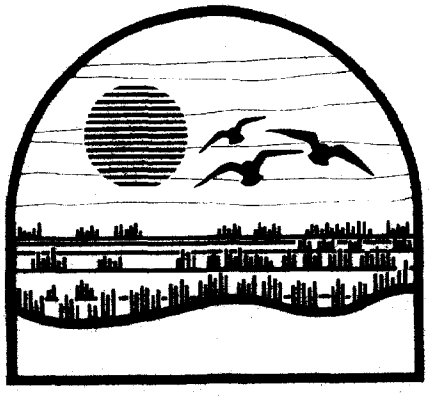
North Carolina National Estuarine Research Reserve Management Plan



National Estuarine Research Reserve System

U.S. Department of Commerce

North Carolina

UNITED STATES

DEPARTMENT OF COMMERCE

FINAL MANAGEMENT PLAN

NORTH CAROLINA NATIONAL ESTUARINE RESEARCH RESERVE

December 1990

Prepared by:

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
1825 Connecticut Avenue, NW
Washington, DC 20235

State of North Carolina
Department of Environment, Health, and Natural Resource
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ACRONYMS

CAMA	North Carolina Coastal Area Management Act
CMSR	Center for Marine Science Research - UNCW
CRC	Coastal Resources Commission
CZMA	Federal Coastal Zone Management Act
DCM	North Carolina Division of Coastal Management
DEH&NR	North Carolina Department of Environment, Health, and Natural Resources
DEM	North Carolina Division of Environmental Management
DMF	North Carolina Division of Marine Fisheries
DPR	North Carolina Division of Parks and Recreation
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FWS	United States Fish and Wildlife Service
LAC	Local Advisory Committee
MOU	Memorandum of Understanding
NCA-FF	North Carolina Aquarium at Fort Fisher
NCA-PKS	North Carolina Aquarium at Pine Knoll Shores
NCA-RI	North Carolina Aquarium at Roanoke Island
NCMM	North Carolina Maritime Museum
NCNERR	North Carolina National Estuarine Research Reserve
NERRS	National Estuarine Research Reserve System
NCSU	North Carolina State University
NOAA	National Oceanic Atmospheric Administration - United States Department of Commerce
RAC	Research Advisory Committee
RRP	Research Review Panel
SMI	Society for Masonboro Island
SRD	Sanctuaries and Reserves Division
UNCIMS	University of North Carolina Institute of Marine Science
UNCW	University of North Carolina at Wilmington
WRC	North Carolina Wildlife Resources Commission

UNITED STATES DEPARTMENT OF COMMERCE
The Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

DESIGNATION OF THE NORTH CAROLINA
NATIONAL ESTUARINE RESEARCH RESERVE
MASONBORO ISLAND COMPONENT

Consistent with the provisions of Section 315 of the Coastal Zone Management Act, 16 U.S.C. 1461, the State of North Carolina has met the following conditions to establish Masonboro Island as a component of the North Carolina National Estuarine Research Reserve.

1) Masonboro Island is a representative estuarine ecosystem that is suitable for long-term research and contributes to the biogeographical and topological balance of the National Estuarine Research Reserve System.

2) North Carolina state law provides long-term protection for reserve resources to ensure a stable environment for research.

3) Designation of Masonboro Island as a reserve component will serve to enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation.

4) The State of North Carolina has complied with the requirements of the regulations relating to designation of a National Estuarine Research Reserve.

Accordingly, I hereby designate the area of Masonboro Island as a component of the North Carolina National Estuarine Research Reserve, the boundaries of which are specified in the Final Management Plan.

John A. Knauss
Under Secretary for Oceans
and Atmosphere

THE ADMINISTRATOR

I. EXECUTIVE SUMMARY

Section 315 of the Federal Coastal Zone Management Act of 1972 established the National Estuarine Reserve Research System (originally called the National Estuarine Sanctuary Program) as a federal/state cooperative venture. Federal matching grants are available to coastal states to develop and manage a national system of estuarine research reserves which are representative of various regions and estuarine types in the United States. In addition, annual grants for research and education projects are available. The goal of the program is to protect areas of representative estuaries, including valuable wetland habitat, for use as natural field laboratories. National Estuarine Research Reserves are established to: 1) provide opportunities for long-term estuarine research and monitoring; 2) provide opportunities for estuarine education and interpretation; 3) provide a basis for more informed coastal management decisions; and 4) promote public awareness, understanding and appreciation of estuarine ecosystems and their relationships to the environment as a whole.

North Carolina ranks third among all states with a total estuarine area of approximately 2.2 million acres (Davis and Hart, 1979), and includes portions of the Middle Atlantic sub-region of the Virginian biogeographic region and the Northern Carolinas sub-region of the Carolinian biogeographic region. Because of this extensive estuarine area and its diversity, a multi-component reserve was proposed by the North Carolina Department of Environment, Health, and Natural Resources/Division of Coastal Management (DCM) in 1982. Following recommendations from various sources, four components were selected: 1) Zeke's Island, 2) Rachel Carson, 3) Currituck Banks, and 4) Masonboro Island. Biogeographic classification and estuarine typology of each component are shown in Appendix A.

Land comprising the four components is owned in fee simple by the State of North Carolina. The DCM has been designated as lead agency for management of the components and development of the reserve program (see Appendix B). The Zeke's Island Component is located in Brunswick-New Hanover counties, just south of Kure Beach. The Rachel Carson Component is located in Carteret County, near the historic town of Beaufort. The Currituck Banks Component is located in Currituck County, just north of the village of Corolla. The Masonboro Island Component is an entire barrier island located in New Hanover County between the towns of Wrightsville Beach and Carolina Beach.

The purpose of the North Carolina National Estuarine Research Reserve (NCNERR) is to establish and manage the four components as natural laboratories and develop a coordinated program of research and education for the reserve. A coordinated management approach

will be used involving the DCM; federal, state, and local agencies; private organizations; and advisory committees.

Reserve staff include a program coordinator (based in Wilmington), research specialist (based in Wilmington), and education specialist (based in Beaufort). The program coordinator oversees administrative functions and the research and education programs, and acts as liaison to the National Oceanic and Atmospheric Administration (NOAA) and Estuarine Research Reserve programs of other states. The research and education specialists coordinate their respective activities for all the components, with particular emphasis placed on the Masonboro Island Component for research and the Rachel Carson Component for education.

Management of the components is facilitated by memoranda of understanding (MOUs), volunteer efforts, and direct staff involvement. The reserve coordinator and research specialist oversee the Zeke's Island and Masonboro Island components. The Division of Parks and Recreation patrols a portion of the Zeke's Island Component. The education specialist also serves as site manager for the Rachel Carson Component. The Currituck Banks Component is patrolled by the U.S. Fish and Wildlife Service. The reserve coordinator makes at least quarterly visits to all components.

The reserve research and education specialists gather and make available information necessary for improved understanding, appreciation, and management of North Carolina estuaries and estuarine systems in general. Though no on-site facilities exist research and educational institutions have facilities available for use in the vicinity of each component. Component use requirements (see Appendix C) are enforced to protect the natural integrity of the reserve. The NCNERR coordinates activities with other estuarine research and educational programs throughout the state, Middle Atlantic Region, and the National Estuarine Research Reserve System to attain maximum benefits for coastal management decisionmaking.

Natural resources that have been preserved by reserve designation include four biologically diverse, highly productive estuarine systems composed of intertidal wetlands, open waters, and uplands with salinities ranging from 0 to 35 ppt. The four reserve components support various rare plant and animal species. Nationally threatened loggerhead sea turtles nest at the Zeke's Island, Rachel Carson, and Masonboro Island components. Brown pelicans and ospreys are commonly seen at the four components, as are nesting colonies of waterbirds. Pristine remnants of maritime forest are also found in the reserve.

Traditional activities at the reserve components include commercial and sport fishing, hunting, swimming, recreational boating, and environmental education programs. All of these

traditional uses will be allowed to continue subject to state regulations.

It is the responsibility of the reserve staff to be knowledgeable and involved with land use issues in the vicinities of the components that could impact the reserve. An essential part of this task is regular monitoring, by the reserve staff and concerned citizens, of adjacent development and other nearby land uses.

This plan is in accordance with all relevant state, local, and federal regulations and is consistent with the objectives of federal, state, and local land use plans, policies, and controls for the areas concerned.

II. INTRODUCTION

A. Purpose and Scope of Plan

The State of North Carolina established the North Carolina National Estuarine Research Reserve (NCNERR) to provide representative natural areas for long-term research, monitoring, and education. The mission of the research reserve program is to improve coastal resource management by increasing scientific understanding of estuarine systems and provide useful information for decisionmakers and the public. This plan will ensure that activities planned for the reserve program are consistent with this primary mission.

This management plan has been developed according to NOAA regulations (15 CFR Part 912) given in Appendix D, using information derived from research and public input. It is consistent with the Congressional intent of the NERRS, the NOAA-State of North Carolina MOU concerning the NCNERR, and the provisions of the North Carolina Coastal Management Program.

The purpose of this management plan is to inform interested parties about the reserve and activities that will be conducted. Though it is long-term in scope, the plan will be reviewed by NOAA every two years and revised every five years.

B. Background

1. National Estuarine Research Reserve System (NERRS)

In response to intense pressures on the coastal resources of the United States, Congress enacted the Coastal Zone Management Act (CZMA). This act was signed in to law in 1972, amended in 1976, 1980, 1986, and 1990. The CZMA authorized a federal grant-in-aid and assistance program to be administered by the Secretary of Commerce, who in turn delegated this responsibility to the Assistant Administrator for Ocean Service and Coastal Zone Management within NOAA.

The act and its amendments affirm a national interest in the effective protection and careful development of the coastal zone by providing financial and technical assistance to U.S. coastal states and territories to voluntarily develop and implement coastal zone management programs. The act established a variety of grant-in-aid programs to coastal states for purposes of:

- Developing coastal zone management programs (Sec. 305);

- Implementing and administering coastal management programs that receive federal approval (Sec. 306);

- Avoiding or minimizing adverse environmental, social, and economic impacts resulting from coastal energy activities (Sec. 308);

- Coordinating, studying, planning, and implementing interstate coastal management activities and programs (Sec. 309);

- Conducting research, study and training programs to provide scientific and technical support to state coastal management programs. (Sec. 310); and

- Establishing national estuarine research reserves. Funds are available to assist states in the acquisition, development, and operation of reserves, and to support research, monitoring, and education or interpretation programs (Sec. 315);

Recognizing the need to address threats to the important and sensitive estuarine areas throughout the county, Congress established the National Estuarine Sanctuary Program as Section 315 of the CZMA (see Appendix D). The reauthorization of CZMA in 1986 included an amendment changing the name of the program to National Estuarine Research Reserve System, reflecting a stronger emphasis on research. What were formerly "sanctuaries" are now called "research reserves." The goal of the program is to create a system of reserves that represent distinct estuarine ecosystems found nationally and to manage these areas for long-term research and education. Although the program is national in scope, individual states are responsible for implementation and administration of their own programs.

Coordination of the NERRS is provided by NOAA, specifically the Sanctuaries and Reserves Division (SRD). In this management plan, the coordinating entity will be referred to simply as NOAA, with the understanding the SRD is actually the responsible division within NOAA.

Regulations revising the rules for NERRS were approved as Interim Final Rule in Vol. 55, No. 141 of the Federal Register in July 1990. This management plan is consistent with these regulations. NOAA will conduct periodic performance evaluations of a reserve at least once every four years. Evaluations may be conducted more frequently as determined necessary by NOAA. These evaluations are required by Sections 312 and 315 of the Coastal Zone Management Act (CZMA) and will follow the evaluation procedures described in Section 312. Evaluations may assess all aspects of reserve

operation and management, or they may focus on selected issues. Evaluations may also examine whether a reserve is in compliance with NERRS designation regulations, and particularly whether the operations and management of the reserve are consistent with and further the mission and goals of the NERRS.

If performance evaluations reveal that the operation and management of the reserve is deficient or that research is inconsistent with the estuarine reserve guidelines, the eligibility of the reserve for federal assistance may be suspended until the situation is remedied. If the deficiencies are not remedied within a reasonable amount of time, NOAA may initiate a process to withdraw designation of the reserve.

To ensure that the NERRS includes sites that adequately represent regional and ecological differences, the NERRS regulations establish a biogeographical classification scheme that reflects regional differences in biogeography and an estuarine typology system which includes a variety of ecosystem types (see Appendix D for a map of the biogeographic regions of the United States). The North Carolina National Estuarine Research Reserve (NCNERR) lies in both the Middle Atlantic sub-region of the Virginian biogeographic region and the Northern Carolinas sub-region of the Carolinian biogeographic region.

At the present time, eighteen reserve sites have been designated across the country (Figure 1). Designated reserves are:

Research Reserve	Biogeographic Classification
Wells York County, Maine	Acadian
Great Bay Great Bay, New Hampshire	Acadian
Waquoit Bay Mashpee and Falmouth, Massachusetts	Virginian
Narragansett Bay Newport County, Rhode Island	Virginian
Hudson River (4 components) Hudson River, New York	Virginian

Research Reserve	Biogeographic Classification
Chesapeake Bay, Maryland (3 components) Anne, Arundel, Harford, Prince George's, and Somerset counties	Virginian
North Carolina (4 components) Brunswick, Carteret, Currituck, and New Hanover counties	Virginian/Carolinian
Sapelo Island McIntosh County, Georgia	Carolinian
Rookery Bay Collier County, Florida	West Indian
Jobos Bay Puerto Rico	West Indian
Apalachicola River/Bay Franklin County, Florida	Louisianan
Weeks Bay Baldwin County, Alabama	Louisianan
Tijuana River San Diego County, California	Californian
Elkhorn Slough Montery County, California	Californian
South Slough Charleston, Oregon	Columbian
Padilla Bay Skagit County, Washington	Columbian
Old Woman Creek Erie County, Ohio	Great Lakes
Waimanu Valley Island of Hawaii, Hawaii	Insular

In addition, California-San Francisco Bay (San Francisco Bay), New York-St. Lawrence River Basin (Acadian), Delaware (Virginian), Virginia (Virginian), and South Carolina (Carolinian) have proposed sites to be included as National Estuarine Research Reserves and are in the process of producing environmental impact statements and management plans.

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The National Estuarine Reserve Research System

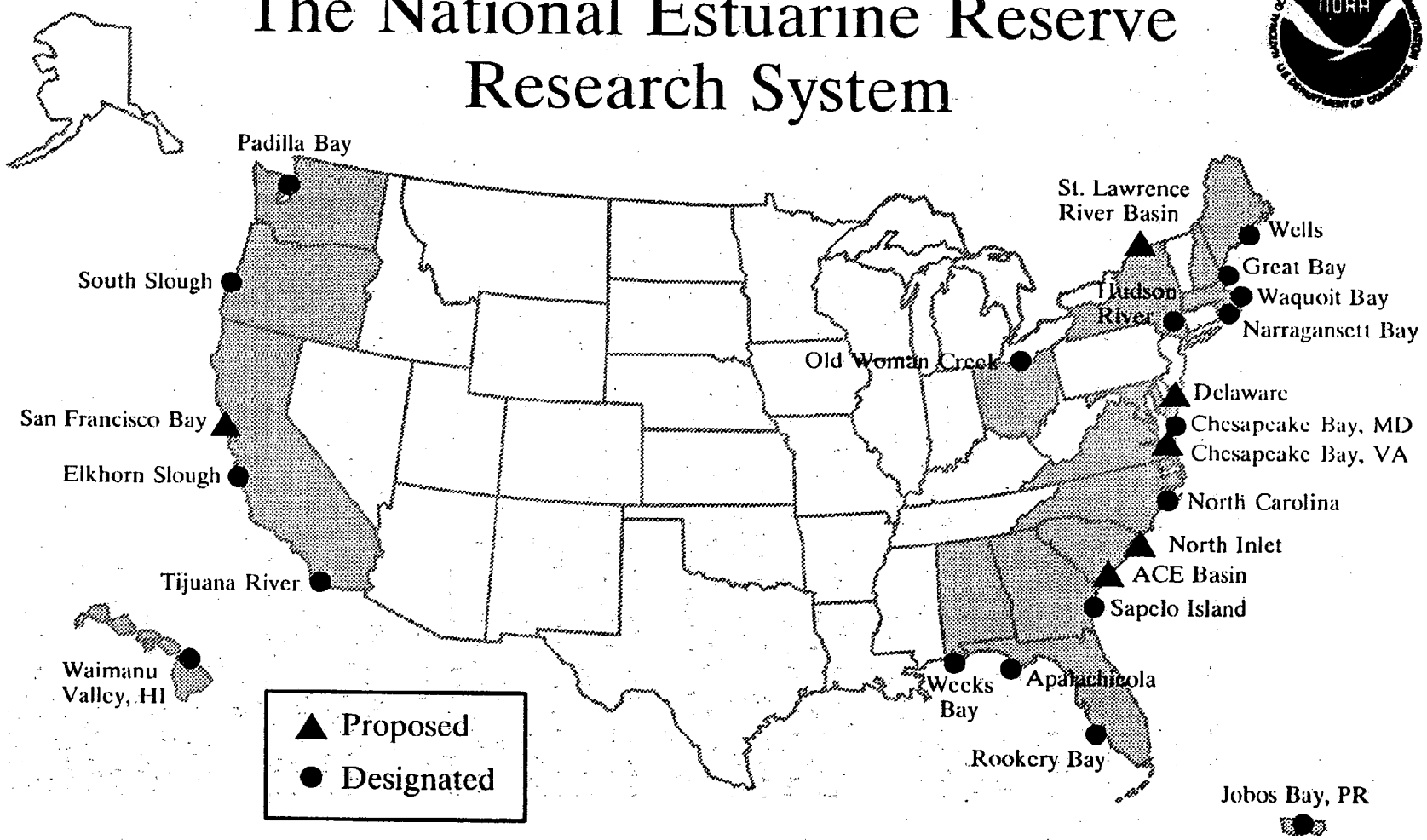

Figure 1. Designated and Proposed National Estuarine Research Reserves

National Oceanic and Atmospheric Administration
Sanctuaries and Reserves Division
Office of Ocean and Coastal Resource Management
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2. North Carolina National Estuarine Research Reserve (NCNERR)

The participation of North Carolina in the NERRS is based upon the recognition that the state contains a vast wealth of estuarine area that is being affected by associated changes in land uses, including rapid development of coastal barrier islands. Other obvious impacts include the closing of thousands of the acres of shellfish beds due to high fecal coliform levels and the recent presence of red sore disease in fish and crabs of the Albemarle-Pamlico Sound. Thus fewer and fewer undisturbed or unpolluted areas remain for scientific study and public education.

In response to these trends and concerns, the State of North Carolina had for several years been actively considering the establishment of estuarine reserves in general and the preservation of specific sites as unique natural areas. The NERRS helped bring these reserve plans to fruition.

A site selection process was initiated by the North Carolina Department of Natural Resources and Community Development (now the North Carolina Department of Environment, Health, and Natural Resources [DEH&NR]) in early 1980 to determine the most representative areas in the state appropriate for inclusion in the proposed reserve (then called sanctuary). Detailed inventories of 112 important natural areas were reviewed and nominations were solicited from over fifty key parties (state and federal agencies, researchers, coastal environmental groups, and private citizens). Personnel from the federal Office of Coastal Zone Management (now SRD) and DEH&NR visited and evaluated these potential sites along the coast in 1981.

The twenty-eight sites that were nominated as potential estuarine reserves in North Carolina encompassed examples of highly diverse estuarine habitats. The 2.2 million acres of estuaries delineated by approximately 4,500 miles (7,200 km) of estuarine shoreline are naturally divided by: portions of two major biogeographic regions--Virginian and Carolinian, salinities that range from oligohaline to euhaline, various estuarine basin types and geomorphic features associated with both barrier islands and the mainland, and water level fluctuations determined by either semi-diurnal or wind-influenced tides. For these reasons it was essential that a multiple site system be developed to adequately represent the complexity of the North Carolina estuarine system.

