grounds for many sea and shore birds, including the roseate tern, potentially an endangered species. The barriers and associated ponds are important habitats for many species of the heron family, waterfowl, gulls, ospreys, skimmers, and terns. Several species of terns also nest on the beaches.

FIO-Napeague (Suffolk): This unit has an outstanding dune system, with elevations up to 20+ feet, two dune ridges throughout, and three dune ridges in certain sections. The barrier protects Napeague Bay. It is located on the southside of eastern Long Island facing the Atlantic Ocean. It is adjacent to Hither Hills State Park. The dunes provide habitat for numerous small animals, such as mice and rabbits, and are excellent hunting grounds for raptors. Marsh hawks, peregrine falcons, and short-eared owls have been seen in the unit. The latter two are considered rare on Long Island.

F11-Mecox (Suffolk): This unit consists of a large bay barrier with a dune ridge up to 30 feet high. It protects two small ponds called Jule Pond and Channel Pond which are near the southwestern corner of Mecox Bay on the south shore of Long Island in the Town of Southampton. The beach is called Watermill Beach and faces on the Atlantic Ocean.

F12-Southampton Beach (Suffolk): This unit is at the western end of a linear spit called Southampton Beach. The barrier protects Shinnecock Bay and extends westward from Southampton on the south shore of Long Island. It has a single vegetated dune ridge with portions up to 20 feet high. A sand road runs down the back of the barrier to the inlet. Salt marshes fringe the backside of the barrier. Shinnecock Inlet is dredged and jettied.

F13-Tiana Beach (Suffolk): Tiana Beach is part of the bay barrier system protecting Shinnecock Bay and is located west of Shinnecock Inlet near the Village of Hampton Beach. The barrier consists of a single dune ridge which reaches 20+ feet in places and supports typical dune vegetation. A dune road runs along the backside of the barrier. Salt marshes, including one called Sedge Island, along the bay shore of the barrier are included in the unit, as well as bay waters out to Quogue Canal. The barrier itself fronts on the Atlantic Ocean.

Coastal Resource Management

As late as 1973, the dredging and filling of wetlands along the coast was largely unregulated. Wetlands provided convenient and inexpensive sites for disposal of dredge spoils and the huge amounts of garbage emanating from the big cities until the mid to late 1970's when the state legislature began enacting laws to protect the marine and coastal environment. These laws included.

> The Tidal Wetlands Act, Environmental Conservation Law (Article 24) regulates any land use activities that would diminish the value of wetlands as fish and wildlife habitats. Regulated activities include any form of draining, dredging, excavation, dumping, filling, construction, pollutant discharge or any other activity which directly or indirectly impairs the tidal wetland's ability to provide habitat. The Department of Environmental Conservation has inventoried, classified and mapped the State's tidal wetlands.

The Waterfront Revitalization and Coastal Resources Act, Executive Law (Article 42) calls for the restoration and revitalization of natural and developed coastal resources. The main purpose of the Act is to restore, revitalize, and redevelop deteriorated and underutilized waterfront areas for commercial, industrial, cultural, recreational and other compatible uses.

The New York State Park Preserve System, Parks and Recreation Law (Article 20) gives the Office of Parks, Recreation and Historic Preservation the power (in conjunction with Section 309, authorizing acquisition of land for state recreational facilities) to purchase park preserve areas in or near metropolitan regions in order to "maintain the integrity of fauna..." and to "provide for management of all unique, rare, or endangered species of fauna within park preserve areas."

The State Nature and Historical Preserve Trust, Environmental Conservation Law (Article 45) provides for acquisition, when authorized by act of the legislature, of real property (including less than fee interests) and administration of lands, outside the forest preserve counties, "...of special natural beauty, wilderness character or geological, ecological, or historical significance."

The Coastal Erosion Hazard Areas Act Environmental Conservation Law (Article 34) provides for the identification of coastal erosion hazard areas, including nearshore natural protective features such as shoals, bars and spits, which if altered might lower the reserves of sand or other natural materials available to replenish storm losses through natural processes. The law requires also that excavation or other alteration of land will be regulated to minimize adverse effects on those natural protective features as well as to prevent erosion of other lands.

The Flood Plain Management Act, Environmental Conservation Law (Article 36) ensures that, if a community fails to qualify for the federal flood insurance program, the state will develop flood hazard regulations for that community to make it eligible for participation in the program. The regulations are, at a minimum, those specified by the Federal Emergency Management Agency. State agencies are also constrained by this law through regulation of such activities as the financing or authorization for implementation of projects on state lands. The regulations are, at a minimum, those specified by the federal flood insurance program.

The Water Resources Act, Environmental Conservation Law (Article 15) requires that proposals which would excavate or deposit fill in any navigable waters and adjacent marshes and estuaries of the state, including those to construct pipelines, require permits issued by the Department of Environmental Conservation.

State Environmental Qualitv Review Act (SEQRA), Environmental Conservation Law (Article 8) requires state agencies and local governments to prepare an environmental impact statement for any action that might have a significant impact upon the environment. The environment is broadly defined to include existing patterns of development and land resources. Actions subject to an environmental impact statement must minimize or avoid to the maximum extent practicable, the adverse environmental effects revealed in the impact statement (ECL 8-0109-8). In addition, pursuant to the Tidal Wetland Act SEQRA regulations are amended to require that actions by a State agency for which an EIS has been prepared shall also be consistent with that Act's coastal policies.

The New York Coastal Management Program as authorized by L. 1975, C. 464, Sect. 47, serves two major functions: coordinating the existing programs, activities, and decisions that affect the coast, and advocating specific coastal activities. The State's program is based on several determinations made in response to the Coastal Zone Management Act of 1972:

1. New York State would, to the greatest extent possible, rely upon existing laws and programs to implement the program's objectives.

2. The Waterfront Revitalization and Coastal Resources Act and the Coastal Erosion Hazards Area Act. This legislation filled gaps in existing laws and programs, thus enabling the state to have an approvable program.

3. Comprehensive review processes, such as the Environmental Quality Review (Environmental Conservation Law, Article 8) and Siting of Major Steam Electric Generating Facilities (Public Service Law, Article VIII), would be used to determine an action's consistency with the program's policies.

4. Local governments would be encouraged to develop and implement waterfront revitalization programs, thus participating in the State's Coastal Management Program.

Chapter 464 of the 1975 law authorizes the New York Secretary of State to apply for, receive and administer any federal funds which are made available to the State under the Coastal Zone Management Act of 1972, as amended. These laws also permit the Secretary to enter into agreements with other state, regional, county and local agencies which could assist the Department of State in the administration and/or implementation of the Coastal Management Program.

The Waterfront Revitalization and Coastal Resources Act (Executive Law, Article 42) requires the Secretary to file, maintain and, when appropriate, amend the Coastal Area map that shows the lands and waters in New York State to which the Act's coastal policies apply. The Act also charges the Secretary to review and approve waterfront revitalization programs prepared by coastal communities. As part of this review process, state agencies and appropriate county and local governments will be consulted before the Secretary of State approves any local waterfront revitalization program. In situations where a conflict between a local program and an existing state policy arises, the Secretary must attempt to resolve the differences.

The Department of State also performs other activities essential to the State's Coastal Management and Waterfront Revitalization Programs. The Department tracks actions proposed in the coastal area through the State Environmental Quality Review Act (SEQRA) process and evaluates the consistency determinations made by state agencies. When appropriate, the Department advises the agencies on the consistency of such actions with the coastal policies. The program-related administrative and implementation activities of agencies under contract to the Department are also monitored and reviewed.

Changes to policies and boundaries of the Coastal Area require the review and approval of the Secretary of State. If appropriate, such changes may necessitate notification, review and/or approval by the federal and local governments. Procedures covering amendments to local Waterfront Revitalization Programs are found in the draft regulations pertaining to the Department's review and approval of such local programs.

The Department of State is also responsible for conducting the Federal consistency review process at the state level. Generally, the Department will evaluate major actions proposed in the coastal area of the State by federal agencies or by entities requiring federal permits and determine the consistency of those actions with the program's policies.

The Department of Environmental Conservation (DEC) has the major responsibility for protecting the natural resources of the coastal area. This responsibility includes new administrative authority for protecting coastal erosion hazard areas as well as its existing permit authority for wetlands, both tidal and freshwater, and air and water quality.

In its permitting role, DEC reviews most activities that have the potential to affect coastal resources. Those with the potential for significant impact are thoroughly reviewed in connection with the SEQRA process and can be approved only after DEC has found that the activity will be consistent with the policies of the Coastal Management program. This review ensures comprehensive implementation of the program with respect to a wide variety of activities.

In addition, DEC is responsible for a number of direct and funding activities, some of which, such as the construction of wastewater treatment facilities, have major consequences for coastal development. The assured consistency of these activities will have major long range beneficial effects on the coastal area.

The main thrust of the state's coastal program is to coordinate the many laws and programs that were passed in recent years. The program has spelled out 44 policies relating to management of the state's coastal resources. Each one of these policies is directed towards a specific coastal problem and uses existing laws and agencies to carry out the policies. The policies require that agencies responsible for carrying out the existing laws consider interrelationships that exist and/or should exist in the coastal area -- not just interrelationships evident in a single ecosystem, i.e., wetlands, but the coastal area as a whole.

The section of the Waterfront Revitalization and Coastal Resources Act that deals specifically with coastal barriers is Section 919. It "requires (1) that State agencies actions, including funding, planning, land transactions, as well as direct development activities must be consistent with the policies of this Act". This provision of law is implemented by amendments to SEQRA and by Department of State regulations. Those Department of State regulations (19 NYCRR Part 600) provide that, for direct actions which do not have a significant effect on the environment, State agencies certify that the action is consistent with the coastal policies. These policies state that activities or development in the coastal area will be undertaken so as to minimize damage to natural resources and property from flooding and erosion by protecting natural protective features including beaches, dunes, barrier islands and bluffs. Primary dunes will be protected from all encroachments that could impair their natural protective capacity; that the Secretary of State shall review actions of State agencies that may affect achievement of the policy; and, that SEQRA regulations be amended to reflect consideration of the adverse effect of activities or development on natural protective features.

The Tidal Wetlands Act is designed to preserve and protect tidal wetlands, and to prevent their despoilation and destruction, giving due consideration to the reasonable economic and social development of the State. The regulatory program associated with the act is contained in the NYCRR, Title 6, Parts 660 and 661. Part 660 describes a moratorium regulatory program, while Part 661 details a permanent regulatory program.

The moratorium program provided interim protection to wetlands while the tidal wetlands inventory was being completed. Once maps were filed with the appropriate local governments, the moratorium on development in the majority of wetlands was lifted and permanent land use regulations went into effect.

For the purposes of the Tidal Wetlands Act, the permanent regulations apply to the six tidal wetland types and divide land uses into four categories: uses not requiring a permit; generally compatible uses; presumptively incompatible uses; and incompatible uses. All but the first category are subject to permit restrictions. More specifically, regulated uses include draining, dredging, excavation, filling, construction of facilities, pollution, and land subdivision.

Each application for a permit is subject to a hearing. A notice of public meeting is sent to affected parties. If no objections are received, the hearing may be cancelled. The application is then reviewed and denied or granted with conditions to minimize impact. Permits may be suspended or revoked upon grounds stated in the regulations.

Local Actions

The Long Island Regional Planning Board is under contract with FEMA to prepare a Hurricane Damage Mitigation Plan for the South Shore of the Long Island Counties of Nassau and Suffolk. The plan will be complete this fall and contains recommendations for modifying FEMA regulations in flood-prone areas.

The Southampton Conservation Board has had beach and dune setback restrictions on barrier beaches for several years. New York State also has wetland setbacks for marshes behind barriers, and a flood plain overlay district covers the barrier beaches. The Town is sensitive to the issue of coastal conservation and regulates development under paragraph 69.9 of the Town Code. Suffolk County owns a large portion of the barrier system west of Shinnecock Inlet, and this has been preserved. The eastern side is heavily developed and a "commercial fishing facility" is being constructed at the inlet. The Town has issued a moratorium on building permits in the heavily eroding area in front of Moriches Bay. Construction continues elsewhere.

The Town of Shelter Island amended its own Zoning Ordinance to include the CBRS units within its district. In taking this action the Board stated:

> "whenever an undeveloped coastal barrier district (OBRA and CBRS Units) exists within a major district, no structure shall be erected nor operations conducted thereon, or use made thereof other than the use existing at the time of the adoption thereof, unless approved by the Board of Appeals".

Private Sector Initiatives

Chapters of the Nature Conservancy, particularly the Long Island Chapter, have been active in preserving coastal barriers throughout Long Island .

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIER UNITS IN NEW YORK

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
NY-01	MANURSING ISLAND	WESTCHESTER	20	MAMARONECK	1.18	261	PROTECTED
NY-02	HUNTER ISLAND	BRONX	19	FLUSHING	1.89	718	PROTECTED
NY-03	SANDS POINT	NASSAU	3	SEA CLIFF	0.62	45	UNKNOWN
NY-04	PROSPECT POINT	NASSAU	3	SEA CLIFF	0.24	39	PROTECTED
NY-05	DOSORIS POND	NASSAU	3	BAYVILLE	0.19	63	PROTECTED
NY-06	FROST CREEK	NASSAU	3	BAYVILLE	0.89	105	MIXED
NY-07	OYSTER BAY	NASSAU	3	BAYVILLE	0.86	2645	MIXED
NY-08	SAGAMORE HILL	NASSAU	3	LLOYD HARBOR	0.29	16	MIXED
NY-09	LLOYD BEACH	SUFFOLK	3	LLOYD HARBOR	1.02	124	PROTECTED
NY-10	LLOYD POINT	SUFFOLK	3	LLOYD HARBOR	2.02	310	MIXED
NY-11	LLOYD HARBOR	SUFFOLK	3	LLOYD HARBOR	1.46	571	MIXED
NY-12	HOBART BEACH	SUFFOLK	3	LLOYD HARBOR	1.10	232	PROTECTED
NY-13	CENTERPORT HARBOR	SUFFOLK	3	LLOYD HARBOR	0.43	112	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
F-02	EATONS NECK	SUFFOLK	3	LLOYD HARBOR	0.13	54	ADDITION TO CBRS UNIT
NY-14	CRAB MEADOW	SUFFOLK	3	NORTHPORT	0.35	285	PROTECTED
NY-15	SUNKEN MEADOW	SUFFOLK	3	NORTHPORT SAINT JAMES	0.25	686	PROTECTED
NY-16	STONY BROOK HARBOR	SUFFOLK	1	SAINT JAMES	2.03	1316	PROTECTED
F-04	CRANE NECK	SUFFOLK	1	SAINT JAMES	0.32	10	ADDITION TO CBRS UNIT
F-05	OLD FIELD BEACH	SUFFOLK	1	PORT JEFFERSON	0.45	1144	ADDITION TO CBRS UNIT
NY-17	MT. SINAI HARBOR	SUFFOLK	1	PORT JEFFERSON	0.88	581	MIXED
NY-18	WADING RIVER	SUFFOLK	1	WADING RIVER	0.34	216	PROTECTED
NY-19	BAITING HOLLOW	SUFFOLK	1	WADING RIVER	0.26	52	PROTECTED
NY-20	LUCE LANDING	SUFFOLK	1	MATTITUCK	0.13	23	PROTECTED
NY-21	MATTITUCK INLET	SUFFOLK	1	MATTITUCK HILLS	0.37	56	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
NY-22	GOLDSMITH INLET	SUFFOLK	1	SOUTHOLD	0.25	47	PROTECTED
NY-23	TRUMAN BEACH	SUFFOLK	1	ORIENT	1.15	271	MIXED
NY-24	PLUM ISLAND	SUFFOLK	1	PLUM ISLAND	1.40	213	UNPROTECTED
NY-25	ORIENT BEACH	SUFFOLK	1	ORIENT	4.34	1712	PROTECTED
NY-26	PIPES COVE	SUFFOLK	1	SOUTHOLD	0.43	60	PRIVATE
NY-27	CONKLING POINT	SUFFOLK	1	SOUTHOLD	0.50	24	PRIVATE
NY-28	SOUTHOLD BAY	SUFFOLK	1	SOUTHOLD	1.18	240	MIXED
NY-29	CEDAR BEACH POINT	SUFFOLK	1	SOUTHOLD	0.58	89	PROTECTED
NY-30	HOG NECK BAY	SUFFOLK	1	SOUTHOLD	1.17	253	PRIVATE
NY-31	BROADWATER COVE	SUFFOLK	1	SOUTHOLD	0.77	106	MIXED
NY-32	DOWNS CREEK	SUFFOLK	1	SOUTHAMPTON	0.29	66	UNKNOWN
NY-33	ROBINS ISLAND	SUFFOLK	1	SOUTHAMPTON	1.01	41	PRIVATE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
F-01	FISHERS ISLAND BARRIERS	SUFFOLK	1	MYSTIC NEW LONDON	0.31	91	ADDITION TO CBRS UNIT
NY-34	EAST CREEK	SUFFOLK	1	MATTITUCK	0.37	53	PROTECTED
NY-35	INDIAN ISLAND	SUFFOLK	1	MATTITUCK	0.49	44	PROTECTED
NY-36	FLANDERS BAY	SUFFOLK	1	MATTITUCK	0.31	561	PROTECTED
NY-37	RED CREEK POND	SUFFOLK	1	MATTITUCK	0.43	68	PRIVATE
NY-38	SQUIRE POND	SUFFOLK	1	MATTITUCK	0.39	53	UNKNOWN
NY-39	COW NECK	SUFFOLK	1	SOUTHAMPTON	1.82	785	MIXED
NY-40	NORTH SEAL HARBOR	SUFFOLK	1	SOUTHAMPTON	0.82	296	MIXED
NY-41	JESSUP NECK	SUFFOLK	1	GREENPORT	1.98	641	PROTECTED
NY-42	MILL CREEK	SUFFOLK	1	SAG HARBOR GREENPORT	0.33	51	PRIVATE
NY-43	SAG HARBOR	SUFFOLK	1	SAG HARBOR GREENPORT	1.46	238	MIXED
NY-44	GLEASON POINT	SUFFOLK	1	GREENPORT	0.67	54	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
NY-45	WEST NECK HARBOR	SUFFOLK	1	GREENPORT	1.20	266	MIXED
NY-46	CRAB CREEK	SUFFOLK	1	GREENPORT	0.49	40	PRIVATE
NY-47	HAY BEACH POINT	SUFFOLK	1	GREENPORT	0.37	13	PRIVATE
F-06	SHELTER ISLAND	SUFFOLK	1	GREENPORT	1.15	1164	ADDITION TO CBRS UNIT
NY-48	MASHOMACK POINT	SUFFOLK	1	GREENPORT	2.15	241	PROTECTEED
NY-49	SMITH COVE	SUFFOLK	1	GREENPORT	0.32	37	PRIVATE
NY-50	FRESH POND	SUFFOLK	1	GREENPORT	0.28	40	PRIVATE
NY-51	NORTHWEST HARBOR	SUFFOLK	1	GARDINERS ISLAND W.	1.29	1658	PROTECTED
F-08A	SAMMYS BEACH	SUFFOLK	1	GARDINERS ISLAND W.	0.10	845	ADDITION TO CBRS UNIT
NY-52	HOG CREEK	SUFFOLK	1	GARDINERS ISLAND W.	0.24	28	UNKNOWN
F-08B	ACABONACK HARBOR	SUFFOLK	1	GARDINERS ISLAND W.	0.13	486	ADDITION TO CBRS UNIT
F-09	GARDINERS ISLAND BARRIERS	SUFFOLK	1	GARDINERS ISLAND E. GARDINERS ISLAND W.	0.32	24	ADDITION TO CBRS UNIT

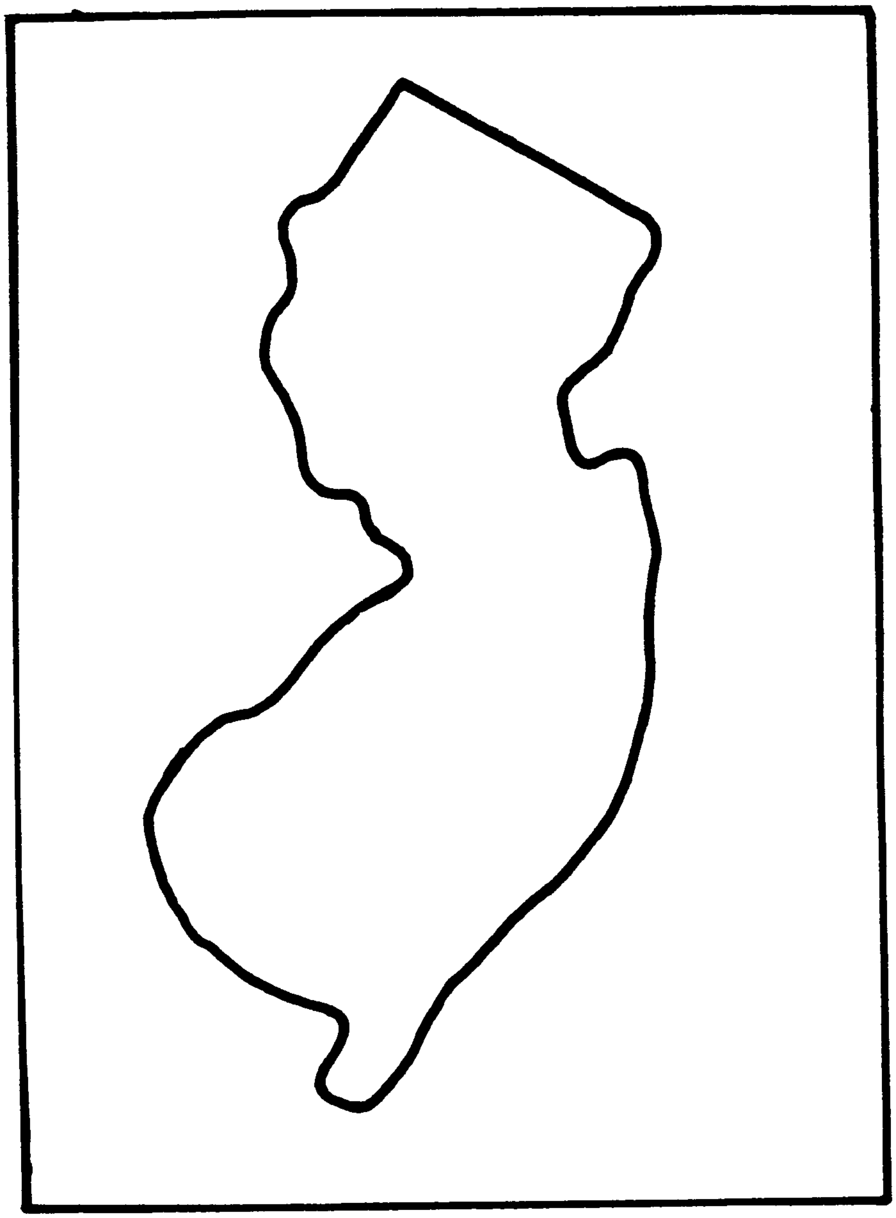
ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
F-10	NAPEAGUE	SUFFOLK	1	GARDINERS ISLAND E. NAPEAGUE BEACH	3.46	1550	ADDITION TO CBRS UNIT
NY-53	BIG REED POND	SUFFOLK	1	MONTAUK POINT	0.76	161	PROTECTED
NY-54	OYSTER POND	SUFFOLK	1	MONTAUK POINT	0.47	162	PROTECTED
NY-55	MONTAUK POINT	SUFFOLK	1	MONTAUK POINT	0.67	31	PROTECTED
NY-56	AMAGANSETT	SUFFOLK	1	EAST HAMPTON	1.01	101	PROTECTED
NY-57	GEORGIA/WAINSCOTT PONDS	SUFFOLK	1	EAST HAMPTON	0.58	280	MIXED
NY-58	SAGAPONACK PONDS	SUFFOLK	1	SAG HARBOR	0.52	115	MIXED
F-11	MECOX	SUFFOLK	1	SAG HARBOR	0.22	1044	ADDITION TO CBRS UNIT
F-12	SOUTHAMPTON	SUFFOLK	1	SHINNECOCK INLET QUOGUE	1.41	2211	ADDITION TO CBRS UNIT
F-13	TIANA BEACH	SUFFOLK	1	QUOGUE	1.99	3620	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
NY-59	FIRE ISLAND	SUFFOLK	1	EASTPORT	46.53	66792	MIXED
		NASSAU	2	MORICHES			
				PATTERSQUASH ISLAND			
				BELLPORT			
			1&2	HOWELLS POINT			
			2	SAYVILLE			
				BAY SHORE EAST			
				BAY SHORE WEST			
			2&4	AMITYVILLE			
			4	WEST GILGO BEACH			
				JONES INLET			
				FREEPORT			
NY-60	HEMPSTEAD	NASSAU	5	FAR ROCKAWAY	0.74	267	PROTECTED
NY-61	JAMAICA BAY	KINGS	6&10	FAR ROCKAWAY	5.50	18152	PROTECTED
		QUEENS	6&10	JAMAICA			
			6&10	CONEY ISLAND			
			10	BROOKLYN			
NY-62	GATEWAY	RICHMOND	13	ARTHUR KILL	1.90	738	PROTECTED
NY-63	WOLFES POND	RICHMOND	13	ARTHUR KILL	0.50	60	PROTECTED
NY-64	WILSON BAY	JEFFERSON	26	CAPE VINCENT SOUTH	0.39	164	PRIVATE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
NY-65	GRENADIER ISLAND	JEFFERSON	26	CAPE VINCENT SOUTH	1.14	29	PRIVATE
NY-66	THE ISTHMUS	JEFFERSON	26	CAPE VINCENT SOUTH	0.28	100	PRIVATE
NY-67	POINT PENINSULA	JEFFERSON	26	CAPE VINCENT SOUTH POINT PENINSULA	0.81	296	UNKNOWN
NY-68	STONY ISLAND	JEFFERSON	26	POINT PENINSULA	0.82	165	UNKNOWN
NY-69	SHERWIN BAY	JEFFERSON	26	HENDERSON BAY	0.23	51	UNKNOWN
NY-70	ASSOCIATION ISLAND	JEFFERSON	26	HENDERSON BAY	2.17	523	UNKNOWN
NY-71	BLACK POND	JEFFERSON	26	HENDERSON	0.99	242	UNKNOWN
NY-72	SANDY CREEK COMPLEX	JEFFERSON	26	HENDERSON ELLISBURG	4.74	2245	PROTECTED
NY-73	NORTH POND	OSWEGO	29	ELLISBURG	2.93	2574	PROTECTED
NY-74	DEER CREEK MARSH	OSWEGO	29	PULASKI	0.91	428	PRIVATE
NY-75	GRINESTONE CREEK	OSWEGO	29	PULASKI	0.35	125	PROTECTED
NY-76	THE BLUFFS	CAYUGA	29	FAIR HAVEN	0.65	251	MIXED
NY-77	LITTLE SODUS & BLIND SODUS BAY	CAYUGA WAYNE	29	FAIR HAVEN	2.34	1790	PRIVATE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length in miles)	Acreage (in acres)	Status
NY-78	BLACK CREEK	WAYNE	29	NORTH WOLCOTT	1.01	198	MIXED
NY-79	SCOTTS BLUFF	WAYNE	29	NORTH WOLCOTT	0.59	211	PRIVATE
NY-80	PORT BAY	WAYNE	29	NORTH WOLCOTT	0.82	309	MIXED
NY-81	EAST BAY	WAYNE	29	SODUS POINT	0.47	124	MIXED
NY-82	CRESCENT BEACH	WAYNE	29	SODUS POINT	0.46	91	MIXED
NY-83	BRADDOCK	MONROE	30	BRADDOCK HEIGHTS	1.36	1072	MIXED
NY-84	BIG SISTER CREEK	ERIE	31	ANGOLA	0.50	32	PROTECTED
Totals:					138.41	126,867	

COASTAL BARRIER RESOURCES SYSTEM
NEW JERSEY



NEW JERSEY

New Jersey has the greatest population density of any state in the country, and some of the most heavily industrialized and most polluted regions to be found anywhere in the East. Some land and waters have been severely abused in the past, particularly along the coast where its shoreline is one of the most heavily developed regions of the Atlantic coast. But some parts of its coast are still very wild, especially along mainland areas in the south where extensive marshes and swamps survive. The state is one of the four smallest in the country - only 7,836 square miles in area. It is approximately 166 miles long north to south, and 70 miles wide at its widest.

In the 1960's the population of Ocean County increased 90 percent and other rural areas increased by more than 50 percent. This rapid urbanization is making the state the most urbanized in the country after California - about 90 percent of the population lives in areas classified as cities, and some counties are 95 to 100 percent urban. Even most of the coastal barrier beaches are now classified as urban with only natural areas remaining in parks.

Tourism and resort businesses, especially around Atlantic City, are a growing part of the state's economy. Over $5 billion pours into the state annually through coastal resorts.

The natural resource base of the state is quite diverse considering its small size. The western hills stop abruptly just west of Princeton and New Brunswick where the land drops down to a central plain with low rolling country, then finally to the coastal plain, a geographical region that ties New Jersey to the states of the mid and south Atlantic coast. New Jersey was not glaciated south of the New Brunswick area so the coastal plain consists of very old sands, shale and other coastal deposits. It was affected by changes of sea level during previous times, but the land was not directly affected by ice. Where the forests remain, they are mostly oak hickory and pine, much like elsewhere on the southern coastal plain with gum and white cedar in the wetter places.

The most outstanding natural features of New Jersey are its coastal lowlands, marshes and beaches, most of which have been developed. The white cedar swamps found in ponds and along the sluggish rivers of the south coast are some of the best developed along the Atlantic Coast. In fact, southern white cedar seems to have reached its maximum distribution in southern New Jersey. The swamps and bogs found here also harbor many rare and unusual species, including orchids, azaleas, and insectivorous plants.

The tidal wetlands are still extensive on the south coast, although many have been filled. Those that remain are dominated by cordgrasses and provide outstanding habitat for marine and estuarine organisms. One of the largest wetlands in the Northeast existed in the northeastern part of New Jersey--the Hackensack Meadows. These huge marshes, once covering over 19,000 acres, have been largely filled; even so, those acres that still exist, support a surprising array of wildlife. The barrier islands and beaches that front the Atlantic Ocean were once some of the best examples of this landform on the Northeast coastline. Formed from erosion of the coastal plain sediments and headlands, they have a geological link to barriers further south. However, they have nearly all been converted to resorts, permanent towns with seasonal and full-time residents, and major cities. Only about 20 miles remain in a relatively natural state in the parks of Sandy Hook, Island Beach State Park and Brigantine National Wildlife Refuge. Where the vegetation on the barriers is natural, there is beach grass, bayberry, seaside goldenrod, beach pea, and woodlands of cherry, pine, black oak, and cedar. An outstanding forest of American holly survives on Sandy Hook.

All of these parks are heavily visited by thousands of people annually. Some sections of the coast have been extensively "stabilized" and are so severely eroded that only sea walls and groins remain. Much of the coast was badly damaged in the 1962 Ash Wednesday storm. In some areas dunes have been leveled for dense concentrations of cottages, while in other areas there are no dunes left at all. On the other hand, some communities, like Mantoloking, have good dune systems and relatively wide beaches. Mantoloking has taken a very aggressive stand on protecting its dunes from damage and developed a progressive ordinance to maintain and improve the dunes.

Wildlife along south coast rivers is diverse and plentiful, especially waterfowl. The coastal region still supports a great diversity of bird and marine life, although certain species can no longer nest in traditional habitats. Terns and other seabirds that once nested on beaches must now nest in salt marshes and spoil islands because their normal habitats have been ursurped by people.

The port areas of northern New Jersey such as Elizabeth, Newark, and Camden: receive large shipments of petroleum and other products that maintain the refineries and chemical companies. Fishing is no longer part of the state's economy to any degree except for sport fishing. Recreational boating and the support given to boaters is a significant part of the coastal industry. A study done in 1982 showed that non-business visitors to New Jersey's shorefront area accounted for $4.87 billion of which $850 million was for motels, hotels, and campgrounds; it also estimated that a total economic output of $7 billion was generated from the visitors.

CBRS Units

There are no CBRS units in the state of New Jersey as enacted.

Coastal Resource Management

New Jersey's interest in its tidal waters precedes the American Revolution, for under the public trust doctrine of English common law, tidal waters and the lands thereunder belonged to the sovereign for the common use of all the people. With the Revolution, the royal rights to the State's tidelands became vested in the people of New Jersey. In 1821, the State Supreme Court in Arnold vs. Mundv (6 N.J.L. 1) articulated the State's right to convey, regulate, improve and secure the tidelands for the common benefit of every individual citizen, but also determined that neither the State nor the purchaser or licensee of tidelands could impair the public's common rights of fishing and navigation in tidal waters. In 1869, the General Riparian Act was passed setting forth the procedure by which an administrative agency, then the Riparian Commissioners, could alienate State-owned tidelands. Subsequent State Supreme Court decisions have declared that because tidal lands are held in public trust, the State must consider the broad public interest and must receive adequate compensation for these lands.

In 1914, the State Legislature enacted the Waterfront Development Law which requires that prospective developers obtain State agency approval for plans for the development of any water-front upon any navigable water or stream of this State or bounding thereon..." (N.J.S.A. 12:5-3).

New Jersey's coastal program had its beginnings with a series of laws passed in the late 1960's and early 1970's when the state became concerned about wetlands and associated coastal resources, which in most cases, came too late to protect extensive areas of coastal wetlands that were filled or developed in years past. The state created the Department of Environmental Protection (DEP) in 1970 to "formulate comprehensive policies for the conservation of natural resources of the State." (N.J.S.A. 13: ID-9).

The Hackensack Meadowlands Reclamation and Development Act was passed in 1969. To ensure the orderly development of the Meadowlands District, the law created the Hackensack Meadowlands Development Commission, provided it with authority to regulate all forms of development within the District, and instructed it to develop a master plan for the District. The Wetlands Act of 1970 delegated authority to the newly created Department of Environmental Protection to delineate and regulate development in all coastal wetlands of the State from the Raritan River basin southward.

The next major legislative advance in coastal management and protection occurred in 1973 when the state passed the Coastal Area Facility Review Act (CAFRA) giving DEP authority to regulate major development in the Bay and Ocean Shore Segment of the coastal zone to preserve environmentally sensitive sites and ensure a rational pattern of development. CAFRA also required the Department to prepare a strategy for the management area by September, 1977.

In 1972, when the Coastal Zone Management Act was enacted, the State began working to prepare and obtain federal approval for a statewide coastal management program. The Governor designated DEP as the agency responsiblie for developing this program. Because DEP, under CAFRA, had already prepared a coastal management strategy for the Bay and Ocean Shore area in 1977, DEP elected to seek federal approval of this segment first, and to then complete a boundary, policy and management system suitable for the remainder of the State's coastal zone. Between 1974 and 1978, the Department collected data and viewpoints, and met with interested groups throughout the State. As a result of these meetings, a comprehensive set of Coastal Resource and Development Policies designed to ensure consistent and predictable permit decision-making in the coastal zone, was adopted effective September 28, 1978 and the Coastal Management Program for the Bay and Ocean Shore Segment received federal approval the next day.

The first step toward continuing the coastal management program into the more developed portions of the State was publication of Options for New Jersey's Developed Coast in March 1979. In the report, DEP candidly discussed the opportunities and choices available to New Jersey under the Federal Coastal Zone Management Act, with a particular emphasis on the State's more developed coastal areas. This report served as a basis for public comment and discussion in the Spring and early Summer of 1979.

Publication of the Proposed New Jersey Coastal Management Program and Draft Environmental Impact Statement was the second step. The third step was the public review and comment on it and on the Options report. DEP staff met with, and received comments from many residents, Federal, State, county and municipal elected representatives and agencies, regional planning groups, and interest groups with environmental, civic, residential, industrial development, and other concerns. In addition, DEP and NOAA-CZM jointly held four formal public hearings on the State's proposed coastal management program on June 11 and 12, 1979 in Camden, Jersey City, Toms River and Trenton. (New Jersey Coastal Management Program: Summary and Management System. 1980. Div. of Coastal Resources, N.J. Dept. of Environ. Protection.)

The regulatory authority for DEP in the coastal zone is based on several laws, as noted below, which apply to nearly all types of development within the coastal region, including coastal barriers. The DEP contains nine units:

1. Division of Coastal Resources (prior to July 1, 1979, the Division of Marine Services),
2. Division of Water Resources,
3. Division of Environmental Quality,
4. Division of Fish, Game and Wildlife,
5. Division of Parks and Forestry,
6. Green Acres Administration,
7. Division of Fiscal and Support Services,
8. Division of Employee Management and Development,
9 Commissioner's Office.

The Division of Coastal Resources is further broken down into the following sections which resulted from a reorganization of the former Division of Marine Services following the amendments to DEP's enabling legislation in 1979 (N.J.S.A. 13: ID- ET SEQ.):

The Bureau of Coastal Project Review administers CAFRA (Coastal Area Facility Review Act), Wetlands and Waterfront Development Permit Programs, in accordance with legislation and within the Rules on Coastal Resource and Development Policies. The Bureau has taken over the permit functions of the former Offices of Coastal Zone Management, Riparian Lands Management, and Wetlands Management.

The Bureau of Coastal Planning provides planning assistance in development and refinement of programs to guide and regulate development and protect resource in the coastal areas. This office has taken over planning functions formerly in the Office of Coastal Zone Management.

The Bureau of Tidelands provides staffing for the Tidelands Resource Council and helps in protecting and managing State-owned tidelands by reviewing applications for conveyances of grants, leases, and licenses. The functions of the former Office of Riparian Lands is now within this Bureau.

The Bureau of Coastal Enforcement and Field Services provides a multi-disciplinary team to support the functions of the Bureaus of Tidelands and Coastal Project Review. The team is basically a field inspection group. Former inspection functions of the CZM, Wetlands Management and Riparian Lands Management offices are now in this bureau.

The Bureau of Coastal Engineering takes care of the State's shore protection and waterway maintenance programs. The functions of the former Office of Shore Protection are included here.

Other divisions of the DEP are also required to follow and enforce coastal regulations that fall within their spheres of interest - e.g. water pollution, air pollution, development of parks and historic sites and recreation areas.

The DEP's regulatory powers in the coastal zone came from three laws passed by the state legislature:

1. Waterfront Development Law (N.J.S.A.) 12:5-3): authorizes the DEP to regulate the construction or alteration of coastal structures such as docks, wharves, piers,

bulkheads, bridges, pipelines, cables or other "similar or dissimilar developments" along or on navigable waters in the state. Persons planning to carry out waterfront developments must apply for permits from the DEP which then goes through a review process.

2. Coastal Area Facility Review Act (CAFRA) (N.J.S.A. 13:19-1 et seq) gives the DEP power to approve and regulate the design, location, and construction of major facilities within the New Jersey coastal zone, an area of 1,376 square miles. Permit applications and Environmental Impact Statements must be submitted to the DEP for public hearings and review.

3. The Wetlands Act (N.J.S.A.) 13:9A-1 et seq.) of 1970, authorizes DEP to regulate activities on coastal wetlands. The amount of wetlands filled in New Jersey after passage of the Act, and subsequent regulations, was reduced from 1,900 to 55 acres annually. In 1978 about 14 acres were filled, and by 1979 less than one. The Act is administered by the Division of Coastal Resources and gives the state broad powers to control every form of wetland disturbance or development with the exception of mosquito control and continued use for agricultural purposes, such as harvesting salt marsh hay. Most coastal wetlands were mapped in 1972, but only those which are mapped fall within the regulations of the Act. Wetland permit decisions are made by the Division Director, but can be appealed to the Commissioner of DEP.

