Department of the Interior

Alternative Policies for Protecting Barrier Islands Along the Atlantic and Gulf Coasts of the United States

and

Draft Environmental Statement

Prepared by:

Heritage Conservation and Recreation Service

in conjunction with:

National Park Service

Fish and Wildlife Service

Office of Coastal Zone Management

Council on Environmental Quality

QH
541.5
.I8
A48
1979

Department of the Interior

Alternative Policies for Protecting Barrier Islands Along the Atlantic and Gulf Coasts of the United States

and

Draft Environmental Statement

DES 80-1

Prepared by:

Heritage Conservation and Recreation Service

in conjunction with:

National Park Service

Fish and Wildlife Service

Office of Coastal Zone Management

Council on Environmental Quality

Robert L. Herbst
Assistant Secretary for Fish and Wildlife and Parks

Property of CSC Library

US Department of Commerce
NOAA Coastal Services Center Library
2234 South Hobson Avenue
Charleston, SC 29405-2413

GH541.5.I8 A18 1997
AUG 8 1997

COVER SHEET

ALTERNATIVE POLICIES FOR PROTECTING BARRIER ISLANDS ALONG THE ATLANTIC AND GULF COASTS OF THE UNITED STATES AND DRAFT ENVIRONMENTAL STATEMENT

` Council on Environmental Quality

` Department of Commerce - Office of Coastal Zone Management

` Department of the Interior

Heritage Conservation and Recreation Service (Lead agency)

National Park Service

Fish and Wildlife Service

December 1979

Abstract: This statement is in response to a directive contained in the President's 1977 Environmental Protection Message. It examines Federal programs which, through grants, loans, subsidies, permits, or acquisition and management, contribute to the development or protection of barrier islands, beaches, and spits which lie adjacent to the Atlantic and Gulf Coasts of the United States. Further, it examines alternative changes to those programs which would enhance the opportunities for protecting the islands and discusses consequences of each of the alternatives.

For further information: Director, Heritage Conservation and Recreation Service, Department of the Interior, Pension Building, 440 G Street NW, Washington, D.C. 20243; Attention: Deputy Director.

BARRIER ISLAND PROTECTION PLAN--DRAFT ENVIRONMENTAL IMPACT STATEMENT

Summary

In his May 1977 Environmental Message, President Carter directed the Secretary of the Interior, in consultation with the Secretary of Commerce, the Council on Environmental Quality, and State and local officials of coastal areas, to develop an effective plan for protecting Atlantic and Gulf Coast barrier islands, including recommendations for action. This DEIS is the result of that directive.

The barrier islands included in this study extend from Maine to Texas. Each is an elongated, narrow landform separated from the mainland by marshes or open water intimately related to the island. They range in size from less than 50 acres to well over 100,000 acres and are equally varied in shape and profile.

The estuaries and sounds that barrier islands protect are among the richest and most productive ecosystems known. In addition to providing spawning and nursery grounds for a wide variety of fin and shellfish, they also provide nesting and feeding grounds for numerous birds and other mammals.

The islands are made up of unconsolidated and shifting sands. The continually changing relationship between the ocean floor, surf line and moving sediment, produces islands that are, for the most part, structurally and locationally unstable.

Nearly 300 study units were identified in the course of the study leading up to this statement and about 50 bits of information on each incorporated into a computerized program. A study unit may consist of a single island, part of an island, or a group of islands; sand spit; barrier beach; or mangrove island.

The 300 units total about 1.6 million acres. Of these, approximately 621,000 acres are managed by Federal, State, or local government agencies and 986,000 are under private ownership. Over 243,000 acres are considered to be developed while 625,000 are protected from future development. The remaining 739,000 acres are undeveloped but are not protected from future development.

In terms of land use or land cover, the greatest amount of area (about one-half) is wetland; nearly equal amounts are urbanized or barren (slightly less than 229,000 acres each). However, the data show that between 1950 and 1973-4, slightly more than 137,000 acres were added to the urbanized column, while nearly that many were removed from the wetland column.

Permanent human habitation of many of these islands is hazardous for a number of reasons. First, sea level is slowly but steadily rising, averaging about one foot per century along the mid-Atlantic coast. Secondly, the unconsolidated sand routinely moves about while the works of man require stability. Erosion, or migration, rates are high. Lands now considered safe for building may be extremely hazardous or may simply disappear within a few

years. Thirdly, the islands are vulnerable to hurricanes and other storms. Storm waves breach and overwash the dunes and entire sections of an island can be inundated or severely eroded.

The unique character of each island, combined with the national interest in protection of barrier islands in general, represents a special opportunity for cooperation between Federal and State governments in formulating future barrier island policy.

Several significant conclusions were developed from the research conducted and data collected for this statement. These are:

1. Barrier islands need special recognition.

   --Barrier islands are unique, discrete components of the coastal zone meriting special action and attention. The dynamic and fragile character of barrier islands often has not been recognized by the governmental jurisdictions whose programs affect them.

   --The responsibility for the development of a consistent Federal policy related to barrier islands is unfocused and uncoordinated. As a result, Federal programs have unanticipated and conflicting impacts on them.

2. Review of existing Federal authorities related to barrier islands reveals the need for a clear Federal barrier island policy.

   --Federal authorities exist which could positively address aspects of barrier island protection; however, they do not relate specifically to barrier islands. They include: the Coastal Zone Management Act of 1972 (as amended, 1976), the Floodplains Management Executive Order 11988 and Wetlands Protection Executive Order 11990, the National Flood Insurance Program, the Flood Disaster Protection Act, and the Fish and Wildlife Coordination Act. Properly implemented and enforced, these programs have the potential to promote the wise use of barrier islands. However, new legislative initiatives specifically directed towards barrier island preservation will be required to achieve the highest levels of protection.

3. Information on which to base the formulation of barrier island policy needs to be made available to planners and other public and private officials.

   --Federal, State and local growth management decisions concerning barrier islands often have been based on insufficient impact analysis.

   --The information necessary and appropriate for barrier island resource management planning is just beginning to become widely available. The dissemination of this information to the range of decisionmakers in need of it has not been widespread.

4. Private enterprise needs to continue to play a valuable role in barrier island protection.

   --Private conservation groups have taken a lead in monitoring Federal, State and local barrier island related activities and in the drive for an evaluation of Federal barrier island related policies. Some also have acquired significant portions or numbers of barrier islands for preservation purposes.

5. The roles of the States and localities are critical to any program to protect barrier islands. They are key to the success or failure of any barrier island protection effort.

   --States and local units of government have the first opportunity to protect their barrier islands and/or provide for their orderly development. States and their subdivisions have the tools by virtue of the authorities and roles granted them by the U.S. Constitution and as a result of various Federal programs and through land development controls traditionally exercised by local governments.

   --The decisions made by the States and localities will be affected by the extent to which Federal programs can be redirected, implemented, and enforced; the "trickle-down" effect of the redirected Federal programs; and, the increasing public awareness of barrier island dynamics and values as storm buffers, fish and wildlife habitat, and public recreation sites.

The research and data from which these conclusions were derived represent a substantial effort on the part of the Fish and Wildlife Service, National Park Service, Office of Coastal Zone Management, and the States. These organizations provided specific information to update and supplement data gathered by HCRS (formerly BOR) for its more generalized study, Islands of America (1970). HCRS then put these data into a computerized program for easy retrieval and future up-dating.

The data gathered for this statement, for the most part, were island specific and were the basis for the various alternatives and options for barrier island protection which have been developed. However, rather than addressing specific problems or opportunities of actions on a particular island, the alternatives and options presented and discussed in this statement are directed at Federal agencies and authorities that in one way or another impact on barrier islands. In other words, they are program, rather than resource, specific.

Federal programs and authorities have, in many ways, encouraged development of barrier islands, resulting in potential problems of public health and safety, increasing costs, and loss of important public benefits provided by unspoiled barrier islands.

This situation is not the result of any directed Federal policy to encourage barrier island development. Rather, it results from a general lack of knowledge and understanding of barrier islands as unique resources warranting special attention and a lack of appreciation of the need for protection. While a broad range of Federal and State authorities address aspects of barrier island land management, barrier islands as a whole are treated only as a peripheral concern. Thus, the development on many barrier islands is the product of inadequate planning policy.

Although accomplishments under national environmental policies are noteworthy, there still is room for improvement, particularly with regard to barrier islands. Several programs exist which can be redirected to help protect, maintain, and enhance the unique resources of barrier islands. New legislation, or amendments to existing authorities, is necessary, however, to attain the highest level of barrier island protection. The success of any endeavor depends greatly on the guidelines, objectives, programs and policies which agencies develop and the effort and determination they commit to the implementation and enforcement of those programs and policies.

The thrust of the alternatives and options is to identify means by which the development oriented programs can be modified to effect conservation rather than unwise development of these narrow and valuable landscapes.

Each of the options by itself will provide a measure of protection to barrier islands. Obviously, some will be more far reaching than others; some will provide stricter protection than others; some will be more or less costly to implement than others; and, some will be more or less popular with the agency responsible for enforcement and the affected public than others. Some are simply different degrees of the same basic option.

By presenting different levels of effort, the options or actions necessary to achieve those levels, and the impacts of various alternatives, this draft environmental impact statement offers decisionmakers the opportunity to determine the level of commitment and expenditure of energy they believe feasible. The options consciously emphasize Federal programs and responsibilities but also give recognition to the significant role played by State and local governments in determining whether barrier islands are protected or developed.

Three alternative levels of effort are presented--low, moderate, and high. The low level alternative describes existing Federal programs which already are working to protect barrier islands from unwise development and those which are being redirected or are evolving away from a development oriented posture toward protection of barrier islands. This essentially is a description of the status quo - no options for change are presented.

The moderate level builds on the low level by describing existing authorities which could contribute to barrier island protection but which, because of a lack of direction, delegation, or appropriation, are not moving as effectively as they could toward barrier island protection. The options presented are

designed to make these authorized programs more effective in protecting barrier islands.

The high level options are new program thrusts. New and amendatory legislation will be required as well as strong executive directives.

It should be noted that these preliminary options are not recommendations and do not constitute administration position on any of the issues or programs identified. The options address a wide range of activities and, consequently, may be further refined before final recommendations are developed.

The Affected Environment chapter contains, among other pertinent information, a description of barrier islands, the processes that created them, and the dynamics that make them an ephemeral and fragile land form.

In addition to the description of the physical environment, socio-economic information primarily related to the 18 Atlantic and Gulf coast States and 108 coastal counties which contain the barrier island study units is provided as well. Although the socio-economic situation on the islands may tend to be substantially different than in the larger geographic areas for which specific data are available, a description of the States and counties does provide some insight about the surrounding areas.

The counties in which the barrier island study units are located present a varied profile. Population is growing rapidly, primarily as a result of in-migration. Recreation and tourism, not surprisingly, play a major role in the economy of these coastal counties. Tied closely to recreation and tourism is the availability of transportation facilities to the coast and to the islands themselves. Of the 300 study units, 175 have direct vehicular access by road, bridge, or causeway; nine have airports; and, 24 are accessible by regular ferry boat service.

Cultural resources of significance abound on the barrier islands. Although no complete and coordinated survey or inventory has been conducted of the sites on barrier islands, 76 sites listed on the National Register of Historic Places and 73 sites listed as National Natural Landmarks have been identified on the study units.

The barrier islands also were found to contain valuable habitat for numerous species of plants and animals, many of which are listed as endangered or threatened.

The belief that Federal programs are encouraging and assisting development of barrier islands with resulting losses of natural, cultural, fish and wildlife, and recreational values is well founded. Programs of nearly 20 Federal agencies were identified as having an impact on barrier islands. Although about one-fourth of the agencies administer programs which directly or indirectly provide protection for barrier islands, over one-half administer grant, loan, permit, or construction programs that have had adverse impacts on the study units; the remainder administer property, insurance, and relief programs that have encouraged or perpetuated unwise use of the islands. These programs are described in detail in Appendix "A".

Over three fiscal years, the permitting, granting, and licensing agencies committed nearly one-half billion dollars to barrier island development projects.

The Environmental Protection Agency contributed the largest share of these funds in the form of grants for waste water treatment facilities. The Economic Development Administration, Farmers Home Administration, and others also provided grants for waste water treatment. The Corps of Engineers invested heavily in beach restoration and protection projects. Home and business mortgage insurance programs also supported heavy investment in barrier island development.

Some agencies do not administer lands or provide loans or grants for projects on barrier islands but, through permit programs or regulations, have a profound effect on them. One such agency is the U.S. Coast Guard which has responsibility for issuing permits for bridges across navigable waters. A bridge frequently is the first and most essential item required for development of a barrier island. Another such agency is the Federal Emergency Management Agency which administers both the Flood Insurance Program and the Federal Disaster Relief Program. These programs appear, in many situations, to provide the impetus for developing (or redeveloping) barrier islands.

Over 620,000 acres of the 1.6 million are held by public agencies whose primary barrier island mission is protection of natural values and/or provision of recreation opportunities. These conservation minded agencies are making some progress in acquiring critical areas on the barrier islands. In the past 10 years, the Fish and Wildlife Service alone has acquired all or major portions of 13 barrier islands involving nearly 50 miles of beach. The Service has plans to acquire more in the near future. The National Park Service, too, has acquired substantial barrier island acreage; has prepared comprehensive management plans for its units; and has adopted a policy for preserving the natural processes on barrier islands. Both agencies are studying their units for possible additions to the Wilderness System.

State and local governments, too, are acquiring barrier islands for recreation, fish, and wildlife purposes. With assistance from the Land and Water Conservation Fund, at least 112 projects costing over $100 million have been undertaken on barrier islands. These projects are located on 74 islands in 17 of the 18 States. The Office of Coastal Zone Management also assists the States in designating and acquiring estuarine sanctuaries. Although this latter program has, as yet, not been extremely successful, it has great potential for protecting barrier islands.

In spite of these significant accomplishments and high potential for accomplishing even more, it has not been enough.

A long, uncharacteristic period of low storm activity (especially hurricanes along the southeast Atlantic Coast) has caused tremendous demands to be placed on the islands for development of primary and secondary home sites and recreation resort areas. As a consequence, the barrier islands are urbanizing

at a rate twice that of the Nation as a whole. The result is that 14% of the island space is considered urban while only 3% of the mainland area is urban.

This unprecedented growth creates severe problems in terms of the numbers of people and the amount of personal property in a hazardous location. Development of adequate means of escape during storm threats has not kept pace with development on the islands. Nearly 80% of the people now living in island cities and communities have never experienced a hurricane. Even if they heed and take seriously a hurricane warning, it is doubtful that more than a relatively minor percentage could escape before the storm hits. Property values, too, have increased tremendously over the past two decades. Damage from a major hurricane or nor'easter in areas such as Galveston, the Florida and Northeast coasts would be astronomical. Costs for disaster relief would be borne not only by the island residents, but by all of the Nation's taxpayers.

The alternatives and options presented in this statement will afford decisionmakers an opportunity to weigh the advantages and disadvantages of various types and levels of possible actions to protect barrier islands.

To be sure, there will be controversies. People already live on barrier islands and substantial economic investments have been made. For many of the investors and inhabitants, Federal protection and subsidy have become a way of life. Many of the alternatives and options are designed to get the Federal Government out of the business of developing, or encouraging development of, barrier islands. As such, they would dramatically change the way of life to which many people on barrier islands have become accustomed.

However, the time for action is now--before the next big storm. Afterwards, it would be virtually impossible to resist repeating past mistakes in the face of human suffering and loss.

TABLE OF CONTENTS

Page

Cover Sheet i

Summary ii

Table of Contents ix

List of Tables xii

List of Figures xiii

Purpose and Need for Action.....xiv

Chronology and Consultation to Date.....xvi

Future Actions xvii

I. ALTERNATIVE POLICIES.....1

Alternatives for action.....1

Low level 4

Moderate level.....18

High level 45

II. ENVIRONMENTAL STATEMENT.....57

Affected Environment.....57

A. The Islands - General Description.....57

B. Topographic Variation.....61

C. Barrier Island Fauna.....69

Page

1. Terrestrial....69
2. Marine....73
3. Rare and Endangered Species....77

D. Vegetation....78
1. The Northern Section....86
2. The Transition Section....86
3. The Southern Section....88
4. The Gulf Coast Section....88

E. Soils....88

F. Oceanic Storms....92
1. Sea Level....97
2. Tide Influence....98

G. Water and Water Quality....98

H. Cultural Features....101

I. Recreation....102

J. Public Lands....105

K. Land Use....105

L. Transportation....118

M. Socio-Economic Factors....119
1. Economy....119
2. Government Finances....123
3. Income....125
4. Population....125
5. Housing....128

Page

Environmental Consequences.....129

Relationship Between Local Short-term Use of the Environment and Maintenance and Enhancement of Long-term Productivity.....140

List of Appendices.....142

List of Tables

Page

1. Topographical Variations of a Barrier Island.....62
2. Summary of Study Units by Various Categories.....64
3. Origin of Barrier Islands and Spits.....66
4. Ubiquitous Barrier Island Mammals and Reptiles.....71
5. Mammals and Reptiles of Cape Cod Region, N.C. Banks, Gulf Islands...72
6. Endangered Species on Coastal Barrier Islands.....79
7. Barrier Island Vegetative Categories.....87
8. Study Units Without Potable Water Supply.....100
9. Number of Registered Historic Places.....103
10. National Natural Landmarks by State.....104
11. Annual Visits to National Seashores.....106
12. Major Recreation Activities by State.....107
13. National Wildlife Refuges on Coastal Barrier Islands.....108
14. State Owned Barrier Islands.....110
15. Land Use or Land Cover.....117
16. Types of Access to Study Units.....120
17. A Comparison of Socio-Economic Data.....121
18. Fish Species Sought by Sport and Commercial Fishermen.....122
19. Annual Recreation-Tourism Dollars Generated-by State.....124
20. Population Trends on Several Barrier Island Study Units.....127

List of Figures

Page

1. Basic Types of Barrier Beaches.....58
2. Model of Barrier Beach.....59
3. Geological Formation of Cape Cod.....67
4. Mechanisms of Sand Transport on Barrier Beaches.....68
5. Vegetative Zones.....84
6. Locations of Cores Taken on Marshes at Old Cedar Inlet, Core Banks..90
7. Drum Inlet Succession.....91
8. Effect of Groin on Shoreline.....94
9. Effect of Seawall on Beach.....95
10. Hurricane Probability on the East and Gulf Coasts.....96
11. Locations of Barrier Island Related Units of the NPS and FWS.....116
12. Coastal Population Trends.....126

Purpose and the Need for Action

In the May 1977 Environmental Message, President Carter said:

> "Coastal barrier islands are a fragile buffer between the wetlands and the sea. The 189 barrier islands on the Atlantic and Gulf Coasts are an integral part of an ecosystem which helps protect inland areas from flood waves and hurricanes. Many of them are unstable and not suited for development, yet in the past the Federal Government has subsidized and insured new construction on them. Eventually, we can expect heavy economic losses from this shortsighted policy.
>
> About 68 coastal barrier islands are still unspoiled. Because I believe these remaining natural islands should be protected from unwise development, I am directing the Secretary of the Interior, in consultation with the Secretary of Commerce, the Council on Environmental Quality, and State and local officials of coastal areas, to develop an effective plan for protecting the islands.
>
> This report should include recommendations for action to achieve this purpose."

The purpose of this Statement is to respond to the President's directive by providing a number of options, according to specific levels of protection, which would allow decisionmakers to determine the most desirable and feasible plan of action for barrier island protection.

In an information supplement issued following his May 1977 Environmental Protection Message, the President said:

> "Most of the barrier islands are . . . targets of intense real estate and development activity. The development of these resources has often been encouraged by federally permitted or subsidized roads, bridges, and sewers, with the result that millions of people have been subjected to the hazards of hurricanes, and to property losses from the erosion and other physical changes that are characteristic to barrier formations. These hazards and losses have, in turn, invited substantial Federal spending for seawalls . . and beach restoration projects that perpetuate more settlement and then more Federal investment, while causing the continuous loss of valuable and unique resources."

Permanent human habitation of the islands is hazardous, if for no other reason than overwash and erosion. Unconsolidated sand routinely moves about while roads and houses cannot. Yet, a large number of people inhabit barrier islands and many others continue to seek living space on them. Public demands for new facilities and developments as well as increased access and use are occurring on the Atlantic and Gulf Coast barrier islands. Between 1950 and 1973, urban acreage of barrier islands increased by nearly 138,000 acres;

forty islands which had no urban acreage in 1950 had land categorized as urban in 1973; approximately 14% of the total barrier island acreage is urbanized as compared to 3% for the Nation as a whole; the rate at which barrier islands are urbanizing is about twice that of the Nation as a whole. Even on those heavily developed islands where further expansion of urbanized areas is not possible, assessed valuation of developments has increased tremendously.

As these trends continue and intensify, further loss of the natural attractions and inherent values on barrier islands, as well as further development in high hazard areas, is imminent. Likewise, increased governmental expenditures to subsidize developments, to protect lives and investments, and to rebuild storm-damaged facilities are probable.

The responsibility for the development of a consistent Federal policy related to barrier islands has been unfocused and uncoordinated. This has resulted in many Federal program actions with unanticipated and conflicting impacts on barrier islands. About 20 different Federal agencies administer approximately 30 programs that either do, or have the capability to, impact barrier islands. During the past three fiscal years, development oriented agencies have committed nearly a half billion dollars to barrier island development projects.

Insufficient coordination among Federal agencies is a major problem in barrier island protection. On one hand, there are Federal programs and policies that tend to encourage development that is incompatible with natural processes and values of barrier islands and beaches. On the other, there are Federal programs and policies designed to promote the conservation of barrier islands and their resources. These programs often work at cross purposes, resulting in potential problems of public health and safety, loss of important public benefits provided by unspoiled barrier islands, increasing costs, and wasted dollars.

This situation is not the result of any directed Federal policy to encourage barrier island development; it results from a general lack of knowledge and understanding of barrier islands as unique resources warranting special attention. Federal, State, and local growth management decisions concerning barrier islands often have been based on insufficient impact analysis and resource descriptive information. Information concerning the dynamics and values of barrier islands, necessary and appropriate for barrier island resource management planning, is just beginning to become widely available. Because interest in the scientific aspects of barrier island dynamics is relatively recent, the findings generally have been circulated only among members of the scientific community. The dissemination of this information to decisionmakers in need of it has not been widespread.

Thus, the need for action becomes quite obvious. The hazards and expense of barrier island development and habitation must be realized as well as the serious impacts that unwise programs are having on the environment. By identifying and isolating existing Federal programs which are both beneficial and detrimental to barrier island protection, this Statement analyzes a broad

action proposal which can be used as the basis from which more specific action proposals can be developed. It provides decisionmakers with strategies and a comprehensive source of information they will need in their attempt to solve barrier island conflicts in keeping with the President's directive.

Chronology and Consultation to Date

Following the May 1977 Environmental Message, the Secretary of the Interior established a study group to prepare a report on barrier island issues and to determine an action plan to protect barrier islands. The study group consisted or representatives primarily from HCRS, NPS, FWS, OCZM, and CEQ and held its first meeting on June 30,1977. The work group was to encompass all barrier islands in the report; developed, as well as those relatively unspoiled. Once identified, barrier island study units were described according to the level of protection affored by current owners, current land use, and other natural resource features.

In September 1977, letters were sent to DHUD, DOD, EPA, DOT, DOA, GSA, the American Wildlife Federation, Nature Conservancy, the Environmental Defense Fund, and the governors of the eighteen coastal States inviting representatives to form an Advisory Committee to provide information on agency programs affecting barrier islands and to act as a sounding board for policy options. During October 1977 personal contact was made with each Federal Agency on the Advisory Committee.

A barrier island conference was conducted on December 12 and 13, 1977, in Savannah, Georgia. The Conference served as public information meeting to address barrier island natural processes and policy options for their protection, to recognize the States role in barrier island protection, and to present barrier island study concepts. As a result of the conference, a number of issues and recommendations were surfaced with respect to protecting barrier islands.

The first draft of the study report was competed in June 1978. It was reviewed, revised and released to the public in July 1978. The study consisted of a description of the barrier island problem; the impacts of development on government agencies and the private sector to protect the islands. The study did not include recommendations or an action proposal specifically directed to protecting barrier islands. When the document was made available for review, comments were received from ten States and a number of Federal and private agencies.

On October 2, 1978, a decision was made to prepare a draft EIS in order to present an array of options dealing with Federal programs to protect barrier islands. The barrier island work group was reconvened and strategies discussed to complete the DEIS in such a way as to further promote the protection of barrier islands.

During February 1979, a draft EIS was circulated for comment within the Department of the Interior. On February 26, 1979, Department of the Interior,

DHUD, FIA, and FDAA representatives met to review respective programs and agency responsibilities to protect the barrier islands.

A one-day workshop was held on March 15, 1979, with Federal and State officials to project a multi-level strategy to build support for the confidence in the barrier island DEIS process. The following individuals from outside the Department of the Interior participated in this effort.

Mr. Hans Neuhauser, The Georgia Conservancy, Inc.
Mr. Steve Frishman, Texas Coastal Marine Council
Ms. Lesli Rice, Natural Resources Defense Council
Mr. Carney Moran, FDAA
Mr. Dick Gardner, OCZM
Mr. Truman Goins, DHUD

An action proposal resulting from the workshop stressed the need for accuracy with respect to the various Federal programs discussed in the DEIS. Consequently, letters were sent to all appropriate Federal offices seeking comments on their program responsibilities as described within the DEIS. Follow-up meetings were conducted with OCZM to obtain accurate program descriptions for the DEIS.

As a result of the above mentioned efforts and the input, as provided from a variety of sources, the DEIS was completed in December 1979.

Future Actions

This DEIS does not adhere to the exact standards for environmental impact statements. It does not provide a preferred alternative nor does it include a comprehensive environmental impact analysis due to the unique array of options which are presented in the Alternatives Section. What this document does do, however, is present a wide range of options which could be utilized to protect barrier islands. Obviously, some options may be quite difficult to implement; others may have only a minimal effect on protecting barrier islands; while others may not be feasible at all at this time. This review process, nonetheless, will enable governmental agencies, the private sector, and the general public to screen the options, cull those options considered non-feasible, and focus on those considered most effective and feasible.

Specifically, The Secretary of the Interior and the Secretary of Commerce will use the review process in preparing their recommendations on how best to protect coastal barrier islands. Their recommendations will describe how Federal programs already working to protect the island's integrity can be improved. Further changes in Federal activities to meet the President's objective of preventing unwise development on our barrier islands also will be presented.

Special commitments will be made by the Secretaries of Interior and Commerce to change programs for which they have authority to better protect the islands and to seek changes in other program areas for which new authority is needed.

Those options receiving favorable response will be further addressed in the final EIS. Those same options will be reviewed further by all agencies in order to determine agency commitment and to implement and enforce specific programs resulting from the selected options. On the basis of the agency response, a proposed action program for protecting barrier islands will be presented in the final EIS and forwarded to the President for his review and recommendation.

Officials, by agency, who participated in the development or review or who offered comments and data for the barrier island study and the DEIS include:

Corps of Engineers	Mr. John Housley Mr. Richard Makinen Lt. Col. John Hill
Environmental Protection Agency	Mr. Larry McBennett
Department of Agriculture	Mr. Dan Ball Mr. James F. Thornton
Small Business Administration	Ms. Maxine Wood
Department of Transportation USCG	Mr. Robert Thurber Cpt. Richard Hodges
Department of Energy	Mr. Robert Catlin
Council on Environmental Quality	Mr. Malcom Baldwin Mr. Robert Kutler
Federal Insurance Administration	Mr. Ken Garvey
Federal Disaster Assistance Administration	Mr. Carney Moran Mr. Ugo Morrelli
Federal Energy Regulatory Commission	Mr. George Taylor
General Services Administration	Mr. Jim Buckley Mr. Jim Kearns Mr. Carl Penland
Department of Housing and Urban Development	Ms. Margaret Pepin-Donat
Department of Interior Bureau of Land Management	Mr. David Lodzinski

National Park Service	Dr. William Gregg
Fish and Wildlife Service	Mr. Robert Peoples
Department of Commerce	
OCZM	Mr. Jim McFarland
	Ms. Carol Sondheimer
	Mr. Richard Gardner
EDA	Ms. Diana Wall
University of Georgia	Mr. Eugene Odum
Natural Resources Defense Council	Mr. Larry Rockefeller
University of Massachusetts	Dr. Paul Godfrey
	Ms. Melinda Godfrey
	Dr. Steve Leatherman
Texas Coastal and Marine Council	Mr. Joe Moseley

I. ALTERNATIVE POLICIES

ALTERNATIVES FOR ACTION

The Nation is becoming increasingly concerned with the protection of its coastal resources. Recent congressional and presidential actions have begun to address this concern with laws and executive orders which affect numerous Federal and State agencies' programs. As a result, many diverse capabilities can be brought to bear on the need to focus on and expand the role of protection and enhancement of the coastal environment for the future of the Nation.

Although the establishment of many national environmental policies is noteworthy, a clear need remains to provide for the protection of barrier islands. This chapter presents three alternative levels of effort, each with an array of options, for protecting barrier islands.

The options presented are Federal program, rather than island resource, specific and are designed to guide Federal decisionmakers in making their programs more effective in protecting barrier islands. While the options relate exclusively to Federal programs, policies, and authorities, implementation of many of them will influence and set the tone for related State and local actions.

The three levels, low (current efforts), moderate (redirection of authorized programs), and high (legislation and executive directives), afford flexibility to decisionmakers as they evaluate each option according to its ability to protect barrier islands. In addition, identifying the options by level of protection clearly presents a number of possible ways the Federal programs within each level could be utilized to protect barrier islands. A preferred alternative is not presented in this draft environmental impact statement for the following reasons: (1) the President directed the development of "an effective plan for protecting the islands." The purpose of arraying options by alternative levels of protection is to allow decisionmakers to determine the level of protection most feasible; (2) each barrier island is a dynamic and interdependent part of a resource system. The level of protective effort determined to be most feasible must, therefore, consider the islands as a continuum and not as independent, disconnected pieces of real estate; and (3) the options involve the programs of about 20 different Federal bureaus and agencies. To be effective, each option would require a solid commitment by the responsible agency to enforce or administer the program requirements necessary to protect barrier islands. Before a practical preferred alternative can be developed, each agency must be given an opportunity to carefully review the various options affecting their areas of responsibility.

The options recognize many Federal programs which already provide some protection. They also include programs which have protection potential but all too often do not specifically identify the need for, nor the value of, protecting barrier islands.

The low level protection alternative offers nothing new; it does identify what is ongoing in terms of trends and existing Federal programs. It would, however, increase the level of awareness of barrier island problems and the need to protect these coastal environments. At a minimum, this would have a beneficial effect on the work of the various agencies and officials responsible for administering existing programs. The low level alternative briefly discusses those programs identified as having significant impacts on barrier islands. These same programs are described in greater detail in Appendix A. This alternative is the no-action alternative required to be discussed in an EIS, and, as such, is valuable for understanding the nature and extent of present Federal involvement on barrier islands. However, the President directed the development of a Federal plan for action, and this is what is presented under the moderate and high levels of protection.

The moderate and high level protection options are organized differently than the low level section. Whereas the low level discussion is organized according to the Federal agency involved, the moderate and high level options are grouped by eight major types of Federal actions identified as requiring modifications in program administration or emphasis. An option is not presented under the moderate or the high levels on the basis of the degree of protection it would afford, but instead is grouped under the moderate level when it would appear that it could be implemented under existing legislative authorities, and under the high level whenever it would appear that new legislation would be necessary.

The moderate level protection alternative offers many opportunities to make existing program authorities more effective in protecting barrier islands. They identify numerous Federal authorities and responsibilities which, because of certain constraints, have not been fully implemented. By merely emphasizing the need for certain existing programs to be more fully and sensitively implemented by the responsible agency, barrier islands would receive more protection. Of major importance in the moderate level alternative is the need to specifically direct or redirect these full implementation efforts by giving high priority to barrier island resources.

This is particularly true for Federal grant and loan programs whose purpose it is to stimulate development or to aid disaster recovery. While these programs are of undeniable benefit in most other areas of the country, they must be carefully evaluated before being applied on barrier islands. Existing environmental review procedures such as the National Environmental Policy Act and the Executive Orders on floodplain management and protection of wetlands need to be applied strictly in regards to barrier island proposals, as do all development project approval procedures. Restricting all development on barrier islands is infeasible and probably undesirable, but the identified national programs must be capable of giving barrier island dynamics and restrictions their due weight.

The high level protection alternatives recommend new measures to be developed, established, and adopted to assure barrier island protection over an indefinite time period. In most instances new legislation will be required to

achieve the high level options for protecting barrier islands. This is because, in contrast to the moderate level options, either existing laws cannot be sufficiently directed to provide the requisite protection, or because new legislative direction was deemed necessary to complete the framework for barrier island protection. There are fewer options presented in the high level alternative because it was determined that full application of the moderate level recommendations would achieve substantial barrier island protection, and because new legislative proposals traditionally emanate from Congress. It is anticipated that the problems associated with developing barrier islands will result in more legislative proposals being developed than those presented here, and that this plan adequately documents any problem under existing authorities. Hence, most legislative recommendations are simply amendments to present laws.

The draft EIS does not represent the final plan for the President, because it is anticipated that after Federal agencies and the public review the information presented in this document regarding the agency programs and their impact on barrier islands, their comments will help shape the final product.

Again, it is important to iterate that these options do not represent administration policy; they simply discuss methods which may be means of achieving the President's goal of protecting barrier islands from unwise development. The options are not recommendations at this time and are subject to further refinement.

Low-level Protection Alternative

This section is not a call to action. No specific proposals for change are made. The section describes the current status of activities; indicates that some changes in program direction are taking place; and establishes a base for subsequent alternatives that will require specific action to be taken.

Some of the changes that are occurring are the result of a recognition of barrier island values and dynamics and conscious decisons to administratively redirect program activities toward a wiser use of barrier islands. Others are the result of exogenous influences, such as the executive orders on floodplain management and protection of wetlands, which require administrators to examine their programs and to be in conformance with the intent of those orders. But the President was not satisfied with simply waiting for the natural evolution of existing programs to become sufficiently sensitized to the hazards of barrier island development; instead a plan of action was called for and is presented with a variable mix of options under the moderate and high levels.

Program Areas

Programs administered by Department of the Interior bureaus, perhaps more than those of any other Federal department or other level of government, have directly and indirectly provided for the protection of barrier islands or have heightened the public awareness of the public benefits of providing that protection. A brief description of these program activities follows.

Heritage Conservation and Recreation Service

Land and Water Conservation Fund (LWCF)

The Land and Water Conservation Fund Act of 1965, P.L. 88-578, as amended, established a fund to increase outdoor recreation opportunities for the American people. The Fund is administered by the Heritage Conservation and Recreation Service (HCRS).

The program provides for (1) acquisition of lands for federally-administered parks, wildlife refuges, and recreation areas (the "Federal side"), and (2) matching grants for State recreation planning and State and local land acquisition and development (the "State side").

In order to receive grants from the Fund, a State must develop a Statewide Comprehensive Outdoor Recreation Plan (SCORP), and update and refine it on a continuing basis. The Fund provides matching planning grants and technical assistance to States to help develop and update comprehensive outdoor recreation plans.

HCRS figures show that during the 13 years of program operation, Federal agencies have spent over $128 million in LWCF monies to acquire barrier island acreage.

The National Park Service (NPS) and the Fish and Wildlife Service (FWS) are the two DOI agencies which are eligible to use the Land and Water Conservation Fund for acquisition of barrier islands.

Although the National Park Service currenty administers more barrier island acreage than the FWS, the FWS administers 2 1/2 times more units and maintains a more active acquisition program. The NPS has identified three barrier island areas which merit detailed study by the the NPS to determine the most effective way to protect them. The FWS, on the other hand, expects to begin acquisition of at least two more barrier islands in the next two years. In addition, the Service has identified 51 other barrier islands which are suitable for inclusion in the National Wildlife Refuge System and which may be acquired if there is no other way of protecting them.

State and local agencies have received more than $51 million in matching grants to acquire acreage and develop projects located on barrier islands. The States and localities used the Fund money for 112 projects of which about 50 were for acquisition. Florida has the most ambitious acquisition program on barrier islands with Fund assistance. The State of South Carolina requested and received Fund assistance for development of a barrier island related planning component of its SCORP. Thus far, it is the only State to do so.

Natural Landmarks and National Register Sites programs also are administered by HCRS.

Any Federal agency that intends to carry out, fund, license, or permit a project that would adversely affect a landmark would be required to circulate an EIS describing the probable impacts, means of mitigation, and the feasible alternatives to the proposed project. An EIS would be required in accordance with the general provisions of Section 102(2)(c) of the National Environmental Policy Act.

A similar form of protection is extended to any item on the National Register, but in this case it is done so by the explicit mandate of Section 106 in the National Historic Preservation Act of 1966, as amended, (P.L. 89-665). Any Federal agency, prior to its funding, licensing, or approval of a project must consider the project's effect on sites included or eligible for inclusion on the Register, and must provide the Advisory Council on Historic Preservation with the opportunity to comment on the undertaking.

Seventy-three sites on 68 barrier island units have been identified under the National Natural Landmarks Program. Of these, 17 have been designated officially by the Secretary of the Interior as National Landmarks.

The National Register of Historic Places lists 76 barrier island properties, three of which have been designated by the Secretary as National Historic Landmarks. (See appendix for a complete listing).

The Historic Preservation Fund, administered under the authority of the National Historic Preservation Act of 1966, makes matching grants for historic preservation to the States from an annual appropriation for that purpose. The States may use the grants for surveying, evaluating, acquiring, and preserving significant cultural resources.

Since the program was first funded in 1970, over $46,625,000 have been granted to the 18 barrier island States through FY 1978. Considerably less than 1% of this amount is estimated to have been used to promote resource preservation on barrier islands.

National Park Service

The National Park Service's primary responsibilities in protecting barrier islands are associated with its stewardship of nine national seashores, one national recreation area, one national monument, and part of one national park. These units of the National Park System are administered to ensure long-term protection and preservation of natural and cultural resources and to provide recreational opportunities consistent with preservation of the natural values.

The recreational use of the National Park Service units reflects three significant factors. One is proximity to urban centers; Gateway National Recreation Area and Cape Cod are primary examples. The second factor is accessibility; those islands that are more remote or lack bridge access (Cape Lookout, Cumberland Island) draw fewer visitors. The third factor is public familiarity. The earlier established seashores or those receiving public attention show steady visitation growth.

Except for Wright Brothers National Monument (on Bodie Island, North Carolina), which was established by Presidential Proclamation in 1927, the remaining 11 units were authorized by separate acts of Congress. These acts set forth the specific purpose of each unit as well as constraints and obligations in its administration.

The National Park Service has undertaken and sponsored a multi-faceted program of research which continually expands the understanding of the barrier island environment and the unique constraints the environment places on development and use. With respect to barrier islands administered by the National Park Service, the research findings have demonstrated the inability of these areas to support the amount of permanent development and public use typically envisioned at the time the units were legislatively authorized. Management objectives are continually being revised to point future use of the barrier island units in the direction of less permanent development, less manipulation of natural processes, and increased opportunities for less intensive public use related to appreciation of the natural environment. Management plans for the barrier island units reflect a generally conservative approach to development and public use that is born of an awareness of the fragility and vulnerability of these resources and the dynamic nature of the forces acting upon them. The only exception is Gateway National Recreation Area, where the provision of intensive structured recreation is a major objective.

Until recently, the national seashores were managed under the National Park Service's guidelines for recreation areas, as opposed to natural areas and historic areas. This promoted the construction of roads, utilities, visitor centers, campgrounds, and other facilities. Like other owners of barrier island property, NPS took measures to protect its investment against the islands' natural proclivity to move around. However, after nearly three decades of unsuccessful attempts to stabilize the dunes at Cape Hatteras, as well as less ambitious efforts elsewhere, the National Park Service recognized the ultimate futility of human efforts to arrest the forces of nature on dynamic barrier island systems.

The newly-approved "Management Policy for Shoreline Processes" states that, as far as possible, and cognizant of NPS responsibilities that accrue from its previous policy and actions, there will be no further attempts to restrain the natural processes of erosion, deposition, dune formation, and inlet formation. The policy further states that:

> "In development zones, management should plan to phase out, systematically relocate, or provide alternative developments to facilities located in hazardous areas. New facilities will not be placed in areas subject to flood or wave erosion hazard unless it can be demonstrated that they are essential to meet the park's purpose, that no alternative locations are available, and that the facilities will be reasonably assured of surviving during their planned lifespans without the need of shoreline control measures."

This new policy for barrier island land management will be implemented on a seashore-by-seashore basis, and will be accomplished through each unit's general management plan. The specific application of the policy can be seen in the example of Fire Island National Seashore, where the following proposed actions demonstrate the application of the policy in a specific management unit:

- The NPS will attempt to restore the island's natural sand movement.
- A Sand bypass system will be developed to maintain a more natural littoral drift system on the Seashore.
- Sand nourishment of beaches on the Seashore will be conditional upon implementation by the Corps of Engineers of sand bypass systems at the inlets.
- No inlets will be opened artificially.
- There will be no beach stabilization structures.
- All pedestrian dune crossings will be on elevated boardwalks and vehicular dune crossings limited to those essential for access and management.
- There will be no anti-mosquito ditching in the marshes.

Public Law 94-458, the NPS Administrative Authorities Act, directs the Secretary of the Interior "to investigate, study, and continually monitor the welfare of areas whose resources exhibit qualities of national significance and which may have potential for inclusion in the National Park System, and annually to submit a listing of not less than 12 such areas to the Speaker of the House and President of the Senate." This authority presents the NPS with an opportunity to identify high priority barrier islands for inclusion in the National Park System.

Nine of the 12 barrier island units contain varying amounts of privately owned or non-Federal publicly owned acreage. These amounts range from over 35,500 acres of non-Federal public lands at Gulf Islands National Seashore to less than 100 acres at Padre Island National Seashore. The total acreage involved (12-31-76) is nearly 147,000 acres or about 21% of the amount within the authorized boundaries of the 12 units.

It should be noted that, although privately owned lands comprise only about 4% of the total authorized acreage in the barrier island units, they make up about 11% of their fast land acreage, with individual unit percentages ranging from 0% in several units to 31% at Gulf Islands.

It is established Service policy to prepare a land acquisition plan for each unit and to acquire lands as needed to achieve the management objectives of the unit in a manner consistent with legislation, executive direction, and the plan. A land acquisition strategy will be developed on a unit-by-unit basis.

All of the enabling acts which allow the use of public funds for land acquisition in barrier island units also allow the owners of private property to exercise a right of use and occupancy. Use and occupancy agreements normally run for the duration of the owner's life or for a fixed time period, usually 25 years.

The increase in the Federal investment in and ownership of NPS-administered barrier islands has been substantial in recent years. Utilizing data from 9 barrier island units since 1961, total Federal investment has risen from $4.3 million to $143.8 million--a 33-fold increase. The inventory of NPS-administered fast lands on barrier islands has risen from about 19,000 acres to almost 222,000 acres--nearly a 15-fold increase. During the same period, the Service's inventory of structures on barrier islands increased from about 52,000 square feet of floor space to nearly 1.4 million square feet--an almost 27-fold increase, in large part due to the substantial number of structures transferred to the Service from the City of New York at Gateway National Recreation Area. The disposition of these structures poses continuing management problems on barrier islands where the Service is committed to reducing the level of development to the absolute minimum necessary to achieve park management objectives.

The National Park Service also is responsible for designating suitable sites as National Environmental Study Areas (NESAs) following a request to do so by a local school system or other educational entity. These designations provide special recognition to areas which, by virtue of their resource values and history of educational use, have acquired particular educational significance.

Fish and Wildlife Service

The Fish and Wildlife Service administers 31 National Wildlife Refuges which are, at least in part, located on Atlantic or Gulf Coast barrier islands. They are fairly well distributed along the coast from Maine to Texas in 12 of the 18 States.

The total area of these 31 refuges is 388,582 acres. In addition, nearly 180 miles of beach are contained within the refuge boundaries.

The FWS anticipates acquisition of at least two more areas containing a total of about 44,000 acres and 14 miles of beach. Six other area acquisitions are being considered.

The refuges are managed in order to protect a wide variety of animal species and their habitats. Another important purpose of the refuges is the fulfillment of U.S. responsibilities for migratory birds, as established in treaties with Great Britain (on behalf of Canada) and Mexico. Management practices on the refuges often aim at improving, and sometimes creating habitats through artificial impoundments. However, because development would be inimical to the natural environment required by the animals, generally the refuges are kept natural.

Visitation is becoming increasingly important on the refuges; the USFWS is placing emphasis on providing opportunities for interpretation and public recreation on the refuges. Seasonal gatherings of immense numbers of migratory birds or the opportunity to see an endangered species are of great interest to the public, and more and more visitors are coming to see them.

Fiscal year 1978 visitation figures indicate that total visits to wildlife refuges amounted to over 9.4 million. Slightly more than 11% of the visitation was related to education-interpretation programs.

The National Wildlife Refuges often occupy barrier island land and waters including large areas of marshes and bays. These exceedingly productive ecosystems provide key habitats for a large variety of fish and wildlife among which are a number of species listed as endangered, such as the bald eagle, brown pelican, whooping crane, peregrine falcon and leatherback turtle.

The Service also has primary responsibility for implementation of the Endangered Species Act which requires all Federal agencies to take whatever action is necessary to insure that their activities will not further jeopardize an already endangered species of plant or animal, or result in the destruction or modification of habitat critical to the existence of that species. Through the medium of early consultation between the Service and an agency proposing an action which may adversely affect fish or wildlife habitat or endangered plant species, those adverse impacts frequently are avoided.

The Service also has an active program for administration of Research Natural Areas (RNA). RNA are set aside to protect "a representative array of all significant natural ecosystems" for the purpose of understanding these ecosystems and as a baseline for comparison with manipulated ecosystems. RNA have significant long term value for environmental monitoring and research.

The Service has established nine RNA's totalling 3,830 acres on six barrier island refuges.

Wilderness

Designation by the Congress of barrier islands as wilderness represents the greatest possible level of protection that can be given to the island units.

In accordance with the provisions of the Wilderness Act of 1964, the Fish and Wildlife Service and National Park Service barrier island units are being studied for possible inclusion in the wilderness system. Ten areas on wildlife refuges already have been established and range in size from a six acre wilderness area at Pelican Island NWR on Vero Beach, Florida, to one of 29,000 acres at Cape Romain NWR on Cape Island, Raccoon Key, and Bulls Island, South Carolina. Four other refuges have been studied and found to lack qualifications for the establishment of wilderness areas, while four others have been found to be qualified, and the departmental recommendations are awaiting congressional action. One of these is for Assateague Island and is a joint FWS-NPS proposal.

The amount of barrier island refuge acreage included in the Wilderness System is slightly more than 61,000. The four refuges on which wilderness areas have been proposed amount to 26,593 acres. Of this, 7,195 acres are included in the wilderness proposals.

Thirteen refuges which include barrier island acreage have been established since enactment of the Wilderness Act in 1964, and have not been considered for wilderness status. These 13 refuges vary from less than 30 to over 24,000 acres and total 64,200 acres.

Wilderness areas have been designated on two NPS areas (Gulf Islands and Everglades) and the only currently proposed area is included in the joint FWS-NPS proposal for Assateague. The Gulf Islands wilderness contains 1,800 acres; another 2,800 have been identified as potential wilderness. The Everglades designation involves 1,196,500 acres; another 81,900 acres have been identified as potential wilderness. The proposed NPS area for Assateague involves about 440 acres.

Two areas have been found unqualified for wilderness status (Padre Island and the Florida portion of Gulf Islands National Seashore). Five areas currently are being studied or are programmed for study in the near future.

Coastal Zone Management

The Coastal Zone Management Act (CZMA), administered by the Office of Coastal Zone Management (OCZM) in the Department of Commerce, has potential for providing mechanisms to protect barrier islands, particularly through State and local government initiatives.

The provisions of the Act that most directly relate to barrier island protection are those that provide financial assistance to States to develop and implement comprehensive coastal resource management programs and those that provide funds for the acquisition or further protection of barrier islands (through the shorefront access and barrier island acquisition, estuarine sanctuary, and coastal energy impact program provisions).

The Act provides funds for States to develop and implement comprehensive management programs addressing the needs for resource use and protection in a State's coastal zone. Up to 5 years of funding to develop a program is available to eligible States. Authorization for program development purposes expired in September 1979.

Subsequent to approval of its management program by the Secretary of Commerce, a State is eligible for funding to implement and operate its approved program. Funding authorization for this section also expired in September 1979 but is anticipated to be extended for at least another 5 years. In addition, once a State's coastal management program is approved, Federal agencies are required to conduct all activities, including the issuance of licenses, permits and federal financial assistance, consistent with the approved management program to the greatest extent possible.

Of the 35 States and territories (including the Great Lakes States) eligible to participate in the program, 15 already have federally approved programs, covering over 50% of the Nation's shoreline. Six of the 18 Atlantic and Gulf Coast States have approved plans and are receiving grants to administer and implement the programs. Within the next 2 years, it is anticipated that at least 27 States will have approved management programs, covering over 75% of the Nation's coastline.

A number of requirements in the Act for Federal approval are potentially important in promoting protection of barrier islands. These requirements include provisions for States to: (1) identify uses subject to the management program and the standards by which these uses are to be allowed or prohibited; (2) inventory and designate geographic areas of particular concern; (3) include procedures for designating areas for preservation or restoration; and (4) develop a planning process for the protection of and access to public beaches and other public coastal areas of environmental, esthetic or ecological value.

These provisions have been used by a number of States to afford barrier islands greater protection than existed before coastal management programs went into effect. For example, Rhode Island has made it a matter of State policy to prohibit future development on presently undeveloped barrier beaches. South Carolina's management program includes policies for discouraging new public investments in infrastructure (such as roads, bridges or sewage facilities) on undeveloped barrier islands.

Of the 3 provisions that could be used for barrier island acquisition, the one with the most direct relevance is Section 315(2): Shorefront Access and Barrier Island Acquisition. However, it also has been the least used. Although $25 million annually is authorized through FY 80 to remain available until expended, no funds yet have been appropriated for this program.

The estuarine sanctuary program authorized by Section 315(1) of the Act is designed to preserve representative estuarine areas around the Nation in their natural states. These sanctuaries may be used for research and education purposes. While not specifically designed to protect barrier islands, such islands - in part or whole - may be acquired as part of a sanctuary. Since 1974, 5 sanctuaries have been established in Oregon, Georgia, Hawaii, Ohio and Florida at a cost of $5.9 million, including maintenance and operations. Two

more sanctuaries in California and Florida are in the process of being established. The sanctuary in Georgia includes a barrier island and a marsh, and the one being established in Florida includes 3 barrier islands.

The Coastal Energy Impact Program authorizes grants and loans to States and localities to help them deal with the impacts of energy development, production, and transmission, particularly activities associated with outer continental shelf oil and gas development. One particularly relevant grant provision is designed to prevent, reduce or ameliorate unavoidable losses of valuable environmental or recreational resources when such losses are the result of coastal energy activity. However, this environmental grant provision is funded at only $1.5 million per year and no State has yet used these monies to acquire barrier islands.

Floodplain Management, Executive Order 11988

Executive Order 11988, Floodplain Management, signed May 24, 1977, established new Federal policy for executive agencies and requires Federal agencies to avoid, to the extent possible, the long and short term adverse impacts associated with activities in floodplains, and to avoid the direct or indirect support of floodplain development. It requires agencies to issue new or amended procedures to ensure the nonhazardous use of riverine, coastal and other floodplains.

The Order applies specifically to agencies that: (1) acquire, manage, or dispose of Federal lands and facilities; (2) undertake, finance, or assist in construction and improvements; and (3) conduct activities and programs affecting land use, including planning, regulation, and licensing.

The term "base floodplain" is used as the measurement for determining, in most cases, when the Order applies, and refers to the area subject to a flood having a one percent chance of occurring in any given year (100 year flood). The "critical action" floodplain is the other measurement used, and refers to the area having a 0.2 percent chance of flooding in any year (500 year flood). As stated within the Order "this determination shall be made according to a Department of Housing and Urban Development floodplain map or a more detailed map of an area, if available."

Based on floodplain maps for a sampling of areas, a high percentage of the land area on barrier islands (up to 85%) is located in floodplains covered by the Order.

Each agency has the responsibility to evaluate the potential direct and indirect effects of any actions it may take in a floodplain, and ensure that its planning programs and budget requests reflect adequate consideration of flood hazards and floodplain management.

The Water Resources Council issued guidelines on February 10, 1978, outlining the major steps in the decisionmaking process an agency should follow when proposing an action which would be located in the base floodplain. The procedures recommended by the guidelines state that once an agency determines

an action is located in the base floodplain (or critical action floodplain for proposals such as hospitals or facilities producing toxic water-reactive materials), the agency must then notify the public early enough for there to be a meaningful public input. The Order additionally requires agencies to consider all practicable alternatives to the proposal, including alternative siting or the alternative of taking no action. The impacts to the floodplain that would occur from the action must be fully identified. Adverse impacts must be minimized, and natural and beneficial floodplain values must be restored and preserved.

The Order also requires any requests for new authorizations or appropriations transmitted to the Office of Management and Budget to indicate when a proposed action would be located in a floodplain, and if in a floodplain, whether the proposed action is in accord with the Order. Because so much of the land on barrier islands is located in floodplains, the Executive Order on floodplain management, in combination with the Executive Order on the protection of wetlands (discussed separately), could provide substantial protection to the barrier islands' ecosystems. Although neither Order constitutes a prohibition on Federal involvement when floodplains or wetlands are involved, a complete prohibition is not feasible.

Without a clear requirement that Federal agencies objectively assess the effects of growth and development induced by their actions on floodplain values, the effectiveness of the Executive Order may be less than optimal.

It is these long-term impacts of progressive development which have the greatest potential for compromising floodplain and wetland values. It is in this area where agencies are the most reluctant to undertake an analysis and where, once undertaken, an analysis is most likely to be inadequate.

Protection of Wetlands, Executive Order 11990

Executive Order 11990, issued on May 24, 1977, directs Federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands. All agencies are ordered to avoid "to the extent possible" the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands whenever there is "a practicable alternative." Like Executive Order 11988 relating to floodplains, the Order is both procedural and substantive, and applies to agencies involved in (1) acquiring, managing and disposing of Federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities affecting land use, including but not limited to water and related land resources planning, regulatory, and licensing activities.

The Wetlands Order was issued at the same time and contains many identical provisions as Executive Order 11988.

The Wetlands Order differs from the Floodplain Order, however, by specifically delineating the major factors agencies must consider when proposing an action located in a wetland area. The factors that must be considered are: the

public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; sediment and erosion; maintenance of natural systems including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; recreational, scientific, and cultural uses.

The Order does not apply to private permits for activities involving wetlands on non-Federal property, because that would be duplicative of Section 404 permits. The Wetlands Order also does not apply to any Federal activity as does the Floodplain Order, but only to new construction undertaken in or affecting wetlands. The Wetlands Order does, however, require Federal leases, easements, or deeds involving non-Federal parties to reference in the conveyance restricted uses as identified by any Federal, State or local wetlands regulations.

The review required by the Order is very comprehensive, and should have wide application to many environmentally-damaging projects now undertaken by the Federal Government on or near barrier islands.

The Order, although not quite as broad as the one for floodplains, will require Federal agencies to seek all practicable alternatives to new construction in wetlands and should significantly reduce dredge and fill operations, beach reconstruction, and groin or seawall construction on the barrier islands.

Environmental Impact Statement Reviews

The National Environmental Policy Act (NEPA) requires all Federal agencies to take into account the value of environmental preservation in their activities and prescribes certain procedural measures to ensure that such values are fully respected. An important aspect of the law is the requirement of preparation of Environmental Impact Statements (EIS) for every proposal for legislation and other major Federal actions significantly affecting the quality of the human environment.

EIS's and environmental assessments under NEPA may be required for permits (e.g. Corps of Engineers, Coast Guard, Environmental Protection Agency), grants of money (e.g. Federal Highway Administration, Economic Development Agency, Office of Coastal Zone Management), and new housing (e.g. Department of Housing and Urban Development). Environmental review must also be undertaken for direct Federal projects and for land use management or disposal proposals (e.g. Department of the Interior, Department of Defense, General Services Administration).

CEQ regulations for implementing procedural provisions of NEPA became binding on all Federal agencies on July 30, 1979. The purpose of the new regulations is to reduce paperwork, reduce delays, and produce better decisions.

The regulations emphasize the need for early cooperation among agencies with an interest in the proposed action and, further, emphasize the need for continued coordination throughout the process.

