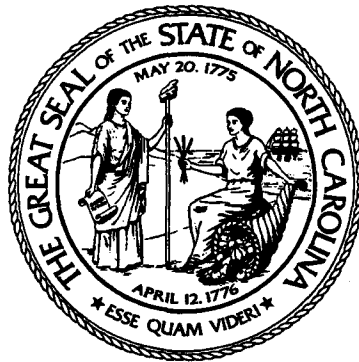


LEGISLATIVE RESEARCH COMMISSION

COASTAL BEACH MOVEMENT ISSUES



REPORT TO THE  
1998 SESSION OF THE  
1997 GENERAL ASSEMBLY  
OF NORTH CAROLINA

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JULY 1984






STATE OF NORTH CAROLINA  
LEGISLATIVE RESEARCH COMMISSION  
STATE LEGISLATIVE BUILDING  
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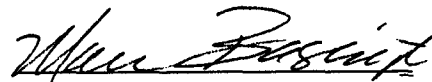
May 11, 1998

TO THE MEMBERS OF THE 1997 GENERAL ASSEMBLY (REGULAR SESSION 1998):

The Legislative Research Commission herewith submits to you for your consideration its interim report on coastal beach movement issues. The report was prepared by the Legislative Research Commission's Committee on coastal beach movement issues pursuant to G.S. 120-30.17(1).

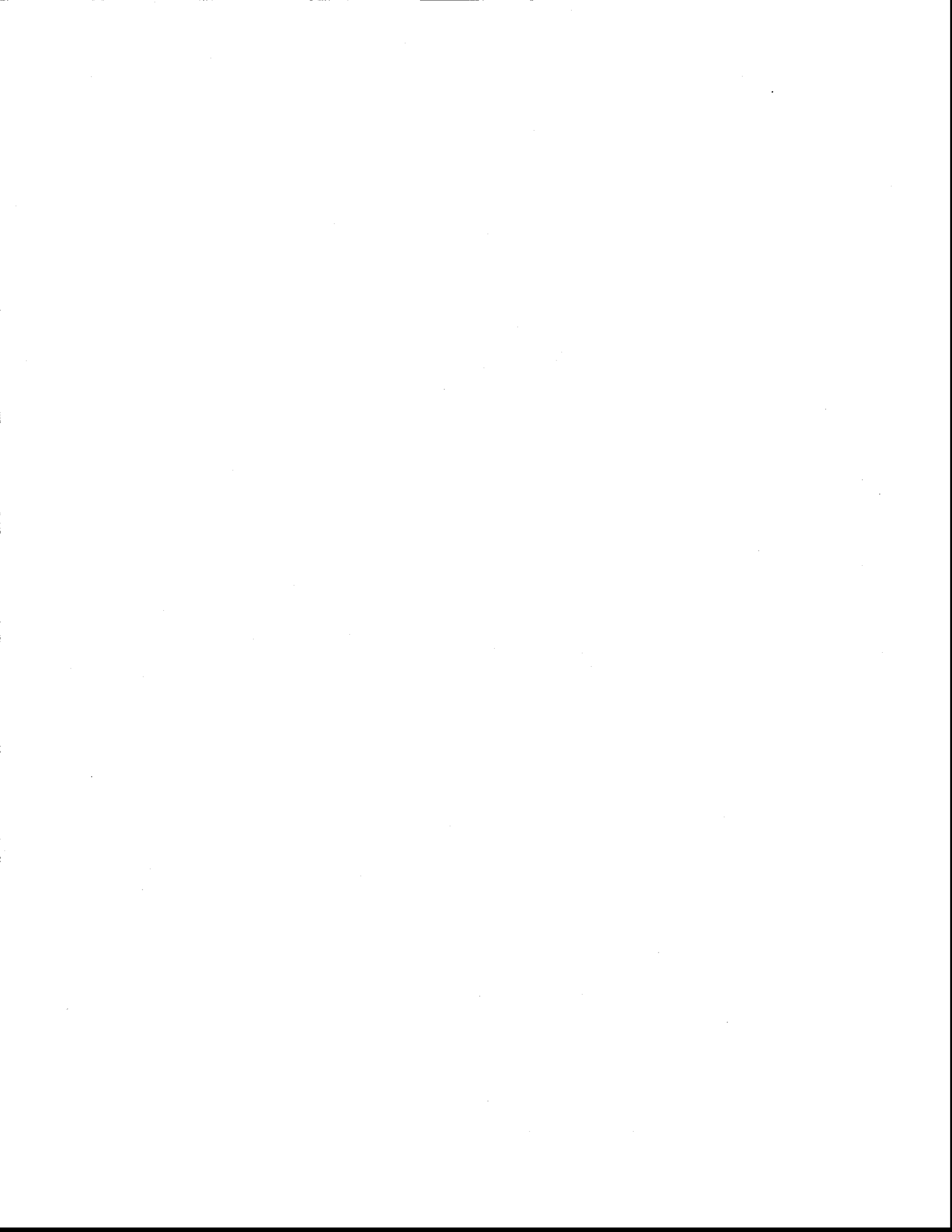
Respectfully submitted,

  
Harold J. Brubaker  
Speaker of the House

  
Marc Basnight  
President Pro Tempore

Cochair  
Legislative Research Commission





1997-1999

LEGISLATIVE RESEARCH COMMISSION

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## PREFACE

The Legislative Research Commission, established by Article 6B of Chapter 120 of the General Statutes, is the general purpose study group in the Legislative Branch of State Government. The Commission is cochaired by the Speaker of the House and the President Pro Tempore of the Senate and has five additional members appointed from each house of the General Assembly. Among the Commission's duties is that of making or causing to be made, upon the direction of the General Assembly, "such studies of and investigations into governmental agencies and institutions and matters of public policy as will aid the General Assembly in performing its duties in the most efficient and effective manner" (G.S. 120-30.17(1)).

The Legislative Research Commission, prompted by actions during the 1997 Session, has undertaken studies of numerous subjects. These studies were grouped into broad categories and each member of the Commission was given responsibility for one category of study. The Cochairs of the Legislative Research Commission, under the authority of G.S. 120-30.10(b) and (c), appointed committees consisting of members of the General Assembly and the public to conduct the studies. Cochairs, one from each house of the General Assembly, were designated for each committee.

The study of coastal beach movement issues was authorized by Section 2.1(3) of Chapter 483 of the 1997 Session Laws. The relevant portions of Chapter 483 are included in Appendix B. The Legislative Research Commission authorized this study under authority of G.S. 120-30.17(1) and grouped this study in its environmental area under the direction of Senator Austin Allran. The Committee was chaired by Ray Sturza and Representative Cindy Watson. The full membership of the Committee is listed in Appendix C of this report. A committee notebook containing the committee minutes and all information presented to the committee is filed in the Legislative Library.

## COMMITTEE PROCEEDINGS

The Legislative Research Commission's Coastal Beach Movement Issues Study Committee met five times. Three of the meetings were held in Raleigh, one in Kill Devil Hills, and one in North Topsail Beach. The Committee agreed to address the beach renourishment issue prior to the 1998 Regular Session and to consider the storm hazard mitigation issues after that session. The Committee heard from a number of coastal experts who are knowledgeable about beach erosion issues, the North Carolina coast and its unique features, and the current administrative and legislative policies (local, State, and federal) that affect beach erosion issues in the State.

Dr. Stephen Snyder, Assistant Professor of Marine, Earth and Atmospheric Sciences College of Physical and Mathematical Sciences at North Carolina State University addressed the Committee at its first meeting. Dr. Snyder provided the members of the Committee with an overview of the State's barrier island system. He informed the Committee that North Carolina has one of the most pristine and unique barrier island coastlines in the country. Over one-third of the State's coastline is owned by the National Park Service. As a result, the State's coast is quite pristine and many of the natural processes can actually be witnessed and studied as they occur.

Geologically the barrier island systems in North Carolina are unique. Barrier islands are usually located closer to the mainland than are those in North Carolina. Dr. Snyder stated that North Carolina's beaches are almost two different coastlines. North of Cape Lookout there are long linear barrier systems cut by very few inlets. South of Cape Lookout there are smaller barrier island systems with more inlets. The wave climate, or the amount of wave energy is huge in the northern area because it is open to the North Atlantic with its Nor'easters. The southern coastline is more protected with a lot of long shore currents that try to fill in the inlets.

The biology of North Carolina's coastline is also unique because Cape Hatteras is a paleogeographic boundary. There is an old continental shelf off the State's coast that creates a low lying plane only four or five feet above sea level which is also an incredible fish habitat. The North Atlantic drift waters come down the shelf and bring gene pools from the North Atlantic. The Gulf Stream and Carolina shelf waters also flow along the State's coast. As a result there are northern and southern species of marine life along the coast creating a gene pool that is not matched anywhere else in the world.

At its second meeting the Committee heard presentations by Spencer Rogers with North Carolina Sea Grant and North Carolina State University Department of Civil Engineering; Gene Tomlinson, Chair of the Coastal Resources Commission; Roger Schecter, Director of the Coastal Management Division, Department of Environment and Natural Resources; Tom Jarret, Chief of the Coastal Hydrology and Hydraulic Section, U.S. Army Corps of Engineers; and John Morris, Director of the North Carolina Division of Water Resources, Department of Environment and Natural Resources.

Spencer Rogers discussed the different types of erosion, the causes of erosion, and various erosion control options. Mr. Rogers focused on three types of erosion: erosion that

is a seasonal fluctuation along the beach that occurs annually, erosion that is caused by individual, severe storms or hurricanes and that is partially temporary, and long-term erosion that is a permanent loss of land. Erosion control options for one type of erosion may not be effective for another type of erosion. The erosion control options discussed were dune building, beach pushing, relocation of structures, sand trapping, structural alternatives such as sea walls, sand bagging, and beach renourishment. Mr. Spencer informed the Committee that erosion rates along the State's coast average a couple of feet per year and in some cases are much higher. He indicated that there are valid methods of erosion control that the State does need to address its erosion problems since there are continuing risks from hurricanes such as Fran.

Gene Tomlinson provided the Committee with an overview of the Coastal Area Management Act (CAMA). He noted that the balance of economic development and the quality of life in this State has made North Carolina's coast one of the most desirable along the Atlantic seaboard. He also pointed out that North Carolina's seashores belong to all of the State's citizens. That public doctrine is a major factor considered by members of the Coastal Resources Commission in developing policy, rules, and guidelines.

Roger Schecter discussed the various responses of the Coastal Resources Commission to erosion issues. He pointed out that hard stabilization is not allowed on North Carolina's beaches. The preferred response to erosion is originally to locate a structure far enough from harm's way that it will not be destroyed or to relocate the structure if it becomes threatened by erosion. The secondary response is beach bulldozing and beach renourishment. He outlined for the Committee some of the difficulties in crafting a policy that honors property rights but also respects the fact that the shoreline is dynamic and will always be moving to some degree.

One of the Committee members observed that beach renourishment appears to be one of the few viable solutions for erosion problems. He asked how the Coastal Resources Commission viewed beach renourishment as a method of erosion control. Mr. Schecter responded that the Coastal Resources Commission not only encourages beach renourishment, it actively works with State and federal agencies to proceed in that manner. According to Mr. Schecter the Coastal Resources Commission has uniformly indicated that it wants to encourage beach renourishment.

Tom Jarrett, U.S. Army Corps of Engineers, informed the Committee that the main focus of coastal protection, at least within the Corps of Engineers has, since the 1950's been primarily beach renourishment. The goal is to mimic the natural system as much as possible. The shape of the profile depends on the waves, tides and the character of the sediment. When successful, the waves reshape the blob of sand pumped onto the beach into a shape pretty much equal to the pre-project beach. The construction is designed to provide enough residual sediment to last between renourishment cycles which is usually between three to four years. He mentioned two renourishment projects in North Carolina built by the Corps, one at Carolina Beach and one at Wrightsville beach. Mr. Jarrett stated that the Corps of Engineers strongly supports the State's prohibition against hard structures to control erosion. The main

concern with those hard structures is that they impact neighboring coastal areas and also limit public access to beaches.