Because most of the sites nominated are viable candidates for reserve status from a physical/biological standpoint, the Division of Coastal Management (DCM) sought to incorporate various practical considerations into the selection process:

- Natural area significance (biotic communities, threatened and endangered species);
- Development pressure;
- Estuarine research-education potential;
- Availability of land that would constitute a natural, yet manageable estuarine unit;
- Local interest in estuarine preservation;
- Accessibility;
- Lack of on-site disturbance; and
- Compatibility of adjacent land uses.

After careful analysis the DCM staff determined that the estuaries associated with the coastal barrier islands deserved priority consideration because of the relatively greater development pressure on these areas compared to the mainland. Several such estuarine areas that were available for acquisition were also known to be highly desirable sites for research by local universities or colleges. Similarly, public sentiment favored preservation of these sites for education and traditional hunting and fishing. By combining all of these factors with the physical/biological variations of the North Carolina estuarine system, DCM selected four sites--Zeke's Island, Carrot Island-Bird Shoal (now called Rachel Carson), Currituck Banks, and Masonboro Island (Figure 2). Each of these selections represents a distinctly different estuarine typology or biogeographic region (see Appendix B) according to the revised regulations.

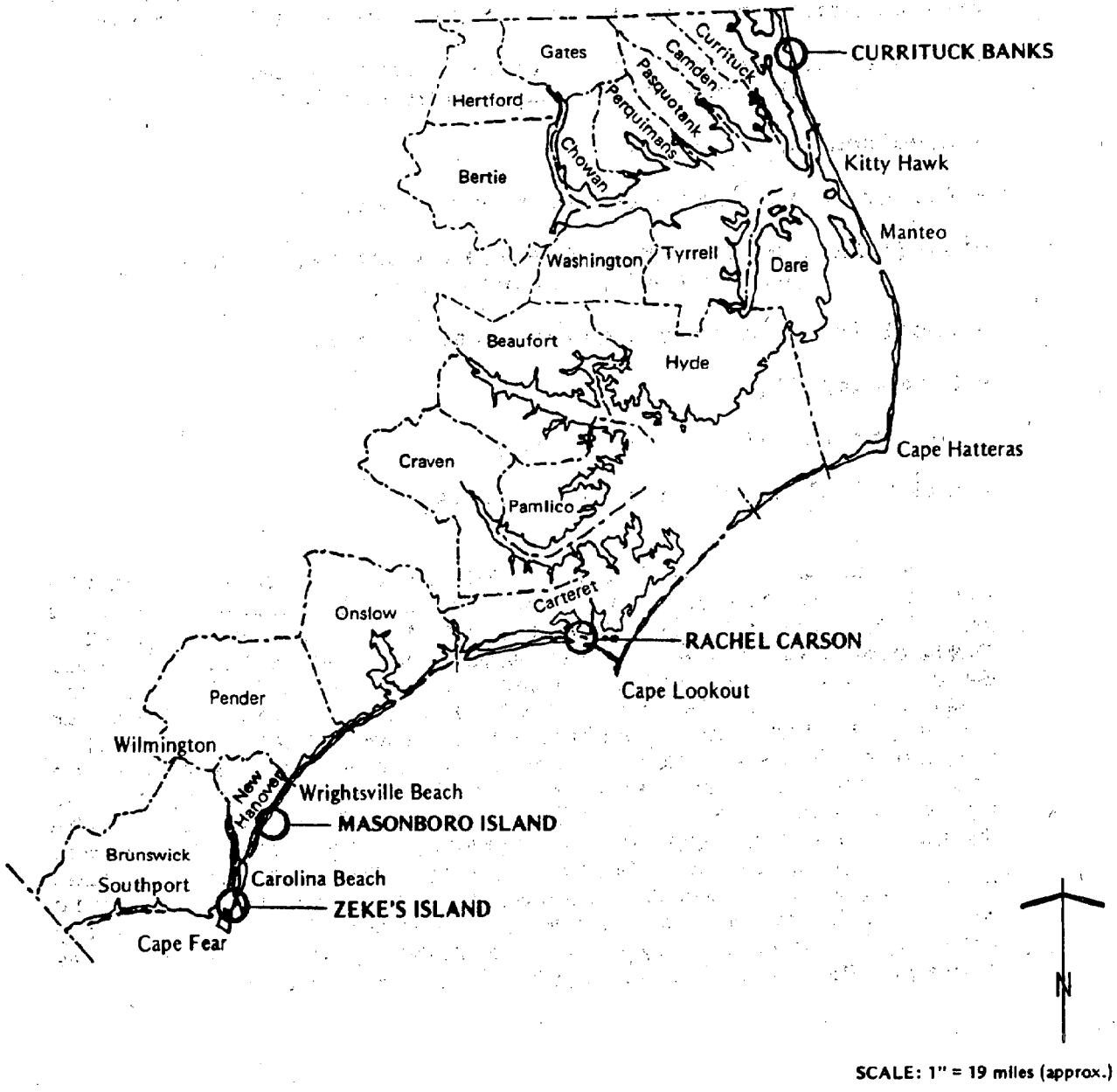

Figure 2. North Carolina National Estuarine Research Reserve

III. MANAGEMENT BACKGROUND

A. General Description of the North Carolina Estuarine Area

The 2.2 million-acre estuarine area of North Carolina is part of the coastal plain, a physiographic province that evolved over tens of thousands of years as changes in climate and ocean level influenced deposition and erosion of vast quantities of sand, silt, and clay. The majority of these sediments at one time or another were part of the ocean bottom or mountains, primarily the Appalachians. In the mountains, constant physical and chemical weathering gradually reduced rocks to sediments which were carried to the coast by streams and rivers to mix with other sediments and become beaches, dunes, flats, marshes, shoals, and sound bottoms. Processes that developed the coastal landscape are still at work, constantly changing the relationship between water and land.

The barrier islands that compose portions of the four reserve components are the eastern edge of the coastal plain. Although there are different theories about how the islands were created, one of the most widely accepted explanations is that these islands were created by a process known as mainland beach ridge drowning (Hoyt, 1967).

Before the glaciers began to recede 10,000 to 14,000 years ago, dunes had formed along the seaward edge of the mainland. The rapid rise in water level from the melting glaciers flooded the low areas behind the dunes, creating shallow sounds bordered by developing barrier islands. When sea level rise slowed to a fairly constant rate of one foot per century some 5,000 years ago, the new barrier islands were able to build up, enabling plants to take hold and bind the sediments.

It is thought that the islands are migrating or moving landward as sea level rises. Evidence of this process, known as "erosion" to most beach-goers, can be inferred from ocean beach exposures of old sound-side marsh peat, oyster/clam shell deposits, or stumps of former mid-island maritime forest trees.

B. Regional Settings

1. Zeke's Island Component

a. Location and Access

The Zeke's Island Component is located in

Brunswick/New Hanover counties, approximately four miles (6.4 km) south of Kure Beach (See Figures 3 and 4). The component is bounded by the Atlantic Ocean to the east, the Cape Fear River to the west, Bald Head Island State Natural Area to the south, and the Fort Fisher State Recreation area to the north. Nearby towns and cities include Carolina Beach (5 miles/8 km), Southport (7 miles/13 km), Wilmington (23 miles/37 km), and Wrightsville Beach (25/40 km miles). The component is located one-half mile (0.8 km) south of the N.C. Aquarium at Fort Fisher (NCA-FF), one mile (1.6 km) south of the Fort Fisher State Historic Site and Museum, and six miles (9.6 km) south of Carolina Beach State Park. The state Department of Transportation operates the Fort Fisher-Southport ferry from a terminal located approximately 100 yards (91 m) north of the component.

U.S. Route 421 provides access to the component where visitors may: 1) walk on a rock jetty ("The Rocks") to Zeke's Island, 2) use the public boat ramp (maintained by the state Wildlife Resources Commission) and parking lot, or 3) drive on an unimproved beach/backdune road (Ramsgate Road) which runs from U.S. 421 to New Inlet. Access within the component is primarily by private boat except for the jetty and off-road-vehicle (ORV) road. In addition, the state Division of Parks and Recreation maintains a pedestrian beach access facility and vehicular dune crossover areas north of the component near the N.C. Aquarium at Fort Fisher (NCA-FF).

The primary local facility utilizing the component for education purposes is the NCA-FF. There is also considerable daily use by commercial and sport fishermen because of the public boat ramp. Local sport fishermen also drive Ramsgate Road to New Inlet.

b. Natural Environment

(1) Hydrology and Climate

The estuary of the Zeke's Island Component is generally quite shallow with the deepest tidal creeks measuring less than ten feet (3 m) in depth. The salinity of The Basin is typically near that of sea water (35 ppt - euhaline) because of regular ocean tides through New Inlet, although some fresh water leaks through The Rocks from the Cape Fear River at the western edge of the component. The semi-diurnal tide range is up to six feet (2 m).

Estuarine water quality within the component waters is classified by the state Division of

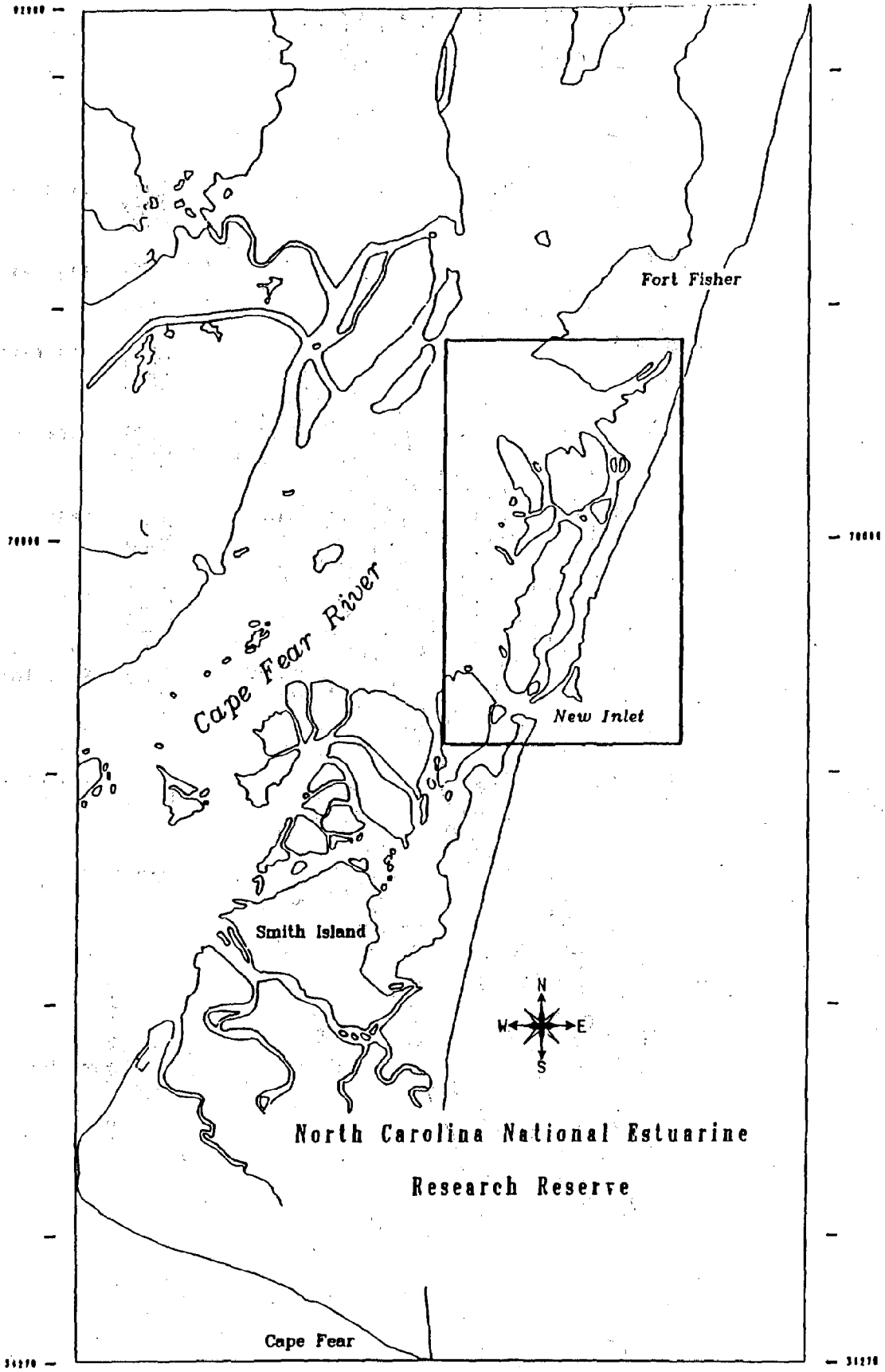

Figure 3. Zeke's Island Component Vicinity

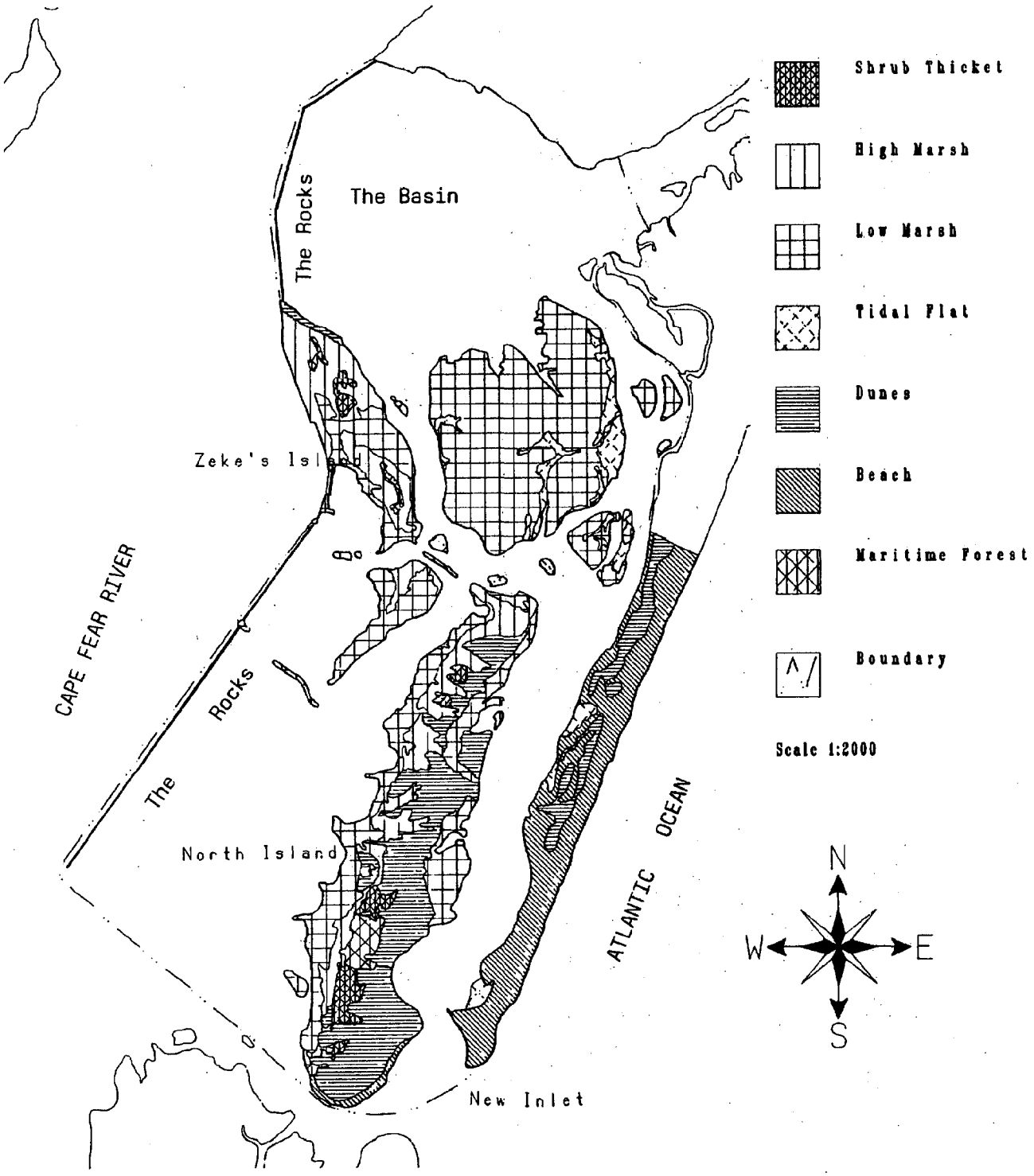

Figure 4. Boundary and Habitats of the Zeke's Island Component

Environmental Management (DEM) as "SA", except for a 100-foot (32 m) radius within the public boat ramp. The "SA" category allows for the collection of shellfish, swimming, and other water-based activities. The "SC" classification for the ramp area means that no shellfish may be taken nor is swimming permitted due to high coliform counts, but finfish may be taken. The ocean beach portion of the component has "SB" waters which may be used for swimming, but not shellfish harvest.

There is no weather station in the immediate area of the component, but general climatic information is available from nearby Wilmington. The mean annual air temperature is 63.7°F (19.0°C) with extremes of 104°F (40°C) and -2°F (-18.8°C). Normal annual precipitation is 53.3 inches (133.3 cm). The annual probability of a hurricane is approximately seven percent (NOAA, 1951-81; U.S. Dept. of the Interior, 1980).

(2) Geology and Soils

The Zeke's Island Component is composed of Recent and Pleistocene sediments (up to one million years old) situated on the Pamlico Terrace of the North Carolina coastal plain. The varying combinations of sand, silt, and clay are derived from both marine and terrestrial origins.

Soils of the component exhibit little horizon development and thus reflect the relatively young age of the sediments. Beach and dune areas are classified in the Newhan-Corolla association and consist of porous sands that are excessively well-drained and low in nutrients. The Duckston series is found in dune flats and drainage swells is similar in profile to the previous soils, but occurs nearer to the water table. Poorly-drained sands mixed with organic matter in intertidal and supratidal marshes are classified in the Carteret series (SCS, 1977).

(3) Biology

The component vegetation includes pristine examples of barrier island communities found in this region. Dunes dominated by sea oats occur from the upper beach drift line back to the secondary dunes where they mix with other grasses (e.g., saltmeadow cordgrass, panic grass) and forbs (e.g., seaside goldenrod, spurge, gaillardia, sand primrose) to form a stable grassland. Shrub thicket and maritime forest consisting of live oak, loblolly pine, wax myrtle,

yaupon, and red cedar occur where salt spray and saltwater flooding do not prohibit woody plant growth. Extensive salt marshes are found throughout the component with intertidal areas dominated by saltmarsh cordgrass and supratidal flats containing a mixture of saltmeadow cordgrass, salt grass, black needlerush, sea ox-eye, glasswort, and sea lavender. Amaranthus pumilus, a species with threatened status (federal), occurs on upper beaches and foredunes of the component.

Fishes, shrimps, crabs, clams, and oysters use the estuary as a nursery ground where young organisms take advantage of the shallow protected waters and abundant food. The component serves as a nursery habitat in the development of numerous commercially important species found throughout the area.

Atlantic loggerhead sea turtles, a federally-listed species, occasionally nest on the site's ocean beach. Other endangered or threatened fauna reported from or near the site include: bald eagles, piping plovers, and green turtles. Atlantic bottle-nosed dolphins swim in the adjacent ocean waters and occasionally enter the component via New Inlet. Humpback whales and pygmy spermwhales have been sighted just offshore from the barrier spit.

The expanse of intertidal flats in the Zeke's Island area is one of the most important shorebird habitats in southeastern North Carolina. A variety of species have been recorded, among them are dunlins, black-bellied plovers, short-billed dowitchers, white ibises, great blue herons, snowy egrets, Louisiana herons, black ducks, mallards, and pintails.

Mammals observed within the component include opossums, raccoons, grey foxes, marsh rabbits, and cotton rats. North Island affords the best habitat for many of these species because of its size, stabilized dunes, and available freshwater.