In addition to the DEP and its coastal divisions, the State manages tidelands through its proprietary role as owner of the lands. The ownership role of the State is exercised through the Tidelands Resource Council which is composed of twelve citizens appointed by the Governor, with advice and consent from the State Senate. The State's ownership of tidelands extends to the mean high water mark, determined on the basis of a theoretical 18.6 year tide. The Council has broad discretionary powers concerning applications for tideland use. Many of the State's tidelands were sold in the past, but today title remains with the State and the Council can only license use on a case by case basis following permit review. The Council can issue grants, leases, or license use of the tidelands provided such activities are within the public interest.

The Hackensack Meadowlands District is now a joint venture between the DEP and the Hackensack Meadowlands Development Commission (HMD) which is composed of the

Commissioner of the Department of Community Affairs and three residents each from Bergen and Hudson Counties appointed by the Governor. The Commission is required to develop and implement an ecologically sound program for development of the Meadowlands District. The DEP's Division of Coastal Resources makes federal consistency determinations for any action affecting the District. The requirements of the Wetlands Act do not apply to this area.

The New Jersey Department of Energy and its authority is a significant part of the coastal management program since most energy siting projects are on the coast. The Department has broad planning authority and decision making powers with other State agencies over energy-related matters. It is the lead agency for the Coastal Energy Impact Program. Amendments to the Federal Coastal Zone Management Act of 1976 created the CEIP which was designed to provide funds for assistance to coastal states regarding energy resources.

The Green Acres Administration determines how and where state funds will be spent for parks and open space purchases along with development and capital improvements. The DEP can buy land by condemnation if necessary through this program. The Division of Coastal Resources reviews proposals for consistency with the Coastal Resource and Development policies of the State. One of the program's top priorities is creation of waterfront parks in urban areas, and to provide public access and recreational opportunities in the coastal zone.

The DEP is authorized to undertake Shore Protection programs to prevent and/or repair damage caused by shoreline erosion. The Beaches and Harbor Act of 1977 (P.L. 77-208) provided a $30 million bond issue to fund State matching grants for beach maintenance, protection, and restoration. The DEP is required to prepare a master plan, underway since 1978, to develop Shore Protection Rules. These rules include policies on Coastal Engineering, Dunes and Dune Management, Beach Nourishment, and High Risk Beach Erosion Areas. The Shore Protection Master Plan and Coastal Policies will become the basis for planning of joint projects with the U.S. Army Corps of Engineers and coastal permits will be issued only when in conformity with the Policies.

The fundamental core of the Coastal Management Program's management operation is the adoption of the Coastal Resource and Development Policies as administrative rules by the DEP. The basic coastal policies are:

1. Protect and enhance the coastal ecosystem.

2. Concentrate rather than disperse the pattern of coastal residential, commercial, industrial, and resort development and encourage the preservation of open space.

3. Employ a method for decision-making which allows each coastal location to be evaluated in terms of both the advantages and the disadvantages it offers for development.

4. Protect the health, safety and welfare of people who reside, work and visit in the coastal zone.

5. Promote public access to the waterfront through linear walkways and at least one waterfront park in each waterfront municipality.

6. Maintain active port and industrial facilities, and provide for necessary expansion in adjacent sites.

7. Maintain and upgrade existing energy facilities, and site additional energy facilities determined to be needed by the N.J. Department of Energy (DOE) in a manner consistent with the policies of this Coastal Management Program.

8. Encourage residential, commercial, and recreational mixed-use redevelopment of the developed waterfront.

<u>Local Actions</u>

No information is available at this time.

<u>Private Sector Initiatives</u>

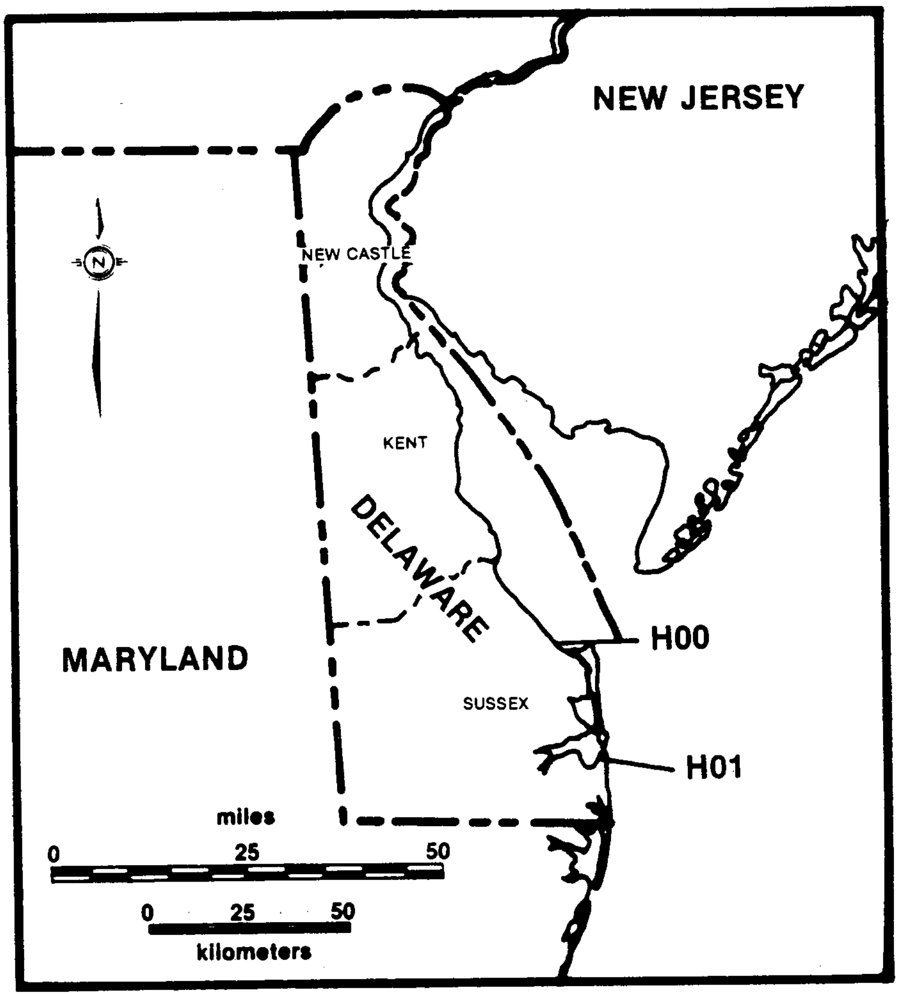
No information is available at this time.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIER UNITS IN NEW JERSEY

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
NJ-01	GATEWAY	MONMOUTH	3	SANDY HOOK	6.82	5688	PROTECTED
NJ-02	SEIDLER BEACH	MIDDLESEX	3	KEYPORT	0.44	80	MIXED
NJ-03	CLIFFWOOD BEACH	MONMOUTH	3	KEYPORT	0.68	67	MIXED
NJ-04	CONASKONK POINT	MONMOUTH	3	KEYPORT	1.63	262	PRIVATE
NJ-05	ISLAND BEACH	OCEAN	13	SEASIDE PARK BARNEGAT LIGHT FORKED RIVER	2.06	13356	PROTECTED
NJ-06	BRIGANTINE	OCEAN ATLANTIC	13 2	TUCKERTON NEW GRETNA BRIGANTINE INLET OCLEANVILLE	14.14	45199	MIXED
NJ-07	OCEAN CITY BEACH	CAPE MAY ATLANTIC	2	OCEAN CITY	0.43	24	PROTECTED
NJ-08	CORSON INLET	CAPE MAY	2	SEA ISLE CITY	1.51	2126	PROTECTED
NJ-09	STONE HARBOR	CAPE MAY	2	STONE HARBOR	1.72	3953	PROTECTED
NJ-10	CAPE MAY	CAPE MAY	2	CAPE MAY	1.32	315	MIXED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
NJ-11	HIGBEE BEACH	CAPE MAY	2	CAPE MAY	1.10	890	MIXED
NJ-12	DEL HAVEN	CAPE MAY	2	RIO GRANDE	1.87	508	MIXED
NJ-13	KIMBLES CREEK	CAPE MAY	2	RIO GRANDE	1.91	675	PRIVATE
NJ-14	DENNIS CREEK	CAPE MAY CUMBERLAND	2	WOODBINE HEISLERVILLE	7.94	11082	MIXED
Totals:					43.64	84225	

COASTAL BARRIER RESOURCES SYSTEM
DELAWARE UNITS



DELAWARE

The State of Delaware, with a total land area of 1,982 square miles, is characterized by two separate coastal areas: the 24.5 mile oceanfront Atlantic coastline that runs from Fenwick Island to Cape Henlopen,and the 65-70 mile Delaware Bay coastline that includes the coastal area north of Cape Henlopen to the Pennsylvania state line.

The Atlantic coast of Delaware is comprised of wave dominated barrier islands, spits and headlands with broad sandy beaches and well developed dune systems. Most of these areas are publicly owned and heavily utilized for public recreation. In general, development consists of private residential homes owned by out-of-state people, although highrise structures are present at Fenwick Island, South Bethany, and Rehoboth Beach.

The Delaware Bay coast is a transitional area with ocean influence predominant around Lewes and riverine influence more prevalent north of Wilmington. Large marsh areas with associated narrow beaches and low dune ridges are common from Lewes to Smyrna/Woodland Beach. These areas are not heavily developed and much of the land is in Federal or State ownership. Large waterfowl populations generally can be found here in the fall.

From Smyrna/Woodland Beach northward, the coastline is primarily used by industry. Getty Oil Company's refinery in Delaware City is the only oil refinery in the State. The capacity of this oil refinery exceeds State demands, thus making Delaware a net exporter of petroleum products. The Coastal Management Program prohibits construction of new petroleum refineries in wetlands or in the "coastal zone", an area that averages four miles in width and comprises approximately 20% of the State's total land area. This prohibition does not, however, apply to the expansion of existing refinery facilities. Therefore, with the appropriate permits, Getty Oil Company could expand its operations.

The Delmarva Power and Light Company operates an electrical generating facility in Delaware City, the only such facility in the Delaware coastal zone. Power plants, both coal-fueled and nuclear-powered, are permitted by the Coastal Management Program only where compatible with State environmental laws. Wetlands may not be utilized for construction of power plants; however, with State approval, transmission facilities and associated activities are permitted under the Wetlands Regulations adopted pursuant to Title 7, Chapter 66, Delaware Code.

The port of Wilmington is the state's most important port operation, and it functions principally as a general cargo facility. In Fiscal Year 1977, the port handled 2.4 million tons of cargo (vehicles, oil, basic ores) of which approximately one-half of the total tonnage was crude oil and three-fifths some form of fuel. Because of its significance to the State, the Port of Wilmington is excluded from the offshore bulk product transfer facility prohibition in the Delaware Coastal Zone Act. The expansion of the port of Wilmington along the Delaware River is supported by the Coastal Management Program to meet national and regional trans-shipment needs as well as to reduce the dredging and spoils disposal activities associated with port operations.

Chemical concerns, automotive industries, manufacturing, financial services such as insurance and real estate, agriculture, mining, and tourism provide the largest sources of employment and income in the state of Delaware. In 1983, tourists spend over $480 million in Deleware.

There are three counties in the state (New Castle, Kent and Sussex) and three major cities: Wilmington (population: 70,000) Newark (26,000) and Dover (24,000). Delaware ranks 49th in land area among the 50 states.

The state has an abundant natural resource base which includes wild birds, fish, and fur bearing animals. Coastal and freshwater wetlands provide habitats for mallards, black ducks, least terns, blue-winged teals, gadwalls, wood ducks, and snow and Canada geese. Fall migrations of waterfowl along the Atlantic flyway bring thousands of waterbirds to Delaware's coastal areas including a large wintering concentrations of Canada geese (approximately 125,000). Salt and brackish water environments contain abundant populations of weakfish, flounder, bluefish, striped bass, sea bass, perch, commercial and sport sturgeon, spot, drum, Atlantic croaker, shad, crabs, and clams.

CBRS Units

Name of Unit	Unit #	County	Beach Length (mi)
Broadkill Beach Complex	HOO	Kent/Sussex	16.3
North Bethany Beach	HOl	Sussex	0.8

Two CBRS units have been defined in Delaware: Broadkill Beach and North Bethany Beach. The Broadkill Beach Complex Unit (HOO) is a relatively undeveloped barrier beach on Delaware Bay. Intermittent developments such as Slaughter Beach and Broadkill Beach are excluded from this unit. The North Bethany Beach System Unit (HOl) is an ocean front barrier beach. A small portion of wetlands behind the beachfront and across Highway 1 is also included, with residential developments on both the north and south sides of the unit.

A brief description of the CBRS units in Delaware is provided below. Each unit is identified by its name, number, and the county in which it is located.

HOO-Broadkill Beach Complex (Kent/Sussex): This unit has a narrow beach strand with associated wetlands. In the southern part of the area are extensive wetlands that are protected within Primehook National Wildlife Sanctuary. Located on Delaware Bay, this unit is approximately 16.3 miles in length and is relatively undeveloped. The community developments at Slaughter Beach and Broadkill Beach are excluded from the system.

HOl-North Bethany Beach (Sussex): The unit includes a one-quarter mile ocean front barrier beach-dune complex, associated back barrier wetlands and aquatic habitats, and drained marshlands. The residential communities of Cotton Patch Hill and Sussex Shores are located north and south of this unit, respectively. The unit is currently being developed with construction of high rise condominiums. The rest of the unit has been subdivided into residential lots.

Coastal Resource Management

Historically, the primary impetus for coastal conservation in Delaware has been natural disasters. Hurricanes Connie and Diane in 1955, which claimed 100 lives and caused damages in excess of $100 million, supplied the initiative for a comprehensive water resources survey of the Delaware River Basin. This study signaled the beginning of a unified policy level concern for the State's coastal resources. This concern was re-emphasized in a 1969 study that focused on loss of bay wetlands, dredging, pollution of bays and groundwater, and increasing uncontrolled growth in recreational areas.

An inventory of Delaware's coastal wetlands and policy development recommendations that was sent to the Governor in 1973 concluded that a statewide system for coastal wetlands preservation and control was necessary to ensure protection of these resources. Subsequent to that inventory, the Wetlands Act of 1973 (Title 7, Chapter 66, Delaware Code) was passed. This Act established a permit system for activities in fresh and saline wetlands.

The Beach Preservation Act of 1972 (Title 7, Chapter 68, Delaware Code) was enacted to ensure protection, enhancement, and preservation of public and private beaches of the State. It makes acts of beach destruction punishable as crimes and establishes building lines on the landward side of primary dunes. Additionally, the Coastal Zone Act which was signed into law in 1971 (Title 7, Chapter 70, Delaware Code) prohibits heavy industrial usage and bulk product transfer facilities along the coastal strip. As previously stated, the Port of Wilmington is exempted from this statute.

Both the Wetlands Act and the Beach Preservation Act are administered by the Department of Natural Resources and Environmental Control. The Coastal Zone Act and Coastal Management Program are administered by the Office of Management, Budget and Planning. In 1979 the State of Delaware's Coastal Zone Management Program was approved by the Federal Office of Coastal Zone Management.

Local Actions

No information is available at this time.

Private Sector Initiatives

No information is available at this time

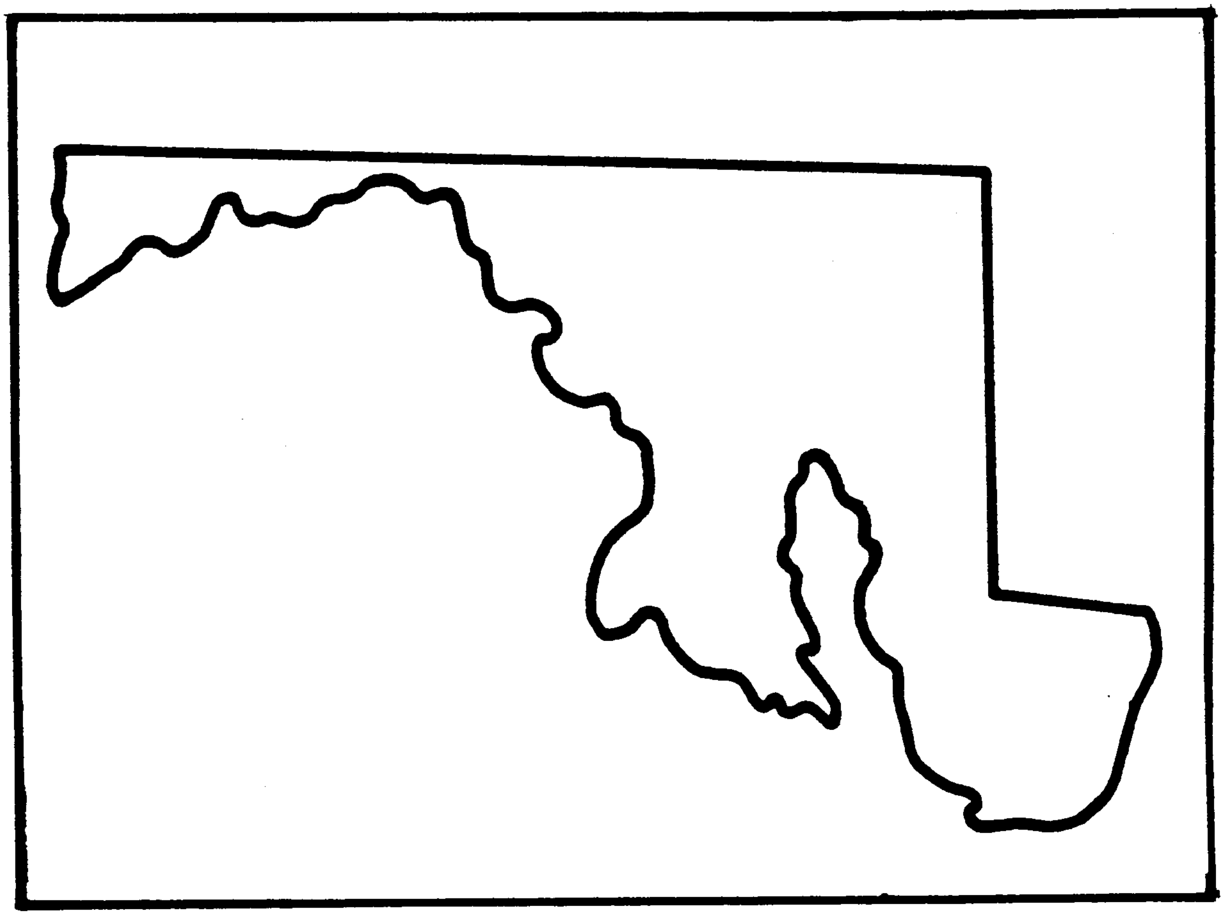
IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN DELAWARE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
DE-01	LITTLE CREEK	KENT	AL*	FREDERICA LITTLE CREEK	5.00	6413	PROTECTED
H-00	BROADKILL BEACH	KENT SUSSEX	AL	FREDERICA MISPILLION RIVER BENNETTS PIER MILTON LEWES	0.39	4779	ADDITION TO CBRS UNIT
DE-02	MILFORD NECK	SUSSEX	AL	MISPILLION RIVER	1.23	1478	PROTECTED
DE-03	PRIME HOOK	SUSSEX	AL	MILTON LEWES	N/A	9541	MIXED
DE-04	PLUM BEACH ISLAND	SUSSEX	AL	LEWES	2.00	2782	PROTECTED
DE-05	CAPE HENLOPEN	SUSSEX	AL	LEWES CAPE HENLOPEN REHOBOTH BEACH	7.44	3851	MIXED
DE-06	SILVER LAKE	SUSSEX	AL	REHOBOTH BEACH	0.22	61	PRIVATE
DE-07	DELAWARE SEASHORE	SUSSEX	AL	REHOBOTH BEACH BETHANY BEACH	6.74	7664	PROTECTED
H-01	NORTH BETHANY BEACH	SUSSEX	AL	BETHANY BEACH	N/A	N/A	NO CHANGE TO CBRS UNIT

* = At Large

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
DE-08	ASSAWOMAN BAY	SUSSEX	AL	BETHANY BEACH ASSAWOMAN BAY	3.18	3585	PROTECTED
Totals:					26.20	40154	

COASTAL BARRIER RESOURCES SYSTEM
MARYLAND



MARYLAND

The State of Maryland has a total land area of approximately 12,303 square miles. Two principal areas, the Chesapeake Bay with 4,000 miles of shoreline and the Atlantic Coast with 31 miles of shoreline, provide the State with an extensive coastal system. The Chesapeake Bay is divided into two distinct regions: the eastern and western shores. The eastern shore is primarily rural with farming and seafood harvesting the principal industries. Most of this region is covered by wetlands, wooded swamps, and farmland. The western shore contains two large metropolitan areas, Baltimore and Washington D.C., in addition to the rural southern region. Baltimore, one of the leading harbors in the United States, is located on the western shore.

The wave-dominated Atlantic shoreline contains two barrier islands, the southern one-half of Fenwick Island and the northern two-thirds of Assateague Island. These narrow islands form an almost continuous complex of wide sandy beaches and extensive dune and wash-over systems that protect Assawoman and Chincoteague Bays.

The economy of the State is supported by manufacturing, agriculture, mineral production, seafood production, and the activities of the port of Baltimore. Maryland leads the nation in oyster production and ranks second in production of blue crabs. The port of Baltimore handles 23.4 percent of the export commerce of U.S. North Atlantic ports. Coal, petroleum products, and mineral ores are the chief commodities which pass through Chesapeake Bay ports.

Natural resources are abundant, and the Chesapeake Bay is considered very productive. In the Bay, oysters, crabs, bluefish, summer flounder, Atlantic croaker and white perch are found in large numbers. Other wildlife found in this region include egrets, herons, terns, sandpipers, plovers, skimmers, wetland raptors and upland migratory game birds. Endangered species in Maryland as defined by the Federal Government include: the bald eagle, blue whale, sei whale, sperm whale, Atlantic green turtle, and loggerhead turtle. The striped bass has been declared endangered by the State and is now totally protected.

CBRS Units

No units were designated in Maryland when CBRA was enacted in 1982.

Coastal Resource Management

Following passage of the Federal Coastal Zone Management Act in 1972, Maryland initiated development of a State CZM program (CZMP). Subsequent to approval by the Department of Commerce, the Maryland Coastal Zone Management Program began operations in 1978. The major objectives of this program include coordination of study and management efforts of State agencies, development of information necessary to implement existing programs, and provision for a satisfactory mechanism to involve the public in coastal decisions. The Coastal Resources Division (CRD), a part of the Tidewater Administration of the Department of Natural Resources, provides staff support for coordinating the CZMP. Other units in the Department of Natural Resources have authority for various legal areas in the CZMP.

Coastal zone management program policies are very thorough and extensive. Listed below are a few of the policies that pertain most directly to shorefront access. Many of these predate the CZMP.

1. It is State policy to prohibit the construction or placement of permanent structures east of the dune line along Maryland's Atlantic Coast with the exception of beach erosion, sediment control, storm control, and maintenance projects approved by both the Department of Natural Resources and the Worcester Soil Conservation District. Maryland Natural Resource Code Ann. 8-1105.1 (Supp. 1981).

2. Activities which will adversely affect the integrity and natural character of Assateague Island are inconsistent with the State's Coastal Zone Management Program, and are prohibited. Maryland Natural Resource Code Ann. 1-302, 5-201, 8-1105.1 (1974 and Supp. 1981).

3. Dredging, filling, and other activities which adversely affect the integrity of beach, as on Chesapeake Bay and its tributaries, are inconsistent with the State's Coastal Zone Management Program, and prohibited. Maryland Natural Resource Code Ann. 9-102, -202 (1974 and Supp. 1981).

4. The Beach Erosion Control District Act - Land clearing and construction activities are prohibited within the Beach Erosion Control District. Maryland Natural Resource Code Ann. 8-1105.1 (Supp. 1981).

5. The Wetlands Act of 1970 - Establishes policies and procedures for the restriction and regulation of activities affecting wetlands. State wetlands may not be dredged or filled without a license. Maryland Natural Resource Code Ann. 9-101 to 501 (1974 and Supp. 1981).

Taxes

The Maryland Environmental Trust provides conservation easements through a voluntary program. Any donations of ecologically valuable land provide the landowner with tax incentives and deductions. This is the only state program that appears to support conservation by landowners through incentives.

Local Actions

An innovative feature of the Maryland Coastal Zone Management Plan is the availability of pass-through funds to local governments for the creation of positions for planners. All coastal counties now have coastal zone planners who work closely with the Coastal Resources Division on county land-use policies to ensure that the perspective of the CZMP is considered in the evaulation of new projects and plans.

Private Sector Initiatives

Public participation opportunities exists for Maryland citizens regarding decisions affecting the use of coastal resources. The Coastal Resources Advisory Committee (CRAC) is a group composed of voting and nonvoting members. Non-voting members are from State and Federal agencies or academic institutions. Voting members include citizens, special interest group representatives, and local government representatives. CRAC serves as the sounding board that citizens can contact to discuss their ideas about coastal resources management.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN MARYLAND

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MD-01	ASSATEAGUE	WORCESTER	1	BOXIRON WHITTINGTON POINT TINGLES ISLAND OCEAN CITY BERLIN	15.50	26262	PROTECTED
MD-02	FAIR ISLAND	SOMERSET	1	SAXIS	0.75	173	UNKNOWN
MD-03	SOUND SHORE	SOMERSET	1	SAXIS	2.17	1043	UNKNOWN
MD-04	CEDAR ISLAND	SOMERSET	1	CRISFIELD GREAT FOX ISLAND	3.57	4261	PROTECTED
MD-05	JANES ISLAND	SOMERSET	1	CRISFIELD GREAT FOX ISLAND MARION TERRAPIN SAND POINT	6.88	5254	PROTECTED
MD-06	JOES COVE	SOMERSET	1	MARION	0.96	92	UNKNOWN
MD-07	SCOTT POINT	SOMERSET	1	MARION	2.55	495	UNKNOWN
MD-08	HAZARD COVE	SOMERSET	1	MARION TERRAPIN SAND POINT	3.46	898	UNKNOWN
MD-09	TEAGUE CREEK	SOMERSET	1	MARION	1.22	337	UNKNOWN

NOTE: MD-02 THROUGH MD-48 ARE IN THE CHESAPEAKE BAY.

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MD-10	ST. PIERRE MARSH	SOMERSET	1	MARION MONIE	1.37	216	UNKNOWN
MD-11	LITTLE DEAL ISLAND	SOMERSET	1	DEAL ISLAND TERRAPIN SAND POINT	1.31	653	UNKNOWN
MD-12	DEAL ISLAND	SOMERSET	1	DEAL ISLAND	2.26	332	UNKNOWN
MD-13	HAINES POINT	SOMERSET	1	DEAL ISLAND	0.68	68	UNKNOWN
MD-14	FRANKS ISLAND	SOMERSET	1	DEAL ISLAND	0.32	558	UNKNOWN
MD-15	LONG POINT	SOMERSET	1	DEAL ISLAND	0.44	19	UNKNOWN
MD-16	STUMP POINT	WICOMICO	1	DEAL ISLAND	1.84	925	UNKNOWN
MD-17	SMITH ISLAND	SOMERSET	1	GREAT FOX ISLAND EWELL KEDGES STRAITS TERRAPIN SAND POINT	4.21	5158	PROTECTED
MD-18	PRY COVE	SOMERSET	1	KEDGES STRAITS	3.61	842	UNKNOWN
MD-19	HOLLAND ISLAND	DORCHESTER	1	KEDGES STRAITS BLOODSWORTH ISLAND	1.62	527	UNKNOWN
MD-20	JENNY ISLAND	DORCHESTER	1	BLOODSWORTH ISLAND	0.75	107	UNKNOWN
MD-21	BARREN ISLAND	DORCHESTER	1	BARREN ISLAND	3.19	1680	UNKNOWN
MD-22	HOOPER NECK	DORCHESTER	1	HUDSON	0.55	68	UNKNOWN

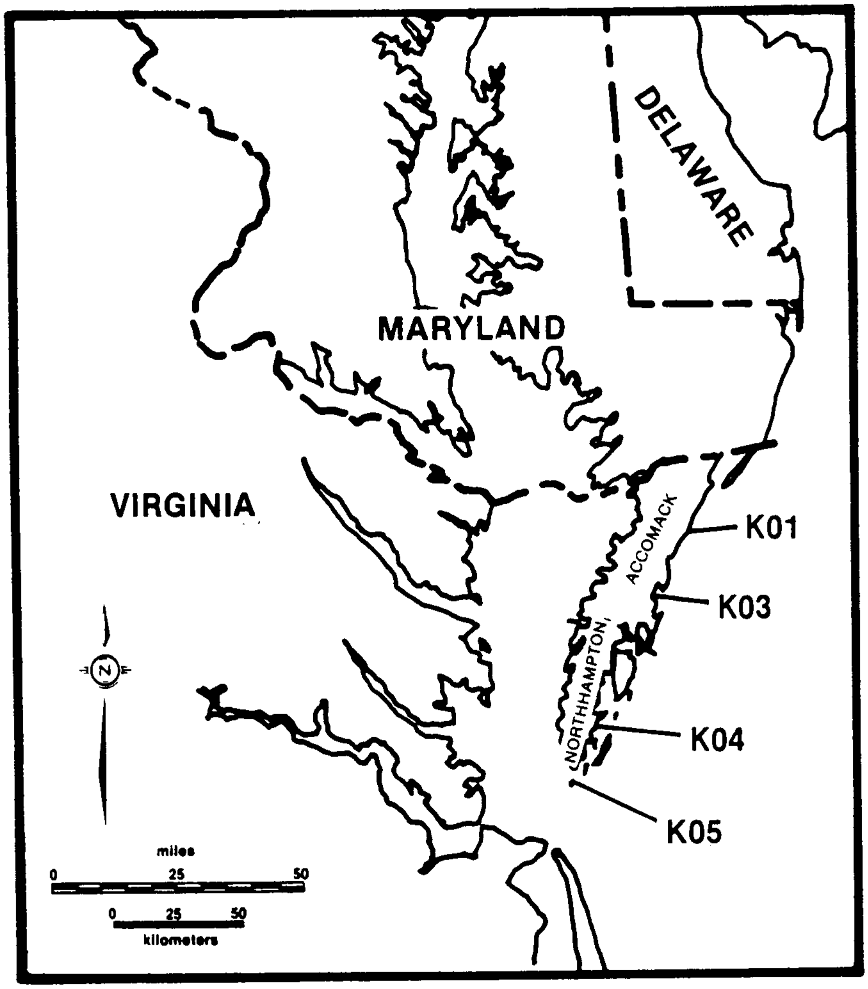
ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MD-23	HILLS POINT	DORCHESTER	1	HUDSON	0.44	24	UNKNOWN
MD-24	COVEY CREEK	DORCHESTER	1	HUDSON	0.38	16	UNKNOWN
MD-25	CASTLE HAVEN POINT	DORCHESTER	1	OXFORD	0.49	32	UNKNOWN
MD-26	BOONE CREEK	TALBOT	1	OXFORD	0.40	154	UNKNOWN
MD-27	BENON POINT	TALBOT	1	OXFORD	0.69	45	UNKNOWN
MD-28	LOWES POINT	TALBOT	1	CLAIBORNE	0.94	106	UNKNOWN
MD-29	RICH NECK	TALBOT	1	CLAIBORNE	1.38	541	UNKNOWN
MD-30	KENT POINT	QUEEN ANNES	1	CLAIBORNE	0.40	40	UNKNOWN
MD-31	MATTAPEX	QUEEN ANNES	1	KENT ISLAND	0.21	186	UNKNOWN
MD-32	STEVENSVILLE	QUEEN ANNES	1	KENT ISLAND	0.70	67	UNKNOWN
MD-33	WESLEY CHURCH	QUEEN ANNES	1	KENT ISLAND	0.28	21	UNKNOWN
MD-34	MACUM CREEK	QUEEN ANNES	1	KENT ISLAND	0.21	65	UNKNOWN
MD-35	WILSON POND	KENT	1	LANGFORD CREEK	0.25	51	UNKNOWN
MD-36	HUNTINGFIELD POINT	KENT	1	LANGFORD CREEK	0.53	144	UNKNOWN
MD-37	FLAG PONDS	CALVERT	1	COVE POINT	0.62	74	UNKNOWN
MD-38	COVE POINT MARSH	CALVERT	1	COVE POINT	1.26	173	UNKNOWN

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MD-39	DRUM POINT	CALVERT	1	SOLOMONS ISLAND	0.60	47	UNKNOWN
MD-40	POINT PATIENCE	CALVERT	1	SOLOMONS ISLAND	0.36	30	UNPROTECTED
MD-41	GREEN HOLLY POND	ST. MARYS	1	SOLOMONS ISLAND	0.40	91	UNPROTECTED
MD-42	FISHING POINT	ST. MARYS	1	SOLOMONS ISLAND	0.53	42	UNPROTECTED
MD-43	FRESH POND	ST. MARYS	1	SOLOMONS ISLAND	0.71	225	UNPROTECTED
MD-44	ST. CLARENCE CREEK	ST. MARYS	1	POINT NO POINT	0.90	175	UNKNOWN
MD-45	DEEP POINT	ST. MARYS	1	POINT LOOKOUT	0.49	62	UNKNOWN
MD-46	POINT LOOK-IN	ST. MARYS	1	POINT LOOKOUT	0.25	21	UNKNOWN
MD-47	CORNFIELD HARBOR	ST. MARYS	1	POINT LOOKOUT	2.33	607	PROTECTED
MD-48	POINT LOOKOUT	ST. MARYS	1	POINT LOOKOUT	0.61	29	UNPROTECTED
MD-49	BISCOE CREEK	ST. MARYS	1	POINT LOOKOUT ST. GEORGE ISLAND	0.25	40	UNKNOWN
MD-50	CHICKEN COCK CREEK	ST. MARYS	1	ST. GEORGE ISLAND	0.41	43	UNKNOWN
MD-51	PINEY POINT CREEK	ST. MARYS	1	PINEY POINT	0.81	275	UNKNOWN
MD-52	MCKAY COVE	ST. MARYS	1	PINEY POINT	0.54	258	UNKNOWN
MD-53	BLAKE CREEK	ST. MARYS	1	PINEY POINT	0.39	41	UNKNOWN
MD-54	BELVEDERE CREEK	ST. MARYS	1	PINEY POINT	0.51	132	UNKNOWN

NOTE: MD-49 THROUGH MD-56 ARE IN THE POTOMAC RIVER.

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MD-55	ST. CLEMENTS ISLAND	ST. MARYS	1	ST. CLEMENTS ISLAND	1.64	60	UNKNOWN
MD-56	ST. CATHERINE ISLAND	ST. MARYS	1	STRATFORD HALL	0.61	64	UNKNOWN
Totals:					81.03	53949	

COASTAL BARRIER RESOURCES SYSTEM
VIRGINIA UNITS



VIRGINIA

The State of Virginia has approximately 110.9 miles of coastline on the oceanfront. Of that, 77.4 miles are protected from development, 19.7 miles are developed, and 13.8 miles remain undeveloped. Another significant portion of the Virginia coastal region is in the Chesapeake Bay. Statistics from the State of Virginia indicate that well over 60 percent of the population resides within the coastal area.

The Atlantic shoreline of Virginia from Cape Charles to Chincoteague Island consists of ten major barrier islands that front an extensive system of salt marshes and open bays. Wave and tidal processes have created relatively long narrow barrier islands with sandy beaches and extensive dune systems. The islands are separated by narrow, relatively deep tidal inlets.

The Virginia shoreline south of the Chesapeake Bay entrance consists of sandy beaches and dunes fronting the Cape Henry spit complex, the Virginia Beach headland and the barrier island protecting Back Bay.

The principal industries in Virginia include textile manufacturing, ship building, truck farming, fisheries, food processing, and tourism. The port of Hampton Roads leads the nation in volume of exports and ranks first in total foreign trade tonnage. It is a major deep water port and capable of handling every category of cargo in large volumes. The Hampton Roads area also has the nation's largest concentration of military installations, making the Federal Government another important contributor to the State's economy.

Natural resources are abundant along Virginia's shoreline. The Chesapeake Bay, the largest estuary in the United States, contains abundant fish and shellfish resources. Millions of migrating waterfowl stop over annually, and over 75 percent of the Atlantic flyway waterfowl winter in the bay. The ocean front shoreline is also rich in aquatic and terrestrial wildlife resources.

Coastal industries include the port activities of Hampton Roads, food processing and agriculture, ship building, two liquified natural gas plants in the coastal region at Chesapeake Bay, and a major oil refinery located at Yorktown on the Chesapeake Bay.

CBRS Units

Unit Name	Unit #	County	Beach Length (mi.)
Assawoman Island	KOl	Accomack	4.2
Cedar Island	K03	Accomack	6.6
Little Cobb Island	K04	Northampton	0.7
Fishermans Island	K05	Northampton	2.3

These units comprise a total of 14 miles of ocean-facing shoreline. They are all barrier islands and have extensive saltwater marshes behind them. Cedar Island, Fishermans Island, and Assawoman Island are used seasonally by hunters and fisherman. No development pressures are apparent or probable on any of these units due to limited access, and they remain relatively unspoiled barriers.

A brief description of each CBRS unit in Virginia is provided below. Each unit is identified by, its number, name and the county in which it is located.

KOl-Assawoman Island (Accomack): This 931-acre barrier island has a beach length of 4.2 miles. Approximately 572 acres are aquatic habitats (wetlands and open water) and the remaining 359 acres are fastfand. The island protects both an extensive salt marsh system as well as Kegotank Bay. Due to limited access the island's beach/dune systems are well preserved. The island is used seasonally for fishing and hunting. In the past this area has been considered as a potential site for a pipeline crossing.

K03-Cedar Island (Accomack): This unit is composed of a 6.6 miles of beachfront and protects an extensive marsh and bay system. The Nature Conservancy owns a large tract of land on the northern part of the island. A few cottages are on the island and are used seasonally by local residents for hunting and fishing.

K04-Little Cobb Island (Northampton): This barrier island has a beach length of 0.7 miles and a total acreage of 270 acres. Fast land acreage is approximately 40 acres with the remaining 230 acres in associated aquatic habitats, principally open waters. One structure and a wharf are the only developments on the island.

K05-Fishermans Island (Northampton): This unit is approximately 394 acres in extent, of which 204 acres are fastland and the remainder associated wetlands. Located adjacent to Fishermans Island National Wildlife Refuge, access to the island is limited to boat or foot traffic from the Chesapeake Bay Bridge-Tunnel Highway. The island supports abundant wildlife resources such as osprey, peregrine falcons, herons, and bald eagles. Hunting and fishing are seasonal activities on the island.