John Morris provided the Committee with a detailed explanation of the State's role in various beach renourishment projects. He focused first on the financial aspects of beach renourishment. In North Carolina, beach renourishment projects are done as a partnership between the federal, State, and local governments. The federal government, through the U.S. Army Corps of Engineers provides about sixty-five percent of the cost of a beach renourishment project leaving thirty-five percent to be provided by a non-federal sponsor. State government, through the General Assembly may pay up to seventy-five percent of that thirty-five percent and the local government sponsor must pay the remaining cost. (The federal government pays about sixty-five percent, State government pays about twenty-six percent, and local government pays about nine percent.) The projects go through an elaborate planning and justification process. The Corps must prove that the economic benefits exceed the cost of the project. State funds to match federal and local funds for beach renourishment projects are managed by the Division of Water Resources, Department of Environment and Natural Resources.

With regard to policy issues, Mr. Morris pointed out that beach renourishment as an erosion control technique addresses critical erosion problems in a way that is environmentally acceptable and in accord with good public policy. He further noted that some years ago the General Assembly enacted legislation that requires that prior to the beginning of any beach renourishment project a line is established. The legislation provides that all new land that is renourished and built up seaward to the line belongs to the local government sponsor of the project. Thus, these are some of the few places that the public actually owns the dry sand beach. He also pointed out that the Corps requires public access as a condition of any beach renourishment project. As a result beach renourishment projects provide hurricane flood protection and also essentially create a public park.

Mr. Morris further informed the Committee that federal funding for future beach renourishment projects is being cut. As a result the states will have to pick up more of the financial burden and it is prudent to begin considering new ways to finance this type of project. Mr. Morris pointed out that there are many benefits of the beach renourishment projects, many of which are statewide. Such projects provide hurricane flood protection. They make coastal areas attractive to tourists resulting in additional tax revenue for the State. They also provide additional beach access.

In February the Committee met in Kill Devil Hills. The Committee visited several locations in Dare County to view the destruction caused by erosion and heard from local government officials regarding the importance of tourism to local and State economies.

The Committee also heard a presentation from Bob Finch with the U.S. Army Corps of Engineers who explained the different type of cost benefit analyses that are useful in evaluating beach renourishment projects. Mr. Finch made the point that tourism is the leading industry in America and the leading tourist attractions are beaches. He stated that most Americans do not realize that the beaches are a key driver of America's economy and an important factor in America maintaining its position in the world economy.

Mr. Finch informed the Committee that the economic justification of a federally financed beach renourishment project is based exclusively on National Economic Development (NED) benefits. Those benefits consist primarily of storm damage reduction and, to a limited degree, recreation. Regional Economic Development (RED) benefits are not used in the federal justification formula, but are an important consideration at the State and local level when deciding whether to participate in a beach renourishment project or study. RED benefits reflect how the local economy maybe stimulated as a result of the construction of a beach renourishment project

The economic criteria used by the Corps to evaluate proposed public works projects has become more comprehensive and more stringent over time. The intent is to determine whether a given project is worth the investment. There has been increasing interest in the distribution of costs and benefits - who benefits, who pays. Mr. Finch explained that "economic impacts" and "cost benefits" are different concepts. Economic impacts measures reflect the dollar value of market transactions such as beach front rental, hotels and restaurant revenues. Cost benefits measures are less tangible. Cost benefits measures reflect how a project may improve society's well being.

In evaluating the economics of a proposed beach renourishment project the following are considered; storm damage reduction and recreational benefits. Storm damage reduction is the difference in expected losses of property values with and without the project. Highly developed areas have much larger gains from storm damage reduction because the amount of capital at risk is comparatively large.

Structures and land are also considered. With regard to land, the goal is to prevent further erosion of property along the ocean front. The value of the property that is used for this type of analysis is "near shore value" or the interior lot value. That figure is often four or five times less than the ocean front value. Structural value, in the Corp's analysis, is basically an estimate of the depreciated replacement value of impacted residential or commercial development that would be protected by a beach fill. In most cases each impacted structure is individually evaluated for its value and elevation data for the damaged model.

Mr. Finch stated that the Corps of Engineers uses recreational benefits, only in a limited sense, as the economic measure justify beach projects. The Corps uses the unpaid value enjoyed by the consumer that would be captured by a project. This is a concept known in the economic literature as consumer surplus. If the beach goer is willing to pay more to use an improved beach, then this unpaid value is the basis for this recreational benefit. Someone may be willing to pay \$10 a day to lie out on a nice wide sandy beach and that same person may only want to pay \$7 to go out on a beach like we have seen here today which is narrow, unsightly, eroded and next to an exposed septic tank. But the Corps of Engineers cannot participate in beach building at all if the justification is based solely on recreational benefits, there must be storm damage reduction benefits.

In considering other benefits the consumer surplus used by the Corps is far from the total package. For example the resulting support and stimulation of the local recreational industry and resulting increases in the tax value are not considered. Mr. Finch pointed out

that research done by Dr. Bill Strong, a Florida economist suggests that there is often an increase in property value due to the beach renourishment. Dr. Strong has done many economic analyses on several Florida beaches, including a Marco Island project, in which property values increased over two times the initial construction costs of the project generating hundreds of thousands of dollars additional property tax revenues.

Mr. Finch left the Committee with the following thought: "Remember these beach renourishment projects are designed to be sacrificed. When you witness a Carolina Beach or Wrightsville Beach dune and berm system that was practically destroyed by a large event like Hurricane Fran, don't think that the project failed because the pile of sand is gone. The project did exactly what it was designed to do which is to dissipate the energy of the storm, to sacrifice itself to protect the millions of dollars of potential damage. That is exactly what happened in Hurricane Fran. The Wrightsville Beach and Carolina Beach project performed outstandingly."

Agreeing with that thought, one committee member compared the Carolina Beach area which had the benefit of beach renourishment to the Kure Beach area which did not have beach renourishment. He pointed out that Carolina Beach sustained massive damage while Kure Beach did not fare so well.

In March the Committee met in North Topsail Island. The Committee heard from local government officials and residents of the area regarding beach erosion problems and the economic threats posed to North Topsail Island as a result of the erosion. Afterwards the Committee visited a number of sites to view the damage caused at erosion in North Topsail Island.

At its last meeting, the Committee discussed its recommendations and approved this report.

## COMMITTEE FINDINGS AND RECOMMENDATIONS

After reviewing the expert testimony received by the Committee regarding the causes of beach erosion, the problems created by beach erosion, and the various methods recommended to control beach erosion, and after reviewing the testimony provided by local government officials and citizens of the State's coastal communities regarding the economic impact that beach erosion may have on those citizens, communities, and the State the Committee makes the following findings:

North Carolina has some of the most pristine and unique beaches in the country. North Carolina has also done an excellent job of balancing concerns about its coastal economics, environment, and quality of life. As a result this State has some of the most attractive beaches on the Atlantic seaboard. Those beaches provide beauty, recreational opportunities, and economic benefits for all of North Carolina's citizens. The State's beaches are also vital to the State's tourism industry which is critical to the State's economic well-being. (Tourism is the State's second largest industry.)

Coastlines are dynamic and beach erosion is a natural consequence of wind, waves and currents constantly shifting and redistributing sand within the dune, beach and nearshore environment. Over long periods of time, this shifting enables the landward migration of barrier islands, a process by which barriers maintain themselves as sea level rises. In contrast, short-term shoreline fluctuations can be very dramatic. During the Ash Wednesday storm of 1962, for instance, the shoreline along the National Park Service Property on Bodie Island eroded as much as 500 feet; within a year all but approximately 10 feet had built back.

Erosion during intermediate time frames is less understood than short and long-term erosion due to the complex factors which can cause it. For instance, changes in erosion patterns can be caused by storm cycles which vary seasonally, annually, and over longer time periods. Changes in offshore shoal and bar configurations can increase erosion, and the opening or closing of an inlet has a significant effect on erosion rates for miles along the adjacent ocean shoreline. Man's activities also can cause increased erosion. (Coastal Resources Commission's Outer Banks Task Force Report, July 1984.)

There are a number of methods used to control beach erosion. Structural methods that harden the shoreline are prohibited in North Carolina. These methods are prohibited because the construction of bulkheads, seawalls, and revetments increases wave energy and consequently accelerates erosion along their seaward side and adjacent property. Jetties, groins, and breakwaters trap sand moving along the shoreline causing sand starvation downdrift. (Coastal Resources Commission's Outer Banks Task Force Report, July 1984.)

The method of erosion control that is supported and encouraged by both the Coastal Resources Commission and the U.S. Army Corps of Engineers is beach renourishment. Beach renourishment is the rebuilding of an eroded beach by trucking or pumping (by pipeline) sand to the beach from an outside source area. Renourishment is the only form of

erosion abatement which will maintain a natural shoreline. (Coastal Resources Commission's Outer Banks Task Force Report, July 1984.)

Beach renourishment projects have many benefits. They provide hurricane flood protection. They make coastal areas attractive to tourists resulting in additional tax revenue for the State. They also provide additional beach access.

Beach renourishment has also been "tested" to some degree in North Carolina. There have been several projects in the State and most have been quite successful. For example the beach renourishment projects in Wrightsville Beach and Carolina Beach were very successful. Although all of North Carolina's coast suffered damage when Hurricane Fran hit the coast, there was significant difference in the destruction that occurred at Wrightsville Beach and Carolina Beach when compared with the damage that occurred at Kure Beach which did not have the benefit of beach renourishment. As one speaker remarked to the Committee:

"Remember these beach renourishment projects are designed to be sacrificed. When you witness a Carolina Beach or Wrightsville Beach dune and berm system that was practically destroyed by a large event like Hurricane Fran, don't think that that project failed because the pile of sand is gone. The project did exactly what it was designed to do which is to dissipate the energy of the storm, to sacrifice itself to protect against the millions of dollars of potential damage. That is exactly what happened in Hurricane Fran. The Wrightsville Beach and Carolina Beach project performed outstandingly."

Based on these findings, the Legislative Study Committee on Coastal Beach Movement Issues recommends the legislation in Appendix A to the 1997 General Assembly for consideration during the 1998 Regular Session. Each legislative proposal is followed by an explanation.



**APPENDIX A**

LEGISLATIVE PROPOSAL 1  
GENERAL ASSEMBLY OF NORTH CAROLINA

SESSION 1997

H/S

D

98-LH-214(4.15)  
(THIS IS A DRAFT AND IS NOT READY FOR INTRODUCTION)

Short Title: Beach Renourish/Reserve Funds.

(Public)

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Sponsors: Senator Ballantine  
Representatives Redwine, Watson, Gulley, Mosley,  
Owens, Preston, and Rayfield.

---

Referred to:

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1 A BILL TO BE ENTITLED  
2 AN ACT TO ESTABLISH THE BEACH RENOURISHMENT FUND, TO ESTABLISH  
3 THE TRUSTEES OF THE FUND, TO RESERVE FIVE PERCENT OF THE  
4 UNRESERVED CREDIT BALANCE IN THE GENERAL FUND AT THE END OF  
5 EACH FISCAL YEAR TO THE BEACH RENOURISHMENT FUND, AND TO MAKE  
6 CONFORMING STATUTORY CHANGES.  
7 Whereas, North Carolina has some of the most pristine  
8 and unique beaches in the country; and  
9 Whereas, the balance of economic development and the  
10 quality of life in this State has made North Carolina's coast one  
11 of the most desirable along the Atlantic Seaboard; and  
12 Whereas, North Carolina's beaches are vital to the  
13 State's tourism industry; and  
14 Whereas, North Carolina's beaches belong to all of the  
15 State's citizens and provide recreational and economic benefits  
16 to all the State's citizens; and  
17 Whereas, the Atlantic Seaboard is vulnerable to  
18 hurricanes and other storms, and it is prudent to take  
19 precautions such as beach renourishment that help protect and  
20 conserve the State's beaches and that help limit storm damage and  
21 flooding; and

1           Whereas, beach renourishment as an erosion control  
2 method is sound, provides hurricane flood protection, enhances  
3 the attractiveness of the beaches to tourists, and also provides  
4 additional beach access; and

5           Whereas, beach renourishment projects such as those in  
6 Wrightsville Beach and Carolina Beach have been very successful  
7 and assisted greatly in helping those areas weather Hurricane  
8 Fran; and

9           Whereas, beach renourishment is encouraged by both the  
10 Coastal Resources Commission and the US Army Corps of Engineers  
11 as a method to control beach erosion; Now therefore,  
12 The General Assembly of North Carolina enacts:

13           Section 1. Article 1 of Chapter 143 of the General  
14 Statutes is amended by adding a new section to read:

15 "§ 143-15.3D. Funds reserved to the Beach Renourishment Fund.