(4) Habitats

- *Tidal flats* consisting of sand and mud host numerous shellfish, marine worms, and other benthic organisms;

- *Intertidal (low) salt marshes* dominated by saltmarsh cordgrass are a primary source of rich organic detritus which is flushed by diurnal

tides into the surrounding estuarine nursery waters for benthic organisms and juvenile fish to feed upon;

- *Supratidal (high) salt marshes* contain a mixture of black needlerush, sea ox-eye, saltmeadow cordgrass, glasswort, salt grass, and sea lavender and are flooded by spring or storm tides;

- *Shrub thicket* grows above the high marsh and typically contains sporadic clumps of stunted trees, shrubs, and vines such as live oak, red cedar, yaupon, silverling, and greenbrier;

- *Maritime forest* on the west side of North Island is dominated by well developed stands of loblolly pine and live oak;

- *Dune areas* are vegetated with clumps of sea oats, camphor weed, seaside goldenrod, sea elder, and sand primrose;

- *Sandy beach* extends from the low tide line to the base of the dunes; this dynamic habitat is devoid of rooted plants, but is inhabited by intertidal mollusks and crustaceans; and

- *Rock jetty* (The Rocks) provides a hard substrate for the attachment of sessile organisms.

c. Human Environment

(1) Local History and Socio-economic Characteristics

Between 1663 and 1666 the New England explorer, William Hilton, explored the lower Cape Fear area. He entered through Old Inlet, sailed upriver past the present reserve site and continued upstream approximately 60 miles. Encouraged by Hilton's reports of the area, a group of hopeful colonists set sail in several ships from Massachusetts Bay Colony in the winter of 1663-1664. For reasons not entirely clear, this early attempt to settle the area failed after a very short time. From 1664 to 1667 there were ill-fated attempts to establish and maintain a colony of Barbadians along the Lower Cape Fear. This settlement soon failed due to a combination of inadequate external support, internal dissension, and

increasingly hostile relations with local Indians. The lower Cape Fear then reverted to its native inhabitants for more than a century. It is unknown whether these Native Americans or their ancestors made use of the Zeke's Island vicinity for fishing, hunting, and the gathering of shellfish (Sprunt, 1916).

Permanent European settlement along the Lower Cape Fear finally began in the mid-1770s with the construction of Brunswick town located on the west bank of the river, a short distance upstream from the present reserve area. Within a few years, plantations were carved out along the west bank of the lower portions of the river (Lee, 1965).

A violent storm in 1761 opened New Inlet, probably at the narrow section of beach used as a "haul over." Located about two miles north of its present location, the inlet ran northeast from the Cape Fear River past Zeke's Island to the ocean at Fort Fisher. Old Inlet, as the older inlet came to be known, continued to be the chief means of passage between the Cape Fear and the Atlantic, but the shallower New Inlet saw considerable use by smaller vessels for over a century (Lee, 1965).

A map of 1770 shows an extended shoal area within New Inlet, running north and south from the inlet, along the east bank of the river. There are indications that Zeke's Island slowly increased in size during the late eighteenth and nineteenth centuries. Between 1852 and 1858 its configuration changed noticeably -- extending northeastward to New Inlet channel. Wooden walkways traversed Zeke's Island at this time and a small wharf jutted outward from the northwest tip of the island into the river (Lee, 1975).

During the Civil War, and especially during its later stages, the Cape Fear River served as the principal life line of the Confederacy. Despite vigilant patrolling of both the Old and New Inlets by as many as fifty federal ships, numerous blockade-runners made their way stealthily into and up the Cape Fear to deliver essential supplies. These were exchanged at Wilmington for cotton and other agricultural products. Fort Fisher was situated just north of New Inlet and guarded its approaches. Many smaller batteries and forts were scattered around the Lower Cape Fear, among these were a battery of three guns on Zeke's Island. In January of 1865, a massive

amphibious assault by Union forces resulted in the fall of Fort Fisher and, after passage through New Inlet and upriver, the fall of Wilmington (Barrett, 1963).

Between 1875 and 1881 a major engineering feat was accomplished when the U.S. Army Corps of Engineers constructed an extensive rock breakwater ("The Rocks") running 3.5 miles (5.6 km)-- from the mainland to Zeke's Island then southward to Smith Island. Designed to reduce shoaling in the Cape Fear River, "The Rocks" drastically reduced the flow of water through New Inlet and brought about extensive changes in the landforms of the area. New Inlet subsequently migrated southward while Zeke's Island grew significantly in length and later contained a turpentine factory and a center for gill net fishing. The turpentine factory was destroyed during the hurricane of 1889 (Sprunt, 1916).

"The Basin", contained between "The Rocks" and the barrier spit, has been used by inhabitants for hunting and fishing. The spit has been used by off-road vehicles (ORVs).

Except for The Rocks and ORV use, the area designated as the Zeke's Island Component shows little or no evidence of human encroachment. The lands composing the Zeke's Island Component were donated to the State of North Carolina by Mr. Walter Davis in 1980.

(2) Cultural Resources

The North Carolina Division of Archives and History has documented a number of Civil War shipwrecks in the Zeke's Island vicinity. These were associated with the fall of Fort Fisher and the high volume of shipping traffic along the coast during that time.

d. Present Uses

The Zeke's Island Component receives daily use by commercial/sport fisherman and beach visitors. The North Carolina Aquarium at Ft. Fisher (NCA-FF) has occasional nature walks for public and school groups, while limited hunting for marsh hens is done in the fall. Wind surfing on The Basin has become a popular pastime on summer weekends. Duck and marsh hen hunting is done in the fall.

The component is patrolled by staff from Carolina Beach State Park (DPR) per an existing MOU (see Appendix F.5). Primary problems encountered by the ranger include occasional littering, destruction of vegetation and designated ground-nesting shorebird habitat by off-road-vehicle (ORV) traffic, and illegal camping.

e. Local Activities That May Affect the Component

Since the component is surrounded by state-owned lands that are managed for low-intensity recreation and conservation uses, there is no incompatible adjacent land uses. The reserve coordinator is a member of the Fort Fisher Management Board which consists of representatives from all agencies managing lands in that area. Any proposed change in use policy by a given agency would be discussed by the board.

2. Rachel Carson Component

a. Location and Access

The 2,625-acre (1,050 ha) Rachel Carson Component is located near the mouth of the Newport River in southern Carteret County across Taylor's Creek from the historic town of Beaufort (see Figures 5 and 6). Morehead City is located three miles (5 km) to the west and Atlantic Beach lies five miles (8 km) to the southwest. The site is accessible by boat only. The state Wildlife Resources Commission (WRC) operates a public boat ramp and parking lot on Taylor's Creek, while the Duke University Marine Laboratory and the National Marine Fisheries Service has boat facilities on nearby Pivers Island.

b. Natural Environment

(1) Hydrology and Climate

The waters of the Rachel Carson Component are generally less than six feet (2 m) in depth except for Taylor's Creek which is maintained at a depth of twelve feet (3.8 m) by the U.S. Army Corps of Engineers. The salinity of the component waters near Beaufort is close to that of sea water (35 ppt - euhaline) because of the proximity to Beaufort Inlet. Tides are in the microtidal range (>6 feet or >2 m) and semi-diurnal.

Water quality of Taylor's Creek and the northern portions of the component are classified as "SC" (no taking of shellfish or swimming allowed) by DEM, while

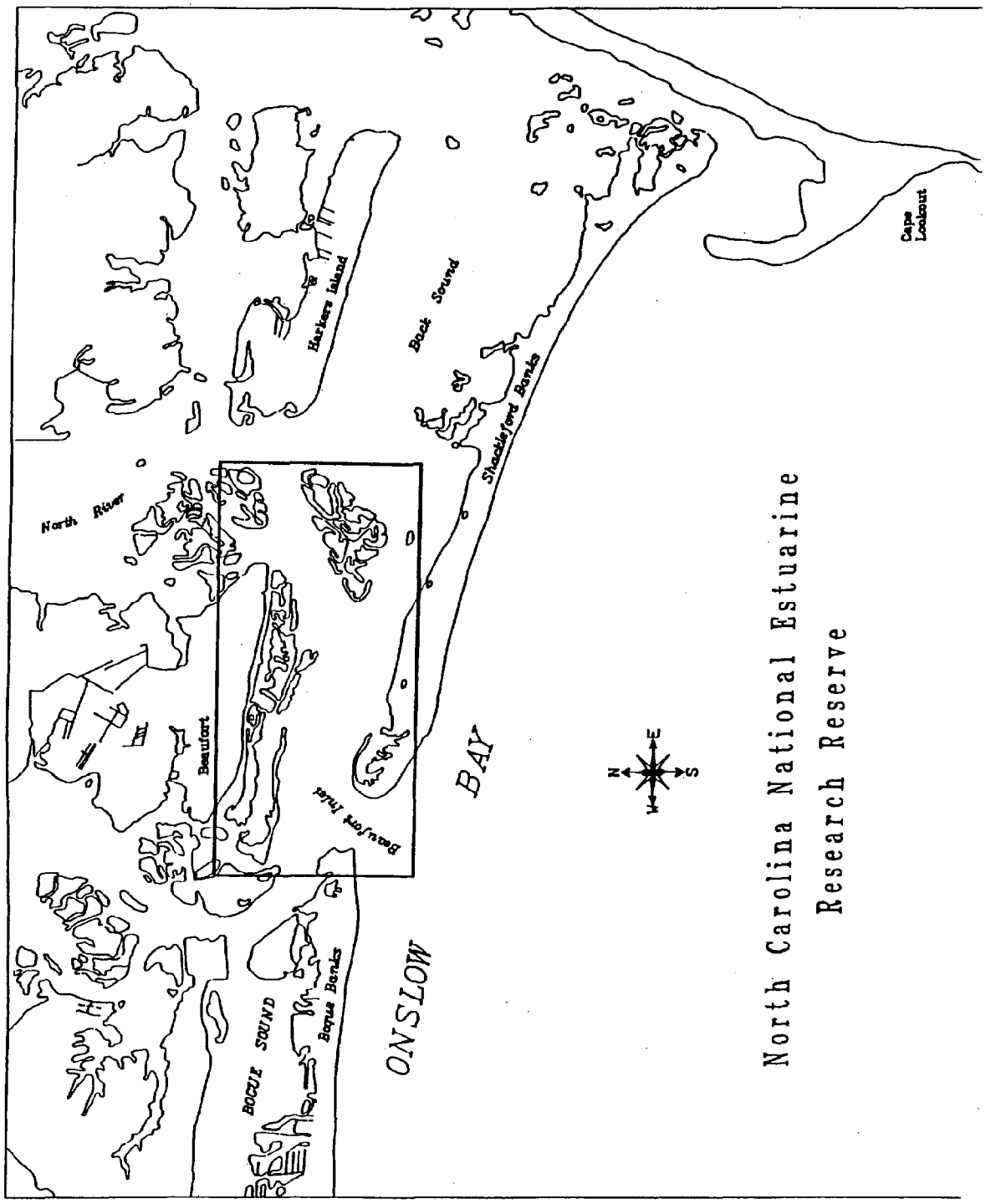

Figure 5. Rachel Carson Component Vicinity

North Carolina National Estuarine Research Reserve Rachel Carson

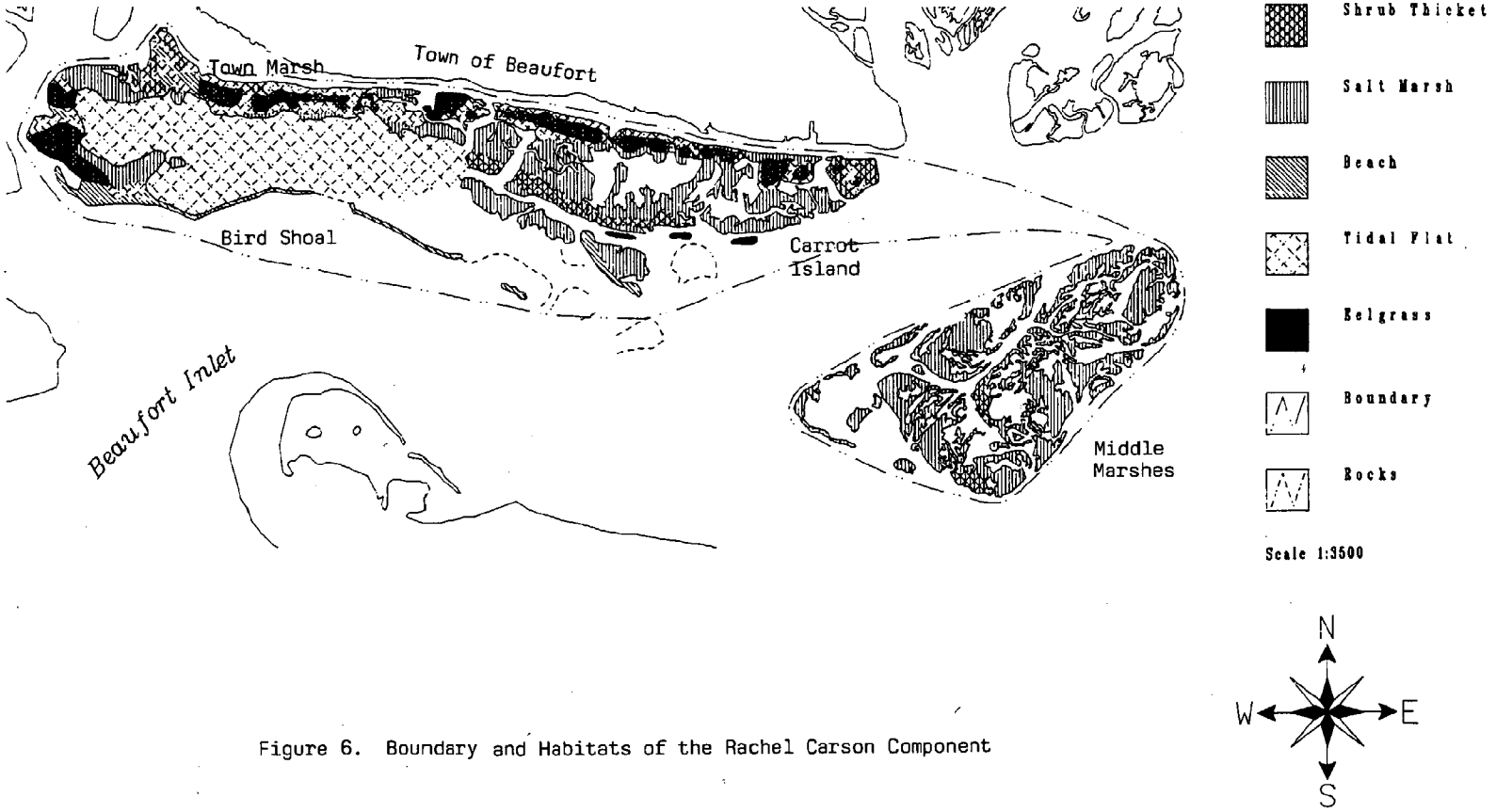

Figure 6. Boundary and Habitats of the Rachel Carson Component

the southern portion of Carrot Island and Bird Shoal as well as all of Middle Marshes encompass "SA" (safe for shellfish gathering) waters.

There is no weather station in the Beaufort area, but a general idea of the climate can be obtained from nearby Morehead City. The mean annual air temperature is 61.6°F (17.7°C) with extremes of 98°F (39.6°C) and 2°F (-18°C). Mean annual precipitation is 51.8 inches (129.5 mm). Probability of a hurricane in a given year is six percent (NOAA, 1951-81).

(2) Geology and Soils

The islands and tidal flats composing the component consist of Recent and Pleistocene sediments including sands, silts, and clays of the Pamlico Terrace. The component is not a barrier island system as such, but includes islands and shoals that developed behind the barriers of Shackleford Banks (part of Cape Lookout National Seashore) and Bogue Banks.

The soils of the component include primarily sandy profiles of such recent development that diagnostic horizons are not present. Natural dunes, beaches, vegetated spoil areas, and a limited area of natural shrub thicket and maritime forest (primarily at the east end of Carrot Island) of the component are classified in the excessively-drained Newhan series. Intertidal (low) and supratidal (high) marshes grow in the poorly-drained sand and muck of the Carteret series (SCS, 1987).

(3) Biology

Various plant species are characteristic of dredge spoil, dune, maritime forest, and salt marsh communities. Weedy asters, grasses, vines, and shrubs occupy successional communities on the numerous soil areas along Taylor's Creek. Sea oats grow on the few natural dunes (primarily on Bird Shoal) within the component. A small area of maritime forest and shrub thicket on the east end of Carrot Island is dominated by live oak, loblolly pine, red cedar, yaupon, and wax myrtle. Intertidal salt marsh is colonized by saltmarsh cordgrass, while supratidal or high marsh typically contains a mixture of saltmeadow cordgrass, sea ox-eye, black needlerush, and glasswort.

The component has a diverse fauna due to the diversity of habitats within a relatively small area

and because it is located within the Atlantic Flyway. Over 160 species of birds have been observed within the area (Fussell, 1976) including the peregrine falcon, a federally listed endangered species. Twenty-three species that use Bird Shoal are considered rare or decreasing in numbers by state ornithologists (Cooper et al., 1977). The site is an important feeding area for Wilson's plovers in the summer and piping plovers (threatened federal status) in the winter--both are listed by state biologists as species of special concern. The shrub thicket of Middle Marshes support egret and heron rookeries.

Nine species of reptiles and ten species of mammals (e.g., river otters, gray foxes, raccoons, marsh rabbits, feral horses) inhabit the islands. American bottle-nosed dolphins swim the creeks and channels around the component in addition to 52 fish species. Loggerhead sea turtles (federal threatened status) occasionally nest on Bird Shoal. Forty-seven invertebrate species common to the component include various bivalves and whelks. Of these, three whelk species (channelled, knobbed, and lightning) and a polychaete, the parchment tube worm, have been given special concern status by state biologists (Cooper et al., 1977).

(4) Habitats

- *Tidal creeks,* some lined with oyster rocks, weave through the marshes and cut across the intertidal flats, allowing fishes and invertebrates access to the marshes for food, shelter, and spawning;

- *Eelgrass beds* occur in the subtidal areas, although location may vary from year to year;

- *Intertidal sand and mud flats* store nutrients washed from the marshes or introduced by tides; worms and clams live within the sediments; bacteria and algae coat the surface; the flats at this component are significant because of their large extent;

- *Intertidal (low) salt marshes* are dominated by saltmarsh cordgrass; approximately one-half of the plant tissue produced by this species actually enters the estuary except for areas that are grazed by

feral horses; the extensive marshes of Middle Marshes are undisturbed;

- *Supratidal (high) salt marshes* occur along the lower edges of the dredge material areas and are dominated by saltmeadow cordgrass, black needlerush, sea ox-eye, and glasswort;

- *Beach* areas on Bird Shoal have developed with the accretion of sand to create open, sandy habitats used by ground nesting shorebirds such as least terns; intertidal organisms (e.g., mole crabs, coquina clams) live in the intertidal sediments;

- *Dredge spoil areas* are populated by various herbs, shrubs, and trees that gradually invade the man-made sand deposits along Taylor's Creek;

- *Dunes* have been created by the stabilization of sand by grasses such as sea oats on certain portions of Bird Shoal; and

- *Maritime forest/shrub thicket* on the east end of Carrot Island is an example of a coastal ecosystem that is rapidly being developed along most portions of the North Carolina coast.

c. Human Environment

(1) Local History and Socio-economic Characteristics

Before the European colonization of America, the Carrot Island-Middle Marshes area may have seen intermittent use by the Coree tribe of Native Americans. The Corees are thought to have spent considerable time on the nearby Outer Banks, especially in the vicinity of Cape Lookout (Angely, 1984).

European settlement of the Beaufort area began in the first two decades of the eighteenth century. In 1723, the commissioners of Beaufort began to sell lots and the town began to develop as a port. The early settlers used the waters in and near the Rachel Carson area for shipping lumber, naval stores, and farm commodities. They erected private wharves along the

shores of the mainland, and perhaps, on Carrot Island (Kell, 1975).