Coastal Resource Management

The State of Virginia began developing a coastal management program in 1975, largely as a study of the effects of exploration and development of oil and gas reserves on the outer continental shelf. In 1976, the Coastal Study Commission was broadened to include development of the State's coastal resources management programs. By 1977, the commission published a draft document, Proposals for Coastal Resources Management in Virginia. In 1979 the State and Federal Government terminated their cooperative efforts to develop a Federally approved CZMP in Virginia. This resulted because the Coastal Resources Management Act (S.B. 403) failed to pass both the State House and Senate. However, the State continued management efforts and developed "A Process for the Review and Evaluation of the Management of Virginia's Coastal Resources" in 1980. In 1982, the Governor endorsed coastal management in Virginia in his first address to the General Assembly. That endorsement, coupled with enactment of the Coastal Primary Sand Dune Protection Act, and the incorporation of nonvegetated wetlands into the Wetlands Act suggested a renewed interest by the State in defining a Coastal Zone Management Program. At present the program is in development and will be submitted to the Office of Ocean and Coastal Resources Management in the near future.

Local Actions

Taxes

The State has given cities and counties the authority to levy taxes for the purchase of open areas. The Open-Space Land Act (Va. Code Ann. 10-151 to 10-157 1974 and Supp. 1982) was passed in 1966 to help preserve recreational, historic, park, and scenic areas. Any county or municipality can acquire open space land and levy taxes to fund those acquisitions.

Zoning

A local zoning action revealed during research was a Flood Plain Ordinance passed in June, 1984 by Accomack County. This ordinance, which was adapted to FEMA standards, apparently discourages development on uninhabited barrier islands. Unfortunately, a copy of the ordinance was not available.

Private Initiatives

No information is available at this time.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN VIRGINIA

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
VA-01	ASSATEAGUE	ACCOMACK	1	BOXIRON CHINCOTEAGUE EAST CHINCOTEAGUE WEST WALLOPS ISLAND	15.62	28100	MIXED
VA-02	WALLOPS ISLAND	ACCOMACK	1	CHINCOTEAGUE WEST WALLOPS ISLAND BLOXOM	3.77	9342	MIXED
K-01	ASSAWOMAN	ACCOMACK	1	BLOXOM	N/A	3083	ADDITION TO CBRS UNIT
VA-03	METOMKIN	ACCOMACK	1	BLOXOM METOMKIN INLET	5.36	6361	PROTECTED
K-03	CEDAR ISLAND	ACCOMACK	1	ACCOMAC METOMKIN INLET WACHAPREAGUE	N/A	7142	ADDITION TO CBRS UNIT
VA-04	PARRAMORE ISLAND	ACCOMACK	1	QUINBY INLET WACHAPREAGUE EXMORE NASSAWADOX	7.57	38544	MIXED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
VA-05	HOG ISLAND	NORTHAMPTON	1	QUINBY INLET FRANKTOWN GREAT MACHINPONGO INLET NASSAWADOX	7.60	34255	MIXED
VA-06	COBB ISLAND	NORTHAMPTON	1	COBB ISLAND FRANKTOWN GREAT MACHINPONGO INLET NASSAWADOX CHERITON	5.65	32550	MIXED
K-04	LITTLE COBB ISLAND	NORTHAMPTON	1	COBB ISLAND	N/A	363	NO CHANGE TO CBRS UNIT
VA-07	WRECK ISLAND	NORTHAMPTON	1	COBB ISLAND CHERITON TOWNSEND SHIP SHOAL INLET	5.65	40470	MIXED
VA-08	SMITH ISLAND COMPLEX	NORTHAMPTON	1	FISHERMANS ISLAND SHIP SHOAL INLET TOWNSEND	10.52	15300	MIXED
K-05	FISHERMANS ISLAND	NORTHAMPTON	1	FISHERMANS ISLAND	2.19	2300	ADDITION TO CBRS UNIT
VA-09	ELLIOTTS CREEK	NORTHAMPTON	1	ELLIOTTS CREEK	0.34	98	PRIVATE
VA-10	OLD PLANTATION CREEK	NORTHAMPTON	1	ELLIOTTS CREEK	0.37	258	PRIVATE
VA-11	REMUS CREEK	NORTHAMPTON	1	CAPE CHARLES	1.42	315	PRIVATE

NOTE: VA-09 THROUGH VA-29 ARE IN THE CHESAPEAKE BAY.

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
VA-12	CHURCH NECK	NORTHAMPTON	1	FRANKTOWN	1.02	40	UNKNOWN
VA-13	WESTERHOUSE CREEK	NORTHAMPTON	1	FRANKTOWN	0.18	60	UNKNOWN
VA-14	SHOOTING POINT	NORTHAMPTON	1	FRANKTOWN	0.26	30	UNKNOWN
VA-15	HORSE ISLAND	NORTHAMPTON	1	FRANKTOWN	0.94	390	UNKNOWN
VA-16	SCARBOROUGH NECK	ACCOMACK	1	JAMESVILLE	2.87	328	UNKNOWN
VA-17	CRADDOCK NECK	ACCOMACK	1	JAMESVILLE	3.02	1220	UNKNOWN
VA-18	BLUFF POINT	ACCOMACK	1	PUNGOTEAGUE	1.16	482	UNKNOWN
VA-19	PARKERS ISLAND	ACCOMACK	1	PUNGOTEAGUE	0.80	370	UNKNOWN
VA-20	PARKERS MARSH	ACCOMACK	1	PUNGOTEAGUE CHESCONESSEX	3.12	1457	MIXED
VA-21	BEACH ISLAND	ACCOMACK	1	CHESCONESSEX	0.75	174	UNKNOWN
VA-22	RUSSELL ISLAND	ACCOMACK	1	CHESCONESSEX	0.46	110	UNKNOWN
VA-23	SIMPSON BEND	ACCOMACK	1	PARKSLEY	1.20	494	UNKNOWN
VA-24	DRUM BAY	ACCOMACK	1	SAXIS	1.15	715	UNKNOWN
VA-25	FOX ISLAND	ACCOMACK	1	GREAT FOX ISLAND	1.71	985	UNKNOWN
VA-26	CHEESEMAN ISLAND	ACCOMACK	1	EWELL	3.13	1129	UNKNOWN

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
VA-27	WATTS ISLAND	ACCOMACK	1	TANGIER ISLAND	1.91	987	UNKNOWN
VA-28	TANGIER ISLAND	ACCOMACK	1	TANGIER ISLAND	2.69	593	UNKNOWN
VA-29	ELBOW POINT	ST.MARYS WESTMORELAND	1	STRATFORD HALL ST. CLEMENTS ISLAND	3.75	1600	UNKNOWN
VA-30	WHITE POINT	WESTMORELAND	1	ST. CLEMENTS ISLAND	3.53	366	UNKNOWN
VA-31	CABIN POINT	WESTMORELAND	1	ST. CLEMENTS ISLAND	0.70	125	UNKNOWN
VA-32	GLEBE POINT	WESTMORELAND	1	ST. CLEMENTS ISLAND	6.91	300	UNKNOWN
VA-33	SANDY POINT	ST. MARYS	1	KINSALE	0.29	28	UNKNOWN
VA-34	JUDITH SOUND	NORTHUMBER-LAND	1	ST. GEORGE ISLAND	0.88	230	UNKNOWN
VA-35	COD CREEK	NORTHUMBER-LAND	1	HEATHSVILLE	0.73	251	UNKNOWN
VA-36	PRESLEY CREEK	NORTHUMBER-LAND	1	HEATHSVILLE	0.36	94	UNKNOWN
VA-37	CORDREYS BEACH	NORTHUMBER-LAND	1	HEATHSVILLE	0.38	138	UNKNOWN
VA-38	MARSHALLS BEACH	NORTHUMBER-LAND	1	BURGESS	0.25	80	UNKNOWN
VA-39	GINNY BEACH	NORTHUMBER-LAND	1	BURGESS	0.24	31	UNKNOWN

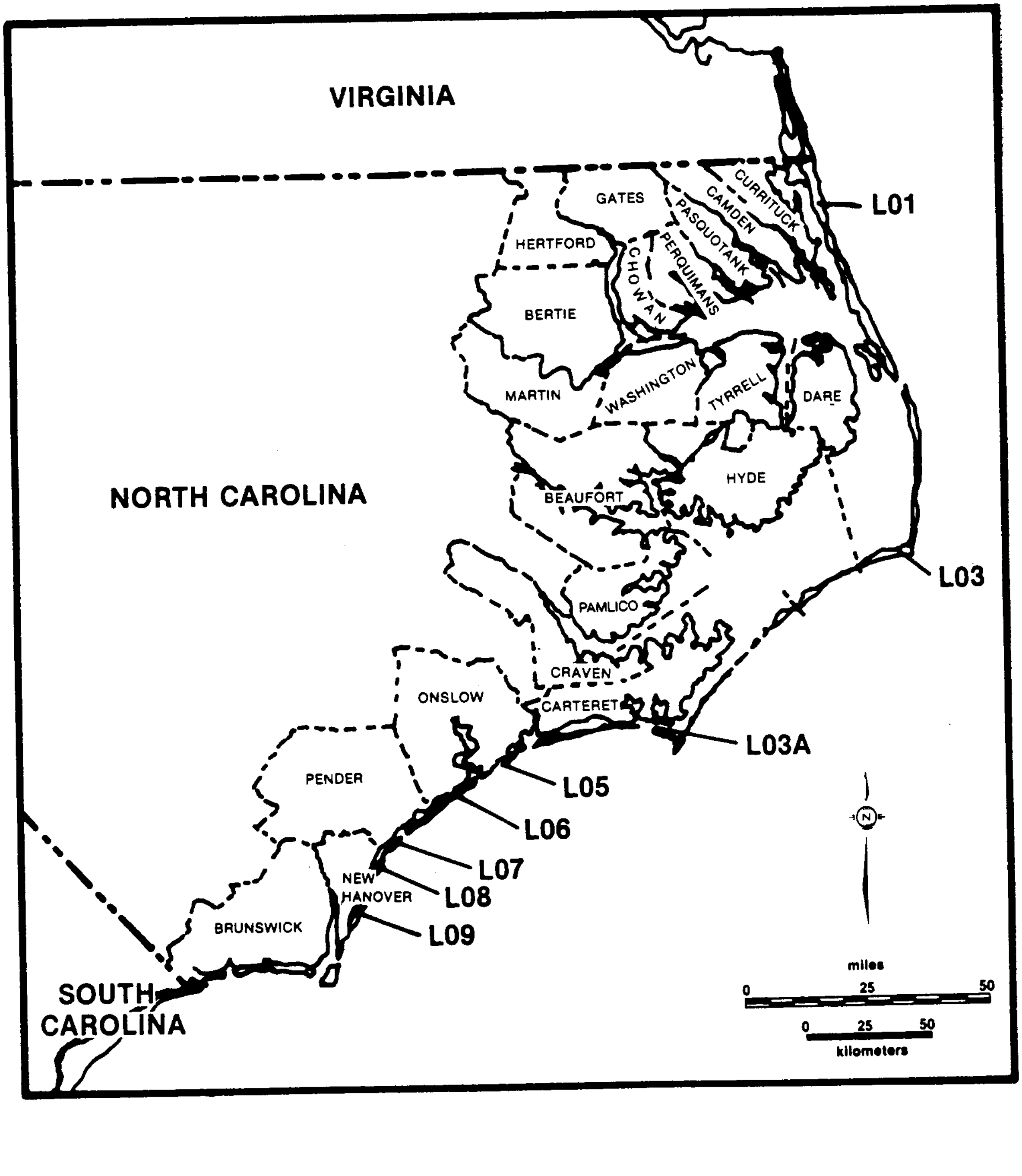
NOTE: VA-30 THROUGH VA-62 ARE IN THE POTOMAC RIVER.

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
VA-40	GASKIN POND	NORTHUMBER-LAND	1	REEDVILLE	0.26	87	UNKNOWN
VA-41	OWENS POND	NORTHUMBER-LAND	1	REEDVILLE	0.80	104	UNKNOWN
VA-42	CHESAPEAKE BEACH	NORTHUMBER-LAND	1	REEDVILLE	0.44	33	UNKNOWN
VA-43	FLEET POINT	NORTHUMBER-LAND	1	REEDVILLE	0.53	26	UNKNOWN
VA-44	BUSSEL POINT	NORTHUMBER-LAND	1	REEDVILLE	0.44	33	UNKNOWN
VA-45	HARVEYS CREEK	NORTHUMBER-LAND	1	REEDVILLE	0.35	31	UNKNOWN
VA-46	INGRAM COVE	NORTHUMBER-LAND	1	FLEETS BAY	0.08	22	UNKNOWN
VA-47	BLUFF POINT NECK	NORTHUMBER-LAND	1	FLEETS BAY	1.22	157	UNKNOWN
VA-48	BARNES CREEK	NORTHUMBER-LAND	1	FLEETS BAY	0.58	75	UNKNOWN
VA-49	NORTH POINT	LANCASTER	1	FLEETS BAY	1.38	322	UNKNOWN
VA-50	WINDMILL POINT	LANCASTER	1	DELTAVILLE	0.47	20	UNKNOWN

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
VA-51	DEEP HOLE POINT	LANCASTER	1	DELTAVILLE	1.69	207	UNKNOWN
VA-52	STURGEON CREEK	MIDDLESEX	1	DELTAVILLE	0.29	142	UNKNOWN
VA-53	JACKSON CREEK	MIDDLESEX	1	DELTAVILLE	0.38	45	UNKNOWN
VA-54	STOVE POINT	MIDDLESEX	1	DELTAVILLE	0.37	233	UNKNOWN
VA-55	RIGBY ISLAND/ BETHEL BEACH	MATHEWS	1	MATHEWS NEW POINT COMFORT	7.45	4450	UNKNOWN
VA-56	NEW POINT COMFORT	MATHEWS	1	NEW POINT COMFORT	0.87	430	UNKNOWN
VA-57	WARREN NECK	GLOUCESTER	1	ACHILLES	0.29	45	UNKNOWN
VA-58	ALLENS ISLAND	GLOUCESTER	1	ACHILLES	0.65	238	UNKNOWN
VA-59	PLUM TREE ISLAND	POQUOSON CITY	1	HAMPTON POQUOSON EAST	6.89	3053	PROTECTED
VA-60	LONG CREEK	HAMPTON CITY	1	HAMPTON	4.52	1060	PROTECTED
VA-61	MILL CREEK	HAMPTON CITY	1	HAMPTON	0.69	366	MIXED
VA-62	EAST OCEAN VIEW PARK	NORFOLK CITY	2	LITTLE CREEK	0.20	15	PROTECTED
VA-63	LITTLE CREEK	VIRGINIA BEACH CITY	2	LITTLE CREEK	0.97	140	UNPROTECTED
VA-64	LYNNHAVEN INLET	VIRGINIA BEACH CITY	2	CAPE HENRY	0.41	410	MIXED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
VA-65	CAPE HENRY	VIRGINIA BEACH CITY	2	CAPE HENRY	1.68	4378	PROTECTED
VA-66	LOVETTS MARSH	VIRGINIA BEACH CITY	2	VIRGINIA BEACH	0.46	141	MIXED
VA-67	TECUMSEH	VIRGINIA BEACH CITY	2	VIRGINIA BEACH	1.22	643	MIXED
VA-68	LITTLE ISLAND	VIRGINIA BEACH CITY	2	NORTH BAY	0.71	5566	MIXED
VA-69	BACK BAY	VIRGINIA BEACH CITY	2	NORTH BAY KNOTTS ISLAND	4.27	9230	PROTECTED
VA-70	FALSE CAPE	VIRGINIA BEACH CITY	2	NORTH BAY KNOTTS ISLAND	5.66	1263	PROTECTED
Totals:					157.02	264,253	

COASTAL BARRIER RESOURCES SYSTEM
NORTH CAROLINA UNITS



NORTH CAROLINA

The State of North Carolina has 23 separate islands on an ocean coastline 324 miles in length. The coast is characterized by gently sloping sandy beaches, small sand dunes, larger dune fields and maritime forests in broad areas, and back-barrier marsh complexes. North of Morehead City, the barrier islands form the seaward boundary of Albermarle and Pamlico Sounds. Wave energy is the dominant agent in shaping the shoreline and has formed long narrow barriers with relatively few tidal inlets. The general development pattern in the past was low density residential/recreational development; however, high density development is dramatically increasing. Two significant public holdings, Cape Hatteras and Cape Lookout National Seashores, constitute 127 miles of ocean frontage. Additional Federal and State lands open to the public combined with the National Seashores result in 48% of the ocean coast being in public ownership.

Natural resources are abundant in the coastal region; the North Carolina estuarine system is the second largest among the lower 48 states. The estuarine system is composed of 4,500 square miles of shallow sounds, bays, tidal creeks, and salt marshes. Fishing and spawning grounds for crabs, shrimp, shad, striped bass, Atlantic croaker, flounder, and mullet provide abundant quantities of finfish and shellfish. Waterfowl and shore birds traverse this region in large numbers during spring and fall. Migratory bird populations are high during spring after they spend the winter farther south.

Industry in the coastal area is mostly agriculture, manufacturing, fisheries, mining (phosphate and peat) and tourism. Two deep water ports, at Morehead City and Wilmington, handle a great deal of shipping commerce both in export and import cargo.

CBRS Units

North Carolina has eight units in the CBRS. A total of 324 miles of oceanshore exist in North Carolina, 148.5 miles are protected and 49.1 miles are undeveloped. Total area of the CBRS units is approximately 35,000 acres. The units are located mostly in the southern part of the State and are:

Unit Name	Unit #	County	Beach Length (mi)

Currituck Banks	LOl	Currituck	11.3
Hatteras Island	L03	Dare	0.0
Shackleford Banks	L03A	Cacteret	9.5
Onslow Beach Complex	LO5	Onslow	
Topsail	L06	Onslow	6.3
Lea Island Complex	L07	Pender-New Hanover	2.1
Wrightsville Beach	L08	New Hanover	1.1
Masonboro Island	L09	New Hanover	9.1

In general, the CBRS units are barrier beaches and associated wetlands. The Hatteras Island unit is on the Pamlico Sound side of Cape Hatteras. The Topsail Unit (L06) is currently undergoing development. This is the only unit currently experiencing development pressures.

A brief description of each CBRS unit in North Carolina is provided below. Eac unit is identified by its number, name and, the county in which it is located.

LOl-Currituck Banks (Currituck): This unit includes vegetated dune ridges with back barrier flats, tidal marshlands, beach front and extensive actively migrating dune fields. Approximately 100 structures are located on this unit which is accessible by sand roads from both the north and south. Recently single family units and an associated canal system have been constructed. House lots have been sub-divided in some areas, particularly near the Virginia border. The unit is bordered by Back Bay National Wildlife Refuge and False Cape State Park to the north. Abundant species of shore birds, sea birds, water fowl, and marsh birds use this area for breeding and wintering grounds.

L03-Hatteras Island (Dare): This unit consists vegetated beach ridges, back barrier flats, and open water. Most of the use in this unit is recreational although some logging has been done in Buxton Woods. A state highway, NC Highway 12 passes through the unit.

L03A-Shackleford Banks (Carteret): This unit is within the authorized boundaries of Cape Lookout National Seashore and was privately owned in 1982. Typical environments include: vegetated dune ridges, tidal marshlands, and beach/dune systems.

L05-Onslow Beach Complex (Onslow): This unit is composed of two barriers which shelter extensive Wetlands including tidal marshlands, vegetated dune ridges, active beach/dune systems, and ebb-tidal shoals. A light-duty road along the western two-thirds of the unit provides access. A substantial development of approximately 20 structures is located in the middle of the southern island at Onslow Beach. The northern island is used for military maneuvers by Camp Lejeune Military Reservation.

L06-Topsail (Onslow): This unit contains tidal marshlands and ponds, vegetated beach dune ridges, and active shoreface beach/dune complexes. An improved road, Route 210, runs through the unit. Topsail Island is an important migration and wintering ground for waterfowl, shorebirds, and marsh birds. A small development of 12 structures occurs in this unit. At present a 156 unit condominium development is underway with plans for an eventual 586 units. Development pressure is a critical issue in this unit.

L07-Lea Island Complex (Pender-New Hanover): This unit includes two sections, Lea Island and Hutaffs Beach define this unit. Characteristic environments include tidal marshlands, tidal creeks, and low beach/dune complexes. Approximately 7 structures are located on these islands which are accessible by boat only. A development project of 57 units with a 20 slip docking facility is planned and 10 of these units have been sold.

L08-Wrightsville Beach (New Hanover): This unit has a beach length as 1.1 miles. Characteristic environments in this unit include tidal marshlands, ebb-tidal delta, beach/dune systems and some vegetated high ground (spoil sites). Developments are located north and south of the unit. Access to the unit is by bridge and paved road.

L09-Masonboro Island (New Hanover): Total acreage in this unit is 5250 acres, including extensive tidal wetlands, vegetated spoil islands, an inlet system (Masonboro Inlet), and an active beach/dune complex. Access to this unit is by boat. Many shorebirds use this island as a nesting area.

Coastal Resource Management

North Carolina's coastal management program was passed by the State legislature in 1974. Prior to that date there was no specific state authority to manage coastal development. Problems associated with polluted shellfishing areas and unsafe beachfront developments prompted the passage of a Dredge and Fill permit law in 1969. This was incorporated later into the Coastal Area Management Act (CAMA). The CAMA legislation emerged as an experiment in land-use planning and has been controversial from its inception.

The primary policymaking and regulatory body under CAMA is the 15-member Coastal Resources Commission (CRC). Members are appointed to staggered, four year terms by the governor and must, by statute, represent various interest groups such as agriculture, marine biology, and commercial fisheries. A 47-person Coastal Resources Advisory Council (CRAC) advises the CRC and is composed mostly of coastal residents appointed by county commissioners and municipal officials in the 20-county coastal area. The Council members advise the CRC and serve as liaison with their respective local governments. The Office of Coastal Management (OCM) provides the staff for the CRC and the CRAC and is charged with carrying out the policies and programs adopted under CAMA. The North Carolina Management Program joined the Federal Coastal Zone Management Program in 1978.

The main elements of CAMA are local land use planning, regulations for development in areas of environmental concern, and permit coordination in the State's 20 coastal counties. Special programs for beach access, the impacts of coastal energy projects, and estuarine sanctuaries are also included. The major elements of CAMA will be discussed briefly below.

1. Comprehensive Land Use Plans

The planning program of CAMA required all 20 coastal counties to develop land use plans by 1976 through a public hearing process conducted within each county. By 1976 all 20 coastal counties and approximately 50 coastal municipalities had adopted land use plans. The land use plans include a data summary of existing resources, policy discussion, and a land use map which divides the land into a number of categories depending on use. CAMA also requires that these land use plans be updated every five years.

2. Permits

A second part of the CAMA program is the issuance and review of permits for any development in environmentally sensitive coastal areas. The CRC designates areas of environmental concern (AEC) and sets standards for development as mandated by CAMA. Four categories of AEC have been designated: the estuarine system, ocean hazard areas, public water supplies, and natural and cultural resource areas. The AECs cover about three per cent of the land area in the coastal counties and all coastal waters. These are the only areas that require CAMA permits. Permits in AECs guide development through the use of performance standards and fall into two categories, major development and minor development.

Major development permits are required for any development over 20 acres, any structure covering 60,000 square feet, and any project requiring another state permit. The setback distance, revised in November 1983, is determined by multiplying 60 times the average annual erosion rate for each area along the coast. For a town with an average annual erosion rate of two feet per year, a minimum setback of 120 feet will be required. These permit applications are administered by OCM staff based on a comprehensive review by all interested State agencies.

Minor development permits are required of all developments that do not qualify as "major", such as home construction. Minor development permits are administered by a local permit officer within the local government, trained by OCM. Approximately 75% of all CAMA permits are classified as minor. For any building of less than 5,000 square feet or four dwelling units, the setback rule requires development be located, at a minimum, the furthest landward of four points: 1) a distance equal to 30 times the long-term annual erosion rate, measured from the vegetation line; 2) behind the crest of the "primary" dune (first dune with an elevation equal to the 100-year storm level plus six feet); 3) behind the landward toe of the "frontal" dune; or 4) 60 feet landward of the vegetation line.

3. Federal Project Review

Another part of the CAMA permit program is the review of federal projects in the coastal area for consistency with the coastal management program. If a State permit is denied, the Federal agency cannot issue a Federal permit for the project. On the other hand if a State permit is issued, the Federal agency can still deny the federal permit based on their regulations. Overall the CAMA program streamlines the permit process. A CAMA permit in an AEC satisfies five State and Federal permits.

4. Additional programs included in CAMA include: a beach access program designed to improve public access to beaches and coastal waters, the estuarine sanctuary system which protects and preserves valuable estuarine areas for scientific study and public enjoyment; and a coastal energy impact program which studies the effects of energy development along the coast. These additional components help provide a thorough and comprehensive coastal management program in North Carolina. This management system is designed to effectively manage long- and short-term growth and changes along the coast.

5. Taxes

An initiative relative to taxes that has an effect on conservation of natural resources is an income tax credit for individuals or corporations that make qualified donations of interests in real property for conservation purposes (N.C. General Statutes 105-130.34 to 105.12, enacted 1983). The credit will equal 25 per cent of the fair market value of the donated property interest, up to a maximum credit of $5,000 for a taxable year. Credits are allowed for gifts of interest in real property useful for public beach access, public access to public waters or trails, fish and wildlife conservation, or other conservation purposes found suitable by the N.C. Department of Natural Resources and Community Development.

Another State law (G.S. 105-275) exempts from property taxes any real property owned by a qualified nonprofit organization that holds and uses the land as a "protected natural area" for educational and scientific purposes.

Local Actions

Taxes

Land assessments for tax purposes generally are made every eight years and will not be calculated again for several years. Most undeveloped lands, however, are generally valued lower for tax purposes. An exception is the Topsail Island undeveloped area. New development there has had a significant impact on the Onslow County tax base. Godschalk (1984) cites the following statistics:

	1976	1984	Difference
Actual	$4,232,612	$17,355,850+	$13,123,238
Adjusted	$7,195,440	$17,355,850+	$10,160,410

*To account for inflation between 1976 and 1984 valuations, the 1976 figure is multiplied by the 1982 Consumer Price Index and divided by the 1976 Consumer Price index.

The probable factor accounting for the $10 million adjusted difference is the $5.3 million improvements by the developers of Topsail Dunes (Godschalk, 1984). Tax valuations in other undeveloped areas could also change as development continues. At present these statistics are unavailable.

Permits/Zoning

Local CAMA officials are in charge of permitting on minor development projects in coastal counties. Their responsibilities have been discussed previously and no further changes or modifications on a local level have occurred.

Two minor zoning changes in early 1984 were enacted in the New Hanover County land use plan. They are: 1) county land use plan prohibits residential development on undeveloped barrier islands with no evacuation network of roads and bridges, and 2) a subdivision ordinance requires hurricane evacuation plans in certain areas. It is probable they were part of the five-year land use plan revision required by CAMA.

The coastal region in North Carolina has continued to experience growth and development particularly within the past five years. High density multi-family and commercial construction has become the development pattern in the Topsail Beach unit (L06)

Private Sector Initiatives

According to a local official, an iniative undertaken by the private sector involves donations and bargains sales of some tracts for conservation purpose;. e.g., Pamlico Properties Inc., has designated a wilderness protected area.

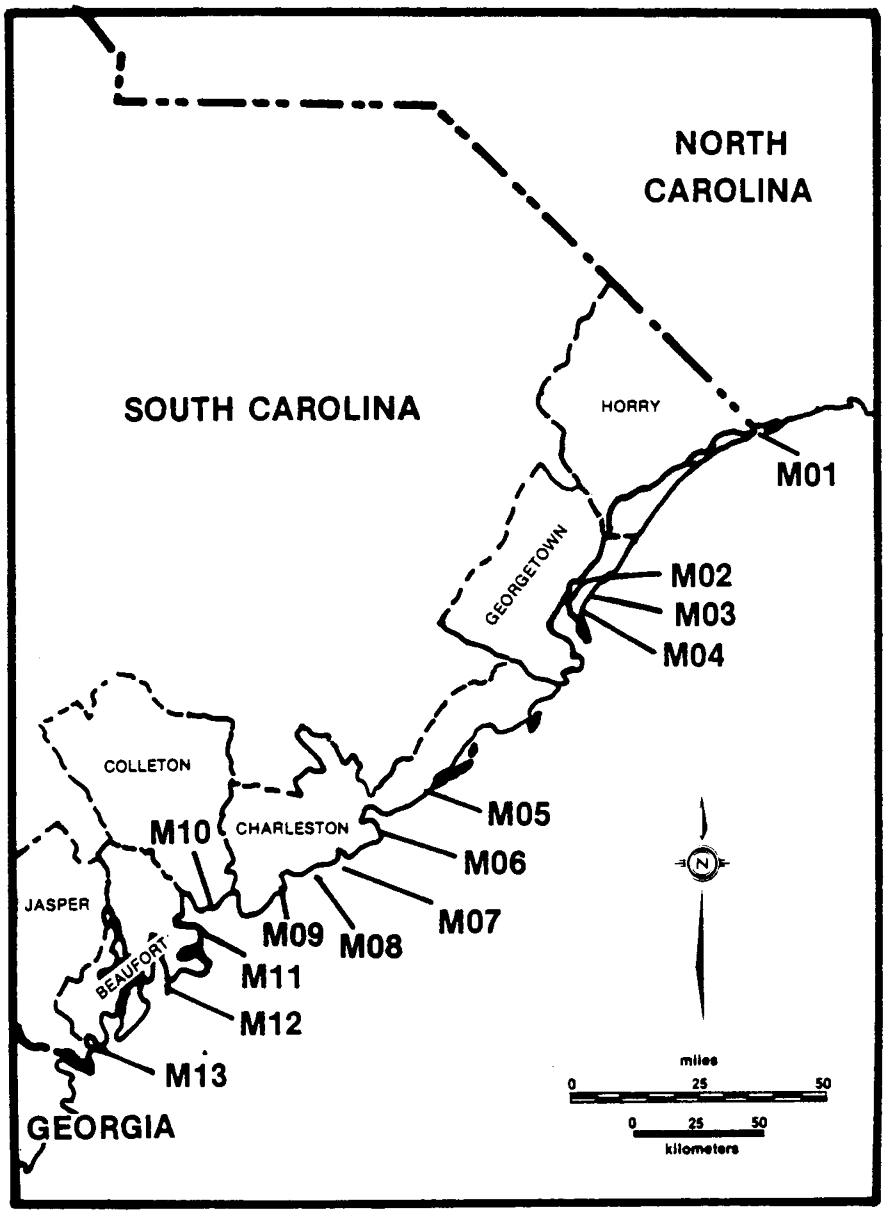
IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIER UNITS IN NORTH CAROLINA

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
L-01	CURRITUCK BANKS	CURRITUCK	1	KNOTTS ISLAND BARCO COROLLA	N/A	9957	ADDITION TO CBRS UNIT
NC-01	PINE ISLAND BAY	CURRITUCK	1	JARVISBURG	1.51	2988	PROTECTED
NC-02	KILLDEVIL HILL	DARE	1	KITTY HAWK	N/A	337	PROTECTED
NC-03	NAGS HEAD WOODS	DARE	1	MANTEO	N/A	2576	PROTECTED
NC-04	JOCKEY RIDGE	DARE	1	MANTEO	N/A	917	PROTECTED
NC-05	CAPE HATTERAS	DARE HYDE	1	ROANOKE ISLAND NE OREGON INLET PEA ISLAND RODANTHE LITTLE KINNAKEET BUXTON CAPE HATTERAS HATTERAS GREEN ISLAND HOWARD REEF OCRACOKE PORTSMOUTH	70.12	108521	MIXED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
L-03	HATTERAS ISLAND	DARE	1	BUXTON CAPE HATTERAS HATTERAS	N/A	N/A	NO CHANGE TO CBRS UNIT
NC-06	CAPE LOOKOUT	CARTERET	1	PORTSMOUTH WAINWRIGHT ISLAND DAVIS ATLANTIC STYRON BAY CAPE LOOKOUT HORSEPEN POINT HARKERS ISLAND	36.38	51030	MIXED
L-03A	SHACKELFORD BANKS	CARTERET	1	BEAUFORT HARKERS ISLAND CAPE LOOKOUT	N/A	11883	ADDITION TO CBRS UNIT
NC-07	FORT MACON	CARTERET	1	BEAUFORT	1.12	1100	PROTECTED
NC-08	THEODORE ROOSEVELT	CARTERET	1	MANSFIELD	1.48	1613	PROTECTED
NC-09	HAMMOCKS BEACH	ONSLOW	3	HUBERT SWANSBORO BROWNS INLET	4.27	8105	MIXED
L-05	ONSLOW BEACH	ONSLOW	3	HUBERT BROWNS INLET NEW RIVER INLET	N/A	3545	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
L-06	TOPSAIL	ONSLOW	3	NEW RIVER INLET SNEADS FERRY SPICER BAY	0.94	3273	ADDITION TO CBRS UNIT
L-07	LEA ISLAND	PENDER	3	HAMPSTEAD	0.34	2631	ADDITION TO CBRS UNIT
L-08	WRIGHTSVILLE BEACH	NEW HANOVER	7	WRIGHTSVILLE BEACH	N/A	309	ADDITON TO CBRS UNIT
L-09	MASONBORO ISLAND	NEW HANOVER	7	WRIGHTSVILLE BEACH CAROLINA BEACH	N/A	1425	ADDITON TO CBRS UNIT
NC-10	CAROLINA BEACH	NEW HANOVER	7	KURE BEACH CAROLINA BEACH	N/A	4526	PROTECTED
NC-11	FORT FISHER	BRUNSWICK	7	KURE BEACH	3.76	5230	PROTECTED
NC-12	BALD HEAD	BRUNSWICK	7	KURE BEACH SOUTH PORT CAPE FEAR	3.93	11613	PROTECTED
M-01	WAITES ISLAND	BRUNSWICK	7	LITTLE RIVER	N/A	1041	ADDITION TO CBRS UNIT
Totals:					125.23	235893	

COASTAL BARRIER RESOURCES SYSTEM
SOUTH CAROLINA UNITS



SOUTH CAROLINA

The South Carolina shoreline is approximately 153 miles in length. A total of 63.5 miles of that area has been developed, 50.5 miles are protected, and 39 miles remain undeveloped to some extent. Approximately 59% of the State's coastal barriers have development constraints due to protected and undeveloped designations.

The northern one-third of the South Carolina shoreline consists of sandy barrier beaches and associated dunes formed on an eroding shoreline. Tidal inlets are present. South of the Santee Delta, the shoreline is composed of relatively short, often wide barrier islands with broad sandy beaches and numerous dune ridges. This portion of the coast is characteristic of a tide-dominated sea island physiographic province.

The major economic industries on the coast include manufacturing, wood and associated products, chemicals, textiles, seafood, agriculture, and paper production. Charleston serves as a major port with bulk cargo handling facilities. Tourism is another important industry particularly in the coastal zone where large scale resort developments are found.

The coastal zone has a valuable natural resource base comprised of diverse aquatic and terrestrial wildlife resources. This zone of barrier islands and associated salt marsh complexes supports abundant finfish and shellfish populations. Aquatic resources include clams, oysters, blue crabs, shrimp, seatrout, flounder, sheepshead, and bluefish. Abundant and diverse bird life is also found in this region and includes ibis, terns, skimmers, osprey, brown pelicans, and gulls.

CBRS Units

Unit Name	Unit #	County	Beach length (mi.)
Waites Island Complex	M01	Horry, S.C Brunswick, N.C.	6.0
Litchfield Beach	M02	Georgetown	0.9
Pawleys Inlet	M03	Georgetown	1.1
Debidue Beach	M04	Georgetown	2.2
Dewees Island	M05	Charleston	1.5
Morris Island Complex	M06	Charleston	3.4
Bird Key Complex	M07	Charleston	4.1
Captain Sams Inlet	M08	Charleston	1.9
Edisto Complex	M09	Charleston	4.8

Otter Island	M10	Colleton	3.8
Harbor Island	M11	Beaufort	0.9
St. Phillips Island Complex	M12	Beaufort	7.1
Daufuskie Island	M13	Beaufort	2.3

These units comprise a total of 40 miles of ocean-facing shoreline. Typical environments found in these units include beach/dune systems, tidal marshlands, creeks, and multiple vegetated beach ridges. The only unit that is experiencing development pressure is Daufuskie Island. Portions of the island have recently been acquired and are scheduled for the development of a large beach resort complex.

A brief description of the CBRS units in South Carolina is provided below. Each unit is identified by its number, name and the county in which it is located.

M01-Waites Island Complex (Brunswick, N.C. Horry, S.C.): Three segments characterize this unit: a northern spit on the end of Sunset Beach which is accessible by foot or offroad vehicles; a central portion, Bird Island in the middle of Little River Inlet; and a southern low washover barrier with associated tidal marshlands. A jetty has been constructed on Waites Island at the Little River Inlet.

M02-Litchfield Beach (Georgetown): This unit is basically two recurved spits, one at the southern tip of Magnolia Beach and the other at the northern tip of Pawley's Island. The northern end of the parcel is accessible by foot and off-road vehicles, the southern end is accessible by road.

M03-Pawley's Inlet (Georgetown): Two sections define this unit: a recurved spit on the southern end of Pawley's Island and a beach strand dune system on the northern end of Debidue Beach. Multiple vegetated beach/dune ridges, tidal wetlands, and open water further characterize this unit. Access to the northern end of the unit is by road from developed sections of Pawleys Island. A off-road vehicle trail provides access to the southern end of the unit.

M04-Debidue Beach (Georgetown): This unit is a recurved spit with dune fields and vegetated forest at the northern end and a washover barrier with developing dunes at the southern end. Extensive tidal marshlands and creeks are also included in the unit. Access to the unit is by boat, foot, and a light duty road from settled areas to the north.

M05-Dewees Island (Charleston): Multiple vegetated beach ridges, tidal marshlands, and beach/dune environments characterize this unit. Access to the island is by boat, but there are sand roads in the wooded upland sections of the island. The southern end of the island has been subdivided into 70 house lots.

M06-Morris Island Complex (Charleston): This unit includes extensive tidal marshlands, vegetated dune ridges, active beach/dune systems, and a recurving spit on the northern end. Maintenance operations in the Charleston Harbor Channel have affected sediment supplies to Morris Island. A groin is apparent on the northern beach front of the island. Five buildings and a rather large area which has been diked for dredge spoil disposal are on the island. Active retreat and erosion of the southern end of the island is readily apparent with the Charleston Lighthouse standing in the water off from the beach. Access to the island is by boat only.

M07-Bird Key Complex (Charleston): Three sub-units characterize this unit: a recurved dune ridge system on the southern tip of Folly Island; Bird Key, a sand shoal in the ebb-tidal delta of Stono Inlet; and the Sandy Point section of Kiawah Island which is comprised of multiple vegetated beach/dune ridges, extensive tidal marshlands and tidal creeks. No structures are present in the unit which is accessible by road in the northern and southern portions of the unit. Bird Key, however, is accessible by boat only. The unit has an extensive inventory of natural wildlife resources and includes shorebirds, seabirds, turtles and fishes.

M08-Captain Sams Inlet (Charleston): This unit is essentially an active recurved spit with some vegetated dune ridges. Large expanses of tidal marshlands and open waters are associated with this unit. No structures are present and access is by foot from developed areas on South Kiawah.

M09-Edisto Comples (Charleston): Three segments characterize this unit: the western half of South Creek Island which is an active beach/dune complex with associated tidal marshlands; Botany Bay Island, a low washover barrier feature with extensive tidal marshlands that has undergone sigificant shoreline retreat; and Edingsville Beach, a low washover feature with tidal marshlands. Access is by boat with the exception of Botany Bay Island which is accessible by dirt road.