In preparing environmental impact statements, agencies are to make sincere efforts to involve the public in preparing the EIS and in its review. NEPA review is promoting progressively more reevaluation of projects affecting barier islands. A major case in point is the Fire Island Inlet to Montauk Point hurricane protection/ erosion control project, a major Corps of Engineer's shoreline stabilization project authorized in 1960 and potentially affecting 83 miles of Long Island's south shore. The environmental statement was the vehicle for bringing to light serious deficiencies in the analytical support for the project and, as a result of an administrative referral to CEQ (a process available for mediation of environmental issues) by Interior, the project is now being reformulated. As a spin-off, the Corps is now conducting a major study (through the Coastal Engineering Reseach Center) of barrier island evolution and sedimentary dynamics, which should provide considerable information useful in assessing the possible effects of a wide variety of actions affecting barrier islands. There are many other pending cases (e.g. St. Phillips Island Section 10 permit, Corps' Oregon Inlet stabilization project on the Outer Banks, etc.) where the NEPA process has been the primary vehicle for promoting reconsideration of questionable proposals. The more effective use of NEPA under the Council's new regulations holds great potential for improving our ability to protect barrier islands, provided there is sufficient monitoring of Federal programs to be sure that NEPA analyses are conducted for all actions having potential for causing significant impacts on barrier islands and that sufficient technical expertise is available for and brought to bear on Federal agencies' review of these analyses.

Air Quality Control

The Clean Air Act of 1970 established a two-phase strategy to maintain ambient air quality standards. First is the regulation of new indirect, or complex sources--those facilities likely to generate substantially increased vehicular traffic. Such facilities in the coastal zone might include new ports or marinas, waterfront recreational complexes, and large industrial plants. Under the Clean Air Act, assurance must be provided that such facilities will not result in the violation of air quality standards. Second, and still largely unformulated, the EPA air quality maintenance strategy calls for the development of growth plans and development of a long-term control strategy where such growth may lead to air quality deterioration.

Federal funds are available for up to two-thirds the cost of planning, developing, establishing or improving State air pollution prevention and control programs; and up to one-half the cost of maintaining such programs.

The authority under Section 309 of the Clean Air Act parallels that under NEPA and relates to the subject areas where EPA has jurisdiction or special expertise. It requires the EPA Administrator to "review and comment...on the environmental impact of any matter relating to...the authority of the Administrator contained in (1) any legislation proposed by any Federal department or agency; (2) newly authorized Federal projects for construction and any major Federal agency action other than a project for construction to which Section 102 (2) (c) of NEPA applies, and (3) proposed regulations published by any department or agency..." The Administrator's comments must be made public and if he determines that the matter under review "is unsatisfactory from the standpoint of public health or welfare or environmental quality, he shall publish his determination and the matter shall be referred to the Council on Environmental Quality."

This requirement brings within EPA purview any major Federal actio proposal that impacts health, welfare, or the environment on the barrier islands. This includes actions in the territorial sea, the contiguous zone, or the oceans that would impact these islands.

EPA policy and regulations require that activities, such as those listed above, be in conformance with related statutory requirements. The Coastal Zone Management Act (CZMA) - which could provide special considerations for the barrier islands - requires:

1. that the requirements of the Federal Water Pollution Control Act and Clean Air Act be incorporated into CZM programs developed by the States, and

2. that all Federal activities in the coastal zone (including issuance of permits and licenses) be consistent with State CZM programs.

Flood Insurance Program

Section 1360 of the National Flood Insurance Act of 1968 authorizes the Secretary of the Department of Housing and Urban Development to enter into agreements with other agencies for the purpose of identifying and publishing information on floodplain areas which have special flood hazards.

One of the stated purposes of the Flood Disaster Protection Act of 1973 is to:

> "require the purchase of flood insurance by property owners who are being assisted by Federal programs or by federally supervised, regulated, or insured agencies or institutions in the acquisition or improvement of land or facilities located or to be located in identified areas having special flood hazards."

From 1936 through mid-1977, almost $10 billion in general tax revenues were invested in various flood protection works. In spite of the heavy Federal investment, annual flood losses have continued to increase. For urbanized areas alone, the flood loss is estimated at $1.5 billion per year.1/ This in spite of the relative absence of major hurricane activity along the east coast during the past 15-20 years; a period during which the urbanization of barrier islands has grown to about 14% as compared to 3% of the Nation as a whole. The rate at which the islands are urbanizing is about twice that of the Nation as a whole.

Flood damages result from man's generally ill-advised use of floodplains and his attitude that solutions to flood problems can be attained by altering the riverine or coastal environment rather than adapting his environment to that of nature.

The coastal flood hazard from hurricanes and other tropical storms is distinctly different than that of riverine floods. Coastal surge, wave action, high winds, and scouring make development of areas adjacent to open ocean extremely hazardous.

1/ J. Robert Hunter, Environmental Comment, June 1977

Yet demand for property in these areas has grown substantially in the period of remarkable quiescence in terms of hurricane activity along the east coast mentioned above.

The Flood Insurance Program's efforts to reduce flood losses are, in large part, dependent upon completion of the Flood Insurance Rate Maps (FIRM) for identification of flood prone and flood hazard areas.

FIA has given priority to mapping coastal floodplain areas. Of the nearly 300 units identified by this study, 188 are included in communities covered by the National Flood Insurance Program. As of May 4, 1979, 130 of these communities already were in the regular phase of the program; 55 still were in the emergency phase of the program; and 3 were not participating in the program. Of these 58:

36 have mapping studies underway

14 have mapping studies scheduled to start in FY '79

6 have no studies scheduled

2 have studies completed and are scheduled to convert to the regular program before the end of calendar year 1979.

Despite a high rate of participation and compliance by communities in the Flood Insurance Program, decisions about whether or where to locate in coastal high hazard areas do not appear to be affected by the program's minimum requirements or actuarial rates.

Therefore, the Federal Insurance Administration (FIA) has published regulations relating to construction on sand dunes and in mangrove areas and requiring consideration of wave scour under coastal structures. FIA also is considering incorporation of wave run-up in determination of minimum building elevation requirements. A study also is underway on the feasibility of implementing Section 1362 of the Flood Insurance Act which authorizes acquisition of severly damaged properties in flood prone areas.

These items, properly implemented and enforced, could aid substantially in protecting coastal high hazard areas from unwise development.

Moderate-level Protection Alternative

I. Developmental Project Evaluation

Objective: Ensure that strict environmental review is given to all projects on barrier islands proposed or assisted by Federal agencies.

Discussion: The Federal actions which affect the barrier islands most dramatically and directly are Federal construction projects or development projects funded through loans and grants made to other governmental entities or private citizens. A number of agencies have been identified as supporting development on barrier islands through loan or grant programs; others such as the General Services Administration, Fish and Wildlife Service, National Park Service and Corps of Engineers however, are specifically responsible for Federal facility construction. The options presented address all federally assisted programs directly related to development projects.

Prior to approval, development project applications are subjected to two types of review. These consist of the environmental impact analysis required by the National Environmental Policy Act (NEPA) and regulations issued by the Council on Environmental Quality (CEQ) implementing NEPA, and the approving agencies' own procedures for awarding loans and grants.

A number of grant programs induce growth on the fragile resources of the barrier islands. This growth should be limited to those areas where its impacts are determined to be least detrimental to these resources. Approval of any grant should be conditioned on soil suitability and capability to accommodate the proposed project. Areas unable to support growth-inducing proposals should remain in open space, contributing to the overall protection of the natural resources on the islands. It is essential that Federal development program managers consider the influence, either direct or indirect, their programs have on the patterns of land use and on the rate of timing of development occurring on a barrier island.

Special attention should be given to the various loan and grant programs which subsidize development and which could have significant effects on the barrier island environment. It is critical, therefore, that the programs be carefully monitored. For example, loans and grants for constructing or expanding areawide wastewater treatment facilities or water and sewer lines, assistance to small-business concerns, or disaster relief construction on barrier islands, should be limited to those facilities essential to the health and safety of the residents or critical for the protection of the environment. Furthermore, since the relationship between wastewater treatment and high-quality domestic water sources is extremly critical on the barrier islands, wastewater treatment

projects on barrier islands should be in accordance with the current water quality management plan and with the State Coastal Zone Management plan.

The development of an environmental impact statement (EIS) or environmental assessment (EA) for each proposed development or reconstruction project on a barrier island would greatly enhance the protection effort. Once a development proposal is approved, it serves as a catalyst for more development which may overtax the physical capabilities of the barrier island and expose large numbers of people to extremely hazardous conditions. Hence, all projects should fully consider both the direct and indirect impacts which approval would bring.

Any EIS and EA for a barrier island project should address all potential hazards; carefully analyze all feasible alternatives to the proposed project; identify the measures to minimize or mitigate possible impacts; and provide the burden of proving the necessity of locating the proposed project on a barrier island. Through the EIS process, the public benefits from any proposed project on a barrier island would be affirmed; the costs to the public, as well as any loss of resources, would be recognized; and finally, potential conflicts between supported development and areas deserving protection would be minimized. There is no doubt that Federal agencies need to better analyze developmental proposals on barrier islands as to their impacts on the natural resource and the consequences of natural hazards. The EA and EIS are the tools for ensuring that full analysis and consideration is given to a project's merits and detriments before any approval is finalized.

It is also essential, however, that all agency procedures ensure that severe environmental constraints surrounding developmental projects on barrier islands will receive a comprehensive review. Agency approval procedures should specify how the barrier island constraints, such as island migration, storm vulnerability, water supply, and endangered species would be fully addressed in the project's design and construction. The procedures should be directed to ensure that all projects undertaken or subsidized by the Federal Government on barrier islands would endure through their useful life cycle.

A Federal program, usually undertaken for a State or a political subdivision within the State, and which has no specific agency approval procedures, is the Corps navigation program. Navigational dredging is performed to maintain channels, turning basins, harbors, and marinas and it exerts a profound long-term effect on the dynamic sand-sharing system essential to perpetuating the barrier islands.

The need constantly to remove sediment from the various above-mentioned areas creates an enormous amount of dredge "spoil" which

should be disposed of in an economical, but environmentally sound manner. Instead the practice has been to dump much of the spoil in tidal marshes, primarily because alternative methods are more expensive and the Corps does not always have the right equipment at the right time so as to minimize expenses. In some instances on troublesome shoal areas, the Corps has, for economic reasons, dredged to an overdepth as advance maintenance to prevent the requirement of returning to the same project two or more times in the same dredge season.

The Corps has recently, however, made a major effort to reduce the inputs of spoil disposal. One of the benefits of this effort is the creation of hundreds of acres of spoil islands providing prime wildlife habitat for colonially nesting short birds.

Navigational dredging also may have potential adverse effects on many historic and archeological resources around barrier islands, including ship wrecks and submerged prehistoric sites. If not properly identified and mitigated by avoidance or related actions, such impacts could include irreversible and irretrievable commitments of these resources. Current interagency coordination efforts, often associated with the NEPA process, have proven very effective in reducing the severity of impacts from disposal of spoil and navigational dredging.

Options:

1. In determining a proposal's "significance" under NEPA and CEQ's regulations (40 CFR { Section 1508.27) Federal agencies should give thoughtful consideration to the barrier island's unique natural processes and inherent hazards. The natural dynamics of barrier islands mandate stricter application of NEPA's test of "major Federal actions significantly affecting the quality of the human environment"; Federal actions that would not be significant if proposed elsewhere, would in most cases, be significant for NEPA purposes when proposed on barrier islands.

2. All agencies responsible for programs which undertake or provide assistance for development projects on barrier islands should be required to demonstrate that their approval procedures provide for critical review of projects which have the potential to increase population growth or land development or which lead to any one or more of the following:

    a. destruction of wetlands or significant areas of fish or wildlife habitat;

    b. shoreline erosion (or changes in shoreline erosion) which lead to potential damage to structures and real property;

c. questionable ability of the population to reach mainland areas for safety, or to be temporarily housed in physically safe structures during times of intense storms;

d. reduction in existing fresh water table or quality of groundwater; or

e. inadequate sewage and/or solid waste disposal.

3. An effort should be undertaken by all Federal agencies to avoid direct or indirect support or approval of barrier island development proposals where there is a practicable alternative. In addition, each agency should develop specific factors which must be analyzed in the assessment of potential adverse impacts from all proposed projects.

4. New Federal construction or reconstruction or the leasing of excess Federal building space in hazardous barrier island locations should be restricted unless such space is essential for reasons of health, safety, or other public service and there is no feasible alternative. Restricting growth-inducing Federal facilities such as offices, warehouses, and the like to safer mainland sites may reduce related development pressures on the islands. Likewise, Federal facilities which are damaged by storms and which are not required for purposes of public health or safety, should be removed and not rebuilt on the hazardous barrier islands.

5. Minimize navigational dredging to reduce adverse impacts to the aquatic and terrestrial ecosystems. Spoil material should not be deposited on, near, or within the land and water areas of the barrier islands unless long-term benefits are demonstrated.

6. The siting of primary energy facilities on the barrier islands should be restricted unless there is no practicable alternative. Undeveloped and unprotected barrier islands should be provided protection from energy facility developments to the maximum extent feasible. Energy facilities proposed for sites on barrier islands should be planned and developed with careful consideration for the remaining resource values on the islands and for the potential impacts on adjacent islands.

7. Require all approved wastewater treatment projects on barrier islands to be in accordance with a current water quality management plan and with a State Coastal Zone Management plan.

Agencies and Programs Affected:

1. Environmental Protection Agency (EPA)

   A. The Clean Water Act (Clean Water Act of 1977 and the Federal Water Pollution Control Act Amendments of 1972; P.L. 92-500; 33 U.S.C. 1281 et seq.) authorizing:
      a. Wastewater Treatment Construction Grants (Sec. 201)
      b. Water Quality Management Planning (Sec. 208)
      c. National Pollutant Discharge Elimination System (NPDES) (Sec. 402)
      d. Permits for Dredged or Fill Material (Sec. 404)

   B. Clean Air Act of 1963, P.L. 88-206, 42 U.S.C. 1857; as amended by P.L. 91-604, the Clean Air Act Amendments of 1970.
      a. State Implementation Plans (SIP)
      b. Air Quality Maintenance Areas (AQMA)
      c. Air Pollution Program Grants
      d. Section 309 Review

2. Small Business Administration (SBA)

   The Small Business Act of 1953, P.L. 83-163, 15 U.S.C. 631 as amended.

3. Economic Development Administration (EDA)

   The Public Works and Economic Act of 1965, P.L. 89-136, 42 U.S.C. 3121.

4. General Services Administration (GSA)

   The Federal Property and Administrative Services Act of 1949, as amended, and Public Law 93-288, Title IV.

5. Farmers Home Administration (FmHA)
   The Consolidated Farm and Rural Development Act (P.L. 92-419, 7 U.S.C. 1921 as amended by P.L. 93-237, 15 U.S.C. 633); the Housing Act of 1949 and the Food and Agriculture Act of 1962.

6. Department of Housing and Urban Development (HUD)
   The Housing and Community Development Act of 1974 (P.L. 93-383), 42 U.S.C. 5301; Housing and Community Development Act of 1977 (P.L. 95-128); Interstate Land Sales Full Disclosure Act established by Title XIV of P.L. 90-448, 15 U.S.C. 1701.

7. U.S. Army Corps of Engineers
   Flood Control Act of 1941 (P.L. 84-99, 33 U.S.C. 701n; 77-228, 33 U.S.C. 701(b) et seq as amended by P.L. 87-874); Rivers and Harbors Act of 1960 (Sec. 107, P.L. 86-645 as amended).

8. Federal Emergency Management Agency (FEMA)
Disaster Relief Act of 1974, P.L. 93-288, 42 U.S.C. 5121.

9. Department of Energy (DOE)
Atomic Energy Act of 1954, P.L. 83-703, 42 U.S.C. 2011, as amended. Energy Reorganization Act of 1974, P.L. 93-438, 42 U.S.C. 5801. Department of Energy Organization Act, P.L. 95-91, 42 U.S.C. 7101.

II. Flood Insurance

Objective: To promote wiser use of barrier islands through prompt identification and mapping of the high hazard areas and reflection of those hazards in federally sponsored flood insurance programs affecting barrier island properties.

Discussion: Under the provisions of the Flood Disaster Protection Act of 1973, communities having one or more identified special flood hazard areas must enter into the National Flood Insurance Program or be denied Federal or federally related financial assistance for acquisition or construction purposes within those areas.

Property owners may buy flood insurance at a rate lower than normal actuarial rates due to a subsidy by the Federal Government. In communities where actuarial rates have been determined, "regular program" coverage permits policy owners to purchase at actuarial rates a second level of coverage, equal in amount to the established limits.

From the outset of the Flood Insurance Program, the minimum flood plain management requirements have been building requirements. That is, guidance to reduce flooding impacts has been directed primarily to structural rather than locational considerations.

The National Flood Insurance Act of 1968, as amended, provides authorities to the Secretary * not only to identify and publish information with respect to all flood plain areas (Sec. 1360(a)(1)) and to establish flood risk zones (1360(a)(2)), but also to: "develop comprehensive criteria designed to encourage, where necessary, the adoption of adequate State and local measures which..." will improve the management of flood prone areas and to assist States and local governments to acquire properties located in flood risk areas and which are severely damaged by floods. The Flood Insurance Program considerations are very important in any plan to protect barrier islands from unwise development, particularly since a large majority of island land is located in the 100-year flood plain.

* Or representative as directed by the Housing Authorization Act (12 U.S.C. 1701)

The 100-year flood plain is now calculated on the basis of still water elevations. The effects of storm surges are not taken into consideration for coastal zones. These dramatically influence flood levels and damage in coastal areas. Barrier island flood prone areas present a number of hazards in addition to wave crest and run-up not encountered in riverine or other flood plains, e.g., wave scour, extreme high winds, and wave uplift.

Options:

1. Federal Insurance Administration (FIA) - Higher priority should be placed on flood plain mapping for barrier islands. Although the FIA has placed emphasis on completing coastal flood plain mapping, the fact remains that substantially increased efforts will be required to meet the congressionally mandated completion date of 1983. Once the mapping and precise delineation of flood hazard areas is completed, insurance rates and construction standards for many barrier island communities will be affected.

2. In calculating the 100-year flood elevations on barrier islands, the height of wave crest and run-up should be included as an integral part of the process.

3. To adequately reflect these unique hazards, Federal Insurance Administration should consider modifying its regulations to differentiate between the types and degrees of hazard. Incorporating this information into determination of rate structures may reduce risk to life and property and further protect the natural resource values on the islands.

4. Upon completion of flood plain mapping for barrier islands, FIA should consider developing actuarial rates specifically related to barrier islands and which reflect the true risks of developing on barrier islands. These insurance rates would, undoubtedly, be higher. Hopefully, decisions on where and how to build would be affected by the higher rates; the islands natural features would be protected; and, costs to the general taxpayer from insurance subsidies would be reduced.

5. Once the true risks are reflected in the actuarial rates and construction standards, FIA should ensure adequate levels of inspection and enforcement of approved building codes as a qualification for flood insurance eligibility. Building codes and other regulations affecting development on barrier islands are only as effective as the quality of inspection and enforcement. FIA should establish minimum quality standards for inspectors and require certification of inspectors as a requirement for flood insurance eligibility.

6. FIA regulations for insurance eligibility should include local requirements that new construction or reconstruction be located landward of the reach of mean high tide.

Agency and Programs Affected:

These options would affect only programs and authorities of the Federal Insurance Administration which are: National Flood Insurance Act of 1968, P.L. 90-448, 42 U.S.C. 1441, as amended by the Housing and Urban Development Act of 1968, P.L. 91-152, and the Housing and Community Development Act of 1974, P.L. 93-383, 42 U.S.C. 4001, as amended by the Housing Authorization Act of 1976, P.L. 94-375, 12 U.S.C. 1701.

III. Disaster Mitigation and Recovery

Objective: To promote the use of disaster assistance and coastal protection programs to guide future uses of barrier islands so as to minimize the loss of natural values, reduce the loss of human life and property, and lessen costs to the general taxpayer resulting from unwise development of high hazard areas on barrier islands.

Discussion: Several Federal programs are designed to provide assistance to States, local governments, individuals, and owners of selected non-profit facilities to alleviate suffering and damage which result from natural disasters. These programs also assist in the reconstruction and rehabilitation of devastated areas including those located in hazardous locations on barrier islands.

The Disaster Relief Act of 1974 authorizes establishment of disaster preparedness plans, utilizing all appropriate agencies. It provides for technical assistance and grants to the States in developing comprehensive disaster plans and programs, to include hazard reduction, avoidance, and mitigation. Section 401 authorizes the repair, reconstruction, restoration or replacement of any facility owned by the United States which is damaged or destroyed by any major disaster if it is determined that such a facility is necessary. In implementing the section, the appropriate Federal agency is responsible for evaluating the natural hazards to which the facility is exposed and is required to take the necessary action to mitigate such hazards.

Under Title VIII of the Act, Recovery Planning Councils may be authorized and established following a major disaster. These Councils are responsible for determining when and under what conditions recovery investment plans should be prepared. This provision generally has been interpreted to be a vehicle to get a maximum amount of recovery assistance into a devastated area as quickly as possible.

The Small Business Administration (SBA) also provides disaster assistance loans for reconstruction or restoration of property to redisaster conditions. Funds are available to a wide variety of institutions and to individuals.

The U.S. Army Corps of Engineers administers coastal protection works programs which: (1) provide assistance for repair and restoration of flood damages and shore protection works damaged by storms; and (2) provide assistance to State and local governments for emergency operations, including rescue, during flood periods. The first program permits the restoration of coastal protection structures which control or restrict the normal retreat or erosion of barrier islands and their beaches and promotes a false sense of security in island inhabitants.

Federal disaster mitigation and recovery programs should be redirected to assure that they do not simply perpetuate past mistakes by encouraging or subsidizing reconstruction or restoration of storm damaged structures in high hazard areas.

Options:

1. Federal Disaster Assistance Administration (FDAA) and Small Business Administration (SBA) should consider developing regulations by which to condition receipt of pre-disaster planning assistance and post-disaster loans or grants on adoption of standards in State disaster recovery plans which would:

   a) incorporate the State's own disaster legislation and require its full implementation;

   b) require a recognition that barrier islands are areas particularly vulnerable to disaster;

   c) be adequate to protect human life by discouraging development of high hazard areas; and

   d) require State preparation of "contingency redevelopment plans" which will encourage reconstruction away from barrier islands.

2. Corps of Engineers - Strengthen the role of the Corps of Engineers in coastal protection by emphasizing the natural protective capabilities and the need to preserve the ecological integrity of wetlands, beaches, and dunes.

3. Encourage the Corps shift away from increasingly expensive structural control of erosion and flooding toward cooperative land management.

4. Restrict development of erosion and flood control structures on undeveloped barrier islands except in exceptional circumstances and then only where it can be demonstrated that the proposed stucture will not adversely affect other barrier island areas.

5. Require concurrence of the Secretary of the Interior for any erosion or flood control structure which may adversely affect an island administered by the Department of the Interior.

6. Restrict issuance of permits to dredge or fill in wetlands on a barrier island except in extreme cases of overriding national interest.

7. Require the Office of the Chief of Engineers to (a) develop and issue specific criteria and guidance regarding the significance of barrier islands; (b) prepare a uniform method for each Corps District to carry out its program operations on the islands; (c) define regulatory boundaries for District and Division Offices by which to identify jurisdictional control and to ensure consistency within the flood control and disaster assistance programs as they relate to barrier islands.

Agency and Programs Affected:

1. FDAA - Disaster Relief Act of 1974; P.L. 93-288; 42 U.S.C. 5121

2. SBA - Small Business Act of 1953, as amended; P.L. 83-163; 15 U.S.C. 631

3. Corps - Public Law 84-99, 33 U.S.C. 701n, Flood Control Act of 1941; 77-228, 33 U.S.C. 701b et seq as amended by P.L. 87-874. Flood Control Act of 1941; P.L. 77-228 as amended by P.L. 84-874

IV. Resource Evaluation and Planning

Objective: Increase emphasis by Federal agencies in identifying and evaluating barrier island resources possessing high natural, cultural, or historical values, to ensure that the greatest degree of protection feasible can be provided to these values.

Discussion: The data collected for the barrier island study provides an excellent overview of the scope and variety of the barrier island resource, the magnitude of the problems and opportunities presented by that resource, and of the impacts Federal programs have on barrier islands. However, the study also emphasized that much more needs to be accomplished to identify and evaluate specific kinds of resources and values for designation and protection under a variety of classifications. In other words, it is necessary to know what the special values are before plans and programs can be developed and implemented for protection of the unique opportunities barrier islands can provide.

Consistent basic management goals and policies for protecting and/or enhancing the islands and resources are extremely important and should be provided through a comprehensive planning process. To be an effective guide for decisionmaking, management goals for Federal lands must be responsive to legislative and administrative constraints on the management of a particular area as well as to the conditions and trends occurring in the area itself and in its surrounding region. Particularly important is a comprehensive information base on the particular barrier island environment and on the effects of various influences upon it.

A systematic, interdisciplinary planning process should provide the vehicle for formulating alternative strategies for achieving the management objectives of a particular island, for objectively assessing the environmental and other consequences of these strategies, for integrating a particular island into its regional ecological and socioeconomic environment, for carrying out cooperative activities with other agencies and interests, and for involving a relatively large segment of the public in determining an island's future. Such a planning process also should provide a comprehensive public record of decisionmaking, and by showing how environmental and other factors were weighed, help promote objective, balanced decisions on management and use. Most importantly, such a planning process should result in plans that provide sufficient information for programming the funds necessary to implement actions that are required to protect the environment and provide for resource compatible public use. The planning process also will highlight deficiencies in the total system that can be corrected by acquisition. The National Park Service has prepared management plans for its barrier island units which could serve as a model for State and other Federal agencies.

A number of existing Federal programs and resource classifications can be applied to barrier islands. Wilderness designation and the designation of qualified areas as Research Natural Areas and National Environmental Study Areas are three such classifications which could provide means to protect barrier islands.

Wilderness designation offers perhaps the greatest possible level of protection that could be given to a barrier island under Federal administration. Some studies of potential wilderness areas on NPS lands have been completed and others are underway. However, wilderness areas have been designated in only two NPS management units. In contrast, wilderness areas have already been designated on 12 FWS managed refuges and five other refuge areas have been recommended for designation.

Research Natural Areas (RNA's) are lands and waters set aside from existing Federal lands to protect a "representative array of all significant natural ecosystems" as baseline areas for the purpose of obtaining information for understanding and comparing these ecosystems with manipulated ecosystems. RNA's have significant value in long-term environmental monitoring and research, in detecting changes and trends in environmental conditions, and in providing objective information on which to base land management decisions.

RNA's currently receive no special legislative protection and are managed for educational and research purposes solely as a result of a particular agency's administrative commitment to do so.

To date, the only designation of RNA's on barrier islands has been done by the U.S. Fish and Wildlife Service within 6 units of the National Wildlife Refuge System. The National Park Service has not designated any RNA's on barrier island units, although all of the NPS units--except Wright Brothers National Memorial--have areas that potentially qualify.

National Environmental Study Areas (NESA'S) may be designated on Federal lands following a request to do so by a local school system or other educational entity. These designations provide special recognition to areas which, by virtue of their resource values and history of educational use, have acquired particular educational significance. NESA's may be designated wherever a site is of particular significance in carrying out environmental education objectives.

RNA's and NESA's have great potential for enhancing public understanding of the relationship between man and the barrier island environment, with particular emphasis on the hazards associated with human development and use.

The Land and Water Conservation Fund (LWCF), administered by HCRS, is another program with great potential for protecting barrier islands. To qualify for grants under the LWCF, States must have in existence a Statewide Comprehensive Outdoor Recreation Plan (SCORP), up-to-date and approved by the Secretary. The Fund then provides matching grants to States for the acquisition and development of public outdoor recreation areas and facilities. Such plans have been prepared by all 18 coastal States and have been approved, and all but one State have used the Fund for barrier island projects. However, the present HCRS guidelines for preparation of the SCORP contain no special provisions to promote protection and environmentally compatible uses of barrier island resources in general or of protected islands in particular.

HCRS also maintains a barrier island data inventory and data bank and provides for technical assistance as provided by its Organic Act. The data bank consists of about 50 bits of information on each of the nearly 300 units identified in the study. These data bits include information on physical attributes as well as development status, ownership, management, and other characteristics. Such information is vital to the discernment of changing trends and to the development of long-range management plans and objectives.

HCRS also is responsible for evaluating and designating significant natural, historic, and cultural areas on barrier islands which qualify for inclusion on the National Registry of Natural Landmarks and the National Register of Historic Places. Even though barrier islands contain sites of the first landings by explorers and were the location for numerous early settlements, no coordinated systemmatic review and inventory of cultural, historic and natural resources has been conducted on barrier islands. The listing of a resource does not guarantee it will be protected totally, but such action does highlight the significance of the resource.

The Historic Preservation Fund, also administered by HCRS under the authority of the National Historic Preservation Act of 1966, provides matching grants for historic preservation to States from an annual appropriation for that purpose. The States may use the grants for surveying, evaluating, acquiring, and preserving significant cultural resources.

The Office of Coastal Zone Management (OCZM) administers a grant program to assist States in developing comprehensive management programs for their coastal zones. The management program must make provisions for procedures to designate specific areas for the purpose of preserving or restoring them for conservation, recreational, ecological, or aesthetic values. Once their programs have been approved, States then are eligible for financial assistance to administer the programs. Six of the 18 Atlantic and Gulf Coast States have approved programs and are receiving administrative grants to implement the programs. Five additional States should have their programs approved within a year.

The Office of Coastal Zone Management should encourage States, through use of grant allocations, to use their approved coastal management programs to provide greater protection to barrier islands. Working with other NOAA units with scientific data and expertise, OCZM also should provide technical assistance to States regarding hazards and impacts of special significance to barrier islands and suggested techniques for mitigating and avoiding these hazards.

The FWS is responsible for preparing inventories and lists of rare and endangered species of both plants and animals existing on barrier islands. Once a species is identified as being rare or endangered, the FWS delineates the areas of critical habitat for those species. Although many species of animals have been listed, many of the plants have not. The designation of critical habitat gives the Endangered Species Act its most definitive thrust by providing strong protection from Federal actions that would adversely impact identified critical habitat.

Options:

1. In order to protect barrier island resources and values adequately, the National Park Service and the Fish and Wildlife Service should place high priority on identifying and evaluating those barrier islands, parts of islands, or groups of islands which exhibit qualities of national significance. The primary purpose would be to identify and establish protection priorities for those areas suitable for designation as Wilderness areas, units of the National Park System, National Wildlife Refuge System, or for inclusion on the appropriate national register for natural, cultural or historic areas.

2. The FWS should expedite the inventory and listing of rare and endangered species of plants and animals on barrier islands. Areas of critical habitat for those species should be delineated.

3. Emphasis should be given to designating qualified barrier islands (areas) as Research Natural Areas and National Environmental Study Areas. Federal land holdings on barrier islands should be assessed for their qualities as unique (or high quality representatives of types of) ecosystems that should be protected for their scientific values and/or as areas suitable to support environmental science educational programs.

4. In order to improve the extent to which barrier islands are given special recognition at State and local levels, HCRS should amend and expand the State Comprehensive Outdoor Recreation Plan (SCORP) guidelines to consider barrier islands as areas of special environmental importance in the planning process.

   Specifically, barrier islands should be named as "special areas of broader national concern" in Section 630.1.5B(7) of the HCRS Grants-in-Aid Manual.

   Guidelines should make provision for designating barrier islands as special environments where particular precautions will be taken to ensure that recreational use and development does not adversely affect the resources and natural processes which make diverse recreational activities possible.

   The guidelines should provide proposed strategies for management of natural and cultural resources; provision of interpretive, educational, and recreational programs and opportunities; development of park facilities; and the integration of strategies with other governmental agencies and private organizations.

   The SCORP's also should consider an assessment of suitability of barrier islands and their adjacent resources for designation as National Marine Sanctuaries, National Estuarine Sanctuaries, nomination to the National Register of Historic Places, or use as sites for environmental education.

5. The Office of Coastal Zone Management should encourage States, through use of grant allocations, to use their approved coastal management programs to provide greater protection to barrier islands. This can be accomplished by States establishing policies to limit or prohibit development on barrier islands, by designating such islands as geographic areas of particular concern for preservation purposes, and by using the access and shorefront protection planning element of their programs to identify acquisition and protection priorities for barrier islands. Federal agencies should implement actions in a manner consistent with State program policies that are designed to protect barrier islands to the greatest extent practicable.

6. HCRS should update the barrier island inventory and information base every five years.

   The inventory update would correct inaccuracies and account for changes in management and island conditions. The update should be published with appropriate maps and distributed to the eighteen coastal States to supplement their planning and operational activities. The information has relevance to planners and decisionmakers only to the extent that it is accurate and current.

7. FWS should expedite the development of comprehensive management plans for each of its barrier island refuges utilizing a systematic, interdisciplinary planning process.

8. The review and identification of undeveloped areas of NPS and FWS administered barrier islands which qualify for wilderness designation should be expedited.

   Those areas where wilderness already has been designated should be reevaluated periodically to determine if additional acreage qualifies. More importantly, areas previously determined to be unqualified for wilderness designation should be reevaluated periodically to determine whether the responsible conditions still exist and whether they can be mitigated or eliminated sufficiently to qualify the area for wilderness. Areas where wilderness suitability has not been determined should be evaluated as soon as comprehensive plans can be scheduled. This applies especially to FWS barrier island related refuges added to the System since 1964.

Agency and Programs Affected:

1. HCRS - The Land and Water Conservation Fund Act - P.L. 88-578, as amended; 16 U.S.C. 1-4 et seq.

   The Historic Sites Act; 16 U.S.C. 463

   The National Historic Preservation Act of 1966; 16 U.S.C. 470

   The Archeological and Historic Preservation Act, as amended; 16 U.S.C. 469

   HCRS (BOR) Organic Act; 16 U.S.C. 1

2 NPS - The Act of August 25, 1916; 16 U.S.C. Section 1 et seq

   The NPS Administrative Authorities Act; 16 U.S.C. 1-1a

   The Wilderness Act 16 U.S.C. 1131-1136

   The Park, Parkway, and Recreation Study Act; 16 U.S.C. 17

3. FWS - Fish and Wildlife Act of 1956; 16 U.S.C. 742(a)-754

   Fish and Wildlife Coordination Act; 16 U.S.C. 661-667e

   National Wildlife Refuge System Act; 16 U.S.C. 668 dd-668jj

   Migratory Bird Conservation Act; 16 U.S.C. 701-718h

   Endangered Species Act of 1973; 16 U.S.C. 1531-1543

   Wilderness Act; 16 U.S.C. 1131-1136

   Recreation Act of 1962 16 U.S.C. 460k-460k-4

4. OCZM - Coastal Zone Management Act of 1972, as amended; 16 U.S.C. 1451

V Permit Process

Objective: Ensure that all permits or rights-of-way awarded for activities related to barrier islands would not alter or destroy existing natural resource values.

Discussion: A number of Federal agencies are responsible for issuing permits, rights-of-way and leases which could impact upon barrier islands. The Army Corps of Engineers, for example, through its responsibilities for Section 404 permits, has jurisdiction over all discharges of material into the waters of the United States. The Corps, then, has the power to encourage sound barrier island development by applying its wetlands protection policy which states that dredge or fill permits in wetlands will not be issued if there exists an alternative means. Furthermore, the Corps is required to consider and act upon factors other than navigation in deciding permit cases in the public interest. In regard to barrier islands, storm hazard mitigation and the protection of valuable resources are two obvious factors which should be considered in determining the public interest.

Another very critical permit program and one that could have detrimental inpacts upon barrier islands is the Coast Guard's bridge permit program. It has been the practice of the Coast Guard to issue bridge permits unless the proposed structure would interfere with navigation.

Until recently, neither the Coast Guard nor the public adequately considered the crucial role bridges play in promoting and making possible the development of barrier islands. Bridge permits were not evaluated on the basis of environmental, social economic, or hazard factors unrelated to decisions regarding navigation. To date the Coast Guard has no current regulations that spell out the regulatory test which the agency will apply in evaluating bridge proposals that lead to barrier island development or that set forth the burden of proof which a bridge permit applicant must satisfy in order to qualify for a permit. While the Coast Guard does have NEPA regulations, and has been preparing environmental impact statements, it is not clear whether these impacts will be considered as the basis for agency decisionmaking.

Equally unclear are Coast Guard policies with respect to the administration of other statutory requirements and considerations. The Department of Transportation, the parent agency, has adopted a wetlands protection policy, DOT Order No. 5660.1, May 21, 1975. While wetlands are usually found in association with barrier islands, the Coast Guard has yet to decide how it will apply the DOT policy to bridge and development cases.

Similarly, Section 4(f) of the DOT Act of 1966, 49 U.S.C. 1653(f), forbids the agency from sponsoring or approving projects that would use publicly-owned land that is important for wildlife and recreation, unless there are no feasible alternatives and all planning measures have been taken to reduce the impact of the project on public wildlife and recreational resources. An unresolved question is whether tidal marshlands, generally deemed "public trust" lands, and certainly important for wildlife and recreation, come under the protection of Section 4(f) and what the Coast Guard policy in bridge cases affecting these marshes will be.

Further, the Coast Guard has no clear policy on how it will administer the bridge permit program so as not to prejudice or compromise the later administrative decisionmaking of other agencies.

Finally, the Coast Guard has not determined how it will deal with the Federal policies designed to prevent unsound development in flood-prone areas, such as those universally found on barrier islands.

Other types of permits and/or leases affecting barrier islands consist of use of or rights-of-way across lands owned by the Federal Government. The two primary Federal land managing agencies for barrier islands are the National Park Service and the Fish and Wildlife Service. Concern and a careful review should be given to any type of use permit or right-of-way proposed for Federal land on the barrier islands. Rights-of-way requiring special attention include pipelines, roadways, or utilities which could be harmful to island resources and coastal character. Use permits include activities not requiring long-term use of lands and waters, which may, in some cases, involve disturbance of barrier island resources.

Options:

1. Coast Guard - Restrict Federal permits for constructing, reconstructing, or expanding bridges to barrier islands to only those facilities essential to the health and safety of existing residents or critical for the protection of the island environment.

2. Army Corps of Engineers - Discourage Corps 404 dredging permits which would stimulate development on barrier islands. With regard to wetlands, permits to dredge and fill which would adversely affect barrier islands should be discouraged and, except in extreme cases of an overriding national interest, denied.

3. Issue rights-of-way and special use permits over Federally administered barrier islands only in cases where it has been shown through a systemtic publicly reviewed process that substantial

public benefits will result, no feasible alternatives exist, and all possible measures have been taken to mitigate direct and indirect adverse environmental impacts on the Federal barrier island resource.

Agency and Program Affected:

1. U.S. Army Corps of Engineers: Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. § 1344, and § 10 of the Rivers and Harbors Act of 1899, 33 U.S.C. § 401, et seq.

2. The Department of Transportation: DOT Act of 1966, 49 U.S.C. 1655(g)(6).

VI. Executive Orders 11988 and 11990

Objective: Provide maximum support to the enforcement of Executive Orders 11988 and 11990.

Discussion: In conjunction with President Carter's 1977 Environmental Message, two executive orders were signed which potentially will be very effective in protecting barrier islands from unwise development: Executive Order 11988 on Floodplain Management, and Executive Order 11990, Protection of Wetlands. Together these orders are estimated to cover up to 85% of the land area of many barrier islands. Because many of the same values sought by this plan would have to be analyzed by Federal agencies before undertaking most projects, the Executive Orders are a very important component in a barrier island protection plan.

Executive Order 11988, Floodplain Management, established a new Federal policy by requiring all Federal executive agencies to issue new or amended procedures to ensure the nonhazardous use of riverine, coastal and other floodplains. The Order directs them to avoid, to the extent possible, the long and short-term adverse impacts associated with activities in floodplains, and to avoid the direct or indirect support of floodplain development.

Each agency has the responsibility to evaluate the potential direct and indirect effects of any actions it may take in a floodplain, and to ensure that its planning programs and budget requests reflect adequate consideration of flood hazards and floodplain management. An agency proposing or supporting an action in or affecting a floodplain must show that such an action is the only practicable alternative and must design its action to minimize harm to or within the floodplain and circulate a notice explaining why the action must be located in the floodplain.

The Water Resources Council (WRC) was directed to prepare guidance under the Order and to conduct periodic oversight of agency

procedures and their effectiveness. The WRC issued guidelines outlining the major steps in the decisionmaking process an agency should follow when proposing an action which would be located in the base floodplain. The procedures state that once an agency determines a project will be located in the floodplain, the agency must notify the public early enough for there to be meaningful public input. The Order also requires agencies to consider all practicable alternatives to the proposal.

WRC has no explicit oversight authority for ensuring agency proposal compliance once the procedures are established, although Section 5 directs the WRC to periodically evaluate agency procedures and their effectiveness.

Effective implementation of the Floodplains Executive Order should foster increased awareness within Federal agencies of the hazards of barrier island development, and will also set an example for State and local decisionmakers to become more conscious of the impact of their actions on floodplains, particularly when located on barrier islands.

Executive Order 11990, Protection of Wetlands, directs Federal agencies to provide leadership in minimizing the destruction, loss or degradation of wetlands and to avoid to the extent possible the destruction or modification of wetlands whenever there is a practicable alternative. The Order applies to agencies involved in (1) acquiring, managing and disposing of Federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities affecting land use, including but not limited to water and related land resources planning.

Identical provisions of the two Orders require: (1) the head of an agency to avoid undertaking or providing assistance for most Federal actions unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm; (2) early public review for new construction proposals located in wetlands; and, (3) requests for new authorizations or appropriations from the Office of Management and Budget to indicate whether the proposed action is in accord with the Order.

The Wetlands Order differs from the Floodplains Order by specifically delineating the major factors agencies must consider when proposing an action located in a wetland area. The Order does not apply to private permits for activities involving wetlands on non-Federal land. It also pertains only to new construction undertaken in or affecting wetlands.

The review required by the Order is very comprehensive, and should have a wide application to many environmentally-damaging projects now undertaken by the Federal government on or near barrier islands. Although not as broad as the Floodplains Executive Order, it will require Federal agencies to seek all practicable alternatives to new construction in wetlands, and hence should significantly reduce dredge and fill operations, beach reconstruction and groin or seawall construction undertaken on the barrier islands.

Options:

1. Agency compliance with the Wetlands and Floodplains Executive Orders should be carefully monitored by the Council on Environmental Quality and the Water Resources Council.

2. Approval of Federal grants or loans should be denied for facilities which do not conform to the guidelines prepared by the WRC for the implementation of the Orders.

3. Authorize the WRC to issue implementing regulations under the Orders which ensure that Federal and Federally assisted proposals will not adversely affect, either directly or indirectly, floodplain and wetland values unless there is no feasible alternative and all possible planning is undertaken to mitigate any adverse impacts on those values.

Agencies and Programs Affected:

All agencies listed in Appendix A that administer a construction, grant, permit, loan, or licensing program which could impact on a barrier island will be affected by these options.

VII. Public Information and Education

Objective: Federal agencies should undertake an extensive public information and education effort to highlight resource values and hazards frequently encountered on barrier islands.

Discussion: Raising the public awareness and knowledge of barrier islands, their resources, and their inherent hazards is one way of providing protection for the barrier islands. Although much has been written about the natural hazards and dynamics of barrier islands, there is no coordinated system of making the information readily available to persons interested in buying or developing property on a barrier island. It can be anticipated that fewer people would be willing to risk life and limb or a significant personal investment, that could be destroyed by a storm or other natural process (such as erosion), if the facts about barrier

islands were more widely known. Similarly, it can be anticipated that fewer people would seek Federal grant or loan assistance for homes or businesses on barrier islands for the same reasons.

Educating the public to the hazards of permanent human occupation of the islands is particularly timely and important because of the nearly 20-year hiatus in major storm activity along the southern and Mid-Atlantic coast.

The public should also be made aware of the wealth of the recreational and natural resource opportunities available to them on barrier islands and the importance of protecting these resources. Tempered with the information regarding the hazards of permanent buildings on barrier islands, it is crucial to the support of a change in Federal policy toward barrier islands for the public to understand the uniqueness and natural beauty of the islands. Then it will be easier for the public to acknowledge and support the necessity for protecting island values, and the importance of reducing the Federal subsidies in order to sustain the islands' natural values. With increased public knowledge provided by a comprehensive public information program including displays at existing parks and refuges, public service television, and informational brochures, greater public support could be anticipated for protecting irreplaceable historical landmarks and wildlife habitat, and for providing a greater degree of safety to life and property.

Emphasis should be placed on describing the natural forces that work on a barrier island and the different characteristics and variety of the islands. A more informed public could then also take steps to assure barrier island protection within local communities, counties, and States, as well as on a national scale.

The Interstate Land Sales Full Disclosure Act is essentially a "disclosure" statute which requires interstate land developers to register their subdivisions before offering or selling lots to prospective purchasers. The standards for disclosure have been established by the Congress and, through delegation, by regulations published by the Secretary. The disclosure requirements apply to subdivisions as such, without regard to where the land is geographically situated or, as may be the case in barrier island developments, to the inherent hazards of the location. The physical features of the land involved are pertinent only to the extent that those features are properly subject to disclosure with the object of protecting purchasers. For example, the mere fact that a subdivision is situated on a barrier island would not of itself necessarily be a proper subject of required disclosure, but the fact that there is no access by road to the island probably would.

Although there is a substantial amount of research completed and underway on barrier island dynamics and ecosystems, there still exists a need for developing an increased capability to collect, archive, analyze, interpret, and disseminate scientific and

technical information on barrier islands to planners, scientists, governmental agencies, organizations, and other potential users. Expanded information for the general public is only a part of the challenge. Equally important is to make needed information available to decisionmakers and those who support or directly influence decisions.

Options:

1. Heritage Conservation and Recreation Service (HCRS) should continue to pursue widespread airplay of three public information spots by television stations along the East and Gulf Coasts. These programs, alerting people to the fragility of barrier islands, are being played by interested television stations; but more stations might use them if encouraged. This type of program should also be continued on a periodic basis, and expanded to public information newspaper and magazine articles and radio messages. HCRS should emphasize the natural and cultural heritage of the barrier islands and the protection afforded designated areas of the islands through the National Registry of Natural Landmarks and the National Register of Historic Places.

   HCRS should work to ensure extensive public distribution of a recently released public information booklet on the barrier islands. The booklet contains a great deal of information pertaining to the barrier islands. It discusses good and bad land management techniques, the hazards of development on barrier islands, the methods of protecting barrier islands, and the natural, historical, cultural, and recreational values found on barrier islands. National and local environmental organizations should be informed of its availability, but copies should also be made available to the public in Federal, State, and local government buildings.

2. Fish and Wildlife Service and National Park Service should develop public information and interpretive programs for each of their respective barrier island holdings. These programs should describe, among other topics, the natural values and processes of barrier islands, the animals dependent on barrier islands for their survival, and the benefits of wise land management practices and use on barrier islands. These National Seashore and Refuge areas are governed by area management plans, which should consider public information an integral part of every plan.

   For example, the NPS has enacted a new land management policy (discussed on page 7) of which the public should be informed. This policy discourages further attempts to restrain the natural processes of erosion, deposition, dune formation, and inlet formation although some exceptions may be made when it may be necessary to manipulate the system in order to restore a more natural sedimentary regime. Each situation will be decided on a case by case basis. The policy further states that National

Seashores should be managed to phase out, relocate, or provide alternative developments to facilities located in hazardous coastal areas. New facilities will not be placed in areas subject to flood or wave erosion unless it can be demonstrated that they are essential to meet the management objectives, that no alternative locations are available, and that the facilities will be reasonably assured of surviving during their planned lifespan without the need of shoreline control measures. Providing for wide public distribution of this management policy will underscore the damages of barrier island development and will set an example of good planning principles based upon working with nature.

Also, the Fish and Wildlife Service is responsible for the inventory and list of rare and endangered species of both plants and animals and delineates areas of critical habitat for those species. The FWS should include in their public education and information program the value of the barrier islands to the rare and endangered species they sustain, as well as the role islands play in supporting sport and commercial fisheries which receive protection from National Wildlife Refuges.

3. The Federal Emergency Management Agency (FEMA), composed of the Federal Disaster Assistance Administration and the Federal Insurance Administration, should undertake a public awareness program to inform the public about the dangers and the costs of residing on the barrier islands. The critical issues to be emphasized are the hazards inherent with living on an island--damage to property, inadequate escape routes, constantly changing landscape, land too unstable for building, and the risk to life. Such a program, directed to increasing public awareness and education about all aspects of barrier islands could be the cornerstone on which to build a barrier island protection program supported by the citizenry of the country. Booklets should be distributed to institutions such as banks and savings and loan associations, which should be encouraged to distribute information to individuals applying for loans or flood insurance.

4. The Office of Coastal Zone Management (OCZM) should encourage States to use their coastal management programs to provide information to the public generally and developers in particular about the risks and problems associated with development on barrier islands. Funds should be available to States under Section 306 implementation grants for this purpose, and a "model" booklet should be developed by OCZM.

5. The Office of Interstate Land Sales (DHUD) should require developers of barrier island properties to be explicit about the hazardous nature of barrier island occupancy. Developers on barrier islands should be directed to specifically inform potential buyers of the hazards and potential costs of living on the islands.

6. The Department of the Interior should, in cooperation with other Federal agencies, the states, and private organizations, develop the capability for acquiring archiving, analyzing, and disseminating information on barrier island environments. Particular emphasis should be placed on increasing the sensitivity of planners and developers to the unique limitations barrier island environments place on many human uses, bringing the latest research findings to bear on governmental decisionmaking, and improving the awareness of the general public.

Agencies and Programs Affected:

1. Heritage Conservation and Recreation Service

2. Fish and Wildlife Service

3. National Park Service

4. The Federal Emergency Management Agency

5. The Office of Coastal Zone Management

6. The Office of Interstate Land Sales

VIII. Acquisition

Objective: To emphasize acquisition of barrier islands through existing Federal programs and to encourage application of appropriate less-than-fee acquisition methods when feasible.

Discussion:
The national seashores and recreation areas that are situated on barrier islands were created individually through separate Acts of Congress. Each Act specifies the purposes for which the unit was established, identifies the general boundaries, sets out basic management guidelines, and establishes the authorities governing the Secretary's right to acquire land by various means. Since 1965, the Land and Water Conservation Fund (LWCF) has been the primary source of land acquisition funds for the NPS.

Wildlife refuges are acquired under a number of authorizations including site specific and species specific Acts of Congress. The Migratory Bird Conservation Act of 1929 provided the first unified land acquisition program for waterfowl refuges. The Act has been implemented with funds derived from the Migratory Bird Hunting Stamp Act and the Wetlands Loan Act. The LWCF and the Endangered Species Act both broadened acquisition authorities and increased potential funding levels.

Generally, the entire fee simple title of lands acquired by the Federal government has been purchased. However, donations of land also have played an important role in the acquisitions for both national seashores and refuges.

Because land acquisition is a long-term commitment of dollar and manpower resources for protection and management, less-than-fee mechanisms are being given greater consideration by the Federal agencies, especially by the FWS. In an August 1977 policy paper, the basic FWS policy was stated as being "to acquire land only when other means of achieving program goals and objectives are no longer available and/or effective."

Many of the national units contain private inholdings or private lands that are immediately adjacent to the Federal boundaries. Especially in NPS areas, development of the private lands ranges from dispersed residences to whole communities of several thousand structures. The adverse use of private inholdings is considered a particularly serious long-term problem because acquisition money to eliminate existing adversities is sometimes unavailable. The future use of peripheral lands also poses a great potential threat to the integrity of Federal units, especially where these lands consist of private communities located on the same island as the Federal unit.

Particularly in undeveloped rural areas, local development controls frequently are inadequate to ensure compatibility of private land development with barrier island resources in general and the protection of an adjacent publicly owned unit in particular. If developed intensively for residential and commercial uses, adjacent lands can seriously impair the quality of the natural environment--through groundwater pollution, surface water pollution, impairment of wildlife habitat values, and related ecological effects--as well as the quality of the visitor's experience--through traffic congestion, impairment of visual quality, and degradation of the inspirational value of the barrier island. If shoreline stabilization measures are implemented to protect developed areas from erosion, destabilization of the sediment balance of nearby public lands is a probable result.

GSA is responsible for disposal of Federal surplus property. When GSA disposes of a surplus property, not all future development plans may be known to GSA at the time of the disposal action. Unanticipated uses could occur with the subsequent sale or transfer of title to real property which might involve increased development or densities on barrier islands.

Cities, counties, and States also may acquire Federal surplus property for parks, recreation, economic development (commercial and industrial), and numerous other uses. Although many surplus properties are converted to recreation or wildlife purposes by Federal, State or local governments, many also are assigned to the Department of Health, Education, and Welfare (DHEW) for conveyance to local governments for public health or educational purposes. As with most other Federal agencies, GSA does not differentiate between barrier islands or mainland in administration of its programs. However, various controls are placed on property through the determination by GSA of the most desirable uses, and in the case of historic properties, restrictions are frequently added to the deed which will insure proper use and preservation of the property.

Two other Federal agency acquisition programs that could provide a measure of protection to specific barrier island areas have been authorized by Congress. However, neither of these has been funded.

The first is a program administered by the Office of Coastal Zone Management to assist States in purchasing access to beaches and other coastal areas (Section 315(2)).

The other is administered by the Federal Insurance Administration and is to assist communities in acquiring properties in flood prone areas once they are damaged substantially beyond repair by a flood (Section 1362). In addition to having not been funded, no specific delegation of responsibility has been made for this section.

Options:

The National Park Service and the Fish and Wildlife Service should:

1. As a means of managing and regulating inholdings, develop cooperative agreements and other authorities with local governments to promote compatible development and use of peripheral lands. Searching for common points of concern and interest in leaving certain areas for open space, to promote the wisest use of resources in watershed areas for example, should result in better land use practices on a regional and area basis.

2. Dependent upon existing authorities, purchase or seek donations of scenic and open space easements on adjacent lands wherever it is economically and programmatically practical. Although these easements sometimes may cost almost as much as fee simple acquisition, significant long-range savings to the Federal Government and to local government tax collections may result because the land is not removed from tax rolls, and the Federal Government does not become directly responsible for its management.

3. Dependent upon existing authorities, consider purchasing certain adjacent lands in the marketplace and later resell such lands with deed restrictions permanently limiting the type of activity that can occur. It may be legally necessary for one Federal Government agency to deed enforcement of a restriction like this, for example an open space or scenic easement, to another Federal agency to avoid having it considered an unreasonable restraint on the alienation of land. If it is deemed necessary to get legislative authority for such activities, then legislative authority should be sought.

4. Consider restricting issuance of special-use permits and rights-of-way to inholders, adjacent land owners, or State and local governments for activities on Federal lands such as refuges and seashores. See the discussion under "Permits" in the moderate level alternative section.

5. The Office of Coastal Zone Management should analyze the merits of implementing Section 315(2) of the Coastal Zone Management Act which would provide funds for States (on a 50% matching basis) to acquire shorefront access and islands. If Section 315(2) is implemented, OCZM should consider earmarking a substantial proportion of these funds for protecting and preserving barrier islands through innovative techniques which could include less-than-fee simple acquisition.

6. The Office of Coastal Zone Management should revise its estuarine sanctuary regulations to give high priority to the inclusion of portions or all of a barrier island as part of an estuarine sanctuary.

7. The Federal Insurance Administration (FIA) should be delegated the authority created under Section 1362 of the National Flood Insurance Act of 1968 to assist communities in acquisition of flood prone areas. If Section 1362 is implemented, FIA should consider acquiring barrier island properties located in a flood risk area which are covered by the flood insurance program and are damaged beyond reasonable repair. These properties could then be transferred, leased, sold, or donated to public agencies which agree to use the properties for conservation or recreation purposes.

8. HCRS should encourage contributions of barrier island properties by the private sector to public agencies and work to ensure that private groups continue to have an active role in future barrier island protection efforts.

9. The General Services Administration should consider limiting the disposal of Federal surplus properties on barrier islands for recreation, conservation, and open space purposes and of incorporating reverter provisions in leases and deeds of sale on Federal surplus transfers to restrict changes in use patterns and densities.

Agencies and Programs Affected:

National Park Service

Fish and Wildlife Service

Office of Coastal Zone Management

Federal Insurance Administration

General Services Administration

High-level Protection Alternative

I. Development Project Evaluation

Objective: Restrict Federal government initiated or assisted development projects on barrier islands unless they can be shown to be in the national interest.