A map of 1777 shows that Carrot Island was, at the time, the only island within the current Rachel Carson Component. Town Marsh, then known as "Island Marsh", was only barely exposed. It was referred to in a deed of this period as merely a "bunch of bushes." As early as 1806, it was reported that mullet were being taken by a fishery on Carrot Island. Huge nets were used and the manpower usually consisted of local farmers. Once taken, the mullet were dressed, salted, and taken into Beaufort to be sold (Angley, 1984).

In 1854 Town Marsh (then called Bird Shoal) was three-eighths of a mile long. By 1885 Town Marsh had more than doubled in length and its northern shoreline moved ever closer to the Beaufort waterfront. The growth of Town Marsh had made the Taylor's Creek channel almost completely unusable. In 1893 the citizens of Beaufort requested the federal government to build a breakwater on Town Marsh to protect the channel along the town's waterfront (Angley, 1948).

The U.S. Army Corps of Engineers began dredging Taylor's Creek in the early 1920s, using Carrot Island as a deposition area. The Corps maintains an easement along Taylor's Creek to dredge the area and deposit material on Town Marsh and Carrot Island.

Except for the deposition of dredge material along Taylor's Creek and grazing of certain marsh and upland areas by feral horses, most of the Rachel Carson Component is undisturbed. Perhaps the most important reason has been the attitude of the local citizens toward the preservation of the islands. In 1977 Beaufort residents and area merchants objected furiously to a developer's intentions to build resort homes on Carrot Island-Town Marsh and successfully blocked an auction of the property. Later that same year, The North Carolina Nature Conservancy purchased most of Carrot Island to preserve it as a natural area. The State of North Carolina acquired the present Rachel Carson complex during 1984-1989: 1) Carrot Island purchased by a bargain sale from The Nature Conservancy, 2) Town Marsh (in part) donated by the Town of Beaufort, 3) Town Marsh (in part) purchased by a bargain sale from the Episcopal Church, 4) Bird Shoal purchased by a bargain sale from the Babcock/Palazzo family, 5) Middle Marshes condemned from the Pyrtherch/Betts and Hunt families, and 6)

Guthrie Shoal condemned from the Smith family.

During the late 1940s a local resident placed a small herd of horses on Carrot Island. For decades descendants of these animals lived on the islands and grazed the intertidal marsh. By 1986 the population had reached approximately 70 horses, during that winter 29 animals died of starvation. In October 1988 the state reduced the number of animals from 52 to 19 but discovered that nine of the animals had equine infectious anemia, an incurable disease of horses. These animals had to be euthanized to avoid spread of the virus. Management of the remaining horses will be based on results of research concerning impacts on marsh ecology, consultation with veterinarians, and information from other horse management programs (e.g., Chincoteague National Wildlife Refuge, Virginia).

The economy of the Beaufort/Morehead City region is primarily based on farming, fishing, tourism, and a state port. Commercial fishing, fish processing, and the secondary economic activity generated by this industry are of major importance to coastal North Carolina.

(2) Cultural Resources

No archaeological site within the Rachel Carson Component has been documented by the North Carolina Division of Archives and History.

d. Present Uses

The component is used daily by visitors for hiking, fishing, picnicking, and observation of wildlife. Commercial fisherman gather shellfish from tidal flats near Carrot Island and Middle Marshes. Boat activity is frequent in surrounding waterways such as Taylor's Creek. There is also a limited amount of marsh hen hunting in the fall.

e. Local Activities That May Affect the Component

(1) Radio Island

Radio Island, located adjacent to the west boundary of the component, is used for a variety of military and industrial uses. There exists the possibility that a development on the island could directly or indirectly impact the component. Past rejected proposals have included a cleaning station

for military vehicles entering the country, a liquid ammonia tank, and a liquid propane storage area.

(2) Maintenance Dredging

The U.S. Army Corps of Engineers performs periodic maintenance dredging of Taylor's Creek and surrounding channels. Sites for spoil deposition are within a permanent easement along Taylor's Creek on Town Marsh and Carrot Island. Though the disposal must be done within existing spoil areas and according to federal and state regulations, the process temporarily disrupts visitor use in the vicinity of the deposition site(s) and local residents dislike the appearance of the spoil areas. A 1987 deposition on Town Marsh was later modified because it blocked the local residents' view of the ocean.

3. Currituck Banks Component

a. Location and Access

The Currituck Banks Component is located one mile (1.6 km) north of the village of Corolla in Currituck County. The component is accessible on the Outer Banks via NC 12 which leads to a series of roads (e.g., Atlantic Avenue, Ocean Trail) that dead end at the south boundary of the property. Four-wheel-drive traffic is permitted along the ocean beach which is accessible from the road network by local ramps. The sound side of the component is reached by boat if one travels five miles (8 km) east across Currituck Sound from the village of Water Lily on the Currituck County mainland. The state property consists of approximately 960 acres (384 ha) of which 335 acres (134 ha) are upland and 625 acres (250 ha) are intertidal and subtidal (see Figures 7 and 8).

b. Natural Environment

(1) Hydrology and Climate

Prior to 1828 Currituck Banks had as many as three inlets that allowed tidal exchange of ocean waters with the sound. These inlets kept Currituck Sound saltier than at present and sustained local finfish and shellfish populations similar to sounds farther south. However, Currituck Sound gradually converted to a low salinity regime after 1828 when the last direct opening to the ocean, New Currituck Inlet, closed. While saltwater no longer flows directly into the sound, salinity is sporadically influenced by

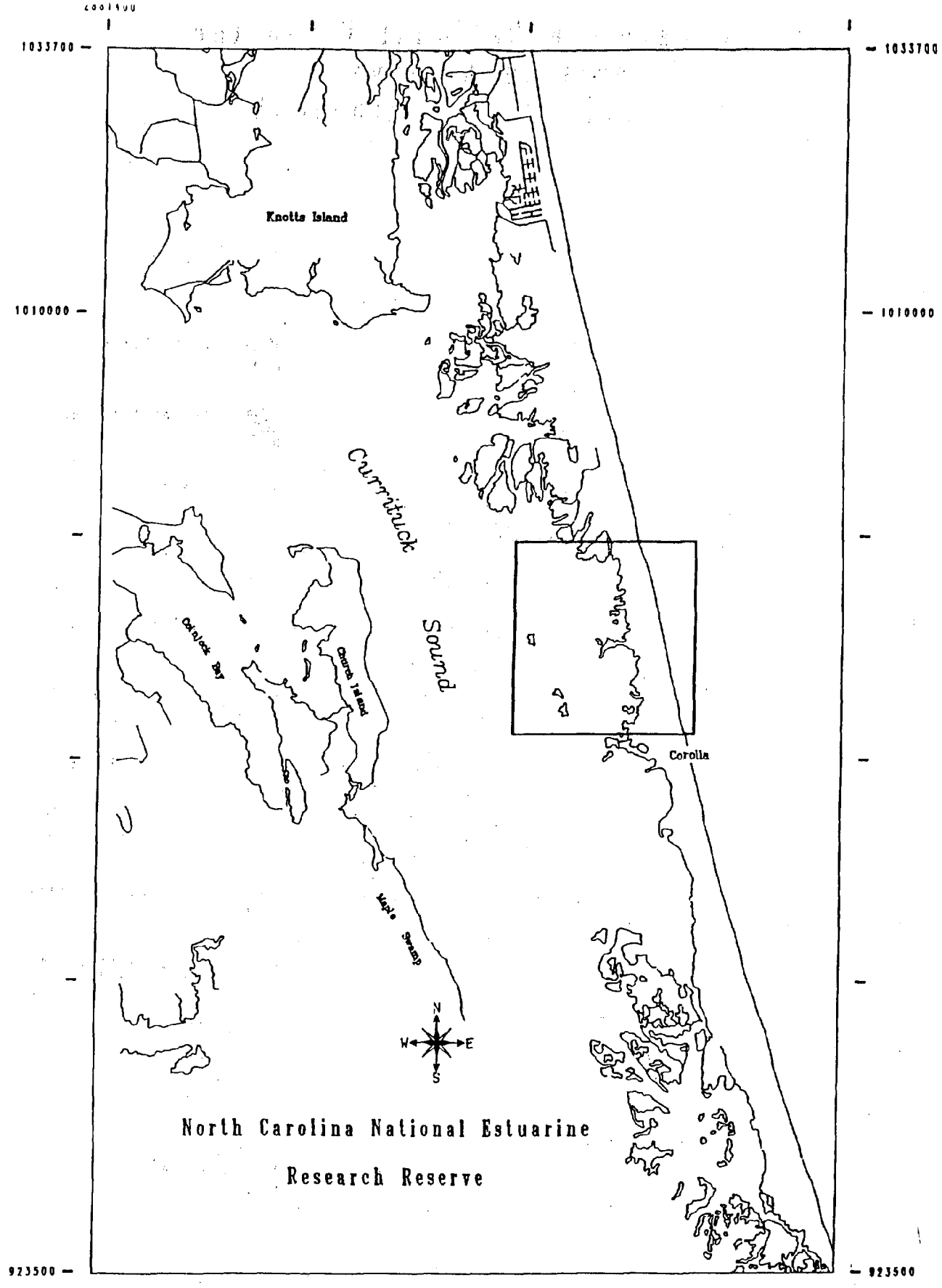

Figure 7. Currituck Banks Component Vicinity

North Carolina National Estuarine Research Reserve Currituck Banks Component

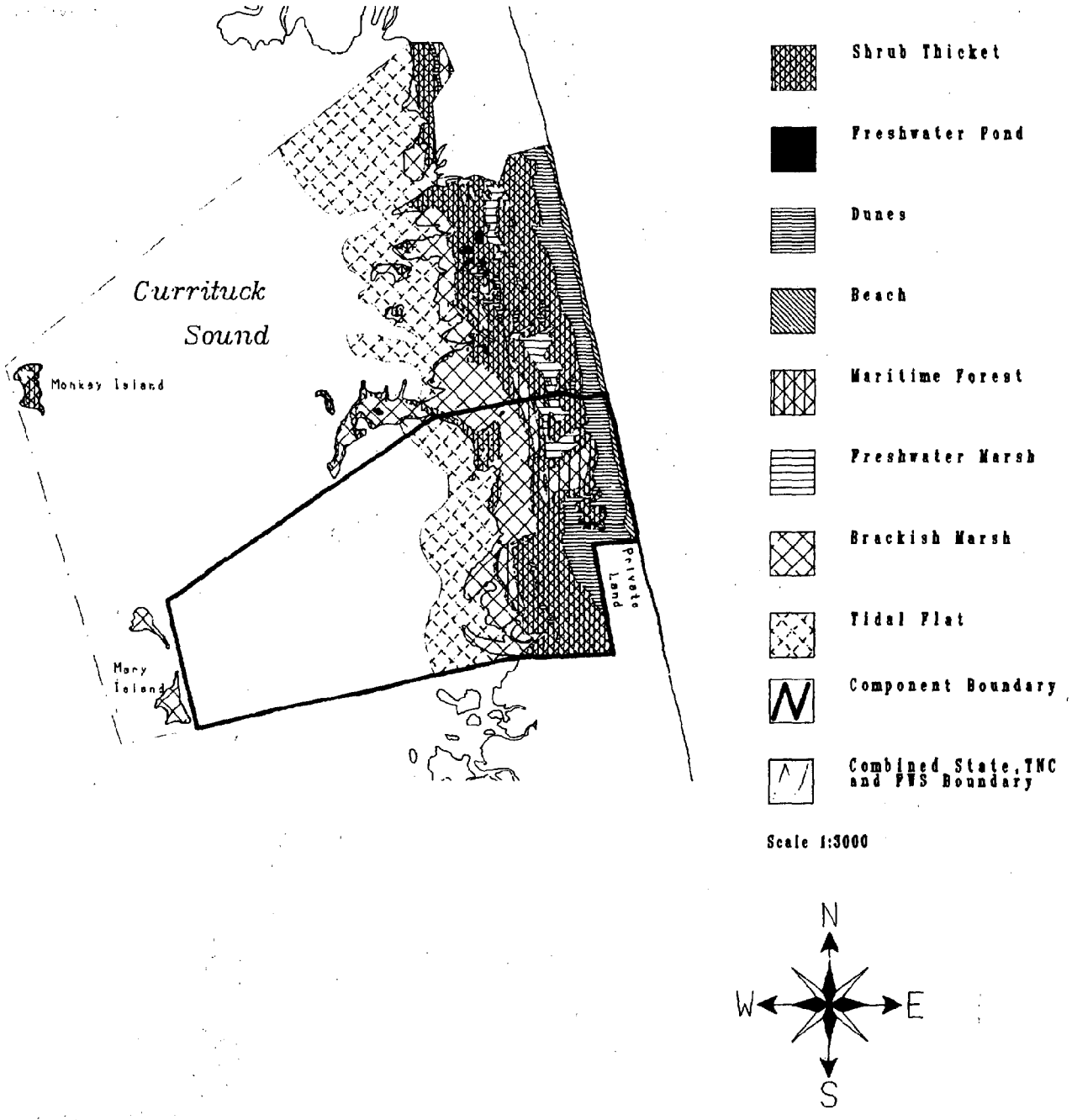

Figure 8. Boundary and Habitats of the Currituck Banks Component

ocean waters from Oregon Inlet (45 miles/72 km south) via Roanoke Sound, Croatan Sound, and Albemarle Sound. There is also occasional direct overwash from the Atlantic Ocean during major storms. Freshwater enters Currituck Sound mainly from the North Landing River, Northwest River, and Back Bay (Gale, 1982).

The waters of Currituck Sound are brackish (rarely exceeding 5 ppt salinity) and fluctuate by wind-dominated tides owing to the considerable distance from Oregon Inlet. The average depth of the sound is approximately five feet (1.5 m), while a few areas exceed ten feet (3 m) in depth. Currituck Sound is classified as "SC" by the DEM and is thus closed to shellfishing and swimming.

The weather of the Currituck Outer Banks is typical of a maritime climate on the Outer Banks where the ocean has a strong moderating effect on temperatures compared to mainland areas. The nearest similar site that has a weather station is Cape Hatteras, some 95 miles (152 km) to the south. The daily mean annual temperature is 61.7°F (16.5°C) with extreme temperatures of 95°F (35°C) and 12°F (-11.1 C). Annual precipitation average is 55.6 inches (139.0 cm). Annual probability of hurricanes on the Currituck Outer Banks is only two percent (U.S. Dept. of the Interior, 1980).

(2) Geology and Soils

The Currituck Banks separate Currituck Sound from the Atlantic Ocean. Through recent geological time, these banks have been an unstable, migratory barrier land form, consisting of Holocene and Pleistocene sediments (primarily sand) that shift in response to changes in sea level. Though the banks were previously a series of islands, they are now part of a complex barrier spit that extends about 70 miles (122 km) from Virginia Beach to Oregon Inlet. Behind this barrier spit are extensive marshes that have built up from remnant inlet deltas and submerged overwash fans. This pattern of marsh evolution is part of the barrier island migration process and is especially noticeable on the Currituck Banks. For example, Wash Woods near Swan Beach has tree stumps on the ocean beach that were formerly part of maritime forest originally located in the central portion of the island (U.S. Dept. of the Interior, 1980).

Soils of the reserve are composed of sediments that have not been weathered to the extent that

distinct horizons are present in the profiles. The dunes and beach areas of the component consist of excessively well-drained sands of the Newhan series. Back dunes, shrub thicket, and maritime forest occur over the slightly moister and lower-lying sands of the Duckston and Corolla series. Marshes and seasonal ponds of the component are associated with the poorly-drained sands of the Currituck series that is characterized by a shallow, mucky peat surface layer (SCS, 1984).

(3) Biology

Plant life of the component is typical for the barrier islands of the northern Outer Banks. The area represents a transition between the Virginian and Carolinian biogeographic provinces. Plant species indicative of this change are sea oats (typical of the southern areas) and American beach grass (found to the north and around the Great Lakes) which grow together on Currituck dunes. Likewise, bayberry reaches its natural southern limit in the shrub thicket and maritime forest of the component area, while the closely-related wax myrtle is typical of southern areas. General plant communities of the component include grass-dominated dunes, shrub thicket, maritime forest, freshwater marsh, brackish marsh, and submerged aquatics of the sound.

Currituck Sound contains a rich resource of forage, commercial, and game fish. Largemouth bass, yellow perch, striped bass, tidewater silverside, and pumpkinseed are the ecologically dominant species. Other game fish found in the area include white perch, bluegill, black crappie, chain pickerel, and channel catfish. Commercial fish catches include white perch, catfish, carp, shad, herring, and eel.

Currituck Sound is located within the Atlantic Flyway and therefore attracts a diversity of avian species. Accipiters, falcons, ducks, geese, warblers, gulls, terns, herons, and egrets use the reserve component as a migration corridor. Indigo buntings, bobwhites, and other mainland species are also present.

The site has particular significance with respect to waterfowl. Currituck Sound harbors an estimated six percent of the Atlantic Flyway overwintering waterfowl population and 32 percent of North Carolina's wintering fowl. Typical types of waterfowl include dabbling ducks, diving ducks, geese, swans,

and coots.

The marsh complex in the component serves as valuable habitat for several mammals. Among these are muskrats, river otters, and minks. Upland areas support deer, gray foxes, raccoons, opossums, nutrias and feral hogs. Occasionally, feral horses graze or pass through the component.

Sand-burrowing, filter-feeding decapods and mollusks are common in the subtidal zone of the ocean beach. Mole crabs, ghost crabs, and coquina clams are common in the intertidal zone. A modest amount of surf fishing and haul seining have been traditionally carried out along the beach in the reserve area. Striped bass, bluefish, mullet, croaker, spot and weakfish are common catches.

Threatened or endangered animals in the vicinity of the component include four federally-listed species and 63 species recognized by state biologists as endangered, threatened, or of special concern. Bald eagles (endangered) and piping plovers (threatened) are seen occasionally, but are not known to nest in the area. Peregrine falcons, also federally-listed as endangered, migrate through the banks during fall. Scattered nest sites for loggerhead sea turtles, a federally-protected, threatened reptile, have been reported on the beaches of Back Bay National Wildlife Refuge, False Cape State Park, and Currituck Banks (U.S. Dept. of the Interior, 1980).

(4) Habitats

- *Shallow waters* of Currituck Sound provide an environment where submerged aquatic vegetation thrives. The dominant aquatic vegetation currently at the site includes sago pondweed, redhead grass, widgeon grass, wild celery, and Eurasian water milfoil;

- *Shallow irregularly-exposed mud flats* consist of organic mud and sand. The flats contain various benthic organisms;

- *Marshes* along the sound are a mosaic of wetland species, reflecting the complex transitions between southern and northern species and between *brackish* and *freshwater* regimes (particularly

away from the sound). Two prominent examples of brackish marsh communities are those dominated by black needlerush and giant cordgrass. The freshwater marshes are dominated by either the cattails or a mixture of sedges and rushes;

- Stands of *shrub thicket* appear upland from the marshes and are characterized by stunted live oak, loblolly pine, and wax myrtle/bayberry. Virginia creeper and greenbrier are also found in this community;

- Well-developed *maritime forests* are present adjacent to portions of shrub thicket vegetation. Forest canopy dominants include live oak and loblolly pine;

- *Dune systems* of the banks are maintained by American beach grass, sea oats, panic grass, and salt meadow cordgrass; and

- The *beach* along the Atlantic Ocean is open, sandy and gently sloping; it does not support vegetation, but certain animals species (e.g., the ghost crab) have adapted to the harsh conditions.

c. Human Environment

(1) Local History and Socio-economic Characteristics

Before the European settlement of northeastern North Carolina, the area now known as Currituck County was home to the Poteskeet Tribe. Although the Poteskeet's main village was located on the mainland, they used Currituck Banks as hunting and fishing grounds. At that time, Currituck Sound received ocean waters via one or more inlets and supported abundant wildlife and waterfowl. The area included in the component was undoubtedly used by the Poteskeet, as evidenced by the presence of oyster shell middens and pottery fragments at several locations (Gale, 1982).

Until the early 1800s, Currituck Sound was directly connected to the Atlantic Ocean by inlets through the banks. One inlet, known as Musketo Inlet, was documented by the English in the 1580s at or near the reserve site. By 1680, shifting sands began to

fill the inlet and completely closed it. By 1828 the last of the inlets, New Currituck Inlet, had closed and thus began the transformation of Currituck Sound from a high to low salinity estuary (Gale, 1982).