16 (a) The Beach Renourishment Fund is established in G.S. 113-  
17 146.1. The State Controller shall reserve to the Beach  
18 Renourishment Fund five percent (5%) of any unreserved credit  
19 balance remaining in the General Fund at the end of each fiscal  
20 year.

21 (b) The funds in the Beach Renourishment Fund shall be used  
22 only in accordance with Article 13B of Chapter 113 of the General  
23 Statutes."

24           Section 2. G.S. 143-15.2 reads as rewritten:

25 "§ 143-15.2. Use of General Fund credit balance; priority uses.

26 (a) As used in G.S. 143-15.3, 143-15.3A, and 143-15.3D, the  
27 term "unreserved credit balance" means the credit balance amount,  
28 as determined on a cash basis, before funds are reserved by the  
29 State Controller to the Savings Reserve Account, the Repairs and  
30 Renovations Reserve Account, the Clean Water Management Trust  
31 Fund Fund, or the Beach Renourishment Fund pursuant to G.S. 143-  
32 15.3, 143-15.3A, and ~~143-15.3B.~~ 143-15.3B, and 143-15.3D.

33 (b) The State Controller shall transfer funds from the  
34 unreserved credit balance to the Savings Reserve Account in  
35 accordance with G.S. 143-15.3(a).

36 (c) The State Controller shall transfer funds from the  
37 unreserved credit balance to the Repairs and Renovation Reserve  
38 Account in accordance with G.S. 143-15.3A(a).

39 (d) The State Controller shall transfer funds from the  
40 unreserved credit balance to the Clean Water Management Trust  
41 Fund in accordance with G.S. 143-15.3B(a).

42 (d1) The State Controller shall transfer funds from the  
43 unreserved credit balance to the Beach Renourishment Fund in  
44 accordance with G.S. 143-15.3D(a).

1 (e) The General Assembly may appropriate that part of the  
2 anticipated General Fund credit balance not expected to be  
3 reserved only for capital improvements or other one-time  
4 expenditures."

5 Section 3. G.S. 143-15.3(a) reads as rewritten:

6 " (a) There is established a Savings Reserve Account as a  
7 restricted reserve in the General Fund. The State Controller  
8 shall reserve to the Savings Reserve Account one-fourth of any  
9 unreserved credit balance remaining in the General Fund at the  
10 end of each fiscal year until the account contains funds equal to  
11 five percent (5%) of the amount appropriated the preceding year  
12 for the General Fund operating budget, including local government  
13 tax-sharing funds, that were directly appropriated. In the event  
14 that the one-fourth exceeds the amount necessary to reach the  
15 five percent (5%) level, only funds necessary to reach that level  
16 shall be reserved. If there are insufficient funds in the  
17 unreserved credit balance for the Savings Reserve Account, the  
18 Repairs and Renovations Reserve Account, ~~and~~ the Clean Water  
19 Management Trust Fund, and the Beach Renourishment Fund, then  
20 the requirements of this section shall be complied with first,  
21 and any remaining funds shall be reserved to the Repairs and  
22 Renovations Reserve Account, in accordance with G.S. 143-15.3A,  
23 ~~and~~ the Clean Water Management Trust Fund, in accordance with  
24 ~~G.S. 143-15.3B.~~ G.S. 143-15.3B, and the Beach Renourishment Fund  
25 in accordance with G.S. 143-15.3D.

26 Section 4. Chapter 113 of the General Statutes is  
27 amended by adding a new Article to read:

28 "ARTICLE 13B.

29 "Beach Renourishment Fund.

30 "§ 113-146. Definitions.

31 The following definitions apply in this Article:

32 (1) Fund. -- The Beach Renourishment Fund created  
33 pursuant to this Article.

34 (2) Trustees. -- The trustees of the Beach  
35 Renourishment Fund.

36 "§ 113-146.1. Beach Renourishment Fund: established; purpose.

37 (a) Fund Established. -- There is established a Beach  
38 Renourishment Fund in the State Treasurer's Office that shall be  
39 used to provide grants to beach communities for beach  
40 renourishment in accordance with this Article.

41 (b) Fund Earnings, Assets, and Balances. -- The State  
42 Treasurer shall hold the Fund separate and apart from all other  
43 moneys, funds, and accounts. Investment earnings credited to the  
44 assets of the Fund shall become part of the Fund. Any balance

1 remaining in the Fund at the end of any fiscal year shall be  
2 carried forward in the Fund for the next succeeding fiscal year.  
3 Payments from the Fund shall be made on the warrant of the Chair  
4 of the Board of Trustees.

5 "§ 113-146.2. Beach Renourishment Fund: eligibility for grants;  
6 matching funds requirement.

7 (a) Eligible Grant Applicants. -- Any local government or  
8 other political subdivision of the State or a combination of such  
9 entities is eligible to apply for a grant from the Fund for the  
10 purpose of beach renourishment.

11 (b) Grant Matching Requirement. -- The Board of Trustees shall  
12 establish matching requirements for grants awarded under this  
13 Article. The Board of Trustees shall require a match of up to ten  
14 percent (10%) of the amount of the grant awarded.

15 "§ 113-146.3. Beach Renourishment Fund: Board of Trustees  
16 established; membership qualifications; vacancies; meetings and  
17 meeting facilities.

18 (a) Board of Trustees Established. -- There is established the  
19 Beach Renourishment Fund Board of Trustees. The Beach  
20 Renourishment Fund Board of Trustees shall be independent, but  
21 for administrative purposes shall be located under the Department  
22 of Environment, Health, and Natural Resources.

23 (b) Membership. -- The Beach Renourishment Fund Board of  
24 Trustees shall be composed of nine members. Three members shall  
25 be appointed by the Governor, three by the General Assembly upon  
26 the recommendation of the President Pro Tempore of the Senate in  
27 accordance with G.S. 120-121, and three by the General Assembly  
28 upon the recommendation of the Speaker of the House of  
29 Representatives in accordance with G.S. 120-121. The office of  
30 Trustee is declared to be an office that may be held concurrently  
31 with any other executive or appointive office, under the  
32 authority of Article VI, Section 9, of the North Carolina  
33 Constitution.

34 Persons appointed shall be knowledgeable in one of the  
35 following areas:

36 (1) Beach renourishment.

37 (2) Coastal wildlife and fisheries habitats and  
38 resources.

39 (3) Environmental management.

40 (c) Initial Appointments. -- Each appointing officer shall  
41 designate one of the officer's initial appointments to serve two-  
42 year terms, one to serve four-year terms, and one to serve six-  
43 year terms. Thereafter, all appointments shall be for four years,  
44 subject to reappointment. All initial appointments shall be made

1 on or before January 1, 1999. The Governor shall appoint one  
2 Trustee to serve as Chair of the Board.

3 (d) Vacancies. -- If a vacancy occurs, other than by the  
4 expiration of term, of a member subject to appointment by the  
5 General Assembly upon the recommendation of the Speaker of the  
6 House of Representatives or the President Pro Tempore of the  
7 Senate, the vacancy shall be filled in accordance with G.S. 120-  
8 122. All other vacancies shall be filled by the appointing  
9 official in the original manner.

10 (e) Frequency of Meetings. -- The Trustees shall meet at least  
11 twice each year and may hold special meetings at the call of the  
12 Chair or a majority of the members.

13 (f) Per Diem and Expenses. -- The Trustees shall receive per  
14 diem and necessary travel and subsistence expenses in accordance  
15 with the provisions of G.S. 138-5. Per diem, subsistence, and  
16 travel expenses of the Trustees shall be paid from the Fund.

17 (g) Staff and Meeting Facilities. -- The Secretary of the  
18 Department of Environment, Health, and Natural Resources shall  
19 provide staff and meeting facilities for the Board of Trustees as  
20 requested by the Chair.

21 "§ 113-146.4. Beach Renourishment Fund Board of Trustees: powers  
22 and duties.

23 (a) Allocate Grant Funds. -- The Trustees shall allocate  
24 moneys from the Fund as grants. A grant may be awarded only for a  
25 project or activity that satisfies the criteria and furthers the  
26 purposes of this Article.

27 (b) Develop Grant Criteria. -- The Trustees shall develop  
28 criteria for awarding grants under this Article. The criteria  
29 developed shall include the following:

30 (1) The significant enhancement and conservation of  
31 coastal beaches in the State.

32 (2) The specific areas targeted as being in need of  
33 beach renourishment.

34 (3) The geographic distribution of funds as  
35 appropriate.

36 (4) The significant recreational or economic value and  
37 uses of the area.

38 (5) The availability of public access including  
39 handicapped access to the beach.

40 (6) The application for a beach nourishment project  
41 shall have complete planning and design work  
42 adequate to provide project specifications, cost  
43 estimates, review of environmental impacts, and  
44 estimation of benefits. The Trustees may make

1           grants to potential applicants of up to fifty  
2           percent (50%) of the cost of the necessary planning  
3           and design work to prepare applications.

4    (c) Develop Additional Guidelines. -- The Trustees may develop  
5 guidelines in addition to the grant criteria consistent with and  
6 as necessary to implement this Article.

7    (d) Rule-Making Authority. -- The Trustees may adopt rules to  
8 implement this Article. Chapter 150B of the General Statutes  
9 applies to the adoption of rules by the Trustees.

10   (e) The Chair of the Trustees shall report to the  
11 Environmental Review Commission beginning November 1, 1998, and  
12 annually thereafter on implementation of this section. A written  
13 copy of the report shall also be sent to the Fiscal Research  
14 Division of the General Assembly beginning November 1, 1998, and  
15 annually thereafter on implementation of this section."

16           Section 5. This act is effective when it becomes a law.

EXPLANATION OF LEGISLATIVE PROPOSAL 1  
( DRAFT BILL 98-LH-214)

A BILL TO BE ENTITLED AN ACT TO ESTABLISH THE BEACH RENOURISHMENT FUND, TO ESTABLISH THE TRUSTEES OF THE FUND, TO RESERVE FIVE PERCENT OF THE UNRESERVED CREDIT BALANCE IN THE GENERAL FUND AT THE END OF EACH FISCAL YEAR TO THE BEACH RENOURISHMENT FUND, AND TO MAKE CONFORMING STATUTORY CHANGES.

Background Information

On April 27, 1998, the Coastal Beach Movement Issues Legislative Research Study Committee considered House Bill 1090 introduced during the 1997 Regular Session by Representative David Redwine. House Bill 1090 was referred to the House Environment Committee and is still eligible for consideration during the 1998 Regular Session. The Coastal Beach Movement Issues Legislative Research Committee adopted that bill with only a few changes. The substantive changes to House Bill 1090 recommended by the Committee follow:

- To make the local matching requirement for grants awarded from the Beach Renourishment Fund mandatory rather than optional.
- To delete the phrase "consideration of" when listing the criteria to be considered by the Board of Trustees in awarding grants. The criteria set out in the bill must be incorporated as part of the grant criteria developed by the Board of Trustees.
- To add two more items as grant criteria: (i)public and handicapped access to beaches and (ii) a requirement that grant applications have complete planning and design work prepared for the beach renourishment project. In addition, grant funds may be awarded to cover up to fifty percent of the cost for the planning and design work.
- To make the bill effective when it becomes a law.