Discussion: "Many [barrier islands] are unstable and not suited for development, yet in the past the Federal government has subsidized and insured new construction on them."1/ A question remains as to what degree the Federal government should reduce its involvement with barrier island development and redevelopment following severe storm damage. The environmental review process discussed in "Development Project Evaluation-Moderate" would ensure adequate agency analysis of the environmental impact of projects, but it would not place any prohibitions or restrictions on the type of project that should be approved.

It may be necessary to amend numerous authorities if prohibitions on certain types of actions are desired. For example, if a prohibition on new bridge permits to barrier islands was sought, a restriction on the Coast Guard's general legislative authority to issue such permits would appear to be necessary. Likewise if Federal matching funds for sewage treatment plants were to be restricted for new barrier island developments, an amendment to the enabling legislation for EPA and SBA may be necessary.

Options:

1. Fish and Wildlife Service - Consider directing application of the Fish and Wildlife Coordination Act, 16 U.S.C. 661-667e, for all actions affecting barrier islands and other important ecosystems and landforms. Require Federal agencies to consult with the Department of the Interior in the initial planning stages of any agency action which may affect a barrier island. For an action which will affect an undeveloped barrier island, require the action agency to obtain the concurrence of the Secretary of the Interior that no reasonable and prudent alternative to the barrier island site exists, that any adverse impacts will be minimized, and that the action is in the national interest.

2. Department of Housing and Urban Development - Consider amending the Interstate Land Sales Full Disclosure Act, as it applies to barrier island development, to:

1/ President Carter, May 1977 Environmental Message.

a. lower the current threshold for registration requirement from 50 lots to five lots and require construction to be in accord with acceptable barrier island building codes and zoning.

b. prohibit from interstate commerce sales of barrier island lots or developments that adversely impact on areas of vital concern, which are defined as: wetlands, dunes and beaches, acquifer recharge areas, habitats of endangered species of plants and animals, and areas of extreme storm hazard.

3. All Federal Development Programs - Consider amending, as necessary, and appropriate, Federal agency authorities to prohibit the approval of Federal grants, loans, or permits for a barrier island project unless it meets, as a minimum, a three-part test for each requested project. Under this option documentation necessary to show that all feasible alternatives to the project had been considered should be required. Project approval should be granted only when no alternative was feasible, an overriding national interest clearly could be shown, and all possible mitigating measures were agreed to.

   The tests should be applied with increasing severity on the basis of the importance of the natural resource values remaining and the extent to which the island is undeveloped. The test should verify that:

   a. there are no feasible or prudent alternatives;

   b. Federal participation in the project is essential; and

   c. the proposal ensures that harm to the island's resources would be minized and all possible planning is undertaken to mitigate any adverse impacts on the island's natural values.

   This amendment should also:

   -- provide for suitable properties to be acquired and used for public open space and recreational purposes; and

   -- provide for the use of relocation assistance funds for individuals and businesses displaced by such actions.

4. Consider amending the appropriate Federal agency authorities for development oriented grant and loan programs which have passed the three-point test proposed in paragraph #3 above, to change match ratios from current levels which tend to promote development at the expense of the general taxpayer (more than 50% Federal share) to a ratio which internalizes a greater share of the costs to the direct beneficiaries (less than 50% Federal share) of such projects.

Agencies and Programs Affected:

1. Department of the Interior

--Heritage Conservation and Recreation Service - the Land and Water Conservation Fund

--Fish and Wildlife Service - Fish and Wildlife Coordination Act

2. Department of Housing and Urban Development

--Community Block Grant Program

--Office of Interstate Land Sales - Interstate Land Sales Full Disclosure Act

3. Small Business Administration - grants and loans

4. Economic Development Administration - grants and loans

5. Government Services Administration - grants and loans

6. Farmers Home Administration - grants and loans

7. U.S. Army Corps of Engineers - coastal protection works; dredge and fill permits

8. Federal Emergency Management Agency - reconstruction, restoration

9. Department of Energy - facility siting.

10. Department of Transportation/U.S. Coast Guard - bridge permits

11. Department of Agriculture/Rural Electrification Administration - installation and upgrading of electric utility lines.

II. Flood Insurance

Objective: The purpose of these options is to encourage FIA to give higher priority to barrier islands than to other flood-prone areas in implementing its authorities and responsibilities which have barrier island application.

Discussion: High winds, waves, scour, erosion, subsidence, rising sea level, and other forces combine to make barrier island flood hazards potentially much more severe than riverine floods. These hazards and the threats they pose to human life and property should be recognized and reflected in the administration of publicly subsidized flood insurance programs.

Options:

1. FEMA should consider exercising its authority under the National Flood Insurance Program to:

a. prepare flood insurance rate maps for all barrier islands;
b. designate all appropriate barrier island areas as "coastal high hazard areas"; and
c. develop erosion setbacks to ensure that new construction is not undermined during the terms of federally insured mortage.

2. Consider amending the Flood Disaster Protection Act to deny federally subsidized flood insurance for new construction in areas designated by FIA as "coastal high hazard areas" or which are seaward of the erosion setback line.

Agency and Programs Affected

Same as for moderate alternative options.

III. Disaster Mitigation and Recovery

Objective: To encourage the consideration of barrier island values and hazards in the administration of Federal disaster assistance programs.

Discussion: Existing legislation authorizes or permits a wide range of activities to mitigate losses, which are caused by major disasters, to individuals and businesses on barrier islands. Grants and loans are expeditiously provided for reconstruction or restoration of facilities to pre-storm conditions; areas are cleared of debris; and utilities restored to working condition.

The options presented herein would establish mechanisms for identifying and delineating areas and types of facilities in coastal high hazard zones which, when severely damaged by storms, would not be eligible for Federal assistance to reconstruct or restore in the same location. However, relocation assistance would be provided to help individuals and businesses electing to move rather than rebuild in the high hazard areas.

Options: Consider amending the:

1. Flood Disaster Protection Act to restrict disaster assistance from being used for reconstruction in coastal high hazard areas and to provide relocation assistance for businesses and residents who voluntarily elect to move to safer areas.

2. Disaster Relief Act of 1974 to:

a. require disaster preparedness plans and programs to include specifications and standards for determining the areas where, and conditions under which, development would or would not be allowed. (Section 201) Condition post-disaster recovery assistance on the inclusion of such standards and specifications in the State's plan.

b. prohibit the reconstruction of any Federal facility on a barrier island that is substantially damaged by a storm unless there are no prudent or feasible alternatives to reconstructing the facility on the barrier island site and that the facility: (1) is required for public health or safety; (2) is related to the enhancement of fish and wildlife values or provides public recreation opportunities; and (3) will not adversely affect the natural values on the island. (Section 401)

c. authorize the establishment of Recovery Planning Councils prior to a major disaster to assist in developing and gaining approval of pre-disaster contingency plans for barrier islands. (Title VIII)

Agency and Programs Affected:

FEMA - Flood Disaster Protection Act

Disaster Relief Act of 1974

IV. Resource Evaluation and Planning

Objective:To provide mechanisms for identifying, classifying and planning the protection of barrier island values.

Discussion:
Federal barrier island programs and policies currently are unfocused and uncoordinated, and frequently in conflict with one another. Identification and evaluation of barrier island resource values is an important first step in providing consistent protection policies for those values.

The options presented herein would provide a foundation for establishing a framework to provide more effective protection for barrier islands by: designating a Federal focal point in the Department of the Interior for monitoring and coordinating the myriad of Federal programs impacting the islands; strengthen the communications network among the various levels of government; and developing a system of priorities for action.

The Coastal Zone Management Act provides for a voluntary program; there are no sanctions imposed upon any State or territory which chooses to participate. The Act emphasizes the lead roles of State and local governments. Direct State administration, local administration consistent with State-established standards, and local administration subject to State review are the three optional means of program implementation specifically mentioned in the Act. The federal role is basically limited to providing the States with financial and technical assistance during development and implementation of management programs. The Act does provide guidance on the basic framework for State programs and requires participating States to address the following nine points:

1. Identification of boundaries of the coastal zone (determined by State discretion with minimum limits specified in the Act);

2. Designation and inventory of areas of particular concern (these may be areas of economic as well as environmental importance);

3. Broad guidelines on priority of uses in particular coastal areas including specifically those uses of lowest priority;

4. A determination of permissible land and water uses which have a direct and significant impact on coastal waters;

5. The means by which the State proposes to control those uses (this refers to the implementation authorities the State will use in making its program work);

6. The organizational structure which would implement the management program;

7. A planning process for shoreline erosion;

8. A planning process to deal with the issue of access to public waterfronts; and

9. A planning process for the siting of energy facilities.

Section 211 of Public Law 94-579, the Bureau of Land Management's "Organic Act", authorizes the Secretary of the Interior to convey, under the provisions of the Recreation and Public Purposes Act, 43 U.S.C. 869 et seq., to States and their political subdivisions any unsurveyed islands determined to be federal lands of the United States.

The Act also amends the Recreation and Public Purposes Act to require the Secretary to determine that any lands conveyed are not of national significance and that, for parcels of over 640 acres in size, comprehensive land use plans and zoning regulations applicable to the area in which the conveyed lands are located have been adopted by the appropriate State or local authority.

Options: Consideration should be given to:

1. Placing high priority on gaining enactment of the National Heritage Policy Act of 1979.

2. Establishing within the Department of the Interior a barrier island action coordinator to ensure that national policies impacting barrier islands are implemented in a clear coordinated manner by all Federal agencies.

3. Directing the Secretary of the Interior, in consultation with the Secretary of Commerce, to further refine a priority listing of presently undeveloped and unprotected barrier islands for potential acquisition. Further direct all Interior agencies, in particular the National Park Service, the Fish and Wildlife Service and the Heritage Conservation and Recreation Service, as well as OCZM (in its allocation of Section 315(2) funds), to use this list as a guide for acquisition of valuable and threatened barrier islands in the next five years. This list should take into account potential threats to the continued integrity of these islands and gaps in existing Federal land holdings that are also threatened in the near future by irreversible degradation.

4. Amending the Coastal Zone Management Act to assure State designation of all undeveloped barrier islands as "areas for preservation" for which State programs must provide appropriate management and protection. Define "permissable uses" as those which are dependent on a barrier island location, are consistent with long-term conservation of the barrier island values and are designed to minimize adverse impacts. As part of this amendment, standards should be included to assure that any facility planning, siting or development fully considers the fragile nature of barrier islands and avoids, to the extent practicable, any disruption of the natural processes upon which survival of barrier islands is so dependent.

5. Amending the Coastal Zone Management Act to require that a portion of the Federal financial assistance provided to States be used to improve their management and protection programs of coastal areas, including the barrier islands.

6. Amending Section 211 of the Federal Land Policy and Management Act of 1976 (P.L. 94-579) to condition conveyance by the Secretary of the Interior of any barrier island property to any political subdivision on: (a) a determination as to whether the island requires surveying; (b) an analysis of the "scientific, scenic, historical, ecological, environmental, air atmospheric, water resource, and archeological values" (Section 102(a)(8)); and (c) a plan of utilization compatible with conservation of the resource prepared by the potential recipient and approved by the Secretary.

Agency and Programs Affected:

Same as moderate level but including:

Bureau of Land Management - Federal Land Policy and Management Act of 1976, P.L. 94-579; 43 U.S.C. 1701

V. Permit Process

Objective: Restrict approval of Federal permits and rights-of-way for development on barrier islands.

Discussion: Various permits for activities on barrier islands can have harmful consequences. It is essential that approval of permit applications be based on a thorough analysis of alternatives and barrier island specific impacts. Specific criteria and standards for approval should be established and strictly adhered to.

Option:

1. Consider amending the authorities for development-oriented programs to prohibit the approval of any Federal right-of-way or permit for a barrier island project unless it meets, as a minimum, the three-part test described under option 3, Development Project Evaluation for the High Level Protection Alternative.

Agencies and Programs Affected:

1. U.S. Army Corps of Engineers - Section 404 Permits

2. U.S. Department of Transportation

   U.S. Coast Guard - Bridge Permits

   Federal Highway Administration - Wetland Policy

3. U.S. Department of the Interior - Rights-of-way policy.

VI. Executive Orders 11988 and 11990

Objective: Place emphasis on the barrier island flood plains and assure a consistent and comprehensive inplementation of the two Orders.

Discussion: The very nature of barrier islands makes them more vulnerable than the rest of the coastal floodplain to storms and hurricanes and the flooding that often accompanies them. Barrier Islands not only lie within the coastal floodplain but also protect the shoreline from the full severity of coastal storms and flooding. They not only are inundated by floodwaters during storms but also can lose whole sections of land as new inlets are formed by stormy seas.

For the barrier islands, almost all wetlands are located in floodplains. This means that, in most cases, Federal actions proposed in wetlands would have to comply with agency procedures developed in response to both the Wetland and Floodplain Executive Orders. Confusion could be created while the agency determines

whether one or the other or both Orders applied. Two sets of procedures also create a situation where a developer could manipulate one set of regulations against the other to his benefit and the detriment of the purposes of the two Executive Orders. Also, actions in floodplains that are not actually located in a wetland will still often impact on the wetland.

Options:

1. The Water Resources Council should be requested to consider elevating the importance of barrier island floodplains in, and through, the Floodplain Executive Order; these floodplains should be considered a more critical and unstable resource than floodplains located on the mainland.

2. The WRC should consider preparing a common set of procedures which integrate the provisions of the Floodplains Executive Order and the Wetlands Executive Order to the extent that it makes programmatic sense. Unified procedures would permit the full range of interdependent impacts to be considered completely and as a whole. Consequentially, a greater degree of protection for the barrier islands should result.

3. Consideration should be given to assigning oversight authority to the WRC to assure compliance with the two Executive Orders, to provide for careful scrutiny of development proposals impacting upon barrier islands, and to preclude development on large portions of many of the islands. Public hearings and written notice should assure a wide public involvement and would provide for a variety of views and concerns.

Agencies and Programs Affected:

All agencies listed in Appendix A that administer a construction, grant, permit, loan, or licensing program which could impact on a barrier island will be affected by these options.

VIII. Acquisition

Objective: Emphasize Federal and State acquisition of barrier islands and encourage donations of barrier island property by private land owners.

Discussion: The National Park Service currently is legally restricted from acquiring State and locally owned lands within or adjacent to its management boundaries except by donation and has limited authority for boundary adjustments due to congressionally mandated boundaries.

The first restriction is a potential management problem. Eight National Park Service areas contain substantial acreages of non-Federal public lands which can be acquired only by donation or exchange. As of 12/31/76, the total acreage involved was about 120,600. Most of this acreage is submerged land administered by the States and likely to be transferred to the Federal government in the future. Five areas contain State parks and one contains municipal and county parks on the barrier island itself. These parks are not likely to be transferred while there is a reasonable likelihood that Federal administration would result in a reduction in use.

Consideration should be given to authorizing Federal purchases of State or local lands where there is a reasonable liklihood of conflicts that would seriously compromise Federal land management objectives. Such authorization would give valuable flexibility to Federal land managers.

The second restriction, the prohibition on acquisition of private lands as a means of adjusting boundaries should be more flexible as applied to barrier islands. Acquisition authority to adjust established boundaries could be restricted and deferred until major storm damage occurred. An exception should be made for serious non-conforming properties which would be acquired immediately through condemnation. However, following major storm damage and after property owners had been compensated for seriously flood-damaged improvements, the Department of the Interior should be able to acquire adjacent private lands at the fair market value of unimproved property. Undamaged property, if incompatibly used, could be acquired either on an opportunity purchase basis or by condemnation. This modification has the advantage of achieving limited land use control while deferring land acquisition to a future date. It also prevents rebuilding after a disaster and facilitates the acquisition of land at prices lower than would otherwise be possible.

It is difficult for the Federal government to encourage States to buy barrier islands. This may be due in part to the difficulties of access which also are reflected in the high costs of development and administration. One way to encourage them would be to amend the Land and Water Conservation Fund to change the present match ratio of 50% Federal-50% project sponsor to 70% Federal-30% project sponsor for acquisitions proposed on barrier islands. An amendment would also be desirable to permit purchases of land under this authority even where the primary purpose is for conservation rather than recreation use. Such an amendment would probably succeed at encouraging greater State and local acquisition of barrier islands, but is open to the criticism that a more favorable match ratio should also be applied to other fragile resources or scenic areas of the country.

The authorization Congress provided in Section 315(2) of the Coastal Zone Management Act has never been implemented and it expires in 1980. The section has potential, if extended and funded, for providing protection to barrier islands.

Donation of private lands on barrier islands to public agencies, foundations, or conservation organizations has played an important role in protecting a substantial number of the islands. It can be anticipated that increased donation would occur if donations were made more beneficial or if development and speculation were made less profitable.

Options:

The National Park Service

1. If needed to achieve a unit's management objectives as defined and delineated through the planning process, consideration should be given to amending the specific National Seashore Acts which prohibit acquisition of State and local lands within established boundaries except by donation. Where management conflicts exist, the Secretary should be able to acquire those lands by other means including condemnation, when it is necessary to protect the natural values of the federally administered public lands. Authority to purchase land outside of established boundaries after disasters or where serious conflicts with private holdings exist should also be considered.

Heritage Conservation and Recreation Service

2. Consider amending the Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460e-4 through 460e-11) to change the currently imposed match ratio of 50% Federal - 50% project sponsor to a 70% Federal - 30% project sponsor for any State or locally proposed barrier island acquisition even though the primary purpose of the proposed acquisition is conservation rather than recreation related.

3. If it is determined that a problem exists due to insufficient funds or inflexibility in the Federal portion of the Land and Water Conservation Fund to finance needed barrier island acquisitions, consideration should be given to establishing a Barrier Island Trust Fund. Using some of the funds received from Outer Continental Shelf leasing in excess of that appropriated to LWCF, islands should be purchased using less-than-fee simple acquisition wherever possible.

Office of Coastal Zone Management

4. Consider extending Section 315(2) of the Coastal Zone Management Act when it expires in 1980.

5. Department of Treasury and HCRS

Jointly consider the development of a comprehensive conservation tax law which, among other things, would:

a. increase tax benefits for charitable gifts of easements, deed restrictions, or other types of donations which would provide protection for barrier islands.

b. discourage speculation and development of barrier islands by imposing a speculation tax, increasing taxes on capital gains realized on barrier island property transactions, and prohibiting claims of accelerated depreciation of barrier island properties.

Agencies and Programs Affected:

1. The National Park Service - National Seashore Acts

2. Heritage Conservation and Recreation Service - The Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 460e-4 through 460e-11

3. Office of Coastal Zone Management - Section 315(2) of the Coastal Zone Management Act

4. Department of Treasury

Note: The foregoing options are not recommendations nor do they in any way constitute administration policies. Many of these options will be further refined before final recommendations are developed.

II. ENVIRONMENTAL STATEMENT

AFFECTED ENVIRONMENT

A. The Islands - General Description[1]

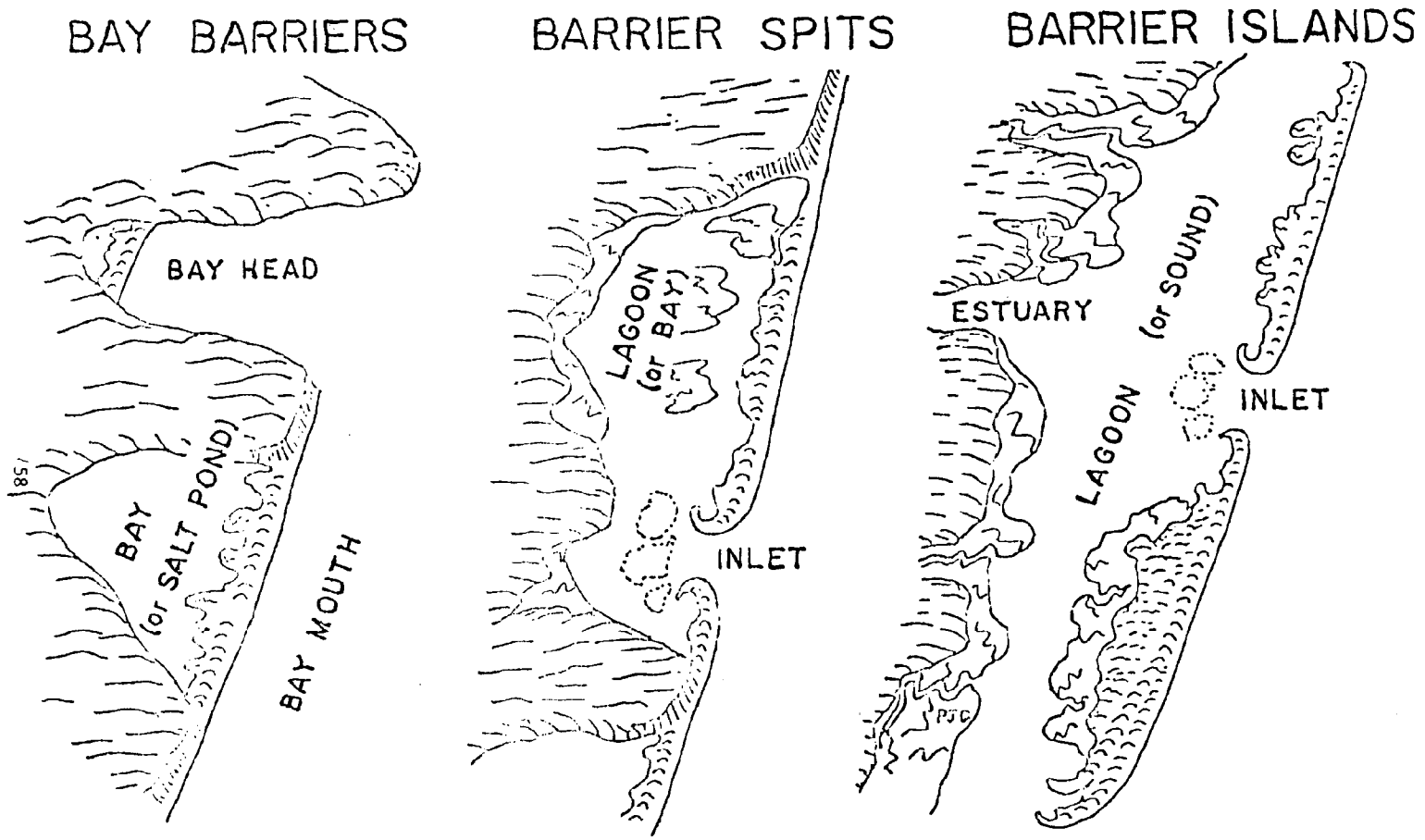
The barrier islands are the most significant coastal feature of the U.S. East Coast from Maine to Texas. Only relatively short sections of the shore are without barrier islands. As a result, the U.S. has the longest and best evolved chain of barrier islands in the world. Although barrier beach structures exist on the West Coast, Alaska, and even in some of the Great Lakes, this discussion relates only to the East and Gulf Coast barriers.

Each island is an elongated, narrow landform consisting of unconsolidated and shifting sand. They are generally characterized by a dynamic beach system consisting of off-shore bars, crashing surf, and a sand beach, dune ridges just behind the beach, interior lowlands, and bay-side wetlands. They are separated from the mainland by marshes or open water intimately related to the island. Geologically speaking, they are quite young, having been formed within the last five or six thousand years. The barrier islands are so named because they protect lagoons, salt marshes, estuarine systems, and the mainland from the direct attack of ocean waves and storm surges. On one side, they face and absorb the full force and energy of the oceanic environment. On the other, they face calmer waters and stable shore that result from the physical barrier formed by the island itself.

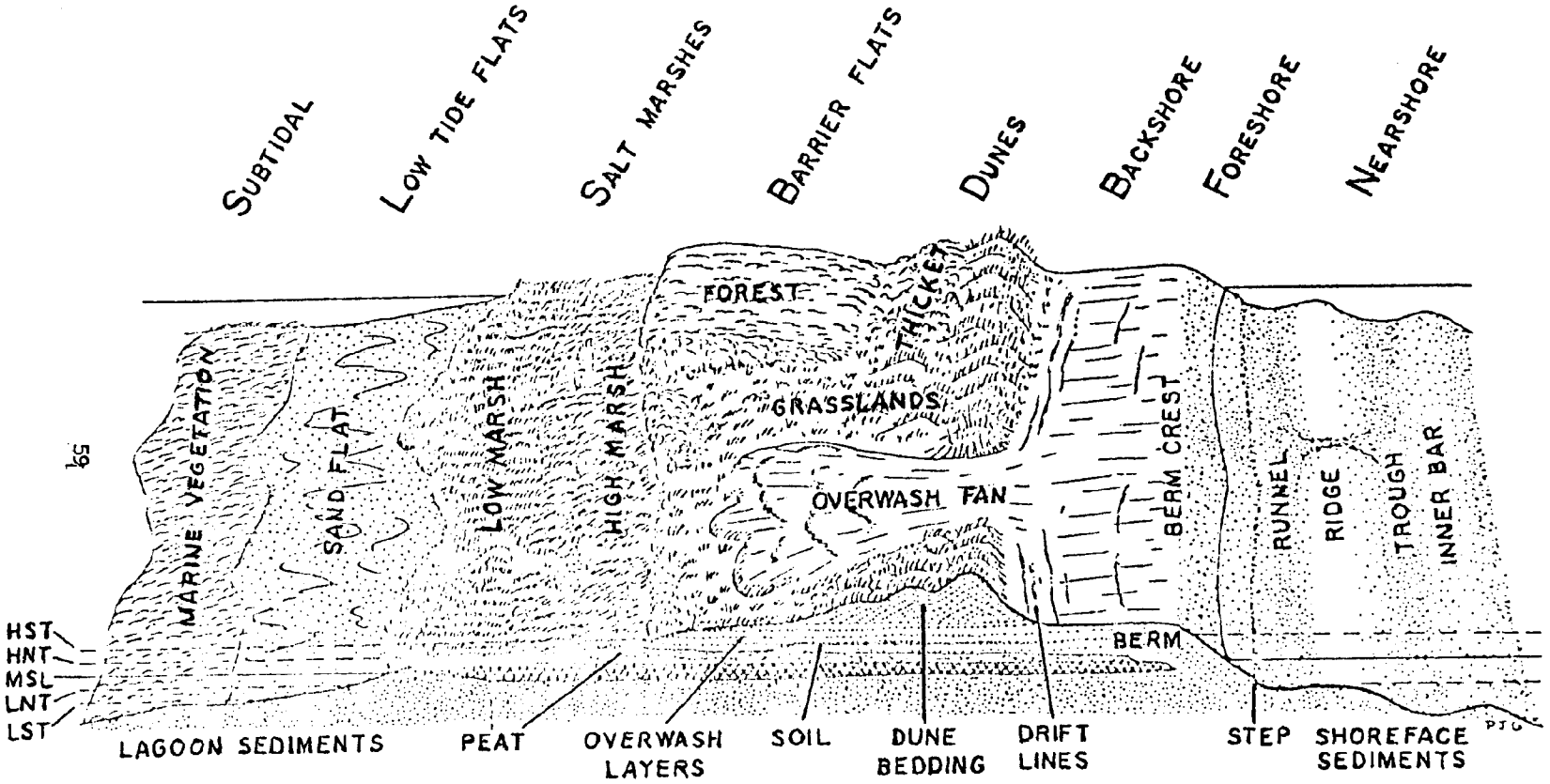
The term "barrier island" in this report includes the barrier spits. Spits are attached to the mainland, with one end forming an attenuated peninsula. They can become barrier islands if a storm-caused inlet severs the peninsula from the mainland. Barrier islands and spits are considered as sub-categories of the overall geomorphic category called barrier beaches (Figure 1).

Barrier islands consist of several basic features (Figure 2). Although they may vary from place to place along the East Coast, the typical barrier island can be defined as including the following portions: that portion of the barrier which faces the ocean and meets the full force of waves on an hour to hour basis is called the berm; the sloping portion of the beach facing the ocean is the foreshore; and that portion of the beach from the berm crest back toward dunes, marshes, and other features, is the backshore. The berm is most directly affected by waves that occur both during storms and calm periods, and is therefore the most unstable portion of the barrier. The berm grades into dune zones, and, in fact, the berm itself may be the place on which dunes are likely

1/ This section is based on a more complete discussion prepared by Dr. Paul Godfrey and Dr. Steve Leatherman for the barrier island study.



BASIC TYPES OF BARRIER BEACHES
FIGURE 1



MODEL OF BARRIER BEACH
FIGURE. 2

to form. In some cases the beach may retreat up to the dune line so that berm as shown in the diagram may not exist. In that case the foreshore extends from the dune line to the low tide mark, and beyond.

The dune zone of a barrier island may consist of a single dune ridge stabilized by various species of beach grasses, or it may consist of several dune ridges parallel to each other, or in curving, arcuate lines; or it may also occur as an open dune region without any distinctive lines. Depending on the manner in which a barrier island or spit system forms, the dune zone may extend all the way to the intertidal zone on the backside, or grade into a region called the barrier flat. Those islands that are subject to periodic or regular overwash tend to be dominated by dune zones with barrier flats.

The barrier flat is an extensive plain which generally supports grasslands, shrub-thickets, or, if the area has been stable for some time, a woodland; but it is primarily dominated by grassland communities. Where a certain degree of stability exists, either on the dune systems or the barrier flats, woodlands and forests can develop, in which case the species found in these communities are adapted to the rigors of life near the sea, primarily salt spray, seawater flooding, and other environmental characteristics of the region.

On the backside of the barrier is the intertidal zone of the lagoonal system, also called the estuarine environment. The intertidal region consists of salt marshes of various types. Most typically, the intertidal zone marked by the highest spring tides down to the neap tide, is called the high marsh, and tends to be dominated by grasses such as Spartina patens, Distichlis spicata, and other plants such as Juncus gerardii, Juncus romerianus, and others. From the high neap tide to mean sea level or below is the low marsh and typically along the East Coast and Gulf Coast, dominated by low marsh cordgrass or Spartina alterniflora. This is the region that is flooded by every tidal cycle of the day, and also is the region most responsible for the organic productivity that is carried out into the estuarine and nearshore oceanic environment, for which salt marshes have recently become well known.

The fact that the barrier islands protect the intertidal zone of the lagoon, that region where waters are shallow, very productive, and the nursery ground for numerous marine species, makes them especially important in maintaining the productivity of the coastal zone. Without the barrier islands these shallow or highly productive environments could not exist, and any changes that occur on the barrier island, either natural or man made, tend to affect the performance and operation of the estuarine systems behind. In nearly all cases the natural functioning of the barrier island and its associated estuaries have evolved together and can withstand the dynamic nature of the oceanic environment as it changes through time. However, the systems are very susceptible to human disturbance and can be thrown completely out of balance by development of barrier beaches, salt marshes, and other associated lands.

B. Topographic Variations of Barrier Islands and Beaches

While certain generalizations can be made about barrier islands and beaches, and all share characteristics in common, there are substantial differences in their basic topography (See Table 1). To a certain extent, these variations are regional, with one portion of the U.S. East Coast having a greater frequency of one type compared to another. However, more than one type of profile can be found within any given region.

The topography of the barriers also reflects to a certain extent, their origins, the existing conditions of the ocean/land interface, and their vulnerability to storm hazards.

Single Dune Ridge (or Dune Zone) barrier islands often have severe scarping along the shoreline and on the seaward dune ridges. Such scarping is typical after major storms and is often healed, to a certain extent, by aeolian deposition, and/or growth of beachgrasses along the toe of the scarped dune.

Dune Ridge-Barrier Plain barrier islands are prone to damage from storms and hurricanes because of the single dune ridge and low flat plains behind. During hurricanes it is not unusual for the storm to break through the seaward dune and overwash the entire island.

The Open Dune Zone - Barrier Plain barrier islands are usually found in areas subject to frequent oceanic storms and are low, flat, and have a low, open dune zone. The dunes are likely to be flattened in a major storm washover. Often, sediment supply is insufficient and shoreline retreat is rapid.

When sand supplies for the littoral processes are interrupted by jetties or groins, overwash barriers develop quickly from other stable types. The lack of sediment supply results in rapid erosion of existing dunes, and frequent overwashing. Even in environments which generally maintain overwash barriers, these disturbed beaches can erode and retreat more rapidly than would otherwise be the case. Attempts to stabilize washover barriers generally meet with failure in the long run. Whatever dunes may be created along the retreating shoreline by human activities are soon eroded away and overwash conditions return.

Such barriers are generally found along coasts with narrow tide ranges, and frequent storm activity. Washover barriers are the most hazardous to develop from the standpont of shoreline retreat and storm surges.

Table 1

Topographical Variations of Barrier Islands

Type	Characteristic Environment	Topography - Dune System	Organic Resources	Storm Features	Islands
1. Coastal Plain Remnant ("Sea Island")	Relic portions of coastal plain isolated from the mainland by Post-Pleistocene rise in sea level.	Relatively high and flat with depressions supporting wetlands. Sedimentation similar to the mainland - coastal plain in nature.	Similar to the mainland.	Relatively stable because of the extensive high ground protecting most of the island	Cumberland Island, GA Sapelo Island, GA Hilton Head, SC Amelia Island, FL
2. Multiple Dune Ridges	Usually found where there are conditions of adequate sand supply and oriented across prevailing winds. Usually *Holocene* in age.	Dune ridge system of parallel sand dunes interdispersed with dune hollows. Dunes and hollows increasingly younger and less stable moving towards the beach. Generally *made up of* high ground protected by high dune ridges.	Interior usually is well vegetated and frequently support excellent examples of mature maritime forests. Great Biological diversity.	Relatively stable and free from most flooding because of high dune ridges and generally high ground.	Provincelands Spit, Cape Cod, MA Assateague Island, VA (portions) Nags Head, NC Bogue Banks, NC *Cape Fear*, NC Blackbeard Island, GA Horn Island, MS Buxton Woods, NC
3. Multiple Dune Ridge with Alternating wetlands	Usually on shorelines with low relative sea energy.	Wide island system made up on numerous parallel low dune ridges separated by extensive wetlands, both tidal and fresh water. Ridges become lower and wetlands wider towards the bay side.	Tremendous ecotonal habitat between uplands and wetlands produces great biological diversity. These islands have extraordinarily rich fauna.	Often faced with severe flooding during major storms. Wetlands often flood at high tide.	St. Phillips Island, SC
4. Single Dune Ridge or Dune Zone	Usully found where conditions favor dune growth - proper *orientation to prevailing winds* and proper dune grasses especially. Typical of regions with relatively wide tidal ranges.	Single dune ridge fronting ocean beach, irregular lower dune zone. Narrow in *size in relation to above island types*. Extensive sand beaches at low tide provide source for aeolian transportation of sand. Seward dune ridges often are scarped where exposed to high average sea energy.	Has a species of dune grass that is sturdy and prolific promoting *rapid development* of dunes	Low chance of storm overwash except during high tide.	Reid and Small Point Beaches, ME Plum Island, Sandy Neck, Nauset Beach, *and* Monomoy, MA Fire Island, NY Island Beach, NJ portions of Cape Hatteras, Ocracoke, and Bodie Island, NC
5. Dune Ridge - Barrier Plain	Usually found where the shoreline is at right angles to the prevailing winds and where there are moderate tidal ranges. Usually low average sea energy at shoreline.	Single dune ridge close to the ocean with extensive, low, and relatively flat plain behind. Receives continuous sand from the beach. Does not usually develop high dune ridges or extensive dune zones.	Supports many strand plants that aid in the formation of the dune ridge.	Occasional severe hurricanes especially hazardous because of lack of extensive dune zones or high dune ridges.	Padre, Mustang and St. Joseph Island, TX Merritt Island, FL Cape Canaveral, FL
6. Open Dune Zone Barrier Plain (Washover Basin)	Usually found where sediment supply is insufficient and shoreline retreat is rapid. Shoreline often oriented along prevailing winds. Relatively high sea energy on coast.	Overwash is the major sedimentation process. Low and flat with open, low dune zone. Wide berm. Dune zone is a broken series of open dune lines.		Dunes are likely to be flattened in a major storm.	Assateague Island, VA Core Banks, NC Masonboro Island, NC
7. Marshy Shore	Usually develops from salt marshes with eroding edges. Often, low average sea energy.	Usually lacks sandy beaches or dunes.	Provides large quantities of organic matter for marine ecosystem. Some shrubs and low trees can be found.	Storms are infrequent but island is often easily flooded by normal tides.	Parts of th Virginia Coast Assawoman Island, MA Cape Cod Bay, MA
8. Mangrove Islands	Usually develop in the mud of an intertidal zone where seeds of the red mangrove are allowed to take root and form a colony, thus creating an environment capable of supporting white and black mangroves that will stabilize the island. Classified as a *barrier island* when they protect the lagoon from direct wave action.	No beach or dunes. Mangroves build up "uplands" of sorts.	Provides large quantities of organic matter for marine ecosystem. Supports red, black and white mangroves, the basis of the island.	Highly susceptible to flooding. Is often completely flooded during storms.	Mostly found in the quiet waters off the coast of Florida.

They seem stable during quiet periods, and therefore give a false impression about their nature. One of the most recent urban areas created on a washover type barrier is Ocean City, Maryland.

Mangrove islands are coastal features which have been formed almost entirely by organic means and can be classified as barriers when they protect lagoons from direct wave action. Mangrove islands usually have no beaches or dunes, and are therefore highly susceptible to flooding. By their very nature, the mangrove islands are intertidal, much like the marshy shore. They develop when seeds of the red mangrove are trapped in the muddy sediments of the intertidal zone. The mangrove plant begins growth and as it does, prop roots are sent out into the mud. As the plant grows, others may start nearby, and soon a colony is produced. As the roots expand over the surface, muds and silts are trapped, and the elevation slowly increases. Over time, the red mangrove builds the substrate higher, and the site can then be colonized by the black mangrove. This species has roots which send aerial portions up from the substrate. As the elevation increases, a third mangrove, the white, can invade. When a mangrove colony is completely separated from the mangrove swamps along the mainland shore, they are classified as islands.

This continually changing relationship of ocean floor, surf line, and moving sediments produces islands that are both locationally and structurally unstable.

Approximately 300 study units consisting of all of the just described topographic variations have been identified. They are distributed unequally along the Atlantic and Gulf Coasts--ranging from two in several States to 80 in Florida. They also are equally diverse in size-ranging from 50 acres or less to well over 100,000 acres. Table 2 summarizes the study units by a number of different measures.

In addition to showing by State, total acres and acres by various management levels, the Table shows acres by three categories which reflect the relative State of protection or development. For purposes of this study, islands were categorized in the following manner:

1. Developed barrier islands are those with 75% or more of their land area developed, or with 1,000 or more acres of developed land area.
2. Undeveloped/unprotected barrier islands are those with no more than 10% of their land area developed, or with 5,000 or more acres of undeveloped land.
3. Protected barrier islands are those which are at least 50% owned and managed by a public agency, private group, or individual whose long-term intention is to maintain the natural conditions.

Those in public ownership (e.g., national seashores and wildlife refuges) are usually available for public recreational use, and usually have some administrative or public use facilities, ranging from simple campgrounds to elaborate overnight accommodations. These islands range

Table 2

Summary of Study Units by Various Categories

State	# of Islands	Acres							
		Total	Fed. Mgmt.	State Mgmt.	Other Public Mgmt.	Private Mgmt.	Developed	Protected	Undeveloped Unprotected
Alabama	5	28200	-	1200	100	26900	5200	1300	21700
Connecticut	14	2362	-	1417	215	730	678	1398	286
Delaware	2	10100	1000	2000	100	7000	2900	3100	4100
Florida	80	467710	212110	32900	7575	215125	103405	233735	130570
Georgia	15	165600	36100	44800	3100	81600	8700	71000	85900
Louisiana	18	41120	7600	1600	500	31420	3980	9650	27490
Maine	9	2640	60	710	110	1760	1640	760	240
Maryland	2	14300	9900	700	200	3500	2400	10500	1400
Mass.	27	37600	12875	2550	5025	17150	8390	19580	9630
Miss.	5	9500	6200	-	-	3300	200	6100	3200
New Hamp.	2	1100	-	200	200	700	700	100	300
New Jersey	10	48000	3800	3500	3500	37200	22700	9600	15700
New York	15	30310	2650	4400	5270	17990	11700	12260	6350
N.C.	23	146400	45400	12100	100	88800	23700	57100	65600
R. Island	6	3660	-	550	300	2810	1360	850	1450
S.C.	35	144150	11125	27350	100	105575	20525	38725	84900
Texas	16	383500	72600	39700	3000	268200	22850	120200	240450
Virginia	11	68900	17350	1400	10	50140	1350	28660	38890
TOTALS	295	1605152	438770	177077	29405	959900	242378	624618	738156

from virtually natural to quite altered environments. Those in non-public ownership are held by their owners (commonly non-profit conservation organizations) in some sort of permanent legal protection.

1. Origin of Barrier Islands and Spits

Barrier structures can develop in a number of different ways, and one type of formation is not necessarily more significant than others. The type of barrier island found in a given geographical region reflects the geological history of that particular region and the forces of sea level rise in a storm. (see Table 3)

Adding to the complexity of the whole system, many previous island systems may have eroded away or changed position by the forces of littoral drift. Shackleford Banks in Cape Lookout National Seashore is a classic spit type of island which apparently formed several thousand years ago as a spit attached to Cape Lookout, and has since been migrating westward. This island has a whole series of arcuate dune ridges, the oldest of which are in the middle portion of the island. Even so, the eastern end of the island now is undergoing a washover retreat as sand moves from one end to the other. The sequence by which a barrier beach develops from the growth of a spit is related to various sand transport mechanisms. As all processes of sand transport are involved in the creation, maintenance, and migration of the barrier island system, the islands may have moved a great deal since their initial formation, particularly islands such as those of the Outer Banks. While on the other hand, the barrier systems such as Cumberland Island and Sapelo Island, Georgia, may have moved very little. They also may have had barrier beaches further seaward than they now exist and these have migrated backward toward these coastal plain remnants. However the barrier island systems have formed, they have undoubtedly moved a fair amount, some more than others, and all represent the forces which have dominated the coastal region for the past several hundred years. (See Figure 3)

2. Inlets

Separating the individual islands of a barrier chain are tidal inlets; the deep, narrow channels through which the tide enters and leaves backbarrier lagoons.

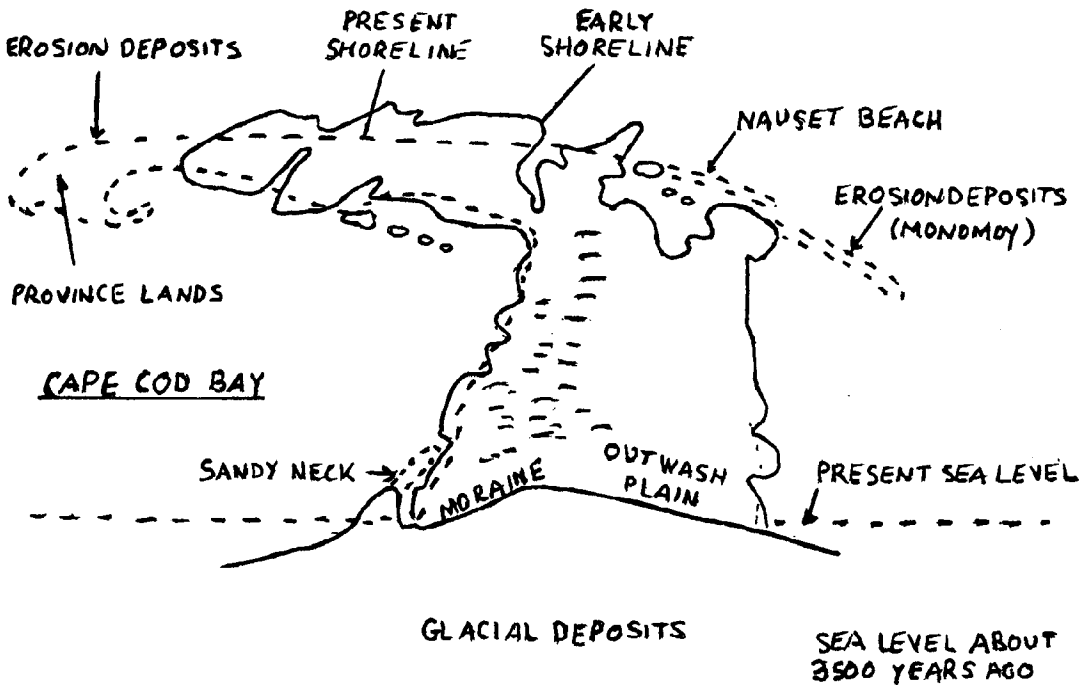
Naturally occurring inlets are the re' .lt of dynamic processes acting along the shoreline. They open and ' ose in response to different conditions and may migrate long dis ces along a barrier island shoreline. While an inlet exists, a balance may be achieved between the tidal inflows and outflows which scour the channel and the longshore transport which tends to close the inlet. These factors approach equilibrium as the inlet cuts deeper or wider, builds shoals, or changes configuration or position. (See Figure 4)

When open, an inlet acts as a complete or partial barrier to the longshore transport of sand. Under the conditions of small tidal flows

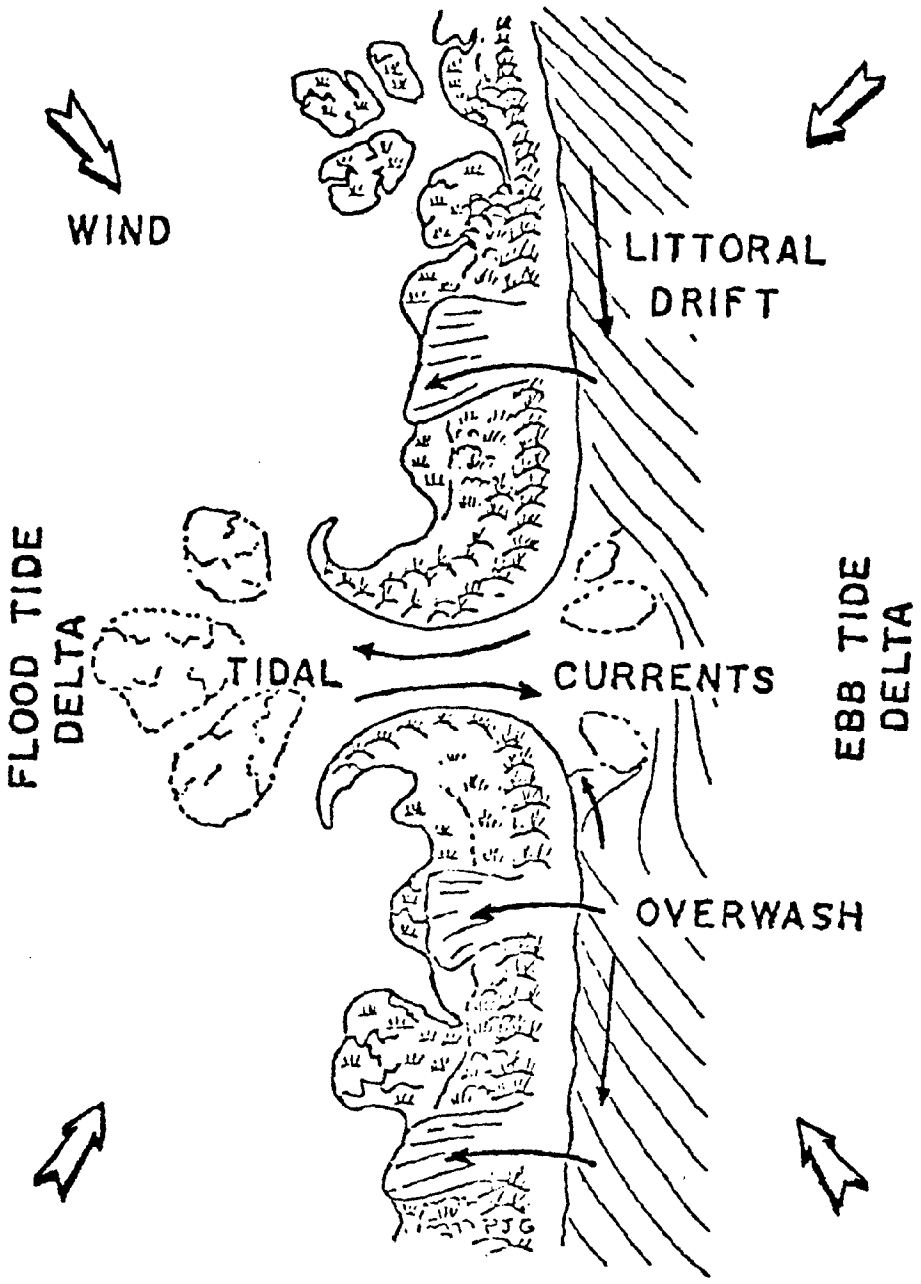
Table 3

Origin of Barrier Islands and Spits

Type	Process	Islands
Erosion of Glacial Deposits and the Subsequent Formation of Elongated Spits as a Result of Littoral Currents (See Figure 5)	Glacial deposits erode and elongated spits result from littoral currents. As a spit lengthens across either open water or along the front of an indented mainland region, the spit may become quite narrow. If it is breached by an inlet, then an island will form.	Monomoy, MA Fire Island, NY Northeastern Coast
	Spits may also end up with both ends attached to the mainland. Such barriers are called bay barriers.	Martha's Vineyard, MA (See Figure 5) Nantucket, MA Rhode Island shoreline
Drowned Beach Theory	The sea level rises along the mainland coast causing dune ridges to form. As a sea level continues to rise it breaks through the dune ridge, floods the mainland area behind it, and creates a lagoon.	Southeastern and Gulf Coast
Coastal Plain Remnants	Pleistocene uplands cut off from the mainland by the submergence of low areas and isolated form these islands. Often they have modern or Holocene barrier beaches.	Cumberland, GA Sapelo Island, GA
Barrier Islands formed by Rivers	Created from riverine sediments deposited at the mouths of major rivers that deposit large amounts of sediment in the ocean. The waves erode the deltaic deposits, especially as sea level rises, creating spits and islands.	Cape Romain Area Mississippi Delta Area Southeastern Coast
	Are also found at large river mouths that do not have river deltas but where the ocean is quite deep.	Small's Point, ME Popham Beach, ME Reid State Park, ME
Chenier-like Barriers	Often related to the various stages of sea level change and storm floods. They have long narrow, almost parallel beach ridges deposited on the marshes when storm surges push materials from the shoreline back across the marsh leaving a deposit on the marsh surface. Sand may blow in on top of these ridges and create higher features called dune ridges. Sea recedes leaving a series of beaches that will be submerged again when the sea rises.	St. Phillip's Island, SC



GEOLOGICAL FORMATION
OF CAPE COD
FIGURE. 3



Mechanisms Of Sand Transport On Barrier Beaches
Figure. 4

and large longshore transport rates, the inlet may close altogether only to be reopened later when conditions are again favorable to its existence. When an inlet is stabilized by jetties, or is maintained at a certain depth for navigation, it may constantly be out of equilibrium and may be restricted as to which factors it can adjust in approaching equilibrium.

Inlets are the essential pathways between the lagoon and the open ocean system for exchange of organisms and maintenance of productivity. Without the presence of inlets the high productivity and nature of the barrier island estuarine system could not be maintained.

The inlets are also the primary means by which sand is transported landward through a barrier beach system, as a function of rising sea level and storm surges. Old inlet sites can be easily located along most of the U.S. East Coast by the conspicuous deltaic pattern of salt marshes and other land forms behind the barrier beach. Nearly every portion of the East and Gulf Coast which has elongated barrier islands and shallow lagoons behind have evidence of previous inlets. In particular, the coastal regions off Long Island that are protected by the Fire Island system, the Jersey Coast, Virginia, and North Carolina near the South Carolina border have typical inlet features along most of this beach. Inlet features behind barrier beaches also exist along the Texas coast. The largest inlet features are along the Texas shore from approximately Galveston down into Padre Island.

C. Barrier Island Fauna

1. Terrestrial 1/

As a class, barrier islands stand apart for many obvious reasons: they are closely adjacent or adherent to mainlands; they are nowhere broad enough or high enough to escape the profound effects of salinity; they are underlain by sea water on which fresh water, from precipitation, floats; and, therefore, are apt to show marked seasonal variations in deep ground temperatures; and they are made of sand.

Indeed, all of the physiographic features of barrier islands are of critical importance to terrestrial organisms because they are dynamic products of on-going geologic processes that serve to perpetuate the barrier island ecosystems despite what is, for the mainland coastal plain, inundative sea level rise.

Three of the characteristic geologic features--capping barriers, inlet-hammock formations, and arc-and-spoke patterns--are of potentially great significance for terrestrial organisms because they produce topographic relief and therefore potential substrate diversity.

Several ecological factors are of note here: the sea insulates these lands and makes the climate equable, relatively cool in summer, warm in

1/ This section on vertebrates is based almost totally on two papers by James D. Lazell, Jr., Massachusetts Audubon Society, Lincoln, Mass. 01773.

winter. This fact favors land animals that might be excluded by either temperature extreme. On the other hand, both ocean and precipitation temperatures directly affect the ground temperature within the land, causing summer warming and winter cooling far more extreme than on the mainland. These extremes can be limiting for ectothermic organisms and all those that hibernate or aestivate.

Because barrier islands have a number of major features of physical and chemical ecology in common, it is not surprising that they also share various land animals. In Table 4 are listed eight ubiquitous forms. Table 5 lists other widespread and characteristic barrier island forms. This list is not exhaustive; several species known from local populations, but not widespread on any system, have been omitted.

Several trends in this summary of deployment are apparent: mammals are a large proportion of the total diversity in the North, lizards become increasingly numerous in the South. Water snakes (Natrix sipedon complex) and mice (Peromyscus) are prone to rapid adaptive alterations everywhere.

Muskeget is one of the most peculiar and distinctive of all the Atlantic islands of North America, and it is tiny. It is well known for, among other things, its endemic vole.

Cottontails are now ubiquitous but gained access to the Massachusetts system after introduction to the adjacent mainland a few decades ago. Muskrats, so characteristic in Massachusetts, drop out south of Cape Hatteras and occur only on the western Gulf Islands. Native mice have undergone adaptive change on parts of all three systems: Monomoy, Massachusetts; Buxton Woods, North Carolina; and Alabama and Florida.

Toads are abundant on Massachusetts and North Carolina systems, but rare on the Mississippi Gulf Islands; all populations seem like their mainland relatives.

The snapping turtle and diamondback terrapin are standard species of the Atlantic littoral. Their presence in suitable marsh habitats on the barriers is unremarkable, except that it is worth noting the peculiar distribution of the terrapin at its northern terminus at Cape Cod. The hognose snake occurs in most places where toads, its principal prey, occur.

Size and distance are, perhaps, less relevant to barrier islands than some other measurable variables that result in ecological diversity. The islands and peninsulas are all low, similarly built of sediments in dune formations that, albeit fascinatingly different from system to system, are not materially different in the physiographic relief they produce. There is, admittedly, quite a marked variation in obvious

Table 4

Ubiquitous Barrier Island Mammals and Reptiles

Mammals:

Raccoon, Procyon lotor (G)
Cottontails, Sylvilagus ssp.
Native Mice, Peromyscus ssp. (C,B,G)

Reptiles:

Hognose snake, Heterodon platyrhinos
Racer, Coluber constrictor (B)
Water snake, Natrix sipenson-fasciata comples (C,B,G)
Terrapin, Malaclemys terrapin
Snapping turtle, Chelydra Serpentina

Note: In some areas evolutionary adaptation is highly visible.

These are indicated as follows: C=Cape Cod; B=Outer Banks,

North Carolina; G=Gulf Islands between Florida and Louisiana.

Table 5

Mammals and Reptiles of Cape Cod Region,
North Carolina Banks, and Gulf Island Barriers

CAPE	BANKS	GULF
Vole*	-	-
Muskrat	Muskrat	?
-	Rice Rat	Rice Rat
Mink	Mink	?
Otter	Otter	?
Harbor Seal	-	-
Gray Seal	-	-
-	(Alligator)	Alligator
-	Mud Turtle	Mud Turtle
-	Slider	Slider
-	-	-
Garter Snake*	-	-
Ribbon Snake	(Ribbon Snake)	?
-	(Rat Snake)	Rat Snake*
-	Cottonmouth	Cottonmouth
-	Glass Lizard	?
-	Racerunner	Racerunner
-	SE Skink	SE Skink
-	(Anole)	Anole
-	Kingsnake*	Kingsnake
-	-	Whipsnake
Smooth Green	Kelled Green	?

NOTE: Asterisks indicate forms showing marked evolutionary departures at species, subspecies, or scotypic levels. Parentheses are for rare or very local population.

"ecological diversity" between say, Shackleford and Core Banks, North Carolina. This obvious difference results from the different vegetative associations present. The land animals do indeed depend on the plants, at least to some extent. It seems apparent that those islands with greater "ecological diversity," i.e., more vegetative associations, i.e., more plant species, have more land animal species. The tautology is complete: islands with more species have more species.