M10-Otter Island (Colleton): This unit contains 5.6 miles of beachfront which protect extensive marshland with vegetated dune ridges and an active beach/dune systems. The unit is accessible only by boat. It currently contains 11 structures.

M11-Harbor Island (Beaufort): This unit has no structures and is accessible only from the north end by foot and off-road vehicle. Environments characteristic of this unit include tidal marshlands, beach/dune systems, and active shoals welding on to the beach front. Development is ongoing to the north and west of this unit.

M12-St. Phillips Island (Beaufort): This unit complex contains four island sub-units: Pritchards Island-vegetated beach ridges with tidal marshlands surrounding the island; Capers Island-extensive tidal marshlands with a narrow beach strand and recurving spit on the southern end; St. Phillips Island-extensive tidal marshlands and multiple vegetated beach/dune ridges; and Bay Point Island-vegetated beach ridges-extensive tidal marshlands and a narrow beach/dune system. Six structures are located in the unit which is accessible by boat only and utilized principally for hunting and fishing. Wildlife habitats are rich and diverse and many rare or endangered species are documented residents or visitors.

M13-Daufuskie Island (Beaufort): Daufuskie Island consists of extensive vegetated dune ridges of oak, pine, cabbage palm, and other tree species. The beach/dune system is very narrow to nonexistent in places. An extensive tidal marsh island south of Daufuskie Island proper also is included in this unit. Access to Daufuskie Island is by ferry from Bull Island. A community of farmers and fishermen is located on the southwest side of the island and contains approximately 100 structures and several sand roads.

Coastal Resource Management

The South Carolina Coastal Council was established in 1977 through the passage of the State's Coastal Zone Management Act (Act 123). During the subsequent two years the Council developed a comprehensive management program for the eight-county coastal zone. This comprehensive management program was approved by the State's General Assembly in February 1979 and by the Federal Office of Coastal Zone Management in September 1979.

The Coastal Management program in South Carolina seeks to balance the needs of a growing population and subsequent development against the needs for preservation of the coastal environment.

Permits

The Coastal Council has direct authority to issue permits and uses an approach that deals with impacts of an activity on coastal resources rather than the activity itself. This "performance standards" approach is conducted on a case-by-case basis with policies developed for all activities which have direct and significant coastal impacts. A direct permitting system for "critical areas" is managed by the Coastal Council. Critical areas are defined as coastal waters, tidelands, beaches, and primary ocean front sand dunes. Anyone who wants to fill, remove, dredge, drain, or erect structures that will alter any critical area must obtain a permit from the Coastal Council.

The Coastal Council has limited permitting authority outside the coastal zone critical areas. Any filling of waters or wetlands below mean high water requires a South Carolina Budget and Control permit in those areas outside coastal Council permitting jurisdiction. South Carolina Department of Health and Environmental Control permits are required for construction of subdivision water supply and waste disposal systems. The Coastal Council, does however, review and certify permits and projects of other State agencies to insure compliance with the Coastal Management Program. This review authority is mandated in the South Carolina Coastal Management Act of 1977.

Taxes

There are several tax incentives for conservation of natural resources in South Carolina. A fee simple donation releases property from property taxes. Two easements, conservation and scenic, result in reduced property taxes (S.C. Code (1976) 51-17-10).

Local Actions

No information is available at this time.

Private Sector Initiatives

No information is available at this time.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIER UNITS IN SOUTH CAROLINA

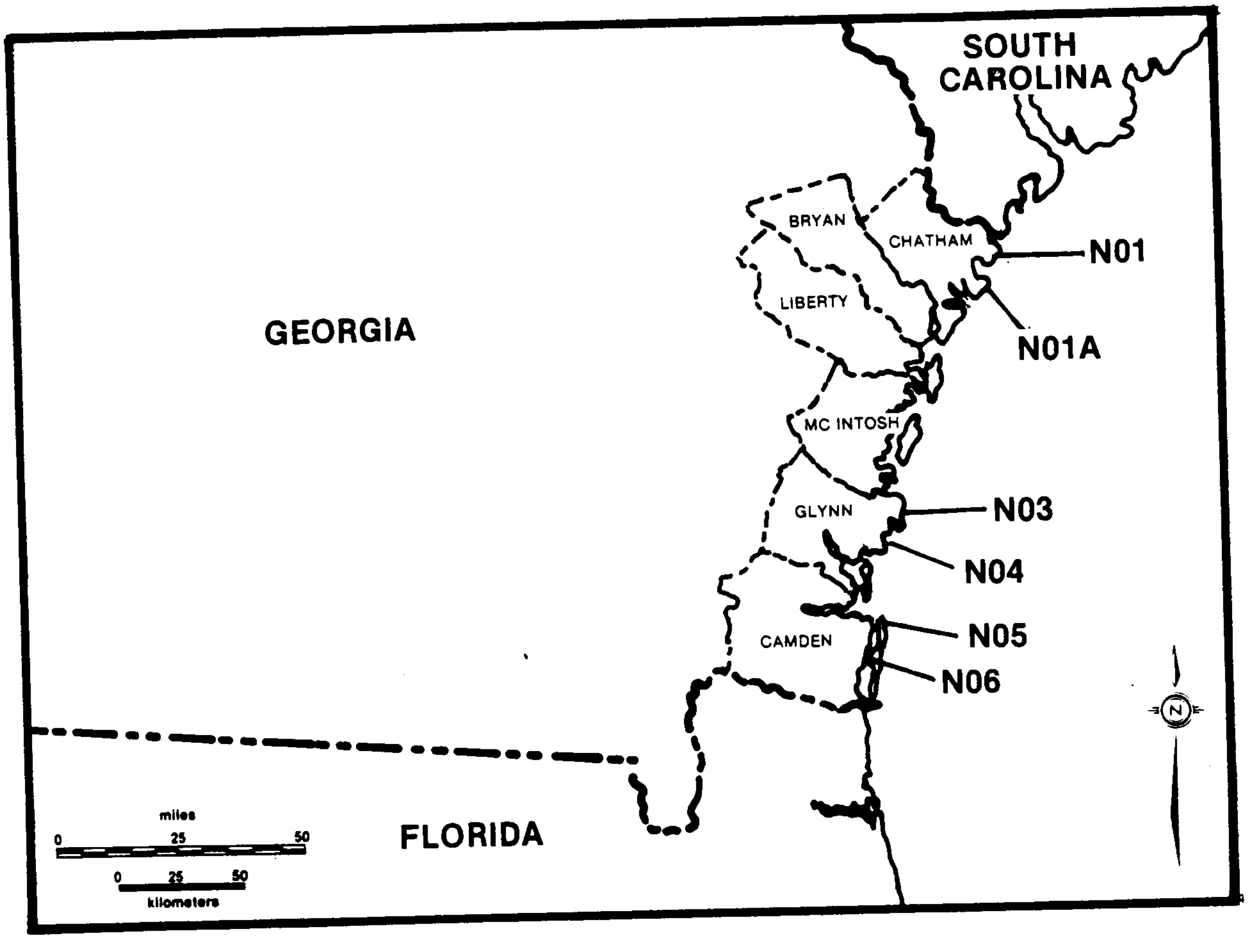
ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
M-01	WAITES ISLAND	HORRY	6	LITTLE RIVER	N/A	721	ADDITION TO CBRS UNIT
SC-01	LONG POND	HORRY	6	NIXONVILLE	1.14	197	PRIVATE
SC-02	MYRTLE BEACH	HORRY	6	MYRTLE BEACH	0.49	310	PROTECTED
SC-03	HUNTINGTON BEACH	GEORGETOWN	6	MAGNOLIA BEACH BROOKGREEN	3.53	2170	MIXED
M-02	LITCHFIELD BEACH	GEORGETOWN	6	MAGNOLIA BEACH	N/A	228	ADDITION TO CBRS UNIT
M-03	PAWLEYS INLET	GEORGETOWN	6	WAVERLY MILLS	N/A	85	ADDITION TO CBRS UNIT
M-04	DEBIDUE BEACH	GEORGETOWN	6	NORTH ISLAND	N/A	7613	ADDITION TO CBRS UNIT
SC-04	NORTH/SOUTH ISLAND	GEORGETOWN	6	NORTH ISLAND GEORGETOWN SOUTH SANTEE POINT MINIM ISLAND	13.94	28300	MIXED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
SC-05	SANTEE	CHARLESTON	1	SANTEE CAPE ROMAIN SANTEE POINT MINIM ISLAND MCCLELLANVILLE	4.23	35175	PROTECTED
SC-06	CAPE ROMAIN	CHARLESTON	1	MCCLELLANVILLE CAPE ROMAIN AWENDAW BULL ISLAND SEWEE BAY CAPERS INLET	16.13	60700	MIXED
SC-07	CAPERS ISLAND	CHARLESTON	1	SEWEE BAY CAPERS INLET	3.16	7015	PROTECTED
M-05	DEWEES ISLAND	CHARLESTON	1	CAPERS INLET SEWEE BAY FORT MOULTRIE	N/A	5736	ADDITION TO CBRS UNIT
SC-08	FORT MOULTRIE	CHARLESTON	1	FORT MOULTRIE	0.11	335	PROTECTED
M-06	MORRIS ISLAND COMPLEX	CHARLESTON	1	JAMES ISLAND CHARLESTON	0.93	5277	ADDITION TO CBRS UNIT
M-07	BIRD KEY COMPLEX	CHARLESTON	1	JAMES ISLAND LEGAREVILLE KIAWAH ISLAND	0.97	4256	ADDITION TO CBRS UNIT
M-08	CAPTAIN SAMS INLET	CHARLESTON	1	ROCKVILLE	N/A	578	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
M-09	EDISTO COMPLEX	CHARLESTON	1	ROCKVILLE EDISTO ISLAND BENNETTS POINT EDISTO BEACH	1.21	288	ADDITION TO CBRS UNIT
SC-09	EDISTO BEACH	CHARLESTON	1	EDISTO ISLAND BENNETTS POINT EDISTO BEACH	1.44	7942	PROTECTED
M-10	OTTER ISLAND	COLLETON	1	EDISTO ISLAND BENNETTS POINT ST. HELENA SOUND EDISTO BEACH	N/A	8375	ADDITION TO CBRS UNIT
M-11	HARBOR ISLAND	BEAUFORT	1	ST. HELENA SOUND	1.24	460	ADDITION TO CBRS UNIT
SC-10	HUNTING ISLAND	BEAUFORT	1	ST. HELENA SOUND FROGMORE FRIPPS INLET ST. PHILLIPS ISLAND	4.68	16425	MIXED
M-12	ST. PHILLIPS COMPLEX	BEAUFORT	1	ST. PHILLIPS ISLAND PARRIS ISLAND	N/A	7250	ADDITION to CBRS UNIT
SC-11	PINCKNEY ISLAND	BEAUFORT	1	PARRIS ISLAND SPRING ISLAND BLUFFTON	0.55	5467	PROTECTED
M-13	DAUFUSKIE ISLAND	BEAUFORT	1	FORT PULASKI TYBEE ISLAND NORTH	N/A	N/A	NO CHANGE TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
SC-12	TURTLE ISLAND	JASPER	1	FORT PULASKI	2.48	2163	PROTECTED
SC-13	TYBEE	JASPER	1	FORT PULASKI	0.83	4290	PROTECTED
Totals:					57.06	211356	

COASTAL BARRIER RESOURCES SYSTEM
GEORGIA UNITS



GEORGIA

The Sea Islands of the Georgia coast are an interrelated system of relatively short and wide barrier islands, and back barrier marshes separated by tidal inlets, and sounds. The 18 barrier islands protect extensive coastal marshlands located between the mainland and the barriers. The coast has approximately 94 miles of ocean-facing beach and over 500,000 acres of adjacent marshlands.

The economy of the State, in general, is dominated by manufacturing, construction, agriculture, fisheries, retail trade, and service industries. The coastal Georgia economy is based on the region's resources, namely forests, fisheries, waterways, and natural and historic features. Two major ports, Savannah and Brunswick, handle extensive cargo transportation in the region. Another industry prominent in the coastal area and related to forest products is paper and pulp processing. Several pulp mills are located in the Brunswick and Savannah regions.

The State has abundant natural resources due to the extensive back barrier salt marsh complexes and numerous rivers and sounds. Aquatic resources include oysters, clams, shrimp, crab, menhaden, spotted seatrout, kingfish, drum, bluefish, flounder, and sheepshead. Transient and wintering waterfowl are found in coastal waters, and shorebirds and marshbirds on beaches and in marshes. Loggerhead turtles nest annually on most of the coastal barriers.

CBRS Units

Unit Name	Unit #	County	Beach Length
Little Tybee Island	NO1	Chatham	5.0
Wassaw Island	NO1A	Chatham	0.2
Little St. Simons Island	NO3	Glynn	
Sea Island	N04	Glynn	1.6
Little Cumberland Is.	N05	Camden	0.3
Cumberland Island	N06	Camden	2.4

These units comprise a total 15.6 miles of ocean facing shoreline. The units are all located on or within barrier islands and include some associated wetlands. The only unit likely to be affected by development pressure is Sea Island (N04) which is a spit on the southern end of Sea Island, and has on it a some resort, home, and recreational development. The other units are accessible by boat only and are adjacent to, surrounded by, or in protected land ownership situations.

A brief description of each CBRS unit in Georgia is provided below. Each unit is identified by its number, name and the county in which it is located.

NOl-Little Tybee Island (Chatham): This unit comprises 7809 acres, of which 1253 acres are fast land and the remaining acreage salt marshes. Multiple dune ridges characterize this low lying barrier island with maximum elevations below ten feet. Large waterfowl populations inhabit the island and nest in coniferous trees on the dune ridges.

NO1A-Wassaw Island (Chatham): This 320 acre unit parcel is within the boundaries of the Wassaw National Wildlife Refuge. The barrier island is characterized by multiple dune ridges with associated tidal wetlands. Over 200 species of birds are found in the habitats on Wassaw Island.

N03-Little St. Simons Island (Glynn): This privately owned island has 6.1 miles of beach front which shelter extensive tidal marshlands and open water. A small development of a dozen buildings is located on the island. The island has been used as a hunting preserve and is reported to have the most diverse bird habitat in the State. Dear and cattle have caused some overgrazing in the dune areas. The island development is run as a private hotel for naturalists.

N04-Sea Island (Glynn): This unit is a 189 acre sand spit located on the south end of Sea Island. No structures are located on the spit which is basically a depositional beach feature. Access is limited to walk-in beach use from the developed area north of the unit. Future growth of the Cloister Resort complex on Sea Island could exert development pressure on this unit.

N05-Little Cumberland Island (Camden): This unit is primarily vegetated dune ridges, tidal creeks and marshlands. Some private homes are located on Little Cumberland Island but access is strictly limited to boats.

N06-Cumberland Island (Camden): This unit is surrounded by the Cumberland Island National Seashore. It includes beach front and associated dune environments, salt and brackish water marshlands, and open water. Large waterfowl populations inhabit the island habitats. Wild horses on the island cause some trampling of dune vegetation and promote dune migrations.

Coastal Resource Management

The Department of Natural Resources and Coastal Resources Division are the principal policy-making branches concerned with coastal resources. The CRD functions in three main areas: marine and estuarine fisheries; shore, beach and tidal wetlands protection; and coastline management. Georgia has not joined the Coastal Zone Management System at the Federal level. The Coastal Protection section protects and manages the coastal marshlands, ocean beaches, and sand dune systems.

Permits

A three-member Coastal Marshlands Committee (CMP) issues permits under the Coastal Marshlands Protection Act of 1970. A Shore Assistance Committee (SAC) similarly assures conservation and environmentally sound use of dunes, beaches and offshore sandbars through permits mandated by the Shore Assistance Act of 1979. Consideration is being given to amend this act to include stronger language defining the State's jurisdiction in permitting procedures. Also, a tentative reevaluation is being made concerning possible participation in the Federal Coastal Resources Management Program.

Taxes

The Facade and Conservation Easement Act of 1976 establishes a legal framework for conservation easement of land in Georgia. The Act requires local tax assessors to reappraise the value of the property in which an easement has been established. Several agencies, such as the Georgia Conservancy and The Nature Conservancy, accept conservation easements.

The development of a coastal management program in Georgia has been relatively slow. This is partly due to limited development pressures in the coastal zone. The existence of a recent task force on Tybee Island, concerned principally with the effects of channel maintenance on the Savannah River ship channel and its subsequent impact on the beaches of Tybee Island, suggests willingness at the State level to deal more directly with coastal issues. Perhaps this is a beginning toward the development of a more comprehensive coastal zone management policy.

Local Actions

No information is available at this time.

Private Sector Initiatives

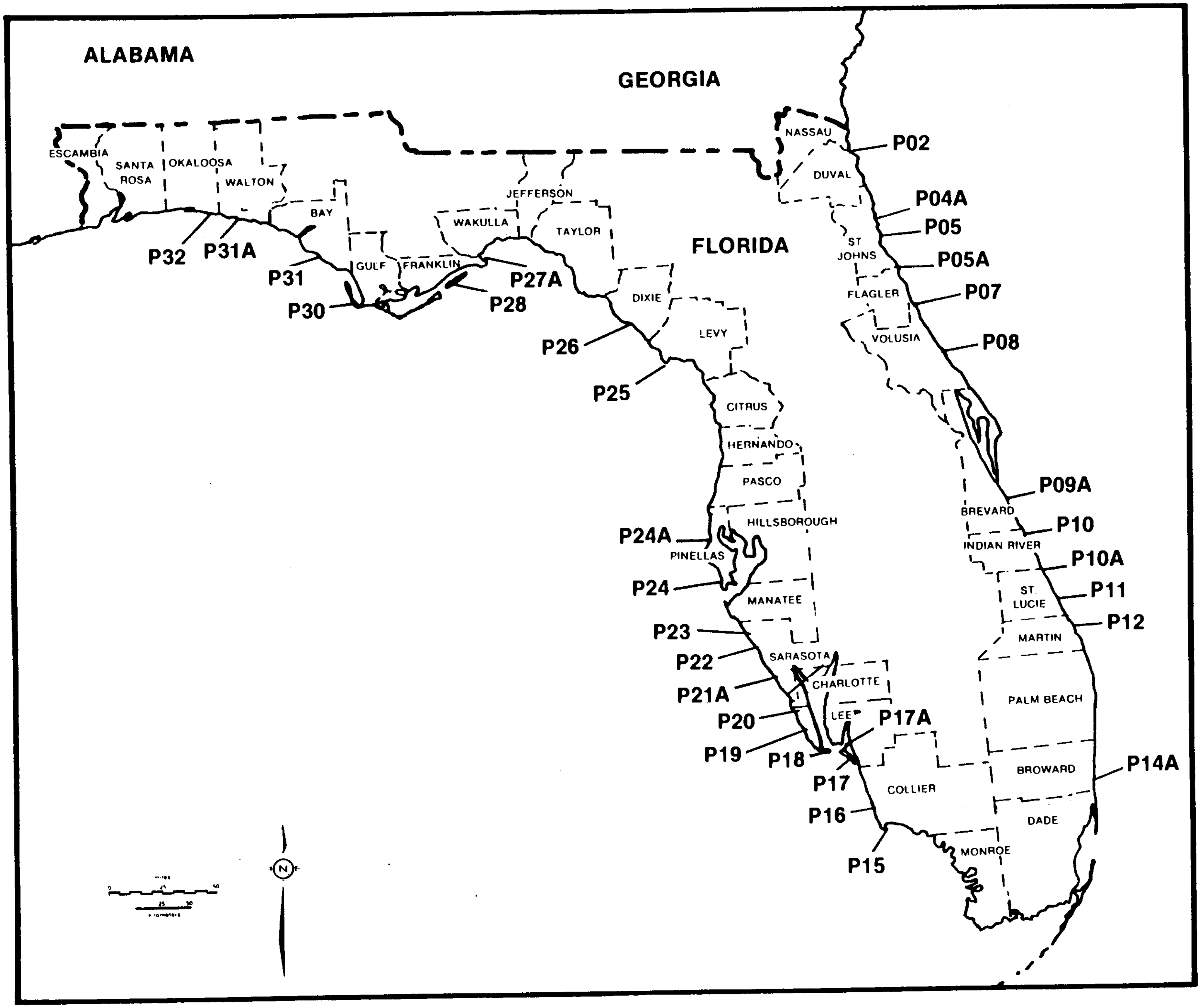
No information is available at this time.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN GEORGIA

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
GA-01	FORT PULASKI	CHATHAM	1	FORT PULASKI WASSAW SOUND	2.30	11210	PROTECTED
N-01	LITTLE TYBEE ISLAND	CHATHAM	1	TYBEE ISLAND SOUTH WASSAW SOUND ISLE OF HOPE FORT PULASKI	2.81	12018	ADDITION TO CBRS UNIT
N-01A	WASSAW ISLAND	CHATHAM	1	WASSAW SOUND ISLE OF HOPE RACCOON KEY	9.86	11223	ADDITION TO CBRS UNIT
GA-02	OSSABAW ISLAND	CHATHAM BRYAN	1	BURROUGHS ISLE OF HOPE RACCOON KEY OAK LEVEL ST. CATHERINES SOUND	13.88	58334	PROTECTED
GA-03	ST. CATHERINES ISLAND	LIBERTY MCINTOSH	1	SEABROOK SAPELO SOUND ST. CATHERINES SOUND SHELLMAN BLUFF	17.16	37083	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
GA-04	SAPELO ISLAND	MCINTOSH	1	DOBOY SOUND SAPELO SOUND CABRETTA INLET SHELLMAN BLUFF	14.65	60367	PROTECTED
GA-05	WOLF ISLAND	MCINTOSH	1	DOBOY SOUND RIDGEVILLE ALTAMAHA SOUND DARIEN	8.45	33870	PROTECTED
N-03	LITTLE ST.SIMONS ISLAND	GLYNN	1	ALTAMAHA SOUND SEA ISLAND DARIEN	N/A	1521	ADDITION TO CBRS UNIT
N-04	SEA ISLAND	GLYNN	1	SEA ISLAND	5.77	4188	ADDITION TO CBRS UNIT
GA-06	JEKYLL ISLAND	GLYNN CAMDEN	1	BRUNSWICK EAST KINGSLAND NE JEKYLL ISLAND DOVER BLUFF	13.94	46931	PROTECTED
N-05	LITTLE CUMBERLAND ISLAND	CAMDEN	1	CUMBERLAND ISLAND N. KINGSLAND NE	2.82	691	ADDITION TO CBRS UNIT
N-06	CUMBERLAND ISLAND	CAMDEN	1	CUMBERLAND ISLAND N. CUMBERLAND ISLAND S. KINGSLAND NE HARRIETTS BLUFF FERNANDINA BEACH ST. MARYS	14.80	38652	ADDITION TO CBRS UNIT
Totals:					106.44	316,088	

COASTAL BARRIER RESOURCES SYSTEM
FLORIDA UNITS



FLORIDA

The State of Florida is one of the rapidly growing "megatrend" states of the sun belt. Its population currently exceeds 10 million and its rate of population growth ranks among the highest in the nation. Most prognosticators predict that Florida will rank among the top four states in both population and economic base by the turn of the century.

Although marked growth in Florida's population took place during the first few decades of the 20th century, it was not until the post-World War II era that the major growth began. Growth may have peaked with an overall increase of 43 percent between 1970 and 1980. During this period coastal counties accounted for 72 percent of the increase (State of Florida, 1981). This growth has been accompanied by a significant diversification in the State's economic base.

Until the 1960's, the bulk of Florida's economic base was in agriculture and tourism. Agriculture is primarily in citrus, cattle and vegetables. Tourism was concentrated on the coasts, with the east coast dominating. This aspect of Florida's economy has spread and diversified with the greatest increase in the central Florida area near Disney World.

Great diversification began in the early 1960's. Much of the impetus for this was the development of the NASA Space Center and related hi-tech activities near Cape Canaveral. This growth and diversification has been accompanied and followed by similar expansion across the entire central Florida strip from the area of the Kennedy Space Center through the Orlando area to Tampa Bay and the numerous cities which surround it.

Great growth has taken place in Florida's four major metropolitan regions: Miami-Ft. Lauderdale, Tampa Bay, Orlando/Orange County and Jacksonville. The Miami area, long known as a major tourist attraction has become a center for international trade with many Latin American corporations relocating or expanding into the central Florida area. The Tampa Bay area includes nearly 2 million people with Tampa, St. Petersburg, Clearwater, and Sarasota the largest of many municipalities. Although this was originally a retirement area, it too has diversified greatly during the past two decades. Tampa especially has changed, becoming a hi-tech electronics and financial center.

Jacksonville is more of a seasonal tourist area than the other metropolitan regions and has long had a diversified economy. It has a large port, numerous military bases, and is the insurance center of Florida.

Three of the four major metropolitan areas of Florida are in the coastal zone. In addition, there are numerous mid-size cities along the coast. These are located along the entire east coast, including the Florida Keys, on the west central coast and on the coast of the panhandle. The only relatively unpopulated coastal areas of the State are between Cape Sable and Cape Romano on the southwestern peninsular coast and between Pasco County and the Appalachicola Delta in the big bend area. These are also the only coasts of Florida where beaches and/or barriers are generally absent.

Florida's most valuable resource is its beaches and its most valuable real estate is found on the coastal barriers. Florida also has petroleum, nimerals, etc., but their impact on the economy of the State falls far below its beaches and its climate. The state ranks among the world leaders in production of phosphate, although recent years have seen the rapid expansion of some foreign producers. Limestone and silica sand are also significant mineral products in the State. Although Florida is not presently among the U.S. leaders in petroleum production, there is optimism about expansion in the future, especially in the offshore Gulf of Mexico. Presently only two major fields are producing in the state: the Jay Field near the Georgia border in the panhandle and the Sunniland Field in the Big Cypress Swamp area of south Florida.

Florida also has extensive renewable living natural resources in the form of its timber and fishing industries. Throughout the panhandle and northern peninsula, there are softwood forests that are used primarily for paper pulp and particle board. The fishing industry includes extensive commercial sportfishing components. Shrimp and oysters are also an important part of this industry.

Much of the state's industry is located on the coast in total or at least in part. This is largely because the majority (about 75 percent) of the population lives in the coastal counties of Florida. Tourism is certainly the largest coastal industry with nearly 40 million out-of-state guests visiting the beaches each year. Related to this coastal tourism industry are such activities as sailing, power boating, fishing, boat-building and numerous amusement and other tourist attractions. Much of the new industry attracted to Florida is concentrated in coastal counties because of the preference of employees toward living on or near the coast. Obviously, the commercial industry is concentrated along the coast as is a large portion of sportfishing.

Some industries rely on the coast to support their activities. Prominent among these are the phosphate and forestry industries. Phosphate products are almost all shipped out the deep water port at Tampa. Many large pulp mills are located in the coastal zone.

CBRS Units

Unit Name	Unit #	County	Beach length
Talbot Islands Complex	PO2	Duval	2.9
Usinas Beach	P04A	St. Johns	10.2
Conch Island	P05	St. Johns	2.0
Matanzas River	P05A	St. Johns	1.9
Ormond-by-the-Sea	P07	Volusia	3.2
Ponce Inlet	P08	Volusia	1.3
Coconut Point	P09A	Brevard	
Vero Beach	PIO	Indian River	3.1
Blue Hole	PIOA	Indian River	3.2
Hutchinson Island	P11	St. Lucie	9.9
Hobe Sound	P12	Martin	1.1
North Beach	P14A	Broward	0.8
Cape Romano	P15	Collier	2.8
Keewaydin Island	P16	Collier	9.0
Lovers Key Complex	P17	Lee	5.0
Bodwitch Point	P17A	Lee	
Sanibel Island Complex	P18	Lee	3.4
North Captiva Island	P19	Lee	1.3
Cayo Costa	P20	Lee	5.2
Bocilla Island	P21	Charlotte	3.9
Manasota Key	P21A	Sarasota	0.5
Casey Key	P22	Sarasota	0.6
			1.4
The Reefs	P24	Hillsborough	1.1
Mandalay Point	P24A	Pinellas	
Atsena Otie Key	P25	Lexy	1.0
Pepperfish Keys	P26	Dixie	1.9
Ochlockonee Complex	P27A	Wakulla	
Dog Island	P28	Franklin	6.7
Cape San Blas	P30	Gulf	5.4
St. Andrew Complex	P31	Bay	31.1
Four-Mile Village	P31A	Walton	
Moreno Point	P32	Okaloosa	3.2

Because of the extensive and varied coast of Florida, this section of the report subdivides the state into reaches of coast that have similar characteristics. Four of these reaches include CBRS units; east coast, west-central coast, big bend area and panhandle coast.

East Coast - The east or Atlantic Ocean coast of Florida contains twelve units from Talbot Island (P02) on the north to North Beach (P14A) on the south. This is a generally high energy coast with frequent storms, including hurricanes. Tidal range decreases southward from about 6 feet to less than 3 feet. This coast is extensively developed and erosion is both widespread and severe. Numerous human structures such as sea walls, groins and jetties are in evidence throughout much of the area.

Beaches are typically narrow and steep reflecting erosional conditions. Dunes may reach over 20 feet above sea level but typically are restricted to one row of foredunes except in the northern most areas. Wetlands behind the barriers also are narrow and open water areas are narrow or absent.

West-central coast - This reach of coast includes the barrier island complex that begins at Cape Romano (P15) on the south and extends just north of Mandalay Point (P24A) on the north. This coast is subjected to low wave energy due to the restricted fetch of the Gulf of Mexico and the gentle slope of the adjacent continental shelf. Tidal range is about 3 feet throughout. Although tropical storms occur on this coast, they are relatively infrequent. The most recent significant hurricane was in 1960 (Donna).

Barriers are typically short and rather wide, at least at one end or the other. Many protect extensive mangrove and marsh wetlands with large open water areas adjacent to them. This gives rise to the numerous large inlets and the apparently irregular shape of the barriers. Erosion is common and locally severe but is more spotty than on the east coast. The barriers on the west-central coast have lower elevations than on the east coast and are, therefore, more susceptible to flooding. Development is locally intense.

Big Bend Coast - The Big Bend Coast is sometimes also called the "zero energy" coast because of the low wave climate and the general absence of beaches. There is also a general absence of barriers in the usual sense; however, there are two small units (P25 and P26) which occur on this reach of coast. This area is remote, unattractive to most people and it does not have extensive beaches. Most of the coast is a low marshy environment that is very susceptible to flooding. As a result, it is only sparsely developed and is likely to remain so for some time.

Panhandle Coast - The generally east-west trending coast of West Florida or the panhandle contains six CBRS units. They extend from the Ochlockonee complex (P27A) on the east side of the Appalachicola Delta to Moreno Point (P32). Some of the barriers are associated with the this large river delta, and others are associated with the mainland. Wave climate increases from the delta westward, partly due to the increase in shelf gradient and decrease in shelf width in that direction. Tides are about 3 feet or less throughout. Incidence of hurricanes also increase westward. There, such storms are about as frequent as they are on the east coast of the State.

The coastal barriers are typically long and narrow, but are rather high due to dune development. The western panhandle coast has the highest dunes in the State. Extensive open water bays are present in most places, but here the barriers front small embayments. Beach erosion is moderate along this coast and generally is related to the passage of tropical storms.

A brief description of the CBRS units in Florida is provided below. Each unit is identified by its number, name, and the county in which it is located.

P02-Talbot Islands Complex (Duval): This is the northernmost unit on the east coast of the State. It consists of two parcels: a northern protected barrier (Talbot Island) which is flanked on 3 sides by salt-water marsh and on the fourth side by open water (Nassau Sound); and a southern sand spit between the mouths of two rivers with salt-water marsh to the landward side. A highway and a jetty are the only significant human features, and neither appears to have much impact on the unit. The surrounding areas are essentially all natural and include Little Talbot Island State Park to the east, Nassau Sound to the north and salt-water marsh to the south and west. The south parcel faces the Atlantic Ocean and is surrounded by Ft. George River to the north, St. John's River to the south and salt marsh to the west.

P04A-Usinas Beach (St. John's): This unit is on a barrier island which contains a well-developed beach and an extensive saltwater marsh on the landward side with the latter comprising about two-thirds of the unit. The salt marsh is pristine. Highway AIA extends the length of the unit and a recent residential development occupies the high area near the center of the unit. Unit P04A faces the Atlantic Ocean and the Tolomato River to the west. The barrier continues to the north and south beyond the designated CBRS unit.

P05-Conch Island (St. Johns): This unit is a fairly recently formed barrier which is attached to the south to Anastasia Island. It has an extensive beach and a narrow fringe of salt marsh on the landward side. The island does experience significant human impact in the form of large spoil piles on the northwest portion as the result of dredging of St. Augustine Inlet which forms the unit's northern border. This occurred several years ago. Currently there is heavy recreational use of the beach

P05A-Matanzas River (St. Johns): This unit consists of about two miles of barrier beginning 0.5 miles south of Matanzas Inlet and continuing south to Marineland. There is a narrow, apparently erosional beach with no residential development. The wetlands in the unit consist of about 30 percent salt marsh and 70 percent mangrove swamp. A highway follows the coast and more or less bisects the wetland. The unit is flanked by development to the north (Summer Haven) and the south (Marineland).

P07-Ormond-By-The-Sea (Volusia): This unit includes 3 miles of barrier beginning about 0.5 miles south of Flagler Beach State Park. There is a well developed beach and dune ridge complex with salt marsh on the landward side. Highway AIA extends throughout the length of the unit. There is evidence of planned development but actual residences are few in number and scattered. The salt marsh has been altered by mosquito control ditches, probably in the mid-1960's. The unit fronts the Atlantic Ocean and is bounded on the landward side by the Intracoastal Waterway (ICW). There is dense residential development at both the north and south ends of the unit.

P08-Ponce de Leon Inlet (Volusia): This unit is mostly barrier beach and associated sand flats and shoals. There is essentially no vegetated wetland. Jetties are present on both sides of the inlet and the only permanent buildings are those of the U.S. Coast Guard station. There is evidence of vehicle trails throughout the unit. The residential development increases greatly to both the north and the south of the unit.

P09A-Coconut Point (Indian River): This unit consists of 2 miles of barrier with a fairly well-developed beach and dune ridge. Highway AIA traverses the unit and there is sparse residential development. The habitat appears to be essentially unaltered. The unit is bounded by the Atlantic Ocean on the east and the Indian River on the west. Extensive and dense development lies to the north and south.

P10-Vero Beach (Indian River): This unit is comprised of 1.6 miles of barrier beginning 2 miles south of Sebastian Inlet. It has a moderately broad beach with mangrove swamp on the landward side of the island. Highway A1A extends the length of the unit. The only apparent alteration of the habitat other than the highway is the presence of mosquito control ditches throughout the southern half of the mangrove swamp. To the south of the unit there is citrus agriculture and sparse residential development.

P10A-Blue Hole (Indian River): This unit consists of 4 miles of barrier with one section of 0.5 miles excluded. There is a fairly well developed beach and dune ridge complex and extensive wetland on the landward side of the island. The coast highway (A1A) traverses the unit and there is some sparse residential development. The wetland is comprised of about 80 percent salt marsh and 20 percent mangrove swamp. About two-thirds of the wetland has mosquito control ditches. The barrier is bounded by extensive development to the north and south.

P11-Hutchinson Island (St. Lucie): This extensive and well-studied unit consists of 10.5 miles of barrier island with three excluded parcels totalling 1.7 miles. The largest of these excluded parcels contains the Hutchinson Island nuclear power station. Approximately 85-90 percent of the unit is mangrove swamp with the remainder being mostly beach and dune. There is a 1.5 miles reach of the island where wetlands are absent. The coast highway and an unpaved trail parallel the coast and there is extensive mosquito control ditching. The island continues to the north and south of the unit with extensive and dense residential development.

P12-Hobe Sound (Martin): This unit consists of about one mile of beach and dune on Jupiter Island. The landward boundary is quite irregular due to development. There are no wetlands included within the unit and it is accessible by road from the south only. There is adjacent mangrove wetland which is ditched and contains some spoil piles adjacent to the ICW. Residential density on the island decreases northward toward St. Lucie Inlet and increases southward where the island is accessible by automobile.

P14A-North Beach (Broward): This unit is comprised of two parcels, each less than 0.5 in miles length and separated by about 0.25 miles. The coast highway traverses the unit and the south parcel is connected to the mainland via a four-lane causeway. There is a moderately wide beach but no wetland. There are a few buildings on the south parcel. The adjacent coastal lagoon is densely developed both to the north (Dania) and to the south (Hollywood).

P15-Cape Romano (Collier): This large unit includes a barrier island complex which is subdivided by bays and tidal channels into Cape Romano Island, Kice Island, Morgan Beach and several unnamed mangrove keys. It is not accessible by land. The entire unit is pristine except for a dredged canal that cut Cape Romano Island but has been closed off, apparently by natural processes. Beaches are well developed but dunes are lacking. Widespread mangrove swamps are also present. The area fronts the Gulf of Mexico on the south and west. It is separated from the mainland by a complex of mangrove islands, tidal channels and open bays. The community of Marco Island is to the north.

P16-Keewaydin Island (Collier): This unit consists of 8 miles of barrier located between Gordon Pass and Big Marco Pass. Numerous mangrove islands and tidal channels separate the island from the mainland. Approximately half of the unit is beach/dune and the other half is mangrove swamp. The unit is pristine except for some spoil piles adjacent to the ICW and a few cottages and related trails on the southern portion of the island. The unit is bounded by the communities of Marco Island to the south and Naples to the north with the Gulf to the west and extensive wetlands to the landward.

P17-Lovers Key Complex (Lee): This unit consists of two parcels, both of which are barrier islands; Lovers Key, which is one mile north of New Pass and Big Hickory Island, which is just south of New Pass. Lovers Key is entirely beach and dune. It is undisturbed and inaccessible by vehicle from the mainland. Big Hickory Island is dominantly mangrove swamp with a fringe of sand beach. A highway extends the entire length of the island. Both islands face the Gulf and are separated from the mainland by mangrove islands and open water. Estero Island to the north and Bonita Beach to the south are fairly heavily developed.

P17A-Bodwitch Point (Lee): This is a very small parcel just in excess of the quarter-mile minimum. It occupies the northwestern tip of Estero Island and is a sand spit beach with some vegetation on the higher ground. The unit is free of residential development but it is accessible by vehicle for recreational use. It is adjacent to and northwest of Ft. Myers Beach but surrounded on the other three sides by water.

P18-Sanibel Island (Lee): This unit is very small and is adjacent to Wulfert Channel and Blind Pass between Sanibel and Captiva Islands. It includes a narrow strip of barrier beach on Captiva Island, several small mangrove islands, and a portion of Sanibel Island.

The habitat is fairly pristine but is heavily used for sport fishing and recreation. A highway and bridge over Blind Pass traverse the unit. Extensive development is present immediately to the south and north of the unit.

P19-North Captiva Island (Lee): This unit consists of three parcels which extend from Foster Point to the southern tip of the island at Redfish Pass. The northern parcel includes part of Foster Point, the middle one is adjacent to Foster Bay and the southern one includes the South Banks. Each of the parcels includes beach, dune and mangrove environments. Although there are a few buildings present, human impact appears minimal. Beach and dune environments are best developed in the south parcel and mangrove swamps are most extensive in the north and middle parcels. North of the unit is a residential development which is accessible by boat or air only.