Because several amendments are also needed to conform House Bill 1090 with statutes amended last session, Committee Counsel was instructed to prepare a draft bill that reflects both the substantive changes to House Bill 1090 that are recommended by the Committee and the conforming changes that are needed. A section by section analysis of that draft bill 98-LH-214 follows.

Section by Section Analysis

Section 1. Adds a new subsection G.S. 143-15.3D to the Executive Budget Act. Reserves five percent of the General Fund unreserved credit balance at the end of each fiscal year to the Beach Renourishment Fund. Provides that those funds shall be used only for beach renourishment projects as directed by Article 13B of Chapter 113 of the General Statutes which creates the Beach Renourishment Fund.

Section 2. Conforming change to G.S. 143-15.2, a provision of the Executive Budget Act. G.S. 143-15.2 defines the term "unreserved credit balance" and directs the State



Controller to transfer funds from the unreserved credit balance to the appropriate accounts and funds. The "unreserved credit balance is the credit balance amount, as determined on a cash basis, before funds are reserved to any accounts. (The accounts to which funds are reserved are the Savings Reserve Account, the Repairs and Renovations Reserve Account, the Clean Water Management Trust Fund, and, if this bill is enacted, the Beach Renourishment Fund) The conforming changes amend the definition of "unreserved credit balance" to include the Beach Renourishment Fund and direct the State Controller to transfer funds from the unreserved credit balance at the end of the fiscal year in accordance with G.S. 143-15.3D.

Section 3. Conforming change to G.S. 143-15.3, the provision of the Executive Budget Act that establishes the Savings Reserve Account and that establishes the priority among the accounts and funds to which are reserved a portion of the unreserved credit balance. The conforming changes provide that the Beach Renourishment Fund has the last priority for monies from the unreserved credit balance.

Section 4. Creates a new Article 13B in Chapter 113 of the General Statutes. Establishes a Beach Renourishment Fund for grants for beach renourishment. The State Treasurer shall administer the Fund and investment earnings are to be credited to the Fund.

Any local government or other political subdivision of the State is eligible for a grant. The Board of Trustees must require a match for a grant of up to 10% of the grant awarded.

Establishes an independent nine member Board of Trustees (housed under Department of Environment and Natural Resources for administrative purposes) to establish grant criteria, review applications, and award the grants. Three members are appointed by the Governor; six members are appointed by the General Assembly, three upon the recommendation of the President Pro Tempore of the Senate and three upon the recommendation of the Speaker of the House of Representatives. Trustees must be knowledgeable in one of the following areas: beach renourishment, coastal wildlife and fisheries habitats and resources, or environmental management. Outlines time frame and procedure for initial appointments. Outlines procedure for handling vacancies. Trustees must meet at least twice a year, shall receive per diem and expenses, and are to be assisted by staff of Department of Environment and Natural Resources as requested.

Trustees must develop grant criteria and award grants that meet that criteria. Grant criteria must include all of the following: significant beach enhancement and conservation, areas in need of renourishment, geographic distribution of funds, significant recreational or economic value and uses of an area, public access to beaches, including handicapped access to beaches, complete planning and design work adequate to provide project specifications, cost estimates, review of environmental impacts and estimation of benefits. Up to fifty percent of the cost of the necessary planning and design work may be awarded as a grant from the Beach Renourishment Fund.

Trustees have rulemaking authority to implement the statutory scheme set out by this Article. Includes an annual reporting requirement to the Environmental Review Commission and the Fiscal Research Division.

Section 5. The bill is effective when it becomes a law.

LEGISLATIVE PROPOSAL 2

GENERAL ASSEMBLY OF NORTH CAROLINA

SESSION 1997

S/H

D

98-LH-216A(4.24)

(THIS IS A DRAFT AND IS NOT READY FOR INTRODUCTION)

Short Title: Beach Erosion Control Funds

(Public)

---

Sponsors: Senator Ballantine  
Representatives Watson, Gulley, Mosley, Owens,  
Preston, Rayfield, and Redwine.

---

Referred to:

---

1                                   A BILL TO BE ENTITLED  
2 AN ACT TO APPROPRIATE FUNDS TO THE DEPARTMENT OF ENVIRONMENT AND  
3 NATURAL RESOURCES TO ASSIST WITH THE RELOCATION OF THREATENED  
4 STRUCTURES AND TO ACQUIRE COASTAL SHORELINE PROPERTY RENDERED  
5 UNBUILDABLE UNDER CAMA RULES BY BEACH EROSION.  
6 The General Assembly of North Carolina enacts:  
7           Section 1. There is appropriated from the General Fund  
8 to the Department of Environment and Natural Resources the sum of  
9 ten million dollars (\$10,000,000) for the 1998-99 fiscal year to  
10 be allocated as follows:  
11                   (1) Five million dollars (\$5,000,000) to be used to  
12                   assist with the relocation of structures along the  
13                   State's shoreline that violate CAMA setback lines.  
14                   (2) Five million dollars (\$5,000,000) to be used to  
15                   acquire property that is not "buildable" under CAMA  
16                   rules and guidelines as a result of beach erosion.  
17           Section 2. This act becomes effective July 1, 1998.

EXPLANATION OF LEGISLATIVE PROPOSAL 2  
(DRAFT BILL 98-LH-216A)

A BILL TO BE ENTITLED AN ACT TO APPROPRIATE FUNDS TO THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES TO ASSIST WITH THE RELOCATION OF STRUCTURES THREATENED BY BEACH EROSION AND TO ACQUIRE COASTAL SHORELINE PROPERTY RENDERED UNBUILDABLE UNDER CAMA RULES BY BEACH EROSION.

Section 1. Appropriates ten million dollars from the General Fund to the Department of Environment and Natural Resources. Funds are allocated as follows: five million dollars for relocation of structures threatened by beach erosion and five million dollars for State acquisition of shoreline property rendered unbuildable under CAMA rules due to beach erosion.

Section 2. Effective date is July 1, 1998.

**APPENDIX B**

**CHAPTER 483**  
**1997 Session Laws**

AN ACT TO AUTHORIZE STUDIES BY THE LEGISLATIVE RESEARCH COMMISSION, TO CREATE AND CONTINUE VARIOUS COMMISSIONS, TO CONTINUE A COUNCIL, TO DIRECT STATE AGENCIES AND LEGISLATIVE OVERSIGHT COMMITTEES AND COMMISSIONS TO STUDY SPECIFIED ISSUES, AND TO IMPOSE A MORATORIUM ON SERVICE CORPORATION CONVERSIONS.

The General Assembly of North Carolina enacts:

**PART I.-----TITLE**

Section 1. This act shall be known as "The Studies Act of 1997".

**PART II.-----LEGISLATIVE RESEARCH COMMISSION**

Section 2.1. The Legislative Research Commission may study the topics listed below. When applicable, the bill or resolution that originally proposed the issue or study and the name of the sponsor is listed. Unless otherwise specified, the listed bill or resolution refers to the measure introduced in the 1997 Regular Session of the 1997 General Assembly. The Commission may consider the original bill or resolution in determining the nature, scope, and aspects of the study.

- ...
- (3) Coastal beach movement issues including, but not limited to:
- a. Beach renourishment; the value cost, level of need, return on investment, and eligible participants.
  - b. Storm hazard mitigation (S.B. 432 - Odom and Horton).

...

Section 2.11. Committee Membership. For each Legislative Research Commission committee created during the 1997-98 biennium, the cochairs of the Legislative Research Commission shall appoint the committee membership.

Section 2.12. Reporting Date. For each of the topics the Legislative Research Commission decides to study under this Part or pursuant to G.S. 120- 30.17(1), the Commission may report its findings, together with any recommended legislation, to the 1997 General Assembly, 1998 Regular Session, or the 1999 General Assembly.

Section 2.13. Funding. From the funds available to the General Assembly, the Legislative Services Commission may allocate additional monies to fund the work of the Legislative Research Commission.

**PART XVII.-----EFFECTIVE DATE AND APPLICABILITY**

Section 17.1. Except as otherwise specifically provided, this act becomes effective July 1, 1997. If a study is authorized both in this act and the Current Operations Appropriations Act of 1997, the study shall be implemented in accordance with the Current Operations Appropriations Act of 1997 as ratified.

In the General Assembly read three times and ratified this the 28th day of August, 1997.

s/ Marc Basnight  
President Pro Tempore of the Senate

s/ Harold J. Brubaker  
Speaker of the House of Representatives

s/ James B. Hunt, Jr.  
Governor

Approved 11:00 a.m. this 10th day of September, 1997

**APPENDIX C**

**LEGISLATIVE RESEARCH COMMISSION  
COASTAL BEACH MOVEMENT ISSUES COMMITTEE  
1997-1999**

**Pro Tem's Appointments**

Mr. Ray Sturza, Cochair  
PO Box 1215  
Kill Devil Hills, NC 27948

Sen. Patrick J. Ballantine  
PO Box 7693  
Wilmington, NC 28406  
(910) 343-1998

Mr. Ed Booker  
PO Box 4525  
Greensboro, NC 27404

Mr. Wade Horne  
PO Box 326  
Supply, NC 28462

Mr. James W. Piner  
PO Box 2102  
Atlantic Beach, NC 28512

Mrs. Llewellyn Fike Ramsey  
118 Bowen Street  
Atlantic Beach, NC 28512

Mr. Ken Stewart  
6435 Westport Drive  
Wilmington, NC 28409

Mr. Sterling Webster  
PO Box 2716  
Kill Devil Hills, NC 27948

**Speaker's Appointments**

Rep. Cynthia B. Watson, Cochair  
121 Ezra Moore Road  
Rose Hill, NC 28458  
(910) 289-2977

Rep. Jim Gulley  
2009 Kimway Drive  
Matthews, NC 28105  
(704) 847-9341

Rep. Daniel F. McComas  
PO Box 2274  
Wilmington, NC 28402  
(910) 343-8372

Rep. Jane H. Mosley  
513 Carolyn Court  
Cary, NC 27511  
(919) 467-8639

Rep. William C. Owens, Jr.  
113 Hunters Trail East  
Elizabeth City, NC 27909  
(919) 335-0167

Rep. Jean R. Preston  
211 Pompano Drive  
Emerald Isle, NC 28594  
(919) 354-6993