Barrier island faunas are tenacious, resilient and highly evolved. Under natural conditions there is no turnover of species and no "equilibrium" of extinction and colonization. The number of species on any given island has to do with a plethora of factors beyond mere size and separation distance; mostly it has to do with the specific, unique and unpredictable attributes of each individual island and the autecology of each individual animal species. The number of species on an island, or anywhere else, can only be empirically determined.

Only man, with his dredges, bulldozers, jetties, groins, and livestock can so alter barrier islands as to exterminate their native faunas.

2. Marine Fauna [2/]

a. Zooplankton

The shallow water immediately adjacent to a barrier island contains plankton populations typical of whatever part of the coast the island represents. At least some members of most major groups of sea animals spend all or part of their lives in the plankton. Although most plankters are small or microscopic, some quite large creatures may be classified in this category. The white jellyfish is abundant along the entire East Coast as are the pink jellyfish, a very large species common from Cape Cod northward, and the sea-nettle. The purple sailor and the dangerous Portuguese man-of-war, may be stranded on barrier beaches, especially in southern States. All these prey on smaller animals with the help of their stinging tentacles as do the ctenophores, another group with both large and small representatives.

The crustacean holoplankton is dominated by animals which feed on phytoplankton and are very important in the nutrition of larger organisms, including many commercially important fishes. Several cosmopolitan arrow-worms are conspicuous in the shallow water holoplankton.

Animals spending only part of their lives, usually the early part, in the plankton comprise the meroplankton. Most of these larvae are quite unlike their parents and must undergo drastic metamorphoses before they

2/ This section is based on a more complete discussion, prepared by Dr. Melinda Godfrey, for the barrier island study.

attain the adult form. Mortality is enormous, but so is the fecundity of the parental stock. Fish may be present in the meroplankton as floating eggs or as larvae.

b. Nekton

Strongly swimming organisms in waters surrounding barrier islands include fishes, mammals, and turtles. Shallow waters protected by barrier structures are usually teeming with juvenile fishes of many species as well as adult fishes of commercial and recreational importance.

Small cetaceans are the most prominent marine mammals to associate themselves with barrier structures. Two common porpoises, the Atlantic bottlenose dolphin and the Atlantic harbor porpoise, are frequently seen in sounds and estuaries. The blackfish swims in schools in coastal waters and strands rather regularly on beaches.

In Table 5, the harbor seal is listed for the Massachusetts system only because it actually breeds there; it winters south to the Outer Banks. The grey seal, the largest carnivore of the eastern United States, has its only U.S. breeding population, the southern-most in the world, at Muskeget, Massachusetts. The shallow waters behind barrier structures are a habitat for the manatee, also found in rivers and estuaries, primarily in Florida but occasionally north to North Carolina and west to the Texas coast. Unlike the carnivorous seals and cetaceans, the manatee lives entirely on aquatic vegetation.

Five species of sea turtles include the Atlantic and Gulf Coasts within their ranges. The loggerhead may stray north as far as Newfoundland. It nests on beaches, often barrier beaches, as far north as North Carolina and occasionally to New Jersey. As with other sea turtles, only the females ever come ashore and then only to bury their eggs in the sand.

Young Atlantic ridleys may often be seen along the Atlantic Coast, but nesting occurs only in Mexico and southern Texas.

Two species that are presently very rare are the green turtle and the hawksbill. Both are occasionally found in shallow coastal water as far north as Massachusetts. Green turtles once nested on Florida and Gulf beaches, but now do so only in the Caribbean.

The Atlantic leatherback is the world's largest living reptile. It is a turtle of warm waters, nesting occasionally on Florida beaches, but it migrates north in summer, feeding on cold water jellyfishes. Leatherbacks stay mostly in the open sea, but occasionally may enter coastal waters.

c. Interstitial Fauna

Possibly the most ignored coastal community is that of the tiny plants and animals that live in the spaces between sand grains, above and below the low tide mark. A seemingly barren expanse of sand actually harbors huge numbers of these animals which exist as primary consumers, detritivores or predators. Although most people are not even aware of their existence, they have an important role in the recycling of organic matter in the coastal zone.

d. Benthos

Barrier structures consist of unconsolidated material and, therefore, most of their associated benthos is that of soft bottoms. Solid substrate fauna appears on rocks and on man-made objects such as groins, jetties, seawalls, pilings, and derelict vessels and automobiles. Salt marshes and seagrass fields harbor specialized communities of their own.

Benthic organisms may be infaunal or epifaunal. Infaunal animals may burrow actively through the substrate or occupy more or less fixed tubes or burrows. Epifaunal animals either attach themselves to objects (sponges, anemones, etc.) or they crawl about on the surface (crabs). Many of the fish mentioned in connection with the nekton are ecologically part of benthic communities, since they feed and often rest on the bottom.

Many benthic animals are detritus feeders; that is, they are nourished by bacterial protoplasm from the surfaces of decomposing organic matter. Detritus feeders return nutrients to the interface and water column that would otherwise be buried by sedimentation, and thus they counteract some of the effects of accelerated sedimentation due to man.

(1) Soft Bottom Communities

Most of the waters immediately surrounding barrier structures are underlain by unconsolidated sediments. In high energy zones such as open beaches and the margins of inlets, this type of bottom is continually being stirred and shifted, and consequently only a few specialized forms can exist here. At the other end of the energy spectrum, the very quiet waters of some sounds allow very fine organic mud to settle out. Such material is so soft and anoxic that, again, very few organisms other than bacteria can exist in it. In semi-protected locations, where energy levels are intermediate, the substrate will consist of muddy sand or sandy mud, and here the benthic fauna will be the most diverse and abundant.

A few macrofaunal forms can survive on open, surf-beaten beaches. In the New England area, large edible surf clams bury themselves in the sand of the surf zone. These, along with wedge clams, are often cast up alive on the beach. This is also the habitat of the lady crab and the flatfish.

Farther south on the Atlantic Coast, surf clams and flatfish continue to be important. Certain filter feeders, such as the mole crab and bean clams, adapted to rapid burrowing, live in the zone of breaking waves. The ghost crab lives in supratidal burrows.

In the semi-protected bottom of the sound just behind a barrier island or spit, an enormous variety of organisms live in or on a substrate of intermediate grain size. Among the soft substrate fauna are several commercially valuable crustaceans and bivalves. Also present are their predators: blue crabs, horseshoe crabs, and large carnivorous snails.

(2) Eelgrass Communities

Eelgrass fields trap sediment and over time tend to make their substrate muddier than the surrounding bottom. The leaves and stems of the plants provide a distinctive habitat for organisms adapted to attaching to them or crawling on them. Certain animals, such as the bay scallop, are more abundant and prosperous in eelgrass than anywhere else. Juvenile fish of many species find shelter among the plants, as well as forage. Small gastropods, amphipods, and polychaetes are prominent among invertebrate exploiters of this habitat. New England eelgrass plants seem to be far "cleaner" than those near the southern end of the range of the species in North Carolina which support a rich and varied epifauna.

(3) Mussel Beds

In the New England area, the edible mussel grows on rocks and pilings but also forms large beds on sandy bottoms. They are of potentially high commercial value as their popularity as food increases on this side of the Atlantic.

(4) Salt Marshes

These intertidal habitats are physically part of the landward side of barrier structures. The animals of salt marshes do much to maintain the high productivity of these communities. Suspension feeders such as mussels strain the water column and deposit on the marsh surface much organic matter in the forms of fecal and pseudo-fecal pellets, thus greatly enriching the soil in phosphorous. Fiddler crabs and other desposit feeders recycle nutrients and metals and further "pelletize" the surface, resulting in increased stability and retention of minerals.

The periwinkle and the pulmonate snail, which crawl on the mud and the grass stems of salt marshes, and the mud nassa, which is abundant in the ooze of the creeks, are common in New England. Oysters may be attached to the roots of the grass, and the ribbed mussel embedded in the mud.

The shrimp and the blue crab enter the marsh creeks. The sand fiddler and mud fiddler dig burrows into the sand and muddy parts of the marshes respectively. The green crab is also often abundant in New England marshes. The mummichog, and the American eel are characteristic northern salt marsh fishes. The diamondback terrapin of culinary fame inhabits marshes as far north as Cape Cod, but it is more abundant in southern States.

Farther south, the pulmonate snail and the ribbed mussel are still present, along with the Carolina marsh clam. Shrimp and blue crab also are present as are the mud crab and the "square-backed fiddler". Some fish commonly reported from marsh creeks in North Carolina are the American eel, sheepshead minnow, mummichog, spot, croaker, striped mullet, and several others.

All salt marshes teem with insects, especially mosquitoes, gnats, greenheads, grasshoppers, and dragonflies. Numerous mites and spiders exist here as well.

(5) Solid Substrates

Zonation is a universal feature of solid surface communities that extend through the intertidal levels. A high intertidal barnacle zone and a mussel zone below it are more or less world-wide in occurrence, and on temperate shores there is usually a zone of brown algae below the mussels. Ecologists have shown experimentally that the upper limit of intertidal organisms is usually set by environmental tolerances, and the lower limit by some biotic factor.

A physically very harsh environment will have few and scattered organisms; this is the case in the high intertidal zone, where desiccation is severe, and on surfaces exposed to pounding surf, where most animals are wiped out before they really get established.

In environments of moderate severity, such as the midintertidal zone on a shore of moderate wave energy, competition is often the primary force that determines community structure; barnacles and mussels undergo strong intra and inter-specific competition.

Where environmental conditions are most benign, as in the low intertidal zone of a moderate energy shore, predators can be active and their behavior will determine the rest of the community. By removing many of the sessile colonists, the predators keep some space open and prevent any one prey species from becoming so abundant that it competes severely for space with its neighbors. Community diversity is greater than it would be in either a wave-swept or a highly competitive situation.

Many types of organisms are adapted to crawling over or among the sessile animals and algae of this community. It is common for attached organisms to rest on other organisms ("secondary space") as well as on the non-living surface ("primary space").

The solid substrate community is best developed on large, continuous objects such as rocks and pilings, but small outposts of this community are found wherever there is a solid object in the water.

3. Rare and Endangered Species

Coastal barrier island (CBI) ecosystems along the Atlantic and Gulf Coasts are among the most unique, diverse, and productive ecosystems in the world. The flora and fauna of CBI are components of highly evolved

systems with complex associations which, if not disturbed, are able to exist and, often, flourish in this harsh, high energy environment.

Individual CBI tend to be ephemeral features in geologic and evolutionary terms. However, this land form has existed for a sufficiently long period that a number of animals and plants have evolved that are specifically adapted to and maintained by the unique balance of forces which occur in this environment. While adapted to the natural stress and major storm events inherent to CBI, this specialization makes these species particularly vulnerable to human modifications of their environment. Even actions located outside of their immediate habitat niche which alter the dynamics, both short and long term of these land forms can have a detectable adverse impact. Man, through uncontrolled and ill-conceived development, can and has caused irretrievable damage to these native species.

As a consequence of these special circumstances, there is a concentration of species on CBI which are presently considered endangered, threatened, or of special concern under the Federal Endangered Species Act of 1973, as amended (16 U.S.C. 1531 - 1543) and by most of the 18 states of the East and Gulf Coasts. Other species yet to be formally classified as rare and endangered undoubtedly also exist on CBI. For example, no plants endemic to CBI have yet been listed although it is expected some species will eventually be so designated.

Listed in Table 6, are 34 species associated with coastal barrier islands currently known to need special considerations if they are to survive. This table presents information relating to the Federal and State designations and status of each species. A brief description of the types of habitat utilized by each species is also given.

D. Vegetation[1]

Barrier spits and islands of the East Coast cross the major vegetation zones of eastern North America from Maine to Texas (See Figure 5). Plants are important on the barrier islands especially in the dune zone because they stabilize the dune or ridges and act as traps. Sand blown off the beach would just keep moving inland if it were not for beach grasses in the northeast and sea oats in the southeast. These grasses have two distinctive characteristics: they can tolerate the salt spray

1/ This section is based on a more complete discussion prepared by Dr. Paul Godfrey and Dr. Steve Leatherman for the barrier island study.

Table 6

Endangered Species on CBI

(Federally Listed Species Only)

Species	Listing Status: Federal [1]	Listing Status: State [2]	Habitat Requirements	Dependency on Habitat [3]: Nature [4]	Dependency on Habitat [3]: Degree [5]	Threats	Current Range [6]
Mammals							
Cumberland Island Pocket Gopher (Geomys cumberlandius)	C	L(GA)	Deep friable soils with scrub vegatation	1 4 5	T T T	Destruction of vegatation	Camden County, Georgia
Manatee (Trichecus manatus)	E	E(NC, SC, GA, TX) T(FL) L(NC, SC, GA, FL, AL)	Warm (>76°F) coastal freash and saline waters in estuaries, bays, sluggish rivers with abundant submerged, floating and emergent vegetation.	1 4 5	T T T	Pollution of water, heavy boat traffic destruction of water vegatation	SC to TX
Alabama Gulf Beach House (Peromyscus polionotus ammobates)	C		Sparsely vegetated coastal dunes.	1 4 5	T T T	Destruction of dunes.	Mobile Point, AL (between Mobile and Perdido Bays)
Anastasia Island Cotton House (Peromyscus gossypinus anastase)	C	L(FL, GA)	Sand hills and dunes with open to moderately dense vegatation.	1 4 5	T T T	Destruction of vegatation.	St. Johns County Florida
Choctawhatchee Beach House (Peromyscus polionotus allophrys)	C	L(FL)	Coastal dunes with cover of bluestem and sea oats.	1 4 5	T T T	Destruction of vegetation.	Okaloosa, Walton and Bay Counties, Florida
Pallid Beach House (Peromyscus polionotus decoloratus)	C	L(FL)	Sea oats zone of sand dunes and dunes with sparse vegatation.	1 4 5	T T T	Destruction of dunes or dune vegatation.	Flagler, St. Johns, Volusa Counties, Florida

Mammals (continued)

Perdido Bay Beach Mouse (Peromyscus polionotus trissyllepsis)	C	L(FL, AL)	Sparsely vegetated coastal dunes.	1 4 5	T T T	Dune destruction.	Escambia County, FL, Baldwin County, AL
Captiva Island (Insular) Cotton Rat (Sigmodon hispidus insulicola	C	L(FL)	Marsh areas with moderate to dense vegatation.	1 4 5	T T T	Filling/dredging marshes.	Lee County, Florida
Pine Island Rice Rat (Oryzomys palustris planirostris)	C	L(FL)	Wetland with dense vegetation.	1 4 5	T T T	Loss of vegetation	Pine Island, Florida
West Indian Monk Seal (monachus tropicalus)	Extinct	L(FL, TX)	Sandy beaches and surrounding nearshore and estuarine shallows.	1 4 5	P P P	Unknown.	Unknown
Delmarra Fox Squirrel (Sciurus niger cinereus)	E	E(MD)	Oak openings, savannahs, narrow belts of trees with a mature stand of mixed mast trees.	1 3 4 5	T T T T	Destruction of nesting and feeding areas.	Delmarra Peninsula including Chincoteague NWR
Red Wolf (Canis rufus)	E	E(MS, TX) L(FL, AL, MS, TX)	Coastal prairies and marshes with dense cover along streams, ridges, and bayous.	1 4 5	I I I	Unknown.	East of Galveston Bay TX to Calasieu Lake, LA
Birds							
Whooping Crane (Grus americana	E	E(TX) L(FL, AL, TX)	Salt flats and adjacent islands dominated by salt grass, saltwort, glasswort, sea ox-eye and gulf cordgrass.	3 4 5	P P P	Pollution, sedimentation, dredging, etc. destroying plant life needed by cranes.	S.E. Texas coast-Matagorda and San Jose Island, Lower Matagorda Peninsula
Eskimo Curlew (Numenius borealis)	E	E(SC, TX, NY, RI, CT) L(SC, TX, MD)	Uses coastal beaches, tide flats, marshes, sand dunes and upland meadows during migrations.	1 2 3 4 5	P P P P P	Unknown.	Texas coast
Bald Eagle (Haliaeetus leucocephalus)	E	E(DE, NJ, NY, CT, NC, SC, GA, MS, TX, RI) T(FL)	Riparian or estuarine habitat. Remote forests with perch and nesting trees. Clear flight path to beach, estuary or river. Open view of surrounding area.	1 4 5	P P I	Loss of feeding and nesting areas. Disturbance by man's activities.	Coastal areas from ME to TX

Birds (continued)

Arctic Peregrin Falcon (Falco peregrinus tundrius)	E	E(RI, CT, NY, NJ NC, SC, GA, FL, MS, TX) T(MD NC, SC, GA, FL, AL, MS, TX) L(NC, SC, GA, MD, FL, AL, MS, TX)	Use beaches, marshes, overwash fans, flats, forests with perch trees during migration	2 4 5	P I I	Clearing, development of feeding and resting sites	Coastal areas from ME to TX
Eastern Brown Pelican (Pelecanus occidentalis	E	E(NC, SC, GA, FL, MS, TX) L(NC, SC, GA, FL, AL, MS, TX)	Uses shallow estuarine waters for feeding. Ground nesting on coastal islands with or without shrubs/trees. Resting/nocturnal/ roosting on spits, exposed sand bars, beaches (ocean and estuarine).	1 3 4 5	T P P P	Development causing loss of nesting sites; pollution reducing feeding habitat.	Coastal Islands from NC to TX
Cape Sable Sparrow (Ammospiza maritima mirabilis)	E	E(FL)	Brackish marshes.	1 3 4 5	P P P P	Filling of marshes.	S.W. FL - Ochopse Marshes to Shark River
Dusky Seaside Sparrow (Ammospiza maritima nigrescens)	E	E(FL)	Periodically flooded, burned cordgrass (Spartina bakerii) prairies.	1 3 4 5	P P P P	Filling marshes, flooding for mosquito control, excessive burning.	Orange and Northern Brevard Counties, FL
Bachman's Warbler (Vermivora bachmanii)	E	E(NC, SC, GA, FL, MS, LA, TX) L(GA, FL, AL, MS, TX)	Uses dense (almost thicket-like) river swamps during migration.	2	I	Unknown.	Unknown
Kirtlands Warbler (Dendroica kirtlandii)	E	E(NC, SC, GA, FL) L(SC, GA, FL)	Wooded uplands during migration.	2	I	Unknown.	Unknown
Red-cocaded woodpecker (picoides (=Dendrocopos) borealis)	E	E(RI, CT, MD, NC SC, GA, FL, MS, TX) L(MD, VA, NC, SC, GA, FL, AL, MS, TX)	Mature diseased pines used for nesting, roosting and forageing.	1 3 4 5	T P P P	Short rotation timber management. Destruction of pine stands.	S.E. VA to SC spotty coastal FL and northern Gulf

Reptiles

American Alligator (Alligator mississippiensis)	E(NC, AL, MS) T(GA, SC, FL, TX) T/SA(LA)	E(NC, GA, MS, TX) T(FL) L(NC, SC, GA, FL AL, MS, TX)	Swampy and marshy shallow fresh water areas. Moist vegetation required for nesting.	1 3 4 5	T P P P	Filling marshes and swamps behind/on coastal barrier islands.	Southeast and Gulf coasts - NC to TX
American Crocodile (Crocodylus acutus	E	E(FL) L(FL, AL)	Saline and brackish bays, brackish creeks and canals mangrove swamps, coastal marshes; nests in mangrove, other hardwood thickets at heads of small sand beaches along estuaries and on marl banks along narrow coastal creeks.	1 3 4	T T T	Destruction of nesting habitat, harrassment.	Florida from Key Largo to Marco Island
Atlantic Salt Marsh Snake (Nerodia fasciata taeniata	T	E(FL)	Tidal creeks and salt marshes usually associated with fiddler crab burrows and glassworts and in black mangrove swamps.	1 3 4 5	T T T T	Destruction and filling in of marshes.	Volusia, Brevard Indian River Counties, FL
Green Sea Turtle (Chelonia mydas)	E(FL) T(elsewhere)	E(NJ, MD, FL, MS, TX) L(NC, GA, FL, AL, L(NC, GA, FL, AL, MS, TX)	Pelagic species. Nests on beaches.	1	T	Use and development of nesting beaches.	MA to TX
Hawksbill Sea Turtle (Eretmochelys imbricata)	E	E(NJ, MD, GA, RI, CT, FL, MS, TX) L(NC, GA, FL, AL)	Offshore oceanic/pelagic species. Nests on undisturbed, deep-sand beaches in tropical regions.	1	T	Use and development of nesting beaches.	FL to TX
Kemps Ridley Sea Turtle (Lepidochelys kempii	E	E(RI, CT, NJ, MD, SC, GA, FL, MS, TX) L(NC, SC, GA, FL, AL, TX)	Shallow coastal and estuarine waters. Often associated with red mangroves. Nest on beaches with a well-defined and elevated dune area backed by exentive bodies of open water with seasonal, narrow connections with the open ocean.	1	T	Nesting beach development and use; destruction of dunes.	MA to TX
Leatherback Sea Turtle (Dermochelys coriacea)	E	E(RI, CT, NJ, MD, NC, SC, GA, MS, TX) L(NC, SC, GA, FL, AL, MS, TX)	Pelagic species. Occassionally enters estuaries in northern waters. Nests on sloping sandy beaches backed by vegetation.	1	T	Nesting beach development and use.	NE to TX
Loggerhead Sea Turtle (Caretta caretta)	T	E(MS, MD) T(FL) L(NJ, NC, SC, GA, FL, AL, MS, TX)	Nesting on beaches.	1	T	Use and development of nesting beaches.	

Fishes								
Shortnosed Sturgeon (Acipenser brevirostrum)	E	E(RI, CT, NY, NJ, NC, SC, GA, FL) L(NC, SC, GA, FL)	Tidal rivers along the Atlantic seaboard.	1 3 4 5	T T T T	Pollution and sedimentation.	St. Johns River, FL to St. Johns River, Nova Scotia
Insects								
Tiger Beatle (Cicindella dorsalis sspp.)	C	E(RI,NY,NJ,MD,VA, NC,SC,GA,FL,AL, MS,TX,LA	Breeds just above high tide line on sandy beaches.	1	T	High use by people	RI,NJ,MD,VA,NC, SC,GA,FL,AL,MS, LA,TX
Ontario Hairstreak Butterfly (Euristryman ontario sspp.)	C	L(NC)	Caterpillar found on Maritime Live Oak (Querous virginiana maritima).	1 4 5	T T T	Destruction of maritime hardward forests.	Dare and, possibly Hyde Countries, NC
Henry's Elfin Butterfly (Incisalia henrici ssp.)	C	L(NC)	Caterpillar found on Yaupon (Ilex vomitoria).	1 4 5	T T T	Destruction of Yaupon Shrubs	NC Coastal Barrier Islands

1/ Categories of Federal listings used in this table:
- E - Endangered
- T - Threatened
- P/E or T - Proposed/Endangered or Threatened
- C/E or T - Candidates for Listing/Endangered or Threatened

T/SA - Threatened/Similarity of Appearance

2/ State listing status E (Endangered and T (Threatened means that specific state legislation exists to protect the species so noted. On the other hand, L (listed by the state) means no protective legislation exists, but there is some concern about and special recognition of the species so noted.

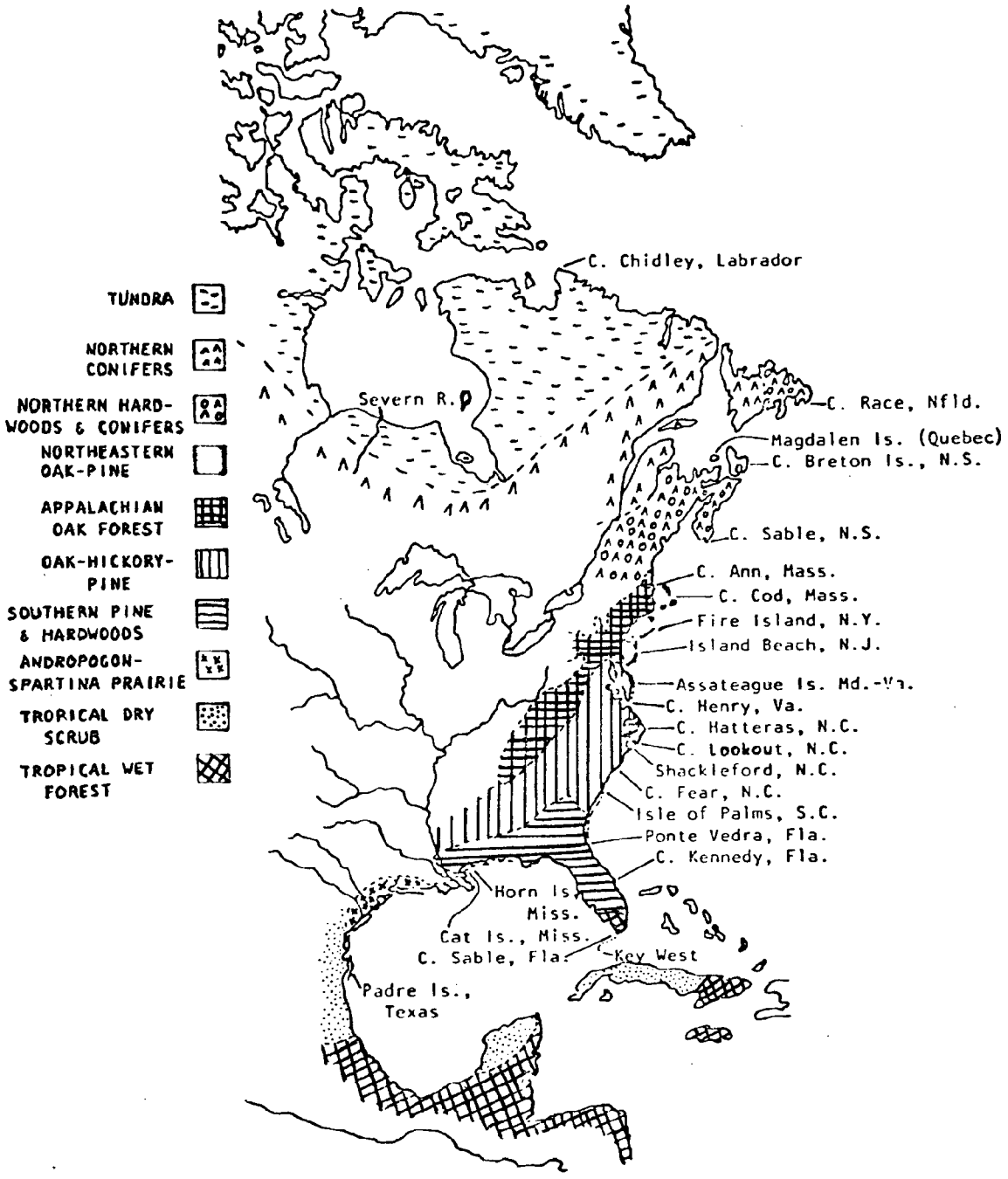
In addition to these state designations, 10 states (ME,NY,NJ, DE,MD,VA,NC,SC,GA,FL) have cooperative agreements with the U.S. Fish and Wildlife Service under provisions of Section 6 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1535(c) which include provisions to protect all Federally listed Endangered Species. Two other states (RI, CT) which do not have cooperative agreements with the USFWS have legislation protecting all species on the Federal list. Two states (CT,LA) have endangered species authorities and/or programs that are unclear or otherwise do not qualify for the Federal cooperative program. Five States (AL,MA, MS,RI,TX) have not submitted their endangered species authorities and/or programs to qualify for the Federal Cooperative program.

3/ Habitat used by each species during some stage of its life cycle.

4/ Nature of use of CBI habitat:
- 1 - Nesting/breeding/nursery
- 2 - Migration
- 3 - Wintering
- 4 - Feeding
- 5 - Resting/Roosting

5/ Degree of dependence on CBI habitat:
- T - Totally dependant
- P - Preferred habitat. Preferred by specie over available alternative habitat(s).
- I - Incidental use

6/ Range of species noted is the current lineal extent of each species along the coast.



VEGETATIVE ZONES
FIGURE. 5

that is a major component of the beach-dune environment and they can sustain burial by windblown sand growing upward and outward as the blowing sand accumulates around them. As the dune grows and the grass continually recolonizes the sand surface, the dune becomes stabilized. Later, nitrogen-fixing plants such as bayberry and beach pea invade the dune, adding to the barren sand nitrates that fertilize other plants. With long-term stability and shelter from salt spray, shrub thickets, and eventually woodlands, can develop on the landward side of the frontal dunes.

The region from Maine to New Hamphire provides a meeting ground for typically southern species and those of the boreal north. In southeastern Maine, spruce and fir trees mingle on sand dunes with pitch pines and oaks. In general, the Maine barriers are part of the northern hardwoods region; those of northern Massachusetts and New Hampshire belong in the Appalachian oak forest region. In southeastern Massachusetts, Rhode Island, New York, and New Jersey, the barrier island forest vegetation fits into the northeastern oak-pitch pine region. The transition zone from the Delmarva Peninsula to North Carolina can be considered part of the southeastern oak-pine forest, but northern beach grass (Ammophila breviligulata) and deciduous oaks remain dominant.

From North Carolina to northern Florida and the Gulf Coast, the barrier island vegetation is part of the southeastern evergreen oak-pine subunit of the oak-hickory and southeastern pine forest. The presence of sea oats (Uniola paniculata) and live oak (Quercus virginiana) distinguish this vegetation from that found inland. In south Florida, the flora of the Caribbean plays an important role in the vegetation, while on the western Gulf Coast there is a rich coastal grassland.

All along the East Coast barriers, there are individual species which overlap and prevent the drawing of definite boundaries. In certain respects, it is easier to consider the vegetation as falling into northern, southern and Gulf Coast types, the major distinctions between these zones being the break between beach grass and sea oats in the dunes, and the appearance of live oak and other evergreen trees in the forests along the Virginia-North Carolina coast. For convenience, we can consider the barriers north of Delaware Bay as "northern", the Delmarva Peninsula as "transition", and the islands south of the Chesapeake Bay as "southern", with the Gulf Coast zone on the western side of Florida to Texas.

All along this coastal region, the climate of the barriers and hence their vegetation are controlled to some extent by ocean currents. The northern beaches are affected by the Labrador current, which brings cool waters south to the northern tip of Cape Cod, where certain subarctic beach plants can be found. The Gulf Stream brings warm water to within

40 miles of Cape Hatteras, thus keeping the coast south of Cape Hatteras much warmer than the mainland. The coastal area between the Outer Banks of North Carolina and southern Cape Cod is intermediate between the two extremes.

In addition to these climatic variables, the vegetation on the barriers is affected by salt spray, frequency of overwash, sand supply and the orientation of the barrier beach relative to prevailing winds and storm waves.

1. The Northern Section: Maine to New Jersey

This zone may be divided into three subunits; Maine to northern Massachusetts; southeastern Massachusetts (Cape Cod and the islands) to New York Harbor; and New Jersey. The most important feature of the northern section, exclusive of New Jersey, is its glacial history. Small though they are, the Maine barriers are very similar to their cousins further south in their dune vegetation, except for the occasional presence of spruce and fir. Further south along the New Hampshire and Massachusetts coast, drumlins and morraines provided massive sources of sediments which have been reworked into the present day barriers.

Westward from Cape Cod and the islands, the shorelines of Rhode Island and Long Island are also the result of erosion of glacial sediments, creating spits and elongated barrier beaches broken by inlets. The unglaciated coast of New Jersey is, at least floristically, part of the northern region. However, the formation of these barriers was probably more like that of the southeastern system--drowning of a beach ridge system and subsequent recession.

The vegetation of the barriers can be broken into five major categories: grasslands, shrublands, woodlands/forests, freshwater marshes and intertidal marshes. The dune grasslands are dominated throughout by beach grass (Ammophila breviligulata), best developed in the more northerly section. (See Table 7).

2. The Transition (or Central) Section: Delmarva Peninsula

On the Delaware coast a major change occurs in the vegetation and the physiography of the islands. Here the barriers are typically southern in their appearance; they are relatively wide, with low dunes and extensive barrier flats. (This description does not apply to the few southern beaches with extensive dunes.) The evergreen nature of the southern forests becomes increasingly evident as one goes south in Delmarva. Loblolly pine forms extensive forests of considerable interest on Parramore, Assateague and Smith Islands. Salt marshes here are extensive and well developed.

Table 7

Barrier Island Vegetative Categories

The Northern Section — Mass to New Jersey	dominated throughout by beach grass yet not with the vigor it shows to the north. Appearance of salt meadow cordgrass (Spartina patens var. monogyna)- plays an important role in swarmsh recovery.		woodland is deciduous, except for pines and junipers. Contains many members of the rose family—beach plum, cherries, shadbush, and wild roses. Dominant hardwoods - are oaks - black (Quercus velutina) and white (Q. alba). American holly (Ilex opaca appears on the shore of Cape Cod; becomes more important on Fire Island and Sandy Hook, NJ.	generally found between dunes or where bioutes have reached the water table. Cattails (Typha) and reeds (Phragmites) dominate the marshes. Azaleas (Rhododendron), blueberries (Vaccinium), alders (alnus), arrowwood (Viburnum), dominate the shrub swamps. Red maple (Acer rubrum) and tupelo (Nyssa sylvatica), the tree swamps.	typical of most of the East Coast except the high marsh of salt meadow cordgrass (Spartina patens), and salt grass (Distichlis spicata) more extensive in the north. Pannes of depressions in the high marsh more prevalent; and macroscopic brown algae—rockweed (Fucus and knotted wrack (Ascophyllum) are mixed with the Spartina alterni-flora plants. Low marsh dominated by S. alterniflora - flooded by daily tides.
The Transition (or Central) Section - Delmarva Peninsula	dune grasslands still dominated by beach grass, yet not with the vigor it shows in the north. Appearance of salt meadow cordgrass (Spartina patens var. monogyna)- plays an important role in swarmsh recovery.		evergreen nature of the southern forests. Red bay (Persea borbonia) mixes with holly to created an evergreen hardwood forest; also Red cedar (Juniperus virginiana) and loblolly pine (Pinus taeda). Deciduous oaks, red maple, and tupelo also common.		extensive and well developed salt marshes. Low marsh of S. alterniflora of more significance than in north. Fewer pannes in the high marsh. Black needle rush (Juncus roemerianus) appears in the high marsh, links region with the south. S. patens and Distichlis spicata also common in the high marsh.
The Southern Section: North Carolina to Florida					
1. Outer Banks	sea oats take over dominance of the dune grassland, typical dune species of the southern U.S. coast. In some areas Spartina patens shares dominance with sea oats. Panic grass (Panicum amarulum), love grass (Eragrostis), purple muhly (Muhlenbergia), ground cherry (Physalis) and pennywort (Hydrocotyle) also come into the vegetation.	Red mulberry (Morus rubra), southern wax myrtle (Myrica cerifera), yaupon holly (Ilex vomitoria), French mulberry (Callicarpa) replace bayberry, plums, cherries and roses in ecological position of the north.	maritime forest become dominated by live oak (Quercus virginiana). This woodland found only on protected sites or well back from the beach.		
2. Beaufort Inlet to Cape Romain	extensive grasslands less common	shurb thickets can occur down to the first line of dunes.	woodland vegetation can occur down to the first line of dunes. Forest more diverse.		often occupy all the low lands between the barrier and the mainland.
3. Georgia embayment	dune strand is dominated by sea oats, salt meadow cordgrass, croton, seashore elder (Iva.) yucca, and others.		forest vegetation of live oak laural oak, loblolly pine, cabbage palm, magnolias, bumelia, and dense understory of palmetto.		some of the best examples of low salt marsh along the East Coast; including the famous Marshes of Glynn. Dominated by S. alterniflora throughout with the high marsh restricted to areas near uplands.
4. Florida			vegetation changes little. Southern end supports mangrove swamps and thickets of sub-tropical harwoods and vines.		
The Gulf Coast					
1. Mississippi River Delta to Florida	many regions are barren. Along the coast of Mississippi, Alabama and the Florida panhandle, dune some dominated by sea oats.	contians of species not found in the north - shrubby goldenrod (Chrysoma pauciflosculosa), rock rose (Helianthemum arenicola), sand rosemary (Ceratiola ericoides) and red calaminth (Clinopodium coccineum).	forest vegetation scattered in isolated groves: slash pine (Pinus elliottii) dominates woodland vegetation on many islands, where it occurs with live oak (Quercus geminata), myrtle oak (Q. myrtifilia), and sawtooth palmetto (Sarenoa serrulata). Isolated spots of hardwood forest of live oak, hercules club (Xanthoxylum clava-herculae), and bumelia (bumelia), mixed with palms and yaupon holly.		Extensive salt marshes, largest on the East Coast, exist throughout Mississippi Delta region. Dominated by several species of cordgrass (Spartina), S. alterniflora most important.
2. Mississippi River Delta to Texas	dominated by sea oats and salt meadow cordgrass along with croton, sand spur, beach evening primrose (Oenorthera humifusa), and railroad vine (Ipomoean stolonifera).		small forests of oak possibly as a result of human use and grazing pressure.		high salinity usually precludes establishment of salt marsh halophytes such as Salicornia and Batis are common.

3. The Southern Section: North Carolina to Florida

The great range of environmental conditions along the southeastern United States permits the division of this section into smaller subunits; the Outer Banks; Beaufort Inlet to Cape Romain; the Georgia embayment; and Florida.

From Cape Romain south, the vegetation is a combination of mainland and dune strand species. As one continues south into Florida, the vegetation changes little. Of growing importance in Florida is the presence of carbonate soils, and also of plant species from the Caribbean. The southern end of the State supports mangrove swamps and thickets of subtropical hardwoods and vines.

4. The Gulf Coast

The barrier island system resumes on the west coast of Florida and continues to Texas. This system can be broken into an eastern section (Mississippi River Delta to Florida) and a western section from the Delta to Texas. In the east, many regions are barren with extensive low sand dunes and sand flats suggestive of frequent overwashes. West of the Mississippi, the barrier chain is well developed from Port Arthur to Brownsville, Texas, with Padre Island illustrating characteristic features of the coast.

The interior of Padre Island consists of low dunes and extensive flats; the latter may be either deflation plains or overwash terraces depending on recent geological events. Wetlands are scattered as shallow ponds in depressions or between dunes. The only forest on Padre Island is a small stand of five oak trees near the southern half; it has been suggested that human use and grazing pressure caused a general decline of the natural forest vegetation.

High salinity levels that develop behind Padre Island in Laguna Madre have precluded the successful establishment of salt marsh, so the western shore of Padre Island is a sandy beach with low dunes. Halophytes such as Salicornia and Batis are common.

E. Soils

The soils of barrier islands are generally poorly developed; most are sand or peat. The type of sand on which soil is developed plays a significant part in the chemical composition of the soil. In general, the northern sands are nearly all siliceous, with little in the way of carbonates. As one goes further south, the carbonate fraction increases and adds more available calcium to the nutrient reservoir. Deeper south, carbonate sands dominate, especially along the Florida coast.

The typical soil profile that develops on sand is the result of years of vegetative cover and is best described as podzolic. As the vegetative cover increases, more organic material is added to the surface, from

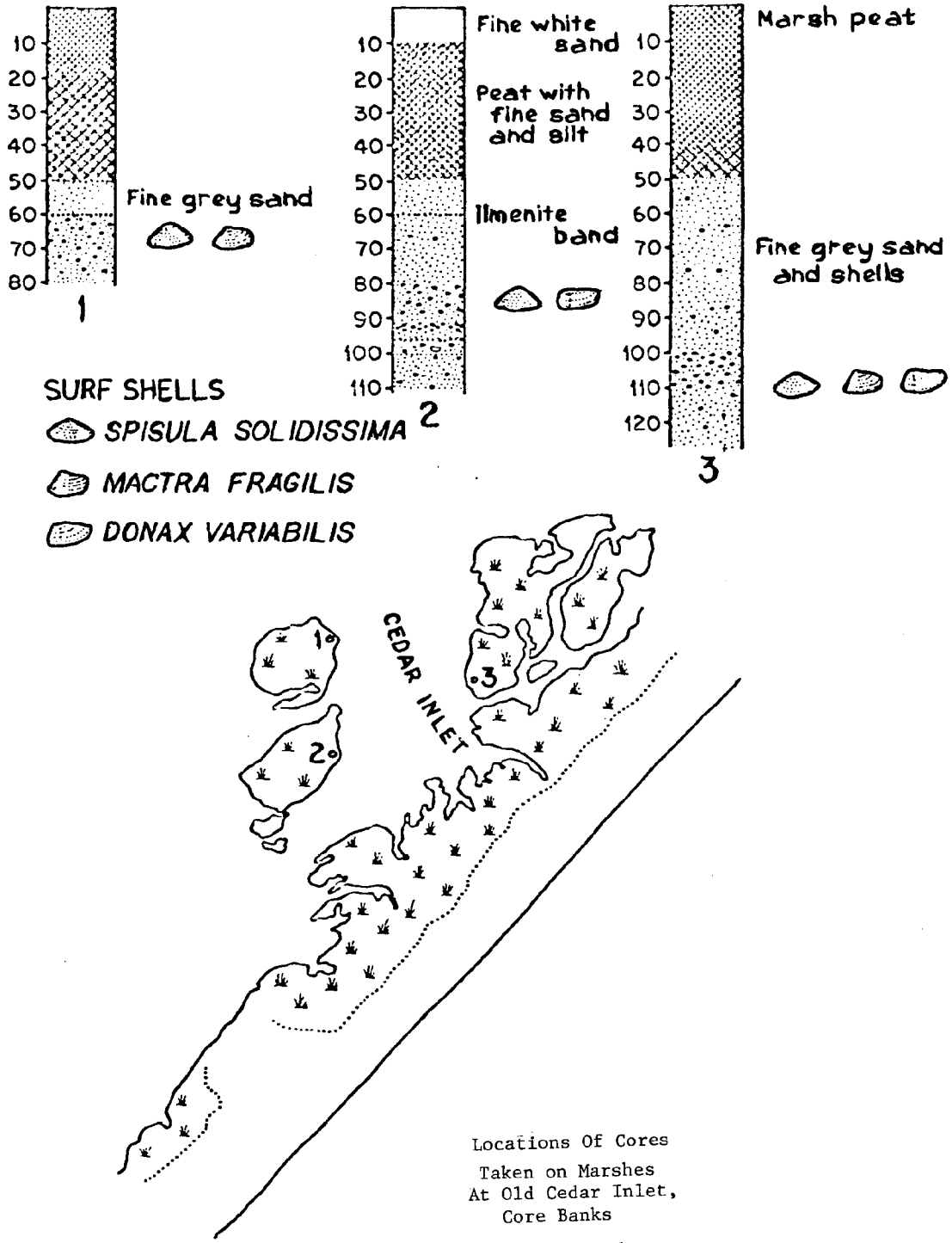
which organic acids are leached downward. This results in an ashy-white leached layer directly below the organic, or A, horizon. The leached materials are carried down into the sand where they accumulate in an orange or tan colored "zone of accumulation". The sandiness of the soil precludes any run-off and thus all the precipitation falling on the system drains down.

Old podzolic layers can frequently be found where migrating dunes have buried former woodlands. When exposed, these layers can be used to determine the location of former forests. The devlopment of a podzolic profile depends on the relative stability of the surface. Since many dunes have migrated or the islands have washed over so frequently, the soil has not had time to develop.

On low barrier islands, overwash sediments can be incorporated into the soil horizon rather quickly where grasslands develop. The productivity from the grasses adds organic matter to the sand, and in a relatively short while a fairly substantial organic-sandy soil will form. These layers are often buried by later overwashes and provide excellent markers for determining the previous surfaces of barrier islands. A good test for determining whether a barrier is retreating by overwash is to look for soil horizons below the surface.

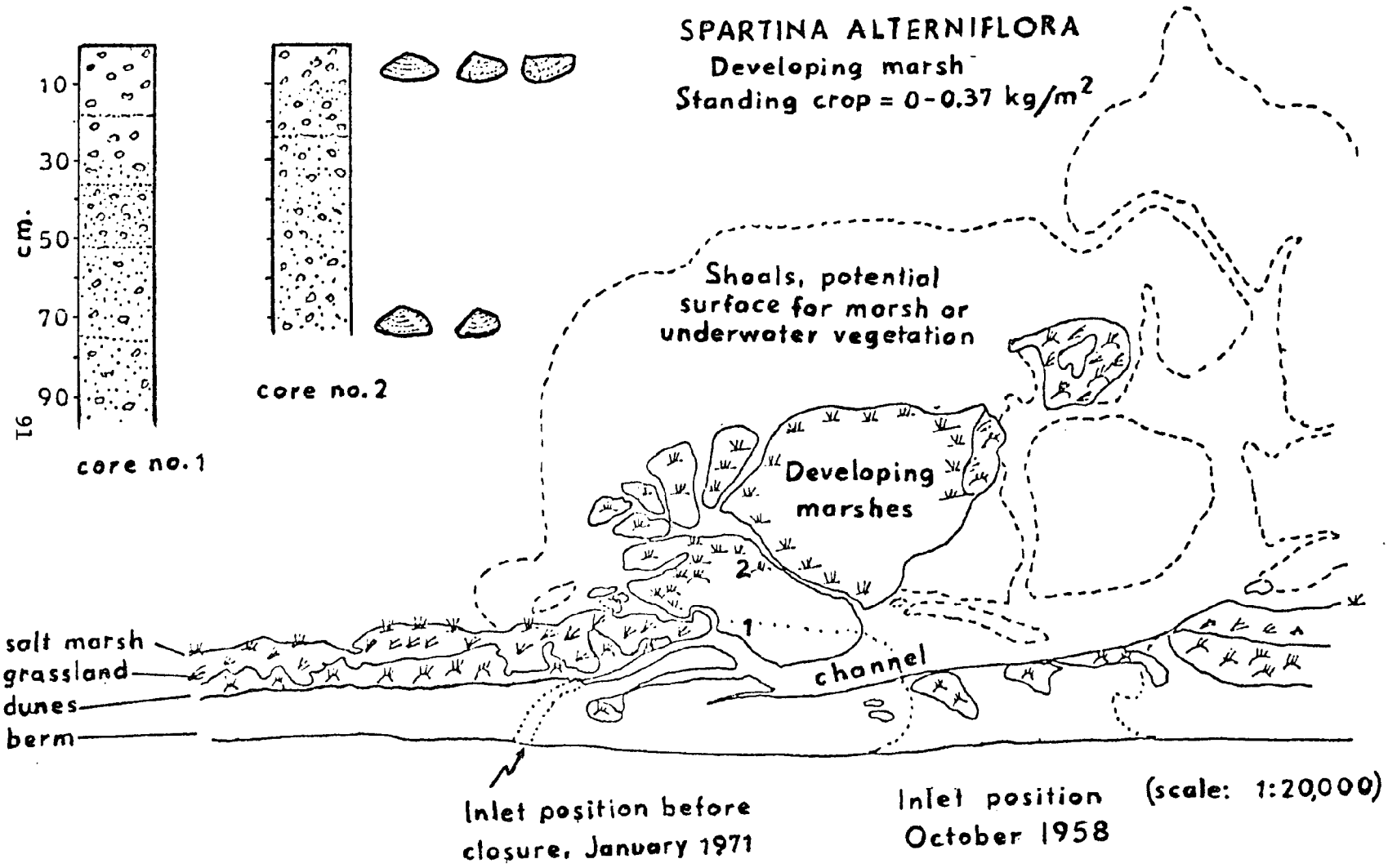
In terms of nutrients, siliceous sands are notably poor, while carbonate sands are somewhat better. Barrier island soils are derived entirely from material carried onto the barrier by water and precipitation. The tremendous input of organic detritus to sand beaches is rapidly broken down by micro-organisms which are specific for agar and chitin in addition to the cellulose of higher plants. The seemingly empty sand beach is an important site for the recycling of nutrients, and without this recycling, beaches would soon be buried with drift. Many dune plants have the capacity to fix nitrogen from the air, as do many inland species. Beach grass, bayberry, and beach pea all have nitrogen fixing bacteria associated with them, and are important sources of nitrates for other plants.

Peat and sandy peat soils form in fresh water wetlands or intertidal salt marshes (Figures 6 and 7). The salt soils are the most common; the peat may form on silts, sands, gravels or even rock. Regardless of the underlying substrate, organic matter accumulates as the marsh grows upward in response to sea level rise. In the early stages, the peat mixes with the underlying sediments. As the marsh grows, pure organic matter eventually makes up the soil. The peat is long lasting since decay rates are very slow in the anaerobic intertidal substrate. The peat formed by Spartina alterniflora may be recognized by fragments of the leaves that are present. When a high marsh begins forming on what was once low marsh, the peat that is laid down is much finer in texture than that associated with the low marsh. There also is more decay and, therefore, a more consolidated organic soil. This difference in peat types is very useful in determining the history of a salt marsh system,



Locations Of Cores
Taken on Marshes
At Old Cedar Inlet,
Core Banks

Figure. 6



DRUM INLET SUCCESSION
FIGURE. 7

and for that matter a barrier island. Such material is evidence that the barrier island is migrating, especially if found underneath existing dunes and beaches.

Fresh water peats on these islands are similar in nature to salt water ones in that they form under anaerobic conditions and, thus, they preserve the material from which they are derived. These peats contain seeds, pollen, and plant fragments which have settled to the bottom of an acid bog or pond with limited drainage and have become incorporated into the peat; they are good markers of the history of the wetland.

F. Oceanic Storms

The storms that affect the U.S. Atlantic and Gulf Coasts fall into two basic categories: the "northeaster" or winter cyclone, and the hurricane or summer cyclone. Northeasters begin as low pressure systems along the Gulf and southeastern United States, and then frequently make land-fall near South Carolina/North Carolina. The storms build intensity along the coast and then move northeastward toward New England. Some of the most intense storms and some of the greatest coastal damage along the U.S. East Coast have occurred during these northeasters. They are yearly phenomena and during the past years have become more frequent.

A second type of storm is the hurricane which affects the East and Gulf Coasts in the late summer and early fall, with September being the most active month. Hurricanes develop as low pressure systems in the sub-tropic/tropical latitudes of the Atlantic west of Africa. As they develop they move westward through the Caribbean and as they go up in latitude toward Florida they can either move directly westward into the Gulf of Mexico or turn northeastward and move up the eastern seaboard. Hurricanes are noted for their intense winds, very low pressures, and massive storm surges which frequently cause substantial property damage and loss of life. They are an integral and predictable part of the oceanic environment, and records going back as far as the 1500's show that hurricanes have affected this coast since that time and before.

On the average, two hurricanes per year strike the U.S. East Coast and cause more combined damage than any other type of natural disaster.* Neither the occurrence of hurricanes nor their course can be predicted with much certainty once they do appear. With the exception of the Virginia-Maryland-Delaware-New Jersey shore, all sections of the Gulf and East Coasts have been repeatedly subjected to hurricanes and sub-hurricane tropical storms. Florida, especially its southern coast, is probably the most hurricane-prone area of the country (See Figure 10); 43 hurricanes struck Florida between 1900 and 1960. During that period, the longest interval <u>without</u> one was four years.

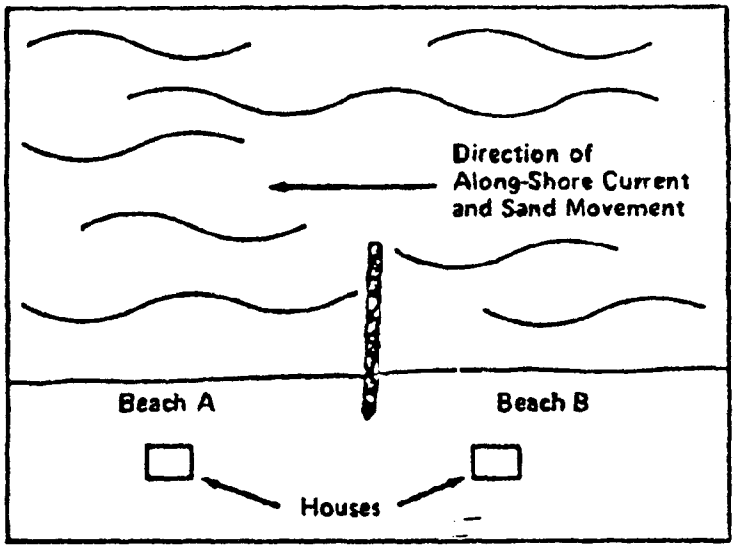
* Jerry L. Machemehl, in <u>Coastal Zone</u> '78 Vol. III, C New York: American Society of Civil Engineers, 1978) pp. 1453-1468.

Hurricanes have an enormous impact on barrier islands, developed and undeveloped. On many islands the only physical defense that residences and other structures have against storm waves, tides, and surges, is the barrier dune system. On developed islands this protection has often been eliminated when the dunes are leveled to provide building sites. Building often takes place in filled lowlands, washover channels, and near man-made inlets, all subject to flooding should a storm hit.

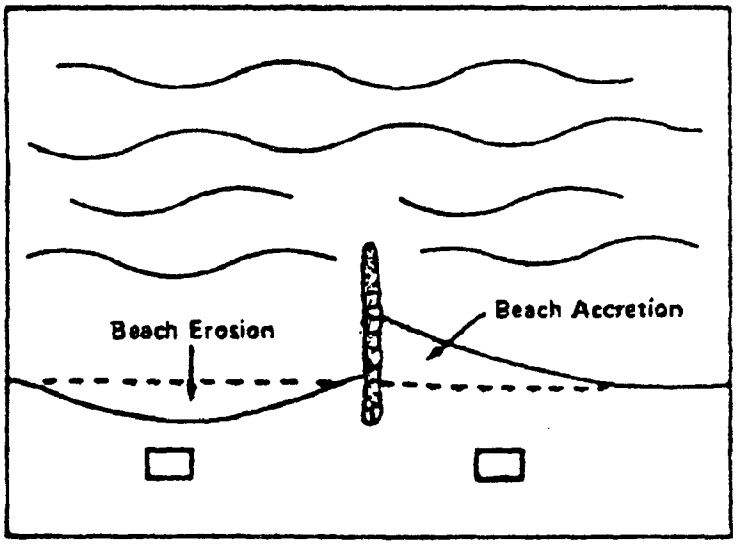
Where development and habitation appear on the barrier islands, often steps have to be taken to prevent damage to the structures as well as damage to property. There are several common solutions to the problem of beach erosion as a result of development too close to the first dune ridge. Construction of a groin will trap sand in the littoral drift, thus holding and collecting the sand on a specific portion of the beach. It is successful, however, only on that portion of the beach above the groin. Below the groin, erosion is accelerated because of ensuing sand depletion due to the groin (See Figure 8). The seawall is another structural approach to arresting beach erosion. It is constructed usually parallel to the beach to interpose a physical barrier between the oncoming waves and the property to be protected. It sometimes halts erosion temporarily but unless the wall is large enough to dwarf both the beach and the waves, the wall itself is soon attacked by the waves and is eventually undermined (See Figure 9).

A non-structural means of arresting beach erosion is beach and dune restoration (or nourishment). Sand dredged from either the bay or ocean bottom is hydraulically deposited on the beach, replacing the sand that had been removed by erosion. This is an extremely expensive and complex operation and must be maintained yearly, also at significant expense. The Army Corps of Engineers has spent nearly $33.5 million for shoreline stabilization on barrier islands during the past three fiscal years.

One of the most serious problems that arise in the event of storms and hurricanes is that of evacuating the population of these islands to safe ground on the mainland. Everything about a hurricane emergency tends to thwart the safe egress of the population from a barrier island. Often the roads are low--only 8 to 10 feet above mean sea level. Almost inevitably these roads flood as sea level rises during a storm, blocking access to the mainland and safe escape. In addition to flooding, these roads may be destroyed outright by the force of the floodwaters smashing against them or from the undermining of the sand or they could be permanently blocked by one felled tree due to the powerful storm winds. Even if the roads remain secure, fleeing vehicles from all sections of the island converging on one or two bridges all at once create a potentially lethal bottleneck.