P20-Cayo Costa Island (Lee): This unit consists of six parcels on Cayo Costa Island, a well-developed drumstick-shaped barrier island. The largest parcel includes most of the central 2.5 miles of the island with four small excluded parcels. The other five parcels are small areas on the southern end of the island. The island is not accessible from the mainland by vehicle. The unit contains well-developed beach, dune and mangrove swamp environments which are undisturbed except for a few scattered cottages. The unit is bounded to the north, by an area of scattered cottages and trails.

P21-Bocilla Island (Charlotte): This unit consists of three parcels totalling 3.6 miles along the barrier island coast. The north parcel is immediately south of Stump Pass at the northern end of Don Pedro Island. The middle parcel is at the southern end of Don Pedro Island and the south parcel is one mile north of Gasparilla Pass on Little Gasparilla Island. The entire unit contains well-developed beach, dune and mangrove swamp environments. There are numerous spoil piles along the mangroves and scattered cottages, trails and boat docks are present within the unit. Intervening tracts contain more extensive human development. All parcels face the Gulf to the west.

P21A-Manasota Key (Sarasota): This unit includes three barrier island parcels on Manasota Key totalling 0.75 miles in length. There is a well developed beach and a narrow fringe of mangrove swamp on each parcel. The habitat appears little disturbed. The parcels front the Gulf on the west and Lemon Bay or the ICW on the east. All intervening tracts contain a relatively high number of dwellings and trails.

P22-Casey Key (Sarasota): This unit consists of one mile of barrier island and mangrove islands adjacent to Midnight Pass. It includes Bird Keys and a portion of Casey Key and Siesta Key. There is a well-developed beach with some Australian pines. Midnight Pass has been closed since late 1983. Large spoil piles are present on the landward side of Bird Keys due to dredging of the ICW. Bird Keys are old tidal deltas of Midnight Pass. Several dwellings are within the unit on Siesta Key. The unit faces the Gulf to the west and Little Sarasota Bay to the east. Density of development increases markedly to the north and south on Siesta and Casey Keys respectively.

P23-Longboat Key (Manatee): This unit includes a small portion of the northern tip of Longboat Key, a barrier island and all of Jewfish Key, a mangrove covered flood tidal delta landward of Longboat Key. That portion of the unit on Longboat Key has a well-developed beach with a fringe of salt marsh. It contains several dwellings and has dense development to the south. Jewfish Key contains undisturbed mangrove wetland. Jewfish Key is surrounded by water and receives no open water waves.

P24-The Reefs (Pinellas): This unit consists of a group of mangrove keys and an emergent barrier located between Bunces Pass on the south and Pass-A-Grille to the north. This unit is accessible by water only. The emergent barrier which first became supratidal in 1961 is completely pristine and contains well-developed beach and dune environments. The mangrove islands are only disturbed by a few widely scattered and rarely used fishing shacks.

P24A-Mandalay Point (Pinellas): This unit is nearly one mile in length and consists of a recently formed sand spit complex at the north end of Clearwater Beach Island. It consists of completely pristine beach and dune environments with some washover aprons. The unit faces the Gulf on the west, Clearwater Harbor on the east and Dunedin Pass on the north. To the south is extensive residential development.

P25-Atsena Otie Key (Levy): This unit includes all of Atsena Otie Key, the southeastern island of the Cedar Keys. The island is fringed with a narrow beach and contains scattered patches of salt marsh and open water. This island is undoubtedly rock-cored and is not a typical barrier island. It is totally pristine and is accessible by water only. The community of Cedar Key is one mile to the north. To the south and west are other keys which are part of a National Wildlife Refuge. Some distance to the east is the drowned karst coast of Florida.

P26-Pepperfish Keys (Dixie): This unit is comprised of a group of three small, low-lying, salt marsh islands located one half mile south of Halfway Point. The islands are pristine and have essentially no beach development. The largest of the three is about one mile long. The islands are surrounded by water and are adjacent to the salt marsh coast of Dixie County.

P27A-Ochlockonee Complex (Franklin and Wakulla): The unit consists of two parcels on either side of the mouth of the Ochlockonee River at the eastern end of Mashes and St. James Islands (Ochlockonee and Bald Points respectively). The Ochlockonee Point parcel is primarily salt marsh with much evidence of human impact in the form of dredged canals and roads for residential development. The Bald Point parcel is less affected. It contains some beach and dune development and is accessible by unpaved trail only. The unit lies west of Appalachicola Bay and east of the mainland which has extensive salt marsh and tidal creeks.

P28-Dog Island (Franklin): This unit contains seven parcels which total about half of the area of Dog Island, a seven mile long barrier off the coast of the mouth of the Carrabelle River. Although the island is not accessible by road, there is a ferry service and an airstrip. Modest development is scattered throughout the island. There are excellent beaches and dunes with salt marsh wetlands landward. The human impact within the unit itself has been minimal. The island is bounded on the southeast by the Gulf and on the landward side by St. George Sound.

P30-Cape San Blas (Gulf): This large unit includes 12 miles of Cape San Blas and St. Joseph Island to the northwest. The island is primarily beach and dune with discontinuous salt marsh on the landward side. Although the unit is accessible by road and is adjacent to a state park, there is little evidence of human impact on habitat quality. There are a few scattered cottages.

P31-St. Andrew Complex (Bay): This is the largest unit in Florida, consisting of 22 miles of barrier coastline in two parcels. The largest parcel is 20 miles in length and includes Crooked Island, St. Andrew Sound, the southern two-thirds of Shell Island and the mainland coastline adjacent. The second parcel includes two miles of Shell Island adjacent to St. Andrews State Park. The unit contains well-developed beach and dune complexes on both the present barriers and the mainland. Some scattered salt marsh is present on the landward side of the barrier. The unit is uninhabited and undisturbed with the exception of a small development on Raffield Peninsula. Adjacent Shell Island is fairly developed.

P31A-Four Mile Village (Walton): This unit includes 3.5 miles of the seaward side of a barrier peninsula (Moreno Point) in front of Choctawhatchee Bay. It is a beach, dune ridge and wooded environment about 1-1.5 miles wide. There are several small freshwater lakes and freshwater march landward of the dunes. The beach/dune complex is well-developed. Although the unit is accessible by trails, there is no visible development or human impact. Adjacent land areas have scattered residential development.

P32-Moreno Point (Walton and Okaloosa): Four miles of Moreno Point, a peninsula seaward of Choctawhatchee Bay, are included in this unit. It contains beach, dune and woods with some small ponds, freshwater marsh and salt marsh. A road corridor and three residentially developed tracts are excluded from the unit. A highway (US 98) traverses the unit and numerous trails are present but human impacts are minimal. Adjacent land areas have scattered residential development.

Coastal Resource Management

In 1967, the Florida Legislature turned its attention to the general topic of resource management. The first of many legislative bills aimed specifically at coastal management was the creation of the Coastal Coordinating Council in 1970. For a five-year period, this body, comprised of representatives from a wide range of local governments, developers and interest groups, worked towards developing a coordinated coastal resource management program (State of Florida, 1981). The Council was abolished by the Legislature in 1975 and its duties transferred to the Department of Natural Resources (DNR). In 1977, the Legislature transferred the program to the Department of Environmental Regulation (DER).

In 1978, the Legislature passed the Florida Coastal Management Act. This act did not include new regulations but simply called for better coordination and enforcement of existing ones. The Governor designated 1980 as "The Year of the Coast" in Florida, and created the Interagency Management Committee in October 1979. This committee consists of the managers of many State agencies and is responsible for coordinating efforts in the State's coastal management programs. The emphasis in Florida is on refinement and better coordination of existing regulations, not on establishing new ones (State of Florida, 1981). It took three years for the State to develop a coastal management program that was consistent with both the 1978 Florida Coastal Management Act and the Federal Coastal Zone Management Act of 1972 (Bernd-Cohen, 1983). After extensive public hearings and interaction with the Federal Office of Coastal Zone Management, the Final Environment Impact Statement was issued in August 1981.

Coastal Management Program

The Florida (CMP) is based on 25 statutes which are administered by 16 state agencies. However, the bulk of the activities rest within three of these agencies: the Department of Environmental Regulation (DER), the Department of Natural Resources (DNR), and the Department of Community Affairs (DCA). The latter contains the Office of Federal Coastal Programs.

The Florida CMP solicits input from the state's five water management districts and eleven regional planning councils. Eligibility for funds through the CMP is limited to 35 coastal counties and 162 coastal municipalities (Bernd-Cohen, 1983).

Florida is one of several coastal states to attempt to regulate new construction on and immediately adjacent to beaches and dunes. The Coastal Construction Setback Line (SBL) was formulated and adopted in 1974 (Purpura and Sensabaugh, 1974). This line establishes a boundary from of which no construction or excavation is allowed without a permit from the state. The SBL is established on a county basis in only those counties where beaches are well developed and widespread. There are numerous exceptions granted and in general, the Florida SBL is considered by some to be much too lax (Kennedy, 1983).

Recently, a modification of the SBL called the Coastal Construction Control Line (CCCL) has been developed using new field data and the experience of the SBL. As of this time it has been completed for only a few counties. In any instances of construction seaward of the SBL or the new CCCL, permits must be obtained from both the DER and the DNR.

Executive Order 81-105

On September 4, 1981, the Governor Graham signed Executive Order 81-105 which directed executive agencies 1) to give high priority to acquisition of coastal barrier properties, 2) to limit development subsidies in hazardous coastal barrier areas, and 3) to cooperate with local governments in managing growth in these coastal barrier areas. The second of these points has become controversial.

The primary emphasis of the order is to reduce state expenditures for infrastructure that is highly susceptible to damage and to prevent further subsidy on hazardous coastal barrier areas. The order was to limit such expenditures as of the date of issue. The controversy surfaced as the result of questions about support of a pending bridge to Hutchinson Island (CBRS Unit P11). An issue paper was presented at a public meeting in Tallahassee on October 10, 1983, which alluded to several points of concern which focused on the limitation of state subsidy for development of coastal barriers. The Interagency Management Committee (IMC) elected to implement the order without amendment. The order is being implemented by individual state agencies only to the extent that their current statutory authority permits. In addition, the IMC through the DCA would prepare a set of maps reflecting the Executive Order and the DCA will develop special guidelines that will apply to post-disaster situations.

Implementation of the order will be based on the set of maps prepared by the DCA and then, using these as guidelines, each agency will modify their program funding to the degree legally possible for compliance with the intent of EO 81-105. For purposes of implementation, all coastal barriers will be considered in two categories: 1) those traditionally called barrier islands, spits or peninsulas, and 2) those which are exposed mainland beaches, marshes or mangrove swamps with no other barriers seaward of them. This second group is affected landward only as far as the velocity zone on national flood insurance maps or the Coastal Construction Control Line, whichever is further inland.

The degree of development includes three sub-categories. Undeveloped barriers are those islands, spits and peninsulas which are limited to watercraft or aircraft access, have sparse settlement and have no publicly subsidized infrastructure. Also, all CBRS units are treated as undeveloped for purposes of this Order. Mainland coastal barrier areas are considered to be undeveloped if they are not within corporate limits or are in a delimited urban area. Developed barrier areas are islands, spits and peninsulas with at least 70 percent of their surface area developed as of the DCA inventory of 1983. Also included are appropriate mainland areas within corporate limits. All coastal barrier areas not classified in either of these groups are considered in the partially developed category.

State subsidies will be restricted to the greatest extent possible under existing authority for all undeveloped barriers. There will also be restrictions on subsidies for partially developed barriers. Exceptions may be granted if proper management is indicated and safe accommodation can be made. The agency head whose department administers the funding will have the power of granting these exceptions. The order will apply to developed barriers only in post-disaster situations.

A draft rule for implementation has been formulated by the Department of Community Affairs under authority of Chapter 252. 35 of the Florida Statutes which delegates responsibility for emergency preparedness functions. The rule is designed to provide state agencies with a common, readily interpretable and functional basis for reviewing and making decisions concerning policy regarding coastal barriers. This draft rule addresses the delineation of maps and interpretations of the level of development.

A barrier island bill (H.B. 1318) was proposed in the 1983 legislative session and although it was considered and passed by the several House committees, the bill was formulated for the 1984 session but was not enacted. Several coastal barriers provisions are being considered for the 1985 session.

Taxes - Presently there are no state taxation policies which support or encourage development in Florida. There are some state taxation incentives which encourage non-development of barrier properties. The best example is the conservation easement (704.06 F.S./193.50 F.S.) which allows a property owner to surrender development rights for a 10-year period. It is renewable at the option of the property owner. During this time no property taxes are levied on the land and it is categorized as a nature preserve. Because of the potential loss of large amounts of revenue, this is not a widely used program.

Permitting - There are numerous State permitting regulations which would apply to CBRS units and which discourage development or at least would keep it in compliance with the State's coastal management program. These permitting regulations are administered by several agencies, including the Department of Natural Resources (Division of Beaches and Shores), the Department of Environmental Regulation, the Department of Community Affairs and the Department of Health and Rehabilitation Services. Unfortunately, there commonly is disagreement between the concerned agencies over specific projects where multiple agencies are involved.

Probably the most visible permitting situation is associated with the coastal construction setback line (SBL) (Purpura and Sensabaugh, 1974) which is currently evolving into the coastal construction control line (CCCL). This is administered by the Division of Beaches and Shores (DNR). As the new CCCL has only been formulated and adopted for a few counties at this time, other counties are still under the SBL, which is more lax in terms of permits for coastal development. There is currently an effort to extend the CCCL from the beaches to the inlet shores as well. This will be a significant addition and will affect several of the CBRS units.

Any development of regional impact (DRI) must be reviewed by regional planning councils and the Department of Community Affairs. The DER has permitting authority over any discharge of waste into surface or groundwater. Another activity requiring permits which may be of greater importance to barrier islands concerns water management. Both the DER and the individual water management districts have permitting authority for withdrawal, storage, diversion and consumption of water. Regulation of the taking of living resources from waters within CBRS units is under the DNR, Marine Fisheries Commission.

The DER also has jurisdiction over all permitting for dredge and fill activity in submerged lands and wetlands. In general, the jurisdiction over dredge and fill activities of the DER is coincident with that of the Corps of Engineers, although in some cases the DER is more stringent (State of Florida, 1981). In virtually all cases, the DER requires that a well-documented environmental impact study (EIS) accompany any application for a dredge and fill permit. Marinas and boat docks are also permitted through the DER.

Beach nourishment and erosion control projects can be undertaken through DNR in conjunction with local governments and the Federal Government (S.S. 161.141 through 161.45 F.S.). There are several ways in which such projects can be implemented. However, Florida's support of the CBRS and Executive Order 81-105 tend to discourage such activities at least in CBRS units.

Financial Assistance - There are presently numerous ways in which the State both supports development on barrier islands and also provides financial assistance that discourages development of barriers. The most direct support for barrier island development is through partial State funding of projects such as bridges and causeways to barriers and sewage treatment plants on barrier islands. Such projects are typically also funded by various federal programs. One study (Sharma 1981) has determined that public thoroughfares and utilities cost two to six times more on barriers than on the mainland. One could argue that public utilities, such as waste treatment, are in fact of value because they indirectly help to preserve and manage the environment. It should be noted, however, that without roads and bridges, it would not be necessary for the utilities to be constructed.

One of the most successful but also most expensive management tools is public acquisition. The State of Florida uses bonds, real estate taxes and legislated appropriations to fund acquisition. It has been shown that although very costly, purchase of a CBRS unit would be only about 20-25 percent of the cost of federal subsidies to develop the property (Miller, 1981). The State of Florida passed the Outdoor Recreation and Conservation Act of 1963 which established a Land Acquisition - Trust Fund administered by the Division of Recreation and Parks (DNR). This Act also provided for loans and grants to local governments for acquisition of public beach tracts (F.S. Chapter 375) (Bernd-Cohen, 1983). The State may also acquire property for parks through a State Park Trust (F.S. Chapter 592). Honeymoon Island in Pinellas County was recently purchased under this program and is now developed as a major coastal park on a property where initial development activities had taken place.

The State offers financial assistance to local governments for the development and implementation of coastal conservation programs. Included are the Erosion Control Assistance Program (DNR), the Coastal Management Program (DER), the Recreation Development Assistance Program (DNR), and the Save Our Coast Program (through bonds). In all of these, state funds are made available to local governments if certain stipulations are met. For example, assistance for beach nourishment at Venice and Manasota Key is being provided. Funds are also available to assist local governmental units in developing beach management plans.

In some instances, the State has provided seed money to assist communities in getting large projects funded. Some of these pertain directly to beach/barrier properties. For example, a planning grant to the City of Naples for $31,000 resulted in successful local funding for eight public parking and access areas. In Martin County, a $34,000 grant led to a successful $5 million bond issue to purchase beach access properties. Grants have also been provided to Sarasota and Collier counties to help implement their local coastal zone management plan.

Local Actions

Taxes - There appear to be no special taxation policies at the local level which benefit or promote development of barriers relative to any other locations.

The study found only Pinellas County, which is the most highly developed county on the west coast, includes taxation policies which support conservation of barriers. Lands which are designated as "Preservation" on the county land use plan (CULP) may remain in private ownership or may be donated to the county. If they remain private, some type of deed restriction or easement is typically applied to specific sensitive areas. These lands are taxed at the lowest rate by the County Property Appraiser. Pinellas County passed a referendum in 1977 to establish a 0.25 mill tax to set up a fund for purchase of environmentally sensitive land. This was for a 2-year period.

Permitting/Zoning - There are numerous local ordinances that tend to conserve barrier island and related coastal zone properties. Tree ordinances are widespread, ranging from protection of mangroves to prohibition of cutting anything but punk trees or Brazilian pepper trees without a special permit.

Another widespread type of ordinance is the flood damage prevention ordinances (FDPO). These ordinances prohibit alteration of any physiographic or vegetative features which would result in increased potential flood hazard. This only applies to communities participating in the national flood insurance program, but the construction requirements of the local FDPO continue to apply in CBRS units even though federal flood insurance is no longer available.

Some counties have established construction requirements that are more strict than those of the State. For example, Martin County has a variety of special requirements that pertain to Hutchinson Island. Included are mean high water line (MHWL) setbacks from the estuary shore, additional setbacks from the CCCL, and minimum roadway and building elevations. Sarasota County does not permit structures closer than 20 feet to MHWL on the bay or estuary regardless of elevation (Ord. 75-38), and no building may be closer than 150 feet to MHWL on the Gulf of Mexico.

Sarasota County also has its own Water and Navigation Control Authority which regulates and controls all submerged and other sovereignty lands of the County. Any activities which affect on these lands must be approved through this body.

One county, Indian River, has modified an ordinance as the result of designation of CBRS units. That ordinance concerns stormwater management and flood protection (Ord. 82-28) but the specific modifications were not reported.

Financial Assistance - As reported in the section above, financial assistance from local government is available only for conservation of barriers, not for their development. The most direct method for local governments to protect barriers is by purchase of property for parks, etc. This is being done by Indian River County ($5,000,000), Martin County ($5,000,000), and Sarasota County (4 parcels), among others.

There is one plan that may be considered as indirectly supporting barrier development. Dunedin Pass in Pinellas County is currently being considered for dredging using local funding. This is directly on a CBRS unit (24A) and could encourage nearby development due to better access from both open and protected water if dredging is successful.

Private Sector Initiatives

There are numerous private organizations at all levels that are actively involved in conservation activities related to coastal barriers. Most visible among these are the national organizations of The Nature Conservancy and the Trust for Public Lands; the former has by far the greatest coastal presence. The Conservancy has purchased numerous tracts either to keep or for resale to the State. The Trust for Public Lands acts more as an intermediary rather than as a purchaser. They have not had much activity in barrier island properties.

Other national conservation organizations such as the National Wildlife Federation, the Audubon Society and the Sierra Club have also supported coastal conservation and serve as forceful lobbyists at both federal and state levels. A large number of local conservation groups operate in the State and many of these are very effective. In some cases, these groups have actually purchased tracts of coastal land. For example, the Moonshine Island Trust, an ad hoc group in Pinellas County, purchased an island and deeded it to the State with the restriction that it remain as a natural preserve. Such a purchase provides for maintenance of the tract in its present state and also gives the Trust members a tax advantage due to their purchase. The Lemon Bay Conservancy in Sarasota County (a local branch of The Nature Conservancy) provided seed money to develop a park at Blind Pass Park on Manasota Key (CBRS unit P21A). The Sarasota Sea Turtle Association is monitoring turtle nesting on the same parcel. The Pelican Island Audubon Society in Indian River County developed a nature center educational facility at Wabasso Island. The Florida Oceanographic Society, Inc., a private group in Martin County, provided the coastal zone management grant project for Hutchinson Island during January to September, 1982.

Some local groups act as "watchdogs" over development activities on barrier islands. Examples are the Vero Beach Civic Association which monitors development projects on the barrier and the Casey Key Protective Association which discourages construction or hardening of the shoreline seaward of the CCCL.

Although it is apparent that there is significant private sector involvement, especially at the local level, there is a great need for increasing these activities. Groups of various sizes and constituencies can pool their resources to directly purchase parcels and public access areas to beach or bay locations, or to fund development of recreational facilities. Funds could also be made available for supporting research on coastal processes, dune revegetation, habitat restoration, sea turtle nesting and endangered species on a site specific basis.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN FLORIDA

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-01	FORT CLINCH	NASSAU	3	ST. MARY'S FERNANDINA BEACH	2.44	55149	PROTECTED
FL-02	NASSAU RIVER	NASSAU DUVAL	3	MAYPORT FERNANDINA BEACH EASTPORT HEDGES AMELIA CITY	1.51	14547	PROTECTED
P-02	TALBOT ISLAND COMPLEX	DUVAL	3	AMELIA CITY MAYPORT	5.42	2076	ADDITION TO CBRS UNIT
FL-03	MICKLER LANDING	ST. JOHNS	4	MICKLER LANDINC SOUTH PONTE VEDRA BEACH	3.49	1087	MIXED
FL-04	TOLOMATO RIVER	ST. JOHNS	4	ST. AUGUSTINE SOUTH PONTE VEDRA BEACH	4.75	16903	MIXED
P-04A	USINAS	ST. JOHNS	4	ST. AUGUSTINE	N/A	N/A	NO CHANGE TO CBRS UNIT
P-05	CONCH ISLAND	ST. JOHNS	4	ST. AUGUSTINE ST. AUGUSTINE BEACH	1.59	1344	ADDITION TO CBRS UNIT
FL-05	BUTLER BEACH	ST. JOHNS	4	ST. AUGUSTINE BEACH	0.45	364	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
P-05A	MATANZAS RIVER	ST. JOHNS	4	MATANZAS INLET	0.97	3373	ADDITION TO CBRS UNIT
FL-06	WASHINGTON OAKS	FLAGLER	4	MATANZAS	0.67	1262	PROTECTED
P-07	ORMOND-BY-THE-SEA	VOLUSIA	4	FLAGLER BEACH ORMOND BEACH	0.53	8971	ADDITION TO CBRS UNIT
P-08	PONCE INLET	VOLUSIA	4	NEW SMYRNA BEACH	0.11	3523	ADDITION TO CBRS UNIT
FL-07	CANAVERAL	VOLUSIA BREVARD	4 11	NEW SMYRNA BEACH EDGEWATER ARIEL OAK HILL PARDON ISLAND MIMS WILSON TITUSVILLE ORSINO FALSE CAPE CAPE CANAVERAL COURTNEY	43.87	65020	MIXED
FL-08	BANANA RIVER	BREVARD	11	CAPE CANAVERAL COURTNEY COCOA COCOA BEACH EAU GALLIE TROPIC	0.11	26806	PROTECTED
FL-09	NEWFOUND HARBOR	BREVARD	11	COCOA BEACH	N/A	26	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-10	COCOA BEACH	BREVARD	11	COCOA BEACH	0.26	34	PROTECTED
FL-11	PELICAN BEACH	BREVARD	11	TROPIC	0.13	4	PROTECTED
FL-12	PARADISE BEACH	BREVARD	11	TROPIC	0.09	4	PROTECTED
FL-13	SPESSARD HOLLAND PARK	BREVARD	11	MELBOURNE EAST	0.79	169	PROTECTED
P-09A	COCONUT POINT	BREVARD	11	MELBOURNE EAST GRANT SEBASTIAN NW SEBASTIAN	1.26	15133	ADDITION TO CBRS UNIT
P-10	VERO BEACH	INDIAN RIVER	11	SEBASTIAN	N/A	4691	ADDITION TO CBRS UNIT
P-10A	BLUE HOLE	INDIAN RIVER ST. LUCIE	11 12	INDRIO RIOMAR FORT PIERCE	0.94	18972	ADDITION TO CBRS UNIT
FL-14	JAYCEE PARK	ST. LUCIE	12	FORT PIERCE	N/A	24	PROTECTED
P-11	HUTCHINSON ISLAND	ST. LUCIE MARTIN	12	FORT PIERCE EDEN ANKONA ST. LUCIE INLET	1.87	17545	ADDITION TO CBRS UNIT
P-12	HOBE SOUND	MARTIN	12	ST. LUCIE INLET GOMEZ HOBE SOUND	4.92	4538	ADDITION TO CBRS UNIT
FL-15	JUPITER SOUND	MARTIN	12	JUPITER	1.38	487	PROTECTED

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FL-10	COCOA BEACH	BREVARD	11	COCOA BEACH	0.26	34	PROTECTED
FL-11	PELICAN BEACH	BREVARD	11	TROPIC	0.13	4	PROTECTED
FL-12	PARADISE BEACH	BREVARD	11	TROPIC	0.09	4	PROTECTED
FL-13	SPESSARD HOLLAND PARK	BREVARD	11	MELBOURNE EAST	0.79	169	PROTECTED
P-09A	COCONUT POINT	BREVARD	11	MELBOURNE EAST GRANT SEBASTIAN NW SEBASTIAN	1.26	15133	ADDITION TO CBRS UNIT
P-10	VERO BEACH	INDIAN RIVER	11	SEBASTIAN	N/A	4691	ADDITION TO CBRS UNIT
P-10A	BLUE HOLE	INDIAN RIVER ST. LUCIE	11 12	INDRIO RIOMAR FORT PIERCE	0.94	18972	ADDITION TO CBRS UNIT
FL-14	JAYCEE PARK	ST. LUCIE	12	FORT PIERCE	N/A	24	PROTECTED
P-11	HUTCHINSON ISLAND	ST. LUCIE MARTIN	12	FORT PIERCE EDEN ANKONA ST. LUCIE INLET	1.87	17545	ADDITION TO CBRS UNIT
P-12	HOBE SOUND	MARTIN	12	ST. LUCIE INLET GOMEZ HOBE SOUND	4.92	4538	ADDITION TO CBRS UNIT
FL-15	JUPITER SOUND	MARTIN	12	JUPITER	1.38	487	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-16	DUBOIS PARK	PALM BEACH	12	JUPITER	0.32	49	PROTECTED
FL-17	CARLIN PARK	PALM BEACH	12	JUPITER	0.55	104	PROTECTED
FL-18	JUNO BEACH	PALM BEACH	12	JUPITER	0.17	18	PROTECTED
FL-19	PEGASUS	PALM BEACH	12	JUPITER	0.11	13	PROTECTED
FL-20	MACARTHUR BEACH	PALM BEACH	12	RIVIERA BEACH	1.60	810	PROTECTED
FL-21	PALM BEACH SHORES	PALM BEACH	12	RIVIERA BEACH	0.18	19	PROTECTED
FL-22	PEANUT ISLAND	PALM BEACH	12	RIVIERA BEACH	1.35	82	UNPROTECTED
FL-23	MAR-A-LAGO	PALM BEACH	12	PALM BEACH	0.07	13	PROTECTED
FL-24	KREUSLER PARK	PALM BEACH	12	LAKE WORTH	0.08	3	PROTECTED
FL-25	BOYNTON INLET	PALM BEACH	12	LAKE WORTH	0.08	9	PROTECTED
FL-26	OAK RIDGE HAMMOCK	PALM BEACH	12	LAKE WORTH	0.20	10	PROTECTED
FL-27	GULF STREAM	PALM BEACH	12	DELRAY BEACH	0.33	15	PROTECTED
FL-28	BOCA RATON	PALM BEACH	12	BOCA RATON	0.16	106	PROTECTED
FL-29	HILLSBORO INLET	BROWARD	16	BOCA RATON	0.59	17	UNPROTECTED
FL-30	HUGH TAYLOR BIRCH	BROWARD	16	POMPANO BEACH	0.43	180	PROTECTED
FL-31	DANIA SOUND	BROWARD	16	PORT EVERGLADES	2.72	789	MIXED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
P-14A	NORTH BEACH	BROWARD	16	PORT EVERGLADES	N/A	509	ADDITION TO CBRS UNIT
FL-32	HAULOVER BEACH	DADE	19	NORTH MIAMI	1.04	3119	PROTECTED
FL-33	MIAMI BEACH PARKS	DADE	19	MIAMI	1.39	79	PROTECTED
FL-34	BISCAYNE	DADE	19	KEY BISCAYNE SOLDIER KEY PERRINE ARSENICKER KEYS ELLIOT KEY PACIFIC REEF CARD SOUND MIAMI SOUTH MIAMI	11.06	136141	PROTECTED
FL-35	KEY LARGO	MONROE	19	ROCK HARBOR GARDEN COVE BLACKWATER SOUND CARD SOUND PACIFIC REEF	18.21	43318	PROTECTED
FL-36	EVERGLADES	MONROE	19	ALL OF EVERGLADES NATIONAL PARK ALL QUADS NOT SHOWN	169.17	1398800	PROTECTED
FL-37	RODRIGUEZ KEY	MONROE	19	ROCK HARBOR	3.73	1144	PRIVATE
FL-38	LONG POINT	MONROE	19	ROCK HARBOR TAVERNIER	3.42	1062	PRIVATE
FL-39	TAVERNIER KEY	MONROE	19	PLANTATION KEY TAVERNIER	1.64	1993	PRIVATE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-40	PLANTATION KEY	MONROE	19	PLANTATION KEY	2.27	4072	PRIVATE
FL-41	LIGNUMVITAE KEY	MONROE	19	UPPER MATECUMBE KEY	2.13	7653	PROTECTED
FL-42	LONG KEY	MONROE	19	LONG KEY	4.11	7395	MIXED
FL-43	CHANNEL KEY	MONROE	19	GRASSY KEY	0.55	1169	PRIVATE
FL-44	TOMS HARBOR KEYS	MONROE	19	GRASSY KEY	1.16	1498	PRIVATE
FL-45	CRAWL KEY COMPLEX	MONROE	19	GRASSY KEY	0.69	3312	PRIVATE
FL-46	BOOT KEY	MONROE	19	MARATHON	2.23	1003	MIXED
FL-47	GREAT WHITE HERON	MONROE	19	EAST BAHIA HONDA KEY SEVENMILE BRIDGE HORSESHOE KEYS BIG PINE KEY CONTENT KEYS SAWYER KEY SUGARLOAF KEY SNIPE KEYS BOCA CHICA KEY BAY KEYS KEY WEST	36.75	159135	PROTECTED
FL-48	KEY DEER	MONROE	19	SUMMERLAND KEY SUGARLOAF KEY HORSESHOE KEYS BIG PINE KEY CONTENT KEYS SAWYER KEY	13.06	66795	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	(in acres)	Status
FL-49	BAHIA HONDA	MONROE	19	BIG PINE KEY SEVENMILE BRIDGE	4.37	8345	PROTECTED
FL-50	COUPON BIGHT	MONROE	19	BIG PINE KEY SUMMERLAND KEY	8.76	7010	MIXED
FL-51	BIG PINE KEY	MONROE	19	BIG PINE KEY SUMMERLAND KEY	2.62	3203	PRIVATE
FL-52	RAMROD KEY	MONROE	19	SUMMERLAND KEY	6.74	876	PRIVATE
FL-53	CUDJOE KEY	MONROE	19	SUMMERLAND KEY SUGARLOAF KEY	0.29	1030	PRIVATE
FL-54	SUGARLOAF KEY	MONROE	19	SADDLEBUNCH KEYS SUGARLOAF KEY	3.25	13646	UNPROTECTED
FL-55	SADDLEBUNCH KEYS	MONROE	19	SADDLEBUNCH KEYS SUGARLOAF KEY SNIPE KEYS BOCA CHICA KEY	6.47	9292	PRIVATE
FL-56	BOCA CHICA KEY	MONROE	19	BOCA CHICA KEY	4.27	5156	UNPROTECTED
FL-57	COW KEY	MONROE	19	BOCA CHICA KEY	0.47	96	PRIVATE
FL-58	ROOSEVELT BOULEVARD PARKS	MONROE	19	KEY WEST	0.93	170	MIXED
FL-59	FORT TAYLOR	MONROE	19	KEY WEST	1.12	72	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-60	KEY WEST	MONROE	19	KEY WEST BAY KEYS COTTRELL KEY MARQUESAS KEYS EAST MARQUESAS KEYS WEST	7.03	210200	MIXED
FL-61	TORTUGAS	MONROE	19	DRY TORTUGAS	0.13	52199	PROTECTED
FL-62	TEN THOUSAND ISLANDS	COLLIER	12	EVERGLADES CITY PANTHER KEY CAPE ROMANO MARCO ISLAND WEAVERS STATION ROYAL PALM HAMMOCK	25.28	42428	PROTECTED
P-15	CAPE ROMANO	COLLIER	12	CAPE ROMANO MARCO ISLAND	0.47	5660	ADDITION TO CBRS UNIT
FL-63	BIG MARCO PASS	COLLIER	12	MARCO ISLAND	2.16	623	PRIVATE
P-16	KEEWAYDIN ISLAND	COLLIER	12	BELLE MEADE MARCO ISLAND NAPLES SOUTH	N/A	15577	ADDITION TO CBRS UNIT
FL-64	PELICAN BAY	COLLIER	12	NAPLES NORTH BONITA SPRINGS	2.99	721	MIXED
FL-65	WIGGINS PASS	COLLIER	12	BONITA SPRINGS	2.90	1554	MIXED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
P-17	LOVERS KEY COMPLEX	LEE	13	BONITA SPRINGS ESTERO FORT MYERS BEACH	0.76	3767	ADDITION TO CBRS UNIT
FL-66	ESTERO BAY	LEE	13	ESTERO FORT MYERS BEACH	0.17	7988	PROTECTED
P-17A	BODWITCH POINT	LEE	13	FORT MYERS BEACH	N/A	N/A	NO CHANGE TO CBRS UNIT
FL-67	BUNCH BEACH	LEE	13	SANIBEL FORT MYERS BEACH PINE ISLAND CENTER	3.85	2277	PRIVATE
FL-68	MATLACHA PASS	LEE	13	SANIBEL MATLACHA PINE ISLAND CENTER	2.37	32319	PROTECTED
FL-69	PINE ISLAND SOUND	LEE	13	SANIBEL CAPTIVA PINE ISLAND CENTER BOKEELIA WULFERT	N/A	53279	PROTECTED
P-18	SANIBEL ISLAND COMPLEX	LEE	13	WULFERT CAPTIVA SANIBEL	3.60	11434	ADDITION TO CBRS UNIT
P-19	NORTH CAPTIVA ISLAND	LEE	13	CAPTIVA	1.52	419	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
P-20	CAYO COSTA	LEE	13	CAPTIVA BOKEELIA PORT BOCA GRANDE	4.75	1437	ADDITION TO CBRS UNIT
FL-70	CHARLOTTE HARBOR	LEE	13	PORT BOCA GRANDE	0.41	27	PROTECTED
FL-71	GASPARILLA SOUND	LEE CHARLOTTE	13	PUNTA GORDA SW PLACIDA	11.44	13629	PROTECTED
P-21	BOCILLA ISLAND	CHARLOTTE	13	PLACIDA ENGLEWOOD	1.14	1629	ADDITION TO CBRS UNIT
FL-72	PUNTA GORDA	CHARLOTTE	13	ENGLEWOOD	0.20	7	PROTECTED
P-21A	MANASOTA KEY	SARASOTA	13	ENGLEWOOD NW VENICE	N/A	84	ADDITION TO CBRS UNIT
FL-73	VENICE AIRPORT	SARASOTA	13	VENICE	0.26	11	UNPROTECTED
FL-74	VENICE INLET	SARASOTA	13	VENICE	0.17	101	PROTECTED
P-22	CASEY KEY	SARASOTA	13	BIRD KEYS	N/A	224	ADDITION TO CBRS UNIT
FL-75	LIDO KEY	SARASOTA	13	SARASOTA	1.86	204	PROTECTED
FL-76	WHITE KEY COMPLEX	MANATEE	10	BRADENTON BEACH	N/A	358	PROTECTED
P-23	LONGBOAT KEY	MANATEE	10	BRADENTON BEACH	0.93	1701	ADDITION TO CBRS UNIT