Rep. John M. Rayfield  
119 Oak Trail  
Belmont, NC 28012  
(704) 827-2679

Rep. E. David Redwine  
PO Box 283  
Shalotte, NC 28459  
(910) 754-4326

Mr. Robert S. Rippy  
5320 Oleander Drive  
Wilmington, NC 28403

**LRC Member**



Sen. Austin Allran  
PO Box 2907  
Hickory, NC 28603  
(704) 322-1410

**Staff:**

Barbara Riley  
Research Division  
(919) 733-2578

Emily Johnson  
Bill Drafting Division  
(919) 733-6660

**Clerk:**

Kathy Davis  
(919) 733-5653

**APPENDIX D**



The Coastal Resources Commission's Outer Banks  
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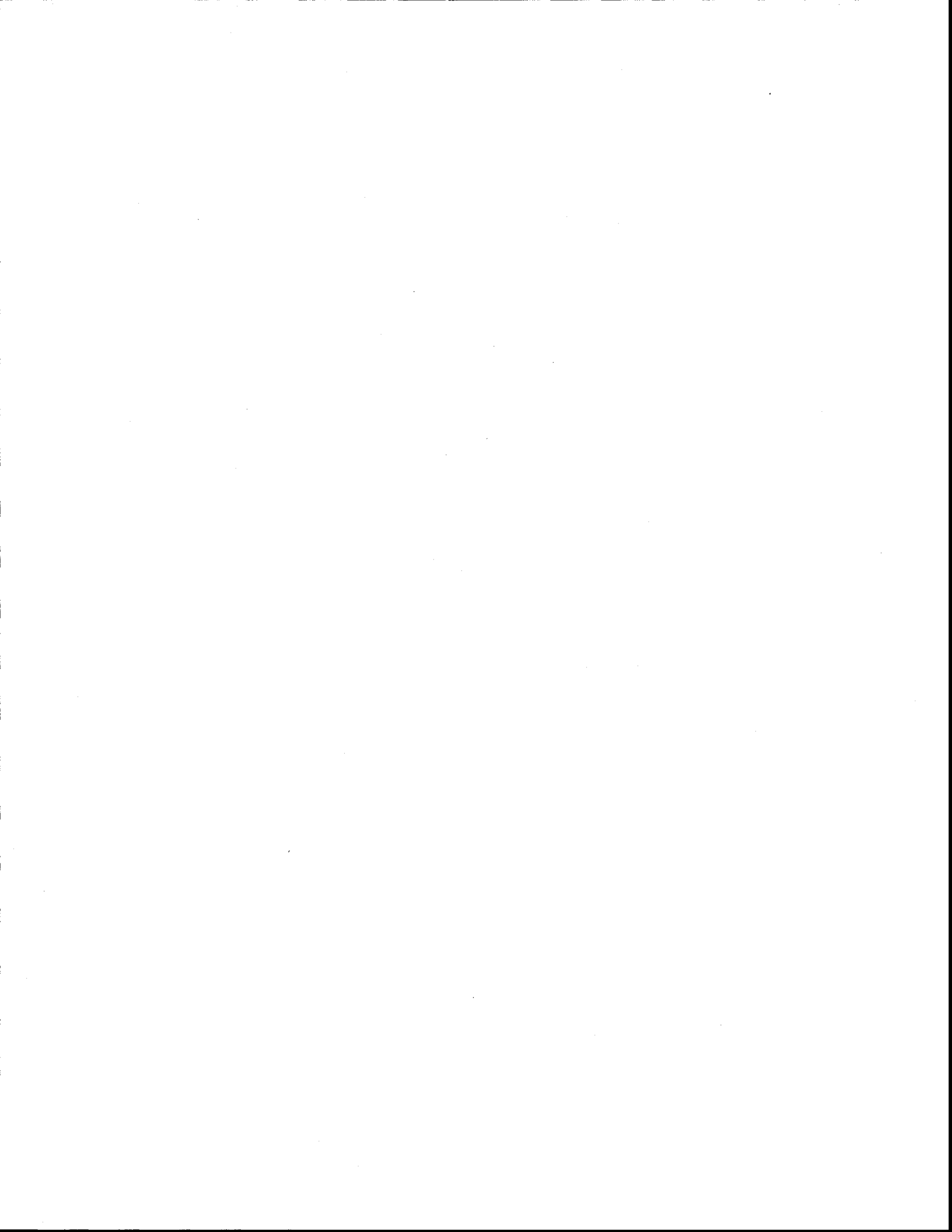
For copies of this report, contact:  
Office of Coastal Management,  
NC DNRCD  
P.O. Box 27687  
Raleigh, NC 27611.

Phone: (919) 733-2293

COASTAL RESOURCES COMMISSION'S  
OUTER BANKS EROSION TASK FORCE  
REPORT

July, 1984

North Carolina  
Department of Natural Resources and Community Development



## OUTER BANKS EROSION TASK FORCE

Dr. L. Jay Langfelder, Chairman  
Dr. J. Parker Chesson, Vice Chairman

### Members

Jerry Hardesty, Coastal Resources Commission  
Erie Haste, Coastal Resources Commission  
Charles Riser, Town of Southern Shores  
Carlton Smith, Town of Kitty Hawk  
Robert E. Rollason, Jr., Town of Kill Devil Hills  
Don Bryan, Town of Nags Head  
Keith Fearing, Dare County  
Barry Nelms, Currituck County  
Paul Denison, Coastal Resources Advisory Council  
Douglas Powell, Coastal Resources Advisory Council  
Colonel Wayne Hanson, U.S. Army Corps of Engineers  
Spencer Rogers, UNC Sea Grant  
John Morris, Office of Water Resources, N.C. Department of Natural  
Resources and Community Development  
Tom Hartman, Cape Hatteras National Seashore

### Advisors

David Hodges, Soil Conservation Service  
Dr. John Fisher, North Carolina State University  
Dr. Margery Overton, North Carolina State University  
Lim Vallianos, U.S. Army Corps of Engineers  
Tom Jarrett, U.S. Army Corps of Engineers  
Curt Mason, Coastal Engineering Research Center  
Dr. Stan Riggs, East Carolina University  
Steve Benton, Office of Coastal Management, N.C. Department of Natural  
Resources and Community Development  
David Brower, University of North Carolina at Chapel Hill  
Walter Clark, UNC Sea Grant  
Bernie Ingram, U.S. Army Corps of Engineers  
Milton Heath, University of North Carolina at Chapel Hill  
Dan McLawhorn, N.C. Department of Justice  
Robin Smith, Office of Coastal Management, N.C. Department of Natural  
Resources and Community Development

### Staff Coordinator

David W. Owens, Office of Coastal Management, N.C. Department of Natural  
Resources and Community Development

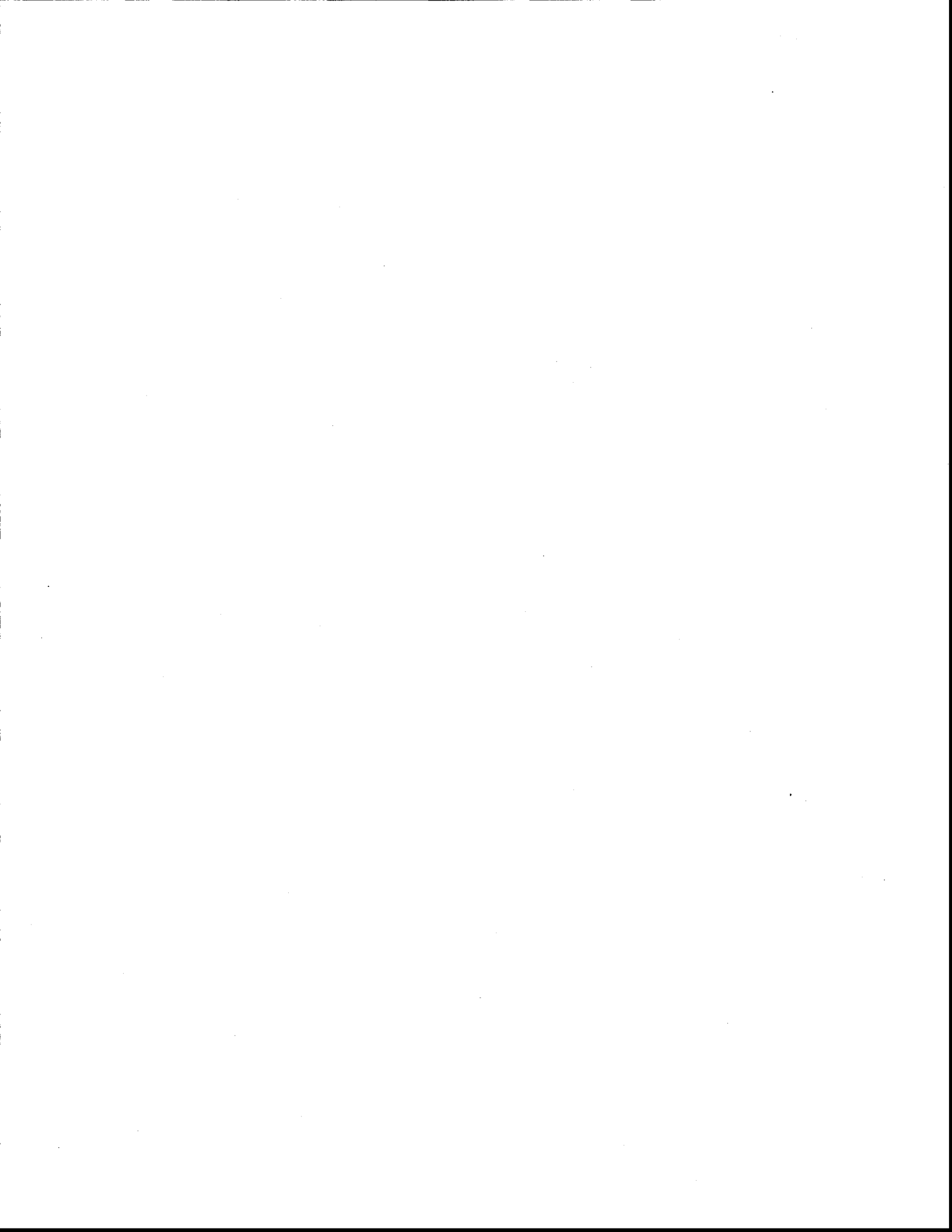




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## INTRODUCTION

The North Carolina Coastal Resources Commission (CRC) established the Outer Banks Erosion Task Force on January 27, 1984 in response to growing concern over serious erosion problems in Dare and Currituck counties. The charge of the group was to investigate the current erosion along the northeast coast in order to suggest responses to it. While focusing on the northern Outer Banks, the CRC and task force were aware that similar erosion problems exist throughout coastal North Carolina. Therefore, the task force was asked to develop policy recommendations that could be considered for statewide applicability.

This report describes the background history of the task force, its findings on technical and policy aspects of coastal erosion, and its recommended policies, standards, and implementation methods.

## TASK FORCE HISTORY

During the past two years several areas along the Outer Banks have experienced severe erosion, prompting local residents and officials to request that the state study the erosion problems. At the January 27, 1984 meeting of the Coastal Resources Commission, Department of Natural Resources and Community Development Secretary James A. Summers proposed that the CRC appoint a "special task force" which would serve as a coordinated effort to address the erosion concerns.

The CRC endorsed the proposal and established the Outer Banks Erosion Task Force, a 16-member group composed of representatives of the commission, the Coastal Resources Advisory Council, town and county governments, the U.S. Army Corps of Engineers, and specialists in coastal erosion matters. An additional 13 technical and policy advisors worked with the task force.

Dr. Jay Langfelder, head of the Department of Marine, Earth, and Atmospheric Sciences at N.C. State University, chaired the task force and CRC Chairman J. Parker Chesson was vice chairman. David Owens, director of the Office of Coastal Management (OCM), was the staff coordinator.

The first meeting of the group was held on February 7 at the Sea Ranch Motel in Kill Devil Hills. After touring some of the areas most affected by erosion, the task force heard presentations on coastal erosion research, CRC erosion policy, and state and federal funding of erosion abatement projects. Following a lengthy discussion, the group was divided into two committees which would look into technical and policy issues.

The two committees met on February 22 and February 27, respectively. The technical committee reviewed the geology of the Outer Banks, discussed various erosion abatement structures, and considered the gaps in erosion data. The policy committee looked at the measures for financing erosion projects, beach ownership and liability, alternatives to erosion abatement structures, and the economic impact of beach erosion, and then identified its needs for further information.

The full task force met again on March 14 at the N. C. Marine Resources Center/Roanoke Island. The information gathered from the committee meetings was presented, and the group agreed to have a working committee draft a set of principles, standards, and implementation measures for dealing with erosion.

The draft was thoroughly reviewed and discussed during the task force's May 9 meeting at the N. C. Marine Resources Center/ Roanoke Island. Revisions were made by the working committee and returned to the full task force, which approved the final draft and this report at a meeting on June 20.

This report was submitted to the Coastal Resources Commission, which is responsible for consideration of this report's recommendations, at its July 19 meeting.

PART ONE

Technical and Policy Issues



## BACKGROUND INFORMATION

Ocean shoreline erosion is a natural consequence of wind, waves, and currents constantly shifting and redistributing sand within the dune, beach, and nearshore environment. Over long periods of time, this shifting enables the landward migration of barrier islands, a process by which barriers maintain themselves as sea level rises. In contrast, short-term shoreline fluctuations can be very dramatic. During the Ash Wednesday storm in 1962, for instance, the shoreline along the National Park Service Property on Bodie Island eroded as much as 500 feet; within a year all but approximately 10 feet had built back.