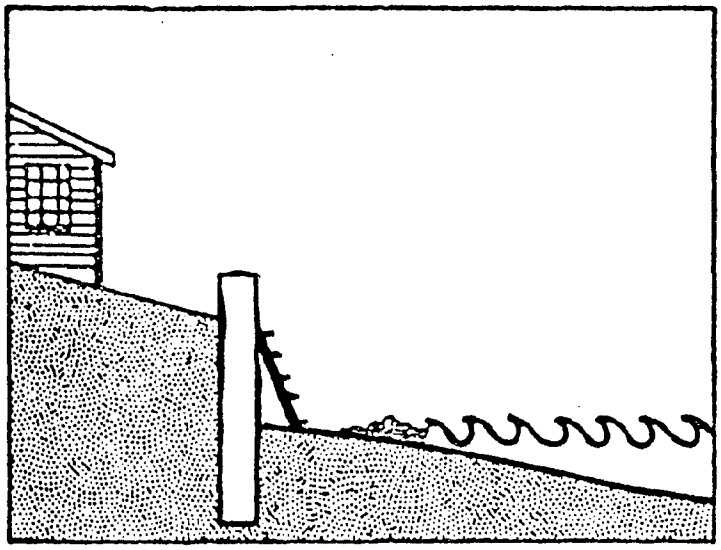


A. Groin Newly Constructed to Protect Beach B

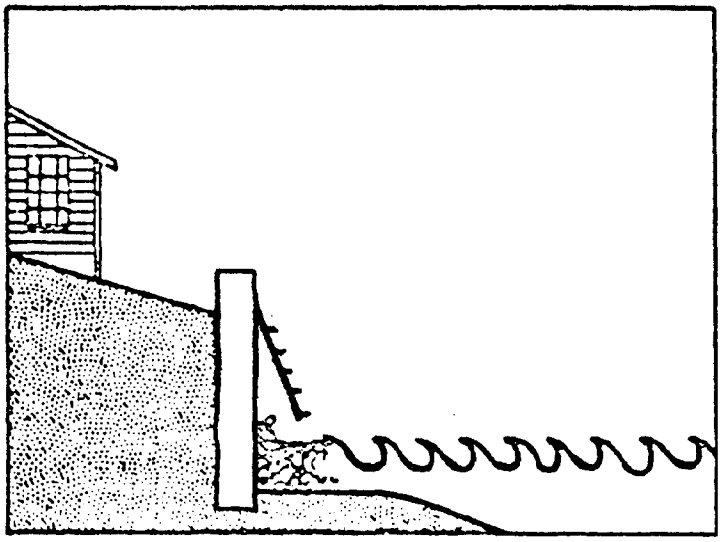


B. Trapped Sand Accretes Beach B at Expense of Eroded Beach A

EFFECT OF SEAWALL ON BEACH
FIGURE. 8

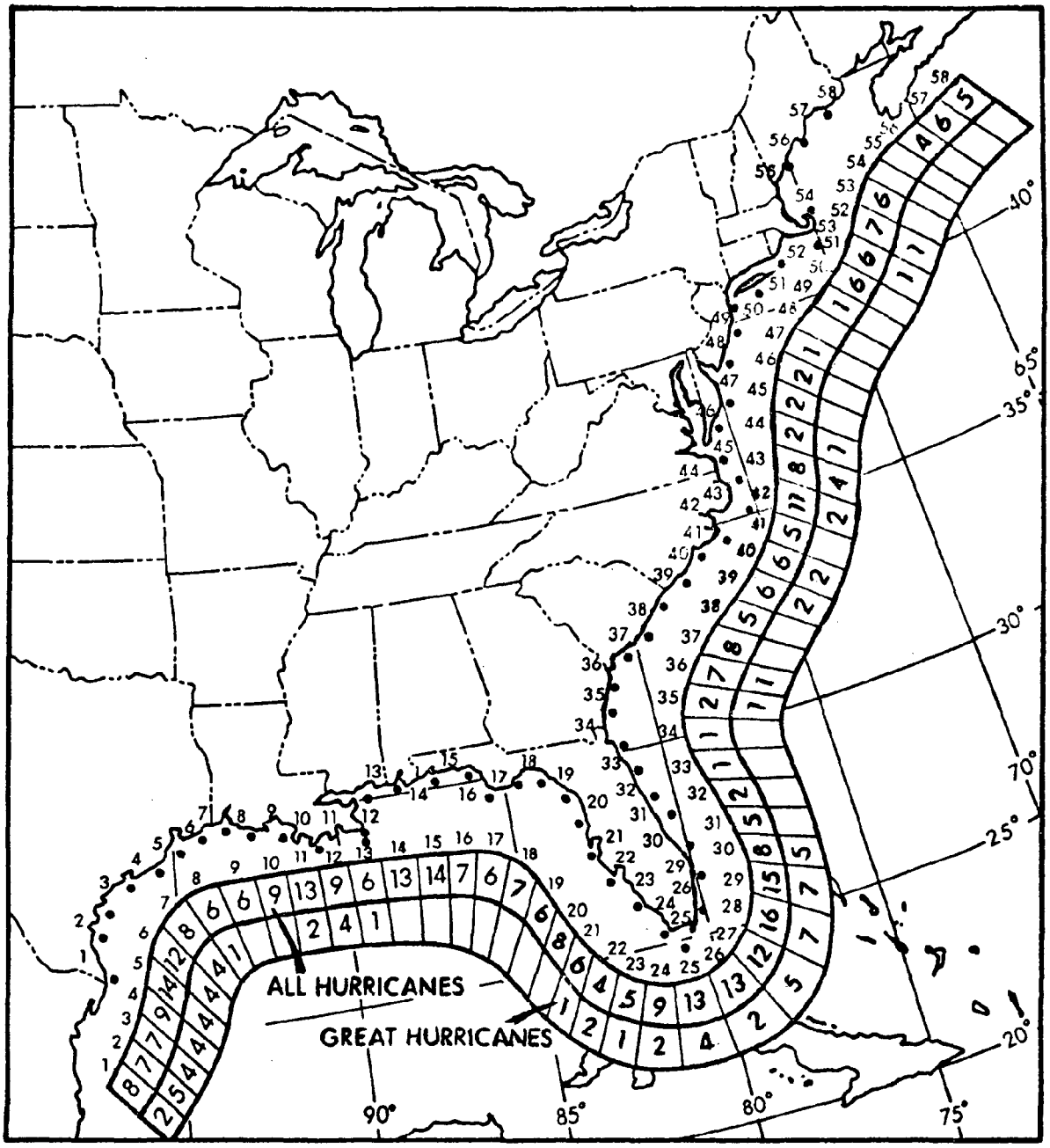


A. Seawall Built to Protect Beach Front Property



B. Subsequent Beach Erosion Due to Deflected Wave Energy

EFFECT OF SEAWALL ON BEACH
FIGURE. 9



HURRICANE PROBABILITY ON THE
EAST AND GULF COASTS
FIGURE. 10

There is some indication that hurricanes come in cycles, although this is not proven. However, it is known that the last series of major storms along the East Coast occurred during the 50's. During the past decade and a half most hurricanes have gone into the Gulf of Mexico rather than up the East Coast.

Most of the development on barrier islands along the East Coast has occurred during this relatively unusual calm period. In addition to driving barrier beaches landward as sea level rises, the northeasters and hurricanes are a major source of the northward movement of heat from lower latitudes, as well as precipitation in the northern latitudes. In fact, the southeastern coast of Florida and the Gulf Coast often derive the greatest sources of precipitation from the hurricane season. All portions of the Gulf Coast and U.S. East Coast, from Florida to Maine, have been affected at one time or other by hurricanes or northeasters. The Hurricane Probability Map (Figure 10) shows the likely percentage that one can expect a hurricane at any given year along this coastline. The greatest hazards to coastal development relate to the increasing potential for storm damage.

1. Sea Level

The primary driving force which is resulting in the landward movement of the coastline, whether barrier island beach or just mainland, is sea level change. The ocean level has never remained constant through geological time, but has always risen or fallen relative to the land surface. The last major change in sea level occurred during the last Ice Age. At the height of the Ice Age, the sea level was down approximately three hundred feet from its present elevation, and, as the ice started melting approximately ten to fifteen thousand years ago, the volume of water in the sea increased very rapidly. With the weight of the ice removed from the northern latitudes, particularly from Labrador northward into the Arctic, the land surface actually began to rebound upward isostatically, resulting in a situation where the land is actually coming up out of the sea and old barrier beach systems can be found inland. On the other hand, the more southern latitudes, encompassing the whole East Coast and Gulf Coast, are experiencing isostatic decline and the land is actually sinking. The land surface is going down and the volume of the sea is going up, resulting in a very rapid rise of sea level relative to the land. On the New England coast this rise amounts to approximately six inches a century, while on the mid-Atlantic coast it is about a foot a century. Recent figures for Charlestown, South Carolina show a rise of nearly fourteen inches since 1920. All evidence suggests that the present trend of sea level rise will continue and, in fact, it is possible that the rise may accelerate. If this does occur, land just a few feet above sea level, as is much of the East and Gulf Coasts, will experience increased

flooding and damage from storm surges. Presently, this sea level rise is causing shoreline retreat of 50 to 200 feet a century on the average. Natural or undeveloped islands respond to this rise in sea level by migrating as a unit.

2. Tide Influence

The average range of the tides along a specific portion of the coast can be a significant factor on the frequency of overwash on a barrier beach. For example, if a storm arrives at low tide and the tidal range eight feet, as in the Georgia embayment, then the normal storm surge of three to four feet or more would not be enough to crest over a barrier beach. On the other hand, if such a storm arrives at high tide or remains in the vicinity during one tide cycle or more, the likelihood of overwash is far greater.

Where the tide ranges are narrow, a storm arriving at almost any stage of the tide cycle may cause an overwash. For instance, where the tide ranges are only about three feet, which is true for the southeastern coast of Virginia, North Carolina, and the Gulf Coast, a storm arriving at high tide will result in a substantial overwash.

G. Water and Water Quality

In most instances water is found in three forms on a barrier island. The forms include (1) salt water on the ocean side, (2) fresh water on the island itself, and (3) brackish water on the marsh or bay side of the island; and each is affected by human activity on the island.

Of the three, the ocean water is obviously the most plentiful and the least affected by man's activities on the island. These waters, however, are easily polluted by activities on the mainland, on the islands themselves, and
at sea.

Fresh water naturally occurs on an island as a result of local precipitation falling directly on the island; there is no watershed. The rate of fresh water replenishment is governed by the island's limited precipitation and catchment area. The plants that live on the dunes and flats require fresh water, which is normally available to them in two ways. First, the dunes--although dry on the surface--hold sufficient moisture within to support the plants. Second, the water table is usually quite close to the surface of the barrier flats, within reach of the plant roots enabling them to get sufficient moisture. The water demand of a community development located on a barrier island is usually greater than the rate of replenishment. In some communities where well water is used, an imbalance between demand and replenishment causes an overdraft on the limited groundwater supply. This overdraft not only means a depletion of the fresh water supply, but the incursion of subterranean salt water bringing unusable brackish water into the

wells. Barring the availability of a deep acquifer, the only alternative for a permanent development is to pipe water from the mainland causing the cost of fresh water to be 4 to 5 times more expensive than on the mainland.

The upper surface of the fresh ground water is in many places at or near the ground surface. This condition, combined with sandy soils, makes it difficult to install septic systems and drain fields. Not only is the septic drainage impeded by the saturated condition of the soil, there is always the possibility of the waste discharge mixing with the fresh water supply. It becomes clear that the water regime of many barrier islands imposes severe limitations. Storm damage, too, causes many problems. Hurricane Beulah cut the Padre Island water line in more than 40 places. Although water limitations are severe in most cases, many of the study units maintained a potable water supply. Only 43 (14%) of the nearly 300 study units do not have a potable water supply. Table 8 identifies the number of units by State without a potable water supply.

The third form, the brackish water, is extremely valuable as a fishery and for its production of vast quantities of seafood. With its protected waters, its recreational value is also undoubted, as these waters support numerous marinas and waterfront subdivisions. It must be remembered, however, that this brackish water is itself an ecosystem of finely tuned associations of fresh water, salt water, transported nutrients and a variety of plant and animal species. The plants and animals are conditioned to and depend upon the natural ambient conditions, including the flux of salinity, the seasonal changes of temperature or dissolved oxygen, and, especially, the protection offered by the barrier islands from major storm winds and tides. These water bodies are fragile in the sense that they do not require too serious an intrusion to upset the natural dynamic balance.

Water quality on and around the barrier islands is also a critical issue. Industry has the potential for hazardous effects on water quality. Discharges of pollutants into the water can result in severe alteration of the biological and scenic resources. The coastline from Long Island, New York, to Cape Hatteras, North Carolina, has been heavily impacted by the dense population and industrialization of the coast from Washington to New York. New York Harbor, the Delaware Bay and the Chesapeake Bay have undergone considerable degradation especially from municipal waste discharge, toxic waste disposal, dumping of sewage sludge and coastal modification.

Construction facilities related to the production of energy have caused conflicts along the coastal area. The increased number of oil spills, the risk of nuclear accidents as well as the great quantities of water utilized for cooling purposes, pose serious damage to the water quality surrounding the barrier island.

Table 8

Study Units Without Potable Water Supply

State	Total # of Units	# of Units Without Potable Water Supply
Alabama	5	1
Florida	80	13
Georgia	15	2
Louisiana	18	8
North Carolina	23	6
South Carolina	35	9
Virginia	11	4

Other coastal activities also cause contamination. For example, the developments associated with marinas or waterfront subdivisions leak gas and oil; pesticide and fertilizer contaminates runoff into the water; and fresh water from rain or snow, which would have percolated into the subsoil, now runs off on newly paved surfaces into the marshes and is lost to the freshwater lens.

Approximately $4 million in Federal funds were appropriated for research and study related to water quality in Fiscal Year 1978. The Corps of Engineers and the National Oceanic and Atmospheric Administration account for 82% of those funds. Research into excessive sediment deposition caused by the disposal of dredged material in the sea is one of the areas being funded.

H. Cultural Features

In the history of this Nation, barrier islands have played a role of significant historic and cultural importance. Not only were they long used and occupied by Native Americans, these outer banks were often the first land sighted by the arriving European explorers, and later became the homes of early settlers. Settlements on some of the barrier islands have survived until the present, and they and their inhabitants have often retained distinguishing cultural characteristics of earlier times recognizable in language patterns, life styles, building techniques, and attitudes.

The islands were (and in some cases still are) important for the location of lighthouses, vital for warning sailors of the nearby shoals and in helping them to determine their position. Today there are active and inactive lighthouses that date back as far as 1765 exhibiting the wide range of designs, construction techniques, and building materials that characterized this architectural form. A closely related aid to coastal navigation that became a cultural feature of the islands was the chain of lifesaving stations created to aid seamen in distress. A number of the stations still exist. Another use of the barrier island, related to their forward location, was that of coastal defense. Ship Island, Mississippi; Santa Rosa Island, Florida; and Sandy Hook, New Jersey, are but three examples of barrier islands that still contain substantial remnants of fortifications that span a long period of American History.

Although much of the physical evidence of successive occupation and use has been lost to erosion and storms, much remains. This is quite evident in a study of both the prehistoric and historic archeological resource potential for onshore and offshore coastal areas of the Gulf of Mexico prepared in 1977 under the auspices of the Interagency Archeological Services, Office of Archeology and Historic Preservation.

As an indication of the important role the islands have played in American culture, the National Register of Historic Places was reviewed

in an attempt to identify a list of historic properties located on barrier islands. The seventy-six properties identified have been listed on the National Register of Historic Places, as of October 1978. These sites include seven military fortifications, six colonial settlements, thirty-one historic structures, eleven lighthouses, three lifesaving stations, two railway depots, one spanish monastery and one sunken ship (Table 9). Three of these sites have been determined to be very significant and as such have been designated National Historic Landmarks. Nine prehistoric and historic Native American sites were also identified. The National Natural Landmarks Program, which identifies physical and biological resources that possess attributes of national significance, was also reviewed to determine the number of sites listed on barrier islands. Seventy-three sites on 68 barrier island study units were listed; of these, 17 have been officially designated as Natural Landmarks by the Secretary of the Interior. Of the 73 sites, many were noted for specific outstanding natural attributes. Included were: 51 for tidal marshes, 41 for maritime forests, 39 for dune communities, 38 for raptor habitats, 36 for rare species habitats. Table 10 identifies the number of landmarks studied and those already designated by States.

The Historic Preservation Fund, administered under the authority of the National Historic Preservation Act of 1966, makes matching grants for historic preservation to the States from an annual appropriation for that purpose. The States may use the grants for surveying, evaluating, acquiring, and preserving significant cultural resources. Since the program was first funded in 1970, over $46,625,000 have been granted to the 18 barrier island States through FY 1978. Considerably less than 1% of this amount is estimated to have been used to promote resource preservation on barrier islands.

I. Recreation

Barrier islands offer a wide range of recreational opportunity including: fishing, clamming, swimming, hunting, scuba-diving, camping, hiking, wildlife observation, environmental study, picnicking, bicycling, and nature walks located in areas such as national seashores, wildlife refuges, parks, and natural areas. Cultural areas such as those designated in the National Natural Landmarks program are important recreational resources as well. Barrier islands also provide, where developed, a deluxe resort atmosphere with motels, restaurants, gift shops, amusement parks, marinas, golf courses, tennis courts, and swimming pools. Barrier islands offer an unlimited opportunity for the recreationist whether he or she lives nearby or travels a great distance.

Visitor characteristics of seashore users are diverse. General observations, however, indicate that family groups most often use the shorelines along with a large number of organized groups. The visitor profile is often influenced by national and regional conventions and

Table 9

Number of Registered Historic Places
By State

State	Number of Barrier Island Units With Registered Places	Number of Registered Places
Maine	2	3
Massachusetts	3	3
Rhode Island	1	3
New York	1	1
New Jersey	5	8
Virginia	2	2
North Carolina	2	3
South Carolina	5	19
Georgia	3	6
Florida	13	21
Alabama	1	1
Mississippi	1	1
Louisiana	1	1
Texas	3	4
Total 14	43	76

Table 10

National Natural Landmarks by State

State	Number of Barrier Island Units With Landmarks	Number of Currently Identified Landmarks	Number of Designated Landmarks
New Hampshire	2	2	
Massachusetts	13	13	1
Rhode Island	1	1	
New York	6	6	1
New Jersey	4	6	1
Delaware	2	2	
Virginia	10	10	10
North Carolina	5	6	2
South Carolina	6	6	
Georgia	10	11	1
Florida	7	8	1
Louisiana	2	2	
Total 12	68	73	17

conferences. Visitation to the coastal shorelines is influenced by several factors, namely, proximity to urban centers, accessibility, and public familiarity.

Visitation to the national seashores administered by the National Park Service is one of increasing importance. For example, in 1956, three years after its establishment as the first national seashore, Cape Hatteras received nearly 300,000 visitors. In 1976, approximately 1,800,000 visits were recorded there, a 500% increase over the twenty-year period. Table 11 reports visitation occurrences during the past three recreation seasons. The trend is still one of growth.

It is becoming more apparent that the large numbers of vacationers and tourists are overtaxing the capacities of some of these delicate coastal resources. As the trend continues to develop toward the sea, the supply and longevity of public coastal recreational areas become more uncertain.

Coastal recreational activities play a major role in all the Atlantic and Gulf States. Table 12 identifies the activities by State which are of major attraction. These States, although recognizing the recreational value of the barrier islands, do not include them in their statewide comprehensive outdoor recreation planning efforts. Seventeen of the eighteen coastal states have utilized the Land and Water Conservation Fund (LWCF) for recreational purposes on barrier islands. Through November 1977, there were approximately 112 (LWCF) projects on 74 study units.

J. Public Lands on Barrier Islands

The total acreage administered by public agencies on the nearly 300 barrier island units amounts to 645,252 acres. Of this, 438,770 acres are federally managed, 177,077 acres are managed by State agencies, and 29,404 acres are managed by county or local agencies.

The vast majority of Federal lands are administered by the National Park Service in 12 barrier island units and the Fish and Wildlife Service (Table 13) in 31 barrier island refuges (Figure 11). Lesser amounts are administered by the Bureau of Land Management, General Services Administration, Department of Defense, and others.

State-administered recreation and fish and wildlife refuge units are located on 69 of the barrier island study units (Table 14). The acreages include only "fast", or dry, land portions of the study units. Inclusion of all wet or submerged lands would, obviously, substantially increase the numbers.

K. Land Use

Table 15 shows land use and land cover changes, by State, on most of the barrier island units where information was available for the period 1950 to 1973-74. Seven land uses or classes of cover are listed.

Table 11

Annual Visits to National Seashores

(in 000's)

Area	1976	1977	%	1978	%
Assateague Island	1,866.2	1,939.2	3.9	2,135.9	10.1
Canaveral	715.4	845.9	18.2	882.6	4.3
Cape Cod	5,018.7	5,348.9	6.6	5,025.9	6.0
Cape Hatteras	1,817.2	2,036.0	12.0	2,043.3	.3
Cape Lookout	26.9	45.4	68.8	54.3	19.6
Cumberland Island	17.8	25.1	41.0	36.4	45.0
Everglades National Park	1,032.6	1,067.8	3.4	1,136.1	6.4
Fire Island	702.2	633.1	-9.8	537.1	.6
Gateway National Recreation Area	9,631.4	9,210.6	-4.4	9,017.5	-2.0
Gulf Island	2,375.3	2,925.5	23.2	3,971.6	35.8
Padre Island	968.1	842.2	13.0	867.0	2.9
Wright Brothers National Memorial	505.1	535.1	5.9	483.5	-9.6
Totals	24,676.9	25,454.8	3.2	26,291.2	3.3

Table 12

Major Recreation Activities

by State

State	Activities
Alabama	sport fishing
Connecticut	swimming
Delaware	swimming - camping - fishing
Florida	beach activities - salt water fishing - boating
Georgia	fishing - swimming - boating
Louisiana	fishing/hunting - boating - picnicking
Maine	beach activities
Maryland	boating
Massachusetts	beach activities
Mississippi	beach activities
New Hampshire	beach activities
New Jersey	beach activities
New York	boating
North Carolina	camping - swimming - surf fishing
Rhode Island	swimming - boating - picnicking
South Carolina	swimming - camping
Texas	sightseeing - hunting - fishing
Virginia	beach activities

Table 13
U.S. Fish and Wildlife Service

National Wildlife Refuges on Coastal Barrier Islands[1/]

State	Refuge	Location (CBI Study Unit(s))	Date Established	Total Refuge Area[2/] (acres)	Est. Beach Length[2/] (miles)	Wilderness Designation Status[4/]	Wilderness Designation Area (acres)	FY 1978 Public Use (000's) Activity Hours: Education/ Interpretation	Other Mission Related Use	Non-Mission Related Use	Total	Total Visits
ME	Rachel Carson	ME0-09	12/21/66	2,068	--	[5/]	--	*	8	*	8	9
MA	Parker River	MA02	12/30/42	4,650	6.5	Proposed[7/]	3,110	62	925	275	1,262	428
	Monomoy	MA18	06/01/44	2,702	8.5	Established 8/	2,420	6	105	10	121	26
	Nantucket	MA23	05/01/73	40	0.4	[5/]	--	--	1	1	2	1
RI	Trustom Pond	RI02	08/15/74	365	0.5	[5/]	--	5	4	24	33	13
	Minigret	RI04	08/12/70	28	0.2	[5/]	--	--	1	*	1	1
	Block Island	RI09	11/01/73	29	0.3	[5/]	--	--	4	1	3	4
NJ	Brigantine	NJ03-04	10/05/39	20,197	6.1	Established[9/]	6,681	154	218	13	385	151
MD/VA	Chincoteague	MD02-VA01	05/13/43	9,439	13.3	Proposed[7/]	1,300	186	1,137	593	1,916	1,221
VA	Wallops Island	VA02	03/11/71	3,373	3.5	[5/]	--	[12/]	[12/]	[12/]	[12/]	[12/]
	Fisherman Island	VA10	01/17/69	1,025	2.1	[5/]	--	[13/]	[13/]	[13/]	[13/]	[13/]
	Back Bay	VA12	06/06/38	4,589	4.2	Proposed[7/]	2,165	5	51	12	68	43
NC	Pea Island	NC03	04/08/38	5,915	12.9	Proposed[7/]	180	14	909	221	1,144	1,037
SC	Cape Romain	SC14-16	06/06/32	34,229	19.1	Established[9/]	29,000	14	114	--	128	53
GA	Tybee Island[3/]	GA01	05/09/38	100	0.6	Not qualified (CE owns land)	--	--	1	*	1	*
	Wassaw	GA04	10/20/69	10,070	5.4	[5/]	--	3	42	19	64	18
	Blackbeard Island	GA07	02/15/24	5,618	7.4	Established[9/]	3,000	*	94	4	98	11
	Wolf Island	GA10-11	04/03/30	5,126	3.9	Established[9/]	5,126	--	10	--	10	2

U.S. Fish and Wildlife Service

National Wildlife Refuges on Coastal Barrier Islands (continued)[1/]

State	Refuge	Location (CBI Study Unit(s))	Date Established	Total Refuge Area[2/] (acres)	Est. Beach Length[2/] (miles)	Wilderness Designation Status[4/]	Wilderness Designation Area (acres)	FY 1978 Public Use (000's) Activity Hours: Education Interepretation	Other Mission Related Use	Non-mission Related Use	Total	Total Visits
FL	Merritt Island	FL08	08/28/63	139,305	--	Not Qualified (NASA Owns Land)	--	108	1,450	1,663	3,221	5,380
	Pelican Island	FL10	03/14/03	4,358	--	Established[8/]	6	2	50	1	53	26
	Hobe Sound	FL12	09/23/68	965	3.9	[5/]	--	11	114	36	161	86
	J.N. "Ding" Darling	FL39	12/01/45	4,833	0.3	Established[11/]	2,619	323	713	96	1,132	709
	Pine Island	FL41	09/15/08	31	--	Not qualified (ownership uncertain	--	[14/]	[14/]	[14/]	[14/]	[14/]
	Passage Key	FL50	10/10/05	36	0.4	Established[8/]	20	[14/]	[14/]	[14/]	[14/]	[14/]
	Egmont Key	FL51	07/10/74	328	2.3	[5/]	--	[14/]	[14/]	[14/]	[14/]	[14/]
	Cedar Keys	FL61-62	07/16/29	379	3.0	Established[11/]	375	22	2	--	24	2
	St. Vincent	FL67	02/12/68	12,490	8.8	[5/]	--	1	67	*	68	5
LA	Breton	LA01, 03	10/04/04	9,047	27.8	Established[9/]	5,000	--	20	*	20	3
TX	Sea Rim	TX01	02/01/79	8,997	5.9	[5/]	--	--	--	--	--	--
	San Bernard	TX06	11/07/68	24,422	6.7	[5/]	--	*	25	3	28	7
	Aransas	TX10	12/31/37	73,828	26.8	Not qualified (mineral/oil gas rights outstanding)	____	316	578	—	894	173
		Totals		388,582	179.8		61,002	1,232	6,643	2,972	10,847	9,409

1/ Includes refuges which are located in CBI Study Units.
2/ As of September 30, 1978, or, if established later, as of date established.
3/ There is some question as to whether this island is located in South Carolina or Georgia.
4/ Four categories are recognized: 1) not qualified (not an island, less than 5,000 acre roadless area, FWS does not own fee title to the land or other reasons as noted); 2) considered, but found unsuitable; 3) proposed (date sent to Congress indicated); and 4) established (public law number, date approved indicated). Not all or, in some instances, any of a wilderness area is within the CBI Study Unit.
5/ Refuge established after 1964 Wilderness Act enacted, hence, it has not been considered for wilderness status.
6/ Part of joint FWS-NPS Assateague Island wilderness proposal. NPS portion totals 440 acres and is located in Maryland, FWS portion totals 1,300 acres and is located in Virginia.
7/ Submitted to Congress December 4, 1974.
8/ Established by P.L. 91-504, approved October 23, 1970.
9/ Established by P.L. 93-632, approved January 3, 1975.
10/ Established by P.L. 94-557, approved October 19, 1976.
11/ Established by P.L. 92-364, approved August 7, 1972.
12/ Satellite station. Public use information under Chicoteague NWR.
13/ Satellite station. Public use information under Back Bay NWR.
14/ Satellite stations. Public use information under J.N. "Ding" Darling NWR.

*Less than 500.

Table 14

State Owned Barrier Islands

Note: The following list of State-owned and administered barrier islands is approximate, both in terms of the areas listed and the acreages. Acreage is an approximate figure; for some units it may include only dry land, while in others it includes water areas on the bay or ocean side that are within the boundaries. The list is intended only for purposes of comparison.

	BARRIER ISLAND STUDY UNIT	#	STATE AREA	ACREAGE
Maine	Sheepscot	01	Reid State Park	400
	Popham Beach	02	Popham Beach State Park	310
Massachusetts	Salisbury	01	Salisbury Beach State Reservation	150
	Plum Island	02	Plum Island State Park	100
	Horseneck Beach	27	Horseneck Beach State Reservation	1,800
Rhode Island	Charlestown	01	East Matunuck State Beach	171

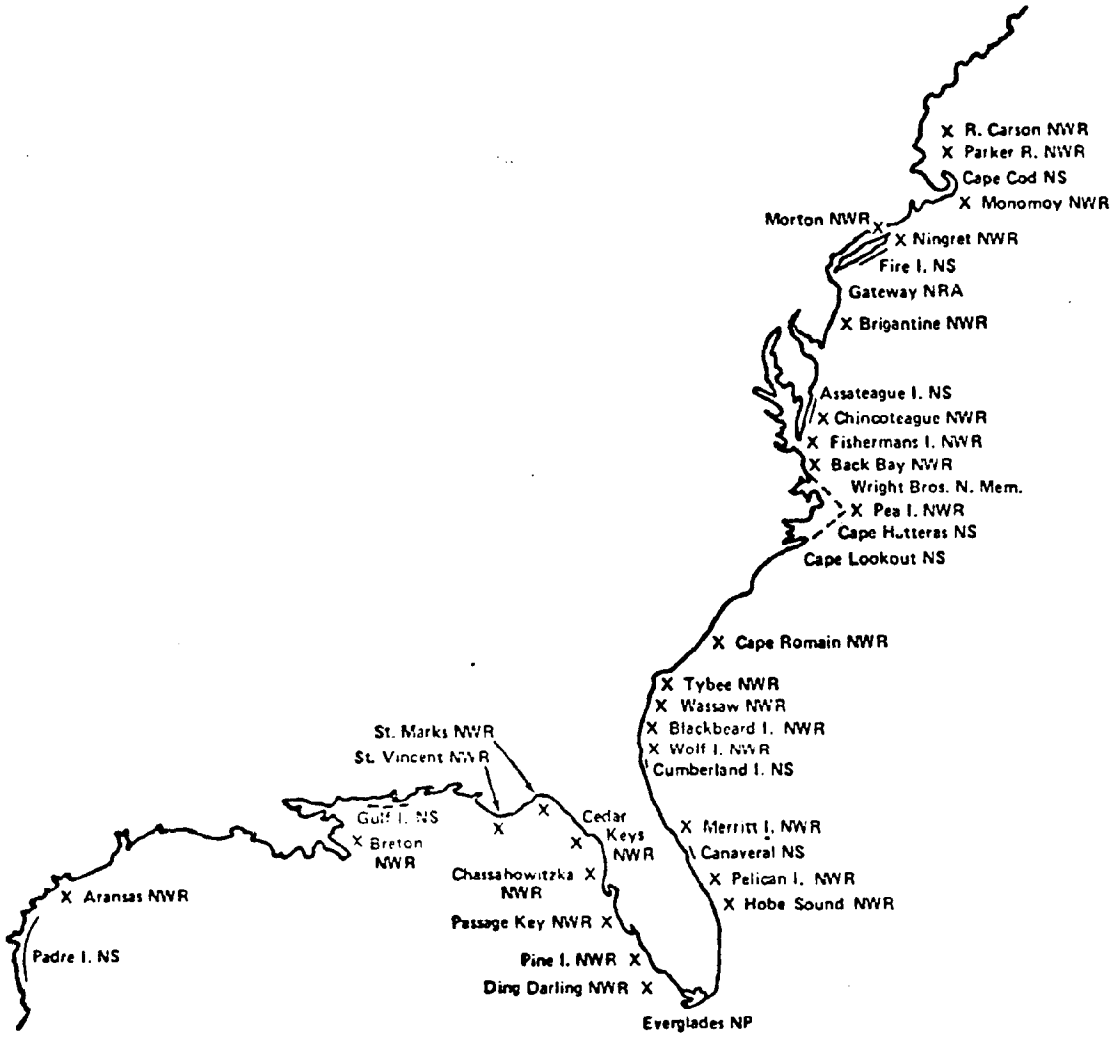
			Ninigret Management Area	174
			Quonochontaug Management Area	50
Connecticut	Hammonasset Point	01	Hammonasset Beach State Park	900
New York	Orient Beach	07	Orient Beach State Park	400
	Fire Island	12	Robert Moses State Park	1,000
	Jones Beach	13	Gilgo Beach State Park, Jones Beach State Park	3,000
New Jersey	Barnegat	02	Island Beach State Park	2,600
	Ocean City	07	(Unidentified State Area)	200
	Seven Mile Beach	09	(Unidentified State Area)	300
Delaware	Rehoboth	01	Cape Henlopen State Park Delaware Seashore State Park	1,500
	Fenwick Island	02	Delaware Seashore State Park	500
Maryland	Assateague North	02	Assateague Island State Park	700

Virginia	Wreck Island	09	State Natural Area	Part of Group
	Mockhorn Island	09	(Unidentified State Area)	Part of Group
North Carolina	Bogue Banks	08	Ft. Macon State Park	3,900
	Hammock Island	09	Hammock Beach State Park	2,000
	Masonboro Island	16	Carolina Beach State Park	3,700
	Carolina Beach	17	Masonboro State Park	1,600
	Smith Island	18	(Unidentified State Area)	500
South Carolina	North Island	05	State Wildlife Refuge	4,200
	South Island	06	State Wildlife Refuge	2,900
	Cedar Island	07	State Wildlife Refuge	4,100
	Murphy Island	08	State Wildlife Refuge	8,000
	Capers Island	12	State Wildlife Refuge	3,400
	Edisto Island	22	Edisto Beach State Park	1,300
	Hunting Island	25	Hunting Island State Park	1,700
	Turtle Island	33	State Wildlife Refuge	1,700

Georgia	Sapelo Island	08	State Wildlife Refuge Duplin R. Est. Sant.	13,500
	Jekyll Island	13	Jekyll Island State Park	6,000
Florida	Amelia	01	Ft. Clinch State Park	1,000
	Little Talbot	03	Little Talbot Island State Park	2,500
	Anastasia Island	05	Anastasia State Park, Butler State Park	9,000
	Matanzas Island	06	Washington Oaks Gardens State Park	200
	Flagler Island	07	Flagler Beach State Park	200
	Vero Beach Island	11	Jack Island State Park	200
	Ft. Lauderdale	18	Birch State Park	100
	Key Biscayne	22	Cape Florida State Park	300
	Naples Park	34	(Unidentified State Area)	100
	North Captiva Island	41	(Unidentified State Area)	400

	Cayo Costa Island	42	(Unidentified State Area)	1,600
	Manasota Key	45	(Unidentified State Area)	100
	Caladesi Island	59	Caladesi State Park	700
	Honeymoon Island	60	Caladesi State Park	700
	Anclote Keys	61	Caladesi State Park	200
	St. George Island	71	St. George Island State Park	1,000
	Cape San Blas	74	St. Joseph Peninsula State Park	3,000
	Shell Island	76	St. Andrews State Rec. Area	400
	St. Andrews	77	St. Andrews State Rec. Area	200
Alabama	Romar Beach	02	Gulf State Park	1,000
	Mobile Point	03	(Unidentified State Area)	200
Louisiana	Grand Gosier Island	02	(Unidentified State Area)	370
	Grand Terre Island Group	13	Wildlife Management Marine Research	200

	Grand Isle	14	Grand Isle State Park	500
	East Timbalier Island	16	(Unidentified State Area)	900
Texas	High Island	01	Sea Rim State Park	15,000
	Galveston Island	03	Galveston Island State Park	2,000
	Brazos Island	05	Bryan Beach State Park	500
	Matagorda Pen. W.	09	(Unidentified State Area)	100
	Mustang Island	12	Mustang Island State Park	3,500
	Padre Island N.	13	(Unidentified State Area	2,000
	Boca Chica	16	Brazos Island State Park	200



Locations Of Barrier Island
Related Units Of The NPS & FWS
Figure. 11

Table 15

Land Use or Land Cover

State	Year	Urban		Agriculture		Range		Forest		Water		Wetland		Barren		Total
		Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	
Alabama	1950	-	-	-	-	-	-	4301	16.2	3398	12.8	13288	50.2	5494	20.8	26431
	1973-4	5273	18.7	-	-	2130	7.5	6951	24.8	3123	11.0	6687	27.7	4049	14.3	28213
Connecticut	1950	264	21.5	-	-	-	-	-	-	-	-	778	63.4	195	15.9	1237
	1973-4	576	42.4	-	-	-	-	-	-	-	-	563	41.5	218	16.1	1357
Delaware	1950	1507	15.0	101	1.0	-	-	696	6.9	114	1.1	5711	56.6	1957	19.4	10086
	1973-4	2956	29.2	26	0.2	-	-	64	0.6	262	2.6	4115	40.7	2683	26.7	10111
Florida	1950	32423	6.3	2606	0.5	279	0.1	25812	5.0	39942	7.8	338304	66.2	71970	14.1	511336
	1973-4	10198	19.7	2437	0.5	1260	0.2	56001	10.8	73759	14.2	244291	47.1	38687	7.5	518633
Georgia	1950	5161	3.0	1116	0.7	4724	2.8	43577	25.4	3297	1.9	106786	62.3	6774	3.9	171435
	1973-4	8436	4.9	1459	0.9	3930	2.3	42375	24.7	3903	2.3	103551	60.3	7944	4.6	171598
Louisiana	1950	1651	4.5	-	-	-	-	-	-	1419	3.8	26447	71.2	7611	20.5	37128
	1973-4	6746	17.5	-	-	-	-	-	-	1504	3.9	24030	62.4	6238	16.2	38518
Maine	1950	593	36.0	-	-	105	6.4	206	12.5	-	-	531	32.2	213	12.9	1648
	1973-4	1165	71.8	-	-	-	-	84	5.2	-	-	239	14.7	134	8.3	1622
Maryland	1950	820	6.8	-	-	-	-	484	4.0	100	0.9	6413	53.3	4208	35.0	12025
	1973-4	1648	13.7	-	-	-	-	651	4.8	160	1.2	5975	44.3	4850	36.0	13484
Massachusetts	1950	4519	13.2	11	0.1	4793	14.0	1310	3.8	526	1.5	9608	28.0	13511	39.4	34280
	1973-4	8128	21.5	70	0.2	4454	11.8	1220	3.2	582	1.5	8900	23.6	14487	38.2	37761
Mississippi	1950	-	-	-	-	-	-	-	-	-	-	5946	61.4	3732	38.6	9678
	1973-4	-	-	-	-	-	-	179	1.8	-	-	5964	61.4	3584	36.9	9727
New Hampshire	1950	467	46.1	-	-	-	-	-	-	-	-	546	53.9	-	-	1013
	1973-4	780	72.1	-	-	-	-	-	-	-	-	301	27.9	-	-	1081
New Jersey	1950	17746	37.4	88	0.2	-	-	1323	2.8	1603	3.4	15701	33.1	10901	23.0	47362
	1973-4	22719	47.4	358	0.8	-	-	627	1.3	1824	3.8	13225	27.6	9172	19.1	47925
New York	1950	8140	27.2	358	1.2	1524	5.1	2228	7.5	357	1.2	7455	25.0	9813	32.8	29875
	1973-4	11578	35.0	273	0.8	1580	4.8	1508	4.5	550	1.7	7408	22.4	10171	30.7	33068
North Carolina	1950	5862	3.9	-	-	-	-	14684	9.7	1418	0.9	88922	58.6	40842	26.9	151728
	1973-4	21625	13.9	-	-	-	-	12327	7.9	1224	0.8	78202	50.3	42051	27.1	155429
Rhode Island	1950	773	23.3	184	5.5	153	4.6	74	2.2	243	7.3	1334	40.1	566	17.0	3327
	1973-4	1226	34.8	246	7.0	153	4.6	162	4.6	213	6.0	1430	40.6	94	2.7	3524
South Carolina	1950	1654	1.1	9766	6.3	-	-	26133	16.9	1731	1.1	107802	69.6	7792	5.0	154878
	1973-4	13081	8.5	5152	3.3	-	-	24994	16.2	2178	1.4	100949	65.3	8241	5.3	154595
Texas	1950	9246	2.5	65	0.02	89127	23.6	816	0.2	9508	2.5	187855	49.8	80545	21.4	377162
	1973-4	19410	5.3	88	0.02	85305	23.5	1152	0.3	9631	2.7	186158	51.2	61623	17.0	363367
Virginia	1950	-	-	-	-	-	-	3660	5.0	2554	3.8	51703	77.2	9398	14.0	67315
	1973-4	1144	1.6	51	0.1	-	-	4487	6.5	2327	3.3	46404	67.5	14509	21.0	68922
TOTALS	1950	90826	6.0	14295	1.0	100705	6.0	125304	8.0	66212	4.0	975130	59.0	275492	16.0	1647964
	1973-4	228679	14.0	10160	0.6	98812	6.0	152782	9.0	101240	6.0	838392	50.1	228656	13.8	1658721

Figures developed by the U.S. Geological Survey from aerial photograph interpretations for barrier islands located in the 18 States indicate that between 1950 and 1973, lands on the islands categorized as urban increased by over 137,900 acres or 142% as compared to a national increase of about 90%. Although substantial portions of this increase can be attributed to a few specific island developments, tangible increases in development have occurred on nearly all islands having "urban" acreage in 1950. Also, about 40 islands which had no urban acreage in 1950 had varying amounts in that category by 1973. Approximately 14% of the total barrier island acreage is urbanized as compared to 3% for the Nation as a whole. The rate at which barrier islands are urbanizing is about twice that of the Nation as a whole.

These data were prepared by the Geography Program, Land Information Analysis Office, U.S. Geological Survey, Reston, Virginia, during the spring of 1978.

Land use problems form a continuum involving the degree of public and private ownership of coastal land and the use of this land. At one extreme is the need to ensure easy access to publicly owned beaches through privately owned beach property if necessary. The other end of the continuum involves conflicting uses of private property which degrade and destroy either public recreational facilities, the barrier island ecosystem, or both. A corollary problem is the matter of locating public recreational resources in relation to concentrations of potential users.

Some 738,156 acres of the barrier islands are undeveloped/unprotected, about 46% of the total area of the study units. A substantial amount of this land is considered undevelopable because of susceptability to flooding or frequent overwash, high erosion factors, wetland areas, or other natural conditions.

L. Transportation

The provision of facilities for the transportation of people, goods, and services to, from, and through the coastal zone is essential to the national interest. Furthermore, full utilization of the coastal natural resources in the production of goods and services as well as for recreation, habitation, and industrial locations are all dependent upon sound transportation systems.

The availability and the future development of transportation facilities on the barrier islands becomes a critical consideration if the barrier island resources are to be protected. Since barrier islands are most readily accessible by automobile, existing and future highway systems have the most direct impact on island resources. In addition to the immediate adverse effects of construction, increased traffic and pollution of the ecosystem are problems that come with easy access to the barrier islands as people from nearby urban centers follow the natural tendency towards the sea for the pursuit of leisure activities.

Few of the barrier islands have airport facilities and only a small number support a ferry service. However, of the approximately 300 study units, 175 (58%) have direct road access, a causeway, or a bridge connection. Table 16 depicts the types of access available on the study units according to State.

M. Socio-Economic Factors

Since the barrier island study encompasses the Atlantic and the Gulf Coasts, the eighteen respective coastal States comprise the broadest region for which socio-economic data were analyzed. Additionally, the 108 coastal counties which border the Atlantic and the Gulf Coasts, including all or portions of the inventoried barrier islands, are also analyzed in some detail to provide a more localized perspective.

The intent of analyzing the State and county data was to provide some general description of the coastal area. Since most of the islands could not be identified within a particular census tract, complete socio-economic data by island was unavailable. It is important to recognize, however, that the State and county analysis does not always depict the socio-economic values occurring on the barrier islands. Generally, due to the extent of the recreation-tourist development, second home development, and private ownership, the socio-economic factors of the islands themselves would reflect a different socio-economic structure.

Much of the socio-economic data presented in this section has been compiled by the Bureau of the Census and taken from the County and City Data Book of 1977. Table 17 provides a comparison of several socio-economic factors at the State and local levels and the national perspective.

1. Economy

Nearly one-third of the approximately 300 barrier island study units support substantial developments; in some cases, major cities like Atlantic City, New Jersey; Miami Beach, Florida; and Galveston, Texas. In addition, the industrial-commercial activity within the coastal area is enormous, as is its onshore and offshore production of fossil fuels, other mineral resources and the fisheries. There is no doubt that the cost of protecting these types of developments and resources is ever increasing; likewise, so is the potential for economic disaster.

As of March 1977, 7.8 million acres of coastal and offshore area were held under active lease for petroleum production; more than 42% are now producing. As of February 1979, there were more than 16,000 exploration and development wells drilled in the Gulf of Mexico.

Fishing is a lucrative commercial industry, as well as a recreational activity, in the offshore portion of the coastal zone. Among the common target species for both sport and commercial fishermen are those listed in Table 18. In 1976, the multimillion dollar Gulf States offshore fishing industry accounted for 33% by weight and 29% by value of total U.S. fisheries, second only to the Peruvian Coast in worldwide fishery

Table 16

Types of Access To
Study Units*

State	# of Units	Airport	Bridge	Boat	Ferry	Undeveloped
Alabama	5		4	1		1
Connecticut	14		10	1		3
Delaware	2		2			
Florida	80	2	52	5	2	25
Georgia	15	2	4		2	9
Louisiana	18	1	2	1		16
Maine	9		9			
Maryland	2		2			
Massachusetts	27		21		2	4
Mississippi	5			1		5
New Hampshire	2		2			
New Jersey	10		9		2	
New York	15		13		2	
North Carolina	23		12		8	5
Rhode Island	6		4		1	1
South Carolina	35	1	12		3	19
Texas	16	3	13	3	2	2
Virginia	11		4			7
Totals	295	9	175	12	24	97

* Note: One unit may have more than one type of access.

Table 17

A Comparison of Socio-Economic Data

FACTORS	BARRIER ISLAND COUNTIES (108)	BARRIER ISLAND STATES (18)	UNITED STATES
1970 Population	19 797 000	85 497 000	203 304 000
-Percent Urban	84	68	74
-Percent Change ('60-70')	30.8	14.9	13.4
1975 Population	21 691 000	90 282 000	213 000 000
- Percent Over 65	12.3	10.3	10.5
Density Per Square Mile	278	293	60
Percent Change ('70-75')	9.6	5.6	4.8
-Natural Increase	1.9	3.3	3.6
-Migration	7.7	2.3	1.2
Percent 1969 Income Below Poverty Level	16.4	12.8	10.7
Percent 1970 Unemployment Rate	4.2	3.9	4.4
1974 Per Capita Income	4015	4358	4572
1967-1972 Percent Change--Retail Sales	77.0	102.0	48
1960-1970 Percent Change--Housing	38.4	22.8	19.9
Governmental Per Capita Expenditure--FY 1971	$367.20	$373.90	$389.00
-Percent Education	53.9	50.5	45.7
-Percent Highways	5.8	5.8	5.9
-Percent Health/Hospitals	7.7	6.1	6.6
-Percent Welfare	2.7	4.2	8.3

Table 18

Fish Species Sought By Sport
And Commercial Fisherman
Atlantic and Gulf Coasts

Region	Northeast Atlantic (Main to New York)	Mid-Atlantic (New Jersey to North Carolina)	South Atlantic (South Carolina to Florida)	Gulf of Mexico
Offshore (Beyond 3 miles)	cod, pollock, porgies, haddock, boston mackerel, bluefish, blackfish, flounders, hake, ling, whiting, swordfish, tuna, sea bass	swordfish, tuna boston mackerel, bluefish, cod, hake, haddock, whiting, flounders, sea bass, pollock, porgies, ling, blackfish	snappers, groupers, king mackerel, swordfish, grunts, porgies, bluefish, tuna, flounders, sea bass	groupers, snappers, tuna, king mackerel, grunts, sea bass, bluefish, dolphin fish
Inshore (Shore and small boat fishing out to 3 miles)	blackfish, bluefish, stripped bass, hake flounders, smelt, shad, whiting sea bass, white perch, weakfish	weakfish, porgies, croakers, spot, spotted weakfish, shad, striped bass, bluefish, blackfish, white perch, sea bass	sea bass, grunts, channel bass, black drum, weakfish, spotted weakfish, flounders, pompano, groupers, snappers, coakers, striped bass, shad, white perch, spanish mackerel	channel bass, black drum, spotted weakfish, flounders, sea bass, groupers, snappers, cobia, spanish mackerel, bluefish, grunts

*Table compiled in Congressional Research Service document 77-203 EP, Recreation and the Coastal Zone, September 8, 1977.

yield. Of that catch, 97.5% are fish of estuarine-dependent species that spend all or part of their lives in estuaries such as those near and protected by barrier islands.

The condition of the estuaries is important to the commercial fishing industry because it is estimated that two thirds of the top-value Atlantic and Gulf Coast species of fish are directly dependent on conditions of the estuaries. Without the protection afforded the bay systems by the barrier islands, productivity would drop with obvious consequences to sport and commercial fishermen.

Sport fishing contributes a great deal to tourism. Between 1960 and 1970, the number of marine sport anglers increased from 6.3 million to 9.5 million respectively and their expenditures increased from $626 million in 1960 to an estimated $1.8 billion by 1975.

Coastal development has a significant bearing on the State and the regional economy. It creates an attraction which requires a need for many services. As a result, job opportunities flourish and income is generated from food and lodging services, gifts and souvenir shops, admission fees and a variety of entertainments. Although revenues are generated and community spirit is fostered, all too often the character of most developments changes as tax dollars are consumed for more highways, more parking lots, more marinas, and more lodging facilities.

Between 1967 and 1972, retail sales increased 77.0% at the county level and an amazing 102.0% at the State level. Four counties in Florida experienced an impressive 200% increase in retail sales: Collier - 203.1%; Pasco - 222.2%; Charlotte - 238.9%; and Citrus - 232.0%. According to the socio-economic data analyzed, the per capita expenditures for retail sales varied from approximately $.58 at the State level to $2.44 at the county level. (See Table 17).

Recreation and tourism is also a major industry along the Atlantic and the Gulf Coasts. Recreational expenditures of over $15 billion per year are concentrated in the coastal recreation market. Table 19 depicts the numbers of dollars generated from the recreational tourist industry for several coastal States.

2. Government Finances

Government expenditures were quite similar for both the State and county levels (Table 17). Direct per capita expenditures for fiscal year 1971 included an average $373.90 for the States, and $367.20 for the counties. A percentage breakdown of the per capita expenditures for education, highways, welfare, and health was fairly similar at both levels. Of particular interest is that State and county levels were somewhat higher than the national level for educational expenditure. The percentage of per capita expenditures for highways was identical for the State and county, 5.8%. The percentage of per capita expenditures for health and hospital care were 5.1% for the States and 7.7% at the county level.

Table 19

Annual Recreational Tourism
Dollars Generated by State

State	Approximate Expenditures
New Jersey	3 billion
Mississippi	200 million
Florida	9 billion
South Carolina	900 million
Maryland	900 million
Delaware	200 million
Texas	5.3 billion
Massachusetts	600 million

3. Income

The percentage of family incomes below poverty level in 1969 was quite high at 16.4% at the county level; the State level was 12.8%. The unemployment rate in 1970 was very close on both State and county levels of comparison; 3.9% and 4.2% respectively. Nationally, the percentage of family income below poverty level was less than the State or county level, but the unemployment rate was higher. Per capita income in 1974 was $4,015 at the county level and $4,358 at the State level, both lower than the national average, but both State and county levels fell well below national expenditures for welfare.

4. Population

Between 1960 and 1970, population growth for the Nation increased by 13.4%. During the same time period, population growth increased by 30.8% in the coastal counties and by 14.9% in the coastal States. In six coastal counties, population increases of 100% or more between 1960 and 1970 were experienced. These were:

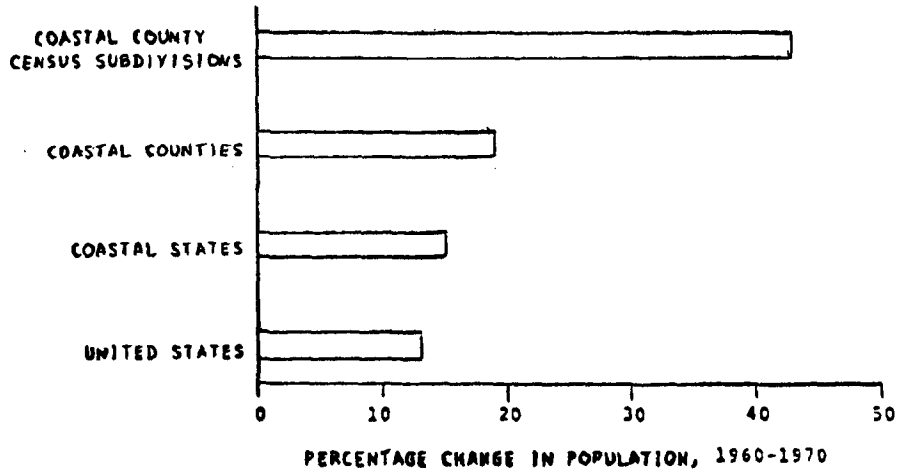
Virginia Beach City	Virginia	104%
Brevard County	Florida	106%
Collier County	Florida	142%
Charlotte County	Florida	119%
Pasco County	Florida	107%
Citrus County	Florida	107%

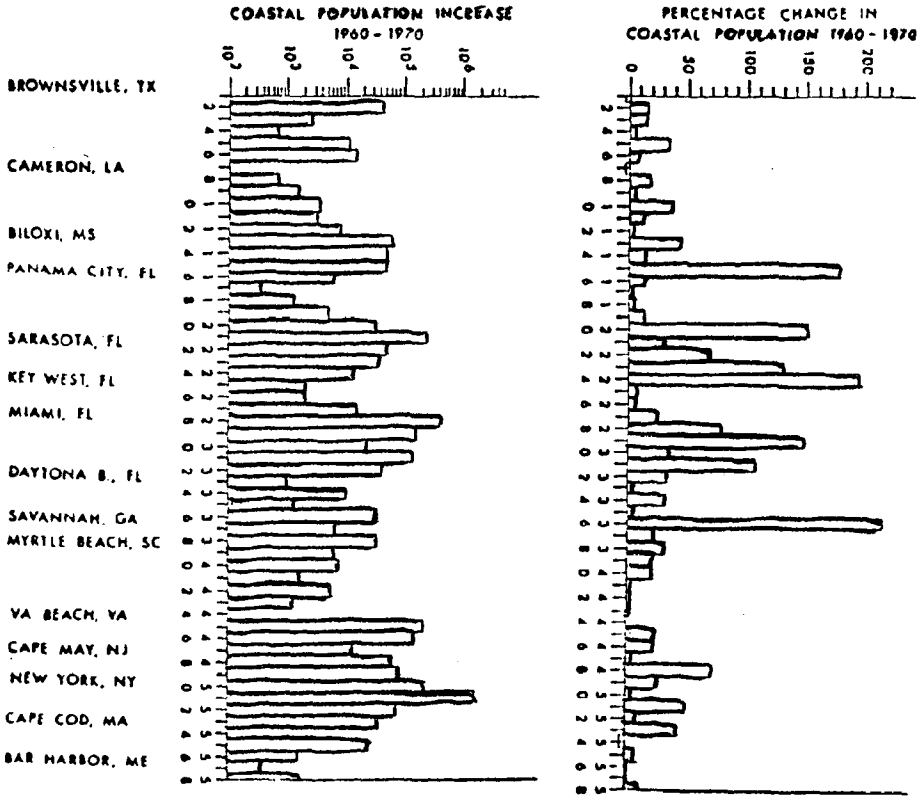
The population increase from 1970 to 1975 was 9.6% for the counties, and 5.6% for the States. Of the 9.6% population increase at the county level, 7.7% was a result of net migration. Consequently, of the population increase from 1970 to 1975 (1,894,000), 1,515,200 were people who had moved into a coastal county.

In 1975, the population of the 108 coastal counties was 21.7 million; and the population of the eighteen coastal States was 90.3 million. The population density per square mile was quite high for the coastal counties (278) and States (293) when compared to the national average (60). The contrast clearly depicts the highly concentrated population along the coastlines (See Figure 12).

The 1970 data depicts the coastal counties as 84% urban. Presently, 51 of the 108 coastal counties are part of a Standard Metropolitan Statistical Area (SMSA).