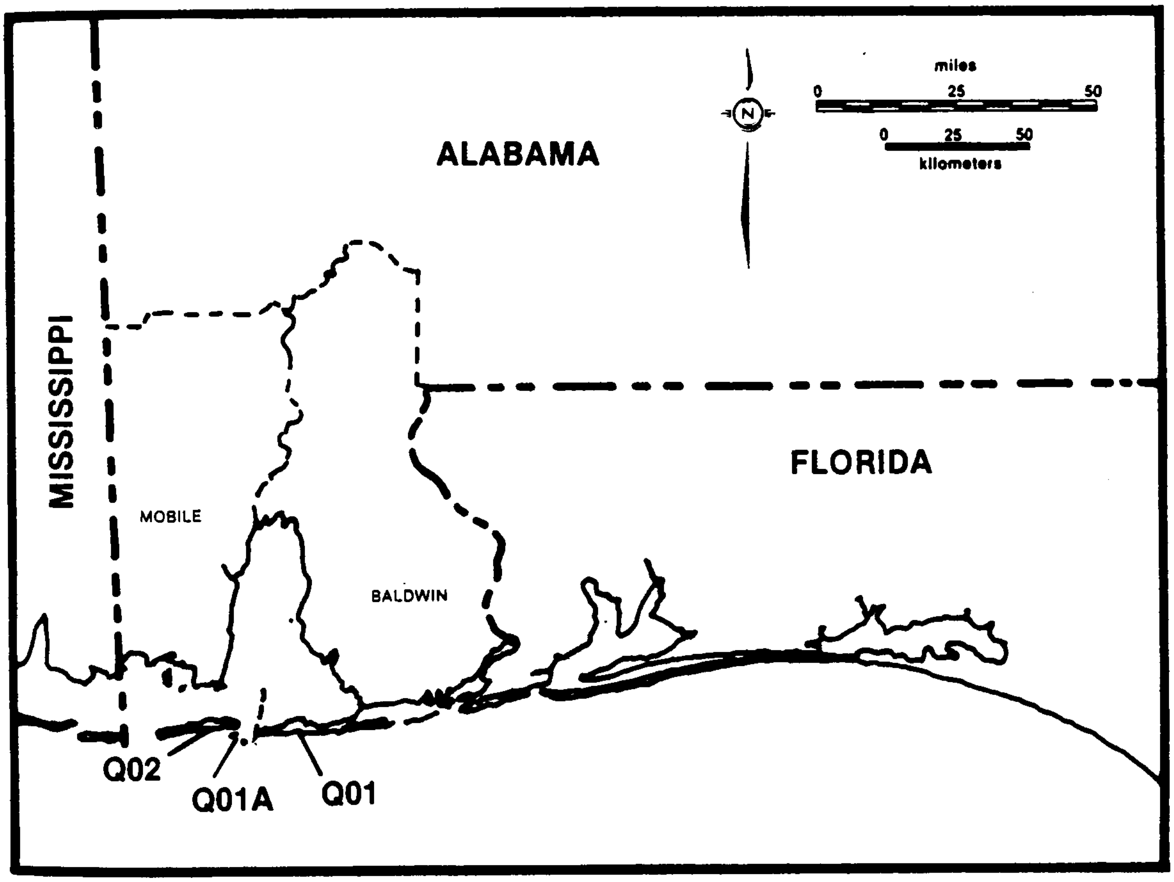
ID Code	Unit Name	County Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-77	MANATEE BEACH	MANATEE	10	BRADENTON BEACH	0.24	4	PROTECTED
FL-78	RATTLESNAKE KEY	MANATEE	10	PALMETTO ANNA MARIA	2.57	3385	PRIVATE
FL-79	ANNA MARIA KEY	MANATEE	10	ANNA MARIA	0.50	5	PROTECTED
FL-80	PASSAGE KEY	MANATEE	10	ANNA MARIA	2.25	349	PROTECTED
P-24	THE REEFS	PINELLAS HILLSBOROUGH	7	PASS-A-GRILLE BEACH ANNA MARIA	0.25	7619	ADDITION TO CBRS UNIT
FL-81	EGMONT KEY	HILLSBOROUGH	7	EGMONT KEY	4.12	770	PROTECTED
FL-82	BISHOP HARBOR	HILLSBOROUGH	7	PALMETTO COCKROACH BAY	4.85	2015	PRIVATE
FL-83	COCKROACH BAY	HILLSBOROUGH MANATEE	7 10	RUSKIN COCKROACH BAY	5.51	4018	PROTECTED
FL-84	TREASURE ISLAND	PINELLAS	9	SEMINOLE	0.78	285	PROTECTED
FL-85	SAND KEY	PINELLAS	9	CLEARWATER	0.44	403	PROTECTED
P-24A	MANDALAY POINT	PINELLAS	9	DUNEDIN	2.41	3592	ADDITION TO CBRS UNIT
FL-86	HONEYMOON ISLAND	PINELLAS	9	DUNEDIN	4.47	5592	MIXED
FL-87	HOWARD PARK	PINELLAS	9	TARPON SPRINGS	0.24	214	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-88	ANCLOTE KEY	PINELLAS PASCO	9	TARPON SPRINGS	3.58	3040	PROTECTED
P-25	ATSENA OTIE KEY	LEVY	2	SEA HORSE KEY SUMNER CEDAR KEY	16.36	8736	ADDITION TO CBRS UNIT
P-26	PEPPERFISH KEYS	DIXIE	2	HORSESHOE BEACH STEINHATCHEE SW	N/A	N/A	NO CHANGE TO CBRS UNIT
P-27A	OCHLOCKONEE COMPLEX	FRANKLIN WAKULLA	2	SPRING CREEK LIGHTHOUSE POINT	3.86	4186	ADDITION TO CBRS UNIT
FL-89	ALLIGATOR HARBOR	FRANKLIN	2	LIGHTHOUSE POINT ST. TERESA MCINTYRE	5.90	7541	PROTECTED
P-28	DOG ISLAND	FRANKLIN	2	DOG ISLAND CARRABELLE	3.51	12066	ADDITION TO CBRS UNIT
FL-90	ST. GEORGE ISLAND	FRANKLIN	2	CARRABELLE SUGAR HILL GOOSE ISLAND BEVERLY GREEN POINT APALACHICOLA JACKSON RIVER NEW INLET CAPE ST. GEORGE WEST PASS	1.95	114378	MIXED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-91	ST. VINCENT	FRANKLIN	2	WEST PASS INDIAN PASS	11.89	12880	PROTECTED
FL-92	INDIAN PENINSULA	GULF	2	CAPE SAN BLAS INDIAN PASS	2.80	1327	UNPROTECTED
P-30	CAPE SAN BLAS	GULF	2	CAPE SAN BLAS PORT ST. JOE ST. JOSEPH PENINSULA ST. JOSEPH POINT	9.00	35086	ADDITION TO CBRS UNIT
P-31	ST. ANDREW COMPLEX	BAY	1	BEACON HILL CROOKED ISLAND LONG POINT BEACON BEACH PANAMA CITY	2.44	3155	ADDITION TO CBRS UNIT
FL-93	PHILIPS INLET	BAY	1	SEMINOLE HILLS	0.57	234	MIXED
FL-94	DEER LAKE COMPLEX	WALTON	1	POINT WASHINGTON	2.32	330	PRIVATE
FL-95	GRAYTON BEACH	WALTON	1	GRAYTON BEACH	2.00	445	MIXED
FL-96	DRAPER LAKE	WALTON	1	GRAYTON BEACH	0.21	44	PRIVATE
P-31A	FOUR MILE VILLAGE	WALTON	1	MIRAMAR BEACH	N/A	31	ADDITION TO CBRS UNIT
P-32	MORENO POINT	WALTON OKALOOSA	1	DESTIN	N/A	N/A	NO CHANGE TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle (s)	Shoreline Length (in miles)	Acreage (in acres)	Status
FL-97	SANTA ROSA ISLAND	OKALOOSA	1	FORT WALTON BEACH MARY ESTHER NAVARRE HOLLEY SOUTH OF HOLLEY	18.51	15733	MIXED
FL-98	GULF ISLANDS	ESCAMBIA	1	FORT BARRANCAS PERDIDO BAY ORIOLE BEACH HOLLEY SOUTH OF HOLLEY GULF BREEZE	25.69	21302	MIXED
FL-99	TOM KING	ESCAMBIA	1	HOLLEY	0.53	29	PRIVATE
FL-100	TOWN POINT	SANTA ROSA	1	GULF BREEZE	0.62	38	PRIVATE
FL-101	GARCON POINT	SANTA ROSA	1	GARCON POINT	3.59	773	PRIVATE
FL-102	BASIN BAYOU	SANTA ROSA	2	GARCON POINT	1.05	102	PRIVATE
FL-103	PERDIDO	ESCAMBIA	1	PERDIDO BAY	1.59	387	PROTECTED
FL-104	KEES BAYOU	ESCAMBIA	1	PERDIDO Bay	1.23	406	PRIVATE
Totals:					647.54	3111440	

COASTAL BARRIER RESOURCES SYSTEM ALABAMA UNITS



ALABAMA

The State of Alabama has one of the most scenic coastlines along the Gulf of Mexico. Centered in a large estuary, Mobile Bay, the coast includes wide marshlands, the 18-mile long, partly forested, barrier island of Dauphin Island, and the Fort Morgan peninsula which is attached to the mainland shore at the community of Gulf Shores, Baldwin County. Mobile Bay is the drowned valley of the Mobile River. In the head of the bay, the Mobile River has built a delta system. In spite of some growth in recent history, the Mobile Delta today experiences land loss (Hardin and others, 1976); probably because of sediment impoundments by dams in the drainage basin.

Recreational activities in coastal Alabama are centered around sports fishing and beach utilization. The primary issue the State perceives regarding these resources is improved access to accomodate the State's 23,300 (1979) pleasure boats. There are approximately 9200 acres in Baldwin County and 1700 acres of Mobile County held for public recreation. The western, undeveloped part of the Dauphin Island (Q02) unit has for some time been leased by Mobile County but the lease has now expired. The State legislature has tried, but been unable to appropriate funds to purchase the land. Major commercial recreational facilities are available at Gulf Shores and eastern Dauphin Island. The State provides recreational opportunities and beach access while protecting the integrity of the coastal resources and rights of private property owners.

Hurricanes and tropical storms dramatically affect the environment along the Alabama Coast. The coastal erosion problem is severe in Alabama. Of 504 miles of estuarine and Gulf shoreline, 220 miles are eroding. More than 90% of the Gulf shoreline is eroding. The rate of erosion typically averages 10 feet per year but increased in some areas to 120 feet in a day during Hurricane Frederic. The State advocates non-structural remedies to this erosion problem.

CBRS Units

Unit Name	Unit #	County	Beach Length (mi.)
Mobile Point	Q01	Baldwin	4.4
Pelican Island	Q01A	Mobile	6.1
Dauphin Islands	Q02	Mobile	5.0

The Alabama CBRS units consist of parcels of sandy barrier spits and barrier islands. The units in the Fort Morgan peninsula are characterized by wide, relatively stable beaches backed by primary and secondary dunes and older beach ridges. The primary dunes are vegetated by sea oats, the secondary dunes by live oaks and occasional other shrubs. The interior of the spit has obtained a typical pine palmetto climax vegetation.

Pelican Island is a "transient" island on the Mobile Bay ebb-tidal delta, better characterized as a swash-bar than an island. The island was leveled to a subaequeous shoal by Hurricane Frederic but has since rebuilt and is now covered with sea-oats and related primary vegetation.

The Dauphin Islands are low (5 feet high) grass-covered barriers built as spits off the older core of the main island's east end.

A brief description of each CBRS unit in Alabama is provided below. Each unit is identified by its number, name, and the county in which it is located.

Q01A-Pelican Island (Mobile): Pelican Island lies to the southwest of the entrance to Mobile Bay, Alabama, and south of the developed end of Dauphin Island. The unit is bounded to the east by the borders of Mobile and Baldwin Counties depicted on the Fort Morgan quad rangle dated 1982 and the nearshore of Dauphin Island on the west. Pelican Island is an emergent bar that had, between 1929 and 1973, grown to 1.7 miles in length. In spite of being completely submerged by Hurricane Camille, in 1969, small patches of vegetation were established on its southwestern end by 1973 (Hardin et al., 1973). Reorientation of Pelican Island by hurricane wave conditions is not an unusual result, such reworking of the shoal/island has been observed frequently in recorded history. Sand Island, the eastern extent of this unit, has been termed a channel margin bar (Hayes, 1967). This shoal is small and has alternated between intertidal and subtidal throughout its history. Following Hurricane Camille the subtidal area of Sand Island increased, but by less than 1%.

Q02-Dauphin Island (Mobile): This unit includes the entire length of the island west of the limit of Bienville Boulevard. This street marks the westward extent of development on the island. A small, protected area of this CBRS unit extends from the north side of Pass Drury (Little Dauphin Island) southeastward, to the harbor entrance. The rest of Little Dauphin Island north of Pass Drury is protected by the Bon Secour National Wildlife Refuge.

Dauphin Island is approximately 15 miles long of which the eastern eight miles have been developed. The island varies in width between 1800 and 1500 feet, narrowing towards the western end of the island. The island separates the Gulf of Mexico from Mississippi Sound and lies approximately 4 miles from the mainland. Its average elevation ranges between 5 and 10 feet with exceptions on the eastern and Gulf side of the island where sand dunes attain heights of 45 feet.

Dauphin Island has a well developed beach running its length on the Gulf side. Landward, the bay shores are marked by beach alternating with marsh. The higher elevations on the eastern side of the island are forested. Significant erosion that occurred on the bayside of the island caused marsh outcrops and exposed tree stumps in the surf zone.

The part of the western side of the island included in the unit is largely a low lying, narrow spit. The western tip of Dauphin Island has historically been accreting at the expense of eastern and central island beaches (Hardin et al., 1976). The amount of sediment entering the system east of the island is less than that transported by longshore currents.

Dauphin Island is extremely vulnerable to hurricane winds and attendant storm waves especially along the lower lying units included in the unit. According to the Army Corps of Engineers' report concerning Hurricane Camille (1970), approximately 70% of Dauphin Island was inundated. The development on the extreme eastern portion of the island was spared flood damage due to its higher elevation.

The small, narrow sub-unit which extends from the Bon Secour National Wildlife Refuge to the harbor entrance is low in elevation, often flooded and generally unsuitable and unsafe for future development.

Coastal Resource Management

The State's efforts in regulating coastal zone activities began with the establishment of the Coastal Area Board (CAB) by 9-7-14 Code of Alabama in 1975, and its reconstitution through Act No. 534 by the Alabama legislature in 1976, the Alabama Coastal Management Act. The CAB's stated purpose is to "promote, improve and safeguard the lands and waters located in the coastal areas of this State..." To help accomplish this, the CAB was directed to provide for the development of a comprehensive coastal area management program (Act. 534 sect. 6). This program, or any rule or regulation proposed by the board, requires approval by the Governor before going into effect. In 1979, CAB's Alabama Coastal Area Management Program was approved by the Governor and the Coastal Area Board was designated as the State agency responsible for the coordination of the coastal area management program. The program was designed under the guidance both of Act 534 by the Alabama legislature and the Federal Coastal Zone Management Act of 1972 (Public Law 92-583).

Act No. 82-612, known as the "Alabama Environmental Management Act" passed by the Alabama legislature in 1982, created the Alabama Department of Environmental Management. This Act also created a seven-member Environmental Management Commission with the following duties:

(a) to appoint a Director of the Department of Environmental Management and to advise him on matters within the Department's scope and authority,

(b) to establish or adopt rules, regulations or environmental standards,

(c) to develop an environmental policy for the State, and

(d) to hear and determine appeals of the Department's administrative actions.

In general, to be consistent with the Alabama coastal zone management program, all coastal actions must be performed in such a way as to minimize detrimental effects on all wildlife, wildlife habitats, fisheries resources and cultural resources.

Acting through the Environmental Commission, the Department was authorized to develop an environmental policy for the State. Also, the Department is the State agency responsible for administering federally approved and federally delegated environmental programs.

To deal specifically with coastal issues within this new broad State environmental framework, Act 82-612 also created a Coastal Resources Advisory Committee to advise both the Department of Environmental Management and the Office of State Planning and Federal Programs on all matters concerning the coastal area. The old Coastal Area

Board (CAB) was repealed by the same act. To provide continuity, however, the initial members of the Coastal Resources Advisory Committee were the members of the old CAB. The new coastal board, however, is purely advisory.

Permit, regulatory and enforcement functions of the Coastal Area Board were transferred to the Alabama Department of Environmental Management (Act 82612, Sect. 4j). Other functions of the Coastal Area Board, as well as personnel, equipment, etc., were transferred to the Office of State Planning and Federal Programs. The Office of State Planning and Federal Programs has subsequently been incorporated into the new Department of Economic and Community Affairs. This department now handles Alabama CZM grant applications and related duties.

Alabama statutes and regulations have been formulated in accordance with federal statutes (Rivers and Harbors Act, etc.) and the Alabama Code of 1975. According to State law:

> No uses determined by ADEM to degrade the coastal area will be permitted unless the department determines that there is a compelling public interest.
>
> No new dead-end canals are permitted in the coastal area unless the department determines them to be non-degrading to the environment.
>
> Dredge spoil should preferably be deposited in uplands.
>
> Mitigation of shoreline erosion should, to the extent possible, use non-structural erosion control methods including preservation and restoration of dunes, beaches, wetlands and submerged grass beds and shoreline nourishment.
>
> Emplacement of "hard" structures is permissible only when there is no technically feasible alternative.
>
> Developments should be designed and constructed such as to avoid increasing the potential for flooding and storm damage. Public projects should not facilitate or encourage development in the 100 year floodplains mapped by FEMA.
>
> Solid waste disposal is prohibited on beaches, in wetlands or dunes.

No degradation of wetlands or submerged grass beds is permitted, although the department may accept the replacement or creation of an equivalent amount as compensation for the loss resulting from an approved project.

No degradation of oyster reefs is permissible.

For building on beaches and dunes, a permit must be obtained from the Department, or the local government, if that body has developed an ordinance or plan (a local code) approved by the State. Construction is not permitted seaward of a "set back" line originally established at 40 feet behind the crest of the primary dune line. The builder may apply for a variance if the application of the set-back line leads to a reduction in lot building area below the minimum practicable.

A new set-back line permanently tied to existing bench marks is now (1984) in the process of being surveyed.

The alteration of the primary dune system through any action is prohibited.

Recently, land owned by the State of Alabama at Plash Island near Gulf Shores in Baldwin County, was sold to private interests for development purposes.

Local Actions

The Alabama Coastal Zone Management program encourages individual local governments to become actively involved in planning, zoning, and permit issues. Each governmental entity is encouraged to submit to the Department (ADEM) any rule, regulation, or plan (local code) it uses to grant local action permits. If approved by the Department, the local government is then authorized to administer the code. The State approval remains valid unless the Department determines that the local government fails to enforce the code or that the code is no longer in compliance with the evolving State coastal zone management program.

The following State acts of local significance pertain to barrier island preservation.

1. Baldwin County Wild Sea Oats Act. Act 971 Regular Session, Alabama Legislature 1973 makes it a misdemeanor to pick wild sea oats on the beaches of Baldwin county. For the purpose of this Act, the term "beach" means land between low water mark and established inland vegetation.

2. Mobile County Island Beaches and Dune Preservation Act. Acts of Alabama, 1975, Act. 1096 prohibits use of vehicles on any beaches and dunes in the county without the specific written approval by the landowner.

3. Baldwin County Island Beaches and Dune Preservation Act. Acts of Alabama, 1977, Act. 728 authorizes Baldwin County to regulate vehicular traffic on its beaches; it does not specifically prohibit such traffic.

Further, counties serve as local administrative units for State functions. Their primary responsibilities within the issues discussed in this report lie in the issuance of permits and licenses for construction, sewage disposal, etc. in unincorporated areas.

Local municipal governments exercise a broad spectrum of responsibilities. Municipalities within the Alabama coastal zone regulate building and infrastructure development activities through the issuance of zoning ordinances and building permits. Within the coastal municipalities of Alabama, permitting requirements range from several to none.

Private Sector Initiatives

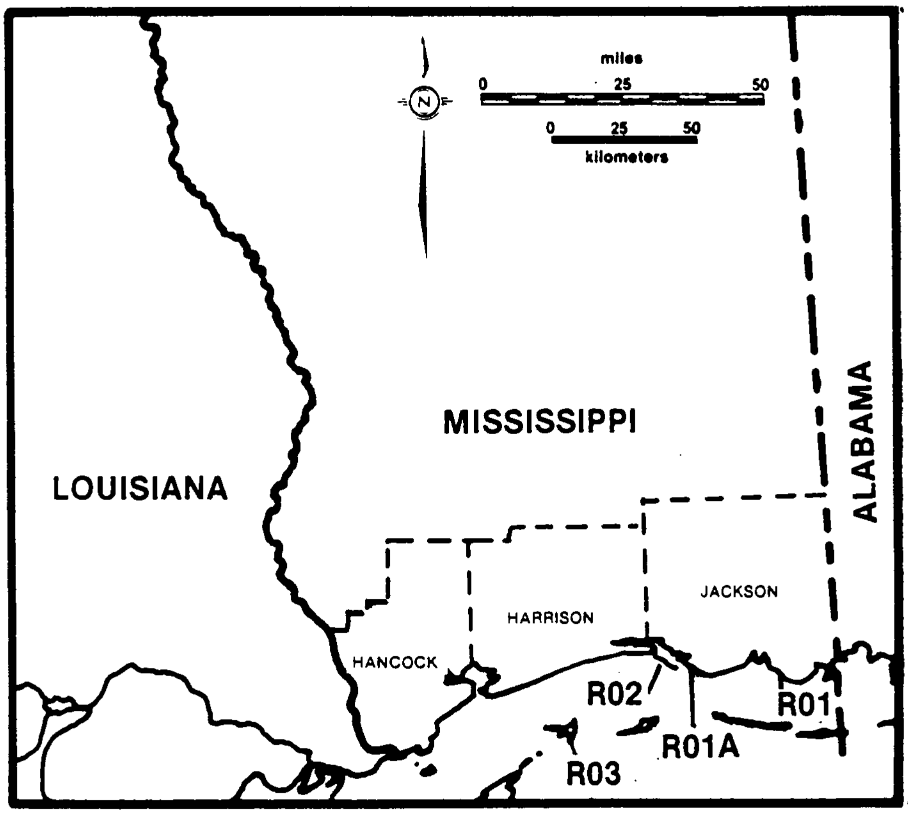
The State of Alabama, in its coastal zone management plan, strongly encourages private donation of land for public purposes. The advantage to the landowner lies in tax savings. Also, the landowner may include restrictions on the future use of the land in the deed of transfer. The Purdue Property, a 1297 acre tract at the west end of Little Lagoon in Baldwin County, was transferred to the Fish and Wildlife Service.

The Audubon Society leases a 170 acre tract on Dauphin Island from the County of Mobile. The tract is administered as a wildlife refuge.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN ALABAMA

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
AL-01	PERDIDO KEY	BALDWIN	1	ORANGE BEACH	1.27	721	PROTECTED
AL-02	GULF STATE PARK	BALDWIN	1	ORANGE BEACH GULF SHORES	2.49	4740	PROTECTED
Q-01	MOBILE POINT	BALDWIN	1	BON SECOUR BAY LITTLE POINT CLEAR FORT MORGAN ST. ANDREWS BAY PINE BEACH	3.80	3763	ADDITION TO CBRS UNIT
Q-01A	PELICAN ISLAND	BALDWIN	1	LITTLE POINT CLEAR	N/A	N/A	NO CHANGE TO CBRS UNIT
Q-02	DAUPHIN ISLANDS	MOBILE	1	FORT MORGAN NW LITTLE DAUPHIN ISLAND FORT MORGAN PETIT BOIS PASS HERON BAY	3.76	2432	ADDITION TO CBRS UNIT
AL-03	SKUNK BAYOU	BALDWIN	1	BON SECOUR BAY	0.97	142	UNKNOWN
AL-04	CYPRESS POINT	BALDWIN	1	BON SECOUR BAY	1.45	909	UNKNOWN
Totals:					13.74	12707	

COASTAL BARRIER RESOURCES SYSTEM
MISSISSIPPI UNITS



MISSISSIPPI

The Mississippi Gulf coast is locally known as the "Riviera of the Gulf." With many stately mansions and antebellum homes facing wide sandy (yet nourished) beaches and Mississippi Sound, the term is appropriate. On clear days the barrier islands of the Gulf Islands National Seashore can be seen from the mainland.

The major components of this coastal region include steep erosional mainland shores, marshes and swamps along rivers and bay margins, and the barrier island chain.

The coastal plain rivers incised deep valleys during an ancient low stand of sea level. The subsequent rate of sea level rise drowned these valleys, thus forming estuaries at St. Louis, Biloxi, Mobile and Perdido Bays. The major rivers of the region have all built bay-head deltas, of which the Mobile, Pascagoula, and Pearl are the largest.

The barrier island chain that begins to the east in Alabama with Dauphin Island, continues west along the Mississippi coast with the following sequence of barriers: Petit Bois, Horn, East and West Ship and Cat Islands. Except for Cat Island, these are all part of the Gulf Islands National Seashore.

Local erosion and accretion occurs to some extent on all Gulf and Sound shores of the islands. Erosion is intense at the eastern island tips whereas the western ends are rapidly prograding (Waller and Malbrough, 1976). In recent years the westward spit extension has been dramatically slowed by maintenance dredging of navigation channels through some of the tidal passes.

Cat Island has a rather unique shape for a barrier. After deposition of the St. Bernard Delta of the Mississippi, waves arriving at Cat Island were restricted to a narrow window from the east-southeast. This led to truncation of the former beach ridges and the development of two transverse spits nearly perpendicular to the old trend. This probably accounts for the T-shape of the present barrier island.

Hurricanes and tropical storms play a major role in the temporal changes of the barrier islands. The historical patterns of change for most islands are well known (Otvos, 1979), and the record shows that major changes have been brought about as sudden response to hurricane impacts (Otvos, 1981 b). Central Ship Island was temporarily cut at least five times during the last 130 years. Hurricane Camille (most intense hurricane in recent U.S. history) formed a 3 km wide cut in 1969, separating the island into the present eastern and western parts.

CBRS Units

Unit Name	Unit #	County/Parish	Beach length
Round Island	ROI	Jackson	1.2
Belle Fontaine Pt.	ROI-A	Jackson	1.3
Deer Island	R02	Harrison	0.5
Cat Island	R03	Harrison	1.5

The CBRS units in Mississippi are all pine-forested, sandy beach ridge barriers. Round Island and Deer Island appear to be modified remnants of the pre-existing Gulfport beach ridge plain system. They are both associated with small wetland areas on their landward sides which are sheltered from wave action of the open Mississippi Sound. The Belle Fontaine unit consists of a thin barrier spit sheltering a fairly extensive associated salt marsh system. Cat Island is a beach ridge barrier island, forming the terminus of Mississippi's offshore chain of barrier islands.

A brief description of each CBRS unit in Mississippi is provided below. Each unit is identified by its number, name, and the county in which it is located.

ROI-Round Island (Jackson): This unit is a tear drop shaped island located directly south of Pascagoula Bay. The island appears to be a remnant of a larger island that has been eroded into its streamlined shape by currents running in a southeastern or northwestern direction. The sandy fringes of the island protect an internally vegetated region.

Flooding and submergence of this small island is frequent due to its naturally low elevation. Both Hurricanes Camille, 1969, and Frederick, 1979, covered this island with more than 10 feet of water. Due to its fragile nature, development of Round Island has not been attempted.

ROIA-Belle Fontaine Point (Jackson): This unit is located east of Belle Fontaine Point in the vicinity of Graveline Bayou. It includes the coastline west of the Bayou outlet for a little more than a mile. The inland boundary of the unit contains wetland communities.

This stretch of coastline is comprised of barrier beaches which protect marshlands and tidal bays (Kelley, unpub., 1982). It is eroding and there are insufficient updrift sediment sources to nourish this coastline. This area is extremely vulnerable to flooding owing to its low elevation. Since 1900 this unit has been inundated 15 times, including two occasions (Hurricane Camille, 1969, and Frederick, 1979) where it had been submerged by more than 10 feet.

R02-Deer Island (Harrison): This unit contains Deer Island in its entirety. The unit extends eastward into the Biloxi Bay entrance, and landward, protecting Biloxi Bay Bottoms. The eastern boundary is marked by the boundary between Harrison and Jackson County.

Deer Island itself is comprised of low, linear beach ridges which protect salt water/brackish marsh habitat on its bay side. Its low elevations make it subject to flooding from storm surge and wave attack. Both Hurricanes Frederick (1979) and Camille (1969) totally inundated this island (COE, 1971; Kelley, unpub., 1982). Limited development of the island has been attempted.

R03-Cat Island (Harrison County): This unit is actually made up of two sub-units separated by the main body of the island. The westernmost sub-unit extends about one mile east of West Point and extends from north shore to south shore. The central armpit of the island which forms the northern shore of Spit Cove, is the eastern sub-unit of this unit and includes a portion of the eastward facing beach.

The crossbow shape of Cat Island suggests that it has been subject to two different dominant wave attacks opposed at right angles. The beach ridges which coalesce forming the main-body of Cat Island do not exceed elevations of 6 feet. The beaches are narrow, but comprised of coarser grained sand than found on Louisiana beaches. Storm surges have overwashed the beaches forming washover fans and terraces in the backbeach area. Hurricane Camille, 1969, caused the submergence of the entire island (COE, 1970). Post-storm surveys indicate that nearly all of the island remained intact losing only .05% to underwater shoals (COE, 1970). There is no new sand entering the system so the island must maintain itself utilizing its own sand. Sand fronting the north-south trending part of the island is eroding with incident waves using that material to extend South Spit. Present development on the island is limited to a few dredged channels in its northern "armpit"and some citrus agriculture and sparse residential development in the south.

Coastal Resource Management

Mississippi has a Federally approved coastal zone management program. Expression of state concern about the coastal wetlands and barriers became evident in 1973 when the Coastal Wetlands Protection Law was passed, one year after the Federal Coastal Zone Management Act.

The Wetlands Protection Law established a state policy which "favors the preservation of the natural state of the coastal wetlands and their ecosystems and to prevent the destruction of them, except where a specific alteration of coastal wetlands would serve a higher public interest in compliance with the public purposes of the trust in which these wetlands are held". Subsequent to the passage of the Wetlands Protection Law, Mississippi began developing its Coastal Zone Program. This program was approved by NOAA's office of Coastal Zone Management in September, 1980.

The Mississippi Coastal Program established the guidelines and specific procedures utilized to carry out the mandates of the Wetlands Protection Law. Regulated activities specifically include dredging, filling and the erection of coastal structures. Very few of the regulations affect the fastland of any CBRS units.

The Mississippi Commission on Wildlife Conservation is ultimately responsible for administering the Wetlands Protection Law and the Coastal Program and assuring that all state agencies act in compliance with it. Daily management of the Coastal Program is in the hands of the Bureau of Marine Resources (BMR), a subdivision of the Department of Wildlife Conservation. The BMR administers the major portions of the program; however, three other agencies also monitor the decisions to ensure that they comply with the Coastal Program objectives. These additional agencies include the Bureau of Pollution Control, the Bureau of Land and Water Resources and the Department of Archives and History.

Local Actions

The major environmental controversies in Mississippi prior to the designation of CBRS units focused on Deer and Cat Islands. Deer Island had been a controversial issue also within the Mississippi Coastal Program because of the owner's desire to develop it for residential condominiums. In early 1981, Deer Island Development Corporation (DIDC) announced its intention to develop a portion of Deer Island. The following description of the island, and the sequence of events which followed DIDC's announcement comes from Jarman and Mills (1983).

> "The island, which at one point is only a few hundred yards from the mainland, of Biloxi, provides a protective storm buffer for the mainland. In addition, it is a nursery area for species important in commercial and sport fisheries, a waterfowl and shore bird breeding ground and a haven for a wide variety of other wildlife. It has for many years served as a major recreational area for coast residents. The proposed development was to consist of 160 to 300 condominium vacation cabins on stilts, a swimming pool, tennis courts, roadways and possibly a marina. In order to provide utilities and transportation to the island from the mainland, DIDC made application to BMR, pursuant to the Wetlands Protection Law and the Coastal Program, to build a pier and a subterranean utility corridor under the wetlands. Following BMR's evaluation of the merit of the application and a public hearing on the permit, the Commission unanimously denied DIDC's permit application because the proposed activities were inconsistent with the policies and goals of the Coastal Program, would adversely affect the coastal wetlands and, ultimately, the public interest."

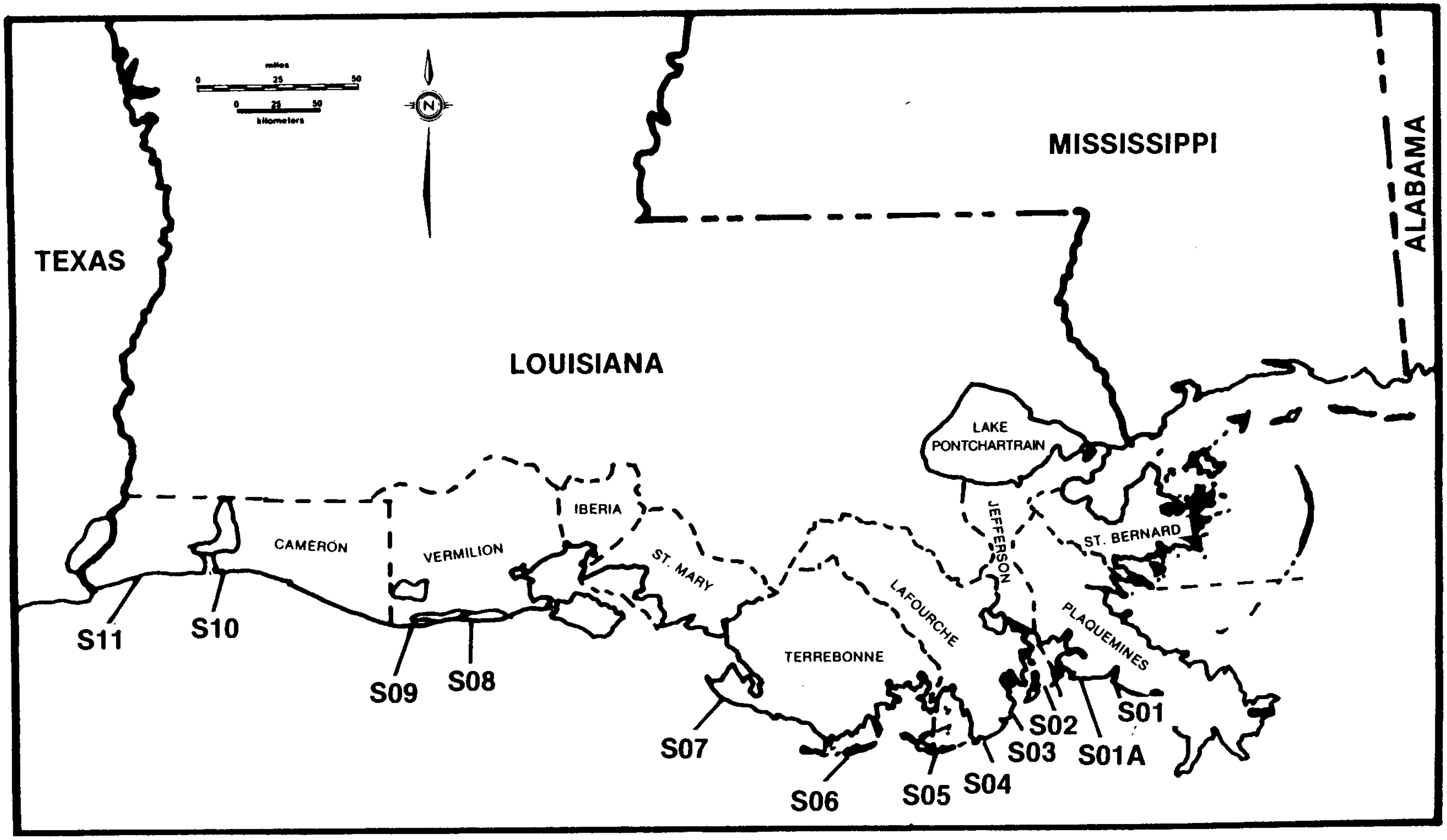
Private Sector Initiatives

No information is available at this time.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN MISSISSIPPI

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
MS-01	GULF ISLANDS	JACKSON HARRISON	5	PETIT BOIS ISLAND HORN ISLAND EAST HORN ISLAND WEST DOG KEYS PASS SHIP ISLAND	29.08	24935	PROTECTED
R-01	ROUND ISLAND	JACKSON	5	PASCAGOULA	N/A	N/A	NO CHANGE TO CBRS UNIT
R-01A	BELLE FONTAINE POINT	JACKSON	5	PASCAGOULA	N/A	865	ADDITION TO CBRS UNIT
MS-02	MARSH POINT	HARRISON	5	OCEAN SPRINGS	2.26	1173	MIXED
R-02	DEER ISLAND	HARRISON	5	DEER ISLAND OCEAN SPRINGS BILOXI	N/A	N/A	NO CHANGE TO CBRS UNIT
MS-03	BUCCANEER	HANCOCK	5	WAVELAND GRAND ISLAND PASS	1.63	692	MIXED
MS-04	HERON BAY POINT	HANCOCK	5	GRAND ISLAND PASS	0.90	72	PRIVATE
R-03	CAT ISLAND	HARRISON	5	CAT ISLAND ISLE AU PITRE	N/A	N/A	NO CHANGE TO CBRS UNIT
Totals:					33.87	27,737	

COASTAL BARRIER RESOURCES SYSTEM
LOUISIANA UNITS



LOUISIANA

The primary coastal concern of all levels of Louisiana government, private industry, and knowledgeable citizens, is coastal land loss. At present, the State is losing in excess of 40 miles of coast per year. The cumulative loss since 1940 has been estimated at 500 miles, an area equal to half of the entire State of Rhode Island. Land-loss is largely a human-made problem directly tied to two other coastal management and utilization practices: the prevention of Mississippi River flooding, and heavy canal dredging for purposes of navigation and wetlands oil-field access. A brief review of the practices which have led to wetlands deterioration follows.

The State was first settled by the French in 1699. Less than 20 years later, LaBlond de la Tour constructed the first levee for the protection of New Orleans. By 1828 a continuous levee had been completed, extending from above Baton Rouge to below New Orleans, and direct human "management" of the Louisiana coastal wetlands had begun. The levees were enlarged and strengthened continuously during the subsequent century such that, since the catastrophic flood of 1927, no significant levee breaches have occurred. While everyone favored flood control and improved navigation, the State was slow in recognizing that these very levees also had major detrimental side-effects: the sediment-laden and nutrient-rich freshwater which nurtured the Louisiana coastal wetlands by annual flooding had been effectively cut off. Concurrently, increased dredging of canals to serve inland port facilities and the independent dredging of barge canals to wetlands oil and gas installations served to alter the hydrologic system the marshes. The breakdown of the natural "flow patterns allowed saltwater to intrude further inland changing the plant communities the coastal marsh. This, in turn, led to an accelerating rate of conversion of coastal wetlands into open bays and sounds (Boesch et al., 1983).

Subsidence, the sinking of the land surface, also contributes a great deal to the conversion of Louisiana's coastal lands into open water. Because of the soft and easily compactable nature of Mississippi delta muds, the coastal wetlands subside rapidly under their own weight. In addition, the large-scale extraction of oil and gas from relatively shallow subsurface reservoirs, is a likely contributing factor to subsidence. Although no one, as yet, has quantified this effect there is strong circumstantial evidence that it has major impact. Well-documented studies have shown that oil and gas extraction have caused tens of feet of subsidence in some California oil fields. A time-series analysis of tidal gage data along the Gulf coast found that a rapid increase in local sea level correlated with the onset of full-scale production of oil and gas off the Louisiana coast (Swanson and Thurlow, 1973).

Regardless of the relative magnitude of natural and human causes of subsidence, all data indicate that the current average rate of local sea level rise on the Louisiana coast is about 1.1 cm per year. Of this, only about 1.5 mm is due to global "eustatic" change, the rest, 90 percent, is caused by sinking of the land (Nummedal, 1983). Because of the levying of the Mississippi River, as discussed above, the average sedimentation rate in the Louisiana marsh appears to be only about 5 mm per year. (Bauman, 1981). The resulting deficit, a 6 mm annual lowering of the sediment surface relative to the sea, is a major cause of coastal land loss.

Not only do the coastal wetlands turn into open water bodies, the front-line of natural coastal defense, the barrier spits and islands, are also rapidly deteriorating. This deterioration is part of the natural cycle of deltaic barrier island evolution. The rate of deterioration, however, is locally accelerated by human interference with the longshore sediment transportation system.

Louisiana's coastal barriers derived their sand from abandoned mouthbars of the shifting Mississippi River channel. As the waves and longshore currents of the Gulf coast "mined" these sandbodies and constructed chains of barrier islands, such as the Chandeleur, Timbalier and Isle Dernieres Islands, the abandoned delta lobe itself slowly subsided. This subsidence had two major impacts: (1) sea water baegan encroachng behind the barriers, separating them from the adjacent mainland by ever-expanding bays and sounds, and (2) the river-mouth bars, which once acted as sand sources to feed the barriers, ultimately would subside beneath the reach of the waves. Consequently, sand delivery would cease and the barrier would rework its own finite supply of sand in response to storms and huricanes. With time the sand of the coastal barriers would be distributed into deep migratory tidal inlet channels, some would be washed into the deepening back-barrier bay and some would be carried seaward onto a sheet of sand on the inner continental shelf. With these continuing losses, and no net sand supply, the subaerial barrier structure would ultimately be entirely removed. This is probably how Ship Shoal, off the Louisiana coast, was formed (Nummedal et al., 1984). Typically, the Louisiana coastal barriers have retreated 2 to 3 km over the last century. At present, they continue to erode im many places at rates as high as 15 to 20 meters per year (Penland et al., 1981). According to a special report prepared for the Louisiana legislature, the total acreage of offshore barrier islands was reduced by 50% in the short time-span of 1955 to 1978.