Erosion during intermediate time frames is less understood than short and long-term erosion due to the complex factors which can cause it. For instance, changes in erosion patterns can be caused by storm cycles which vary seasonally, annually, and over longer time periods. Changes in offshore shoal and bar configurations can increase erosion, and the opening or closing of an inlet has a significant effect on erosion rates for miles along the adjacent ocean shoreline. Man's activities also can cause increased erosion. The construction of bulkheads, seawalls, and revetments increases wave energy and consequently accelerates erosion along their seaward side and adjacent property. ~~Jetties, groins, and breakwaters trap sand moving along the shoreline causing sand starvation downdrift.~~

### Extent of Outer Banks Erosion

The long-term average annual erosion rate along North Carolina's shoreline is generally reported to be three-and-a-half feet per year. On the basis of studies covering the past 40 years, studies extending back to the mid-1800's, and geologic time frame studies, the following generalizations can be made:

1. The shoreline between Cape Hatteras and the Virginia line has a higher average annual erosion rate (4.7 feet per year) than the state average. This is because the 93-mile stretch of shoreline has the greatest exposure to the full force of northeasterly storm winds and waves, and is characterized as a high energy shoreline.
2. Erosion rates within two miles of inlets are typically higher and show a general increase toward the inlet than erosion rates further away from inlets. Variation in erosion rates through time is also generally higher near inlets. A similar trend is found along the east-facing shorelines at Cape Hatteras, Cape Lookout, and Cape Fear.
3. Three areas along the northern Outer Banks have had anomalously high erosion rates over the past 40 years which do not appear to be directly related to inlets or capes: North Rodanthe (up to 19 feet per year), Pea Island (up to 14 feet per year), and the Seagull area of Currituck Banks (up to 13 feet per year). These high rates may be related to sand wave or secondary cape feature processes.

Very little is known about these features, although they appear to be migratory along the shoreline over relatively long periods of time (decades or perhaps centuries).

4. Actual erosion during any year for a given stretch of shoreline will probably not be the same as the average annual erosion rate reported for that area. This is because erosion typically occurs sporadically in response to storms or stormy seasons. High erosion years may be followed by several years of accretion and vice versa. The average annual long-term erosion rates published by the Office of Coastal Management reflect the net change averaged on an annual basis.
5. Not all of North Carolina's shoreline is eroding. The south-facing portions of the capes in general have been building seaward over geologic time. These areas are subject to dramatic erosion events during large storms, however. Several other areas have net accretion over the past 40 years. Although they occur along portions of the entire North Carolina coast, they are most common along the southern half of the coast.

Regardless of its extent or magnitude, ocean shoreline erosion only becomes a problem when it begins to affect manmade structures. At the time that the task force was formed, development was being threatened by erosion along three areas of the Outer Banks: a three-mile stretch in South Nags Head, a one-mile section of Kill Devil Hills, and to a lesser extent, portions of Currituck Banks. In the recent past, parts of Buxton and Kitty Hawk have also been threatened by erosion and in the period since the task force was formed these have come under threat once again.

A large percentage of the oceanfront development in Southern Shores, Kitty Hawk, Kill Devil Hills, Nags Head, and the southern Dare County towns was done prior to the CAMA setback regulations. Much of this development will be threatened by erosion in the near future even where the long-term erosion rates are modest. Southern Shores and Nags Head had setback requirements prior to CAMA, and the southern Dare County towns have a buffer of oceanfront National Park Service property. The erosion threat to much of these areas, with a few exceptions such as South Nags Head, will be somewhat further in the future. Despite this fact, it should be noted that a single large storm is potentially threatening to virtually all oceanfront development.

During the task force discussions much attention was focused on the nature and cause of erosion in the current problem areas. It was reported that Oregon Inlet is causing accelerated erosion eight miles away in South Nags Head. Sand is moving from the ocean shoreline to estuarine shoals causing a shoreline orientation readjustment which appears to be lengthening over time. Building the proposed jetties at the inlet may have a positive, long-term effect on the erosion along the three to five miles of the beach immediately north of the inlet within five to ten years of construction. There might also be some short-term erosion increases associated with the jetty project due to changes in ocean delta shoals and wave refraction patterns.



Recent increases in erosion in Kill Devil Hills and other isolated problem areas are not as well understood. The increased erosion could be a relatively temporary phenomenon related to short-term changes in the offshore bar system or it could be a relatively long-term situation caused by the formation of a giant cusp or sand wave.

Dr. Stan Riggs, professor of geology at East Carolina University, reported that recent seismic surveys along the shoreline showed substantial variations in the thickness of sand associated with the near-shore portion of the barrier island. This may indicate that areas with high rates of erosion are where the sand is thinnest.

It is difficult to determine the cause of an erosion problem for a particular area. A cost-effective solution for a temporary erosion situation (which may reverse shortly) could be very different than the best solution to the onset of a long-term trend.

The easiest studies have been done. There is a need for systematic, comprehensive information to effectively deal with site-specific erosion problems.

#### Historical Responses to Erosion

The traditional responses to erosion on the Outer Banks have been to develop the most stable portions of the islands (the maritime forests along the sound) or, when building on the oceanfront, to move back when threatened. Permanent settlement of the Outer Banks began in the late 17th century. Oceanfront development did not begin until the early 1900's. The early beach cottages were built on pilings and periodically moved when threatened by erosion.

Government involvement in erosion projects began in the late 1930's with the building of a barrier dune from Virginia to Ocracoke. This dune has not prevented erosion but has permitted vegetative stabilization of much of the interior portions of the islands.

In the 1960's, Congress authorized the U.S. Army Corps of Engineers to study erosion and flood problems. A berm project was proposed for the developed portions of the northern Outer Banks but was never built because of funding problems. Two projects in North Carolina, at Carolina Beach and Wrightsville Beach, were begun during this time.

In the late 1960's and early 1970's a series of groins and two beach nourishment projects were built to protect the Naval Facility and Cape Hatteras Lighthouse. The lighthouse is threatened again and a revetment is being designed to allow it to become an island as the shoreline recedes.

In the early 1970's the federal flood insurance program was created, primarily to pay for structures damaged or destroyed by storms. However, flood insurance funds were used in 1982 to move four structures in South Nags Head as part of an experimental program. Unfortunately, this practice was not continued.

The North Carolina Department of Transportation (DOT) has periodically replaced road segments damaged by erosion. Several abandoned segments of the "going to sea highway" can be seen from the landward relocated route. In 1983, DOT nourished a small segment of the oceanfront near Buxton in an effort to solve a chronic overwash problem.

The barrier dune has been periodically repaired by individual property owners and the National Park Service. The Park Service has abandoned this practice at the present time, however.

Individual property owners have attempted to solve erosion problems with small groins, bulkheads, beach bulldozing, and planting artificial seaweed. These efforts are generally temporary. The old lifesaving station in Kitty Hawk had five generations of bulkheads and groins which failed. It was recently moved. The Arlington Hotel had just built a bulkhead when it was destroyed in 1973.

A number of structural and nonstructural approaches to dealing with erosion were discussed by the task force. A review of these, including applicability to the Outer Banks, cost, and impacts, follows (see "Costs of Erosion Responses" on the next page).

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#### Shoreline hardening

Bulkheads, seawalls (larger, more permanent bulkheads), and revetments (seawalls made of stone or rubble) are designed to prevent a change in the shoreline location, thereby protecting property and development behind them. They do not protect the beach and, in fact, increase beach erosion both in front and at the edges of the structure. They also interfere with the movement of sand between the dune and offshore bar, an important natural beach energy dissipation process during storms.

Less expensive wooden and sandbag bulkheads generally do not work on oceanfront shorelines. This is particularly true along the high energy shoreline of the Outer Banks. Bulkheads may provide some temporary protection until a more permanent solution can be found, however. A seawall or revetment can be designed to last for several generations. The Galveston seawall and several structures in New Jersey are examples of permanent shoreline hardening. However, if the beach is to be preserved, shoreline hardening must be accompanied by beach nourishment. Massive erosion abatement structures require a permanent commitment to ongoing nourishment. If a seawall is designed to last 50 years, preserving the beach will require regular nourishment during that time. The amount of nourishment will depend on the specific beach and weather patterns at each site.

#### Sand trapping

Structures which trap sand moving along the shoreline include offshore breakwaters, groins, and jetties. In addition, a number of structures which dissipate the energy of waves offshore such as artifi-

COSTS OF EROSION RESPONSES\*

1. Shoreline Hardening (may require nourishment to prevent beach loss at additional cost).

	<u>Initial Cost</u>	<u>Approximate Life</u>	<u>Annualized Cost</u>
Sandbags	\$ 250/foot	1-2 years	\$125-250/ft/yr.
Bulkheads	\$ 500-1,500/foot	10-30 years	\$ 25-50/ft/yr.
Revetments	\$ 500-1,500/foot	100 years with repairs	\$ 5-15/ft/yr.
Seawalls	\$1,500-2,000/foot	50 years+	\$ 30-40/ft/yr.

2. Sand Trapping (may require sand by-pass and/or nourishment to prevent downdrift impacts).

	<u>Initial Cost</u>	<u>Approximate Life</u>	<u>Annualized Cost</u>
Groins	\$ 750/foot	30-60 years	\$12-25/ft/yr.
Breakwaters	\$3,000+/foot	50 years	\$60+/ft/yr.

3. Other

	<u>Initial Cost</u>	<u>Approximate Life</u>	<u>Annualized Cost</u>
Beach Pushing	\$ 200/foot	days to seasons	-
Nourishment	\$1,000/foot	5 years	\$240/ft/yr.

\*These costs are general estimates that attempt to show the comparative expense of various erosion abatement techniques. Actual costs will vary according to the specific characteristics of each site.

cial seaweed have been attempted with mixed reports of success. To date, there has been no scientific documentation that these structures work under high energy ocean shoreline conditions.

Groins and jetties are structures which are built perpendicular to the beach, extending seaward to block and trap sand moving along the shoreline. Jetties are large structures used primarily for protection of navigation channels.

Groins are usually built in "fields" spaced along the beach a distance approximately equal to their length. To be effective over a long period of time, groins should extend well out into the ocean and be supplemented with beach nourishment. They must be designed to withstand the energy regime of a particular area. Along the Outer Banks this would mean that groins would have to be built of a very substantial material, such as boulders or sheet pilings, and would therefore be expensive. Although somewhat less expensive wooden or sandbag structures can be built, they require considerably more maintenance and are limited in the distance they can extend offshore.

Breakwaters are offshore structures which are built parallel to the coast. They are designed to break the energy of waves and interrupt longshore sand transport. They have been used successfully in several areas along the Atlantic, Pacific, and Great Lakes shorelines. Most are large, permanent structures, although the Corps is now experimenting with portable, temporary breakwaters. These temporary breakwaters will cost \$5,000 to \$7,500 per foot and could not be left in place during storms or winter high energy conditions.

The use of surplus barges or ships has been suggested as a potential, relatively inexpensive alternative to traditional breakwaters. In investigating this possibility, it should be noted that steel ships tend to rust and deteriorate rapidly in the oxygen-rich surf zone. Structural stability, anchoring, and settling into the bottom may also be problems.

The major problem with all sand trapping structures is that they cause sand starvation, and consequently increased erosion, downdrift. Groins and jetties may also severely interfere with access along the beach. In order to minimize these impacts, sand trapping must be accompanied by artificial sand bypassing and/or beach nourishment.

#### Beach nourishment

Beach nourishment is the rebuilding of an eroded beach by trucking or pumping (by pipeline) sand to the beach from an outside source area. Nourishment is the only form of erosion abatement which will maintain a natural shoreline. It is expensive, particularly where there is no nearby sand source, and periodic maintenance is required. The high energy shoreline of the northern Outer Banks requires more frequent maintenance than lower energy shorelines such as Miami Beach, or the southern North Carolina beaches. The grain size of sand used for

nourishment must be compatible with the sand at the project site. If the sand is not in equilibrium with ocean shoreline energy conditions it will be washed away rapidly. A suitable sand for nourishment on the northern Outer Banks might be available in four source areas:

1. Old beach sand from relict barrier islands on Roanoke Island, the Dare County mainland, and possibly Kitty Hawk Woods area;
2. Inlet channel fill, modern and relict;
3. Sand shoals located two to four miles offshore; and,
4. Old river channel fill on the ocean side of the barrier island.