The Currituck Banks received considerable use during the late 1800s and early 1900s. Several small farming and fishing communities such as Corolla, Penny's Hill, and Swan Island were established, but only Corolla remains as a continuous settlement today. The marshes and waters of Currituck Sound became known throughout the nation as prime waterfowl hunting grounds. This led to the founding of a number of hunt clubs, starting with the Currituck Hunting Club in 1857. These clubs, which were mainly composed of wealthy nonresidents, assembled large tracts of land on the banks to preserve waterfowl feeding areas and to ensure a continuous seasonal bounty of geese, ducks, and other migratory game birds. Several of the clubs built expensive clubhouses, some of which remain intact or have been restored (e.g., the Pine Island Club, the Whalehead Club) (Gale, 1982).

Following several shipwrecks in the early 1870s, the U.S. Lifesaving Service erected five lifesaving stations along the Currituck Banks and in 1875, built the Currituck Beach Lighthouse at Corolla. In 1885 a post office was established in Corolla which lent the community a sense of permanence. Around 1890 a sturgeon gill-netting operation began in Corolla, but its own success quickly depleted the sturgeon population and the business was abandoned. Farming and commercial fishing gradually declined on the banks during the twentieth century, while waterfowl hunting and sport fishing grew in popularity (Gale, 1982).

Since World War II, real estate development has played a prominent role in the economic character of the Currituck Banks. Several large tracts of land from the Virginia State Line to Dare County were subdivided for resort homes even though access to the banks was limited due to the absence of paved roads. In 1980 the U.S. Fish and Wildlife Service proposed that the banks become part of a wildlife refuge (U.S. Dept. of the Interior, 1980), but this proposal was later abandoned by the federal government. Since 1986 the public has been able to drive to Corolla on NC 12 (formerly a privately-owned subdivision road). This has resulted in rapid development of areas south of Corolla and even sporadic development north of the component (where no paved road exists) in such communities as Swan Beach and Carova Beach. The

majority of these structures are resort homes. The current permanent population of the Currituck Banks is approximately 200-300 people.

(2) Cultural Resources

The previously mentioned shell middens and pottery fragments of Native Americans are the only archaeologically significant objects known from the component.

d. Present Uses

The component receives daily beach use by persons driving ORVs. Weekend beach use (e.g., sunbathing, picnicking) is high during the warm months. Hunting for deer and waterfowl is a popular activity in the fall and winter.

e. Local Activities That May Affect the Component

(1) Ocean Hill Development

Proposed phase development of the Ocean Hill subdivision will locate more persons along the south boundary of the component. This will increase seasonal use of the beach area, particularly because an entrance road to the northeastern portion of the development (see Figure 8 - "private land") will route traffic to the ocean beach.

4. Masonboro Island Component

a. Location and Access

Masonboro Island is located in New Hanover County between the barrier island towns of Wrightsville Beach and Carolina Beach. The city of Wilmington lies approximately five miles (8 km) to the northwest. The component encompasses the entire barrier island and a small parcel of mainland totalling 5,097 acres (2,038 ha) of uplands and estuarine area. The island is accessible only by boat, most visitors land on the extreme north or south ends where there are sandy beaches associated with the back sides of Masonboro and Carolina Beach inlets (see Figures 9 and 10). Public boat ramps are located in both beach towns.

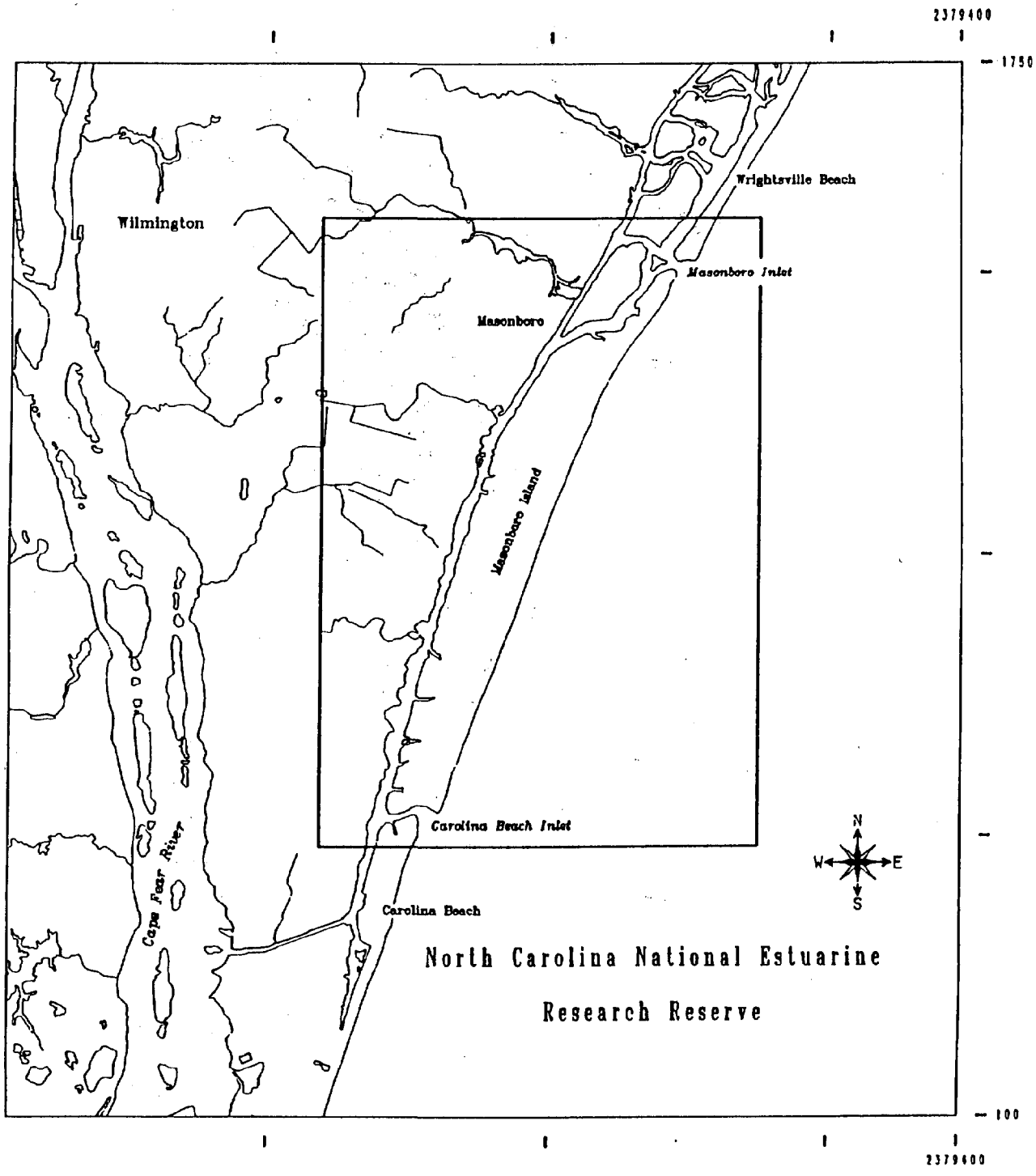

Figure 9. Masonboro Island Component Vicinity

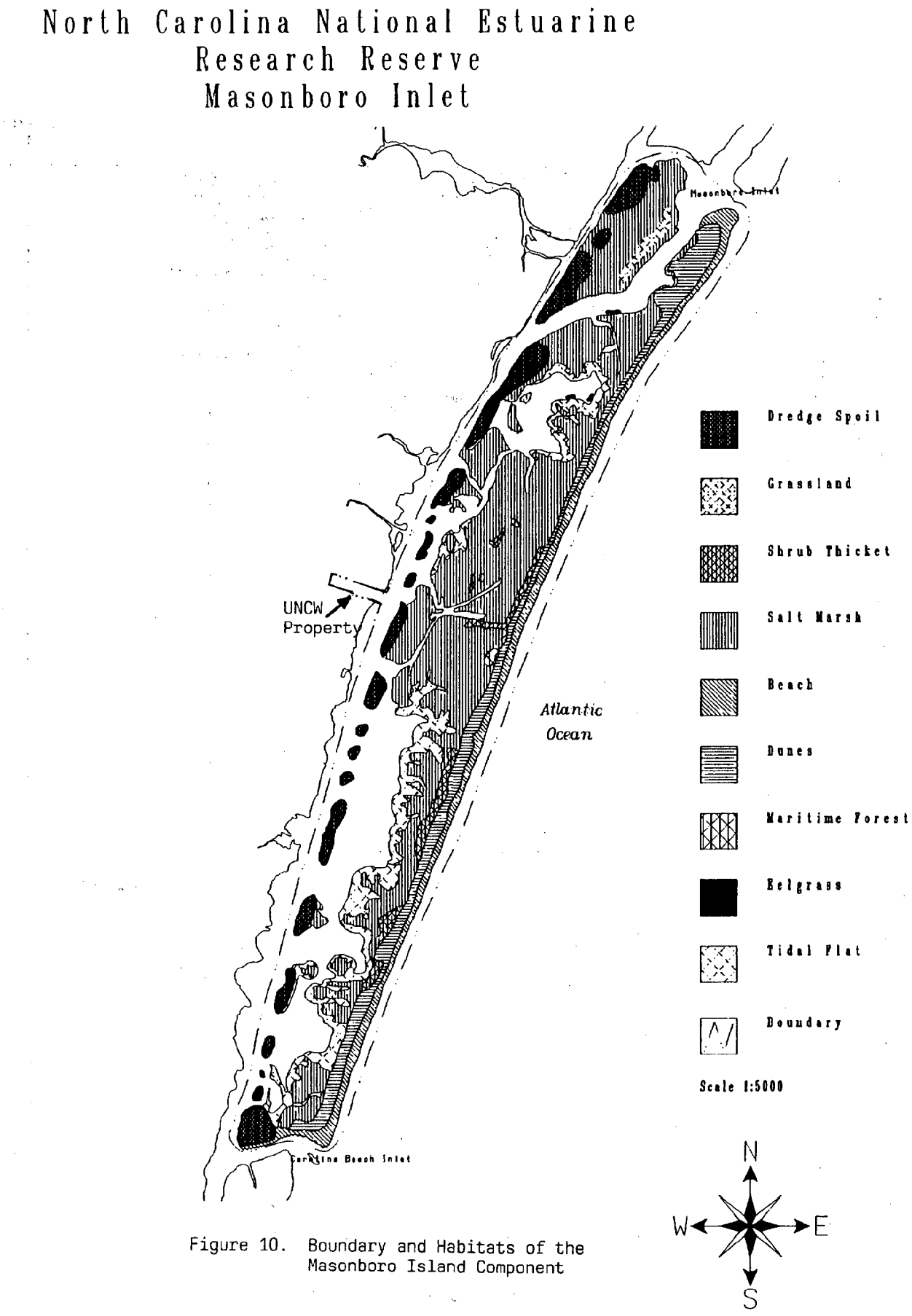

Figure 10. Boundary and Habitats of the Masonboro Island Component

b. Natural Environment

(1) Hydrology and Climate

The sound waters of Masonboro Island are less than six feet (2 m) in depth and range in salinity from 18 to 35 ppt, depending on the location relative to the inlets and mainland creeks. Tides are semi-diurnal and usually fluctuate approximately 3.8 feet (1.2 m), while spring tides average 4.5 feet (1.4 m). These waters have very high water quality, classified as "SA" by the DEM, and encompass primary nursery area according to the DMF. The sound area was designated as Outstanding Resource Waters in 1989 by the state Environmental Management Commission.

The nearest weather station is in Wilmington. However, the ocean influence on Masonboro Island temperatures is very similar to the conditions at the Zeke's Island Component, some ten miles (16 km) to the south. The mean annual air temperature is 63.7°F (17.7°C) with extremes of 104°F (40°C) and -2°F (-18.8° C). Normal annual precipitation is 53.3 inches (133.3 cm). The annual probability of a hurricane is approximately seven percent (U.S. Dept. of the Interior, 1980).

(2) Geology and Soils

The Masonboro Island Component consists of Recent and Pleistocene sediments that are part of the Pamlico Terrace on the eastern edge of the North Carolina coastal plain. The upland area of the island includes 453 acres (181 ha) of natural dune/woodlands and 166 acres (66 ha) of dredge disposal areas. The remaining 4,427 acres (1,771 ha) consist of marsh and estuarine area.

Masonboro Island is the present-day counterpart of a barrier island complex formed some distance offshore, the time being rather speculative. However, the genesis of the original island is thought to have occurred by mainland beach detachment (Hosier and Cleary, 1977). According to Hoyt (1967) separation occurred during the last 5,000 years when the Holocene sea rise slowed down. Dune ridges formed along a seashore that was some distance seaward of the present coast. The rising sea then isolated the dune ridges from the mainland forming barrier islands that were then translated landward under the influence of the rising sea level. The island "migration" is still occurring as evidenced by old sound-side peat or shell

deposits being exposed on the beaches of many present day barrier islands (Godfrey and Godfrey, 1976).

Soils of the component are classified in the Entisol order--soils of such recent origin that horizon development is minimal or non-existent (Buol et al., 1980). Within the Entisol soil order three series have been mapped on Masonboro Island: Carteret, Duckston, and Newhan (SCS, 1977).

The Carteret series underlies the tidal marshes of the island and consists of two subdivisions: 1) Carteret low associated with the regularly flooded or intertidal marsh and 2) Carteret high occupying areas containing supratidal or brackish marsh species. These soils are composed of somewhat poorly to poorly-drained sands mixed with varying amounts of muck and shell hash.

The poorly-drained sands of the Duckston series are found within the shrub thicket and maritime forest communities. In some areas local surface accumulations of organic matter have leached into the subsoil creating the appearance of a buried humus layer (Hosier and Cleary, 1977).

Dune and grassland areas along the ocean side of the island are underlain by excessively to somewhat excessively well-drained sands of the Newhan series. These soils contain variable amounts of calcareous shell material and exhibit low fertility and water holding capacity (SCS, 1977).

(3) Biology

The flora of the component consists of 139 species. However, certain species are characteristic or dominant in the major plant communities of the island complex. Dunes covered by sea oats, other rhizomatous grasses (e.g., saltmeadow cordgrass, panic grasses), and forbs (e.g., seaside spurge, sea rocket, sand primrose, prickly pear, and gaillardia) grow just inland from the ocean beach. Slightly higher sandy areas are covered by shrub thicket characterized by woody shrubs such as wax myrtle, silverling, red cedar, yaupon, and Hercules' club. Isolated patches of maritime forest are located where inundation by storm tides is very rare. Live oak, loblolly pine, and red cedar trees plus an understory of shrub thicket species are typically found in this community. Marsh areas of the component are dominated by saltmarsh cordgrass in intertidal (low marsh) areas,

while high or supratidal marsh is covered by a mixture of species including sea ox-eye, black needlerush, saltmeadow cordgrass, and sea lavender.

Localized algal colonies and eel grass beds also occur on the intertidal flats and subtidal softbottoms of the island's estuary. Typical species include sea lettuce, green fleece, false agardiella, and dictyota. A few isolated patches of eel grass also occur in the subtidal areas of the component.

Three animals species recognized as endangered or threatened by the federal government are found in the component area. Peregrine falcons (endangered) have been reported as rare seasonal transients. Piping plovers (threatened) feed on the island during the winter. Loggerhead sea turtles (threatened) nest on the Masonboro Island ocean beach.

Several birds and marine worms found in the component have special concern status according to state biologists (Cooper et al., 1977). Significant bird species include least tern, common tern, Wilson's plover, black skimmer, American osprey, and Ipswich sparrow. Parchment tube worms, Hartman's echiurid, and a species of polychaete worm in the genus Notomastus, are found in the sound sediments.

Mammals known from the island include cotton rats, gray foxes, house mice, marsh rabbits, opossums, raccoons, and river otters. Most of these animals live in the upland dune, shrub thicket, or maritime forest communities, except for river otters which are typically found in salt marshes. Raccoons often forage in the marshes during low tide cycles.

A typical array of barrier island bird species are found throughout the component's habitats. Nearshore ocean waters are frequented by brown pelicans, shearwaters, royal terns, herring gulls, and laughing gulls. The intertidal beach zone serves as resting and feeding area for such species as sand pipers and plovers. Mourning doves, ground doves, and common night hawks nest and feed within the dune areas, while boat-tailed grackles and red-winged blackbirds feed upon sea oats seeds in the fall. Black skimmers, night hawks, and American oystercatchers are seasonal nesters in the grasslands or dunes. The shrub thicket and maritime forest are important resting habitats for a variety of small birds, particularly warblers and sparrows, during fall migrations. The marshes and associated tidal flats

and creeks are foraged during low tides by great blue and little blue herons, tricolor herons, snowy egrets, great egrets, willets, American oystercatchers, black skimmers, and clapper rails.

Forty-four species of fishes have been collected from the Masonboro Island estuarine waters by the N.C. Division of Marine Fisheries (DMF). The detritus-rich sound waters serve as a primary nursery area for such commercial and sport fish species as spot, mullet, summer flounder, pompano, menhaden, and bluefish. Some of the other fish species present are striped killifish, mummichog, pinfish, silversides, and sheepshead minnow.

Invertebrate residents of the intertidal mud and sand flats include various mollusks: quahog clams, marsh razor clams, oysters, and mud snails. A substantial fauna of marine worms such as parchment worms, plumed worms, blood worms, and scale worms live in the sediments. Clumps of oyster shells in the sound waters are suitable substrates for the attachment of many sessile organisms: sponges, sea whips, oysters, and tunicates.

(4) Habitats

The primary habitats of the component are:

- Isolated *eelgrass beds* occur near the southern limit of the plant's range and provide food and cover for numerous estuarine species;

- *Subtidal softbottoms* are home to numerous benthic organisms as well as fishes and crustaceans;

- *Intertidal mud and sand flats* host numerous shellfish, polychaetes, and other benthic organisms in the sediments;

- *Regularly-flooded (low) salt marshes* are dominated by saltmarsh cordgrass; approximately one-half of the plant tissue created within this ecosystem actually enters the estuary to support life there;

- *Irregularly-flooded (high) salt marshes* fringe the upper edges of the low marsh and consist of over ten species that may occur in various compositions according to local salinity and microrelief. Common

species include saltmeadow cordgrass, black needlerush, and sea ox-eye;

- *Shrub thicket* occurs as a discontinuous strip along the central upland length of the island. Dominant species are wax myrtle, yaupon, silverling, and red cedar;

- Two small areas, totalling approximately ten acres (4 ha), of *maritime forest* are found near the middle of the island upland. Canopy species include live oak, loblolly pine, red cedar, and Hercules' club;

- Dredge material or spoil areas bordering the waterway contain a mixture of dune, shrub thicket, and weedy species growing on the artificial islands;

- *Dunes or grasslands* of Masonboro Island consist of two subcategories: 1. primary dunes dominated by sea oats and 2. secondary dunes covered by saltmeadow cordgrass and panic grasses in association with various forbs such as seaside goldenrod, sand primrose, gaillardia, and yucca; and

- The *ocean beach*--from the low tide line to the base of the dunes--has no stable vegetation, but is populated and foraged by various animals such as ghost crabs, mole crabs, coquina clams, amphipods, and shorebirds.

c. Human Environment

(1) Local History and Socio-economic Characteristics

There is a very strong possibility that the stretch of beach now known as Masonboro Island was the first portion of the entire American coastline to be seen and described by a European explorer. This initial sighting may well have occurred in March of 1524 when the Italian voyager Giovanni Verrazzano, on an expedition sponsored by Francis I of France, came within view of what is generally believed to have been the lower coastline of present day North Carolina, several miles above Cape Fear (Angley, 1983).

During the colonial period Masonboro Sound was generally known as Cabbage Inlet Sound, taking its name from the inlet which existed at that time. Cabbage Inlet was located somewhat south of today's Masonboro Inlet, just below the mouth of Purviance (now Whiskey) Creek on the opposite side of the sound (Angley, 1983).