Population data was available for only eighteen barrier island study units. Table 20 identifies the units and points out the population growth on the units between 1970 and 1975. Although population decreased on two of the units between 1970 and 1975, overall, a growth rate of 11.2% for the eighteen units clearly demonstrates a trend toward





COASTAL POPULATION TRENDS
FIGURE. 12

Table 20

Population Trends on Several Barrier Island Study Units

State	County	Study Unit	1975 Population	1970 Population	%Change
New York	Nassau	Long Beach	33,123	33,127	no change
	Suffolk	Southampton	5,414	4,904	10.4
New Jersey	Atlantic	Atlantic City	43,969	47,859	-8.1
		Bringantine	7,979	6,741	18.4
	Cape May	Ocean City	12,808	10,575	21.1
		Wildwood	4,189	4,110	1.9
South Carolina	Charleston	Isle of Palms	2,961	2,657	11.4
Florida	Brevard	Cape Canaveral	4,712	4,258	10.7
		Cocoa (City)	15,544	16,110	-3.5
	Broward	Fort Lauderdale	152,959	139,520	9.6
	Dade	Miami Beach	94,063	87,072	8.0
	Indian River	Vero Beach (City)	14,680	11,908	23.3
	Palm Beach	Boca Raton	42,363	29,538	43.4
		Lake Worth	28,051	23,714	18.3
		Palm Beach	11,224	9,086	23.5
	Pinellas	Treasure Island	7,061	6,120	15.4
	Sarasota	Longboat Key	6,207	2,850	117.8
		Sarasota (City)	47,089	40,237	17.0
		TOTALS	534,396	480,456	11.2

locations near the sea. Currently, one of every four people in the United States lives within 100 miles of an East or Gulf Coast barrier island.

5. Housing

The recreational and scenic attractions of the ocean and inland coastal waters have and continue to induce high rates of residential and second home development near the water's edge. A large majority of this development is sprawled along the coastal shorelines including many of the barrier islands. The beachfront homesite is becoming more highly prized than ever before. Land values are seemingly boundless; for example, the cost per front foot of prime ocean property on Hilton Head Island, South Carolina, is $2,000.00 and on Key Biscayne, where homes increased in value 3 to 5 percent per year in the 1960's, both homes and condominiums are selling for 25 - 30 percent higher than a year ago. Such costs reflect an unparalleled demand for beach access.

A prime example of residential sprawling occurred at Rehoboth, Delaware. In 1938, less than one mile of the Rehoboth Bay shoreline and nine miles of the Indian River Bay shoreline were developed. By 1969, 25 miles of Rehoboth Bay's 48 miles were developed and 44 miles of Indian River Bay's 45 miles were developed, mostly with summer residences.

With respect to the socio-economic data analyzed (Table 17), year-round housing units developed at a high rate for the State but particularly at the county level. The percentage change in housing units from 1960 to 1970 for the county was 38.4%, the State 22.8%.

Only three counties experienced a negative growth rate for housing. These were:

Willacy County	Texas	-8.2%
Kenedy County	Texas	-9.6%
Suffolk County	Massachusetts	-1.0%

ENVIRONMENTAL CONSEQUENCES

This chapter describes the impacts on barrier islands which would result from implementation of each of the three alternative protection levels. Since no package of options has been selected as a preferred alternative, no impacts of a preferred alternative are presented.

Where practical, the impacts of the low level alternative have been quantified. However, implementation of many of the options in the remaining two alternatives will be dependent upon varying unpredictable influences and events. For instance, some of the options would be implemented only following a major storm or other disaster. It is not possible to predict the timing, location, or magnitude of the next, or subsequent, great storm(s). Further, it is not possible to predict or quantify the amount of damage that will take place in terms of life, property, and resource values lost; nor is it possible to accurately quantify the impact of an option which would be put into effect by such an occurrence.

Other options are totally dependent upon Federal agencies whose dedication to barrier island protection has not been meritorious thus far. Whether or not an option is implemented and how effective it would be depends on the extent to which the commitment and effort of the responsible agency can be redirected toward barrier island protection.

Once the moderate and high level alternative options are adopted and implemented into the responsible agency's programs, environmental consequences could be addressed more specifically and, where practical, quantified at that time. Essentially, however, the environmental consequences are correlative to the level of protection afforded: the greater the commitment to barrier island protection, the fewer alterations to and impacts on the natural environment will occur; while the human environment on barrier islands will undergo less urbanization and development, more opportunities for recreational experiences will be available.

Low Level (Current Effort) Alternative

This alternative will permit: the continued investment of money--both public and private--to develop barrier islands; an increasing number of seasonal and permanent residents; the placing of more and more people in hazardous situations; and, the deterioration or destruction of valuable barrier island ecosystems. However, evolving programs and attitudes concerning protection of the islands also will result in increased numbers of them being placed in protective status. Competition between public and private conservation organizations and private developers for the diminishing amount of "unprotected-undeveloped" barrier island acreage will intensify.

Under this alternative, barrier islands will continue to develop at the rate of about 6000 acres, or more, per year. Costly and frequently temporary flood proofing, erosion control, and beach nourishment projects which may provide

short-term protection from storms will be proposed and constructed; the false sense of security engendered by them will be perpetuated. With some exceptions, low density summer home communities will convert to high density condominium development, as has happened at Rehoboth, Delaware; more areas will become urbanized, as has happened at Hammonasset Point, Connecticut, St.Andrews Island and others in Florida and Alabama; access to public beaches will be impeded, as at Ocean City, Maryland and Hilton Head, South Carolina; and, federally subsidized insurance and Federal disaster relief will help pick up the pieces and put them back together after major storms, as has happened along the Massachusetts coast following the severely damaging nor'easters of February 1978.

Local governments and private individuals will not be discouraged from gambling at the general public's expense that there will be no future storms or storm damage in places they select for barrier island development.

Even with the high priority given by FIA, without adequate funding, floodplain mapping will not be completed by the congressionally mandated date of 1983. As a consequence there could be delays of several years before all communities on barrier islands are covered in the regular phase of the flood insurance program. This is a critical event in that certain regulations and restrictions come into play once a community enters the regular phase of the program.

If there are no changes in current Federal programs and attitudes there will continue to be demands to expand, upgrade, and increase the densities of barrier island developments. The pressures which emanate from those demands may have a profound influence on the Federal program response to the basic issue of the extent to which barrier islands should be developed, if at all, and what the Federal role should be in encouraging or discouraging that development.

The overall end result of a no further action alternative is apparent. Barrier islands will continue to urbanize and the consequences will be increased:

- o Loss of ecological and public recreation values
- o Federal investment to protect developments
- o Risk to life and property.

Natural Resources

Barrier islands are the product of extreme energy stress; the location, topography, geology, vegetation, soils - the entire natural system is determined and maintained by the ever present energy stress. Unimpeded, this natural process will continue indefinitely; only man's innovations and manipulation of the islands' natural processes can change the relationship between the islands and the forces on which they depend for survival.

As man's influence grows, the islands, as significant coastal features, will continue to be depleted of their natural resources. The results will be both intended and unintended physical changes as well as some predictable and unpredictable natural responses. Dunes will be bulldozed; marshes drained or raised by filling; grasses trampled; sea walls built; and, sand sharing systems restricted or severely altered.

Man-made activities on barrier islands, particularly that of creating and protecting building sites, require altering the natural resources. Alteration of the natural condition means disruption of the energy dynamics so unique and critical to maintaining the barrier island itself.

Under this alternative, some of these resource features will be recognized and protected through governmental and private efforts, but only to a limited extent.

Cultural Resources

Some cultural sites will be acquired and protected even with no specific new Federal initiatives for barrier island protection. Recent increases in both the Land and Water Conservation Fund and the National Historic Preservation Fund and changes in tax laws relative to historic properties will provide that opportunity. Others will be given suitable recognition, placed on one of the registers, and given some protection under Section 106 of the National Historic Preservation Act. While the Advisory Council on Historic Preservation and the State Historic Preservation Officers have an important role in implementing regulations for Section 106, the initiative for protecting cultural sites still will rest with local jurisdictions and private organizations and individuals, with few if any new incentives.

Since there is no complete inventory of historical sites on the barrier islands nor an assessment and evaluation of their individual importance, there is no practical way to gauge the number of sites, their value to society, or the potential loss to development that may occur.

With no changes in the rate at which important historic, cultural, and natural sites are being identified, evaluated and provided recognition, losses of these valuable reminders of our heritage will continue to mount. Even an increase of the rate of identification may not help much if protective methods are not given more positive authority to prohibit destruction of the resource.

There is potential for a serious conflict between natural resource conservation and cultural resource preservation on barrier islands. As sea level continues to rise, the islands will continue to recede toward the mainland. This recession will progressively threaten more and more cultural resources, both of document significance and those still undocumented. Lighthouses, military fortifications, whaling stations, and other resources already are threatened and the degree of threat can only increase with time. Protection measures can have serious adverse impacts on natural shoreline processes responsible for perpetuating the barrier island system,

but failure to act can result in loss of the historic resources themselves. Relocation is, of course possible, but typically very costly and probably feasible only in the case of the most significant barrier island structures.

Vegetation and Soils

Barrier island soils are extremely loose and erodable. Unwise development will accelerate the rate of erosion and hinder the growth of vegetation that has adapted to that erosion.

Continued development at current rates will increase threats to the important ecological values of barrier islands. Excellent examples of maritime forest already are threatened by proposed development on St. Phillips Island, South Carolina, and on Bogue Banks, North Carolina. The last remaining grove on Padre Island, Texas, is a small stand of five trees near the northern half. Human use and grazing are blamed for the general decline of the natural forest vegetation on Padre Island.

Grasses which are vital to dune development and maintenance and which are adaptable to the severe natural conditions cannot survive heavy ORV use, bulldozing or repeated heavy foot traffic. Unless future development is carefully planned to protect the dunes and dune vegetation, dune grasses will suffer severely and erosion of dunes and shorelines will accelerate.

If the trend of building closer and closer to the shoreline continues, desirable beach areas will be cut off from public access and more structures will be demanded to protect those buildings whose main "selling point" is convenient beach access. More likely, as in the cases of Ocean City and Miami, the beaches will simply disappear.

Water

Fresh water on barrier islands results from precipitation which filters down into aquifers originating on the island itself (freshwater lens), from deep aquifers originating on the mainland, or from pipelines extending from mainland sources. There is no natural watershed; this characteristic of the barrier island is a critical one. The maintenance of high water quality in the fresh water lens depends greatly on striking a balance between supply and demand and on proper wastewater treatment. Without that balance and proper treatment, water from mainland sources is required.

With no further restrictions on Federal grant, loan, or permit programs, commercial and service industries will continue to be attracted to barrier island locations. The economic environment will be enhanced but increasing demands also will be placed on limited fresh water supplies and on the capacity of the islands to absorb wastewater discharges.

The low level alternative will not inhibit increased urbanization or greater demands for high quality water. Nor will it satisfy the needs for improved monitoring and enforcement of water quality standards.

At the Federal level, the FWS will continue to be the agency primarily concerned with acquiring new sites on barrier islands. If funds are made available over the next several years, tentative plans of the FWS call for the acquisition of about 44,000 acres and 14 miles of beach on two barrier islands. Long range plans envision the acquisition of about 28,000 additional acres and 26 miles of shoreline on six other barrier islands. The areas acquired will protect and enhance valuable fish and wildlife habitat and provide incidental low density recreation and public education programs.

The National Park Service (NPS) will continue to acquire private lands within authorized unit boundaries. Evaluation and assessment of potential new NPS Atlantic and Gulf Coast barrier island units for inclusion on the list of recommended areas (authorized under the provisions of the NPS Administrative Authorities Act) has identified three barrier island areas for possible further study. One of these is a high priority area and pending the availability of funds, should be studied in the near future.

A low level action alternative will continue the intense competition between development and recreation interests for developable barrier island locations. Land values will escalate to the point where only high density development is economically practical and precludes acquisition of the high quality lands for low density recreation purposes. Unless specific barrier island related acquisition programs are promoted, high quality recreation sites will continue to be lost to residential and commercial development.

The proposed Heritage Program, if authorized, will provide additional incentive for the identification and inventory of valuable natural, cultural, and historic properties on barrier islands. It may also inspire agencies to acquire them and/or strengthen the non-acquisition protective mechanisms now available.

Federal agencies will continue to expand their knowledge of barrier island dynamics and values and make information available to other public and private organizations. Improved management and protection of barrier islands should result.

Land Use

A low level action alternative will allow continued loss of valuable barrier island resources to urbanization. The figures provided by the United States Geological Survey for the period 1950 to 1973-4 show an average increase of 6000 acres per year for urbanized lands on the barrier islands study units. At the same time the figures indicate a loss of wetlands in a similar average amount.

During the period, lands in agriculture diminished by over 4,100 acres, lands in forest cover increased by about 27,500 acres, urban lands increased by 137,850 acres. Some of these trends will be altered by the recently issued Executive Orders and the President's expression of concern for barrier islands protection.

Since most barrier island soils have limited capacity to absorb or filter septic system discharges, increased development utilizing septic systems will pose serious threats to the quality of ground water supplies. Simply providing more wastewater treatment facilities is not necessarily the answer. Development pressures on those islands where means of access already have been developed, utilities and wastewater treatment are in place, and other elements of the infrastructure are operating, will continue to create a "Catch 22" situation. That is, more people create more demands for more facilities which create more opportunities and inducements for expanding development for accommodating more people who in turn require more facilities.

An unfortunate illustration of this theory is Hilton Head Island, South Carolina, once considered to be a good example of development based on an environmentally compatible carrying capacity. The attitude of the current developers appears to be one of letting market demands rather than the environment determine the capacity. A result is that condominiums are being constructed, a new four lane highway and bridge are being built to accommodate the increasing population, and--the wastewater treatment load is exceeding the capacity of the treatment plant, valuable shellfish beds are being polluted, and the important shellfish industry is threatened. This scenario has potential for being repeated numerous times under a low-level alternative.

Recreation and Public Lands

Recently authorized increases in the Land and Water Conservation Fund (L&WCF) will, if fully appropriated, permit increased acquisition of barrier island sites by public agencies at all levels. However, unless specific barrier island related programs and policies are established, the likelihood of barrier islands being given higher priority than they now are is remote.

Without specific new incentives to help offset the high costs of development and maintenance and the relatively low public recreation benefit, many States and localities will continue to give barrier islands low priority for acquisition under the Land and Water Conservation Fund grants-in-aid program.

The State and local agencies requesting L&WCF assistance establish their own priorities for use of the requested funds. With few exceptions, these priorities more than likely will continue to favor mainland areas, easily accessible to large numbers of people and more suitable for high density recreation development.

Among the States, only Florida has an active program for acquiring barrier islands and other waterfront areas. Although most of the other States and some localities have acquired barrier island sites for recreation purposes, for a variety of reasons, such sites generally have not been of high priority. South Carolina is the only State to request a Land and Water Conservation Fund grant for a component of its SCORP specifically related to barrier islands. This plan component will deal with barrier island carrying capacities.

It can be assumed that the Wetlands Protection Executive Order will restrict most activities which would tend to further diminish the barrier island wetland acreage from its current level of about 840,000 acres.

Furthermore, many of the kinds of areas that have previously been developed with Federal assistance may not qualify in the future because of the Floodplains Management Executive Order. However, by restricting the areas in which Federal assistance may be operable, competition for the remaining areas located above the 100 year floodplain will intensify, driving up the costs and making it more difficult for public agencies to justify acquisition.

Transportation

A low level alternative that permits increasing urbanization and recreation use of barrier islands also will cause demands for expansion and improvement of transportation networks to and on barrier islands. Improvements will be required simply to move goods and services necessary to support the increased populace and serve increased recreation visitation, as well as to provide quick escape in the event of major storm threats.

More pressures will be placed on the U.S. Coast Guard to approve permits for new bridges or improvements to existing ones. Highway carrying capacities will be increased by improvements and widening. New systems such as hydrofoil ferries may be incorporated where bridge or causeway construction is not practical or where heavy recreation demand requires alternative modes of transportation. Conflicts between transportation agencies and conservation oriented agencies and groups will intensifty as the competition for land for various uses increases.

Climate

A low level action alternative would have no effect on the climate or on the frequency or severity of storms.

People

A low level action alternative could have a profound effect on the densities and distribution of barrier island populations. Population densities in specific developable areas will increase as less and less land becomes available for urban expansion. Seasonal populations will continue to be many times greater than resident populations.

With the disproportionate rate of in-migration to coastal counties, more and more pressure will be placed on developing barrier islands as permanent places to live, work, and play. The fact that nearly 80% of all people now living on barrier islands have never experienced a hurricane and that substantial numbers appear to be in older age brackets (65 years and over) suggests that without improved storm warning, evacuation planning, and routes of escape, the consequences of a major hurricane hitting a heavily developed barrier island will be catastrophic.

Residential communities will continue to thrive and expand and, until a natural disaster strikes, increased numbers of people will inhabit barrier island communities. However, much of the development will continue to be at the expense of the general taxpayers who may never have the opportunity to enjoy that environment.

Urbanization between the years 1950 and 1973 was greatest in the States of North Carolina, South Carolina, Florida, and Texas. Florida and Texas have experienced severe hurricane damage in the past and have the highest likelihood of hurricanes occurring in any given year. Increasing densities along these coastlines creates the potential for storm damage of catastrophic proportions. It is estimated that because of the tremendous increase in development along the Florida Atlantic Ocean coast, one major storm in that area could cause as much damage as the cumulative total of all storms occurring in the first 60+ years of this century.

Pumping for petroleum products and water along the Texas Gulf Coast has caused localized land subsidence (5-7 feet in some places) making low lying lands, and occupants thereof, extremely vulnerable to inundation from tides and storms around Galveston Bay. Areas that were above Hurricane Carla storm surges in 1961 now would be subjected to surges.

In the Northeast, New Jersey, New York, and Massachusetts have experienced the greatest urbanization of barrier islands. These coasts suffered severe battering from northeasters in the early months of 1978.

Current policies are permitting the restoration or rebuilding of several of the heavily damaged areas. The replacement cost of structures is rapidly escalating and will be reflected in future damage estimates.

The increasing scarcity and high cost of fuel may change peoples' patterns of using barrier islands, especially those who make frequent, short trips. Those who may be full time seasonal residents probably will not be so severely affected. However, even for them, fuel shortages may be calamitous during the threat of a hurricane.

Major Wildlife

A low level action alternative could have severe adverse impacts on wildlife habitat and populations; food sources could be lost and entire species threatened.

However, the Fish and Wildlife Service has an active program for acquiring, protecting and/or enhancing wildlife habitat and that would not change dramatically under this alternative. As previously described, the Service has programmed acquisition of several areas on barrier islands. Costs for acquiring lands on barrier islands which may not otherwise be protected by the two executive orders cited earlier or by other means, will rapidly become prohibitive prompting the FWS to acquire lands of less cost on the mainland or to seek greater use of less than fee acquisition methods on barrier islands.

Development will continue to have impacts more far reaching than on the specific site being developed.

Expanding urbanization may cause overdraft or pollution of the fresh water lens and affect vegetation serving as food or cover for wildlife and adversely affect important nursery beds and shell fishing areas around the islands. Noise from construction at certain critical periods may interrupt breeding or nesting activities. Unwise development may alter wind patterns and affect dune dynamics on which barrier islands are so dependent.

Without a specific barrier island related Federal protection program, greater reliance will need to be placed on States, localities, and private interests for protection of valuable habitat areas.

Moderate Level (Redirection of Authorized Programs) Alternative

This section describes, in general terms, the extent of the consequences which could result if the moderate options to protect barrier islands were adopted.

These options highlight and place emphasis on redirecting and maximizing existing authorities for protection of the natural processes of barrier islands. Under this alternative a number of changes would take place in various Federal program areas to make the public more aware of the need for protecting the islands, for recognizing their dynamics and resource character, and for moving toward a national policy to protect barrier islands. In addition, more emphasis would be placed on a stricter application of the NEPA requirements.

Planned uses of barrier island lands would be more cognizant of soil and vegetation capabilities for supporting people and developments; more protection would be afforded wetlands and dunes, although some erosion would continue to occur naturally. Furthermore, as a result of stressing protective measures, greater assurance would be realized in maintaining the quality of ground water supplies. More thorough and precise determination of the available water resources, in relation to projected growth estimates, would aid immeasurably in achieving a balance between water supply and demand.

Environmental consequences would be most pronounced on mainland areas where visitor parking and embarkation centers would be located as well as where highway construction and increased transportation facilities would be needed. However, transportation networks on the islands would be minimized; such networks would provide for recreational access and would supplement escape routes.

More attention would be given to the cultural and historical resources of the islands, which reflect the National heritage, as well as those sites having the potential for supporting these resources. More effort would be placed on the expeditious identification of sites and facilities worthy of protection.

Recreational opportunities for the general public would be expanded; increased recreation development could create substantial economic activity in surrounding areas for development of support facilities and services.

Public land holdings would probably increase. Habitat areas for wildlife and a diversified fishery would be given more safeguards from human encroachment. Interference with the natural processes of shoreline erosion and dune dynamics would decrease as developmental activities became increasingly restricted. Major wildlife and plant communities would benefit greatly. Recognition would be given to habitat values and the fragile nature of the barrier island ecosystem.

In many locations, population density would be dispersed or reduced while in other areas the density would probably increase as land for development becomes less available. The general profile of the people inhabiting barrier islands probably would not change substantially from what it is now. Seasonal populations would continue to be many times greater than resident populations. Although it is difficult to quantify in socio-economic terms the benefits of protecting natural and cultural resources on the barrier islands, it is apparent that these benefits do exist. Some loss of developmental potential or economic gain may result on the barrier islands themselves. However, much of the development likely would be transferred to mainland sites; hence, not all of the development investments would be lost.

Protection of the barrier island resources not only is compatible with local economics, but may also enhance them. Some development will continue to take place, tourists still will be drawn to barrier islands, and dollars will be invested. Additional spinoffs could result in better employment rates, improved community services, and, hopefully, a keener awareness of barrier island natural values. Above all, the health, safety, and well being of many island users would be safeguarded.

Also, taking the Federal Government out of the barrier island subsidy business would mean less government spending and would put barrier island development back into the "free enterprise" system. Development is not stopped, but it is made to pay its own way. Likewise, projects not built in areas subject to inevitable catastrophic hurricanes will, in the long run, save millions of dollars in disaster relief, reconstruction costs, and erosion prevention. More importantly, the risk to life and property would be further lessened.

High Level (Legislation and Executive Directives) Alternative

This alternative expands upon options discussed under the moderate level alternatives. It affords greater protective measures and heightens awareness of barrier islands and the need to protect their natural values and environmental qualities. The options reflect a strong position toward positive environmental consequences. Actions resulting from the options would pointedly favor the natural conditions and reduce economic development on barrier islands.

Fish and wildlife, wetlands, recreation areas, water quality, vegetation, historical sites, soils, and other related elements, would be assured of a high degree of protection. The options would promote a high quality standard for land utilization and husbandry.

As selected options are implemented over a time span of several years, Federal expenditures to protect developments would be significantly reduced; the risks to life and property would be minimized; fewer transportation connectors would

be constructed; and population densities on barrier islands would be reduced. Hazardous areas would reflect actuarial insurance rates; and disaster reconstruction would be carefully planned and directed in a manner to prevent further economic losses. Through some options, acquisition proposals would be addressed to further safeguard the barrier islands and minimize land speculation maneuvers.

Economically, these options could have severe short-term adverse impacts in localized areas. Substantial amounts of land would be removed from local tax rolls, future development possibilities curtailed, and economic growth restricted on many of the islands. Some transfer of economic investment from barrier islands to mainland sites would take place and the potential growth of mainland areas should be greatly enhanced by tourist and other recreation related support industries.

The end result of these options would be a national policy to perpetuate a valuable and fragile natural resource--one which reflects this Nation's heritage and defends this Nation's mainland from the everpresent threat of coastal storm.

Relationship Between Local Short-term Use of the Environment and Maintenance and Enhancement of Long-term Productivity.

Low-level Alternative

The low level alternative permits continuation of existing Federal grant, loan, permit and other programs which encourage barrier island development and occupation. Impediments to those programs will come only from increased activity by the conservation minded community of interests.

The low level alternative will not materially alter man's short term use of the barrier islands. However, long term maintenance and enhancement of the natural environment will be jeopardized. Productivity of the islands and their adjacent bays will, over time, be restricted by increased manipulation and disruption of the natural system.

Lost will be lands and natural features that contribute to the inherent productivity of the barrier islands and their associated bays and marshlands. Increased development also will cause increased depletion and pollution of ground water supplies. Short term economic growth will occur locally as service industries and facilities develop to supply and maintain larger numbers of people residing on the islands. However, as the expanding development encroaches more and more on the high hazard areas and disrupts the natural storm protective features, the potential for long-term economic losses in terms of damage to personal property and loss of life from catastrophic storms will be extremely high.

Moderate Level Alternative

This alternative will not materially alter man's short term use of the barrier islands but has potential for improving the long term maintenance and enhancement of the natural environment.

The options which are adopted will require greater attention to be given to the natural values and to mitigating the impacts on those values from all development proposals.

The options will dampen Federal development oriented programs. At the same time, increased funding of authorized programs for resource protection and enhancement will make those programs more competitive with the development programs. As a consequence, important natural areas and values will be protected from short term economic development and long term productivity will be enhanced. Improved public access to an existing public resource will be provided.

Unwise development projects still will be proposed. However, permits and subsidies should be reduced significantly. Increased numbers of people still will place their lives and personal property in jeopardy. Damage from major storms will be immense. Economic losses to individuals and communities from hurricanes and northeasters will continue to be shared by the general taxpayer.

High Level Alternative

Protection of barrier islands in the manner and by the actions which are adopted in this alternative will not materially affect man's short-term use of the environment. Long term productivity of the islands and their adjacent bays and estuaries will be significantly enhanced.

The options permit continued use of the barrier island resource but, over time, will alter the manner in which that resource is used. Some development will continue to take place. However, it will be accomplished with little if any Federal assistance and with some restriction on where and how it is built. What is developed will be done within the "free enterprise" system; for the most part, made to pay its own way.

Restricting Federal assistance in new development or redevelopment of storm damaged areas will limit expansion into new areas but may cause increased densities in currently developed areas.

Short-term economic losses will occur locally but some offsetting investments and economic growth will occur on proximal mainland areas.

List of Appendices

Page

Appendix A - Federal Programs.....A-1

Appendix B - Categories of Barrier Islands.....B-1

Appendix C - Natural Landmarks on Barrier Islands.....C-1

Appendix D - National Register Properties on Barrier Islands.....D-1

Appendix E - Management Policy for Shoreline Processes - NPS.....E-1

Appendix F - Barrier Island Inventory.....F-1

Appendix G - Appendix of Barrier Island Sources.....G-1

APPENDIX A

FEDERAL PROGRAMS

Appendix A--Federal Programs

Introduction

Federal programs have, in many ways, encouraged and allowed development of barrier islands, resulting in potential problems of public health and safety, increasing costs, and loss of important public benefits provided by unspoiled barrier islands.

This situation is not the result of any directed Federal policy to encourage barrier island development. Rather, it results from a general lack of knowledge and understanding of barrier islands as unique resources warranting special attention. While a broad range of Federal and State authorities address aspects of barrier island land management, barrier islands as a whole are treated only as a peripheral concern. As a consequence, the land management needs of barrier islands are not effectively being met. A discussion of Federal responsible agencies and their programs, which could have significant implications upon barrier island environments follows.

Agencies are listed in the following order:

- Heritage Conservation and Recreation Service (HCRS)
- National Park Service (NPS)
- Fish and Wildlife Service (FWS)
- Bureau of Land Management (BLM)
- Environmental Protection Agency (EPA)
- Department of Commerce (DOC)

  --Office of Coastal Zone Management (OCZM)
  --Economic Development Administration (EDA)

- Corps of Engineers (COE)
- Federal Emergency Management Agency (FEMA)

  --Federal Disaster Assistance Administration (FDAA)
  --Federal Insurance Administration (FIA)

- Council on Environmental Quality (CEQ)

  --Executive Order (EO) 11988
  --Executive Order (EO) 11990

- Department of Transportation (DOT)

  --United States Coast Guard (USCG)
  --Federal Highway Administration (FHWA)

- Housing and Urban Development (HUD)
- Farmers Home Administration (FmHA)
- Small Business Administration (SBA)
- General Services Administration (GSA)
- Department of Energy (DOE)

Heritage Conservation and Recreation Service (HCRS)

The HCRS derives its authorities for program implementation affecting barrier islands from its "organic act" P.L. 88-29, enacted by the Congress on May 28, 1963; the Land and Water Conservation Fund Act, P.L. 88-578 as amended; and functions transferred to it under a Memorandum of Understanding between the HCRS and NPS dated January 31, 1978. These latter include functions authorized by:

- The Historic Sites Act of August 21, 1935; 16 U.S.C. 463
- The National Historic Preservation Act of 1966; 16 U.S.C. 470
- The Archeological and Historic Preservation Act; amendments of 1974; 16 U.S.C. 469

Although the HCRS does not directly manage or administer lands, its program authorities have significant potential for shaping or influencing use of barrier islands. For example, of the 5750 projects approved for LWCF assistance in the 18 States, 112 are for barrier island projects. About 50 of these were for acquisition projects but that number would be substantially less except for the emphasis Florida has placed on acquisition of coastal areas. That State has nearly five times as many acquisition projects than development projects. Although there are more development projects, the dollar figure for acquisition is nearly three times that for development. The total LWCF apportionments to the 18 States has amounted to $681.5 million. Of this $51.4 million has been allocated to barrier islands projects.

To qualify for grants under the Land and Water Conservation Fund, States must have in existence a Statewide Comprehensive Outdoor Recreation Plan (SCORP), up to date and approved by the Secretary.

Such plans have been prepared by all 18 States and have been approved. However, because these plans are focused at the level of State policy and implementation of State programs, they do not provide a framework for managing particular areas or kinds of resources, such as barrier islands.

Furthermore, the present HCRS guidelines for preparation of the SCORP contain no special provisions to promote protection and environmentally compatible uses of barrier island resources in general or of protected islands in particular. As a result, the plans are unlikely to recognize the unique resource characteristics and hazards associated with barrier islands and to sensitively take them into account in developing State policies and programs for acquisition, management, development, and public use of barrier island areas.

At the project level, State as well as local planning is focused on the design of particular facilities to support administration and public use of a specific area or on the development of specific management programs and projects to enhance wildlife, fishery, or other values. Such planning

may facilitate expeditious implementation of projects, but is of limited value as a vehicle for integrating various management activities within the protected area or for integrating the protected area into its surrounding region.

Proposed changes in SCORP manual provisions may provide a framework within which States could address barrier island programs and projects. The proposed provisions suggest that States consider areas of national concern. However, barrier islands are not mentioned as a typical resource of national concern and the provisions are not mandatory.

HCRS also evaluates and designates significant natural, historic, and cultural areas on all barrier islands which qualify for inclusion on the National Registry of Natural Landmarks and the National Register of Historic Places.

Although listing of a resource on one of the Registries does not ensure that the resource will be protected totally, such action does highlight the significance of the resource.

Official designation by the Secretary of the Interior is required before a site can be listed on one of the National Landmarks Registries whereas properties on the National Register of Historic Places are designated by the Keeper of the National Register, an HCRS official.

Although there have been very few instances to date where a listed resource has been compromised or destroyed, the future of resources not permanently protected through public ownership or other means is unpredictable. The

prognosis is further clouded by the fact that privately owned resources may be designated as Natural Landmarks or National Register Properties without the owner's consent, although every effort is made to secure the owner's cooperation in protecting significant resources. In the case of Natural Landmarks, a gentlemen's agreement between the owner and the Secretary of the Interior, indicating the owner's intention to protect the significant resources, must be signed before a designated Natural Landmark can be registered officially and the site marked with an identifying plaque. To date, only 17 registered Natural Landmarks have been established on barrier islands. In the case of National Register properties and National Historic Landmarks, significant resources have received a substantial measure of protection from the adverse effects of Federal or federally assisted activities since 1966, when the National Historic Preservation Act was signed into law. Section 106 of the act, and its implementing Executive Order 11593, establish requirements for identifying significant cultural resources and for mitigating the adverse effects of Federal actions upon them through cooperative agreement with an independent historic preservation agency in the Executive Office of the President. Although these requirements have effectively promoted resource preservation by the Federal Government, they cannot be invoked to curtail actions by the private sector or non-Federal government agencies when Federal funding or other assistance is not involved.

The Historic Preservation Fund, administered under the authority of the National Historic Preservation Act of 1966, makes matching grants for historic preservation to the States from an annual appropriation for that purpose. The States may use the grants for surveying, evaluating, acquiring, and preserving significant cultural resources.

Since the program was first funded in 1970, through FY 1978, over $46,625,000 have been granted to the 18 barrier island States. Considerably less than 1% of this amount is estimated to have been used to promote resource preservation on barrier islands.

Although appropriations have increased over the past several years (actually, the Congress has appropriated more money than has been requested) there apparently has not been any great significance placed on identifying and protecting barrier island cultural resources.

The HCRS may be able to give higher priority to these resources under its proposed National Heritage Policy Act of 1979. The proposed Heritage Program is a Federal initiative to coordinate and strengthen existing public and private efforts to identify and protect significant natural areas and historic places. It will provide a basis for developing and defining a consistent, consolidated policy and program for heritage resources. A national program for historic preservation has been in place since the 1966 Historic Preservation Act and the natural heritage component of the National Heritage Program should be brought up to a similar level of sophistication and development.

The purpose of the program is to establish a national policy and provide the basis for implementing a program to assist in the identification and protection of areas and places of significance to our heritage. Our national heritage consists of that collection of resources important to Americans because they are significant aspects of our history and culture and significant elements of our natural environment. Natural areas include land and waters of ecologic and geologic significance to this Nation's natural environment at the national, State, and local level. Historic places include districts, sites, buildings, structures, objects, networks, cultural landscapes, and neighborhoods significant in American history, architecture, archeology or culture at national, State and local levels. By identifying these areas and places, we will be helping to preserve our American heritage.

HCRS also maintains a barrier island data inventory and data bank and provides for technical assistance as provided by its Organic Act. The data bank consists of about 50 bits of information on each of the nearly 300 units identified in the study. These data bits include information on physical attributes as well as development status, ownership, management, and other characteristics. Such information is vital to the discernment of changing trends and to the development of long range management plans and objectives.

National Park Service (NPS)

The NPS authorities for barrier island activities stem mainly from the Act of August 25, 1916; P.L. 64-235; 16 U.S.C. Section 1 et. seq. This act established the basis for the current system of national parks, monuments, and recreation areas and for the service which administers them. NPS activities on barrier islands also may be affected by the:

- o Park, Parkway, and Recreation Study Act of June 23, 1936; P.L. 74-770; 16 U.S.C. 17;
- o NPS Administrative Authorities Act; P.L. 94-458; 16 U.S.C. 1a-1; and
- o The Wilderness Act; 16 U.S.C. 1131-1136.

The national seashores and recreation areas which are situated on barrier islands were created individually through separate acts of Congress. Among other things, each act specifies the purposes for which the unit was established, identifies the general boundaries, sets out basic management guidelines, and establishes the authorities governing the Secretary's right to acquire land by various means. These authorities vary widely and extend from the exercise of powers of eminent domain to acquisition by donation or purchase from willing sellers.

For the purposes of "developing coordinated and adequate public park, parkway and recreational-area facilities for the people of the United States," the Park, Parkway, and Recreation Area Study Act of June 23, 1936; P.L. 74-770; 16 U.S.C. 17 authorizes the

Secretary of the Interior, operating through the NPS "to aid the several States and political subdivisions thereof in planning such areas therein, and in cooperating with one another to accomplish these ends." Assistance provided under the Act may include technical and advisory services on organization, O & M,* historical and archeological programs (transferred to HCRS 1-31-77), and general development planning. Limited technical assistance may be provided without charge to local and State agencies if staff are available. Major planning efforts would be conducted on a reimbursable basis.

Several NPS administered barrier island units are adjacent to lands where existing or proposed uses are adverse to the purposes of the Federal areas. The future use of these adjacent lands may pose the greatest potential threat to the integrity of the Federal unit when the lands consist of private communities located on the same island as the Federal unit. This occurs at Cape Hatteras where the national seashore is punctuated by no less than seven community developments. The threat is somewhat less if the communities are separated from the Federal unit by an inlet that serves as an access barrier, such as occurs between Ocean City, Maryland, and Assateague Island National Seashore. Development of adjacent lands is governed by State laws and local ordinances. In most locations, particularly in undeveloped rural areas, local development controls are typically inadequate to ensure the compatibility of development with barrier island resources in general and the protection of the Federal unit in particular. If developed intensively for residential

*operation and maintenance

and commercial uses, adjacent lands can seriously impair the quality of the natural environment--through groundwater pollution, surface water pollution, impairment of wildlife habitat values, and related ecological effects--as well as the quality of the visitor's experience--through traffic congestion, impairment of visual quality, and degradation of the inspirational value of the barrier island. If shoreline stabilization measures are implemented to protect developed areas from erosion, destabilization of the sediment balance of nearby Federal lands is a probable result.

The extent of private land holdings varies widely by park area from less than one acre to nearly 7500. Development on those lands ranges from dispersed residences to whole communities and several thousand structures.

Eight National Park Service areas contain substantial acreages of non-Federal public lands which can be acquired only by donation or exchange. As of 12/31/76, the total acreage involved was about 120,600. Most of these are submerged lands that are administered by the States and are likely to be transferred in the future. Five areas contain State parks and one contains municipal and county parks on the barrier island itself. These parks are likely to be transferred in cases where Federal administration would not result in a reduction in the level of public recreational use. However, where there is a reasonable likelihood that Federal administration would result in a reduction in this use, the administering agencies generally are unwilling

to transfer parklands to the Federal government. Unfortunately, the juxtaposition of intensively used and substantially developed non-Federal lands and undeveloped Federal lands with low-intensity use has created management problems which are likely to increase along with increasing public use of the non-Federal parks.

Public Law 94-458, the NPS Administrative Authorities Act, directs the Secretary of the Interior "to investigate, study, and continually monitor the welfare of areas whose resources exhibit qualities of national significance and which may have potential for inclusion in the National Park System, and annually to submit a listing of not less than 12 such areas to the Speaker of the House and President of the Senate."

Threats to resource values and cost escalation factors are to be considered in determining the relative importance or merit of the areas.

In fiscal year 1978, a list of 17 areas was submitted—none of the areas was on an Atlantic or Gulf Coast barrier island. The listing for fiscal year 1979 contains 19 areas and only one, Cape Fear, involves a barrier island. Subsequent listings suggest barrier islands are faring better. Of the 14 highest priority areas to be studied in the immediate future (pending availability of funds) one is a unit containing about ten islands. Of the 16 second priority areas, two are barrier islands. Perhaps in no other type of area are "threats to resource values and cost escalation factors" such important considerations as they are on barrier islands.

Wilderness designation and the designation of qualified areas as Research Natural Areas and National Environmental Study Areas are additional means to protect barrier islands.

Wilderness designation offers perhaps the greatest possible level of protection that could be given to a barrier island under NPS administration. Thus far, 1,800 acres have been designated and another 2,800 acres have been identified as potential wilderness in Gulf Islands National Seasore. At Everglades, 1,296,500 acres have been designated as wilderness and 81,900 acres have been identfied as potential wilderness. NPS has one other area proposed jointly with the Fish and Wildlife Service. This is at Assateague and the NPS portion is 440 acres.

Research Natural Areas are lands and waters set aside to protect a "representative array of all significant natural ecosystems" as baseline areas for the purpose of obtaining information that is useful in understanding these ecosystems and in comparing them with manipulated ecosystems. RNAs have significant value in long-term environmental monitoring and research, in detecting changes and trends in environmental conditions, and in providing objective information on which to base land management decisions. They are administratively designated by the administering Federal agency and receive protection in accordance with agency policies and regulations. These policies

and regulations generally conform to the Standards and Policy Guidelines for Research Natural Areas published by the Federal Committee on Ecological Reserves, chartered in 1974 under the auspices of the Council on Environmental Quality and the National Science Foundation with 19 agency members. The Committee acquires and disseminates information on RNAs and published an updated directory in 1977.

RNAs currently receive no special legislative protection and are managed for educational and research purposes solely as a result of a particular agency's administrative commitment to do so.

To date, the only designation of RNAs on barrier islands has been done by the U.S. Fish and Wildlife Service within 6 units of the National Wildlife Refuge System and by the U.S. Air Force at Matagorda Air Force Base in Texas. The National Park Service has not designated any RNAs in barrier island units, although all of the NPS units--except Wright Brothers National Memorial--have areas that potentially qualify.

The National Park Service also is responsible for designating suitable sites as National Environmental Study Areas (NESAs) following a request to do so by a local school system or other educational entity. These designations provide special recognition to areas which, by virtue of their resource values and history of educational use, have acquired particular educational significance. NESAs may be designated wherever a site is of particular significance in carrying out environmental education objectives.

A New National Park Service Policy

Until recently, the national seashores were managed under the National Park Service's guidelines for recreation areas, as opposed to natural areas and historic areas. The primary purpose of the seashore was to provide appropriate recreational opportunities, sometimes for large numbers of visitors. This promoted construction of roads, utilities, took measures to protect its investment other facilities. Not surprisingly, the NPS, like other owners of barrier island property, felt obliged to protect its investment against the islands' natural proclivity to move around.

The NPS has adopted a "Management Policy for Shoreline Processes" which states that, as far as possible, and cognizant of NPS responsibilities that accrue from its previous policy and actions, there will be no further attempts to restrain the natural processes of erosion, deposition, dune formation, and inlet formation. The policy further states that:

> "In development zones, management should plan to phase out, systematically relocate, or provide alternative developments to facilities located in hazardous areas. New facilities will not be placed in areas subject to flood or wave erosion hazard unless it can be demonstrated that they are essential to meet the park's purpose, that no alternative locations are available, and that the facilities will be reasonably assured of surviving during their planned lifespan without the need of shoreline control measures."

This new policy for barrier island land management will be implemented on a seashore-by-seashore basis, and will be accomplished through each unit's general management plan. The specific application of the policy can be seen in the example of Fire Island National Seashore, where the following actions demonstrate the application of the policy to a specific management unit:

- The NPS will attempt to restore the island's natural sand movement.
- A sand by-pass will be developed to reestabish and maintain the natural littoral drift and prevent the sand entrapment that now robs the beach of its supply of sand.
- No inlets will be opened artifically. Naturally-opening inlets will be evaluated on ecological, economic, navigation, and access factors and either retained or closed.
- There will be no beach stabilization structures. Sand fences will be used only where vegetation is sparse and dune buildup is necessary.
- All pedestrian dune crossings will be on elevated boardwalks, and all vehicler dune crossing will be limited to those essential for access and management.
- There will be no anti-mosquito ditching in the marshes.
- Sand nourishment of beaches on the seashore will be conditioned on implementation by the Corps of Engineers of sand by-pass systems at the inlets.

Each of these policies is subject to a case-by-case analysis of the situation, with possible modification due to extenuating circumstances or long-established patterns or rights. The policy recognizes the

existing reality of adjacent property owners' expectation of protection, of the need to maintain services and transportation on routes in neighboring communities, and the need to protect historic zones and some previously-constructed NPS structures. It recognizes that a complete break with past, now discredited policies will not always be possible. But it also makes clear a new direction for seashore planning and management that takes into consideration the dynamics of barrier island geology and ecology.

Fish and Wildlife Service (FWS)

The FWS draws its authorities for barrier island related activities from a number of Acts of Congress. These include, in addition to the Fish and Wildlife Act of 1956, as amended, the following:

- o Fish and Wildlife Coordination Act
  16 U.S.C. 661-667e
- o National Wildlife Refuge System Act
  16 U.S.C. 668 dd-668jj
- o Migratory Bird Conservation Act
  16 U.S.C. 701-718h
- o Endangered Species Act of 1973
  16 U.S.C. 1531-1543
- o Wilderness Act
  16 U.S.C. 1131-1136
- o Recreation Act of 1962
  16 U.S.C. 460k-460k-4

and various acts establishing specific wildlife refuges within the System.

Thirty-one National Wildlife Refuges (NWR) have been established along the East and Gulf coasts, preserving valuable breeding, nesting, and migratory areas for many species of fish, shellfish, and wildlife. An important purpose of the refuges is the fulfillment of U.S. responsibilities for migratory birds, as established in treaties with Great Britain (on behalf of Canada) and Mexico and implemented in the Migratory Bird Treaty of 1918, as amended. The refuges often occupy barrier island fast land, but also include large areas of the

marshes and bays, those exceedingly productive ecosystems that provide key habitats for fish and wildlife. The refuges shelter or provide habitat for a large number of species including several that are listed as endangered, such as the bald eagle, brown pelican, whooping crane, and peregrine falcon.

In accordance with the provisions of the Wilderness Act of 1964, the Fish and Wildlife Service barrier island units are being studied for possible inclusion in the wilderness system.

Twelve wilderness areas on wildlife refuges have been congressionally mandated, ranging in size from an 8-acre wilderness area at the Pelican Island NWR on Vero Beach, Florida, to one of 29,000 acres at the Cape Romain NWR on Cape Island, Raccoon Key, and Bull Island, South Carolina. Five other refuges have been studied and found to be qualified and departmental recommendations are awaiting congressional action.

National wildlife refuges are managed in order to protect the feeding, hatching, rearing, and permanent habitats of a wide variety of animal species.

The FWS inventories and lists rare and endangered species of both plants and animals that exist on barrier islands and delineates the areas of critical habitat for those species. Although many of the animals have been listed, many of the plants have not. The designation of critical habitat gives the Endangered Species Act its most definitive thrust.

Management practices aim at improving, and sometimes creating, those habitats. Because development would be inimical to the tranquil, unpolluted, and natural environment required by the animals, the refuges are kept largely natural.

Human visitors are of secondary, but increasing importance on the refuges. The seasonal gatherings of immense numbers of migratory birds or the chance to see an endangered species are of great interest to the public, and more and more visitors are coming to see them. The refuges were created for animals, however, and until the early 1960's were for the most part closed to human visitors. The Refuge Recreation Act of 1962 (P.L. 87-714) changed that policy, establishing the principle that opening the refuges to the public and permitting recreational activities would be desirable as long as the activities were compatible with the primary purpose for which the refuges were established--the protection of animals and their habitats. Within this legal and managerial designation as an "appropriate incidental or secondary use," a number of the barrier island refuges have been opened to the public. The main recreational activities encouraged are those that are wildlife-oriented, such as fishing, use of nature trails, bird watching, and natural history interpretation. All of these activities are consistent with the "incidental and secondary" principle, and are strictly controlled in terms of the number of people engaged in these activities as

well as where and when it occurs, in order not to disturb animals during such critical times as nesting, and to protect fragile or susceptible habitats from adverse impact.

The FWS has an active acquisition program and in the past 10 years has acquired all or a major portion of 13 barrier islands involving nearly 60 miles of beach. During the next two years (FYs '79 and '80), the Service expects to begin acquiring at least three more barrier islands involving nearly 40 miles of beach.

Through a land acquisition concept planning process, the Service has identified 44 additional barrier islands in 14 States which appear to be suitable for inclusion in the National Wildlife Refuge System if they cannot be protected by other means.

Bureau of Land Management (BLM)

The BLM has been in existence in one form or another for nearly 170 years. The General Land Office, formed in 1812, was one of the first Federal age cies formed. In 1946 the Office was joined with the Grazing Service to form the Bureau of Land Management.

The Federal Land Policy and Management Act of 1976; P.L. 94-579; 90 Stat. 2743 is referred to as the BLM Organic Act and it is from this Act, plus its responsibilities under the Outer Continental Shelf Lands Act, that BLM derives its authorities for programs which affect barrier islands.

Section 211 of the "Organic Act" authorizes the Secretary of the Interior to convey, under the provisions of the Recreation and Public Purposes Act, 43 U.S.C. 869 et seq., to States and their political subdivisions any unsurveyed islands determined to be public lands of the United States.

The Act also amends the Recreation and Public Purposes Act to require the Secretary to determine that any lands conveyed are not of national significance and that, for parcels of over 640 acres in size, comprehensive land use plans and zoning regulations applicable to the area in which the conveyed lands are located have been adopted by the appropriate State or local authority.

BLM also identifies areas on the Outer Continental Shelf for energy exploration and development and administers the leases

for such areas. Sections 18, 19, 20 and 23 of the Outer Continental Shelf Lands Act Amendment of 1978 appear to provide adequate precautions for protection of the environment and suitable recourse for citizen action in the event of violations of the regulations of the Act. However, there is no specific mention of barrier islands.

Environmental Protection Agency (EPA)

In addition to its recently assigned responsibilities for monitoring environmental impact statements, EPA programs which may affect barrier island development primarily are the result of two major legislative Acts:

1. The Clean Water Act (Clean Water Act of 1977 and the Federal Water Pollution Control Act Amendments of 1972; P.L. 92-500; 33 U.S.C. 1281 et seq.) which authorizes:

   a. Wastewater Treatment Construction Grants: Supports the planning and construction of wastewater treatment facilities. (Sec. 201)

   b. Water Quality Management Planning: Grants to State and designated areawide planning agencies for the development and implementation of areawide water quality management programs. (Sec. 208)

   c. National Pollutant Discharge Elimination System (NPDES): NPDES permits issued to individual dischargers (including municipal waste treatment plants) setting limitations on amount of pollutants a discharge may contain. (Sec. 402)

   d. Permits for Dredged or Fill Material (Sec. 404).

2. Clean Air Act of 1963, P.L. 88-206, 42 U.S.C. 1857; as amended by P.L. 91-604, the Clean Air Act Amendments of 1970.

   a. State Implementation Plans (SIP): Submitted by each State for EPA approval, SIP's set emission levels and control

strategies necessary to achieve and maintain national ambient air pollution standards set by EPA.

b. Air Quality Maintenance Areas (AQMA): Usually an urbanized area or SMSA identified in SIP's or designated by the EPA Administrator which, because of current air quality and/or projected growth, have potential for violating any national air quality standard within 10 years. Addition of major new sources or modification of existing emission sources is controlled to prevent further air quality deterioration.

c. Air Pollution Program Grants: Federal funds are available for up to two-thirds the cost of planning, developing, establishing or improving State air pollution prevention and control programs; and up to one half the cost of maintaining such programs.

d. Section 309 Review: This section of the Clean Air Act requires the EPA Administrator to "review and comment...on the environmental impact of any matter relating to...the authority of the Administrator contained in (1) any legislation proposed by any Federal department or agency; (2) newly authorized Federal projects for construction and any major Federal agency action other than a project for construction to which section 102 (2)(c) of (NEPA) applies, and (3) proposed regulations published by any department or agency..." The Administrator's comments must be made public and if he determines that the matter under review "is unsatisfactory from the standpoint of public health or welfare or

environmental quality, he shall publish his determination and the matter shall be referred to the Council on Environmental Quality."

This requirement brings within EPA purview any major Federal action proposal that impacts health, welfare, or the environment on the barrier islands. This includes actions in the territorial sea, the contiguous zone, or the oceans that would impact these islands.

EPA policy and regulations require that activities, such as those listed above, be in conformance with related statutory requirements.

The Coastal Zone Management Act (CZMA)—which could provide special considerations for the barrier islands requires:

1. that the requirements of the Federal Water Pollution Control Act and the Clean Air Act be incorporated into CZM programs developed by the States, and

2. that all Federal activities in the coastal zone (including issuance of permits and licenses) be consistent with State CZM programs.

EPA has issued general guidance to its coastal regions concerning coordination with State CZM programs and specific guidance concerning the interface of its water quality programs with the State CZM programs.

Most EPA actions involve case-by-case evaluations and decisionmaking. This means that where a barrier island is involved, its specific needs should be considered in making any determination.

Perhaps the greatest impact of EPA programs on barrier islands derives from the grants for the planning and construction of wastewater treatment facilities.

Under this program, EPA funds 75% (and in some cases 85%) of the capital costs (excluding land acquisition) of publicly owned wastewater treatment works. The remaining share of the costs are assumed by the State and/or the grant applicant. Many States make grants to aid local governments in meeting the local share.

EPA regulations do not specifically note barrier islands as being geographic areas of special environmental concern. Although an environmental assessment is made of each proposed project, plans and justification frequently are prepared under contract by engineering firms which may or may not be aware of or sensitive to specific barrier island conditions.

The EPA Regional Administrator has the authority to make a negative declaration on a project proposal. The decision is published in newspapers and distributed to areawide clearinghouses and other interested parties. If there is no adverse comment within 15 days, no environmental impact statement (EIS) is prepared.

If an EIS is required, the preparation generally is by an environmental planning firm under a contract. Few EIS reports are prepared by EPA office staff. EPA staff do carefully consider a project's potential impacts on wetlands and in floodplains and require justification for

"unreasonable" 20 year estimated population growth figures which may be attributable to a project. However, again there is no special significance attached to a wastewater treatment facility proposal on, or serving, a barrier island community.

EPA regulations for the areawide planning grants do not specifically address barrier islands. As a consequence, regional plans for water quality management may not be detailed enough to permit analysis of planned or potential impacts on individual barrier islands.

Water quality management plans could have particular significance for barrier islands because the plans must include waste treatment needs for the next 20 years and consider alternatives and land treatment needs. The plans are to include regulatory programs to control all sources of water pollution identified by the State or designated local agency. For example, any construction in fragile ecological areas might be required to get a building permit with an erosion and sedimentation control plan and special monitoring by State officials as conditions to that permit.

Used in the proper place for the proper purpose, EPA grants have potential for significantly improving environmental conditions. However, such grants also can be the catalyst for expanding development beyond the physical capabilities of a barrier island to accomodate it and exposing large numbers of people to extremely hazardous conditions.

DEPARTMENT OF COMMERCE

Office of Coastal Zone Management (NOAA)

The Coastal Zone Management Act of 1972, 16 U.S.C. 1451, (as amended in 1976) encourages

> the participation of the public, of Federal, State and local governments and of regional agencies in the development of coastal zone management programs to achieve wise use of land and water resources of the coastal zone.

The act provides for a voluntary program; there are no sanctions imposed upon any State or territory which chooses to participate.

The act emphasizes the lead roles of State and local governments. Direct State administration, local administration subject to State review are the three optional means of program implementation specifically mentioned in the act. The Federal role is basically limited to providing the States with financial and technical assistance during development and implementation of management programs. The act does provide guidance on the basic framework for State programs and requires participating States to address the following nine points:

1. Identification of boundaries of the coastal zone (determined by State discretion with minimum limits specified in the act);

2. Designation and inventory of areas of particular concern (these may be areas of economic as well as environmental importance);

3. Broad guidelines on priority of uses in particular coastal areas including specifically those uses of lowest priority;

4. A determination of permissible land and water uses which have a direct and significant impact on coastal waters;

5. The means by which the State proposes to control those use (this refers to the implementation authorities the State will use in making its program work);

6. The organizational structure which would implement the management program;

7. A planning process for shoreline erosion;

8. A planning process to deal with the issue of access to public waterfronts; and,

9. A planning process for the siting of energy facilities.

Federal financial assistance for program planning is provided under section 305 of the act for a maximum of five years. Funding for this section expires in September, 1979. Once a State program has been developed and approved by the governor, the State may voluntarily seek Federal approval by the Secretary of Commerce. If the Secretary judges that the management program meets the basic goals of the act, then the State may receive financial assistance under section 306 to implement this program. Presently, coastal management programs from six States along the Atlantic and Gulf coasts have been approved by the Secretary and are receiving implementation funding. The programs of five additional Atlantic and Gulf States should be approved within the next year.

Under section 315 of the act, financial assistance may be provided to enable States to acquire and maintain estuarine sanctuaries, to preserve islands and to provide for access to public beaches and other public coastal areas of importance.

Finally, section 308 establishes the Coastal Energy Impact Program (CEIP) which consists of the provision for financial assistance to meet the needs of coastal States and local governments in such States resulting from specific activities involving energy development.

A final important aspect of the act is its emphasis on intergovernmental coordination and cooperation, especially with respect to "Federal consistency." Section 307 directs States to coordinate with Federal agencies during program development, and in return directs Federal agencies to conduct their activities within each State in a manner which is consistent to the "maximum extent practicable" with States' approved management program. This "consistency clause," related to federally-assisted actions, direct Federal actions and issuance of Federal licenses, permits, and Federal financial assistance to State and local governments.

Economic Development Administration (EDA)

The Public Works and Economic Development Act of 1965, P.L. 89-136, 42 U.S.C. 3121, authorizes the EDA to provide economic development grants and technical assistance to help distressed areas identify, evaluate and understand their problems and economic potential.

Assistance may be in the form of:

1. Studies to identify area needs or solve industrial or economic problems;

2. Grants-in-aid, amounting to 75% of costs of planning and administering local economic development programs, and

3. Management and operational guidance for private firms.

Grants of up to 50 percent of the development cost provide for such public facilities as water and sewer systems, access roads to industrial parks or areas, harbor facilities, railroad sidings and spurs, public tourism facilities, vocational schools, flood control projects, and site improvements for industrial parks. Severely depressed areas that cannot match Federal funds may receive supplementary grants to bring the Federal contribution up to 80 percent of the project cost.