A considerable amount of study is needed to evaluate these potential source areas before they can be practically utilized.

The costs of nourishment depend on a number of factors which may vary from region to region along the coast. The nourishment project at Carolina Beach was relatively inexpensive, costing approximately \$900 per foot for the initial fill and \$60 per foot, per year for maintenance. The sand source was within three miles of the nourishment site, and so the sand only cost between \$10 and \$15 per cubic yard.

Sand costs for nourishment along the Outer Banks could range upwards of \$50 per cubic yard. Using offshore sources would be expensive because of the need for hopper dredges, transfers, and the like. If Oregon Inlet were used as a source, the sand would have to be pumped approximately 15 miles to nourish the problem areas in Kill Devil Hills.

#### Dune building

Dune building is the physical piling of sand into a dune or the placing of sand fencing or brush to encourage sand deposition. This is generally accompanied by plantings of dune grass. Dunes offer some protection to development during storms. They do not provide protection from erosion however, so unless dunes are allowed to migrate as they do in their natural state, dune building will generally result in a narrowing of the beach. A large storm will generally relocate a dune landward and widen the beach.

Some researchers have argued that artificial barrier dunes function similarly to bulkheads and cause accelerated erosion. Others argue that dunes cause adjustments in the energy dissipation regime and erosion is not accelerated. The CRC allows dune building because of the ease with which it can be done, the storm protection it offers, and its low cost.

#### Beach pushing

Beach pushing is the mechanical reshaping of the beach. It usually entails pushing sand from the lower to the upper portions of the berm. Bulldozers are typically used in North Carolina, though large earth movers are sometimes used in other areas. There is no detailed scientific data on the effectiveness of beach pushing. With the exception of Topsail Beach, beach pushing in North Carolina is generally done irregu-

larly and on a small scale. The practice may increase storm damage if done on a large scale, and may have the same effect as bulkheads if done continuously. At best, the benefits are short-term.

### Relocation

Relocation involves moving a structure from a location threatened by erosion to a safer location further inland. Before the onset of high density development, endangered beach cottages were typically moved back on the existing lot. Today, because of the small size of most lots, many structures have to be moved to a new lot. A traditional beach cottage is probably easiest structure to move, costing from \$3,000 to \$7,500 for a move of 10 miles or less. If many power lines are involved the cost can be higher. This does not include the cost of a new foundation, septic tank, or replacement lot.

Professional structure movers maintain that virtually any structure can be moved. Large motels and condominiums would be considerably more costly to move and may have difficulty locating a suitable site. Multiple ownership presents a situation where it may be difficult to reach the necessary agreement to move a structure when it is in need of being moved. Moving cost information for large structures is not available at this time because of a lack of experience with moving oceanfront structures and because each structure requires a moving cost estimate based on its individual situation and structural design.

### Financial and Institutional Concerns

In addition to technical approaches and costs of erosion abatement, the task force reviewed a number of questions relating to funding, liability, and tools available to local governments for dealing with erosion. Public and private property rights were also discussed.

Dealing with erosion is expensive, particularly along the high energy coastline of the northern Outer Banks. Similarly, erosion abatement efforts are more effective when done as part of a more comprehensive approach along a shoreline problem reach which may be several miles long. Therefore, most major erosion projects in the past have involved federal, state, and local government funding.

### Federal funding

The U. S. Army Corps of Engineers has a beach erosion control and a multi-purpose flood control program. Projects involving public beaches or private beaches with public access may receive 50 percent federal funding. Projects involving flood control in multiple-use areas may receive up to 70 percent federal funds. The Corps will participate only if the proposed project has a positive benefit/cost ratio and projects are limited to restoration of the historic shoreline. Most of the Corps efforts have been structural berm/dune building flood protection pro-

jects, such as the Carolina Beach and Wrightsville Beach projects. However, federal funding is also available for non-structural approaches to flood control such as land-use planning and relocation.

A typical Corps project begins with a local government contacting its congressional representative. This initiates a process which includes the following actions: 1) a congressional resolution to conduct a feasibility study; 2) Corps preparation and review of the feasibility study results; 3) congressional authorization for the project; 4) advanced engineering design; and 5) construction of the project.

In the past, authorization of new projects in the Wilmington Corps District has required an average of 15 to 18 years. At a minimum, the process from start to finish requires eight years. It was also noted that beach erosion projects have a lower priority than urban flood control and water resources projects and that the competition for these limited federal funds is very high.

A new, more simplified feasibility study process has been developed by the Corps of Engineers. Under this process an initial evaluation of both the economics and engineering of a proposed project can be completed in one year and a determination made of whether or not the project merits further detailed study.

#### State funding

In the past the state has participated primarily in two types of erosion projects: large Corps nourishment projects and small sandbag groin fields. In some instances DOT has conducted emergency actions to protect critical road links and bridge foundations. The small sandbag groin field projects, built mostly in the late 1960's and early 1970's, have had a mixed record of effectiveness. The state can participate in large Corps nourishment projects by funding up to 75 percent of the non-federal share. The availability of state funds for beach protection is uncertain. The General Assembly considers appropriations for this purpose in relation to revenue availability and competing needs for state funds.

#### Local funding

Local government is required to contribute a minimum of 25 percent of the non-federal share of federally funded erosion projects. The cost of these projects is high, and in the recent past has increased substantially as the price of diesel fuel has increased. Several federal projects have been delayed or abandoned, including a project authorized in Dare County in the 1960's.

The two primary sources of revenue for local government are sales and property taxes. Legislative approval for an increase in the general sales tax may not be politically feasible in light of the half-cent increase authorized in 1983. The General Assembly did authorize a three percent lodging tax for three coastal towns (Topsail Beach, Ocean Isle

Beach, and Surf City) and a two percent lodging tax for New Hanover County. By statute, New Hanover County is required to spend 80 percent of its lodging tax revenue for beach erosion abatement. Dare County is considering a request to the General Assembly for authorization to levy a meal and/or lodging tax. Preliminary indications are that the tax would provide between \$1.2 and \$2 million annually. As an example, property tax revenues for Dare County are listed on the following page.

In addition to general property taxes, the General Assembly has passed enabling legislation for two other property tax assessment measures, service districts and special assessments. Service districts (G.S. 153A, Sections 300-307) enable local governments to define district boundaries and levy an additional tax from the district for its special needs. For instance, a town could establish an oceanfront property district and use the additional property tax revenues for beach nourishment. Based on the annualized nourishment costs of \$240 per foot per year, and doubling the existing tax rate, one mile of erosion abatement could be funded by revenue from property valued at between \$129.3 and \$214.8 million.

Special assessments (G.S. 153A, Section 1) are like service districts in that they tax only the properties benefited. They offer somewhat greater flexibility because the assessment may be made on the basis of acreage or front footage rather than property value.

The General Assembly has passed enabling legislation (G.S. 160A-460 et seq.) which allows local governments to administer joint programs. Therefore, once a course of action is decided on, local governments can develop, fund, and administer erosion programs which cross political boundaries. Local governments can also combine several revenue sources such as general revenues and special assessments or service districts to fund a single project.

#### Federal flood insurance

The federal flood insurance program significantly reduces the burden of storm damage financial losses to individual property owners. It has also served to encourage elevating structures above predictable storm surge levels. In most parts of the country, the program encourages sound building practices. However, North Carolina has had a rigorous building code since the devastating hurricanes of the 1950's, so improved construction benefits are not as significant here. On the negative side, it can be argued that in removing the financial risks, the federal flood insurance program has encouraged development in hazardous areas.

Although the federal flood insurance program has in the past paid for moving structures imminently endangered by erosion, the program administrators now only pay claims for damage actually done to structures. Paying for relocation of structures could result in substantial savings, but federal administrators will not cover such costs, even though the CRC and Governor Hunt have requested consideration of such a cost-saving program.



LOCAL REVENUES

1. Property Taxes

Current Total Property Tax Revenues Used for All Purposes - Dare County (1983-84)

	<u>Valuation</u>	<u>Tax Rate</u>	<u>Revenue (Millions)</u>
Dare County	\$1,074,850,274	.59	\$6.34
Southern Shores	95,853,340	.25	.24
Kill Devil Hills	222,942,483	.38	.85
Kitty Hawk	88,848,431	.18	.16
Nags Head	232,386,259	.39	<u>.91</u>
			\$8.50

2. Special Assessments

Current oceanfront property values for Dare County were not available at the time of publication.

3. Meal/Lodging Tax

Projected revenue for Dare County meal/lodging tax is \$1.2 - \$2 million.

Section 1362 of the flood insurance program enables it to purchase a flood-damaged structure rather than compensate the owner for damage, provided that the structure has sustained a specified degree of structural damage. Once purchased by the flood insurance program, the property is usually turned over to the local government. This option is rarely -- and with reluctance -- presented to the property owner. Therefore, a program with the potential to reduce development density in particularly hazardous areas, and to provide open space and access resources, is not being used.

#### Beach ownership, rights, and liabilities

Ownership, jurisdiction, rights, and liabilities associated with the beach were important areas of task force interest and discussion.

In North Carolina the area below mean high water belongs to the state. In addition, it is probable that the public has some legal use rights to the dry sand portions of the beach between mean high water and the vegetation line. This specific question, however, has not been addressed by the North Carolina courts.

As the shoreline moves, riparian property lines move. Therefore, ownership of lands created by accretion of the shoreline through both natural and artificial means goes to the riparian landowners. Where accretion is the result of publicly funded actions, title can be retained by the state through special legislation on a case-by-case basis. For example, a precondition of state involvement in the Wrightsville Beach nourishment project was that the beachfront property owners transfer their riparian property rights to the public.

Erosion abatement measures commonly have significant and well documented impacts on adjacent riparian landowners and the public beach resources. A long body of law has developed to define both the rights and the liabilities of property owners with respect to altering the flow of watercourses and surface waters. Some portion of this law may, in the future, be applied to liability questions raised by the use of bulkheads and other structural erosion abatement devices to alter the "flow" of ocean waters. If not applied directly, the existing body of law is likely to influence North Carolina courts in their approach to this new liability problem.

Until 1977, North Carolina applied the "natural flow" rule to diversion of diffused surface waters (such as flood waters and snow melt). The rule prohibited the alteration of the flow of surface waters by a private property owner. In a potentially significant application of the rule, the North Carolina Supreme Court, in Midgett v North Carolina Highway Commission, held that the natural flow rule for diffused surface waters also applied to overflow ocean waters.

In Pendergrast v Aiken, the court abandoned the natural flow rule and adopted the reasonable use rule, holding that a landowner will be liable for interference with the flow of surface water only when the

interference is unreasonable and causes substantial damage. Under this rule a property owner has the right to protect his property, but does not have the right to unreasonably impact the property of others.

In some states, the legal consequences of private property protection were controlled by the "common enemy" doctrine. Under this doctrine, an individual could do essentially anything necessary to protect his property from the common enemies of flooding, erosion, and the like. However, North Carolina has never followed this doctrine. Though no litigation stemming from impact on neighboring landowners, caused by erosion abatement activities has been attempted to date in North Carolina, it has been successful in other states.

There are two basic approaches to the problem of removing damaged structures and debris resulting from erosion from the dry sand beach. These include local ordinances requiring removal of trash, refuse, and debris, and building codes requiring repair and/or removal of abandoned buildings which are a health and safety hazard. Nags Head, for example, has an ordinance which requires removal of debris within a given time period. If the property owner fails to comply with the ordinance, the city cleans the site and has the cost of clean-up levied against the property.

Bonding could be used in conjunction with CAMA permits as a tool for insuring the removal of erosion control structures which are impacting the public beach and/or insuring mitigation measures are maintained. This will require specific statutory authority from the General Assembly. Florida has a bonding provision for bulkheads but it is not being actively used because of difficulties in enforcement.