The western or mainland shoreline of Masonboro and Myrtle Grove Sounds was at least sparsely settled during the second quarter of the eighteenth century. Some of these settlers, generally those of modest means, established permanent residences along the sound, gaining their livelihoods through farming and fishing. Other, more affluent, landowners purchased property on the sound for purposes of speculation or for the establishment of summer homes (Angley, 1983).

Confederate troops were stationed at various points along the mainland shore of Myrtle Grove and Masonboro Sounds during the course of the Civil War, especially in the vicinity of Camp Davis, on the north bank of Hewlett's Creek, and at the state salt works near the mouth of Purviance (Whiskey) Creek. The latter facility was by far the largest of the many salt works in the Wilmington area, but was destroyed in 1864 by Union troops (Angley, 1983).

During the late nineteenth and early twentieth centuries, the mainland side of Masonboro and Myrtle Grove Sounds was settled by scattered farmers, craftsmen, and fishermen. In the fall, mullet were taken in large quantities along the ocean side of the island. Catches were reported as high as 20,000 pounds. Other important fisheries included flounders, shrimps, clams, and oysters that were taken from the waters of the sounds, adjacent creeks, and marshes (Angley, 1983).

It was during the latter part of the nineteenth century that both Wrightsville Beach and Carolina Beach began to develop as resort areas. Construction of the Atlantic Intracoastal Waterway between Beaufort and the Cape Fear River, by way of Masonboro and Myrtle Grove Sounds, was authorized in 1927 and completed in 1932. It provided a channel twelve feet (3.9 m) deep and 90 feet (29 m) wide. At the lower end of Myrtle Grove Sound, the waterway was linked to the Cape Fear River by the creation of Snows Cut (Angley, 1983).

In general, the construction of the waterway through the Masonboro Island Sounds was opposed by local fisherman who feared that it would decrease salinity, disturb breeding grounds, and result in overall reduction of catches. This opposition continued to be expressed long after the waterway was completed. Growing from these concerns was a proposal for the dredging of an artificial inlet through John's Creek (note: at this time the area now known as Masonboro Island was directly connected to Carolina Beach and ran north to Masonboro Inlet). This and related proposals were investigated by the U.S. Army Corps of Engineers in 1940, but it was decided that the creation of such an inlet could not be justified. However, in 1952 Carolina Beach Inlet was cut through the barrier as a private venture and thus created the island. Over the past four decades the position and configuration of the inlet have changed considerably. The Corps now maintains the inlet channel at an eight foot (2.5 m) depth and 150 foot (48.4 m) width.

Beginning in 1947 emergency work was undertaken by the Corps of Engineers to prevent further migration of Masonboro Inlet on the north end of the island. This led to the construction of a massive and lengthy stone jetty on the northern end of the inlet (at the southern end of Wrightsville Beach) in an attempt to stabilize the inlet's position. A south jetty anchored to the north tip of Masonboro Island was completed by the Corps in the late 1970s.

Masonboro Island is situated between two popular resort beach areas--Wrightsville Beach to the north and Carolina Beach to the south (Figure 9). A large portion of the local economy is tied to the burgeoning seasonal tourist population. The historic port city of Wilmington (population of 70,000), approximately 5 miles (8 km) to the northwest, has numerous private business concerns and federal, state, and local government offices. The recent completion of the Interstate 40 to Wilmington is expected to increase development and visitation in this popular coastal area. The University of North Carolina at Wilmington (UNCW) has approximately 7,000 students and an active marine science program that includes the Center for Marine Science Research (CMSR) which includes the main office of the Reserve program.

(2) Cultural Resources

Though there are no known artifacts on the island, Masonboro Island and Sound were involved in

the wrecks of at least four vessels during the course of the Civil War. Three of these ships were blockade-runners forced ashore and destroyed while in route to or from Wilmington. The other lost vessel was part of the Union blockading fleet. None of the remains of these ships is currently visible on the surface of the land or sound bottom.

d. Present Uses

The island complex is a favorite local spot for sunbathing, fishing, camping, boating, nature study, and hunting. The sound area of the component accounts for approximately $386,147.00 in commercial fish and seafood production per year during 1980-83 (NOAA/NRCD, 1984).

Facilities which make use of the island include various federal, state, and local agencies. The Corps of Engineers maintains the jetty on the north end of the island and periodically dredges the inlets and adjacent waterway. UNCW uses the component regularly for research and education activities. The NCA-FF takes school and public groups to the island on occasional field trips. The Marine Science Program and Ocean Science Institute at New Hanover High School and science classes from Laney High School take field trips to the island. Less frequent use of the component is made by local groups such as the Lower Cape Fear Bird Club, the Sierra Club, UNCW Biology Club, and the Society for Masonboro Island.

e. Local Activities That May Affect the Component

(1) Mainland Development

Increasing development on the mainland, particularly near the creeks and runoff areas that flow into the sound area of Masonboro Island, may present a water quality threat to the component's sound waters. This issue will be a central focus of the monitoring plan for the component. These potential impacts will be lessened with the designation of Masonboro Sound as Outstanding Resource Waters and the more stringent regulation of development along the mainland shoreline.

IV. THE PLAN

This management plan establishes goals, program and facility needs as well as framework, policies, and timetables to meet the goals. The plan is flexible and allows for review to make improvements in the program.

A. The NCNERR Multi-component System

1. General

As the state with the third largest estuarine area, North Carolina contains portions of two major biogeographic provinces, various estuarine basin types, and salinity regimes. Therefore, it was deemed necessary by NOAA and the state to have several estuarine types in the program to adequately represent the estuarine diversity of the state. A multiple component system will maximize research and monitoring efforts relative to management decisions and make education programs available to a greater percentage of the state populace than would be reached by a single component. The multi-component system will better reflect the range of habitats in the Virginian and Carolinian subregions and will permit development of complementary research and education programs within the reserve.

Four components have been chosen to comprise the NCNERR: 1) Zeke's Island in Brunswick-New Hanover counties, 2) Rachel Carson in Carteret County, 3) Currituck Banks in Currituck County, and 4) Masonboro Island in New Hanover County. These components span the 300-mile (480 km) length of the North Carolina barrier island system (see Appendix A for physical and chemical typology for each component). The Zeke's Island, Rachel Carson, and Currituck Banks components were designated in 1985. Masonboro Island will be designated in 1991.

2. General Description Of And Relationship Among The NCNERR And Its Components

The Zeke's Island Component encompasses a lagoonal, tidal estuary with barrier islands and a rock jetty. Located adjacent to the Cape Fear River, it is a popular site for fisherman, beach users, and visitors to the nearby North Carolina Aquarium at Fort Fisher (NCA-FF).

Just across Taylor's Creek from Beaufort, the Rachel Carson Component is located at the mouth of the Newport River near Shackleford Banks and Beaufort Inlet. The extensive

tidal salt marshes, flats, and upland communities of the islands have attracted use by local researchers (e.g., Duke Marine Laboratory [DUML] and the University of North Carolina Institute of Marine Science [UNC-IMS]), education programs (e.g., North Carolina Maritime Museum [NCMM] and North Carolina Aquarium at Pine Knoll Shores [NCA-PKS]), and daily recreational activity.

The Currituck Banks Component is situated on the northern Outer Banks near the Virginia State Line. The sound area is oligohaline with wind-fluctuated tides. Formerly a very remote portion of the coastal barrier system in North Carolina, the Currituck Banks is currently undergoing dramatic development and increased seasonal beach use.

Masonboro Island encompasses an entire undeveloped barrier island and estuary. This bar-bound estuary has a variable salinity regime due to mainland creeks that flow into the sound. The island uplands and sound have been the subject of many research and education activities by the University of North Carolina at Wilmington (UNCW) and the NCA-FF. The island beach is a popular spot for fishing, swimming, camping, and sunbathing. The component also encompasses 51 acres (20 ha), located directly across from the island, which will house NCNERR and UNCW staff and future research facilities.

B. NCNERR Management Goals

The NCNERR will be managed to achieve NERRS objectives, and each component will have its own program tailored to the particular research, education, and recreational use needs. The North Carolina National Estuarine Research Reserve will be managed to meet the following goals and objectives:

- Establish and manage the areas within the boundaries of the NCNERR components as natural field laboratories;

- Gather and distribute information on estuarine ecosystems and the impacts of human stress on those systems that is essential for making sound coastal management decisions;

- Preserve and protect estuarine resources on a long-term basis, making them available for continuous future study of the natural processes and ecological relationships sustaining the estuarine system;

- Conduct, coordinate, and facilitate short- and long-term estuarine monitoring;

- Conduct, coordinate, and facilitate education and interpretation programs that will increase public awareness

and understanding of estuarine ecosystems, human effects on them, and the valuable and integral role these ecosystems play in the environment as a whole;

- Establish adequate state control over key land and water areas identified in the management plan;

- Facilitate component access as appropriate for research, monitoring, education, and compatible uses while controlling access for unallowed uses;

- Provide for controlled multiple use of the reserve components that allows for the continuation of existing, low intensity recreational uses that are presently permitted and are compatible with the reserve's character as natural field laboratories;

- Develop facilities as necessary to aid in research, monitoring, and education;

- Promote cooperative management among federal, state, and local agencies;

- Coordinate with existing programs in the areas of reserve components to maximize the research and education potentials of the components; and

- Restore degraded areas to a former, more natural condition when appropriate and practicable, and when the restoration will enhance the research or education value of the reserve.

C. General Policies

The following highlights the general policies of the NCNERR. More specific policies are detailed throughout this management plan.

- The NCNERR will be managed by a coordinated effort involving the reserve staff of DCM and various federal, state, and local groups plus assistance from private individuals. Many of the agreements between the NCNERR and federal/state agencies are according to existing MOUs.

- The NCNERR budget and program activities will follow the state fiscal year, July 1 to June 30. The DEH&NR will coordinate the distribution of federal and state operational funds and will act as a liaison between NOAA and the various agencies and organizations involved in reserve programs.

- Present levels of traditional, compatible uses at components will continue as provided by local or state laws and regulations. However, certain research, monitoring, or educational activities may necessitate temporary changes in visitor use at a specific location within a given component.

D. Administration/Management Structure

1. Administration/Management Framework

Since NERRS programs are delegated by the CZMA to states, the overall program coordination of the NCNERR is the responsibility of the North Carolina Department of Environment, Health, and Natural Resources (DEH&NR). However, implementation of the various facets of the program, (e.g., acquisition, component management, program development, and enforcement) is accomplished through a coordinated and cooperative effort among several state and county agencies, universities, private organizations, and NCNERR committees (Figure 11). This type of effort is essential because much of the management structure relies on existing state and county authorities, laws, and programs.

a. General

(1) Department of Environment, Health, and Natural Resources

The Division of Coastal Management within the DEH&NR is the lead administrative agency for the NCNERR program. The DCM is the recipient agency for CZMA funding, including Sections 306, 306A, and 315 Coastal Zone Management cooperative agreements. The reserve coordinator and research specialist for the NCNERR works for the DCM at the University of North Carolina at Wilmington Center for Marine Science Research (CMSR) per a cooperative agreement (see Appendix E.9).

(2) Involvement of Other Agencies

A number of other state agencies, many located within DEH&NR, will be involved in various aspects of the NCNERR during particular phases of program development and management. Major roles include the following:

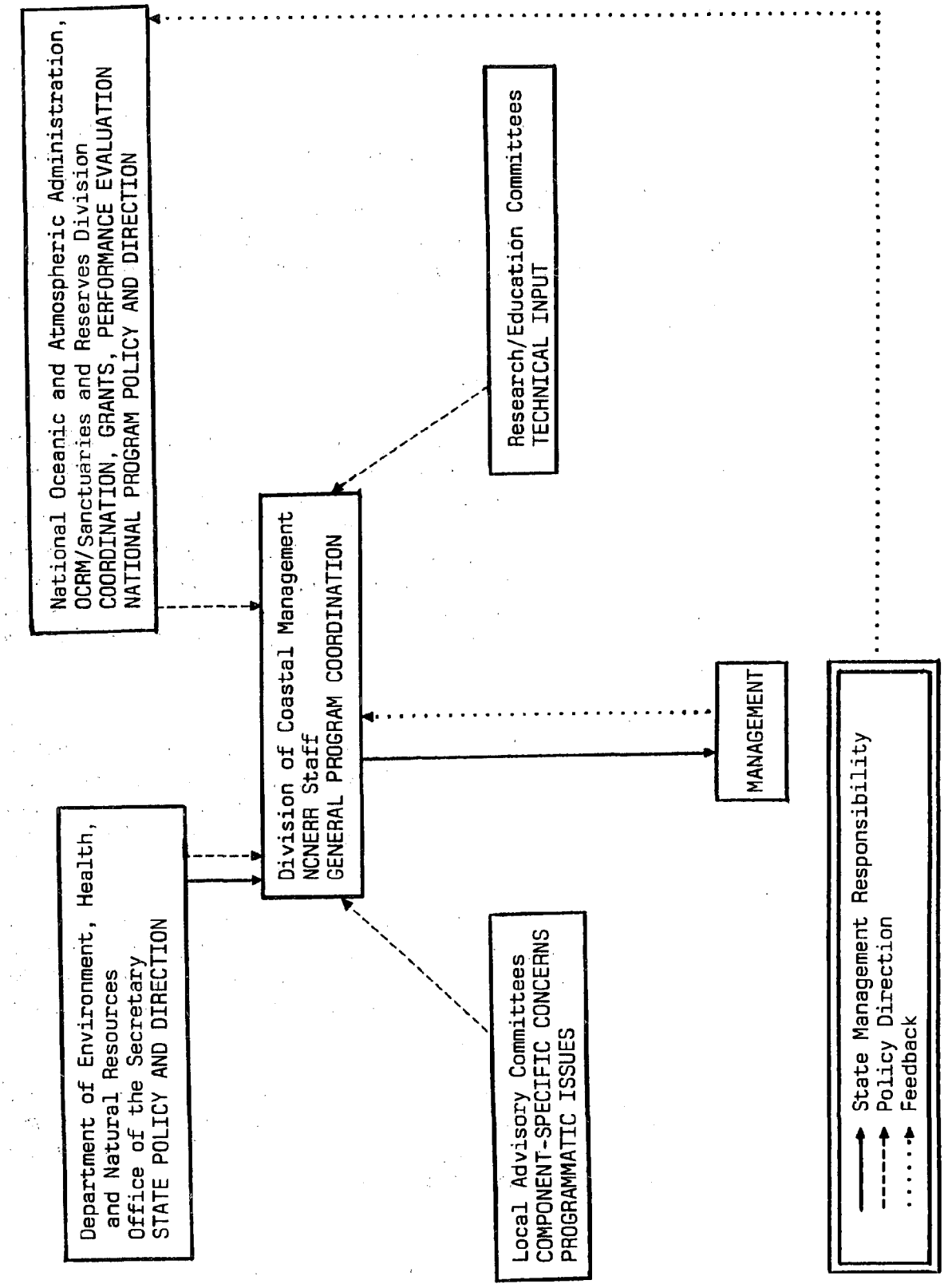

Figure 11. NCNERR Management Structure

Land Acquisition

The State Property Office (SPO) within the Department of Administration (DOA) is the primary agency for any reserve land acquisition including easements. Survey, title certification, and appraisal of a given tract are coordinated through the SPO and officers of that agency perform the formal negotiations with the landowner(s). Title to acquired land is in the name of the State of North Carolina, but management responsibility for reserve property is allocated to the DCM via the Governor and the Secretary of DEH&NR.

Component Management

- Zeke's Island: The reserve coordinator and research specialist are primarily responsible for management, but daily patrols of the component are performed by staff of Carolina Beach State Park per an MOU (Appendix F.5) between DCM and the state Division of Parks and Recreation (DPR). Both New Hanover County and Brunswick County Sheriffs assist with law enforcement. The Component is also patrolled occasionally by enforcement officers from the state Wildlife Resources Commission (WRC) and Division of Marine Fisheries (DMF). The NCA-FF uses the site for education activities.

- Rachel Carson: The reserve education specialist is the lead person in charge of patrol and management at this component. The Beaufort Police, Carteret County Sheriff, and DMF officers assist with law enforcement. The North Carolina Maritime Museum (NCMM) is the primary state facility associated with the component and includes the office of the education specialist.

- Currituck Banks: Though there is no reserve staff in the immediate area of this component, an MOU between DCM and the U.S. FWS (Appendix F.10) provides for patrols of the property by federal staff. Reserve staff visit the component at least quarterly. The Currituck County Sheriff based in Corolla assists with law enforcement.

- Masonboro Island: The reserve coordinator and research specialist will oversee management of this component with law enforcement assistance from the New Hanover County Sheriff. Enforcement officers from DMF and WRC occasionally patrol the area.

b. NCNERR Staffing

An adequate staff is essential to meet the research, education, and other objectives of the NCNERR. Staffing needs will be met through a combination of federal and state support. The NCNERR is managed by coordination of three staff members: the reserve coordinator, research specialist, and education specialist. General programmatic needs are listed below.

(1) NCNERR Reserve Coordinator

This position coordinates administrative functions, research and education programs, and acts as liaison with NOAA and NERR programs of other participating states. The position is located within the CMSR in Wilmington. The priorities of the coordinator are to meet the general NERRS goals and objectives, as well as the specific NCNERR goals and objectives as defined in this management plan. To better meet component user needs, assure reserve resource protection, and secure long-term operation funding, the reserve coordinator develops MOUs with other governmental programs.

Research Responsibilities: The reserve coordinator oversees the implementation of research and monitoring programs within the components through the supervision of the reserve research specialist. These activities will be performed with the cooperation and advice of the scientific advisory committee (SAC), the Research Review Panel (RRP), applicable governmental agencies, and estuarine researchers. Duties include identifying research funding sources, overseeing the grant proposal process, facilitating research at reserve components, and communicating with the estuarine research community.

Education Responsibilities: The reserve coordinator has overall responsibility for coordination and facilitation of education and interpretation programs in the NCNERR, including supervision of the reserve education specialist. The programs will be undertaken with the cooperation and advice of the local advisory committees and the environmental education community. Duties include coordination of development of on-site and outreach programs, preparation and solicitation of grant proposals, and contact with estuarine educators.

Other Responsibilities: The position also involves the total administration of the NCNERR program, particularly those required under state and federal procedures and award conditions. These duties include preparation of required documents and budget management. The coordinator is also responsible for working with the reserve staff, volunteers, advisory committees, DCM officials and those of other state agencies, local officials, and other interested parties on issues involving reserve policy, planning, and operations.

(2) NCNERR Research Specialist

The research specialist is the primary person in charge of the research and monitoring within the NCNERR. This position is located within the CMSR and encompasses the prime mission of the reserve program -- to facilitate and participate in estuarine research within the components so that the results may be utilized to improve coastal management decisionmaking. Job duties include: compilation and maintenance of a computer database of previous reserve research, solicitation of research grant proposals, coordination of proposal review with the Research Review panel and SRD, development and coordination of reserve monitoring regimes, and assisting the reserve coordinator with management of the Zeke's Island and Masonboro Island components.

(3) NCNERR Education Specialist

This position functions as a combination of education coordinator and manager of the Rachel Carson Component. The office for this position will be located at the North Carolina Maritime Museum (NCMM) in Beaufort, just across Taylor's Creek from the component. This proximity to the component is most desirable because of the regular visitor use during April - October. Thus, a regular part of the job is to patrol the site on a daily basis. Among the past problems that occasionally need to be dealt with are: illegal camping, fires, cutting of vegetation, and harassment of wildlife.

The education and interpretation functions of the program are invaluable for increasing the awareness and understanding of estuaries. Teaching school groups and the general public about the importance of estuaries and augmenting that knowledge with results from reserve research and monitoring projects will ultimately improve coastal management decisionmaking.

This is done on-site by field trips to the component combined with lecture/slide presentations at the NCMM. Outreach programs, particularly during the fall and winter months, will focus on the entire reserve program and include workshops to promote the reserve estuarine curriculum, "Project Estuary."