Loans also are available for public works and development facility projects. Loans may pay the full cost of a project and may run for as long as 40 years, the interest being determined by government borrowing costs. A community unable to raise its share of the eligible project cost may receive a grant for 50% or more of the projected cost and a Federal loan for the remainder of the cost.

Provision of public facilities on a barrier island could accelerate its development for urban use.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers administers various programs which have potential for affecting barrier islands. These programs and the Corps authorities for implementing them include:

Beach Erosion Control	Section 103 of P.L. 87-874, Rivers and Harbors Act of 1962, as amended
Flood Control and Coastal Protection Works (Rehabilitation)	Public Law 84-99, 33 U.S.C. 701n, Flood Control Act of 1941; 77-228, 33 U.S.C. 701b et seq as amended by P.L. 87-874
Flood Fighting and Coastal Protection Works (Federally authorized)	Flood Control Act of 1941; P.L. 77-228 as amended by P.L. 84-874
Flood Plain Management	Section 206 of P.L. 86-645, Flood Control Act of 1960 as amended
Navigation	Section 107 of P.L. 86-645, Rivers and Harbor Act of 1960 as amended
Regulatory Functions	Sections 9 and 10, Rivers and Harbors Act of 1899; Clean Water Act of 1977

The beach erosion control program is primarily involved with protection of public shoreline by structures (eg. groins, seawalls, jetties) and beach nourishment. The Corps designs and constructs the projects on the basis of engineering feasibility and economic justification.

The coastal protection works program (rehabilitation) provides assistance for repair and restoration of flood damages and shore protection works damaged by extreme storm conditions. Such assistance includes the restoration of federally authorized coastal protection structures but not their improvement or betterment for flood control.

The second coastal protection works program is directed towards emergency assistance which supplements State and local capabilities in time of storms. This assistance includes all phases of flood fighting and rescue operations.

The flood plain management program is a planning function of the Corps and involves technical assistance and guidance to promote a critical awareness of flood hazards in land and water developments.

The navigation program assures that the needs for general navigation are met in an efficient and effective manner. The Corps usually undertakes the program for a State or a political subdivision within the State.

The regulatory functions program consists of reviewing, analyzing, and authorizing or denying permits for proposed discharges of dredge and/or fill material into the waters of the United States.

Corps programs can exert a long-term impact on barrier island ecosystems and the natural processes essential to their continued existence. The most critical Corps programs from the standpoint of impacting upon barrier islands are the shoreline stabilization programs responsible for beach erosion control, hurricane protection, and inlet stabilization. Since these programs involve manipulation of sand-sharing systems, Corps projects can have significant effects on the natural processes responsible for perpetuating barrier island landforms miles away from the actual project site. Likewise, another program, that of navigational dredging, often disrupts the estuarine environment for maintaining dynamic barrier island environments.

The Corps maintains the Atlantic and Gulf Intracoastal Waterways, small craft navigation channels dredged through the shallow bays that separate the barrier islands from the coastal mainland. The need constantly to remove sediment from the channel creates an enormous amount of dredge "spoil" which must be disposed of in an economical, but environmentally sound manner. The practice has been to dump much of the spoil in tidal marshes along the waterway route, primarily because alternative methods are more expensive and the Corps does not always have the right equipment at the right time so as to minimize expenses. Further, the depth of the waterway channel is maintained in most sections at -12 feet MSL under congressional mandate.

In some instances on troublesome shoal areas, the Corps has, for economic reasons, dredged to an overdepth as advance maintenance to prevent the requirement of returning to the same project two or more times in the same dredge season.

Under Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. §1344, and §10 of the Rivers & Harbors Act of 1899, 33 U.S.C. §§401, et seq., the Corps has jurisdiction over any modification of traditionally navigable waters and over all discharges of dredged and fill material into all waters of the United States, including wetlands. Although there is controversy over the scope of the Corps' jurisdiction above mean high water, in part created by the Corps, the agency has been using its authority to protect coastal wetland ecosystems with consistency. The Corps has the power to encourage sound barrier island development by exercising its wetlands protection policy which states that dredge-and-fill permits in wetlands will not be issued if there exists an alternative means--including uplands development--to provide housing.

The Corps has for 10 years been deciding dredge-and-fill permit cases on environmental public interest grounds. The Rivers and Harbors Act of 1899 has been construed by the courts, together with modern laws

such as the Fish and Wildlife Coordination Act, 16 U.S.C. §§661, et seq., and the National Environmental Policy Act (NEPA), 42 U.S.C. §§4321, et seq., to require the Corps to consider and act upon factors other than navigation in deciding permit cases in the public interest.

Finally, the Corps provides assistance to Federal, State, and local agencies by replenishing sand from eroded beaches and keeping navigation inlets stable. Each of these activities can be caused by man-made changes in the island geologic processes and, when corrected, can lead to further changes. For example, beaches sometimes erode because buildings have been built on or in front of the dunes. Replenishing the beach may only induce further unwise development.

Of primary concern regarding the programs described above, has been lack or inadequacy of early coordination between the Corps and those agencies responsible for safeguarding barrier islands. All too often the first notice of a proposed project has been the issuance of a draft environmental statement. Unfortunately, by this time, there is often a substantial commitment to the project and a general reluctance to modify conditions compatible to the long-term maintenance of barrier islands.

Federal Emergency Management Agency (FEMA)

As a result of the President's Reorganization Plan Number 3 of 1978, transmitted to the Congress on June 19, 1978, FEMA has been established as an independent agency in the Executive Branch.

The Federal Disaster Assistance Administration (FDAA) was abolished by Executive Order 12148 effective July 15, 1979, and FEMA has now assumed the FDAA responsibilities. The Federal Insurance Administration (FIA) was transferred to FEMA by Executive Order 12127 on April 1, 1979. However, FIA retains its identity as an agency within FEMA.

FEMA draws its basic authorities from the Disaster Relief Act of 1974, P.L. 93-288, 42 U.S.C. 5121. The program objectives are to provide assistance to States, local government, individuals, and owners of selected non-profit facilities "in expediting the rendering of aid, assistance, and emergency services, and the reconstruction and rehabilitation of devastated areas..." and "to alleviate the suffering and damage which result from such disasters..."

Section 201 of the Act authorizes the establishment of disaster preparedness plans, utilizing all appropriate agencies. It provides for technical assistance and grants to the States in developing comprehensive disaster plans and programs, to include hazard reduction, avoidance, and mitigation. All States have already completed a $250,000 maximum one-time "development" grant. Remaining funds provide 50/50 matching grants up to $25,000 annually for updating

and improving their preparedness plans and capabilities.

Section 401 authorizes the repair, reconstruction, restoration or replacement of any facility owned by the United States which is damaged or destroyed by any major disaster if it is determined that such a facility is necessary. In implementing the section, the appropriate Federal agency is responsible for evaluating the natural hazards to which the facility is exposed and is required to take the necessary action to mitigate such hazards. However, it should be noted that this section has not yet been delegated by the President.

Section 406 also has important relevance to barrier island situations. This section requires, as a condition for any loan or grant made under the provisions of the Act, that the State or local government agree that the natural hazards of the area in which the loan or grant is to be used will be evaluated and appropriate action taken to mitigate those hazards.

Under Title V of the Act, Recovery Planning Councils may be authorized and established following a major disaster. These Councils are responsible for determining when and under what conditions recovery investment plans should be prepared. The responsibility for this section was delegated by the President (in Executive Order 12148) to the Director of FEMA. However, it has not been funded or implemented.

Council membership consists of, among others, locally elected officials and private citizens. Public participation in Council deliberations is to be provided for and encouraged. This provision generally

has been interpreted to be a vehicle to get a maximum amount of recovery assistance into a devastated area as quickly as possible.

The Federal Insurance Administration draws its authorities primarily from the National Flood Insurance Act of 1968, P.L. 90-448, 42 U.S.C. 1441, as amended by the Housing and Urban Development Act of 1968, P.L. 91-152, and the Housing and Community Development Act of 1974, P.L. 93-383, 42 U.S.C. 5301; and, the Flood Disaster Protection Act of 1973 P.L. 93-234, 42 U.S.C. 4001, as amended by the Housing Authorization Act of 1976, P.L. 94-375, 12 U.S.C. 1701.

Property owners may buy flood insurance at a rate lower than normal actuarial rates, reflecting a subsidy by the Federal Government. In communities in which actuarial rates have been determined, regular program coverage in terms of a second layer of coverage equal in amount to established limits may be purchased at actuarial rates.

Under the provisions of the Flood Disaster Protection Act of 1973, communities having one or more identified special flood hazard areas must enter into the National Flood Insurance Program or be denied Federal or federally-related financial assistance for acquisition or construction purposes within those areas.

Of the nearly 300 study units identified in the study, 188 are in communities covered by the National Flood Insurance program. As of May 4, 1979, 130 of these communities already were in the regular phase of the program; 55 still were in the emergency phase of the program; and three were not participating in the program.

Of the 58 (55 + 3):

36 have mapping studies underway

16 have mapping studies scheduled to start in FY '79

6 have no studies scheduled

2 have studies completed and are scheduled to convert to the regular program before the end of calendar year 1979

From the outset of the Flood Insurance Program, the minimum flood plain management requirements have been building requirements. That is, they have been directed primarily to structural rather than locational considerations.

The National Flood Insurance Act of 1968, as amended, provides authorities to the Secretary not only to identify and publish

information with respect to all flood plain areas (Sec. 1360(a)(1) and to establish flood risk zones (1360(a)(2), but also to: "develop comprehensive criteria designed to encourage, where necessary, the adoption of adequate State and local measures which..." will improve the management of flood prone areas; and, assist States and local governments to acquire properties located in flood risk areas and which are severely damaged by floods. These are important considerations in any plan to protect barrier islands from unwise development.

Council on Environmental Quality (CEQ)

The Council was established by the National Environmental Policy Act of 1969 (NEPA) (83 Stat. 852; 42 U.S.C. 4321 et seq.) to formulate and recommend national policies for improving the quality of the environment. The Office of Environmental Quality, which provides staff to the Council, was subsequently established by Title II of the Environmental Quality Improvement Act of 1970 (84 Stat. 114; 42 U.S.C. 4372).

Section 203 of NEPA established various duties and functions of the Council among which are:

- "to gather timely and authoritative information concerning the conditions and trends in the quality of the environment both current and prospective, to analyze and interpret such information";
- "to review and appraise the various programs and activities of the Federal Government...to determine the extent to which they are contributing to achieving the goals of the Act";
- "to develop and recommend to the President national policies to foster and promote the improvement of environmental quality to meet the conservation, social, economic, health, and other requirements and goals of the Nation";
- "to conduct investigations, studies, surveys, research, and analyses relating to ecological systems and environmental quality";
- "to document and define changes in the natural environment, including the plant and animal systems, and to accumulate necessary data and other information for a continuing analysis of these changes or trends and an interpretation of their underlying causes."

Section 4371(b)(1) of the Act establishing the Office of Environmental Quality recognizes that policies and statutes exist which properly implemented, would contribute significantly to improvement of the environment.

> "(b)(1) the Congress declares that there is a national policy for the environment which provides for the enhancement of environmental quality. This policy is evidenced by statutes heretofore enacted relating to the prevention, abatement, and control of environmental pollution, water and land resources, transportation, and economic and regional development."

The Act also recognizes that much of the responsibility for implementing these policies and statutes rest with State and local governments.

One of the stated purposes of establishing the Office was:

> "to assure that each Federal department and agency conducting supporting public works activities which affect the environment shall implement the policies established under law" (Sec. 4371(c)(1)

Among the stated duties and functions of the Office (Director) which have relevance to the barrier islands are:

- "reviewing the adequacy of existing systems for monitoring and predicting environmental changes in order to achieve effective coverage and efficient use of research facilities and other resources;"
- "promoting the advancement of scientific knowledge of the effects of actions and technology on the environment and encourage the development of the means to prevent or reduce adverse effects that endanger the health and well-being of man;"
- "assisting in coordinating among the Federal departments and agencies those programs and activities which affect, protect, and improve environmental quality;"

- "assisting the Federal departments and agencies in the development and interrelationship of environmental quality criteria and standards established through the Federal Government;"

- "collecting, collating, analyzing, and interpreting data and information on environmental quality, ecological research, and evaluation." (Sec. 4372(c)(3)-(7))

Floodplain Management, Executive Order 11988

Executive Order 11988, Floodplain Management, signed May 24, 1977, revoked and replaced Executive Order 11296 issued on August 10, 1966. It established new Federal policy for executive agencies and requires agencies to issue new or amended procedures to ensure the nonhazardous use of riverine, coastal and other floodplains. The Order directs Federal agencies to avoid, to the extent possible, the long and short term adverse impacts associated with activities in floodplains, and to avoid the direct or indirect support of floodplain development. With respect to barrier islands, it appears, based on floodplain maps for a sampling of areas, that a high percentage of the land area is located in floodplains covered by the Order.

The term "base floodplain" is used as the measurement for determining, in most cases, when the Order applies, and refers to the area subject to a flood having a one percent chance of occurring in any given year (100 year flood). The "critical action" floodplain is the other measurement used, and refers to the area having a 0.2 percent chance of flooding in any year (500 year flood).

Each agency has the responsibility to evaluate the potential direct and indirect effects of any actions it may take in a floodplain, and to ensure that its planning programs and budget requests reflect adequate consideration of flood hazards and floodplain management. If an agency proposes or supports an action in or affecting a floodplain, the head of the agency must make a finding that such an action is the only "practicable alternative." The agency then must "(1) design or modify its action in order to minimize potential harm to or within the floodplain, consistent with regulations issued in accord with section 2(d) of this Order, and (2) prepare and circulate a notice containing an explanation of why the action is proposed to be located in the floodplain." For programs subject to the Office of Management and Budget Circular A-95, the agency must also notify the State and areawide A-95 clearinghouses for the geographic areas affected.

The Water Resources Council was directed to prepare guidance under the Order and to conduct periodic oversight of agency procedures and their effectiveness. The guidelines issued by the WRC on February 10, 1978, outline the major steps in the decisionmaking process an agency should follow when proposing an action which would be located in the base floodplain. The procedures recommended by the guidelines state that once an agency determines an action is located in the base floodplain (or critical action floodplain for proposals such as hospitals or facilities producing toxic water-reactive materials), the agency must then notify the public early enough for there to be a meaningful public input. The Order additionally requires agencies to consider all

practicable alternatives to the proposal, including alternative siting or the alternative of taking no action. The impacts to the floodplain that would occur from the action must be fully identified. Adverse impacts must be minimized, and natural and beneficial floodplain values must be restored and preserved.

The agency would then reevaluate the proposed alternative taking into account the means to minimize impacts and maximize restoration of floodplains. If the agency head still finds that the onl, practicable alternative is locating the proposal in the floodplain, public notice of the reasons must be given in findings describing: (1) why the proposed action must be located in the floodplain; (2) significant facts considered in making the determination including alternative sites and actions; (3) conformity with State or local floodplain protection standards.

The WRC guidelines also state that the notice should explain: (1) the project modifications designed to minimize harm; (2) affects on natural and beneficial floodplain values; and (3) the inappropriateness of National Flood Insurance Program criteria, where applicable. After a brief comment period the agency may implement the proposed action.

The guidelines issued by the Water Resources Council recognize that all of the above steps may not be appropriate to all agency actions. Every Federal agency was directed by the Order to develop its own regulations, but to date some agencies have been delinquent in completing their procedures. Some, notably the financial boards, have maintained that the Order does not apply to their operations activities.

Without the benefit of knowing how effective the Order will be, since it is not completely operational at present, the potential for substantial protection of the barrier islands clearly exists independent of any other recommendations made in this document. This is especially true in light of the responsibilities imposed on agencies by CEQ's NEPA regulations to mitigate adverse impacts and carry out promises made in the environmental review process. At least on paper, most agencies have reported to CEQ and WRC in June, August, and November 1978 that they are adhering to the policies contained in the and that their official procedures will be promulgated in final form shortly.

It will be necessary, however, to have effective oversight during the completion of agencies' (and especially sub-agency) regulations and

during the operational phase. The Water Resources Council, the Domestic Policy Staff and Interior Department will also have some floodplain oversight responsibility under the new water resources policy. The

Water Resources Council has no explicit oversight authority for ensuring an agency proposal's compliance once the procedures are established, though section 5 directs the WRC to periodically evaluate agency procedures and their effectiveness.

The Order itself reflects CEQ's willingness for WRC to take the lead in ensuring that agencies fully implement their procedures. This is proper since the Water Resources Council has been involved in floodplain management at the Federal and State level for many years, as typified by its influential 1976 publication, A Unified National Program for Floodplain Management. The Council on Environmental Quality could, however, serve alternatively in this role.

The Order does require any requests for new authorizations or appropriations transmitted to the Office of Management and Budget to indicate when a proposed action would be located in a floodplain, and if in a floodplain, whether the proposed action is in accord with the Order.

Effective implementation of the floodplains Executive Order should foster increased awareness within Federal agencies of the hazards of barrier island development, and will also set an example for State and local decisionmakers to become more conscious of the impact of their actions on floodplains, particularly when located on barrier islands.

Protection of Wetlands, Executive Order 11990

Executive Order 11990, issued on May 24, 1977, directs Federal agencies to provide leadership in minimizing the destruction, loss or degradation of wetlands. All agencies are ordered to avoid "to the extent possible" the destruction or modification of wetlands whenever there is "a practicable alternative." Like Executive Order 11988 relating to floodplains, the Order is both procedural and substantive, and applies to agencies involved in (1) acquiring, managing and disposing of Federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities affecting land use, including but not limited to water and related land resources planning, regulatory, and licensing activities.

The Wetlands Order was issued at the same time and contains many identical provisions as Executive Order 11988. The floodplain management guidelines issued by the Water Resources Council state that the guidance provided to agencies for the development of floodplain procedures will also frequently apply to wetlands review procedures. Agencies can optionally develop a single set of procedures for both Orders, and most have chosen to do so. Because the Orders are similar in content and are directed at actions which will frequently impact each other, only one set of coordinated procedures for each agency appears advantageous.

Identical provisions of the two Orders require: (1) the head of an agency to avoid undertaking or providing assistance for most Federal actions unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm; (2) early public review for new construction proposals located in wetlands; (3) requests for new authorizations or appropriations from the Office of Management and Budget to indicate whether the proposed action is in accord with the Order.

The Wetlands Order differs from the Floodplain Order, however, by specifically delineating the major factors agencies must consider when proposing an action located in a wetland area. The factors that must be considered are: the public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; sediment and erosion; maintenance of natural systems including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; recreational, scientific, and cultural uses.

The Order does not apply to private permits for activities involving wetlands on non-Federal property, because that would be duplicative of section 404 permits. The Wetlands Order also does not apply to <u>any</u> Federal activity as does the Floodplain Order, but only to new construction

undertaken in or affecting wetlands. The Wetlands Order does, however, require Federal leases, easements, or deeds involving non-Federal parties to reference in the conveyance restricted uses as identified by any Federal, State or local wetlands regulations.

The review required by the Order is very comprehensive, and should have a wide application to many environmentally-damaging projects now undertaken by the Federal Government on or near barrier islands. As President Carter stated in the message accompanying the Order, "the problem of loss of wetlands arises mainly from unwise land use practices. The Federal Government can be responsible for or can influence these practices in the construction of projects, in the management of its own properties, and in the provisions of financial or technical assistance." The Order, although not quite as broad as the one for floodplains, will require Federal agencies to seek all practicable alternatives to new construction in wetlands, and hence should significantly reduce dredge and fill operations on the barrier islands as well as beach reconstruction, groin or seawall construction undertaken by the Corps of Engineers.

The advantages to unified or coordinated agency procedures are numerous. Especially for the barrier islands, almost all wetlands are located in floodplains. This means that, in most cases, Federal actions proposed in wetlands would have to comply with agency procedures developed in response to both the wetland and floodplain Executive Orders. Confusion could be created while the agency determined whether one or the other or both Orders applied. A unified strategy would reduce the possibility

of confusion, and lessen the chances of a situation, for example, where a developer could manipulate one set of regulations against the other.

Another reason why single or coordinated procedures should be encouraged s that actions in floodplains that are not actually located in a wetland will still often impact on the wetland. Unified procedures permit the full range of interdependent impacts to be considered completely and as a whole. As a consequence, a greater degree of protection for the barrier islands should result.

Department of Transportation (DOT)

The Department of Transportation includes several agencies whose program authorities have great potential for impacting barrier islands. Two, the U.S. Coast Guard (U.S.C.G.) and the Federal Highway Administration (FHWA), are particularly important. A third, the Federal Aviation Administration (FAA), has a lesser impact on the islands.

The Coast Guard was established by the Act of January 28, 1915, 14 U.S.C. 1 and became a part of DOT on April 1, 1967.

Authority for approving permits to construct bridges over navigable water, including those necessary to connect barrier islands to the mainland (or to each other), was transferred from the Corps of Engineers to the U.S. Coast Guard by the DOT Act of 1966, 49 U.S.C. 1655(g)(6).

It has been the practice of the agency to issue bridge permits unless the structure would interfere with navigation. Because the costs of construction are likely to be prohibitive without convenient access, and because island property is unlikely to be marketable without a means of hurricane evacuation, bridges can be said to be the sine qua non of development on barrier islands.

Perhaps because neither the agency nor the public, until recently, has been particularly aware of the role that bridges play in promoting and making possible uncontrolled barrier islands development, the Coast Guard has not evaluated bridge permit

applications on the basis of environmental, social and economic factors unrelated to navigation. In fairness, it should be noted that until recently (around 1973) bridges to barrier islands have not been controversial and, thus, the agency may not have been presented with an opportunity to deal squarely with the issue. However, the Coast Guard has no current regulations that spell out the regulatory test which the agency will apply in evaluating bridge proposals that lead to barrier island development or that set forth the burden of proof which a bridge permit applicant must satisfy in order to qualify for a permit. While the Coast Guard does have NEPA regulations, these are not the equivalent of substantive regulatory standards, such as those adopted by the Corps under §10 of the 1899 Act.

The agency has been preparing environmental impact statements which outline the impacts of development that will follow bridge construction in some cases, but it remains to be seen whether these impacts will be considered as the basis for agency decisionmaking.

Equally unclear are Coast Guard policies with respect to the administration of other statutory requirements and considerations. The Department of Transportation, the parent agency, has adopted a wetlands protection policy. DOT Order No. 5660.1, May 21, 1975. While wetlands are usually found in association with barrier islands, the Coast Guard has yet to decide how it will apply the DOT policy to bridge and development cases.

Similarly, Section 4(f) of the DOT Act of 1966, 49 U.S.C. §1653(f), forbids the agency from sponsoring or approving projects that would use publicly-owned land that is important for wildlife and recreation, unless there are no feasible alternatives and all planning measures have been taken to reduce the impact of the project on public wildlife and recreational resources. An unresolved question is whether tidal marshlands, generally deemed "public trust" lands and certainly important for wildlife and recreation, come under the protection of §4(f), and what the Coast Guard policy in bridge cases affecting these marshes will be.

Further, the Coast Guard has no clear policy on how it will administer the bridge permit program so as not to prejudice or compromise the later administrative decisionmaking of other agencies.

Finally, the Coast Guard has not determined how it will deal with the Federal policies designed to prevent unsound development in flood-prone areas, such as those universally found on barrier islands.

The FHWA became a component of DOT by virtue of the DOT Act (80 Stat. 932). The FHWA administers the Federal-aid highway program of financial assistance to States for highway construction. Revenues derived from special taxes on highway users provide the Federal share of the financing for Federal-aid primary, secondary, and urban roads and streets. These funds generally are available

on a 70% Federal--30% State or project sponsor matching basis. Special emphasis currently is being placed on deteriorating bridges.

The FHWA, with its multi-billion dollar per annum program, plays a large role in determining land use patterns in the country and has similar potential to do so on barrier islands.

There are environmental constraints placed on federally-funded highway building. Of particularly substantive import is Section 4(f) of the Department of Transportation Statute (49 U.S.C. 1653(f)) which protects significant, and publicly-owned, recreation areas, wildlife and waterfowl refuges, and parks against new highway building unless (a) there is no feasible and prudent alternative, and (b) then only if all efforts are made to minimize the harm to these protected areas. Since many barrier islands feature national or State wildlife refuges, parks or recreation areas (including State-owned stream beds used as important fisheries) that would be impacted by a new highway, Section 4(f) often will be applicable to a federally-funded highway on a barrier island.

However, Section 4(f) frequently is overlooked in cases of de facto wildlife sanctuaries or recreation areas (e.g., publicly-owned wetlands, or important natural fisheries); and when it is applied, findings of no feasible and prudent alternatives are often made.

The FAA also became a part of DOT in 1967 pursuant to the DOT Act, The FAA is charged with, among other responsibilities, promoting civil aviation and a national system of airports. Because of the

problems of surface access to many barrier islands, air transport provides a reasonable means of access to some of the larger islands.

Grants provided by the FAA to public agencies for airport development have the same potential for inducing growth on barrier islands as do other development oriented grant programs.

Table 17 in the environmental impact statement indicates that only nine of the nearly 300 study units now are accessible by air.

Department of Housing and Urban Development (HUD)

The Housing and Community Development Act of 1974 (P.L. 93-383), 42 U.S.C. 5301, merged several categorical grant programs into the Community Block Grant Program (CDBG) and authorized funds for a three year period. Title I of the Housing and Community Development Act of 1977 (P.L. 95-128) amended the earlier Act and extended funding authorizations for CDBG for an additional three years. CDBG has become HUD's primary vehicle for providing community development assistance.

The CDBG program finances all activities previously eligible under urban renewal, neighborhood development, model cities, water and sewer, neighborhood facilities, public facilities, rehabilitation, open space, urban beautification and historic preservation grant programs.

Although the law does enumerate general objectives which the block grants are designed to fulfill, spending priorities are determined at the local level. Metropolitan cities and urban counties (having populations of at least 50,000 and 20,000 respectively) are guaranteed an amount called an "entitlement" which is based on a number of population, poverty, and housing factors. Smaller communities compete for the remaining "discretionary" funds on the same basis. The discretionary fund amounts to about 2% of the annual appropriation for CDBG purposes. As with most other Federal financial assistance programs, the CDBG guidelines do not differentiate between barrier islands or uplands.

Of the activities eligible for fund assistance under CDBG, water and sewer grants probably have the greatest impact on barrier island development.

Several mortgage and loan insurance programs are administered by the Federal Housing Administration (FHA) within HUD. These programs include insured mortgages or loans for, among others, multi-family dwellings, condominiums, single family homes, hospitals, and replacement of dwellings extensively damaged by major disasters.

Another program in HUD which has an important indirect impact on barrier island development is the Interstate Land Sales Full Disclosure Act program established by Title XIV of P.L. 90-448, 15 U.S.C. 1701.

The Act was not designed by the Congress to encourage or influence, either directly or indirectly, the patterns of land use or the rate of timing of development of the barrier islands. In practice, the administration and enforcement of the Act's provisions do not have such an influence. However, neither does the Act discourage development of barrier islands. The Act is essentially a "disclosure" statute which requires interstate land developers to register their subdivisions before offering or selling lots to prospective purchasers. Theoretically, in order

to meet statutory requirements, land developers (sellers) must, prior to selling, furnish each buyer with a property report which discloses information pertaining to various aspects of the property involved. In practice these reports generally are voluminous, technical in nature, and expensive to reproduce. Therefore, copies usually are available to buyers only through the Office of Interstate Land Sales. The standards for disclosure have been established by the Congress and through delegation, by regulations published by the Secretary. The disclosure requirements apply to subdivisions as such, without regard to where the land is geographically situated or, as may be the case in barrier island developments, to the inherent hazards of the location. The physical features of the land involved are pertinent only to the extent that those features are properly subject to disclosure with the object of protecting purchasers. For example, the mere fact that a subdivision is situated on a barrier island would not of itself necessarily be a proper subject of required disclosure, but the fact that there is no access by road to the island probably would.

The Office of Interstate Land Sales has indicated that approximately 1,700 subdivisions, both registered and unregistered, are situated in 97 of the 108 counties on the barrier island list. To determine the number of barrier islands that might be included in any of these subdivisions would require an examination of each subdivision file.

Farmers Home Administration (FmHA)--Department of Agriculture

The FmHA derives its authorities for programs which may impact on barrier islands from a number of Acts of Congress.

Among the more important of these are:

- The Consolidated Farm and Rural Development Act, P.L. 92-419, 7 U.S.C. 1921 as amended by P.L. 93-237, 15 U.S.C. 633. Sections of this Act authorize: (1) emergency loans to cover losses resulting from designated disasters and to permit continued operations with credit from other sources. (Emergency Loans); (2) loans and grants for installing, repairing, improving or expanding rural water and waste disposal systems. Collection and distribution lines, pumping facilities, and treatment plants all are eligible items. (Water and Waste Disposal Systems for Rural Communities) (3) loans for financial assistance for improving the economic and environmental conditions of rural areas by developing business, industry, and employment (Business and Industrial Development Loans) (4) loans for the development of community services such as fire and rescue services, transportation, industrial and business development, community social, cultural, health, and recreation benefits (Community Facilities Loans).

- Housing Act of 1949 as amended.

  Sections of this Act provide authorities for direct or guaranteed/ insured loans for purchase and development of land in rural areas for subdivision purposes. Included are water and sewer facilities. (Rural Housing Site Loans)

- Food and Agriculture Act of 1962.

  Sections of this Act authorize loans to local sponsoring agencies in authorized areas for:

  1. rural community public outdoor oriented water based recreational facilities;
  2. soil and water development, conservation, control and use facilities,
  3. community water storage facilities in authorized Resource Conservation Development Areas (RC&D) (Resource Conservation and Development Loans)

During the past three fiscal years, total FmHA grants and loans to barrier island communities exceeded $26 million. More than 80% of this money was earmarked for water and waste treatment facilities. Substantial amounts also are involved in insured loans for residential construction on Amelia and Flagler Islands in Florida.

Small Business Administration (SBA)

The SBA draws its authorities for administration of programs which may impact barrier islands from the Small Business Act of 1953, P.L. 83-163, 15 U.S.C. 631, as amended. Amendments to the Act have been numerous but two which may be particularly relevant to barrier island protection were included in the Disaster Relief Act of 1970 and the Federal Water Pollution Control Act Amendments of 1972.

The former authorized the SBA to provide direct loans or guaranteed/insured loans to:

a. assist business concerns suffering economic injury as a result of certain designated disasters (Economic Injury Disaster Loans), and

b. restore, as nearly as possible, disaster damaged physical property to predisaster conditions. (Physical Disaster Loans)

Loans are granted for up to 30 years at a relatively low interest rate. Economic disaster loans may be used to pay certain liabilities and to continue business in operation until "normal" conditions are restored. No funds are available under this program for the repair or acquisition of equipment or for real estate purposes.

Physical disaster loans may be made to individuals, business concerns, churches, private schools, colleges and universities, and hospitals. Funds made available through this program may be used to repair or replace realty, machinery, equipment, and household or other personal property which was damaged or destroyed as a result of a disaster which occurred in an area designated as eligible for assistance because of flood or other catastrophes.

The amendment contained in the Federal Water Pollution Control Act Amendments of 1972 authorizes the SBA to provide direct loans or guaranteed/insured loans to assist small businesses to make additions to or alterations in equipment and facilities necessary to comply with water pollution control requirements. Funds provided can be used for construction of pretreatment facilities and interceptor sewers.

The SBA share of guaranteed loans may amount to as much as 90% of the costs.

General Services Administration (GSA)

GSA currently leases a number of properties on barrier islands for various purposes, mostly Federal agnecy space needs.

Perhaps of primary importance is the fact that GSA also is responsible for disposal of Federal surplus property. When GSA disposes of a surplus property, not all future development plans may be known to GSA at the time of the disposal action. Unanticipated uses could occur with the subsequent sale or transfer of title to real property which might involve increased development or densities on barrier islands.

Cities, counties, and States also may obtain Federal surplus property for parks, recreation, economic development (commercial and industrial), and numerous other uses. Although many surplus properties are converted to recreation or wildlife purposes by Federal, State or local governments, many also are assigned to the Department of Health, Education, and Welfare (DHEW) for conveyance to local governments for public health or educational purposes. As with most other Federal agencies, GSA does not differentiate between barrier islands or mainland in administration of its programs. However, various controls are placed on property through the determination by GSA of the most desirable uses, and in the case of historic properties, restrictions are frequently added to the deed which will insure proper use and preservation of the property.

GSA does have an active and strong environmental assessment and impact statement program for its lease and disposal actions.

Department of Energy (DOE)

Energy is essential to the continued livelihood of the Nation, however, it must be recognized at the same time that energy programs could have detrimental impacts on the resources of barrier islands.

The potential for energy supply and energy developments on barrier islands along the Atlantic and the Gulf coasts is very significant. Energy resource capabilities along the coast become readily apparent when studying coastal features. The coast offers an abundant supply of water for cooling processes and pollutant dilution; numerous sites for loading and unloading, transporting, storing, or refining energy resources; and an extensive continental shelf that may eventually provide valuable oil and gas reserves. Furthermore, the siting of large energy generating facilities including floating nuclear powerplants or the exploration for energy resources, is also a possible realization on the barrier islands.

The authorities for the Department's programs which could impact upon barrier islands are derived primarily from the following:

Atomic Energy Act of 1954, P.L. 83-703, 42 U.S.C. 2011, as amended.

Energy Reorganization Act of 1974, P.L. 93-438, 42 U.S.C. 5801

Department of Energy Organization Act, P.L. 95-91, 42 U.S.C. 7101

APPENDIX B

CATEGORIES OF BARRIER ISLANDS FOR PURPOSES OF THE BARRIER ISLAND STUDY

Categories of Barrier Islands for Purposes of the Barrier Island Study

Categories:

Developed islands - list 1
Undeveloped islands - list 2
Protected islands - list 3
Non-categorized islands - list 4

Category definitions are not mutually exclusive, with the result that some islands occur on two lists. Such redundancy is indicated by the word developed, undeveloped, or protected in parentheses after the island number, indicating the other list on which the island is entered.

Example entry on Developed Barrier Islands list:
Ashe Island NC-11 (Undeveloped)

DEFINITIONS

Developed islands, for the work group's purposes, were defined as those island areas which are generally built up and involve, on the average, one or more structures per five acres. Development on barrier islands often takes the form of irregular strips parallel to the beach, which are impractical to define in acres. Where development takes the form of more or less organized communities, or is grouped, areal measurements are reasonably representative of the situation. Moreover, the figures on development were derived from several sources. These often conflicted,

and adjusted values were used. The resultant acreages given for development are therefore only approximate, and are intended only for grouping the barrier islands for purposes of this study.

It is apparent that this categorizing of the islands is necessarily descretionary. The purpose is dual. It attempts to show the predominant character of an island unit, while at the same time allowing for the important exceptions. Therefore, an island that is 75% developed is considered a developed island. Another, although developed on considerably less than 75% of its land, was nevertheless considered developed if that developed area was at least 1,000 acres. On the one hand, the fact that an island is 75% developed implies that its dominant character is development. On the other, even on a large island, 1,000 acres of development is significant, and should be recognized as such.

These definitions are not mutually exclusive. As will be noticed in this Appendix, a number of islands occur on two lists. Fire Island, New York, for example, is both "developed" (it has more than 1,000 developed acres) and "protected" (more than 50% is protected in Federal and State parks). Edisto Island, South Carolina, for another, is "developed" (more than 1,000 acres) and "undeveloped" (the developed acreage amounts to less than 10% of the island). Also, some islands are not protected and fall between the developed-undeveloped criteria, and therefore do not occur in any of the three categories. Small Point, Maine, for example, is not

"developed" (only 29% of its land is developed), "undeveloped" (the amount developed is more than 10%), nor "protected" (it has no protected acreage). These non-categorized islands are also listed in this Appendix.

DEVELOPED BARRIER ISLANDS

Islands or groups of islands which have 75% or more of their land area developed, or which have 1,000 or more acres of developed land area.

ISLAND NAME	ISLAND NUMBER		ACRES DEVELOPED	TOTAL ACRES	PERCENT DEVELOPED
Pine Point	ME-04		320	320	100%
Goose Creek	ME-05		70	70	100%
Biddleford Pool	ME-06		150	190	78%
Goose Rocks	ME-07		210	210	100%
Wells Beach	ME-08		210	210	100%
Ogunquit	ME-09		230	290	79%
Hampton	NH-01		400	500	80%
Nantasket Beach	MA-07		800	900	88%
Humarock	MA-08		1,400	1,800	77%
Province Lands	MA-14		1,500	8,500	18%
Shelter Island	NY-06		450	600	75%
North Haven	NY-08		150	150	100%
Hampton	NY-11		1,050	2,700	39%
Fire Island	NY-12	(Protected)	1,900	6,900	28%
Jones Beach Island	NY-13	(Protected)	1,200	9,700	12%
Long Beach	NY-14		2,900	3,500	83%
Rockaway	NY-15		3,200	4,000	80%
Sandy Hook	NJ-01		2,400	3,000	80%
Barnegat	NJ-02		3,300	6,400	52%
Long Beach Island	NJ-03		3,900	6,700	58%
Brigantine	NJ-05		1,000	4,900	20%
Atlantic City	NJ-06		4,500	6,300	71%
Cape May	NJ-07		2,200	4,400	50%
Seven Mile Beach	NJ-09		2,100	5,400	39%
Wildwood	NJ-10		2,400	5,500	44%
Rehoboth	DE-01		1,600	6,700	24%
Fenwick Island North	DE-02		1,300	3,400	38%
Fenwick Island South	MD-01		2,000	3,500	57%
Bodie Island South	NC-01	(Undeveloped)	7,100	45,500	16%

ISLAND NAME	ISLAND NUMBER		ACRES DEVELOPED	TOTAL ACRES	PERCENT DEVELOPED
Hatteras Island	NC-02	(Protected)	1,000	17,000	6%
Bogue Banks	NC-08		3,000	8,700	34%
Ashe Island	NC-11	(Undeveloped)	2,000	9,000	22%
Figure Eight Island	NC-14		1,000	4,000	25%
Carolina Beach Island	NC-17	(Protected)	2,200	7,000	31%
Oak Island	NC-19		2,000	6,000	33%
Holden Beach Island	NC-20		1,000	2,000	50%
Hales Beach Island	NC-21		1,000	2,300	43%
Isle of Palms	SC-14		1,000	3,000	33%
Edisto Island	SC-22	(Undeveloped)	1,300	16,200	8%
Hilton Head	SC-31	(Undeveloped)	13,000	22,000	59%
Tybee Island	GA-01		1,000	4,100	24%
Saint Simons Island	GA-12	(Undeveloped)	3,000	28,000	12%
Jekyll Island	GA-13	(Protected)	3,000	6,000	50%
Amelia Island	FL-01	(Undeveloped)	5,600	16,100	35%
Anastasia	FL-05	(Protected)	1,800	10,200	18%
Flagler	FL-07		8,800	11,900	75%
Mosquito	FL-08	(Undeveloped)	2,100	15,300	14%
Cape Canaveral	FL-09		15,000	19,400	77%
Cocoa	FL-10	(Undeveloped)	14,000	21,600	68%
Vero Beach Island	FL-11	(Undeveloped)	3,500	14,700	23%
Hutchison	FL-12	(Undeveloped)	1,000	7,400	14%
Jupiter Island	FL-13		1,000	3,500	28%
Lake Worth	FL-14		600	800	75%
Palm Beach	FL-15		3,100	3,400	91%
Boca Raton	FL-16		2,300	2,700	85%
Hillsboro Beach	FL-17		800	900	89%
Fort Lauderdale	FL-18		1,000	1,100	90%
Miami Beach	FL-19		7,200	7,300	98%
Key Biscayne	FL-22		1,300	2,300	61%
Marco Island	FL-32		1,700	5,100	33%
Estero Island	FL-38		1,000	1,400	72%
Sanibel Island	FL-39		2,300	11,700	20%
Gasparilla	FL-43		1,000	2,100	48%
Manasota Key	FL-45		1,100	1,800	61%

ISLAND NAME	ISLAND NUMBER		ACRES DEVELOPED	TOTAL ACRES	PERCENT DEVELOPED
Sarasota	FL-47		2,400	2,800	83%
Lido Key	FL-48		900	1,200	75%
Longboat Key	FL-49		1,700	2,900	30%
Anna Maria Key	FL-50		1,900	2,600	74%
Long Key	FL-55		1,300	1,600	80%
Treasure Island	FL-56		850	1,100	78%
Sand Key	FL-57		2,400	3,500	70%
Clearwater Beach Island	FL-58		1,200	1,400	85%
Saint Andrew	FL-77		1,500	1,700	88%
Miramar	FL-78	(Undeveloped)	2,500	11,100	23%
Santa Rosa Island	FL-79	(Undeveloped)	2,700	11,200	25%
Mobile Point	AL-03	(Undeveloped)	2,700	17,300	16%
Dauphin Island	AL-05		1,300	4,600	28%
Grand Isle	LA-14		1,900	4,000	48%
High Island	TX-01	(Undeveloped)	3,000	116,000	3%
Bolivar Peninsula	TX-02	(Undeveloped)	3,000	25,000	12%
Galveston Island	TX-03	(Undeveloped)	10,000	27,000	35%
Matagorda Island	TX-10	(Protected)	2,000	56,100	4%
Mustang Island	TX-12	(Undeveloped)	1,000	10,000	10%

UNDEVELOPED BARRIER ISLANDS

Islands or groups of islands which have (1) no development, (2) minor amounts of development not exceeding 10% of their total land area, or (3) 5,000 or more acres of undeveloped land area.

ISLAND NAME	ISLAND NUMBER		ACRES DEVELOPED	TOTAL ACRES	PERCENT DEVELOPED
Castle Neck	MA-02		1,250	1,300	4%
Duxbury	MA-09		1,000	1,100	9%
Ester	MA-19		180	200	10%
Musteget	MA-20		350	350	0%
Cape Page	MA-21		700	700	0%
Edgartown	MA-23		450	500	10%
Tisbury	MA-24		270	300	10%
Nashawena	MA-25		150	150	0%
Cuttyhunk Island	MA-26		550	600	9%
Napatree	RI-04		90	100	10%
Stonington	RI-05		60	60	0%
Gardiners Island	NY-02		450	500	10%
Cedar Island	VA-05		4,250	4,300	1%
Fishermans Island	VA-10		1,500	1,500	0%
Bodie Island North	VA-11		7,600	8,100	9%
Bodie Island South	NC-01	(Developed)	38,400	45,500	16%
Ashe Island	NC-11	(Developed)	7,000	9,000	22%
Lee Island	NC-12		1,500	1,500	0%
Rich Inlet	NC-13		1,300	1,300	0%
Smith Island	NC-18		5,800	6,300	8%
Bird Island	NC-23		300	300	0%
Waites Island	SC-01		900	1,000	10%
Debidue Beach	SC-04		1,350	1,500	10%
Dewees Island	SC-13		1,500	1,600	7%
Morris Island	SC-16		2,800	2,900	4%
Kaiwah	SC-18		7,600	8,000	5%
Seabrook Island	SC-19		4,800	5,300	9%
Botany Bay 1	SC-21				
Edisto Island	SC-22	(Developed)	14,900	16,200	8%
Pine Island	SC-23		2,200	2,200	0%
Otter Island	SC-24		3,600	3,600	0%

ISLAND NAME	ISLAND NUMBER		ACRES DEVELOPED	TOTAL ACRES	PERCENT DEVELOPED
Hunting Island	SC-25		5,700	6,000	5%
Fripp Island	SC-26		3,900	4,300	9%
Pritchards Island	SC-27		2,600	2,600	0%
Little Capers Island	SC-28		2,050	2,100	2%
Saint Phillips Island	SC-29		5,400	5,400	0%
Bay Point	SC-30		1,200	1,200	0%
Hilton Head	SC-31	(Developed)	9,000	22,000	59%
Daufuskie Island	SC-32		6,000	6,200	3%
Jones Island	SC-34		2,600	2,600	0%
Little Tybee Island	GA-02		6,800	6,800	0%
Ossabaw	GA-05		24,700	25,000	1%
Little Saint Simons	GA-10		9,000	9,000	0%
Saint Simons	GA-12	(Developed)	25,000	28,000	11%
Amelia Island	FL-01	(Developed)	10,500	16,100	35%
Bird Island	FL-02		100	100	0%
Guana Island	FL-04		3,600	4,000	10%
Mantanzas	FL-06		3,900	4,200	7%
Mosquito	FL-08	(Developed)	13,200	15,300	14%
Cocoa	FL-10	(Developed)	7,600	21,600	64%
Vero Beach Island	FL-11	(Developed)	11,200	14,700	23%
Hutchinson	FL-12	(Developed)	6,400	7,400	14%
Fisher Island	FL-20		190	200	5%
Cape Romano	FL-30		1,500	1,500	0%
Rice Island	FL-31		1,200	1,200	0%
Keewaydin	FL-33		2,900	3,000	3%
Big Hickory Island	FL-36		270	300	10%
Little Gasparilla Group	FL-44		1,260	1,400	10%
Bay Port	FL-62		140	150	7%
Pine Island	FL-63		95	100	5%
Chassonowitzka	FL-64		25,000	25,000	0%
Piney Island	FL-67		1,400	1,400	0%
Mashes Island	FL-68		1,500	1,600	6%
St. George Island	FL-71		5,800	6,300	8%
Miramar	FL-78	(Developed)	8,600	11,100	23%
Mobile Point	AL-03	(Developed)	14,600	17,300	16%

ISLAND NAME	ISLAND NUMBER		ACRES DEVELOPED	TOTAL ACRES	PERCENT DEVELOPED
Sand Island	AL-04		200	200	0%
Deer Island	MS-03		400	400	0%
Cat Island	MS-05		2,500	2,500	0%
Sable Island	LA-04		150	150	0%
Raccoon Point	LA-05		800	800	0%
Coquile Point	LA-06		2,000	2,200	9%
Bird Island	LA-07		50	50	0%
Pelican Island	LA-08		2,280	2,300	1%
Bastian Island	LA-09		1,300	1,300	0%
Joe Wise	LA-10		500	500	0%
Bay Lamer	LA-11		4,800	5,300	9%
Ronquille Island	LA-12		250	250	0%
Grand Terre Island Group	LA-13		2,400	2,500	4%
Isles Dernieres	LA-18		4,900	5,100	4%
High Island	TX-01	(Developed)	13,000	16,000	3%
Bolivar Peninsula	TX-02	(Undeveloped)	22,000	25,000	12%
Galveston Island	TX-03	(Undeveloped)	17,000	27,000	35%
Follets Island	TX-04		6,300	7,000	10%
Brazos	TX-05		3,100	3,300	7%
Cedar Lakes	TX-06		5,700	6,000	5%
Brown Cedar	TX-07		1,450	1,500	4%
Matagorda Peninsula E.	TX-08		11,100	11,300	2%
Matagorda Peninsula W.	TX-09		18,300	18,700	2%
St. Joseph Island	TX-11		24,200	24,400	1%
Mustang Island	TX-12	(Developed)	9,000	10,000	10%
Padre Island South	TX-15		14,100	15,000	6%
Boca Chica Island	TX-16		4,600	5,000	8%

PROTECTED BARRIER ISLANDS

ISLAND	NUMBER		
Sheepshot	ME-01		Reid State Park
Popham	ME-02		Popham Beach State Park
Plum Island	MA-02		Parker Rivers NWR, Plum Island State Park
Nahant	MA-05		
Long Beach	MA-10		
Sandy Neck	MA-11		
Great Island	MA-13		Cape Cod National Seashore
Nauset	MA-16		Cape Cod National Seashore
Monomoy	MA-17		Monomoy NWR
Katama Bay	MA-22		
Horseneck Beach	MA-27		Horseneck Beach State Preservation
Hammonasset Point	CT-01		Hammonasset Beach State Park
Maidstone Park	NY-04		
Northwest Harbor	NY-05		
Orient Beach	NY-07		Orient Beach State Park
Morton	NY-09		Morton NWR
Fire Island	NY-12	(Developed)	Fire Island National Seashore, Robert Moses State Park
Jones Beach Island	NY-13	(Developed)	Gilgo State Park, Jones Beach State Park
Pullen Island	NJ-04		Brigantine NWR
Assateague North	MD-02		Assateague Island National Seashore, Assateague State Park
Assateague South	VA-01		Chincoteague NWR
Wallops Island	VA-02		NASA
Metomkin Island	VA-04		Nature Conservancy
Parromore Island	VA-06		Nature Conservancy
Hog Island	VA-07		Nature Conservancy
Cobb Island	VA-08		Nature Conservancy
Smith Island Group	VA-09		Nature Conservancy, State Natural Area
Hatteras Island	NC-02	(Developed)	Cape Hatteras N.S., Pea Island NWR
Ocracoke Island	NC-03		Cape Hatteras N.S.
Portsmouth Island	NC-04		Cape Lookout N.S.
Core Banks North	NC-05		Cape Lookout N.S.

ISLAND	NUMBER		
Core Banks South	NC-06		Cape Lookout N.S.
Shackleford Banks	NC-07		Cape Lookout N.S.
Hammock Island	NC-09		Hammock Beach State Park
Onslow Island	NC-10		Marine Corps Reservation
Masonboro Island	NC-16		Carolina Beach State Park
Carolina Beach Island	NC-17	(Developed)	Masonboro State Park
North Island	SC-05		State Wildlife Refuge
South Island	SC-06		State Wildlife Refuge
Cedar Island	SC-07		State Wildlife Refuge
Murphy Island	SC-08		State Wildlife Refuge
Cape Island	SC-09		Cape Romain NWR
Raccoon Key	SC-10		Cape Romain NWR
Bull Island	SC-11		Cape Romain NWR
Capers Island	SC-12		State Wildlife Refuge
Deveaux Banks	SC-20		Audubon Society Wildlife Refuge
Turtle Island	SC-33		State Wildlife Refuge
Williamson Island	GA-03		
Wassaw Island	GA-04		Wassaw NWR
St. Catherines Island	GA-06		John Noble Foundation
Blackbeard Island	GA-07		Blackbeard Island NWR
Sapelo Island	GA-08		State Wildlife Refuge
Wolf Island	GA-09		Wolf Island NWR
Jekyll Island	GA-13	(Developed)	Jekyll Island State Park
Little Cumberland Island	GA-14		Cumberland Island N.S.
Cumberland	GA-15		Cumberland Island N.S.
Little Talbot Island	FL-03		Little Talbot Island State Park
Anastasia Island	FL-05	(Developed)	Anastasia State Park, Butler State Park
Virginia Key	FL-21		
Cape Sable	FL-23		Everglades National Park
Mud Bay	FL-24		Everglades National Park
Shark Point	FL-25		Everglades National Park
Key McLaughlin	FL-26		Everglades National Park
Alligator Cove	FL-27		Everglades National Park
Duck Rock	FL-28		Everglades National Park
Ten Thousand Island	FL-29		Everglades National Park

ISLAND	NUMBER		
North Captiva Island	FL-41		
Cayo Costa	FL-42		
Casey Key	FL-46		
Passage Key	FL-51		Passage Key NWR
Egmont Key	FL-52		
Mullet Key Group	FL-53		
Caladesi Island	FL-59		Caladesi Island State Park
Honeymoon Island	FL-60		Caladesi Island State Park
Anclote Keys	FL-61		Caladesi Island State Park, Anclote Keys NWR
Seashore Keys	FL-65		Cedar Keys NWR
Cape San Blas	FL-74		St. Joseph Peninsula State Park
Crooked Island	FL-75		
Shell Island	FL-76		St. Andrews State Recreation Area
Santa Rosa Island	FL-79	(Developed)	Gulf Islands N.S.
Petit Bois Island	MS-01		Gulf Islands N.S.
Horn Island	MS-02		Gulf Islands N.S.
Ship Island	MS-04		
Chandeleur Island Group	LA-01		Brenton NWR
Grand Gosier Island	LA-02		State Wildlife Refuge
Breton Island	LA-03		Breton NWR
Caminada	LA-15		
East Timbalier Island	LA-16		
Matagorda Island	TX-10	(Developed)	Department of Defense Reservation
Padre Island North	TX-13		Padre Island N.S.
Padre Island Central	TX-14		Padre Island N.S.

NON-CATEGORIZED BARRIER ISLANDS

ISLAND	NUMBER
Small Point	ME-03
Seabrook	NH-02
Salisbury	MA-01
Towel	MA-04
Revere Beach	MA-06
Nobscusset Point	MA-12
Eastham	MA-15
Charlestown	RI-01
Weekapug	RI-02
Atlantic	RI-03
Block Island Beach	RI-06
Black Rock	CT-02
Fishers Island	NY-01
Fireplace	NY-03
Southampton	NY-10
Ludlam	NJ-08
Wrightsville Beach	NC-15
Sunset Beach Island	NC-22
Murrells Inlet	SC-02
Pawleys Island	SC-03
Sullivans Island	SC-15
Folly Island	SC-17
Sea Island	GA-11
Naples Park	FL-34
Bonita Beach	FL-35
Black Island	FL-37
Captiva Island	FL-40
Cabbage Key Group	FL-54
Cedar Keys	FL-66
Alligator Point	FL-69
Dog Island	FL-70
Indian Peninsula	FL-73
Perdido Key East	FL-80
Perdido Key West	AL-01
Romar Beach	AL-02
Timbalier Island	LA-17

APPENDIX C

NATURAL LANDMARKS ON BARRIER ISLANDS

NATURAL LANDMARKS ON BARRIER ISLANDS

The Natural Landmarks Program records were reviewed to inventory the status of natural landmarks on the study units used in the Barrier Island Protection Study. For each registered, eligible, or potential natural landmark, the natural features which possess, or appear to possess, attributes of national significance were identified. The attached chart summarizes this information.

The identified significant resource features are not necessarily all-inclusive. They tend to reflect the professional knowledge of those who studied the area. For example, the chart may show many significant vegetation characteristics for a particular island, but few for animal habitat. This does not necessarily mean that the island lacks significant animal habitat values. It may mean only that the investigators did not focus on the latter area or did not have sufficient information to list significant animal habitat values.

In some cases - notably the Virginia and Georgia barrier islands - a large number of barrier island study units were grouped together in a single landmark designation. Since the attributes of individual islands are not identified, the same attributes were applied to each unit in preparing the chart. This procedure may somewhat overstate the significance of particular natural landmarks on barrier islands. Since the islands

within the groups are quite similar, this tendency should not significantly affect interpretation of the chart, however.

In a few cases, there are two landmarks within a single barrier island study unit. The significant resources features of the two landmarks were combined in preparing the body of the chart.

The reader will note that the chart contains many more entries for the Atlantic Coast than for the Gulf Coast. This is because studies are still in progress for the Gulf Coast, whereas they have been completed for the Atlantic. Unquestionably, many more barrier islands in the Gulf States will be shown to possess significant resource features when the latter study is completed.

The chart displays 72 entries. Of the 72, 17 have been officially designated either in whole or in part as natural landmarks by the Secretary of Interior (13 are registered, 4 are eligible). Of the remainder, experience indicates that about half will eventually be determined to contain nationally significant natural resources; the other half will be shown to contain resources of regional or local significance.