## CONCLUSIONS

On the basis of the information presented to the task force and discussions which followed the group agreed on the following conclusions:

1. An ocean beach is a dynamic natural system which includes the nearshore, intertidal, and dry sand/frontal dune area as inter-related components.
2. North Carolina's ocean beaches are subject to constant fluctuation as a result of short-term events (storms), seasonal changes, and long-term erosion, all of which are natural processes.
3. The intertidal or wet sand beach is reserved for the use of the public and held in trust for the public by the State. The dry sand beach seaward of the vegetation line has been subject to a long-standing custom of public use and enjoyment.
4. An unobstructed public beach is essential to the continued vitality of the tourism industry in coastal North Carolina.

PART TWO

Recommended Policies, Standards, and Actions



## I. POLICY RECOMMENDATIONS

The task force recommends that the following be incorporated into the erosion response policies of the Coastal Resources Commission:

### A. Beach Use

1. The public right to use and enjoy the ocean beaches must be protected. The protected uses include traditional recreational uses (such as walking, swimming, surf-fishing, and sunbathing) as well as commercial fishing and emergency access for beach rescue services.
2. Private property rights in oceanfront properties -- including the right to protect that property in ways that are consistent with public rights -- should be protected.
3. The state should acquire the lands which are most vulnerable to severe erosion only when these lands may be used for some valid public purpose, such as beach access and use. The state should seek opportunities for the acquisition of inexpensive properties. Where feasible, donations and bargain acquisitions should be encouraged.

### B. Economic Impacts

1. Hotels, restaurants, and similar large commercial structures which are important to the local tax base and contribute to the tourism industry should be discouraged from locating in erosion-prone areas.
2. Actions required to deal with erosion problems are very expensive. In addition to the direct costs of erosion abatement measures, many other costs, such as maintenance of projects, disaster relief, and infrastructure repair, will be borne by the public sector. Responses to the erosion should be designed to limit these public costs.

### C. Erosion Responses

1. Efforts to permanently stabilize the location of the shoreline by massive seawalls and similar protection devices which do not preserve public trust rights should not be allowed. The attendant environmental damages and public economic costs are unacceptably high.
2. Temporary measures to counteract erosion, such as beach nourishment, sandbag bulkheads, and beach pushing, should be allowed, but only to the extent necessary to protect property for a short period of time until threatened structures may be relocated or until the effects of a short-term erosion event are reversed. In all cases, temporary stabilization measures should be compatible with public use and enjoyment of the beach.

3. Erosion abatement measures which will interfere with public access to and use of the ocean beaches should be prohibited. ✓
4. Erosion abatement measures which will significantly increase the erosion rates on adjacent properties should be prohibited. ✓
5. Innovative measures which may be developed in the future that will lessen or slow the effects of erosion while minimizing the adverse impacts on the public beach and on nearby properties should be encouraged.
6. Local, state, and federal government activity in the coastal area should reflect an awareness of the natural dynamics of the oceanfront. Government policies should not only address existing erosion problems but should aim toward minimizing future erosion problems. ✓
7. Regulations concerning the use of oceanfront erosion abatement measures should apply to all oceanfront properties without regard to the size of the structures on those properties or the date of their construction. ✓
8. The federal government should be encouraged to amend the flood insurance programs to fund the relocation of structures threatened by erosion and the resultant flooding.



## II. STANDARDS FOR OCEANFRONT EROSION ABATEMENT

The task force recommends that the following be incorporated into the erosion abatement standards of the Coastal Resources Commission:

- A. Beach nourishment is the preferred response to erosion. Sand used for nourishment should be compatible with existing grain size and type, and should be obtained from sources that minimize environmental damage.
- B. Sand trapping, through the use of groins and breakwaters, and shoreline hardening, by the construction of bulkheads and seawalls, should be prohibited unless the project design incorporates features adequate to protect public use of the beach and to prevent or mitigate the impacts of increased erosion on nearby properties. This will generally require addition of sand from an outside source to compensate for sand trapped or lost due to (or potentially caused in the future by) the project. Permitted structures should be limited in size and scope to provide emergency protection and, under normal conditions, be buried under suitable fill (which should be replaced as sand is lost). All oceanfront erosion projects should be required to be properly engineered for their planned purpose prior to being permitted, with the applicant providing certification that this has been done. CAMA permits for such projects should also contain conditions relative to maintenance necessary to protect public interests, and these permits should continue in force as long as the structure exists.

To ensure enforceability of these standards, bonding (or some other legally enforceable provision to place financial responsibility for removal of the structure on the landowner) should be required in order to guarantee removal of the structure if the above performance standards are not met. (The permittee should be held strictly liable for damages resulting from construction and use of erosion abatement structures. Title restrictions should also be required to ensure the enforceability of performance standards if the property ownership changes.

- C. Buildings, debris, and erosion abatement devices which impede travel along the beach and interfere with public use of the beach should not be allowed except for temporary obstructions during construction. All appropriate measures, including removal at the owner's expense, should be instituted in order to preserve, protect, and restore public rights. The state, as owner of the wet sand beach and custodian of public trust rights, should enforce this policy within a reasonable time. Local governments also share the responsibility for maintaining an open beach and, where appropriate ordinances have been enacted, may have the initial opportunity to ensure the prompt removal of obstructions.

D. The following standards should be required with state involvement (funding or sponsorship) in oceanfront erosion abatement projects:

- (1) There should be no unacceptable environmental impacts;
- (2) The entire restored portion of the beach should be in permanent public ownership;
- (3) Adequate parking, public access, and services must be provided for public recreational use of the restored beach;
- (4) State expenditures are to be used only for maintenance of a public beach and not to protect endangered seawalls or other erosion abatement structures; and,
- (5) All publicly funded projects should be consistent with all policies and standards for oceanfront erosion abatement.

E. All artificially accreted oceanfront lands, however financed, should be publicly owned.

### III. RECOMMENDED ACTIONS

The task force recommends that the following measures be implemented in order to carry out the Coastal Resources Commission's policies and standards for erosion abatement:

#### A. Demonstration Projects Feasibility Analysis

1. Detailed monitoring should be undertaken when experimental erosion abatement techniques, such as artificial seaweed, are installed. Financing of such monitoring should be the responsibility of the applicant.
2. A standing technical advisory committee should be established to advise the Department of Natural Resources and Community Development and the Coastal Resources Commission on the feasibility and impacts of erosion abatement projects.

#### B. Federal Legislative Needs

1. Congress should be encouraged to amend, if necessary, the National Flood Insurance Act to provide coverage for the relocation of threatened structures.
2. Congress should be encouraged to provide adequate funding under Section 1362 of the flood insurance program, as well as other programs, for the purchase of severely flood-damaged or imminently endangered structures, if the land is suitable to be used for open space, beach access, or other valid public purposes. Donations, bargain sales, and similar approaches should be used when possible to minimize the public costs of these acquisitions.

#### C. State Legislative Needs

1. Legislative authorization of a bonding requirement should be obtained to assure that performance standards for construction of erosion abatement devices are followed.
2. Legislative authorization to acquire and accept deed restrictions for ongoing conditions for construction and maintenance of erosion abatement structures should be obtained.
3. Legislation should be passed to create strict liability for damage resulting from construction and use of erosion abatement structures.
4. Legislation should be enacted designating an agency or agencies of the state government to enforce public trust rights on the oceanfront. Such legislation should authorize the designated official to remove structures and

obstructions after notice to the person who placed or owns the structure at the expense of that person. If the structure is causing imminent danger to or is damaging other properties, whether public or private, the designated official should be allowed to remove the structure without notice. Such legislation should authorize government to enter the adjacent property as necessary to facilitate removal. Such legislation also should provide that the costs of removing obstructions to public trust rights should be borne by the property owner.

5. Legislation should be obtained to provide that title to all accreted lands created by erosion abatement projects vest in the state, with subsequent conveyances to local governments for beach access and use also being permitted.

#### D. Regulatory Amendments

1. Procedures should be initiated for CRC incorporation of permit standard recommendations in 15 NCAC 7H, Coastal Management State Guidelines for Areas of Environmental Concern. This would include repeal of the existing standards which distinguish between pre- and post June 1, 1979 development and formulation of new performance and use standards, conditions, and exceptions for shoreline hardening and sand trapping activities.
2. Procedures should be initiated for CRC incorporation of the aforementioned policy recommendations in 15 NCAC 7M, Coastal Management General Policy Guidelines for the coastal area.

#### E. Dare County Critical Research Needs

1. An experimental low-cost breakwater has been proposed by the Town of Kill Devil Hills. A technical review committee should be established to evaluate the feasibility, recommend conditions, develop and implement a monitoring program, and report on the effectiveness of the project.
2. The Corps of Engineers should be asked for an assessment -- based on existing information -- of the feasibility, impacts, and cost of transporting material dredged from Oregon Inlet via hopper dredge to erosion problem areas.

#### F. Research Needs

1. A systematic shoreline monitoring program should be established for collecting data needed to assess causes and processes of both long-term and short-term erosion. This information is necessary for cost-effective erosion planning and design. The program should be a joint

federal, state, and local effort. The program would complement the periodic aerial photo study system currently used by the CRC for determining long-term-average annual erosion rates. Shoreline monitoring will provide more detailed information on volumetric shoreline changes and sediment budget analysis, as well as systematic information on wave conditions, weather patterns, and beach slope.

2. A detailed study of present erosion problem areas is needed. This should include a survey of the area involved, magnitude of the erosion problem, determination of the time of onset of the present erosion cycle, and its relation to physical features such as bars, shoals, beach slope, sand sources, wave patterns, and historical patterns.
3. The long-term average annual erosion studies of the Office of Coastal Management should be updated periodically incorporating the use of the best methods available. Programming necessary for making the existing data more accessible to researchers should be done.
4. A systematic detailed survey of sources of suitable sand for beach nourishment should be done.
5. A study of the cost and feasibility of moving large structures to prevent damage or interference with the legally recognized public use rights of the beach should be conducted.
6. A study should be done of the economic impact of erosion on local government tax base, revenues, and expenditures. A set of recommendations for mitigating these losses should be included.
7. A coastal geologist should be added to the staff of the Office of Coastal Management, or otherwise be made permanently available on a regular basis.

#### G. Funding

##### 1. Research

- a. A long-term systematic shoreline monitoring program should be established to provide an integrated data base for the entire coast of North Carolina. This should be a joint local, state, and federal program. The state portion of the monitoring effort may require a special appropriation. Local shares could come from new erosion tax revenues. Federal shares will require further inquiries.

- b. The detailed study of present erosion problem areas should be funded by the N.C. Office of Coastal Management with assistance from UNC Sea Grant. This project should begin immediately.
- c. Periodic long-term erosion study updates should be funded by the N.C. Office of Coastal Management.
- d. The systematic survey of suitable beach nourishment material should be funded as part of a detailed feasibility study involving the Corps of Engineers, the state, and affected local governments.
- e. To demonstrate the feasibility of moving large structures, an economic study should be funded by UNC Sea Grant with assistance from the Office of Coastal Management. Although individual landowners can readily obtain estimates for relocation costs from moving companies (and a site specific estimate would be required in the event of relocation), it will benefit the general public to have basic information on the costs of relocation, and how it compares to other responses to erosion. The study should include an analysis of how sites for relocation can be acquired.
- f. The economic impact of erosion study should be funded by UNC Sea Grant.

## 2. Acquisition

- a. Funding of the acquisition of erosion-prone properties that can be used for a valid public purpose should continue through legislative appropriations to the Beach Access Program. Donations, bargain sales, and similar approaches should be used when feasible.
- b. Additional funding sources, such as the Land and Water Conservation Fund and Section 1362 of the National Flood Insurance Act, should be used where feasible.

## 3. Beach Nourishment

Beach nourishment and other large-scale beach erosion projects are eligible for federal and state funding if: (1) they are economically justifiable; (2) they have minimal environmental impacts; (3) the required local match can be met; and (4) funds are available in the federal and state programs. Recent budgetary constraints at the state and federal level and the long lead time required (a minimum of eight years for federal projects) place the major financial burden on private landowners

and local governments at the present time. State funding should come through special legislative appropriations, biennial capital budget appropriations, or reallocation of funds within the existing public works budget.