Total Louisiana coastal landloss appears to have increased in a geometric fashion. In the Mississippi delta plain alone the rate of landloss increased from 6.7 miles per year in 1913 to 39.4 miles per year in 1980. In addition, the Chenier Plain at the western Louisiana coast lost 7.7 miles per year in the time period of 1952 to 1974 (Gagliano et al., 1981). If these rates of landloss continue, it has been projected that Plaquemines Parish (the "birdfoot" Mississippi delta) will all but disappear in the next 50 years, Terrebonne Parish will disappear over the next 100 years and Lafourche Parish has perhaps a 200 year life-expectancy.

One exemption from the general provisions of CBRA pertains specifically to the Louisiana coast. This is contained in section 5(a)(3). This section states that no financial assistance may be made available under the authority of any Federal law to carry out of any project to prevent the erosion of, or to otherwise stabilize, any inlet, shoreline, or inshore area except those in Louisiana CBRS units designated pursuant to section 4 on maps numbered SOI through S08 and for purposes other than encouraging development. However, Section 6 also states that Federal financial assistance may be available for (1) any use or facility necessary for the exploration, extraction, or transportation of energy resources which can be carried out only on, in, or adjacent to coastal water areas because the use or facility requires access to the coastal water body; (2) the maintenance of existing channel improvements and related structures, such as jetties, and including the disposal of dredge materials related to such improvements.

A letter from the Governor to the Secretary of DOI and related testimony from State agencies and consultants make it very clear that the State of Louisiana wants to protect and enhance its barrier islands for purposes other than development. Louisiana does not encourage residential development of its barriers, as pointed out by the Governor, because the barriers are essentially "undevelopable" due to their isolated location, foundation characteristics, limited size, and the undesirable aesthetic conditions of the shoreline and adjoining waters. Also, the extensive energy development and related industrial uses of Louisiana's coastal zone have made most of the barriers unsuited for residential, recreational types of development.

CBRS Units

Unit Name	Unit #	Parish	Beach Length (mi.)
Bastian Bay Complex	SO1	Plaquemines	6.0
Bay Joe Wise Complex	SO1-A	Plaquemines	5.4
Grand Terre Islands	S02	Plaquemines	1.9
Caminada	S03	La Fourche	
Bay Champagne	S04	La Fourche	6.8
Timbalier Island	S05	La Fourche	11.3
Isles Derniers	S06	Terrebonne	
Point Au Fer	S07	Terrebonne	
Cheniere Au Tigre	S08	Vermilion	1.6
Rollover	S09	Vermilion	1.0
Mermentau River	S10	Cameron	13.4
Sabine	S11	Cameron	9.4

Except for Cheniere au Tigre, all Louisiana CBRS units are grass-covered barriers with some black mangrove and other shrubs. The chenier, however, has a well-developed coastal climax forest composed of live oaks and palmetto. Furthermore, all the barriers in the system are young, a few hundred to about two thousand years, and very low in topographic profile. Many are beach-ridge barriers, but the ridges are not associated with any significant dune fields to enhance their relief. Their young age and rapid migration probably in part accounts for this.

A brief description of each CBRS unit in Louisiana is provided below. Each unit is identified by its number, name and the county in which it is located.

SO1-Bastian Bay Complex (Plaquemines Parish): This unit is separated into two sub-units. The southeasternmost unit includes the eastern portion of Pelican Island between the jetties of Bayou Fontanelle and Scofield Bayou. Scofield Bayou and the beach 1.3 miles to the east are also included in this unit. The western sub-unit of this unit consists of Bastian Island and the western remnant of Lanaux Island. This barrier separates Bastian Bay from the Gulf of Mexico. The landward boundary of this sub-unit extends into and includes a portion of the Bastian and Shell Island Bay bottoms.

The Bastian Bay complex is comprised of deteriorating and subsiding marshlands fronted by a narrow, low elevation beach. It is part of the Plaquemines delta system which formed within the last 600 years. The beach material is made up predominantly of fragmented oyster shells. The recurve spit bounding the eastern side of Grand Bayou Pass has an impressive ridge and swale morphology. The ridges which attain elevations of 6-7 ft are made entirely of oyster shells. The predominance of narrow, shell dominated beaches fronting this complex indicates that there is a lack of sandy, fluvially derived sediments in the vicinity (McGowen, 1979). The relative youth of this region of coastal Louisiana is shown by the marshes which still connect the mainland to the barriers of Pelican and Lanaux Islands. This marsh is subsiding quickly due to the compaction of deltaic sedimentary deposits.

This region is frequently flooded due to its very low elevation. Dominant longshore sediment transport is toward the northwest. The erosion downdrift of the jettied channel has resulted in the demise of Lanaux Island. An open channel designated Lanaux Pass now persists where there once was a narrow tongue of beach fronting Shell Island Bay.

S01A-Bay Joe Wise Complex (Plaquemines Parish): This unit S01A, extends from the west side of the channel at Grand Bayou Pass westward to a man-made channel which cuts Bay La Mer in two. Bayou Chaland flows to the Gulf through Bay Chaland near the middle of this CBRS unit. The landward boundary of unit S01A has been drawn where pipeline canals meet forming a narrow but continuous line of open water in the back bay.

Similar to the beaches of the Bastian Bay Complex, those fronting Bay Joe Wise are narrow with high shell content. They are low in elevation and overwashed during abnormally high tides and mild storm wave activity. Longshore transport directions can vary between east and west. However, there is no local sediment supply to feed the longshore currents. Erosion rates along this portion of the coastline range between 15 and 30 ft/yr. The beaches are a thin (3 ft) veneer of shelly sand west of Chaland Pass and sandy shell to the east, and are highly transgressive. The marsh region behind the beach is criss-crossed with dredged pipeline and petroleum installation channels. Access to CBRS units S01 and S01A is limited to boat and air-transportation.

S02-East End Grande Terre (Jefferson Parish): This unit covers the eastern portion of the island between the Louisiana Fish and Wildlife camp airstrip to the west and Plaquemines/Jefferson Parish boundary on the east, which runs through the channel of Pass Abel. This barrier island is one of a small chain of islands which separates Barataria Bay from the Gulf of Mexico. It is separated from the mainland by Barataria Pass on the west and Pass Abel to the east. West of the Louisiana Fish and Wildlife camp and bordering Barataria Pass are the remnants of Port Livingston, built during the Civil War period.

Beach ridges observed in aerial photographs of Grande Terre indicate it was formed from the east when longshore currents were directed westward. Sediments for this island are hypothesized to have come from earlier Mississippi River delta lobes to the east. Although the beach ridges in the island's interior were built by westward drift, the present beach sands originate from the Caminada Moreau headland to the west. The beaches of Grande Terre are comprised of fine to medium size sand with some shell material. They are narrow (150 ft) away from the ends of the island. At the eastern end of the island the beach widens into an extensive recurve spit. The recurve spit does not appear to be migrating into Pass Abel.

Grande Terre's beachfront is eroding. Penland and Boyd (1981), estimated the rate to be in excess of 30 ft/yr. In addition to erosion, the island's low elevation makes it susceptible to flooding during storm surge. The interior of the island is highly vegetated with scrub brush and grass. The dense vegetation is utilized as grazing land for a local population of cattle, horses, and some goats. There are very few trees. The portion of the island within the unit is incised by pipeline canals and access channels. The borders of these channels are being sought as oyster-rearing sites.

S03-Caminada Spit (Jefferson Parish): This unit is bordered by the middle of Caminada Pass on the east. It extends westward to the point where the spit connects to the Caminada-Moreau Headland. Landward, the CBRS unit boundary runs down the middle of the narrow bay behind the spit and runs along a pipeline canal which parallels the coast along the headland.

This unit is a flanking barrier spit growing eastward. Sediments derived from the headland are moved along the spit by the prevailing easterly longshore currents. The frequency with which this spit is overwashed is reflected in its form-the back beach area is essentially a washover terrace. The beach itself is very narrow with elevations not exceeding 5 feet. Erosion rates on the beach vary from 15 ft/yr at the western end to no erosion at the distal end of the spit. Narrow salt marshes are present on the bay side of the beach. Marsh material also underlies the beach and is frequently exposed on the beach face. The eastern end of the spit bordering Caminada Pass may be fragmented during wave attacks accompanying storm surge.

Access to Caminada Spit is through unimproved roads on Elmers Island. The spit is used frequently for recreational camping, fishing, and hunting.

S04-Bay Champagne (Lafourche Parish): This unit is broken into two sub-units. The eastern sub-unit lies between the Winner Wildlife Area to the east, and the truncated channel of Pass Fourchon to the west. The landward boundary runs along a pipeline canal east of Bay Champagne, then skirts the Bay where it picks up an open channel that joins the Pass Fourchon waterway. The western subunit extends westward from the centerline of the channel at Belle Pass to the west side of Raccoon Pass. Raccoon Pass is an eroded remnant of the east side of East Timbalier Island. The landward boundary runs along a wide, natural channel which connects Timbalier Bay and a dredged access channel located about 2/3 mile back of the jettied channel of Belle Pass. The line drawn landward of Raccoon Pass indicates that a portion of Timbalier Bay bottoms are included in this unit.

The eastern sub-unit morphology is a flat and wide strandplain beach. Its low elevation allows frequent flooding and washover. A washover terrace best describes the morphology of the back beach region. The narrow barrier which separates the Gulf from Champagne Bay is breached annually creating a tidal pass. This pass closes quickly by longshore sediment transport processes which fill the channel with sand from updrift sources. The longshore sediment transport direction in this area is generally to the west.

The east jetties of Belle Pass have blocked the longshore sediment movement of the western unit. The updrift accumulation has caused localized accretion on the shore east of the channel and extensive erosion downdrift within the CBRS unit. Sediment starvation to the eastern portion of east Timbalier Island has caused the island to narrow and breach. Erosion rates in this vicinity are in excess of 40 ft/yr (Penland and Boyd, 1981).

S05-Timbalier Island (Lafourche Parish): This unit is located between the east side of Little Pass Timbalier and Wine Island Pass which is to the west. The landward boundary indicates that remnant intertidal shoals derived from the westward end of East Timbalier are included in this CBRS unit. This border skirts the landward most extent of marsh which dominates the bayside of the island. East Timbalier Island is not included in the CBRS.

Timbalier Island originally formed as a flanking spit which grew west from the Caminada-Moreau Headland. The detachment of the spit from the headland formed the barrier island. The western end of the island is accreting at the expense of the eastern and central portions of the island. Erosion rates of 50 ft/yr on the eastern end switch to downdrift accretion (50 ft/yr) where a spit is growing into Wine Island Pass (Penland and Boyd, 1981). The lack of sediment supply to the island results from human structures to the east which prevents sand from entering the longshore drift. East Timbalier Island has been reveted with boulder size stones since 1964 and the updrift jetty of Belle Pass has redirected beach sediments in an offshore direction.

S06-Isles Dernieres (Terrebone Parish): This unit contains the Isle Derniere Barrier Island Arc system in its entirety. The eastern boundary is Wine Island Pass and the western line is approximately 1/2 mile west of Raccoon Point. The landward boundary is drawn nearly east-west along the open water of the narrow lagoon behind the island. This boundary bisects both Old Camp Pass and Caillou Boca.

Historical charts dating back to 1853 show that the Isles Dernieres were once part of the headland of an earlier lobe of the Mississippi River. The arc system was formed when the deltaic sediments underlying the marshy headland subsided forming Big Pelto and Pelto Bay. The size of the back bay has enlarged during the past hundred plus years forming Lake Pelto which now separates the Isle Dernieres from the mainland by several kilometers. During this time the island has also eroded over a kilometer and has been fragmented into 5 smaller islands. The headland which once supplied sediment to the barrier system is no longer a viable sources of sand. Predominantly southerly waves transport what sand is left in the system from the central Isles Dernieres to both east and west flanks eroding the central portion of the island at a faster rate than the ends (Penland and Boyd, 1981).

The Isles Dernieres offer a very fragile environment with narrow, eroding beaches of limited elevation. The beach morphology has been described as a continuous washover terrace. The limited marsh area on the bay side of the island is rapidly drowning. Toward the central portion of the island, the marsh is cut by a remnant channel of Trinity Bayou and some pipeline and petroleum installation access canals. Access to the islands is limited to boat, helicopter, or airboats.

S07-Point Au Fer (Terrebonne Parish): This unit is made up of two sub-units. The eastern unit runs approximately two miles along the coastline east of the midchannel line of Oyster Bayou. The landward boundary runs along a very minor, meandering tributary of Oyster Bayou which bisects two "pond" size water bodies. The western sub-unit, which comprises the bulk of this CBRS unit begins about half mile west of a dammed pipeline canal and runs the remainder of Point Au Fer Island to Point Au Fer. The landward boundary includes a small portion of Atchafalaya Bay Bottoms (which are also protected by Atchafalaya Delta Wildlife Management Area) and runs along Locus Bayou. At the Point Au Fer oil field the boundary jogs to the east, and then southeast along a pipeline canal.

The Point Au Fer unit shoreline is dominated by marsh and fronted by largely unvegetated mudflats. Shell reefs which occupy the landward side of Point Au Fer are also protected by CBRA. The majority of this unit is salt marsh exhibiting little variability in topography. The low elevation makes it especially susceptible to flooding. Pipeline canals and installation associated with the petroleum industry are the only forms of man-made development in this area.

S08-Chenier Au Tigre (Vermilion Parish): This unit is a very small area of coastline that connects two larger, otherwise protected areas. To the north and east of the unit boundaries is the Paul J. Rainey Wildlife Sanctuary, while to the west the land is owned by the Louisiana Department of Culture, Recreation, and Tourism.

This unit lies at the seaward and easternmost extent of an ancient beach ridge known as Chenier Au Tigre. It is vegetated by grass and scrub oaks (oak is translated from the French equivalent "chene" hence chenier). Supplies of muddy sediment from the Atchafalaya River caused the ridge to be separated from the shoreline by seaward growing mudflats. The area of Chenier Au Tigre in this unit exhibits a narrow, steep, shell hash sand beach as the sediments of the chenier ridge itself are eroded.

S09-Rollover Bayou (Vermilion Parish): This unit is essentially a mile or so long corridor of coastline extending to the east of the Rockefeller Wildlife Refuge. The landward boundary runs along the open water of a pipeline canal less than a half mile from the coastline. The eastern boundary of this unit is not distinguished by any obvious landmarks.

The coastline fronting this unit is a mudflat that is largely unvegetated. The sand and shell content of the fluid mud is generally less than 5% (Wells and Kemp, 1981). The source of fine-grained material is largely offshore and to the east, issuing from the Atchafalaya River (Wells and Kemp, 1981). This mudflat has been building westward from the coastline near Marsh Island since 1954 (Adams et al., 1978). According to Wells and Kemp, 1981, this mudflat growth may be temporary and could be removed quickly.

SIO-Mermentau River Complex (Camaron Parish): This unit is a lengthy coastal barrier stretching from Beach Prong west to the opening of the Mermentau River into the Gulf of Mexico. Unlike the irregular coastline east of Marsh Island, to its west the shoreline has been straightened by incident and storm wave attack. This unit has no outside source of sediment with which to nourish its eroding shoreline. According to figures cited by Morgan and Larimore (1957), this region is retreating at rates approaching 16 ft/yr. What beaches occur along this shoreline are constructed from material derived from within the system. Along Hackberry Beach the shoreline has been eroded into old beach ridges the sand is mined, reworked and added to the retreating beach face. East of Hackberry Beach, beach material overlies older marsh material which frequently outcrops on the beach (Wells and Kemp, 1981). Longshore sediment transport in this region is westerly, however, the minimal sediment moving along this coastline is illustrated by lack of accretion or erosion on the updrift or downdrift sides of the jettied channel to Lower Mud Lake.

Human structures found in the marsh-dominated area landward of the shoreline include pipeline channels, access channels, oil transfer stations, and other installations related to the mining of petroleum. Hog Bayou Oil and Gas Field and Crab Lake Gas Field are located within CBRS unit SIO.

Coastal Resource Management

Coastal management in Louisiana has to differ from that in other States because of the issue of land loss. This was recognized in the CBRA and formed the rationale behind the exception to the Act that applies to Louisiana.

The State's coastal zone management effort presently contains two components, the Coastal Management Division (CMD) of the Department of Natural Resources (DNR), which handles permits and the Coastal Protection Task Force, a Governor's advisory body responsible for the implementation of a program aimed at slowing th e trend of coastal land loss.

The State's coastal zone management program began as a study effort in LSU's Center for Wetland Resources in the early 70's. This effort led to the formulation of a Louisiana Wetlands Prospectus in 1973 with recommendations for appropriate legislation. At the time, there was no wetlands regulation. In 1978, the Louisiana Legislature passed Act 361, the State and Local Coastal Resources Management Act. In this act, the legislature declaired to "protect, develop, and where feasble, restore or enhance the resource of the State's coastal zone." The Act established a series of regulations and guidelines; authority for their implementation was vested in the Louisiana Coastal Management Program. The formulation, hearings and Coastal Commission approval process for proposed rules and regulations took two years. The Louisiana Coastal Zone Management Program was approved by the Governor and the Federal Office of Coastal Zone Management (NOAA) in the late summer 1980.

Local governments, which have the authority under Act 361, to establish their own Local Coastal Management Programs (LCMP's) have, with one exception, failed to get State approval for their programs. Only Lafourche Parish has its LCMP approved.

Guidelines and regulations in the Louisiana Coastal Management Program of specific relevance to the CBRS units include the following:

<u>Guideline 3.7.</u> Linear facilities involving dredging shall not transverse or adversely affect any barrier island.

<u>Guideline 3.8.</u> Linear facilities involving dredging shall not transverse beaches, tidal passes, protective reefs or other natural Gulf shoreline unless no other alternative exists. If a beach, tidal pass, reef or other natural Gulf shoreline must be transversed for a non-navigation canal, they shall be restored at least to their natural condition immediately upon completion of construction. Tidal passes shall not be permanently widened or deepened except when necessary to conduct the use.

<u>Guideline 3.11.</u> All non-navigation canals, channels and ditches which connect more saline areas with fresher areas shall be plugged at all water-way crossings and at intervals between crossings in order to compartmentalize them. The plugs shall be properly maintained.

Guideline 5.1. Non-structural methods of shoreline protection shall be used to the maximum extent practicable.

Guideline 5.6. Marinas, and similar commercial and recreational developments shall to the maximum extent practicable not be located so as to result in adverse impacts on open productive oyster beds, or submersed grass beds.

The State Coastal Protection Task Force was established by Act 669 in 1982 with the objective of overseeing the implementation of the State's program to enhance and restore its coastal wetlands and barriers. This program was authorized by Act 41 in 1981 establishing a $35 million Coastal Protection Trust Fund.

The legislative report which accompanied the passage of Act 41 recommended that the State initiate construction activities to restore three coastal barrier areas subject to critical erosion, and to initiate pilot projects aimed at the creation of land in the Mississippi delta by creating levee breaks to initiate new crevassee-splay subdeltas. Also, plans have been proposed to siphon fresh water from the Mississippi across the levees to improve the water quality in some of the coastal marshes subject to increased saltwater encroachment.

Act 41 programs are moving ahead on schedule with the initial research component of the barrier restoration program essentially complete. The three affected areas include CBRS units. The barriers chosen for restoration are: (1) Grand Ronquille area, (2) the eastern part of Isles Dernieres and (3) Holly Beach - Peveto Beach area. In all these areas plans are to construct some basic engineering "anchor" structures and then nourish the beach with sand to be dredged from offshore deposits.

Local Actions

Cameron Parish, Jefferson Parish and the town of Grand Isle passed resolutions during the phase of hearings CBRA that argue against including the barrier islands and chenier ridges in those parishes in the CBRS. The arguments are of two kinds. Cameron Parish argues that the only developable land in that Parish are the chenier ridges. If they are included in CBRA, the future growth of the Parish is severely affected.

The Jefferson Parish argument is similar to that of the State: restoration of the barriers helps protect valuable estuarine resources.

Private Sector Initiatives

No information is available at this time.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIERS IN LOUISIANA

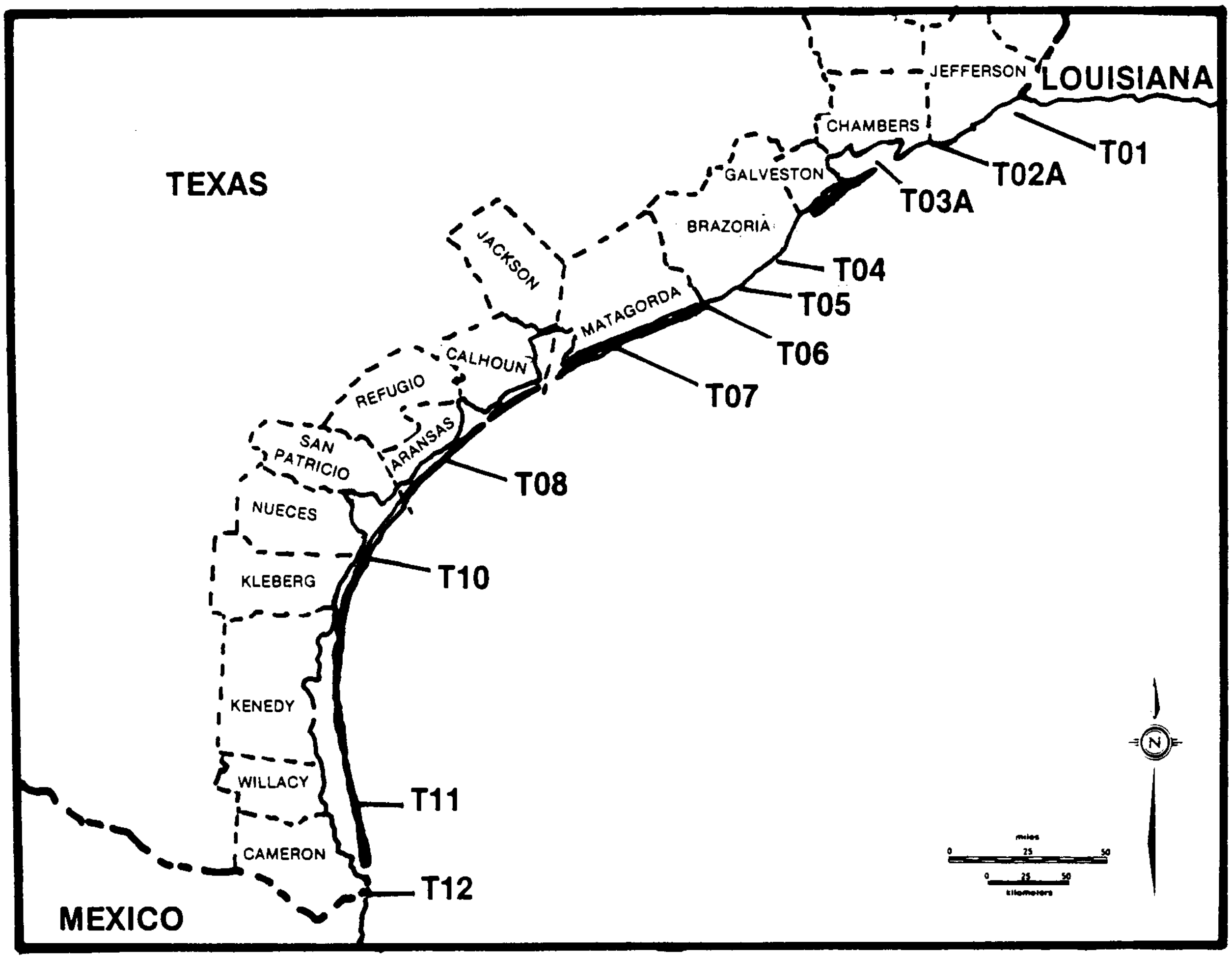
ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
LA-01	ISLE AU PITRE	ST. BERNARD	1	ISLE AU PITRE DOOR POINT	4.03	5950	PRIVATE
LA-02	GRAND ISLAND	ST. BERNARD	1	GRAND ISLAND PASS	3.31	6272	PRIVATE
LA-03	CHANDELEUR ISLANDS	ST. BERNARD PLAQUEMINES	1	CHANDELEUR LIGHT NORTH ISLANDS NEW HARBOR ISLANDS FREEMASON ISLAND STAKE ISLANDS GRAND GOSIER ISLANDS BRETON ISLANDS	39.14	61000	MIXED
LA-04	FREEMASON ISLAND	ST. BERNARD	1	FREEMASON ISLAND	2.51	4275	PROTECTED
S-01	BASTIAN BAY COMPLEX	PLAQUEMINES	1	TRIUMPH BURAS BASTIAN BAY PASS TANTE PHINE	7.15	12050	ADDITION TO CBRS UNIT
S-01A	BAY JOE WISE COMPLEX	PLAQUEMINES	1	BAY RONQUILLE BASTIAN BAY	3.21	4500	ADDITION TO CBRS UNIT
S-02	GRANDE TERRE ISLANDS	PLAQUEMINES	3 1	BARATARIA PASS BAY RONQUILLE	5.43	9150	ADDITION TO CBRS UNIT
LA-05	GRAND ISLE	JEFFERSON	3	BARATARIA PASS	0.89	220	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
S-03	CAMINADA	JEFFERSON LAFOURCHE	3 3	CAMINADA PASS LEEVILLE	4.65	25560	ADDITION TO CBRS UNIT
S-04	BAY CHAMPAGNE	LAFOURCHE	3	BELLE PASS LEEVILLE PELICAN PASS CALUMET ISLAND	0.25	17640	ADDITION TO CBRS UNIT
S-05	TIMBALIER ISLAND	LAFOURCHE	3	TIMBALIER ISLAND CAT ISLAND PASS CALUMET ISLAND	N/A	4430	ADDITION TO CBRS UNIT
S-06	ISLES DERNIERES	TERREBONNE	3	EASTERN ISLES DERNIERES CENTRAL ISLES DERNIERES WESTERN ISLES DERNIERES	N/A	23220	ADDITION TO CBRS UNIT
S-07	POINT AU FER	TERREBONNE ST. MARY	3	PLUMB BAYOU FOURLEAGUE BAY EAST BAY JUNOP POINT AU FER OYSTER BAYOU POINT AU FER NE LAKE SALVE BELLE ISLE POINT CHEVREUIL LOST LAKE	15.53	128650	ADDITION TO CBRS UNIT

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
LA-06	MARSH ISLAND	IBERIA	3	MOUND POINT LAKE POINT BAYOU BLANC CYPREMORT POINT BAYOU LUCIEN HELL HOLE BAYOU	18.75	80550	PROTECTED
S-08	CHENIERE AU TIGRE	VERMILION IBERIA	3 7	CHENIERE AU TIGRE REDFISH POINT FEARMAN LAKE HELL HOLE BAYOU	10.60	38920	ADDITION TO CBRS UNIT
LA-07	FRESHWATER BAYOU	VERMILION	7	CHENIERE AU TIGRE MULBERRY ISLAND EAST MULBERRY ISLAND WEST	16.32	29830	PRIVATE
S-09	ROLLOVER	VERMILION	7	PECAN ISLAND MULBERRY ISLAND WEST FLOATING TURF BAYOU ROLLOVER LAKE	N/A	3290	ADDITION TO CBRS UNIT
LA-08	ROCKEFELLER REFUGE	VERMILION CAMERON	7	FLOATING TURF BAYOU BIG CONSTANCE LAKE ROLLOVER LAKE DEEP LAKE COW ISLAND GRAND CHENIER HOG BAYOU	26.49	55730	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
S-10	MERMENTAU RIVER	CAMERON	7	HOG BAYOU GRAND CHENIER GRAND BAYOU HACKBERRY BEACH CREOLE	5.87	16720	ADDITION TO CBRS UNIT
LA-09	CAMERON	CAMERON	7	GRAND BAYOU CAMERON	12.51	4460	MIXED
LA-10	CALCASIEU PASS	CAMERON	7	HOLLY BEACH CAMERON PEVETO BEACH	10.68	26460	PRIVATE
S-11	SABINE	CAMERON	7	SMITH BAYOU PEVETO BEACH JOHNSONS BAYOU TEXAS POINT WEST OF JOHNSONS BAYOU PORT ARTHUR SOUTH	4.45	13970	ADDITION TO CBRS UNIT
Totals:					191.77	572,847	

COASTAL BARRIER RESOURCES SYSTEM
TEXAS UNITS



TEXAS

The Texas coast consists of 367 miles of barrier islands, spits, and deltaic shorelines. Of this, about 60% is eroding, some at very rapid rates, 33% is essentially stable and 7% is presently accreting. The latter condition is essentially restricted to areas updrift of human-made obstacles to longshore sand transport, such as jetties (McGowen et al., 1977).

The demographic trends demonstrate rapid increase in coastal population. In 1980 about 1/3 of the State population, or about 4.3 million people, lived within the first two tiers of counties bordering the coastline. These counties constitute a band about 50 miles wide (Davenport 1980). The rapid increase in development on Texas barrier islands over the last decade may possibly be attributed both to the demand for such housing by the growing population in the coastal cities and the availability of federal flood insurance, development subsidies and disaster relief which reduced the financial risk of owning a second home on the beach.

CBRS Units

Unit Name	Unit #	County	Beach Length
Sea Rim	T01	Jefferson and Port Arthur	2.5
High Island	T02A	Jefferson and Galveston	11.6
Bolivar Pennisula	T03A	Galveston	9.6
Follets Island	T04	Brazoria	9.4
Brazos River	T05	Brazoria	4.0
Sargent Beach	T06	Matagorda	4.5
Matagorda Peninsula	T07	Matagorda and Calhoun	52.6
San Jose Island Complex	T08	Calhoun	32.9
North Padre Island	T10	Kleberg	6.4
South Padre Island	T11	Willary and Cameron	25.8
Boca Chica	T12	Cameron	6.5

The Texas CBRS units are characteristically sandy barriers with grass and shrub-covered ridges. Because of the stability of the Texas coastal area, as compared to the Mississippi delta region of Louisiana, the barriers are generally older. Galveston and Matagorda Islands date back nearly 4000 years. The other wide barriers are probably of similar age. CBRS units located on one of the two major deltaic headlands (Brazos-Colorado and Rio Grande deltas) are generally erosive and have a low topographic profile with many washover channels and fans. Examples of this are Follets Island, Sargent Beach and the Matagorda Peninsula on the upper coast, and South Padre and Boca Chica Islands on the lower coast.

A brief description of each CBRS unit in Texas is provided below. Each unit is identified by its number, name, and the county in which it is located.

T01-Sea Rim (Jefferson & Port Arthur): This unit is bounded east and west by the Sabine River, Port Arthur Ship channel and a line which runs southward from the southwestern corner of Fence Lake, respectively. The northern boundary trends southwesterly along the shores of Keith Lake and Salt Lake. The coastal segment of T01 is situated between the Texas Point National Wildlife Refuge to the east and Sea Rim State Park to the west.

A modern strandplain and chenier system characterize this unit. Cheniers do not occur elsewhere along the Texas coastline. These beach ridge deposits are situated within extensive salt or brackish marshes. The relief of the ridges generally do not exceed five feet. Due to the generally low regional elevation, storm surges generated by hurricanes can submerge the entire unit. An active processes map published by Fisher, et al. (1973) indicates that the entire area was inundated by Hurricanes Carla (1962) and Beulah (1967).

T02A-High Island (Chambers, Galveston and Jefferson): This unit extends from the westward boundary of Sea Rim State Park to the community of Gilchrist to the west of High Island. The community and industries of High Island are located atop a salt dome and are excluded from the CBRS unit but Horseshoe Marsh just north of High Island is protected by ÇBRA. The landward boundary of the High Island unit is the Galveston intracoastal waterway.

The beaches of T01 are narrow (200 ft between the low-tide and first line of vegetation) and eroding. The beach material contains a lot of shell material. The-low lying narrow beaches are frequently affected by storm generated waves which leave washover fans in the back beach region (Fisher et al., 1973). The region landward of the beach is marked by fresh to brackish water marshes with predominantly fine grained, muddy substrate. The rare mesquite and live oaks are included in the list of vegetation populating the strandplaind flats. Sites of active or potential washover channels have been identified west of the Island. Hurricanes Beulah and Carla flooded the entire T02 unit. Only High Island escaped flooding.

T03A-Bolivar Peninsular (Galveston): This unit is comprised of six sub-units. The Bolivar Peninsula unit extends roughly from Rollover Pass to within a mile of the peninsula's southwestern tip. New land formed by spit accretion on the west side of the peninsula are considered state owned (Fisher et al., 1973). The six units are contained between Gulf beaches and the Galveston Intracoastal Waterway (GIWW).

Bolivar Peninsula, the first detached landform observed west of the Louisiana/Texas border, is comprised of prograded beach ridges. The source of sand for the peninsula is thought to be eroded deltaic headlands near High Island. The predominant southwesterly longshore sediment transport direction in this area supports that observation. Swales, the term for the lower elevations observed between the beach ridges are sites for finer sediment accumulation, and salt marsh type communities.

In the past Bolivar Peninsula was incised by several tidal inlets, two of which have left noticeable deposits on the landward side of the beach ridge system. The saltwater marsh which extends in two lobate fans back into East Bay has grown over flood tidal deltas deposited by past tidal inlets. Beach ridges which curve sharply landward are other evidences of past inlet locations. The saltwater marsh which borders the GIWW, the landward CBRS boundary, is separated from the beach ridge system by sparsely vegetated to unvegetated subaerial tidal flats, characterized by seasonal evaporite crusts.

Topographic maps of the Bolivar Peninsula indicate that the highest point of the beach ridges do not, on average, lie much more than five feet above mean sea level. The susceptibility of this area to flooding was exemplified by the storm surges produced by Hurricanes Carla (1961) and Beulah (1967). The entire peninsula was submerged. The beach along Bolivar Peninsula is narrow and erosive at the eastern end of the unit but widens to the west where the beach is in equilibrium and then accreting nearer to the inlet at the westernmost portion of the peninsula bounding the Bolivar Roads ship channel.

T04-Follets Island (Brazoria): This unit lies between San Luis Island to the east and the community of Surfside Beach to the west. It is continuous for approximately 10 miles except for three breaks or "corridors" representing established communities. Gulf beaches form the seaward boundary to the unit while state-owned, submerged land of Christmas and Drum Bays are the landward edge. The landward and westernmost portion of the CBRS unit is separated from Brazoria National Wildlife Refuge by the Gulf Intracoastal Waterway.

Evidence of beach accretion downdrift is observed only near San Luis Island. Susceptibility of this unit to wave attack and inundation is shown by the presence of at least five regions of frequent storm washovers. Although these channels are healed during regular wave conditions, they are easily reoccupied during intensified storm wave conditions. The back side of Follets Island is characterized by small, vegetated washover fans.

The environment of Follets Island (moving seaward to landward) is characterized by ridge and swale topography. The beach ridges may be lightly vegetated with grass while the swales are grass covered and/or mud filled. Bordering the beach ridges are wind-tidal flats (Fisher et al., 1973). These essentially barren flats support algae communities during infrequent, seasonal flooding. A large, unvegetated active washover fan is situated to the south of the western portion of Christmas Bay. Smaller, but still distinct fan-like deposits are observed in the southwestern corner of Drum Bay and the easternmost portion of Swan Lake.

Man's utilization of the island has been primarily as a coastal community.

T05-Brazos River Complex (Brazoria): This unit is broken into three sub-units, which contain, east to west, Qunitana Beach, Bryan Beach, and the area between the San Bernard River and the new Brazos River channel, respectively. The accreting land of the new Brazos River Delta south of the westernmost sub-unit is not included CBRS. The sub-units of Quintana and Bryan Beach are separated by a small coastal community approximately 1/3 of a mile wide. The Bryan Beach State Recreation Area is located between the Bryan Beach sub-unit and the new Brazos River channel. The GIWW comprises the landward boundary of unit T05.

The Brazos-Colorado fluvial deltaic system supplied the sediment for the evolution of the Texas coast between San Luis Pas and Brown Cedar Cut, which includes CBRS unit T05 and Sargent Beach unit T06 further west. These beaches exhibit ridge and swale topography with elevations generally lower than 5 feet. As a result this region is highly susceptable to damaging storm surge and accompanying intensified wave attacks. This region has a probability of hurricanes, and has been the site of landfall for two minor hurricanes (Fern (1971) and Delia (1973). These hurricanes produced 6 foot and 4.5 foot surges respectively.

Since the Brazos River was diverted to the new channel in 1929, the beachfront of Quintana Beach and Byan Beach has been eroding at an average rate of 6.3 ft/yr. To the southeast of the new river channel, where the river releases sediments in a deltaic form, the coastline is building out at an average annual rate of 19.6 feet (Morton and Pieper, 1976). The new Brazos River Delta land lies south of the westernmost sub-unit of CBRS T05, and is not included in it. This sub-unit without beach front exposure is comprised primarily of low elevation saltwater marsh, as are the landward portions of the eastern sub-units from the rear of the barrier to the GIWW. The landward fringes of unit T05 are sites of spoil mounds dredged from the GIWW. A scar from an old GIWW is observed in the westernmost subunit of T05.

T06-Sargent Beach (Matagorda): This unit is a narrow stretch of coastline which extends from the western edge of Cedar Lakes, 4.3 miles westward to a small, apparently expanding coastal community. The landward boundary is, again, the GIWW.

The dominant southwest transport of incident waves redistributed the sands to form this stretch of coastline. Without a recent source, less sediment is moving into the system than is moving out (to the southwest) of the system. According to Morton and Pieper (1975), Sargent Beach Unit T06 is eroding at rates in excess of 10 ft/yr.

For this portion of the Texas coast, Sargent Beach is typically narrow and low in elevation (5 feet). Its discontinuous dune line is subject to overwash by hurricane storm surge and accompanying waves. Extreme hurricane storm surges have been recorded which inundated the entire shoreline between San Luis Pass and Brown Cedar Cut (U.S. Army Corps, 1962). In fact, due to its low elevations, this stretch of coastline is one of the most affected by severe storms in the southern coastal states. At least a dozen damaging storms have affected the immediate vicinity of Freeport. Predominantly in a natural state, poststorm damage is limited to the blanketing of beach vegetation under a layer of overwashed sands.

T07-Matagorda Peninsula (Calhoun and Matagorda): This unit fronts East Matagorda and Matagorda Bay between Caney Creek to the east and Pass Cavallo to the west. Caney Creek essentially marks the eastern beginning of the Peninsula. The whole peninsula is included in the unit except for a small area adjacent to and east of the Colorado River. According to aerial photographs a small development exists in this area.

The source of sand for mategorda Peninsula was: (1) Brazos-Colorado deltaic system and (2) previously deposited inner shelf sands. Matagorda Peninsula formed as a southwestwardly growing barrier spit. Between 1925 and 1935, the Colorado River built across and split Matagorda Bay. In 1936 a channel was dredged through the Peninsula connecting it with the Gulf. The volume of sediment since supplied by the river has been less than that transported longshore, causing the peninsula to remain in an eroding state.

Matagorda Peninsula is a low profile barrier east of the Colorado River, a high profile barrier to the west. East of the Colorado, discontinuous dunes are low (5 ft). West of the river some isolated dunes attain heights of 25 ft. More continuous dunes from 10-15 feet high occur between Greens Bayou and the Matagorda Ship Channel. From east to west along the peninsula the beach width increase (100 to 400 feet) with a more abundant supply of sand.