General job duties include:

- Provide verbal and written information about the NCNERR to the public;

- Coordinate, with the educational staff of the NCMM, and conduct field trips to the Rachel Carson Component;

- Organize and give presentations (e.g., slide show, lectures, workshops) concerning the NCNERR at the NCMM and various locations;

- Organize and coordinate volunteer activities (e.g., litter pick-up, monitoring of visitor use) relating to the Rachel Carson Component;

- Organize and coordinate activities pertaining to National Estuaries Day and Coast Weeks;

- Patrol the component regularly (daily whenever possible) and be available to deal with problems during off-hours;

- Inform component users of improper activities; request assistance from law enforcement authorities when necessary;

- Maintain liaison with NCMM staff; members of the Rachel Carson Local Advisory Committee, regular users of the component, and researchers with on-site projects; and

- Maintain regular (at least weekly) contact with the reserve coordinator.

c. Advisory Committees and Review Panels

A very important facet of reserve management is input on various topics by component users and interested

parties. Management issues relating to each component are discussed by Local Advisory Committees (LACs), while research matters are covered by the Research Review Panel (RRP) and Scientific Advisory Committee (SAC). These committees encompass broad spectrum of expertise and experience. Membership is by invitation from the Secretary of DEH&NR and the members serve on a permanent basis. However, the reserve coordinator may recommend replacement members for those who no longer choose to serve on a given committee. All of the committees operate strictly in an informal, advisory capacity and are not responsible for the day-to-day operations of the reserve.

(1) Local Advisory Committees (LACs)

Each component has it own Local Advisory Committee (LAC) composed of members representing the local community. Each committee includes the reserve coordinator and representatives from local government, educators, scientists, environmental groups, adjacent landowners, and traditional users.

LACs function both as advisory groups and public forums through which local citizens work with NCNERR staff to:

- Determine the nature of local management problems relating to the component;

- Advise the reserve coordinator in order to resolve conflicts within the community regarding the component; and

- Review the progress in implementation of the management plan at a given component and make their position known on reserve policies and actions in consultation with their constituents.

The LACs make their recommendations to the reserve coordinator. LAC members are expected to discuss relevant program issues and committee actions with their constituents on a regular basis. Each local advisory committee will meet at least annually.

d. Private Organization Involvement

(1) Society for Masonboro Island (SMI)

The SMI is a private, non-profit organization based in the Wilmington area that has as its goal the complete acquisition and preservation of Masonboro

Island. The SMI has assisted the state in acquisition of the island by contacting island landowners, purchasing interests in certain tracts, and lobbying state and federal legislators concerning funding needs. Members of the SMI will serve on the local advisory committee for the component and will participate in management activities.

2. Enabling Agreements

Memoranda of understanding (MOUs) have been established with various agencies (see Appendix F) to affect management of the components. Some of these agreements involve such activities as use of facilities, patrol of components, and development of cooperative programs. Each MOU describes the goals of the NERRS, the relationship of NCNERR to the given agency, and (when applicable) boundaries of the component(s) involved.

3. Federal Government - NOAA Program Review

The research reserve program operates as a federal/state partnership. Although the management of a reserve is the long-term responsibility of a given state, NOAA cooperates with and assists the state on a day-to-day basis, and reviews state programs regularly. The purpose of the NOAA review is to ensure that a state is in compliance with federal NERRS goals, approved work plans, and reserve management plans. The primary mechanisms used by NOAA to review state programs include the following:

a. Communication with NOAA

NOAA staff, in particular the program manager, communicates directly and regularly with state reserve staff. Communication builds a level of trust between federal and state staff, and familiarizes both NOAA and state personnel with reserve management procedures and policies. The cooperative approach is needed for a research reserve to be successful. Both oral and written communication are necessary, and site visits, as travel funding allows, is advisable.

b. Federal Funding

Another mechanism available to NOAA is its research reserve funding program. NOAA provides different categories of funding (e.g. research, education, acquisition and development, operation and management) to a reserve. Quarterly performance reports and a final report are required. NOAA personnel carefully review the

reports and associated communications to ensure compliance with program policies and specific award conditions.

c. Designation

The site designation process is also a primary avenue through which NOAA reviews actions. A state site (or constituent component) nomination must be assessed and endorsed by NOAA prior to formally beginning the designation process. As part of this preliminary stage, the site selection and public participation processes are evaluated by NOAA. When the draft management plan and draft environmental impact statement have been completed they must also be approved by NOAA before the final versions of each document are written. NOAA staff have the responsibility of working with the state to select and designate national estuarine reserve sites.

d. Performance Evaluations

Finally, pursuant to CZMA enabling legislation (Sections 312 and 315), NOAA must conduct performance evaluations of the operation and management of each reserve every four years while federal financial assistance continues. If deficiencies in the cooperation or types of research conducted at a reserve are found, NOAA may withdraw financial assistance to the reserve until remedies are in place. National Estuarine Research Reserve designation can be withdrawn by NOAA when a reserve is found to be deficient and fails to correct the problems within a reasonable time.

E. Research and Monitoring Program

Estuaries are important to the nation's economy and recreation while being an integral part of the earth's environment as a whole. Understanding and protecting this important resource has become increasingly important due to land use practices and the rise of populations in coastal areas which contribute to the degradation of estuaries. There is a need for extensive research to define management strategies while allowing multiple uses that minimize detrimental environmental and ecological impacts on estuaries.

The top priority of the reserve program is to coordinate, facilitate, and conduct research which will provide information useful for coastal management decisionmaking. The creation of permanently protected research sites is an important step toward a more comprehensive and integrated approach to research, monitoring, and management of estuarine areas. The results of

these activities will hopefully improve coastal management in North Carolina and the nation.

The reserve components expand researchers' capabilities to perform long-term studies in sites representative of the diverse estuarine biogeography and typology found in the state. The components provide the opportunity to observe and explain basic functions and changes in the natural systems, and to apply this knowledge to other parts of relatively undisturbed estuarine systems. The components also serve as control areas for comparison to estuarine areas adjacent to developments.

1. Goals of the Research and Monitoring Programs

The goals of the reserve research and monitoring programs shall be to:

- Establish and manage key land and water areas of the reserve for long-term use as natural field laboratories;

- Coordinate NCNERR research projects to streamline scientific efforts, maximize efficient use of funds, and avoid unnecessary duplication of efforts;

- Enhance scientific understanding of estuarine ecosystem processes and functions;

- Gather and make available information needed by reserve managers and coastal decisionmakers for improved understanding and management of estuarine ecosystems;

- Collect important baseline data to use as a control for monitoring differences over time and for making comparisons with other areas;

- Identify priority resources, gather baseline information on them, and establish them as indicators of change; and

- Monitor the impacts of human stresses on the estuarine environment and the effectiveness of water pollution control strategies or other land use regulations.

Specific objectives to aid in achieving these goals shall be to:

- Develop a biological and environmental database for use in long-term and interdisciplinary studies;

- Compile and maintain a library for reserve research, monitoring data, and results from the NCNERR and

other reserves, particularly those in the same biogeographic regions;

- Promote the reserve components in the research community as long-term field laboratories to be used by state, local, and private organizations;

- Utilize volunteers to achieve research and monitoring goals;

- Encourage staff participation in conferences, scientific meetings, and workshops;

- Develop facilities and equipment as necessary to aid in research and monitoring; and

- Seek agreements with other research organizations (e.g. Sea Grant) to facilitate and augment research.

2. Research Priorities

a. NERRS National Research Priorities

Research programs in the NCNERR address coastal management issues identified as having local, regional, or national significance. Projects which benefit reserves in other states and those which correspond with the NERRS National Research Priorities are encouraged. National Research Priorities are:

- *Water Management.* Research is needed to increase understanding of how freshwater inflows affect estuarine productivity, govern salinity regimes, provide nutrients, couple primary and secondary productivity, and sustain habitats;

- *Sediment Management.* Rational biological criteria which can be used to evaluate sediment management strategies must be developed. Research should examine sedimentation processes and the relationships between sedimentation and ecological processes;

- *Nutrients and Other Chemical Inputs.* Research is needed to increase understanding of the relationships among nutrient inputs, nutrient cycling, and production. The environmental fate of chemical inputs, including toxicants, and the effects of these chemicals on the ecosystem is another important area of study.

- *Coupling of Primary and Secondary Productivity.* Research is needed to increase understanding of ecological relationships such as trophic structures and food web interactions, and to increase understanding of human impacts on these estuarine ecosystem processes.

- *Estuarine Fishery Habitat Requirements.* To formulate effective management programs, the relationship between estuarine fish production and the quantity and quality of nursery areas must be investigated. Information must be gathered on habitat selection, species migration, species residence time, food quantity and quality, and the effects of environmental variations on survival and growth of fish and shellfish.

Additional information on these subject areas can be found in the *NERRS Research Plan* (available from NOAA/SRD).

Each year NOAA issues a NERRS Research Opportunity Announcement in which it elaborates on the latest interpretation of these priorities. Proposal funding decisions are based on the relationship between the proposed research and these national priorities. In addition to these five major research areas, NOAA recognizes the need for baseline information and lists the following research areas as being appropriate for federal funding (note: the first two priority areas are also priorities under the NOAA National Estuarine Reserve Research System Research Plan [1987]).

(1) Initial Baseline Surveys

Some baseline data for a few parameters have already been collected at or near the NCNERR components. The state Division of Marine Fisheries has fisheries survey data from the Zeke's Island and Masonboro Island components. Monitoring of coliform bacteria levels is routinely performed by the state Division of Shellfish Sanitation in the vicinities of all four components. A NOAA tide gauge is maintained at the Duke Marine Laboratory near the Rachel Carson Component. Several past studies of Middle Marshes include various baseline data. Obviously, additional baseline studies will be needed to characterize each component. Baseline surveys can be used to:

- Yield data necessary to define or confirm estuarine management issues of concern;

- Serve as a reference for detection of environmental/ecological change in a given estuary; and

- Aid in the planning and conducting of special studies related to the estuarine ecosystem (examples of special studies topics are listed later in this chapter).

(2) Environmental Monitoring

Environmental monitoring will entail the systematic, long-term collection of selected data using many of the same parameters and, ideally, the same sampling techniques and locations as the initial baseline surveys. These data may be collected by NCNERR staff volunteers, other governmental agencies, or outside researchers as part of their research projects. Impacts of new technology and management strategies may be observed. A policy for quick response to collect data in the event of unusual conditions such as floods, hurricanes, or polluting spills will be established where feasible.

Environmental monitoring is designed to:

- Detect changes in estuarine biological and physical features;

- Identify and examine relationships between human activities and estuarine health;

- Provide information to aid in the management of the NCNERR and in coastal management in general; and

- Provide a data base for special studies.

(3) Specific Research Projects

Specific research projects may include experimental research relating to natural resources, cultural resources, or socio-economic topics. Research proposals will be approved and supported based on the research priorities of the NERRS Research Plan, the NERRS Monitoring Program, the NCNERR, and component-specific management needs. Special studies may identify and examine relationships between human activities and ecological impacts. Studies may include temporary manipulative experiments appropriate to improve management of estuarine systems. However,

the manipulative procedures must be reviewed and approved by NCNERR and NOAA staff.

b. NCNERR Program Research Priorities

NCNERR research priorities will be developed by the NCNERR Scientific Advisory Committee and Local Advisory Committees. These priorities will be developed and modified based on reserve and component-specific management needs and information gained from initial baseline surveys and environmental monitoring. They will also reflect NERRS National Research Priorities.

Examples of special research reserve topics are listed below. Examples of component-specific topics are listed under the individual component headings. These lists are not intended to be complete lists of permitted research topics, but rather to suggest some appropriate possibilities. Other research topics which address coastal management issues identified as having a local, regional, or national significance may also be considered. Examples of special studies topics appropriate for the NCNERR include:

- Temporal and spatial variability in the use of marsh/tidal creek ecosystems as nursery areas for finfish and crabs;

- Wetland formation (or losses) and production relative to changes in sea level;

- Archaeological studies; and

- Studies to compare stream systems protected within the reserve to stream systems in adjacent, more developed areas;

The research and monitoring programs at each component vary somewhat because of the different natural characteristics, research potential, and management objectives at each component.

(1) Zeke's Island

This component has considerable research potential because it includes a natural inlet, extensive salt marshes, and an estuarine tidal basin that is partly separated from the Cape Fear River by a rock jetty. Habitat mapping (Kirby-Smith, 1989) and productivity of benthic micoalgae (Cahoon, 1988) have been studied. Examples of possible research topics for the Zeke's Island component are:

- Sedimentation in "The Basin";

- Fish and shellfish production in the tidal creeks; and

- Inlet dynamics and its influence on the estuary and recruitment dynamics.

(2) Rachel Carson

A component with many use demands, Rachel Carson includes Carrot Island, Town Marsh, and Bird Shoal islands which have experienced dredge material deposition, regular grazing by feral horses, and commercial harvest of shellfish. The adjacent Middle Marshes area is truly pristine. Breeding bird use of spoil areas (Parnell and Golder, 1986), habitat mapping (Kirby-Smith, 1987), eel grass wasting in Middle Marshes (Short et al., 1987), plant colonization of dredge material areas (Evans, 1988), and feral horse impacts on the reserve salt marshes (Hay and Wells, 1989) have been studied. Additional research topics include:

- Impacts of sea level rise on marshes;

- Plant and animal succession on dredge material areas;

- Intra-reserve comparisons of human uses and impacts between Middle Marshes and the regularly used areas of the site; and

- Submerged aquatic vegetation research at Middle Marshes.

(3) Currituck Banks

The unique aspect of this reserve is the low-salinity of Currituck Sound and its brackish to freshwater biota. Only habitat mapping of the site by Kirby-Smith (1989) has been completed. Among the potential projects possible at this component are:

- Productivity of submerged aquatic vegetation and associated fauna;

- Potential for inlet formation and its subsequent effects;

- Impacts of feral animals (e.g., horses and pigs) on reserve communities;

- Explore oligohaline habitat values for estuarine dependent fauna found in other salinity regimes; and

- Impacts of local development on island groundwater supplies and sound water quality.

(4) Masonboro Island

This component consists of an essentially undisturbed barrier island situated between two developed barrier systems, Wrightsville Beach to the north and Carolina Beach to the south. The only human activities that have occurred on the island are jetty construction and maintenance dredging of the inlets and the Atlantic Intracoastal Waterway. Habitat mapping (Kirby-Smith, 1989) and various UNCW research projects (e.g., Hosier and Cleary, 1977; McCrary, 1984; Parnell, 1984) have been performed. Topics to be investigated include:

- Migration and erosion of the barrier system and associated marshes;

- Factors affecting establishment of eel grass beds near the southern limit of the its range;

- Comparisons of water quality and estuarine health between the component and adjacent sounds at Carolina Beach and Wrightsville Beach; and

- Inlet dynamics and effects on estuarine physical features and biological recruitment.

3. NCNERR Policies and Procedures for Research

Research at the NCNERR will investigate the natural processes of the estuarine system and human impacts on these processes. The highest priority is to coordinate, facilitate, and conduct research to provide useful information for coastal management decisionmaking.

The NCNERR program makes all components available to researchers as long-term field laboratories which are especially suitable for studying estuarine problems. The program offers:

- Long-term opportunity for temporal and spatial sampling in wetland, upland, and open water habitats that are relatively undisturbed;

- Greater opportunity for use of observational and analytical techniques in protected estuarine subsystems; and

- Opportunity for long-term accumulation of comparative data at these sites.

Activities permitted in the core area of each component (see Section J) are limited to research activities which do not manipulate habitats. Manipulative research procedures may be permitted in the buffer zone of the reserve as long as they address identified research or management needs. Any research activities which, in the estimation of the state and NOAA, may result in significant long-term impacts on reserve resources or habitats require prior approval of the state and NOAA.

To assist new researchers at the components, information packets will be available from the research specialist. These packets will contain background information pertaining to each component and an area map, designating the reserve boundaries. New researchers will also be offered a "tour" of the component(s) to gain familiarity with the research surroundings and general location. They will be informed that all research equipment placed on the reserve must be clearly labeled as to ownership. The researcher(s) will be responsible for removal of these materials at the end of the project. Failure to comply with NCNERR research policies will result in disqualification from future research funding and use of reserve sites.

Research, monitoring, and education projects will receive first priority within the reserve boundaries. Component management will carefully balance uses of the reserve to ensure that the objectives of the program are protected and sustained. The scope of component management will not in any way be diminished by the NCNERR research and monitoring plan.

Research opportunities are available to any qualified scientist, undergraduate, or graduate student affiliated with any college, university or school; non-profit, non-academic research institution (e.g., research laboratory, independent museum, professional society); private profit organization; or state, local, or federal government agency. These opportunities are also available to any individual who has the resources and capabilities needed to perform the work required.

Research opportunities will be available to all applicants without regard to manner of funding. Financial

support may be available for research if the results are directly applicable to improved coastal zone management. Support may come through the State of North Carolina, the NOAA Office of Ocean and Coastal Resource Management, NOAA Sea Grant, the Environmental Protection Agency, or other sources. Researchers not seeking financial support may apply to do research at any time. Researchers seeking financial support from NOAA/OCRM must follow NOAA's research and monitoring time table.

All research proposals are evaluated by the reserve coordinator and the research specialist for consistency with NCNERR goals and to ensure that the proposed research will not interfere with other research at the reserve. Projects are selected based on their importance to coastal zone management issues, scientific/educational merit, and technical approach. Other project selection criteria include: the environmental consequences of the project; immediacy of need; and the relationship of the project to other available information and studies.

a. Procedures for NOAA-Funded NCNERR Research

Proposals which target NOAA funding are evaluated by NOAA using their own guidelines. In order to qualify for NOAA funding, NCNERR research proposals must address one or more of the NERRS National Research Priorities and fulfill the requirement of the appropriate Request for Proposal. NOAA funds are awarded on a competitive basis and proposals will compete with other reserve research proposals throughout the NERRS.

The NCNERR research specialist is responsible for coordinating all research and monitoring activities for the reserve. To facilitate this, NOAA will maintain close contact with the NCNERR research specialist and keep that person informed of the progress of NOAA-funded researchers. One complementary copy of quarterly performance reports, the final report, and any other research information received by NOAA will be sent to the NCNERR in a timely manner. The NCNERR research specialist will maintain regular communication with the researchers and aid in coordination of reserve research activities.

To achieve the NERRS goals of 1) "making available information necessary for improved understanding and management of estuarine areas" and 2) "enhancing public awareness and understanding of the estuarine environment"; it is expected that NOAA-funded researchers will also provide a presentation on their research findings at one of the North Carolina Aquariums or the North Carolina Maritime Museum.

b. Procedures for State-Funded NCNERR Research

All proposals which do not target NOAA funding will also be evaluated by the Research Review Panel. Research proposals that focus primarily on site-specific topics and do not rely on NOAA funding shall not require NOAA approval as long as they are consistent with identified NCNERR research needs. However, a courtesy copy of these proposals will also be sent to NOAA. Coordinated and streamlined procedures for the review and approval of research proposals and permits will be established.

The NCNERR requires that researchers provide the research specialist with quarterly performance reports, a final report, and an abstract and one copy of any publications resulting from research at the reserve. The final report will include: an abstract, a literature review, methods, analyses, results, and a conclusion. It will include a summary of the gathered data and a list of the analyses completed.

Presentations of the research results will be scheduled at the North Carolina Aquariums or the North Carolina Maritime Museum to better inform the public of information needed to improve coastal management decisionmaking. Executive summaries of the results will also be made available to any interested parties, particularly coastal managers and the Coastal Resources Commission. Pertinent research information from these sources will also be sent to NOAA.

c. Procedures for NCNERR Research (funded by sources other than NOAA or the state)

The NCNERR research specialist will negotiate reporting and presentation requirements for research funded by sources other than NOAA and the State of North Carolina with the reserve coordinator, the researcher, and the funding source. For example, researchers who must provide progress reports to their funding agency may be asked to submit copies of those reports to the NCNERR research specialist. A permitting process for research within the reserve will be developed.