NATURAL LANDMARKS ON BARRIER ISLANDS

Barrier Island Unit and Study Number	Natural Landmark Status Register/Eligible/Potential			SIGNIFICANT RESOURCE FEATURES Vegetation Types	Rare and Endangered Plants	Animal Habitat (Inc. those of R & E Species)	Aquatic Environment	Physiography	Aesthetics
N.H. Hampton 01			x						
Seabrook 02			X			waterbirds			
MA Salisbury 01			x		rare species				
Plum Island 02			X	saltmarsh				beach, dunes	
Humarock 08		X	X	Forest, salt & fresh water marsh		waterbirds	estuary, fish & shellfish nursery estuary		
Duxbury 09			X	Grassland			estuary		
Nauset 16			X	Grassland, saltmarsh		migrat. birds, waterfowl	estuary, fish & shellfish nursery		
Monomoy 17			X	various types		waterbirds, rare species	freshwater ponds	diversity	
Musteget 20			X	various types		various			
Sandy Neck 11			X	various types		various		diversity	isolated, pristine
Nashawena 25			X	various types	rare species	various	freshwater ponds	diversity	
Cuttyhunk 26			X	various types	rare species	various	freshwater ponds	diversity	
Cape Page 21			X	various types	rare species	various	freshwater ponds	rare features	
Edgartown 23			X	Forest, swamp		various	ponds, nursery	various	
Tisbury 24			X	Forest, swamp		various	ponds, nursery	various	

NATURAL LANDMARKS ON BARRIER ISLANDS

Barrier Island Unit and Study Number	Natural Landmark Status Register/Eligible/Potential			SIGNIFICANT RESOURCE FEATURES Vegetation Types	Rare and Endangered Plants	Animal Habitat (Inc. those of R & E Species)	Aquatic Environment	Physiography	Aesthetics
R.I. Block Island 06			X	swamp, bog		various		diversity	
N.Y. Gardiner's Isl. 02		X		various		various	estuary	rare features	isolated, vistas
Orient Beach 07			X	forest	rare species	various	nursery		
Morton 09			X	various		various		rare features	
Hampton 11			X	saltmarsh		various			
Fire Island 12			X			various			
Long Beach 14			X	various		waterbirds, water fowl			
N.J. Barnegat 02			X	various		various	estuary, nursery	beach	
Long Beach 03			X	various		various	estuary, nursery	beach	
Brigantine 05			X	various		various	freshwater ponds		
Seven Mile Bch. 09	X		2X	various		various			

NATURAL LANDMARKS ON BARRIER ISLANDS

SIGNIFICANT RESOURCE FEATURES

Barrier Island Unit and Study Number	Natural Landmark Status Register/Eligible/Potential			Vegetation Types	Rare and Endangered Plants	Animal Habitat (Inc. those of R & E Species)	Aquatic Environment	Physiography	Aesthetics
DE Fenwick Isl. N. 02			X	various		various	nurseries		
Rehoboth 01			X	saltmarsh		various			
VA Assateague S. 01	X			various		various	freshwater ponds		
Wallops Island 02	X			salt & fresh marshes		various			
Assanomen 03	X			various		various	freshwater ponds, estuary	various	isolated, pristine
Metomkin 04	X			various		various	freshwater ponds, estuary	various	isolated, pristine
Cedar Island 05	X			various		various	freshwater ponds, estuary	diversity, beach	isolated, pristine
Parramore Isl. 06	X			various		various	freshwater ponds, estuary	diversity, beach	isolated, pristine
Hog Island 07	X			various		various	freshwater ponds, estuary	diversity, beach	isolated, pristine
Cobb Island 08	X			various		various	freshwater ponds, estuary	diversity, beach	isolated, pristine

NATURAL LANDMARKS ON BARRIER ISLANDS

SIGNIFICANT RESOURCE FEATURES

Barrier Island Unit and Study Number	Natural Landmark Status Register/Eligible/Potential			Vegetation Types	Rare and Endangered Plants	Animal Habitat (Inc. those of R & E Species	Aquatic Environment	Physiography	Aesthetics
VA Smith Island 09	X			various		various	freshwater ponds, estuary	diversity, beach	isolated, pristine
Fisherman's Isl. 10	X			various		various		rare features	
N.C. Bodie Isl. South 01		X		various	rare species		freshwater ponds	rare features, dunes	
Hatteras Island 02			X	various	rare species			rare features, dunes	
Bogue Banks 08			X	various		endangered species			
Hammock Island 09			X	forest		waterbirds, rare species		beach, dunes	vistas
Smith Island 18		X	X	various	rare species	waterbirds, endangered species		various	isolated, pristine, vistas
S.C. Murells Inlet 02			X	various		various	freshwater ponds	beach, dunes	vistas
Debidue Beach 04			X	various			estuary		
Bull Island 11			X	forest					isolated, pristine

NATURAL LANDMARKS ON BARRIER ISLANDS

SIGNIFICANT RESOURCE FEATURES

Barrier Island Unit and Study Number	Natural Landmark Status Register/Eligible/Potential			Vegetation Types	Rare and Endangered Plants	Animal Habitat (Inc. those of R & E Species)	Aquatic Environment	Physiography	Aesthetics
S.C. Edisto Island 22			X	various		rare species		dunes	isolated, pristine
Hunting Island 25			X	various	rare species	rare, endangered species		beach, dunes	isolated, pristine, vistas
St. Phillips Isl. 29			X	various		rare, endangered species	freshwater ponds, nursery	various	isolated, pristine, vistas
GA Tybee Island 01			X	various		various	freshwater ponds	beach, dunes	isolated, pristine
Ossabaw Island 05			X	various		various	freshwater ponds	beach, dunes	isolated, pristine
St. Catherine's 06			X	various		various	freshwater ponds	beach, dunes	isolated, pristine
Blackbeard Isl. 07			X	various		various	freshwater ponds	beach, dunes	isolated, pristine
Sapelo Island 08			2X	various		various	freshwater ponds	beach, dunes	isolated, pristine

NATURAL LANDMARKS ON BARRIER ISLANDS

Barrier Island Unit and Study Number	Natural Landmark Status Register/Eligible/Potential			SIGNIFICANT RESOURCE FEATURES Vegetation Types	Rare and Endangered Plants	Animal Habitat (Inc. those of R & E Species)	Aquatic Environment	Physiography	Aesthetics
GA Wolf Island 09			X	various		various	freshwater ponds	beach, dunes	isolated, pristine
Little St. Simons 10			X	various		various	freshwater ponds	beach, dunes	isolated, pristine
Little Cumberland Island 14			X	various		various	freshwater ponds	beach, dunes	isolated, pristine
Cumberland Island 15			X	various		various	freshwater ponds	beach, dunes	isolated, pristine
Wassaw Island 04	X			various	rare species				isolated, pristine
FL Amelia 01			2X	various		various		dunes	
Bird Island 02			X	grassland		waterbirds			isolated, pristine
Little Talbot Isl. 03			X	various		endangered species		dunes	isolated, pristine
Guana Island 04			X	various		rare species		dunes	vistas

NATURAL LANDMARKS ON BARRIER ISLANDS

Barrier Island Unit and Study Number	Natural Landmark Status Register/Eligible/Potential			SIGNIFICANT RESOURCE FEATURES Vegetation Types	Rare and Endangered Plants	Animal Habitat (Inc. those of R & E Species	Aquatic Environment	Physiography	Aesthetics
FL									
Jupiter Island 13	X			various		endangered species			isolated, pristine
St. Vincent Isl. 72			X			rare species	freshwater ponds		isolated, pristine
Shell Island 76			X	grassland		mammals			isolated, pristine
LA									
Chandeleur Isl. 01			X	swamp, saltmarsh		various		rare features, beaches	isolated, pristine
Breton Island 03			X	swamp, saltmarsh		various		rare features, beaches	isolated, pristine

APPENDIX D

NATIONAL REGISTER PROPERTIES ON BARRIER ISLAND STUDY UNITS

NATIONAL REGISTER PROPERTIES ON BARRIER ISLAND STUDY UNITS

The following properties appear to be located on barrier island study units based on information available for both the units and the properties.

STATE	BARRIER ISLAND UNIT	NATIONAL REGISTER PROPERTY[1]
ME	Popham Beach 02	Popham Colony Site Fort Popham Memorial
	Biddleford Pool 06	Fletchers Neck Lifesaving Station
MA	Revere Beach 06	Slade Spice Mill
	Duxbury 09	Plymouth Light Station
	Eastham 15	Edward Penniman House and Barn
RI	Charlestown 01	Historic Village of the Naragansetts Fort Ningrete Indian Burial Ground
NY	Orient Beach 06	Orient Historic District
NJ	Sandy Hook 01	*Sandy Hook Light
	Barnegat 02	Barnegat Light Public School Barnegat Lighthouse
	Brigantine 05	U.S. Coast Guard Station
	Atlantic City 06	Absecon Lighthouse Morton Hotel Blenheim Hotel
	Wildwood 10	Hereford Lighthouse
VA	Assateague Island, S. 01	Assateague Lighthouse
	Metomkin Island 04	Bowman's Folly

[1]Properties which appear to be located within barrier island study units based on information available for both the units and the properties. Further investigation may reveal sites that were inappropriately included in the list and sites that were excluded, but such errors in the listing would be expected to average less than 5% of the total. **This list is as of October 1978.**

*National Historic Landmarks

STATE	BARRIER ISLAND UNIT	NATIONAL REGISTER PROPERTY
NC	Core Banks, N. 05	Cape Lookout Light Station
	Smith Island 18 (Cape Fear)	Orton Plantation St. Philip's Church Ruins
SC	Pawleys Island 03	Pawleys Island Historic District
	Sullivans Island 15	The Battery Gadsden The Battery Thomson The U.S. Coast Guard Historic District (Sullivans Island Station)
	Edisto Island 22	Windsor Plantation Black Hill Plantation Outbuildings *Brick House Ruin Edisto Island Presbyterian Church Middleton's Plantation Old House Plantation Peter's Point Plantation Presbyterian Manse William Seabrook House Spanish Mount Point (The Mound) Trinity Episcopal Church
	Hunting Island 25	Hunting Island State Park Lighthouse
	Hilton Head Island 31	Sea Pines Green's Shell Enclosure Skull Creek (Hilton Head)
GA	St. Catherine's Island 06	*St. Catherine's Island (Spanish mission and home of Button Gwinnett, signer of the Declaration of Independence)
	St. Simons Island 12	St. Simons Lighthouse Keeper's Building
	Jekyll Island 13	Faith Chapel Horton-Dubignon House, Brewery Ruins, and Dubignon Cemetery Jekyll Island Club Rockefeller Cottage
FL	Anastasia 05 Matanzas 06	Spanish Coquina Quarries Fort Matanzas National Monument
	Mosquito 08	Turtle Mound
	Cape Canaveral 09	Launch Complex #39, Kennedy Space Center

STATE	BARRIER ISLAND UNIT	NATIONAL REGISTER PROPERTY
FL	Hutchison Island 12	House of Refuge at Gilbert's Bar
	Jupiter Island 13	Jupiter Inlet Lighthouse
	Palm Beach 15	Bingham-Blossom House (Figulus) Breakers Hotel Complex Brelsford House (Banyans) Henry Morrison Flagler House (White Hall) Mar-a-lago National Historic Site Paramount Theatre Building
	Fort Lauderdale 18	New River Inn (The City Hall Annex) Stranahan House
	Miami Beach 19	North Miami Beach Old Spanish Monastery
	Naples Park 34	Seaboard Coastline Railroad Depot
	Estero Island 38	Koreshan Unity Settlement Historic District Mound Key (Estero Bay)
	Sanibel Island 39	Sanibel Lighthouse and Keeper's Quarters
	Chassanowitzka 64	Yulee Sugar Mill Ruins
AL	Dauphin Island 05	Indian Mound Park
MS	Ship Island 04	Fort Massachusetts
LA	Grande Terre Island Group 13	Fort Livingston
TX	Galveston Island 02	Galveston Causeway (spans to the island) U.S.S. Hatteras (Outer Continental Shelf)
	Cedar Lakes 06	John McCroskey Cabin
	Brazos Island 16	Brazos Santiago Depot
TOTALS		
14 States	43 Study Units	76 National Register Properties

APPENDIX E

MANAGEMENT POLICY FOR SHORELINE PROCESSES IN AREAS OF THE NATIONAL PARK SYSTEM

MANAGEMENT POLICY FOR SHORELINE PROCESSES IN AREAS OF THE NATIONAL PARK SYSTEM

In natural zones, shoreline process - erosion, deposition, dune formation, inlet formation, etc. - will be allowed to take place naturally, except where control measures, required by law or Service commitment, are necessary to protect life and property in neighboring areas.

In historic zones, control measures, if necessary, will be predicated on thorough studies taking into account the nature and rate of the shoreline processes, the threat to the cultural resource, the significance of the cultural resources, and alternatives including costs for protecting the cultural resource. Such studies must also determine if and how control measures would impair resources and processes in natural zones, in order that management may make an informed decision on the course of action to be followed.

In development zones, management should plan to phase out, systematically relocate, or provide alternative developments to facilities located in hazardous areas. New facilities will not be placed in areas subject to flood or wave erosion hazard unless it can be demonstrated that they are essential to meet the park's purpose, that no alternative locations are available, and that the facilities will be reasonably assured of surviving during their planned lifespans without the need for shoreline control

measures. Before development in such areas is provided, the requirements of Executive Order 11968, "Floodplain Management," must be fulfilled. Where erosion control is required by law, or where present developments must be protected to achieve park management objectives, the Service will employ the most natural appearing and effective method feasible.

Most shoreline areas of the National Park System are part of larger physiographic and ecological systems, and the processes of these larger systems directly affect the management of those NPS areas contained therein. Therefore, the Service shall seek to obtain the assistance of appropriate Federal, State, and local agencies in carrying out the management objectives of NPS shoreline areas.

The Service will cooperate with State and other Federal entities to develop strategies for maintaining existing transportation and utility links on barrier islands in the event of storm damage or inlet formation. Where these links are interrupted by inlet formation, the Service will recommend, within the limits of practicality, reestablishment in a manner that allows the unimpeded operations of inlet formation and closure.

Where navigation channels are established in NPS waters, the Service will work with the responsible agency to see that necessary dredging is carefully controlled and that dredged material is disposed of in such a manner as to have the least adverse impact on the aquatic ecosystem and to optimize the value of spoil deposit as wildlife habitat.

APPENDIX F

BARRIER ISLAND INVENTORY

HERITAGE CONSERVATION & RECREATION SERVICE

RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

AL03	AL	BALDWIN	MOBILE POINT		200		17100	2	1	2700	200	16400	21		
AL01	AL	BALDWIN	PERDIDO KEY WEST				1500	2	1	300		1200	2		
AL02	AL	BALDWIN	ROMAR BEACH		1000		3600	2	1	900	1000	2700	8		
AL05	AL	MOBILE	DAUPHIN ISLAND			100	4500	3	1	1300	100	3200	15		
AL04	AL	MOBILE	SAND ISLAND				200	1	1			200	3		
FEDMGT=		ST MGT=	1200	OTHMGT=	100	PRVMGT=	26980	#1ACRS=	5200	#2ACRS=	1300	#3ACRS=	21700	B-MILS=	49
CT02	CONN.	FAIRFIELD	BLACK ROCK					500	4	1	350		150	2	
CT03	CONN.	FAIRFIELD	PLEASURE BEACH/LONG BEACH			125		3	1	1	78	47		3	
CT04	CONN.	MIDDLESEX	MENUNKETESUCK ISLAND					10	1	1			10	1	
CT07	CONN.	NEW HAVEN	HAMMONASSET BEACH		484			21	1	1		484	21	3	
CT01	CONN.	NEW HAVEN	HAMMONASSET POINT		900			2	1	1	250	650		2	
CT05	CONN.	NEW HAVEN	MILFORD POINT			5		85	1	1		5	85	2	
CT06	CONN.	NEW HAVEN	SANDY POINT AND HORSES PARK			40			1	1		40		2	
CT12	CONN.	NEW LONDON	BLACK POINT BEACH					30	1	1		30		3	
CT09	CONN.	NEW LONDON	BLUFF POINT		30				1	1		30		1	
CT10	CONN.	NEW LONDON	GOSHEN COVE BEACH		3			22	1	1		25			
CT14	CONN.	NEW LONDON	GRISWOLD POINT					37	1	1		37		1	
CT13	CONN.	NEW LONDON	HATCHETT POINT					10	2	1		5	5		
CT11	CONN.	NEW LONDON	JORDAN COVE BEACH					15	1	1			15	1	
CT08	CONN.	NEW LONDON	OCEAN BEACH PARK/HARKNESS SPIT			45			1	1		45		1	
FEDMGT=		ST MGT=	1417	OTHMGT=	215	PRVMGT=	730	#1ACRS=	670	#2ACRS=	1398	#3ACRS=	286	B-MILS=	22
DE02	DEL	SUSSEX	FENWICK ISLAND NORTH				500		2900	3	0	1300	500	1600	11
DE01	DEL	SUSSEX	REHOBOTH		1000		1500	100	4100	3	0	1600	2600	2500	14
FEDMGT=		ST MGT=	2000	OTHMGT=	100	PRVMGT=	7000	#1ACRS=	2900	#2ACRS=	3100	#3ACRS=	4100	B-MILS=	25

THE COLUMNS PRINTED ABOVE ARE LEFT TO RIGHT:

FORMA,STNAME,CNTYNM,ISL_NM,FEDMGT,ST_MGT,OTHMGT,PRVMGT,% CODE,URBLOC,#1ACRS,#2ACRS,#3ACRS,B-MILS,

HERITAGE CONSERVATION & RECREATION SERVICE

RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

FL75	FL	BAY	CROOKED ISLAND	1700			1	0		1700		11
FL76	FL	BAY	SHELL ISLAND	400	400		500	2	0	50	800	450	6
FL77	FL	BAY	ST. ANDREW	100	200		1400	2	0	1500	200		6
FL09	FL	BREVARD	CAPE CANAVERAL	19400			4	0		15000	4400		21
FL10	FL	BREVARD	COCOA	1500		500	19600	4	1	14000	2000	5600	39
FL18	FL	BROWARD	FORT LAUDERDALE		100	100	900	5	1	1000	100		4
FL17	FL	BROWARD	HILLSBORO BEACH			100	800	5	1	800	100		6
FL44	FL	CHARLOTTE	LITTLE GASPARILLA GROUP				1400	2	0	140		1260	7
FL46	FL	CITRUS	CHASSAHOWITZKA	7000			18000	1	0		7000	18000	22
FL35	FL	COLLIER	BONITA BEACH			100	1300	3	0	200	100	1100	6
FL30	FL	COLLIER	CAPE ROMANO				1500	1	0			1500	2
FL33	FL	COLLIER	KEE BAYDIN				3000	1	0	100		2900	9
FL32	FL	COLLIER	MARCO ISLAND			100	5000	3	0	1700	100	3300	4
FL34	FL	COLLIER	NAPLES PARK		100	100	1100	2	0	300	100	900	8
FL31	FL	COLLIER	RICE ISLAND				1200	1	0			1200	2
FL29	FL	COLLIER	TEN THOUSAND ISLANDS	6000	9000		8000	1	0		15000	8000	23
FL20	FL	DADE	FISHER ISLAND				200	2	1	20		180	1
FL22	FL	DADE	KEY BISCAYNE		300	1100	900	4	1	1300	1000		5
FL19	FL	DADE	MIAMI BEACH			300	7000	5	1	7200	100		14
FL21	FL	DADE	VIRGINIA KEY			1200		3	1	600	600		2
FL02	FL	DUVAL	BIRD ISLAND				100	1	1			100	1
FL03	FL	DUVAL	LITTLE TALBOT ISLAND		2500			2	1	100	2400		4
FL80	FL	ESCAMBIA	PERDIDO KEY EAST	300			2600	2	1	600	300	2000	13
FL06	FL	FLAGLER	MATANZAS		200		4000	3	1	300	200	3700	10
FL69	FL	FRANKLIN	ALLIGATOR POINT				3100	2	0	800		2300	9
FL70	FL	FRANKLIN	DOG ISLAND				2000	2	0	500		1500	8
FL71	FL	FRANKLIN	ST. GEORGE ISLAND	100	1000		5200	2	0	500	1100	4700	29
FL72	FL	FRANKLIN	VINCENTS ISLAND	12300				1	0		12300		9
FL74	FL	GULF	CAPE SAN BLAS	200	3000		2600	2	0	400	3200	2200	20
FL73	FL	GULF	INDIAN PENINSULA				400	2	0	100		300	2
FL62	FL	HERNANDO	BAY PORT			50	100	2	0	10	50	90	1
FL63	FL	HERNANDO	PINE ISLAND			25	75	2	0	5	25	70	1
FL52	FL	HILLSBORO	EGMONT KEY	500				1	1		500		2
FL11	FL	IND.R.CO	VERO BEACH ISLAND	1000	200		13500	2	1	3500	1200	10000	29
FL36	FL	LEE	BIG HICKORY ISLAND				300	2	0	30		270	1
FL37	FL	LEE	BLACK ISLAND			100	500	2	0	100	100	400	2
FL41	FL	LEE	CAPTIVA ISLAND			100	1100	3	0	500	100	600	5
FL42	FL	LEE	CAYO COSTA		1600		1000	1	0		1600	1000	9
FL38	FL	LEE	ESTERO ISLAND			50	1350	4	0	1000	50	350	7
FL43	FL	LEE	GASPARILLA			100	2000	3	0	1000	100	1000	7
FL40	FL	LEE	NORTH CAPTIVA ISLAND		400		300	1	0		400	300	3
FL39	FL	LEE	SANIBEL ISLAND	5000		400	6300	2	0	2300	5400	4000	13
FL66	FL	LEVY	CEDAR KEYS			100	900	4	0	500	100	400	1
FL65	FL	LEVY	SEAHORSE KEYS	300				1	0		300		3
FL50	FL	MANATEE	ANNA MARIA KEY			300	2300	4	1	1900	300	400	8
FL51	FL	MANATEE	PASSAGE KEY	60				1	1		60		1
FL13	FL	MARTIN	JUPITER ISLAND	200			3300	3	1	1000	200	2300	16

THE COLUMNS PRINTED ABOVE ARE LEFT TO RIGHT:

FORM#,STNAME,CNTYNM,ISL NM,FEDMGT,ST MGT,OTHMGT,PRVMGT,% CODE,URBLOC,#1ACRS,#2ACRS,#3ACRS,B-MILS,

TODAYS DATE 04/05/79

UNITED STATES DEPARTMENT OF THE INTERIOR
HERITAGE CONSERVATION & RECREATION SERVICE
RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

FL27	FL	MONROE	ALLIGATOR CAVE	35000				1	0		35000		18
FL23	FL	MONROE	CAPE SABLE	4100				1	0		4100		12
FL28	FL	MONROE	DUCK ROCK	20000				1	0		20000		13
FL26	FL	MONROE	KEY MCLAUGHLIN	19300				1	0		19300		7
FL24	FL	MONROE	MUD BAY	8000				1	0		8000		6
FL25	FL	MONROE	SHARK POINT	58000				1	0		58000		13
FL01	FL	NASSAU	AMELIA ISLAND		1000		15100	3	1	5600	1000	9500	14
FL78	FL	OKALOOSA	MIRAMAR	100			11000	2	0	2500	100	8500	13
FL16	FL	PALMBEACH	BOCA RATON			200	2500	5	1	2300	200	200	14
FL14	FL	PALMBEACH	LAKE WORTH				800	4	1	600		200	6
FL15	FL	PALMBEACH	PALM BEACH			100	3300	5	1	3100	100	200	16
FL61	FL	PASCO	ANCLOTE KEYS	50	200		250	1	1		250	250	3
FL54	FL	PINELLAS	CABBAGE KEY GROUP			400	500	3	1	400	400	100	2
FL59	FL	PINELLAS	CALADESI ISLAND		700			1	1		700		2
FL58	FL	PINELLAS	CLEARWATER BEACH ISLAND			100	1300	4	1	1200	100	100	2
FL60	FL	PINELLAS	HONEYMOON ISLAND		700			2	1	100	600		2
FL55	FL	PINELLAS	LONG KEY			100	1500	5	1	1300	100	200	4
FL53	FL	PINELLAS	MULLET KEY GROUP			1200		2	1	500	700		6
FL57	FL	PINELLAS	SAND KEY			150	3350	4	1	2400	100	1000	14
FL56	FL	PINELLAS	TREASURE ISLAND			100	1000	5	1	850	100	150	4
FL05	FL	ST. JOHNS	ANASTASIA		9000		1200	2	0	1800	8400		14
FL04	FL	ST. JOHNS	GUANA ISLAND				4000	2	1	400		3600	15
FL12	FL	ST.LUCIE	HUTCHISON			100	7300	2	1	1000	100	6300	2
FL79	FL	SANTA ROSA	SANTA ROSA ISLAND	7500	2000		1700	2	1	2700	8500		48
FL46	FL	SARASOTA	CASEY KEY				1000	3	1	500		500	7
FL48	FL	SARASOTA	LIDO KEY			100	1100	4	1	900	100	200	2
FL49	FL	SARASOTA	LONGBOAT KEY				2900	4	1	1700		1200	10
FL45	FL	SARASOTA	MANASOTA KEY		100	100	1600	4	0	1100	200	500	12
FL47	FL	SARASOTA	SARASOTA			100	2700	5	1	2400	100	300	8
FL07	FL	VOLUSIA	FLAGLER		200		11900	4	1	8800	200	3100	37
FL08	FL	VOLUSIA	MOSQUITO	4000			11300	2	1	2100	4000	9200	28
FL68	FL	WAKULLA	MASHES ISLAND				1600	2	0	100		1500	3
FL67	FL	WAKULLA	PINEY ISLAND				1400	1	0			1400	4

FEDMGT= 212110 ST_MGT= 32900 OTHMGT= 7575 PRVMGT= 215125 #1ACRS= 103405 #2ACRS= 233735 #3ACRS= 130570 B-MILS= 791

THE COLUMNS PRINTED ABOVE ARE LEFT TO RIGHT:
FORM#,STNAME,CNTYNM,ISL_NM,FEDMGT,ST_MGT,OTHMGT,PRVMGT,& CODE,URBLOC,#1ACRS,#2ACRS,#3ACRS,B-MILS.

UNITED STATES DEPARTMENT OF THE INTERIOR
HERITAGE CONSERVATION & RECREATION SERVICE
RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

GA06	GA	LIBERTY	ST. CATHERINES ISLAND					15000	1	0		15000		11
GA15	GA	CAMDEN	CUMBERLAND ISLAND	15600		3000		7400	2	0	200	18600	7200	17
GA14	GA	CAMDEN	LITTLE CUMBERLAND ISLAND					2400	2	0	200		2200	2
GA02	GA	CHATHAM	LITTLE TYBEE ISLAND					6800	1	1			6800	3
GA05	GA	CHATHAM	OSSABAW ISLAND		25000				2	0	300		24700	10
GA01	GA	CHATHAM	TYBEE ISLAND					4100	3	1	1000		3100	3
GA04	GA	CHATHAM	WASSAW ISLAND	9800				300	1	1		9800	300	6
GA03	GA	CHATHAM	WILLIAMSON ISLAND		300				1	1		300		2
GA13	GA	GLYNN	JEKYLL ISLAND		6000				3	0	3000	3000		8
GA10	GA	GLYNN	LITTLE ST. SIMONS					9000	1	0			9000	6
GA11	GA	GLYNN	SEA ISLAND					2000	3	0	700		1300	5
GA12	GA	GLYNN	ST. SIMONS ISLAND			100		27900	2	0	3000	100	24900	3
GA07	GA	MCINTOSH	BLACKBEARD ISLAND	5600					1	0		5600		9
GA08	GA	MCINTOSH	SAPELO ISLAND		13500			4500	2	0	300	13500	4200	5
GA09	GA	MCINTOSH	WOLF ISLAND	5100				2200	1	0		5100	2200	3

FEDMGT= 36100 ST MGT= 44800 OTHMGT= 3100 PRVMGT= 81680 #1ACRS= 8700 #2ACRS= 71000 #3ACRS= 85900 B-MILS=

LA15	LA	JEFFERSON	CAMINADA			100		100	2	0	10	100	90	2
LA14	LA	JEFFERSON	GRAND ISLE	100	500			3400	3	0	1900	600	1500	7
LA13	LA	JEFFERSON	GRAND TERRE ISLAND GROUP		200			2300	2	0	100	200	2200	4
LA16	LA	LAFOURCHE	EAST TIMBALIER ISLAND		900			500	2	0	100	900	400	8
LA09	LA	PLAQUEMINE	BASTIAN ISLAND					1300	1	0			1300	5
LA11	LA	PLAQUEMINE	BAY LAMER					5300	3	0	500		4800	5
LA07	LA	PLAQUEMINE	BIRD ISLAND					50	1	0			50	1
LA03	LA	PLAQUEMINE	BRETON ISLANDS	1000					1	0	50	950		5
LA06	LA	PLAQUEMINE	COQUILE POINT					2200	1	0	200		2000	4
LA02	LA	PLAQUEMINE	GRAND GOSIER ISLAND					370	1	0			370	5
LA10	LA	PLAQUEMINE	JOE WISE					500	1	0			500	3
LA08	LA	PLAQUEMINE	PELICAN ISLAND					2300	1	0	20		2280	3
LA05	LA	PLAQUEMINE	RACCOON POINT					800	1	0			800	3
LA12	LA	PLAQUEMINE	RONQUILLE ISLAND					250	1	0			250	1
LA04	LA	PLAQUEMINE	SABLE ISLAND					150	1	0			150	1
LA01	LA	ST.BERNARD	CHANDELEUR ISLAND GROUP	6500				3700	1	0		6500	3700	34
LA18	LA	TERREBONNE	ISLES DERNIERES			200		4000	2	0	200	200	3800	17
LA17	LA	TERREBONNE	TIMBALIER ISLAND			200		4200	2	0	900	200	3300	9

FEDMGT= 7600 ST MGT= 1600 OTHMGT= 500 PRVMGT= 31420 #1ACRS= 3980 #2ACRS= 9650 #3ACRS= 27490 B-MILS= 117

THE COLUMNS PRINTED ABOVE ARE LEFT TO RIGHT:
FORM#, STNAME, CNTYNM, ISL NM, FEDMGT, ST MGT, OTHMGT, PRVMGT, % CODE, URBLOC, #1ACRS, #2ACRS, #3ACRS, B-MILS.

RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

NY14	N.Y.	NASSAU	LONG BEACH			600	2900	4	1	2900	600		920	
NY15	N.Y.	QUEENS	ROCKAWAY	300		500	3200	4	1	3200	800		10	
NY12	N.Y.	SUFFOLK	FIRE ISLAND	2000	1000	1500	2400	3	1	1900	4500	500	32	
NY03	N.Y.	SUFFOLK	FIREPLACE			40	50	3	0	50	40		1	
NY01	N.Y.	SUFFOLK	FISHERS	100		100	500	4	0	500	200		2	
NY02	N.Y.	SUFFOLK	GARDINERS IS. BEACHES				500	2	0	50		450	5	
NY11	N.Y.	SUFFOLK	HAMPTON			300	2400	3	1	1050	300	1350	16	
NY13	N.Y.	SUFFOLK	JONES BEACH IS.		3000	2000	4700	2	1	1200	5000	3500	15	
NY06	N.Y.	SUFFOLK	MAIDSTONE PARK			80	40	2	0	40	80		8	
NY09	N.Y.	SUFFOLK	MONTON	250			1	0			250		2	
NY08	N.Y.	SUFFOLK	NORTH HAVEN				150	1	0	150			2	
NY05	N.Y.	SUFFOLK	NORTHWEST HARBOR			100	2	0		10	90		2	
NY07	N.Y.	SUFFOLK	ORIENT BEACH		400		2	0		50	350		4	
NY04	N.Y.	SUFFOLK	SHELTER ISLAND				600	3	0	450		150	2	
NY10	N.Y.	SUFFOLK	SOUTHAMPTON			50	550	2	1	150	50	400	4	
FEDMGT=	2450	ST MGT=	4400	OTHMGT=	5270	PRVMGT=	17990	#1ACRS=	11700	#2ACRS=	12260	#3ACRS=	6350	A-MILS= 1026
NC23	N.C.	BRUNSWICK	BIRD ISLAND				300	1	0			300	1	
NC21	N.C.	BRUNSWICK	HALES BEACH ISLAND				2300	3	0	1000		1300	6	
NC20	N.C.	BRUNSWICK	HOLDEN BEACH ISLAND				2000	3	0	1000		1000	8	
NC19	N.C.	BRUNSWICK	OAK ISLAND	100			5900	3	0	2000	100	3900	13	
NC18	N.C.	BRUNSWICK	SMITH ISLAND (CAPE FEAR)		500		5800	2	0	500	500	5300	9	
NC22	N.C.	BRUNSWICK	SUNSET BEACH ISLAND				2000	3	0	900		1100	2	
NC08	N.C.	CARTERET	BOGUE BANKS		3900		4800	3	0	3000	3900	1800	25	
NC05	N.C.	CARTERET	CORE BANKS NORTH	1900			100	1	0		1900	100	10	
NC06	N.C.	CARTERET	CORE BANKS SOUTH	7700				2	0	100	7600		30	
NC04	N.C.	CARTERET	PORTSMOUTH ISLAND	5000				2	0	400	4600		8	
NC07	N.C.	CARTERET	SHACKLEFORD BANKS				2900	1	0			2900	9	
NC01	N.C.	CURRITUCK	BODIE ISLAND SOUTH	6000	400	100	39000	2	0	7100	6500	31900	58	
NC02	N.C.	DARE	HATTERAS ISLAND	15000			2000	2	0	1000	15000	1000	51	
NC03	N.C.	HYDE	OCRACOKE ISLAND	4500			500	2	0	500	4500		16	
NC17	N.C.	NEWHANOVER	CAROLINA BEACH IS.	2700	1600		2700	3	1	2200	4300	500	11	
NC14	N.C.	NEWHANOVER	FIGURE EIGHT IS.				4000	2	1	1000		3000	6	
NC16	N.C.	NEWHANOVER	MASON BORO ISLAND		3700			1	1		3700		8	
NC15	N.C.	NEWHANOVER	WRIGHTSVILLE BEACH				1700	4	1	900		800	3	
NC11	N.C.	ONSLOW	ASHE ISLAND				9000	2	1	2000		7000	22	
NC09	N.C.	ONSLOW	HAMMOCK ISLAND		2000		100	1	0		2000	100	3	
NC10	N.C.	ONSLOW	ONSLOW	2500			900	2	0	100	2500	800	11	
NC12	N.C.	PENDER	LEE ISLAND				1500	1	1			1500	1	
NC13	N.C.	PENDER	RICH INLET				1300	1	1			1300	3	
FEDMGT=	45400	ST MGT=	12100	OTHMGT=	100	PRVMGT=	88800	#1ACRS=	23700	#2ACRS=	57100	#3ACRS=	65600	A-MILS= 314
RI03	R.I.	WASHINGTON	ATLANTIC		50		250	3	0	200	50	50	3	
RI06	R.I.	WASHINGTON	BLOCK ISLAND BEACH			100	300	2	0	50	100	250	4	
RI01	R.I.	WASHINGTON	CHARLESTOWN		400	200	1900	3	1	900	600	1000	8	
RI04	R.I.	WASHINGTON	NARRAGANSETT				100	2	0	10		90	1	
RI05	R.I.	WASHINGTON	STONINGTON (SANDY POINT)				60	1	0			60	1	
RI02	R.I.	WASHINGTON	WESTERLY		100		200	4	1	200	100		2	
FEDMGT=		ST MGT=	550	OTHMGT=	300	PRVMGT=	2810	#1ACRS=	1360	#2ACRS=	850	#3ACRS=	1450	A-MILS= 19

HERITAGE CONSERVATION & RECREATION SERVICE

RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

ME04	MAINE	CUMBERLAND	PINE POINT				10	250	4	1	320				3
ME02	MAINE	SAGADAHOC	POPHAM BEACH			310		300	3	0	300	310			2
ME01	MAINE	SAGADAHOC	SHEEPSCUT			400			2	0	50	350			2
ME03	MAINE	SAGADAHOC	SMALL POINT					340	3	0	100		240		2
ME06	MAINE	YORK	BIDDEFORD				40	150	4	1	150	40			1
ME05	MAINE	YORK	GOOSE CREEK					70	4	1	70				1
ME07	MAINE	YORK	GOOSE ROCKS					210	4	1	210				1
ME09	MAINE	YORK	OGUNQUIT		60			230	4	1	230	60			3
ME08	MAINE	YORK	WELLS BEACH					210	5	1	210				2
FEDMGT=	60	ST MGT=	710	OTHMGT=	110	PRVMGT=	1760	#1ACRS=	1440	#2ACRS=	760	#3ACRS=	240	B-MILS=	17
MD02	MD	WORCESTER	ASSATEAGUE NORTH		9000	700		200	2	0	400	10300	100	23	
MD01	MD	WORCESTER	FENWICK ISLAND SOUTH				200	3300	3	0	2000	200	1300	9	
FEDMGT=	9000	ST MGT=	700	OTHMGT=	200	PRVMGT=	3500	#1ACRS=	2400	#2ACRS=	10500	#3ACRS=	1400	B-MILS=	32
MA15	MASS	BARNSTABLE	EASTHAM		200			700	3	0	200	400	300	3	
MA13	MASS	BARNSTABLE	GREAT ISLAND		700				2	0	50	650		4	
MA17	MASS	BARNSTABLE	MONOMOY		2200				1	0		2200		9	
MA16	MASS	BARNSTABLE	NAUSET		2500			500	2	0	500	2500		12	
MA12	MASS	BARNSTABLE	YORSCUSSET POINT				200	900	4	0	600	200	300	3	
MA14	MASS	BARNSTABLE	PROVINCELANDS		6000			3500	2	0	1500	5000	2000	15	
MA11	MASS	BARNSTABLE	SANDY NECK				2900		2	0	200	2700		5	
MA27	MASS	BRISTOL	HORSENECK BEACH			1000			3	0	800	1000		5	
MA21	MASS	DUKES	CAPE PAGE				300	400	1	0		300	400	7	
MA26	MASS	DUKES	CUTTYHUNK ISLAND		25		25	650	2	0	50	50	500	4	
MA23	MASS	DUKES	EDGARTOWN					500	2	0	50		450	5	
MA22	MASS	DUKES	KATAMA BAY				100	100	2	0	20	100	80	2	
MA25	MASS	DUKES	NASHAWENA					150	1	0			150	1	
MA24	MASS	DUKES	TISBURY					300	2	0	30		270	3	
MA01	MASS	ESSEX	CASTLE NECK			300		1000	2	1	50	300	950	5	
MA05	MASS	ESSEX	NAHANT			200		100	3	1	100	200		2	
MA02	MASS	ESSEX	PLUM ISLAND		2100	100		1100	2	1	600	2200	500	8	
MA04	MASS	ESSEX	SALISBURY			150		1350	3	1	500	150	850	4	
MA03	MASS	ESSEX	TOWEL				150	450	3	1	300	150	150	3	
MA18	MASS	NANTUCKET	COATUE				800	1000	2	0	100	800	900	10	
MA19	MASS	NANTUCKET	ESTER					200	2	0	20		180	2	
MA20	MASS	NANTUCKET	MUSTEGET					350	1	0			350	3	
MA07	MASS	NORFOLK	NANTASKET BEACH				100	800	5	1	800	100		3	
MA09	MASS	PLYMOUTH	DUXBURY		50		50	1000	2	1	100	100	900	8	
MA08	MASS	PLYMOUTH	HUMAROCK		100		100	1600	4	1	1400	200	200	7	
MA10	MASS	PLYMOUTH	LONG BEACH				200		2	0	20	180		3	
MA06	MASS	SUFFOLK	REVERE BEACH				100	600	4	1	400	100	200	2	
FEDMGT=	12875	ST MGT=	2550	OTHMGT=	5025	PRVMGT=	17150	#1ACRS=	8390	#2ACRS=	19580	#3ACRS=	9630	B-MILS=	138

THE COLUMNS PRINTED ABOVE ARE LEFT TO RIGHT:

, FORM, STNAME, CNTYNM, ISL NM, FEDMGT, ST MGT, OTHMGT, PRVMGT, % CODE, URBLOC, #1ACRS, #2ACRS, #3ACRS, B-MILS,

UNITED STATES DEPARTMENT OF THE INTERIOR
HERITAGE CONSERVATION & RECREATION SERVICE
RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

MS05	MISS.	HARRISON	CAT ISLAND					2500	1	1			2500	4
MS03	MISS.	HARRISON	DEER ISLAND					400	1	1			400	5
MS04	MISS.	HARRISON	SHIP ISLAND		1500				2	1	100	1400		9
MS02	MISS.	JACKSON	HORN ISLAND		3200			300	1	1		3200	300	14
MS01	MISS.	JACKSON	PETIT BOIS ISLAND		1500			100	2	1	100	1500		8
FEDMGT=	6200	ST MGT=	OTHMGT=		PRVMGT=	3380	#1ACRS=	200	#2ACRS=	6100	#3ACRS=	3200	B-MILS=	40		
NH01	N.H.	ROCKINGHAM	HAMPTON				200	200	100	5	0	400	100		2	
NH02	N.H.	ROCKINGHAM	SEABROOK						600	3	0	300		300	1	
FEDMGT=		ST MGT=	200	OTHMGT=	200	PRVMGT=	700	#1ACRS=	700	#2ACRS=	100	#3ACRS=	300	B-MILS=		
NJ06	N.J.	ATLANTIC	ATLANTIC CITY					400	5900	4	1	4500	400	1400	8	
NJ05	N.J.	ATLANTIC	BRIGANTINE					500	4400	3	1	1000	500	3400	7	
NJ04	N.J.	ATLANTIC	PULLEN ISLAND(LITTLE BEACH ISL		1900					1	1		1900		3	
NJ08	N.J.	CAPE MAY	LUDLAM					300	3200	3	1	900	300	2300	7	
NJ07	N.J.	CAPE MAY	OCEAN CITY				200	200	4000	3	1	2200	400	1800	9	
NJ09	N.J.	CAPE MAY	SEVEN MILE BEACH				300	600	4500	3	1	2100	900	2400	8	
NJ10	N.J.	CAPE MAY	WILDWOOD		500			500	4500	4	0	2400	1000	2100	8	
NJ01	N.J.	MONMOUTH	SANDY HOOK		1100		400		1500	4	1	2400	600		13	
NJ02	N.J.	OCEAN	BARNEGAT				2600	800	3000	3	1	3300	3100		22	
NJ03	N.J.	OCEAN	LONG BEACH ISLAND		300			200	6200	4	1	3900	500	2300	21	
FEDMGT=	3800	ST MGT=	3500	OTHMGT=	3500	PRVMGT=	37200	#1ACRS=	22700	#2ACRS=	9600	#3ACRS=	15700	B-MILS=	106	

THE COLUMNS PRINTED ABOVE ARE LEFT TO RIGHT:
FORM#,STNAME,CNTYNM,ISL_NM,FEDMGT,ST MGT,OTHMGT,PRVMGT,% CODE,URBLOC,#1ACRS,#2ACRS,#3ACRS,B-MILS,

HERITAGE CONSERVATION & RECREATION SERVICE

RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

SC30	S.C.	BEAUFORT	BAY POINT ISLAND				1200	1	0			1200	2
SC32	S.C.	BEAUFORT	DAUFUSKIE ISLAND				6200	2	1	200		6000	4
SC26	S.C.	BEAUFORT	EDISTO ISLAND				4300	2	0	400		3900	5
SC31	S.C.	BEAUFORT	HILTON HEAD ISLAND				22000	4	1	13000		9000	12
SC25	S.C.	BEAUFORT	HUNTING ISLAND		1700		4300	2	0	300	1700	4000	7
SC28	S.C.	BEAUFORT	LITTLE CAPERS ISLAND				2100	2	0	50		2050	3
SC27	S.C.	BEAUFORT	PITCHARDS ISLAND				2600	1	0			2600	3
SC29	S.C.	BEAUFORT	ST. PHILLIPS ISLAND				5600	1	0			5600	1
SC21	S.C.	CHARLESTON	BOTANY BAY ISLAND				500	2	1	25		475	1
SC11	S.C.	CHARLESTON	BULL ISLAND	4500				1	1		4500		700
SC09	S.C.	CHARLESTON	CAPE ISLAND	1600				1	0		1600		6
SC12	S.C.	CHARLESTON	CAPERS ISLAND		3400			2	1	100	3300		3
SC20	S.C.	CHARLESTON	DELICATE BANKS				250	1	1		250		2
SC13	S.C.	CHARLESTON	DEWEES ISLAND				1600	2	1	100		1500	2
SC22	S.C.	CHARLESTON	EDISTO ISLAND		1300		14900	2	0	1300	1300	12600	9
SC17	S.C.	CHARLESTON	FOLLY ISLAND			100	1900	3	1	700	100	1200	6
SC14	S.C.	CHARLESTON	ISLE OF PALMS				3000	3	1	1000		2000	6
SC18	S.C.	CHARLESTON	KIAWAH ISLAND				8000	2	1	400		7600	10
SC16	S.C.	CHARLESTON	MORRIS ISLAND		50		2850	2	1	100	50	2750	5
SC08	S.C.	CHARLESTON	MURPHY ISLAND		8000			1	0		8000		6
SC10	S.C.	CHARLESTON	RACCOON KEY	5000				1	0		5000		7
SC19	S.C.	CHARLESTON	SEABROOK ISLAND				5300	2	1	500		4800	2
SC15	S.C.	CHARLESTON	SULLIVANS ISLAND	25			1275	4	1	800	25	475	4
SC24	S.C.	COLLETON	OTTER ISLAND				3600	1	0			3600	4
SC23	S.C.	COLLETON	PINE ISLAND				2200	1	0			2200	2
SC07	S.C.	GEORGETOWN	CEDAR ISLAND		4100			1	0		4100		3
SC04	S.C.	GEORGETOWN	DEBIDUE BEACH				1500	2	0	150		1350	4
SC03	S.C.	GEORGETOWN	MURRELLS INLET				3100	3	0	900		2200	7
SC05	S.C.	GEORGETOWN	NORTH ISLAND		4200		1800	1	0		4200	1800	9
SC02	S.C.	GEORGETOWN	PAWLEYS ISLAND				1000	3	0	400		600	5
SC06	S.C.	GEORGETOWN	SOUTH ISLAND		2900		1100	1	0		2900	1100	6
SC01	S.C.	MURRY	WAITES ISLAND				1000	2	0	100		900	4
SC34	S.C.	JASPER	JONES ISLAND				2600	1	1			2600	2
SC33	S.C.	JASPER	TURTLE ISLAND		1700			1	1		1700		2

FEDMGT= 11125 ST MGT= 27250 OTHMGT= 100 PRVMGT= 105575 #1ACRS= 20525 #2ACRS= 38725 #3ACRS= 84900 B-MILS= 854

TX11	TEXAS	ARANSAS	SAN JOSE ISLAND	400			24000	2	1	200	400	23800	20
TX08	TEXAS	BRAZORIA	BRAZOS		500		2900	2	0	200	500	2600	6
TX06	TEXAS	BRAZORIA	CEDAR LAKES			200	5800	2	0	300	200	5500	10
TX04	TEXAS	BRAZORIA	FOLLETS ISLAND			200	6800	2	1	700	200	6100	15
TX10	TEXAS	CALHOUN	MATAGORDA ISLAND	19000	16000		21100	2	0	2000	40000	14100	38
TX16	TEXAS	CAMERON	BOCA CHICA		200		4800	2	0	400	200	4400	7
TX15	TEXAS	CAMERON	PADRE ISLAND SOUTH	5000			10000	2	0	900	5000	9100	35
0004	TEXAS	JEFFSON	HIGH ISLAND		15000		101000	2	1	3000	15000	98000	36
TX02	TEXAS	GALVESTON	BOLIVAR PENINSULA	200	200	600	24000	2	1	3000	1000	21000	19

THE COLUMNS PRINTED ABOVE ARE LEFT TO RIGHT:

FORM,STNAME,CNTYNM,ISLNM,FEDMGT,ST MGT,OTHMGT,PRVMGT,% CODE,URBLOC,#1ACRS,#2ACRS,#3ACRS,B-MILS.

HERITAGE CONSERVATION & RECREATION SERVICE

RESULTS OF INQUIRY AGAINST THE ISLANDS INVENTORY MASTERFILE

BARRIER ISLANDS SUMMARY 1254.

TX03	TEXAS	GALVESTON	GALVESTON ISLAND	500	2000	1500	23000	3	1	10000	4000	13000	31
TX14	TEXAS	KENEDY	PADRE ISLAND CENTRAL	25000				1	0		25000		45
TX13	TEXAS	KLEBERG	PADRE ISLAND NORTH	20000	2200		10000	2	1	500	22200	9500	30
TX07	TEXAS	MATAGORDA	BROWN CEDAR				1500	2	0	50		1450	4
TX08	TEXAS	MATAGORDA	MATAGORDA PENINSULA EAST				11300	2	0	200		11100	18
TX09	TEXAS	MATAGORDA	MATAGORDA PENINSULA WEST	2000	100		16600	1	0	400	2000	16300	29
TX12	TEXAS	NUECES	MUSTANG ISLAND	500	3500	500	6500	2	1	1000	4500	4500	18
FEDWGT= 72600 ST WGT= 89700 OTHWGT= 3000 PRVWGT= 268200 #1ACRS= 22850 #2ACRS= 120200 #3ACRS= 240450 R-MILS= 361														
VA01	VA	ACCOMACK	ASSATEAGUE SOUTH		7200			2	0	100	7100		16
VA03	VA	ACCOMACK	ASSAWOMEN ISLAND				3200	1	0		3200		3
VA05	VA	ACCOMACK	CEDAR ISLAND				4300	2	0	50		4250	6
VA04	VA	ACCOMACK	METOMKIN ISLAND				3400	1	0			3400	7
VA06	VA	ACCOMACK	PARRAMORE ISLAND				7400	1	0		7400		8
VA02	VA	ACCOMACK	WALLOPS ISLAND	6000				2	0	600	5400		6
VA08	VA	NORTHAMPT.	COBB ISLAND				3100	2	0			3100	7
VA10	VA	NORTHAMPT.	FISHERMANS ISLAND	650		10	860	1	1		660	840	2
VA07	VA	NORTHAMPT.	HOG ISLAND				5500	2	0			5500	9
VA09	VA	NORTHAMPT.	SMITH ISLAND GROUP		1400		17800	2	1	100	1400	17700	15
VA11	VA	V.BEACHCTY	FALSE CAPE	3500			4600	2	1	500	3500	4100	13
FEDWGT= 17350 ST WGT= 1400 OTHWGT= 10 PRVWGT= 50140 #1ACRS= 1350 #2ACRS= 28660 #3ACRS= 38890 R-MILS= 91														

THE COLUMNS PRINTED ABOVE ARE LEFT TO RIGHT:
FEDWT,STNAME,CNTYNM,ISL NM,FEDWGT,ST WGT,OTHWGT,PRVWGT,& CODE,URBLOC,#1ACRS,#2ACRS,#3ACRS,R-MILS,

APPENDIX G

BIBLIOGRAPHY OF BARRIER ISLAND SOURCES

BIBLIOGRAPHY OF BARRIER ISLAND SOURCES

Broadhead, J. M., and P. Godfrey. 1977. Off road vehicle impact in Cape Cod National Seashore: disruption and recovery of dune vegetation. International Journal of Biometeorology 21(3): 299-306.

Clark, John, ed. 1976. Barrier islands and beaches: technical proceedings of the 1976 barrier island workshop, Annapolis, Maryland, May 17-18, 1976.

Clark, John. 1974. Coastal ecosystems: ecological considerations for management of the coastal zone. The Conservation Foundation Washington, D.C.

Clark, J. 1976. The Sanibel report: formulation of a comprehensive plan based on natural systems. The Conservation Foundation.

Connors, D. L. A private approach to conservation: Tuckernuck Island, Massachusetts. Unpublished. Tyler and Reynolds and Craig, One Boston Place, Boston, Massachusetts 02108.

Connors, D. L. A regional approach to regulation of land use and development. Unpublished. Tyler and Reynolds and Craig, One Boston Place, Boston, Massachusetts 02108.

Cooke, C. W. 1968. Barrier island formation: discussion. Geological Society of America Bulletin 79(7) and (10): 945-46.

Culter, R. M., et al. 1976. The Virginia coast reserve study. The Nature Conservancy, Arlington, Virginia.

Dolan, R., and B. Hayden. 1974. Adjusting to nature in our national seashores. National Parks and Conservation Magazine 48(6): 9-14.

Dolan, R. and P. Godfrey. 1973. Effects of Hurricane Ginger on the barrier islands of North Carolina. Geological Society of America Bulletin 84(4): 1329-1333.

Dolan, R. 1965. Seasonal variations in beach profiles along the Outer Banks of North Carolina. Shore and Beach 33(2): 22-26.

Ducsik, D. W. 1973. Coastal zone utilization. Pages 12-1 to 12-141 in S. B. Saila, ed. Coastal and offshore environmental inventory: Cape Hatteras to Nantucket Shoals, complement volume. University of Rhode Island, Marine Publication Series No. 3.

Ducsik, D. W. 1974. Shoreline for the Public: a handbook of social and legal considerations regarding public recreational use of the nation's coastal shoreline. MIT Press, Boston.

Fisher, J. J. 1968. Barrier island formation: discussion. Geological Society of America Bulletin 79: 1421-1425.

Florida Department of Environmental Regulation. 1977. The Florida coastal management program workshop draft.

Gaskin, P., and J. R. Stottlemyer. 1974. Ecological and economic principles in park planning: the Assateague National Seashore model. Coastal Zone Management Journal 1(4): 395.

Godfrey, P. J. 1976. Barrier beaches of the East Coast. Oceanus 19(5): 27-40.

Godfrey P., and M. Godfrey. 1976. Barrier island ecology of Cape Lookout National Seashore and vicinity, North Carolina. NPS Scientific Monograph Series No. 9.

Godfrey, P. 1977. Climate, plant response and development of dunes on barrier beaches along the U.S. East Coast. International Journal of Biometeorology 21(3): 203-215.

Godfrey, P. 1978. Management guidelines for parks on barrier beaches. Parks 2(4).

Hoyt, J. H. 1970. Development and migration of barrier islands, northern Gulf of Mexico: discussion. Geological Society of America Bulletin 81: 3779-3782.

Hoyt, J. H., and V. J. Henry, Jr. 1967. Influence of island migration on barrier island sedimentation. Bulletin of the Geological Society of America 78(1): 77-86.

Kneeland, C. September 11, 1977. Islands for our future. Corpus Cristi Caller, Section B.

Kraft, J. C., et al. 1976. Delaware's changing shoreline. Delaware Coastal Zone Management Program Technical Report No. 1.

Manley, S., and R. Manley. 1968. Beaches: their lives, legends, and lore. Chilton Book Co., Philadelphia.

McGowen, J. H., et al. 1970. Effects of Hurricane Celia - a focus on environmental geologic problems of the Texas coastal zone. Texas University, Austin Bureau of Economic Geology, Geological Circular 70-3.

McHarg, I. L. 1969. Design with nature. Doubleday/Natural History Press, Garden City, N.Y.

Miller, H. C. 1977. Coastal flood hazards and the national flood insurance program. Department of Housing and Urban Development, Washington, D.C.

National Park Service. 1955. A report on the seashore recreation area survey of the Atlantic and Gulf Coasts. Washington, D.C.

National Park Service. 1962. Seashore preservation and recreation opportunities and storm damage. Washington, D.C.

Odum, E. P. 1961. The role of tidal marshes in estuarine production. The New York State Conservationist, June-July, 1961, Albany, N.Y.

Olsen, S. B. and M. J. Grant. 1973. Rhode Island's barrier beaches: Volume I, a report on a management problem and an evaluation of options. Coastal Management Publication, University of Rhode Island.

Pilkey, O. H., and D. M. Richter. 1965. Beach profiles of a Georgia barrier island. Southeastern Geology 6(1): 11-19.

Pilkey, O. H., et al. 1975. How to live with an island: a handbook to Bogue Banks, N.C. N.C. Department of Natural and Economic Resources.

Price, W. A. 1971. Environmental impact of Padre Isles development. Shore and Beach 39(2): 4-10.

Schwartz, M. L., ed. 1973. Barrier islands. Stroudsburg, Pennsylvania.

Shows, E. W. Florida's coastal setback line: an effort to regulate beachfront development. Florida Department of Natural Resources.

Slaughter, T. H. 1973. Regulatory aspects relative to coastal management problems: Ocean City, Maryland's Atlantic coast beach. Shore and Beach 41(2): 5-11.

Spagna, N. J. 1977. A case history of Marco Island, Florida. Unpublished. Community Development Administrator, Collier County, Florida.

Sterling, D. 1967. The outer lands: a natural history guide to Cape Cod, Martha's Vineyard, Nantucket, Block Island, and Long Island. The Natural History Press, Garden City, N.Y.

Texas Coastal and Marine Council. 1977. Pictorial atlas of Texas coastal hazards.

Warner, L., and D. Strauss. 1976. Inventory of the status of the barrier islands of the southeast. Open Space Institute, Washington, D.C.

Warnke, D. A. 1966. Drastic beach changes in a low-energy-environment caused by Hurricane Betsy. Journal of Geophysical Research 71(6): 2013-2016.

White, G., and J. E. Haas. 1975. Assessment of research on natural hazards. MIT Press, Cambridge.

U.S. Army Corps of Engineers. 1973. The national shoreline study. U.S. Government Printing Office, Washington, D.C.

U.S. Department of the Interior, FWS. 1970. National estuary study, U.S. Government Printing Office, Washington, D.C.

Yonge, C. M. 1950. Life on sandy beaches. Science Progress 38(151): 430-443.

Ziegler, J. M. 1959. Origin of the sea islands of the southeastern United States. Geographical Review 49: 222-237.

NOAA COASTAL SERVICES CENTER LIBRARY
3 6668 00000 1794