Matagorda Peninsula is subject to damage from high waves and storm surge in hurricanes and other tropical storms. Hurricane Carla (1962) crossed the Texas coast at Pass Cavallo initiating a storm surge in excess of 12 feet that submerged a large percentage of the Matagorda Peninsula. East of the Colorado River to the CBRS boundary 29 active or potential washover channels have been observed in a span of 59 miles, or a frequency of 1.5 washovers/mile. West of the Colorado, this ratio decreases to 1.1/mile to Green's Bayou. Only one washover channel was identified by Morton et al. (1974), between Greens Bayou and the westernmost extent of the unit at Decros Point. According to Morton et al. (1974), the Matagorda Peninsula is eroding at high rates on the western shore of Brown Cedar Cut (10-15 ft./yr), the eastern shore of Green's Bayou (5-10 ft./yr), and at Decros Point (5-15 ft./yr). The north jetty of Matagorda Ship Channel has caused the updrift beach on Matagorda Peninsula to accrete. The remainder of the island is undergoing erosion at a rate of less than 5 ft/yr.

T08-San Jose Island Complex (Aransas): This unit includes Matagorda Island from Panther Point Lake southward to Aransas Pass. This unit separates Aransas and Espiritus Santo Bay from the Gulf of Mexico with beaches between 200 and 350 feet wide. The more northern portion of lower Matagorda Island between Panther Point and Pass Cavallo is apparently included in state owned Matagorda Island State Park. The saltwater marsh on the bay side of Matagorda Island, north and east of Mesquite Bay is also part of this state park. San Jose Island is also part of this unit.

The fore dune system of these high profile barriers is relatively continuous along this unit and ranges up to 50 feet in elevation. However, the average elevation is between 15 and 20 feet. This tremendous bank of sand buffers erosion rates during storm conditions. Storm waves break upon the fore dune line and pull the sand to offshore deposits. Post-storm healing of the beach and fore dune ridges is observed in this system. Few washover and potential washover channels were identified by Morton and Pieper (1974), for this region. Hurricane Carla which made landfall at Pass Cavallo produced a storm surge in excess of 12 feet that flooded 95% of Matagorda and San Jose Island. Beulah, a hurricane of average intensity caused extensive flooding in low lying areas.

TIO-North Padre Island (Kleburg) This unit follows Padre Island National Seashore northward to the boundary of Kleburg and Nueces County. This county boundary marks the beginning of the "Padre Isles" development. The landward boundary of thls CBRS unit cuts off the back third of the island which contains blowout dune systems, saltmarsh and dredge spoil mounds whereas the entire width of the island is protected by the National Seashore.

Padre Island exhibits high profile barrier characteristics with well developed, relatively continuous fore dunes averaging 20 to 25 feet in elevation. Fronting this dune line is a beach ridge and swale system with elevations between 5 and 10 feet. The combination of wide beaches, high, well developed fore dunes, and an abundant supply of sand makes North Padre more resilient to storm and hurricane activities. The high dune line helps dissipate breaking storm waves, preventing the occurrence of numerous washovers. The large supply of sand in the system replenishes the beach sands at the expense of the fore dune ridge. During Hurricane Carla (1962), 150 feet of the dune line was eroded. However, strong winds built up sand in mounds in front of the eroded dune line. These insipient dunes represent the islands post-storm healing response for the fore dune ridges. Longshore sediment transport along northern Padre Island changes direction from southerly to northerly depending on the season. Net southerly transport affects northern Padre during winter months changing to northerly transport during summer months. Padre Island and Mustang Island (which is north of this unit) have historically been accretional, however, a diminished sediment supply is probably why this trend is presently reversing. Non-critical erosion rates between 1-3 feet/yr have been recorded for this area in the past century.

Environments toward the back of Padre Island include dunes, bay margin sand shoals, underwater grass flats, and barren, infrequently flooded wind-tidal flats. The lower elevations observed on the landward side of the barrier are frequently flooded during storm surges or by water piled against the back of the barrier during strong and persistant northerly winds.

T11-South Padre Island (Cameron and Willary): This unit extends southward from the Mansfield Ship Channel to the northern end of the road originating from the Port Isabel development. This unit covers the entire width of the island. Padre Island is separated from the mainland by Laguna Madre. Prior to de-authorization in 1978, the northern part of this unit was included in Padre Island National Seashore.

South Padre Island exhibits a moderate profile in comparison to the 20-25 foot fore dunes of middle and northern Padre Island. The southern part of the island is marked by a discontinuous dune line with elevations in the 10-15 foot range. These dunes are breached in numerous places by old and recent washover channels. South Padre Island is sesceptible to washover because of both its low profile and relatively narrow width (Morton and Peiper, 1974). Storms in 1933 and 1967 (Beulah) produced surges approaching 12 feet which caused extensive salt marsh flooding and substantial retreat of the existing of the existing fore dune ridge. Hurricane Carla (1962) caused as much as 150 feet of fore dune retreat on south Padre (Hayes, 1973). Hurricane Allen (1980) completely inundated most of CBRS unit T11 changing its morphology to that of a wash-over terrace (Nummedal, 1982).

The southern Texas coast was built by northerly directed longshore sediment transport. The source of this coarse sediment was primarily older delta deposits of the Rio Grande

River. The accretionary phase of Padre Island and Brazos Island, further south, has been altered to an erosional trend by decreases in sediment supply. This decrease is the result of: (1) dams on the Rio Grande, (2) disruption of longshore sediment transport by jetties at the Brazos-Santiago, and (3) lack of sufficient coarse sediment in near-shore inner-shelf deposits. Generally, net erosion on south Padre Island has been reported in excess of 10 ft/yr, except in the vicinity of the Mansfield Ship Channel jetty.

T12-Boca Chica (Cameron): This unit is contained between the jettied channel of Brazos-Santiago Pass and the mouth of the Rio Grande River. The unit is actually comprised of two sub-units separated by the Brazos Island State Recreation Area. The northern sub-unit lie beetween South Bay and the Gulf of Mexico. The southern sub-unit fronts deltaic deposits whose origins are probably the Rio Grande River.

Brazos Island is an accumulation of delta front sands located an the flanks of the Rio Grande River. Sediments derived from the Rio Grande River were transported northward by longshore currents. The island's morphology can be described as discontinuous dunes with elevations averaging 20 feet. Extensive washover channels exist between the dune ridges. In general, the fore dune ridge is poorly defined in this CBRS unit. An accretionary period observed at Brazos Island between 1854 and 1937 has reversed to an erosional trend. Brazos Island is presently eroding at rates between 10 and 40 ft/yr. Extreme erosion occurs near and is influenced by the migrating nature of the Rio Grande River outlet.

The Brazos Island shoreline has historically changed dramatically due to shifts in the Rio Grande River outlet. Charts between 1854 and 1937 show the outlet migrating northward over 4,000 feet. A southward movement of the Rio Grande channel outlet (1,000 feet) was recorded between 1958 and 1960. In 1962 Hurricane Carla cut a new channel 4,000 feet to the south near the vicinity of the originally observed outlet location in 1854. After the southerly relocation the river mouth again began migrating northward. In 1967 Hurricane Beulah caused another southward shift of the Rio Grande. However, the cycle of northerly channel migration resumed. By 1974 the channel had moved 750 feet to the north.

Coastal Resource Management

Texas coastal management began in 1937 with the establishment of a Coastal Division of the Texas Game and Fish Commission. This was also the year of Congressional passage of the Pittman-Robertson Act, which established an excise tax on firearms and ammunition with the earnings earmarked for wildlife management.

The public trust doctrine forms the basis for State ownership of coastal wetlands: "all lands beneath tidal waters are held in trust for the use and benefit of the whole public". The seaward limit on State lands is the 3-league (9m) boundary. The landward limit, on the other hand, has a rather complex definition. Since early Texas law was based on Roman civil law principles, there is one landward boundary definition on littoral parcels with a title issued by Spain, Mexico or Texas prior to 1840. The landward limit in these cases extends to mean higher high water. Since Texas adopted common law principles in 1840, titles issued after that date define the boundary as mean high tide. On many flat beaches, and particularly on the extensive wind-tidal flats of south Texas, the difference in these two elevation definitions may translate into large horizontally distances.

A major piece of early Texas coastal legislation was the Texas Open Beaches Act, passed in 1959. This Act, (Texas Natural Resources Code 61.001) stated:

> "It is declared and affirmed to be the public policy of this State that the public, individually and collectively, shall have the free and unrestricted right of ingress and egress to and from the State-owned beaches bordering on the seaward shore of the Gulf of Mexico, or if the public has acquired a right of use or easement to or over an area by prescription, dedication, or has retained a right by virtue of continuous use in the public, the public shall have the free and unrestricted right of ingress and egress to the larger area extending from the line of mean low tide to the line of vegetation bordering on the Gulf of Mexico."

The Texas Open Beaches Act has successfully maintained Texas beaches for the use of the public and has been strengthened by litigation over the years.

The next step in coastal management came in 1973 with the passage of the Coastal Public Lands Management Act (CPLMA). Related to this was the Coastal Wetlands Acquisition Act passed in 1977. The Management Act pertains to State-owned submerged land and State-owned islands or portion of islands. Originally, coastal public lands were sold for navigation purposes for $1 per acre. In 1969, a moratorium was put on such sales, and the passage of CPLMA in 1973 revised the laws to permit only leasing, not purchasing. Also, the Act provided for comprehensive State management of all the submerged lands. It became the State's policy to protect the biologically most sensitive coastal land areas by keeping dredging permits to a minimum and by requiring dredged material to be disposed on upland areas "to the extent practicable".

Texas took one more step to prevent wetlands damage in 1977 with the passage of the Coastal Wetlands Acquisition Act. This Act authorized the Texas Parks and Wildlife Department to acquire, by purchase or condemnation, those coastal wetlands most essential to the public interest. As of 1984, however, no money has actually been appropriated for this use.

The regulation of coastal activities, implementation of State and federally funded programs and studies of coastal issues are distributed among a number of State agencies, including:

The Governor's Budget and Planning Office which collects information and serves as the central coordinating agency for federal, State and regional planning.

The General Land Office which is responsible for management of State owned lands, including the submerged bay bottoms. They collect State revenues accruing from lease of such lands.

The School Land Board and GLO which jointly manage leases for energy extraction from State lands.

The Texas Coastal and Marine Council which was established by the legislature to act as an information agency and to help manage joint State and federal programs.

The Parks and Wildlife Department which manages all wildlife resources and operates an extensive State park system.

The Department of Highways and Public Transportation which is responsible for State funds and Federal contributions to highway construction and maintenance. Together with the Corps of Engineers they are also responsible for administration of the Gulf Intracoastal Waterway (GIWW).

Additionally, the State administers the following:

The Texas Open Beaches Act, initially a declaration of the public's right to unimpeded use of the State's beaches, has, in effect, become a strong management tool. Public acquisition of private property can be accomplished either by "dedication" which implies formal dedication of title or commonly accepted public usage with the consent of the owner, or by "prescription" which implies that the public may take the land from the private owner.

The issue of State acquisition of private land becomes particularly relevant after storm-induced shoreline retreat which has left buildings standing on the public beach, i.e., seaward of the vegetation line.

Shortly after the passage of the Open Beaches Act (1959), the State's right to such land was settled in the "Seaway Co. Case" and the "Moody Case". In the Seaway Co. case, the issue was whether barriers could be erected by a private company (on Galveston Island) to limit access to a section of existing beach. The court found that since the beach had been used unrestricted by the public for more than a hundred years, this, in effect, constituted implied dedication of an easement to the public. The man-made barriers were found to be in violation of this principle.

In the Seaway Co. case, the question concerned public usage of the "historical" beach. The aftermath of Hurricane Alicia provided an answer.

Hurricane Alicia made landfall on August 8, 1983, just west of San Luis Pass, to the southwest of Galveston Island. The maximum onshore winds, storm surge and wave energy were concentrated to the east of landfall, along the western half of Galveston Island. In this area the vegetation line was eroded up to 130 feet landward; the vertical down-cutting of the beach amounted to about 5 feet. One year later a lot of sand had returned to Galveston Island beaches, presumably from the nearshore bars, yet the vegetation line had not moved seaward (Dupre, 1984).

Two law suits have been filed as a result of this hurricane, one was settled in October 1984, the other is still pending. In the first case, the State attorney general filed a suit against those homeowners on Galveston beach whose property was more than 50% destroyed and which was located between the water and the vegetation line after the hurricane. The State argued that structures in this zone were in violation of the Open Beaches Act and should not be rebuilt. The State won the case with a directed verdict in an Austin court. The homeowners have appealed.

A counter-suit has been filed in a Galveston court. In this litigation the Plaintiffs (homeowners) argue that the Open Beaches Act does not imply a rolling easement. Hence, when the public beach erodes, so do the public rights. The case has yet to be heard, but the plaintiffs hope that Galveston will provide a court more sympathetic to their views. Related litigation has been tried before on Galveston Island. In 1970, property owners along the West Beach were charged with violation of the Open Beaches Act. After a delayed trial, as late as 1975, three different judgements were agreed upon by the parties. Most of the defendants (homeowners) refused to concede any public rights to the receding beach, i.e., there was no acceptance of the rolling easement concept. A few homeowners accepted a qualified rolling easement, i.e., they accepted public access to the retreating beach but that the structures on the beach would continue to be used by the owner. A minority of the land owners fully accepted the concept that public rights of beach access should move landward with the receding shoreline.

<u>The CATPOOL insurance program</u> was created by the Texas legislature in the 1960's, after hurricanes Carla, Celia and Beulah had hit coastal settlements on the upper, central and lower Texas coast. This widespread hurricane impact generated legislative support for a program to protect homeowners and persons with legitimate business interests along the coast who found that they were unable to secure insurance through conventional sources. CATPOOL requires that all insurance companies licensed to write property insurance in Texas have to share the risk of major natural catastrophes on a formula basis. The insurance covers wind, hail and fire damage. The State of Texas does not offer flood insurance.

There is no rate subsidy in the Texas CATPOOL program, but companies are entitled to a premium tax credit if the total aggregate payment after a disaster exceeds $100 million. After Hurricane Allen (1980) this provision did not come into effect because aggregate payments were only about $14 million (Dyer, 1983). It appears, however, that after Hurricane Alicia, the total payments from CATPOOL may be on the order of $150 to $200 million (Schwartz, 1984). This would cause the tax credit provision to go into effect.

The CATPOOL program subsidizes coastal property owners at two levels: (1) other property owners subsidize high-hazard coastal development through escalated premiums and (2) the tax payers of the State subsidize the program through the premium tax credit for catastrophic losses. There are liability limits on individual policies. The limit for private homes is $200,000; for commercial properties the policies may go to $1,000,000. The total current liability for the CATPOOL program is $2 75 billion (J. Douglas, State Insurance Board).

The costly impact of Hurricane Alicia has created a move to reassess the CATPOOL program. Some argue that the State should follow the Federal example set by CBRA and reduce the State subsidies for insurance on coastal barriers. Others argue the opposite, that the State should step in to provide the insurance coverage being withdrawn through the passage of CBRA.

Dune protection. An early act of some significance to Texas coastal dune protection was the 1970 decision to require permits from the county commissions for removal of sand, marl, gravel and shell within 1500 feet of any public beach.

In 1973, the State legislature passed the "Sand Dune Protection Act" which authorized those counties with jurisdiction over coastal barriers to establish a dune protection line 1000 feet landward of the mean high tide line. Once a county has established such a dune protection line, a permit must be obtained from the county commission to disturb a dune or vegetation seaward of the line.

One feature of the Act is its optional adoption by the individual counties. To date, Nueces (Corpus Christi), Galveston and Matagorda counties have adopted a dune protection line. Only Nueces County has included all of the barrier island sand dunes under its dune protection scheme.

If a dune area under consideration for some alteration is judged as critical to the protection of State-owned lands, then the General Land Office may comment on the proposed activities. There is no required State permit, however, nor can the Land Office comment if the county has not adopted a dune protection line.

IDENTIFICATION INFORMATION SUMMARY FOR COASTAL BARRIER UNITS IN TEXAS

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
T-01	SEA RIM	JEFFERSON	9	TEXAS POINT PORT ARTHUR SOUTH CLAM LAKE BIG HILL BAYOU SABINE PASS	12.32	29684	ADDITION TO CBRS UNIT
T-02A	HIGH ISLAND	JEFFERSON GALVESTON	9	WHITES RANCH MUD LAKE HIGH ISLAND CLAM LAKE BIG HILL BAYOU STAR LAKE SOUTH OF STAR LAKE	9.09	12123	ADDITION TO CBRS UNIT
T-03A	BOLIVAR PENINSULA	GALVESTON	9	FLAKE PORT BOLIVAR THE JETTIES CAPLEN FROZEN POINT	0.39	13892	ADDITION TO CBRS UNIT
TX-01	FORT TRAVIS	GALVESTON	9	GALVESTON	0.67	60	PROTECTED
TX-02	EAST BEACH	GALVESTON	9	GALVESTON THE JETTIES	4.10	500	PROTECTED
TX-03	WEST PELICAN SPIT	GALVESTON	9	GALVESTON	1.55	200	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
TX-04	SWAN LAKE	GALVESTON	9	VIRGINIA POINT	2.10	790	UNKNOWN
TX-05	GALVESTON ISLAND	GALVESTON	9	LAKE COMO SEA ISLE	1.51	5740	PROTECTED
TX-06	SNAKE ISLAND	GALVESTON	9	SEA ISLE	1.56	2510	MIXED
TX-07	BAY HARBOR	GALVESTON	9	SEA ISLE	0.13	630	PROTECTED
TX-08	SAN LUIS PASS	GALVESTON BRAZORIA	22	SAN LUIS PASS	0.76	705	PROTECTED
T-04	FOLLETS ISLAND	BRAZORIA	22	HOSKINS MOUND CHRISTMAS POINT FREEPORT OYSTER CREEK	1.60	35050	ADDITION TO CBRS UNIT
T-05	BRAZOS RIVER COMPLEX	BRAZORIA	22	FREEPORT JONES CREEK CEDAR LAKES EAST	6.41	16920	ADDITION TO CBRS UNIT
T-06	SARGENT BEACH	BRAZORIA	22	CEDAR LAKES EAST CEDAR LANE NE JONES CREEK	5.58	19190	ADDITION TO CBRS UNIT
		MATAGORDA	14	CEDAR LAKES WEST			

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
T-07	MATAGORDA PENINSULA	MATAGORDA CALHOUN	14	CEDAR LAKES WEST SARGENT BROWN CEDAR CUT DRESSING POINT PALACIOS POINT PALACIOS SE MATAGORDA MATAGORDA SW SOUTH OF PALACIOS POINT DECROS POINT PORT O'CONNER	3.02	63100	ADDITION TO CBRS UNIT
TX-09	COON ISLAND BAY	CALHOUN	14	PALACIOS	5.54	588	PRIVATE
TX-10	SHELL BEACH	MATAGORDA	14	TURTLE BAY	1.29	775	PRIVATE
TX-11	MATAGORDA ISLAND	CALHOUN	14	PORT O'CONNOR PANTHER POINT PASS CAVALLO SW PANTHER POINT NE LONG ISLAND MOSQUITO POINT	22.25	63435	PROTECTED
TX-12	SHOALWATER BAY	CALHOUN	14	PORT O'CONNOR LONG ISLAND MOSQUITO POINT SEADRIFT NE	10.63	15715	UNKNOWN

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
T-08	SAN JOSE ISLAND COMPLEX	CALHOUN NUECES	14 27	PANTHER POINT MESQUITE BAY ST. CHARLES BAY ALLYNS BIGHT ST. CHARLES BAY SW ESTES PORT ARANSAS ST. CHARLES BAY SE	1.65	49740	ADDITION TO CBRS UNIT
TX-13	GOOSE ISLAND	ARANSAS	14	ST. CHARLES BAY ST. CHARLES BAY SW	N/A	500	PROTECTED
TX-14	ROCKPORT BEACH	ARANSAS	14	ROCKPORT	0.99	232	UNKNOWN
TX-15	LIVE OAK POINT	ARANSAS	14	ROCKPORT	1.22	N/A	UNKNOWN
TX-16	PORT ARANSAS	NUECES	27	PORT ARANSAS	0.58	136	PROTECTED
TX-17	MUSTANG ISLAND	NUECES	27	OSO CREEK NE CRANE ISLANDS NW CRANE ISLANDS SW ESTES PORT ARANSAS PORT INGLESIDE	14.20	51734	PROTECTED

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
T-10	NORTH PADRE ISLAND	KLEBURG KENEDY NUECES WILLACY	27	PITA ISLAND SOUTH BIRD ISLAND CRANE ISLANDS SW SOUTH BIRD ISLAND NW SOUTH BIRD ISLAND SE MARIA ESTELLA WELL POTRERO LOPENO NW POTRERO LOPENO SW POTRERO LOPENO SE SOUTH OF POTRERO LOPENO SE SOUTH OF POTRERO LOPENO NW SOUTH OF POTRERO LOPENO NE POINT OF ROCKS PORT MANSFIELD YARBOROUGH PASS POTRERO CORTADO	66.17	244000	ADDITION TO CBRS UNIT
TX-18	BAFFIN BAY	KLEBERG	27	POINT OF ROCKS	1.65	328	PRIVATE
TX-19	STARVATION POINT	KLEBERG	27	KLEBERG POINT	1.76	194	PRIVATE
TX-20	CAYO DEL INFIERILLO	KLEBERG	27	KLEBERG POINT	2.45	1860	PRIVATE
TX-21	KLEBERG POINT	KLEBERG	27	KLEBERG POINT	1.42	268	PRIVATE

ID Code	Unit Name	County/ Parish	Cong. Dist.	USGS Topographic Quadrangle(s)	Shoreline Length (in miles)	Acreage (in acres)	Status
T-11	SOUTH PADRE ISLAND	WILLACY CAMERON	27	SOUTH OF POTRERO LOPENO SE GREEN ISLAND NORTH OF PORT ISABEL NW NORTH OF PORT ISABEL SW PORT ISABEL NW THREE ISLANDS PORT MANSFIELD HAWK ISLAND LA COMA	N/A	59145	ADDITION TO CBRS UNIT
TX-22	ANDY BOWIE	CAMERON	27	PORT ISABEL NW	0.53	567	PROTECTED
TX-23	ISLA BLANCA	CAMERON	27	PORT ISABEL	0.68	55	PROTECTED
T-12	BOCA CHICA	CAMERON	27	PORT ISABEL MOUTH OF RIO GRANDE	2.15	13280	ADDITION TO CBRS UNIT
Totals:					185.95	703646	

Appendix S

OVERVIEW OF NATURAL AREA PRESERVATION EFFORTS INVOLVING THE FEDERAL TAX SYSTEM

Recent efforts to apply tax policy to the conservation of identified natural resource areas have generated a variety of good ideas. Accordingly, many of the tax changes that may be considered as a part of management alternatives for the coastal barrier system have already been discussed in other contexts. A chronology of many of these ideas and a brief reference to the discussion that occurred at the time the idea was introduced is listed below. As each idea is presented, its relevance to CBRA and use as a management tool is indicated.

1974 -- The First Nationwide Outdoor Recreation Plan.

In 1963, Congress enacted legislation to establish a Federal policy with regard to the availability of outdoor recreation resources for the benefit and enjoyment of the American people, (P. L. 88-29, 77 Stat. 49, 16 U.S.C. 4601, 1982). Included in this mandate was the responsibility to "formulate and maintain a comprehensive nationwide outdoor recreation plan...." The Land and Water Conservation Fund Act of 1965, (P. L. 88-578, 78 Stat. 897,16 U.S.C.4601-4 (1982)) (L&WCF Act), reenforced this responsibility by establishing a grant program which states could utilize if they first developed individual Statewide Comprehensive Outdoor Recreation Plans (SCORPS).

The First Nationwide Outdoor Recreation Plan was completed in 1974. One recommendation in this plan concerned the preservation and utilization of the Nation's wetlands for recreation. This recommendation stated the following:

"To encourage interim retention and protection of remaining wetlands, the Administration will seek Congressional approval of legislation which would:

(a) Make development of coastal wetlands less attractive from a tax standpoint by:

1) permitting only a straight line method of depreciation;

2) requiring gains on the sale of improvements to be treated generally as ordinary income;

3) disallowing deductions for draining, dredging, or filling; and

4) providing that deductions for interest and taxes attributable to improvements may not exceed income therefrom.

(b) Allow income tax deductions for charitable contributions of certain less-than-fee interests in real property for conservation purposes.

States which do not have wetlands preservation programs should enact legislation modeled after that proposed above. Such complementary actions are necessary to realize full protection of wetlands."

1974 -- H.R. 5584.

Former Representative Barber Conable introduced H.R. 5584 during the 93rd Congress in 1974 (the Conable Bill) prior to the final release of the First Nationwide Outdoor Recreation Plan. In most respects this bill foreshadowed the wetland recommendations contained in the Plan and placed them into a legislative format. H.R. 5584 is significant for two reasons. First, the subject matter -- coastal wetlands -- encompasses a type of natural resource intrinsic to the CBRS units. Second, its sponsor was a knowledgable and respected tax expert. This legislative proposal is a model for future efforts to conserve significant natural resource areas through changes in tax policy.

1975 -- Publication of Legal Study by the University of Georgia School of Law

In 1975, the University of Georgia published a study concerning tax relief as an incentive to the use of land for outdoor recreational purposes (Quarterman, "Incentives to Use of Land for Outdoor Recreational Purposes: Insulation from Tort Liability & Tax Relief" Office of Special Projects, University of Georgia School of Law, July, 1975.) This study was directed at State and local opportunities and did not address Federal tax provisions. It provided a survey of the law in 1975 and concluded with a model tax incentive statute designed to use a present use value method of assessment as opposed to a fair market value method. Its primary significance to the CBRA study is to emphasize the importance of state and local property taxes in any long term approach to the conservation of the units of the CBRS and to stress the need for coordination between state, local and Federal efforts.

1978 -- State Income Tax Refund Contribution Systems

In 1978, Colorado initiated a State income tax refund contribution system for funding a portion of its natural area preservation program. Other States have since followed that lead. (McCance, "State Income Tax Refund Contribution Systems: A Mechanism For Funding Natural Areas Programs", 2 Natural Areas Journal 17, 1982.) While this approach remains important at the State and local level, it could also have application to Federal tax policy with regard to the conservation of CBRS units.

1980 -- Reforestation Tax Incentives

Pursuant to legislation enacted on October 14, 1980, two new tax incentives have been provided for persons who plant trees on their property (P. L. 96-451 1980). Under this Act, a ten per cent tax credit is provided for tree planting costs such as site preparation, seeds and seedlings, and labor up to $10,000 per year. As a credit, this amount can be subtracted from the amount of taxes otherwise owed to the Federal government. In addition, the owner can also deduct from yearly earnings the full amount, again up to $10,000, over a 7-year period. While identification of those areas suitable for timber production is not considered, this program is an example of the use of Federal tax policy to renew a conservation purpose. To the degree that renewal, as opposed to stabilization, efforts are an appropriate conservation measure, this type of program may have some application to the conservation of the units of the CBRS.

1980 -- National Park Foundation letter

In June, 1979, the late Representative Philip Burton conducted a meeting with interested citizens to analyze available methods of acquiring lands for federal purposes. One result of that meeting was a request to the various participating private conservation organizations to develop and submit to Mr. Burton a coherent package of recommended changes in federal tax laws that would encourage private donations for conservation and preservation purposes. In a letter of April 4, 1980, the National Park Foundation complied with this request by providing the following recommendations:

(1) Carryforward Extension: Extension of the carryforward provisions on all charitable contributions of appreciated property to permit a carryover period of ten years.

(2) Estate Tax Credits: Institution of a provision establishing estate tax credits so that gifts of property directly to the federal government could be considered as in kind payment of estate taxes.

(3) Valuation Panel: Establishment of a Conservation and Preservation Advisory Panel to assist the Commissioner of the Internal Revenue Service in the valuation of property contributed for conservation and/or preservation purposes The functions of this panel would parallel those of the current Art Advisory Panel.

(4) Increased Rate of Deduction for Appreciated Property: Increases in the maximum rate of deduction for gifts of appreciated property. This would involve elimination of the current 30 percent limitation, in favor of a general 50 percent limitation.

(5) Estate Tax Valuation: Application to conservation/preservation property of the favorable valuation rule in estate taxes, which, under current provisions, permits real estate used in farming or closely-held businesses to be valued for estate tax purposes at their actual use, rather than their highest and best use which would reflect their developmental value. Windfalls and improper tax avoidance could be prevented by proper safeguards.

1980 -- Tax Treatment Extension Act of 1980

Section 6 of the Tax Treatment Extension Act of 1980 (P.L. 96-541, 94 Stat. 3207, 26 U.S.C. 170, 1982), addresses the status of the donation of partial interests in land for a conservation purpose. These donations are allowed if they are a qualified real property interest, to a qualified organization, exclusively for a conservation purpose. Proposed regulations to implement these provisions were issued by the U.S. Treasury Department on May 23, 1983 (48 Federal Register 22940) but no final rulemaking has been issued. The Congressional Research Service of the Library of Congress published an overview of this situation on February 29, 1984 (Report 84-48 ENR).

The lack of final regulations and continuing valuation problems have posed a significant problem to conservation programs structured around the donation of conservation easements. One of the principal difficulties is the lack of a rigorous identification process to determine those areas that serve a conservation purpose and that are, therefore, worthy of a tax incentive to encourage their protection. Although the Tax Treatment Extension Act provides a fairly elaborate definition of those areas that can serve a conservation purpose (26 U.S.C. 170(h)(4)), the lack of implementing regulations reduces each donation to case by case analysis. As applied to the units of the CBRS, this means that there is no present assurance that lands within these units will be determined to serve the requisite conservation purpose.

The difficulties regarding the donation of conservation interests are in sharp contrast with donations of an owner's entire interest. There are no conservation purpose limitations on the donation of an owner's entire land interest so long as it is made to a qualified charitable organization. Once again, as applied to CBRS units, this means that an owner can qualify for a gift tax deduction for the donation of his entire interest within a coastal barrier unit despite the fact that the charitable recipient may sell the land for development and utilize the proceeds to further its other than conservation purposes.

Valuation of conservation donations has also become a problem because the value of a donation requires an appraisal The value of the donation should represent the difference in the fair market value before and after the gift. The fair market value is based upon the highest and best use of the property, not its present use. This means that a valuable donation may not result in any change in present use. A farm rich in development potential will still continue to be a farm after the donation of these valuable development rights. As an appraisal matter this result is clear cut. From a tax revenue perspective, however, it has become all too easy to assume that because nothing has changed on the surface, no value has been foregone. This type of policy serves to destroy the purpose of a conservation easement program. It is the protection of this resource in perpetuity, not the apparent windfall of an individual taxpayer that must be considered.

1981 -- Workshop on Public Land Acquisition and Alternatives

In 1981 and again in 1982, the Chairman of the Senate Subcommittee on Public Lands and Reserved Water, Senator Malcolm Wallop (WY), conducted a series of workshops concerning the problems of and alternatives to current land acquisition practices. The first workshop met July 9 and 10, 1981. A Committee Print of that proceeding was also published. (Staff of the Senate Committee on Energy and Natural Resources, 97th Cong., lst Sess., Publication No. 97-34, Workshop on Public Land Acquisition and Alternatives (Comm. Print, October 1981)). Panel VIII of this workshop addressed the topic of the "Private Sector and Tax Policy." (Id 589-654.)

1981 -- H.R. 4680

On October 5, 1981, Representaive Robert Lagomarsino (CA) introduced H.R. 4680 to provide tax relief for the sale or exchange of qualified real property to an eligible conservation authority for a conservation purpose. H.R. 4680, (97th Congress lst Session, 127 Congressional Record, p. H7018, October 5, 1981.) would have excluded from gross income the gain on sales for a conservation purpose. To be eligible, such a sale or exchange had to assure the conservation or preservation of the area in question as a natural area. Qualified real property was defined to be primarily applicable to wetlands.

1982 -- H.R. 6465

On May 21, 1982, Representative Lagomarsino reintroduced his tax bill (H.R 4680) with several clarifications, as H.R. 6465. The primary purpose of the new legislation remained the same, to exclude from gross income for income tax purposes amounts received from certain sales of key natural area lands to qualified organizations, including the various States and the United States, if the primary purpose of such land after the sale was for a conservation purpose, and that purpose was protected in perpetuity. (H.R. 6465, 97th Congress, 2nd Session, 128 CONG. REC. H2600, May 21, 1982).

1982 -- Workshop on Land Protection and Management

The second Wallop workshop was conducted on June 14 and 15, 1982. Its purpose was to examine in greater depth some of the problems and proposed approachs that developed in the first workshop and to examine new land-related issues. With regard to tax policy, this included the examination of a concept paper dealing with tax law changes that could bring about more protection of significant landscapes without the need for fee acquisition by Federal or other levels of government. A Committee Print of the proceeding was again provided. (Staff of the Senate Committee on Energy and Natural Resources, 97th Congress, 2nd Session, Publication No. 97-101, Workshop on Land

Protection and Management , June 1982). Panel VI of this workshop addressed the topic of the "Tax Law Incentives."

1982 -- Tax on Real Property Transfers.

Coastal barrier areas themselves have been the subject of an important new idea that has possible implications for Federal tax policy. As reported by the National Wildlife Federation, several Massachusetts counties and New York towns are protecting coastal and recreational areas from the pressures of development through a tax on real property transfers. Revenues from this tax are being used to purchase and maintain undeveloped land in coastal areas facing rapid development and inadequate legal controls. (Landstrom, "Eastern Communities Initiate Tax to Secure Coastal Habitat", The Leader, August 1984.) The National Wildlife Federation study indicates that Nantucket, Martha's Vineyard, Cape Cod, and the Long Island towns of Southhampton and Easthampton have all sought to impose local taxes on the transfer of real property in order to create a fund to purchase open spaces for recreation and preservation. The study indicates that to do so, these counties and towns have had to seek state legislation granting them authority. Similar state legislation would apparently be required for most, if not all, local units of government within the mid-Atlantic region according to the Federation study.

1982 -- Proposed Tax Legislation to Protect CBRS Units

On October 1, 1982, Representaive Pete Stark (CA) introduced a tax proposal to provide additional protection for the CBRS units. (128 CONG. REC. H8492, October 1, 1982). Because CBRA was then in Conference, Mr. Stark, as Chairman of the Ways and Means Select Revenue Subcommittee proposed a tax bill that would complement the purposes of CBRA. He stated that he was introducing a bill to deny interest expenses for loans used to finance the purchase of dwelling units on the lands which would be included in the final version of H.R. 3252/S. 1018 (CBRA).

1982 -- S. 3025.

The Natural Areas Tax Protection Act (S. 3025, 97th Congress, 2nd Session, 128 CONG. REC. S13333, October 1, 1982) was introduced by Senator Wallop on October 1, 1982. This bill was based upon the discussions held in the second public lands workshop. It provided authority for 4 major tax changes: 1) to authorize the Secretaries of Interior and Agriculture to identify those lands worthy of protection consistent with the "clearly delineated governmental policy" criteria contained in the Tax Treatment Extension Act; 2) to provide for an estate tax credit for estate donations of interests in lands to the government or qualified conservation organizations equal to the fair market value of the donation; 3) to encourage sales and exchanges to conservation organizations (other than the Federal Government) by providing a right of reinvestment to the seller and by providing special capital gains treatment for selected areas; and, 4) to raise from 30 to 50 percent the limitation on contributions of capital gain property and to permit an unlimited carryforward.

1983 --S. 152.

On January 26, 1983, Senator Roger Jepsen introduced S. 152 to provide an investment tax credit for certain soil and water conservation expenditures. (98th Congress, 1st Session, 129 CONG. REC. S93 January 26, 1983). The bill was designed to encourage private landowners and operators to conserve and manage land and water in a manner which provides for sustained production and the prevention of environmental deterioration. It was generally applicable to land which is used by the taxpayer in carrying on the business of farming.

1983 -- H.R. 2871

On May 3, 1983, Representative Lagomarsino introduced another tax measure focusing on lands held by estates and sold for a conservation purpose. (H.R. 2871, 98th Congress, 1st Session, 129 CONG. REC. H2599, May 3, 1983) This bill was built around the definitions of conservation purpose and qualified conservation organization contained in the Tax Treatment Extension Act. It provided for a delay in the payment of estate taxes if negotiations for a qualified sale were ongoing and a credit against those taxes for the value of such a sale if it was completed.

1983 -- S. 1675

On July 25, 1983, Senator Wallop introduced a new bill building upon S. 3024, which he had introduced in the previous Congress. This bill was entitled the "Public Lands Acquisition Alternatives Act of 1983." (S. 1675, 98th Congress, 1st Session, 129 CONG. REC. S10757, July 25, 1983). Like H.R. 2871, this bill was structured around the conservation purpose definitions of the Tax Treatment Extension Act of 1980. It had a series of provisions that would encourage private owners to transfer their property for a conservation purpose. These included the following:

(1) The allowable deduction for charitable contributions of long-term capital gains property for qualified conservation purposes would be increased from the current level of 30% of adjusted gross income to 50% of adjusted gross income.

(2) The current five year limit on carryovers of unused charitable deductions would be entirely eliminated with respect to contributions of qualified conservation property.

(3) The gift by an estate of "qualified conservation property" to the federal government could be used to offset federal estate tax liability on a dollar for dollar basis -- in essence an estate tax credit.

(4) The unused charitable contributions at the time of death would be allowed to reduce the taxable estate to the extent those contributions were "qualified conservation property".

(5) The sale of conservation property for conservation purposes would be free from long-term capital gains recognition, if the proceeds from the sale were invested in investment property within the next three years. This provision would sunset 10 years after enactment.

(6) Finally, the sale of qualified conservation property would be entitled to a reduced maximum long-term capital gains rate if the reinvestment option was not exercised. The rate reduction would impose a maximum 15% tax rate compared with the present 20% rate.

On February 6, 1984, public hearings were held on S. 1675. (Hearings on S. 1675 before the Subcommittee on Energy and Agricultural Taxation of the Senate Finance Committee, (98th Congress, 2nd Session, 1984).

1984 --H.R. 5900

On June 20, 1984, Representative John Breaux (LA) introduced another tax bill concerning the protection of key natural areas. (H.R. 5900, 98th Congress, 2nd Session, 130 CONG. REC. H6223, June 20, 1984). As explained by Representative Breaux, this bill would provide tax credits for conservation actions on two types of habitat that are particularly valuable to wildlife and the nation -- wetlands and critical habitat for endangered species. In addition, the bill would provide for a number of benefits to landowners who donate or sell land or conservation easements on land that is particularly valuable for conservation purposes. Lands other than wetlands and critical habitat included under this proposal were lands identified by the National Wildlife Refuge or Park System, natural heritage areas identified by the Park Service and areas identified by the States as part of a Natural Heritage inventory (Id. at E. 2913).

On June 28, 1984, hearings were held on H.R. 5900. (Hearings on H.R. 5900 before the Subcommittee on Fisheries and Wildlife Conservation and the Environment of the House Committee on Merchant Marine and Fisheries, 98th Congress 2nd Session, 1984).

1984 -- Deficit Reduction Tax Act of 1984

The Deficit Reduction Tax Act of 1984 (P.L. 98-369, 98 Stat. 494) contains estate tax relief for two specific estates. Section 1028 provides that an estate tax credit is available as a result of a transfer, without reimbursement or payment, of lands held by these estates to the Secretary of Agriculture for addition to the Toiyabe National Forest.

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