4. Monitoring Program

In 1989, NOAA initiated a phased monitoring program to assist states in developing a better understanding of the estuarine resources being managed under the reserve program. The following phases will constitute the development of the NCNERR monitoring program:

- Phase I, *Environmental Characterization:* literature review and/or field research to acquire all available information on hydrology, geology, water chemistry, water quality, biological resources, and the problems and issues confronting the reserve environment;

- Phase II, *Site Profile:* involves a synthesis of information gathered in Phase I to provide an overall picture of the reserve in terms of its resources, issues, management constraints, and research needs;

- Phase III, *Procedures and Requirements:* identification of parameters to be measured, procedures to be used (criteria for measurements, quality control, and standard procedures where they already exist), sampling strategy for selected parameters (spatial and temporal intervals), storage and retrieval of data (reporting, formatting and analytical requirements), manpower requirements, logistics, and cost; and

- Phase IV, *Implementation:* initially, pilot projects and upon successful evaluation, full-scale monitoring of selected parameters.

5. Recruitment of Researchers for the NCNERR

Recruitment of researchers is important to build the NCNERR data base and to establish the components as long-term natural field laboratories. Recruitment strategies include:

- Coordination through scientific/technical advisory committees;

- Participation of NCNERR staff in research symposia, conferences and workshops;

- Intern programs involving graduate students or upper class college students;

- Annual announcements of research opportunities and NOAA research funds through NOAA's Sanctuaries and Reserves Division; and

- Other research and monitoring funding;

6. Coordination of Research/Monitoring Efforts

Another research benefit offered by the reserve is the potential for coordination of research/monitoring efforts. The NCNERR offers permanent places where various research institutions may coordinate their projects and compare

results. Data will be compiled, assembled, analyzed, and made available in the appropriate form for use by other researchers, coastal managers, and the public.

a. Coordination among NCNERR Components

The reserve coordinator and research specialist oversee research and monitoring among the NCNERR components with assistance from the Scientific Advisory Committee and NOAA. Data for all research/monitoring activities will be maintained at the Center for Marine Science Research (CMSR) in Wilmington. The Rachel Carson Component may also have a repository for site specific information and research results.

b. Coordination with the NERR System

The NCNERR works closely with NOAA staff, especially their research coordinator, to develop and access National Research Priorities. NOAA is also involved with the reserve through research funding and proposal evaluation as already discussed in section 3.a of this chapter. The reserve coordinator will communicate with reserve managers from other states, particularly middle and south Atlantic states, and will work with NOAA and the NERRS network to establish a national information exchange system.

Data from the NCNERR contribute the national network of long-term studies to monitor the status and trends of estuarine ecosystems. Data from the NERRS make a substantial contribution to the understanding of long-term ecological effects on estuaries and are useful in predictive trend analyses of ecological stresses. Coordinated research aids greatly in understanding the theoretical and practical aspects of conservation and coastal resources management.

With assistance from NOAA, an electronic mail system (OMNET) will be established at the CMSR in Wilmington. The system will help link the reserve to other National Estuarine Research Reserves, National Marine Sanctuaries, the University of North Carolina Sea Grant Program, NOAA, and other programs in marine and estuarine science community.

c. Coordination with Other Coastal, Estuarine, and Natural Area Programs

Research and monitoring programs will be coordinated with a number of state agencies and academic institutions. These institutions include:

Duke University Marine Laboratory
East Carolina University
Elizabeth City State University
North Carolina Aquariums (NCAs)
North Carolina Maritime Museum (NCMM)
North Carolina State University
North Carolina Division of Coastal Management
North Carolina Division of Environmental Management
North Carolina Division of Marine Fisheries
University of North Carolina - Institute of Marine Science
University of North Carolina at Wilmington
National Marine Fisheries Service - Southeast Fisheries Center at Beaufort

7. Information Dissemination

Information gathered in NCNERR research and monitoring and the management implication of this information will be made available to decisionmakers and the public in understandable formats. Both NOAA and NCNERR will encourage the dissemination of research results according to the following methods:

- NOAA's computerized abstract service, keyed to NOAA contract numbers and revised annually (hard copies of the collected abstracts are available upon request to reserve managers, other federal and state agencies, universities, and individuals);

- Technical reports, including final reports and those distributed by NOAA through its Technical Memorandum Series;

- Journal articles;

- NOAA-written synthesis of technical reports;

- Presentations at professional societies; and

- Special symposia arranged by NOAA or reserves, often in association with other meetings such as the biennial meetings of the Estuarine Research Federation or Coastal Zone Managers.

In addition to NOAA information dissemination routes, NCNERR will utilize several state-wide avenues of information and research exchange including:

- Summary of research at reserve components;

- Workshops and conferences at the CMSR;

- NCNERR research opportunities brochure and additional literature, distributed with the annual call for proposals and at appropriate conferences and other events;

- Press releases to local media;

- Articles in journals of local organizations;

- Direct mailings to state and local decisionmakers; and

- Regular contact with representatives of other state and federal agencies, local government agencies, and planning boards.

F. Education and Interpretation Program

Protected estuarine systems, such as the North Carolina National Estuarine Research Reserve, provide exceptional education opportunities. Reserve education and interpretation programs broaden the public understanding of the value of estuarine resources, increase citizen awareness of actions they can take to protect these important resources, and interpret and disseminate useful research results and other information to coastal decisionmakers.

1. Goals of the Education and Interpretation Program

The goals of education and interpretation programs are to:

- Enhance public awareness and understanding of estuarine ecosystems, human effects on them, and the interrelationships of these ecosystems with the environment as a whole;

- Provide information and education opportunities to coastal managers and other decisionmakers, enabling them to make sound, informed decisions;

- Increase public awareness of the value of estuaries (e.g., for flood control, as a chemical and nutrient buffer zone, as a habitat for wildlife, and as a food web base);

- Increase awareness of the value of North Carolina estuaries, particularly the NCNERR components, for seafood, recreation, navigation, wildlife, and aesthetics;

- Foster individual responsibility and stewardship of estuarine resources and increase awareness of actions citizens can take to protect these important resources;

In order to achieve these goals, education and interpretation programs will:

- Provide facilities, materials, and staff as necessary to aid in education and interpretation;

- Educate the public about the importance of estuaries in the natural environment, through exposure and participation in activities that will develop a sense of ecological awareness, appreciation, and responsibility;

- Provide exhibits and displays which focus on the functions and importance of estuaries, with emphasis on a multisensory, interactive approach;

- Conduct educational activities on-site and provide outreach programs for schools, camps, and other organizations;

- Participate in regional, state, and local programs such as National Estuaries Day and other Coast Weeks programs; and

- Utilize volunteers and community resources to implement educational objectives.

2. Framework/Policies of Education and Interpretation Programs

Reserve education programs operate, in part, through cooperative efforts with education organizations already established in the region. In particular, the education programs of the NCAs, the NCMM, and Sea Grant have already initiated estuarine awareness in the state. Using this as a foundation, the reserve will create a hands-on, interpretive approach to convey existing and new information to visitors. Specific activities are tailored to reflect individual component resources, while increasing overall knowledge and awareness of estuarine systems. Particular emphasis is placed on the role of the estuary in the total environment and interrelationships of research, conservation, and management.

To meet the goals and objectives of the education program, the education specialist will develop and implement education programs at the Rachel Carson Component and will coordinate and assist the education programs at the other three components. Because the Rachel Carson, Zeke's Island,

and Masonboro Island Components are near relatively large coastal population centers, regular programs will be provided. The Currituck Banks Component is far removed from the nearest marine education facility, the NCA/RI, thus special group field trips will be the primary planned activity.

Interpretive activities at the components will expand awareness and appreciation of estuarine resource management. Activities should provide an understanding of the processes that created these valuable resources and the continuous nature of those processes.

The focus of education and interpretation programs will be outdoors, using foot trails and predetermined routes. Indoor exhibits will act to supplement the outdoor exhibits and activities. Exhibits will be interactive and multisensory whenever possible, based on the belief that learning absorption is facilitated by the involvement of the senses. Where practical, education programs will be linked to research projects at the components.

Education and interpretation programs will be designed to place minimal stress on the ecosystem. Generally, education activities will be conducted outside the critical research areas at each component to prevent disturbance to research projects and to avoid disruption of remote, pristine areas of the ecosystem. In some cases, research projects will be involved in education activities. With careful management and coordination, education and research/monitoring programs will compliment and enhance each other at each component.

The education specialist will organize outreach activities to schools, special interest groups, civic groups, and professional organizations. Lectures and workshops will explain the educational experiences available at each component and how each group can take advantage of these opportunities to meet its specific needs. The education specialist will also be available to help schools and other groups develop curriculum units and other educational materials for environmental education classes. In addition, the education specialist will make information available to coastal management decisionmakers.

The education specialist and reserve coordinator will promote the reserve's research and educational opportunities through press releases and articles, slide shows, exhibits, solicitation of media coverage, and development and dissemination of brochures. Refinements and special projects may be added to the NCNERR program through participation at local and regional conferences related to natural area education.

3. Education and Interpretation Programs

a. Types of Programs

A variety of educational opportunities will be generally available at each component. These will be tailored to the characteristics of the local ecosystems and associated facilities. Examples of possible education and interpretive programs include:

- Guided and self-guided field trips;
- Participatory, interactive, and multisensory education activities and games (e.g., from Project Estuary);
- "Hands-on" activities such as banding birds and sampling water quality;
- Teacher training workshops;
- Research-related tours and demonstrations;
- On-site and off-site presentations such as lectures, slide-shows, movies workshops, and demonstrations;
- Production and distribution of videos, brochures, newsletters, and articles as part of an outreach effort;
- A gifted/talented student program in estuarine studies may be initiated during summer months;
- Historical/archeological tours;
- Work-study internships for local high school and college students may be established;
- Site orientations to educate component users about the fragility of the estuarine ecosystem and the locations of restricted access areas such as critical research zones; and
- Workshops or "teach-ins" to educate decisionmakers on topics related to estuarine systems, particularly involving the results of reserve research projects.

b. Education Policies and Programs at Individual Components

Education opportunities will be provided at each component of the reserve. Education programs will target a wide variety of groups including college students, parents, public and private school children, the local community, and the general public. The education specialist will establish policies and develop programs which build on and complement existing polices and programs at the components. Education activities will be tailored to take advantage of special characteristics of each component.

(1) Zeke's Island

Education policies for Zeke's Island will be developed by the reserve education specialist with assistance and advice from the reserve coordinator, reserve research specialist, and the Local Advisory Committee. The education specialist will work with state agencies, Brunswick/New Hanover county school systems, and private organizations in the area to augment the present level of marine/estuarine educational activities.

The NCA-FF currently conducts field trips on the jetty ("The Rocks") and by boat within the component. This is complemented by a marsh/sound boardwalk on the Aquarium property as well as a classroom, exhibits, and audio visual activities. These programs will continue and periodically be updated with new activities and information.

Expanded use of the component for education activities will be initiated by the use of the Project Estuary reserve publication. The education specialist and Dr. Gail Jones will hold workshops for local teachers to develop a local constituency of instructors who can perform the various activities in the curriculum guide. This will encourage both on- and off-site estuarine activities that do not require the participation of the limited reserve or aquarium staff. A brochure describing a self-guided tour will be developed for public use.

(2) Rachel Carson

This component receives regular educational use in the form of field trips presented by the NCMM, and less frequently by Duke University Marine Laboratory

and the NCA-PKS. A brochure that describes a self-guided tour of the component has also been developed.

Since the education specialist will be based at the Rachel Carson component, this site will be a prime focus of education activity within the reserve. Project Estuary activities and lesson plans will be presented to local teachers in programs at the NCMM and via outreach efforts. The education specialist will work closely with NCMM staff to coordinate educational activities at the component and off-site to the mutual benefit of both the museum and reserve programs.

(3) Currituck Banks

Remote Currituck Banks has very little education use compared to the other components. Field trips by The Nature Conservancy and the College of the Albemarle have visited the site. The nearest education facility is the NCA-RI, some 45 miles (72 km) to the south.

This component will be used primarily by groups that specifically request a field trip from the education specialist or the NCA-RI. Currituck County is presently attempting to restore the nearby Monkey Island clubhouse which would serve as ideal overnight facility. Regional workshops will also be presented to local teachers in an effort to encourage off-site as well on-site estuarine education. A self-guided tour brochure will be developed.

(4) Masonboro Island

This component has received regular seasonal use in the form of field trips by the NCA-FF and UNCW. Education development will be very similar to that described under the Zeke's Island Component, some eight miles (13 km) south of Masonboro Island.

c. Possible Topics for Education Programs Throughout the Reserve

Topics for reserve education should correspond with the goals of the National Estuarine Research Reserve System and with the goals of the NCNERR. Examples of topics for education are listed below. This list is not intended to be a complete array of permitted education topics, but rather to suggest some appropriate possibilities.

- definition and importance of estuaries
- state regulations as they pertain to estuaries
- impacts of local development on estuaries
- wetlands ecology
- reserve wildlife
- history
- biological and physical features
- food webs and seafood production
- regional and national estuarine concerns

d. Coordination of Education Efforts

(1) Coordination among Components

The reserve coordinator and education specialist will coordinate education programs among the components. They will communicate directly and frequently members of the local advisory committees. A newsletter will be developed to keep all committee members and individuals involved with the NCNERR program up to date on pertinent information. The newsletter will also be made available to other interested parities.

(2) Coordination with the NERR System

Information will be provided to NOAA, as requested, for the NERRS status reports and the reserve coordinator will communicate directly and frequently with NOAA. The reserve coordinator and another reserve representative will attend NERR manager meetings and conferences.

(3) Coordination with Existing Education Programs

The education specialist will coordinate with existing education programs of school systems, government agencies, private organizations, and universities in North Carolina. When possible, the reserve staff will work with organizations that have environmental and estuarine education programs (e.g., county school systems, the North Carolina Aquariums, and North Carolina Maritime Museum) to expand local estuarine educational activities.

College and universities in the vicinities of the reserve will be encouraged to make use of the reserve for courses, field trips, and workshops for coastal managers. These institutions include:

- Duke University Marine Laboratory
- University of North Carolina Institute of Marine Sciences
- East Carolina University
- North Carolina State University
- Cape Fear Community College
- Elizabeth City State University
- Carteret Community College
- College of the Albemarle
- University of North Carolina at Wilmington

Efforts will also be made to coordinate with other agencies, groups and programs on educational projects. Examples of such entities include other divisions in the North Carolina DEH&NR, the North Carolina Department of Public Instruction, the North Carolina Sea Grant Program, the U.S. Fish and Wildlife Service, state and county parks and recreation departments, and private organizations (e.g., Sierra Club, scouting groups).

G. Volunteer Program

Volunteers will have important roles at the NCNERR components. As components receive on-site staff, volunteer programs will be developed to deliver information about the protected reserve components to the general public and to scheduled groups. These programs will be designed to educate volunteers about the applicable reserve component, its history, flora and fauna, characteristics of the area, and the NERRS. Volunteers will be able to share their knowledge and experiences with a large portion of the general public. They will serve as the site representatives. Opinions that people create about an area are often formed by the first contact that is made. Therefore, initial contact between a reserve volunteer and the public is very important.

1. Goals of the Volunteer Program

The goals of the volunteer programs are to:

- Educate the local community through volunteer participation;
- Gain local community support and interaction;
- Promote public appreciation of estuaries and surrounding uses; and
- Create a sense of responsibility for wise use of natural resources and protected reserve areas.

2. Proposed Program

To solicit interested volunteers, the reserve staff will work through local advisory committees, local media, and educational institutions. For example, articles in local newspapers will notify the public about the need for reserve volunteers.

Volunteers must be well trained to be effective and successful. Information will be available to educate volunteers about the history of the NCNERR program, local history, and estuarine processes of the given component. On-site training will also be provided. The reserve Field Guide (Taggart and Henderson, 1988) will be very helpful in this regard. Training sessions will be held as needed. These sessions may be general for new volunteers, or they may cover specific topics to help expand the information available to the experienced volunteers. Sessions may be coordinated and conducted by NCNERR staff, area scientists, educators, or other knowledgeable persons. A volunteer log book will be used to keep track of all volunteer hours. This will include time for training sessions.

A reserve representative in charge of the volunteer program at each staffed component will arrange for special events and coordinate these activities with the volunteer staff. All interested volunteers will be contacted for duty at least one week prior to the scheduled program or event. If, after commitment, the volunteer cannot make the scheduled event, they must find a replacement. The reserve representative in charge of the volunteer program should only have local replacements in emergency situations.

A volunteer list will be developed and updated yearly. This list will contain phone numbers, addresses, and areas of interest or special talents. Volunteers will take part in all aspects of site use. They may share their ideas in rule and

policy making, planning, and maintenance. They will be able to reap personal satisfaction from becoming part of team, dedicated to helping and educating others while expanding their own knowledge. A private non-profit group (e.g., "Friends of the Reserve") will be created at Rachel Carson and Masonboro to help develop community, financial, and political support for the local volunteer program.

H. Resource Protection and Restoration

The health, productivity, and integrity of the estuarine reserve resources must be protected and, where necessary, restored in order to provide a stable environment for research and education programs which are used to address coastal management issues.

1. Goals of Resource Protection and Restoration

The goals of resource protection and restoration are to:

- Preserve estuarine ecosystems for continuous future use as natural field laboratories where information essential to coastal management decisions can be gathered and disseminated;

- Ensure a stable environment for research through long-term protection of estuarine areas, including open water, transitional area wetlands, and adjacent uplands;

- Protect natural, pristine estuarine sites for education and interpretation programs;

- Protect the habitats of birds and other wildlife as an integral part of the natural system; and

- Permit restoration of degraded areas to a former, more natural condition when appropriate and practicable, and when the restoration will enhance the research or education value of the reserve.

Specific objectives include:

- Acquisition of key land and water areas identified in the site selection process;

- Control of access to the components;

- Assistance with enforcement of permitted uses of the components;

- Knowledge of and involvement with land use issues in the vicinities of the components that could impact the reserve; and

- Coordination with state and federal authorities to help prevent degradation of the components by outside activities.

2. Policies

Resource protection relies on a number of existing federal, state, and local laws and regulations, plus reserve use policies and their overall enforcement by reserve staff and local authorities at the individual components. It is also the responsibility of the reserve staff to be knowledgeable and involved with land use issues in the vicinities of the components. Some major current issues affecting each component are listed under Chapter 3, "Local Activities That May Affect the Component."

The NERRS regulations allow for multiple use of reserves to the degree compatible with each reserve's management plan and consistent with the mission and goals of the NERRS. Traditional activities in the NCNERR may continue at levels currently permitted under local and state laws as long these uses do not conflict with the overall goals of the reserve as defined in the management plan.

Public access is encouraged to the extent that it will not conflict with key protection (core) areas described in Section J of this chapter. Coordinated enforcement of existing regulations and access policies will help to preserve cultural resources as well as natural resources.

Research is the key use of the reserve and is given highest priority in the management plan. Interference with research activities can disrupt the effective long-term management of the estuarine systems. Reserve staff will monitor research sites and will post signs identifying active research areas. Nothing may be removed from a component (except for legally taken fish and game) without prior approval of the reserve coordinator. Plants, animals, and other natural features must remain to protect the integrity of the components. Hunting and fishing are permitted according to state and local regulations. Areas may be designated "off limits" to traditional uses during research projects that require undisturbed conditions. Bird colonies requiring special protection will be posted as "off limits" to vehicles and foot traffic.

The planning of any construction within the reserve will include an archaeological survey of the given component. A determination will be made whether known archaeological sites will be disturbed by construction. Contact will be made with the state Division of Archives and History to evaluate potential effects to cultural resources. Whenever feasible, construction plans will be altered to avoid disturbance to archaeologically significant sites.

In order to protect the integrity of the Reserve, proposed activities which manipulate habitats will be carefully reviewed to avoid irreparable damage to specific sites. However, manipulative research which is deemed acceptable (e.g., within dredge material areas) by NOAA, the reserve staff, and pertinent local advisory committee, will be approved. Restoration of the manipulated areas should also be considered in the proposal review.

Restoration activities will be minimal. The components are generally pristine with only sporadic areas that have experienced past disturbance (e.g., dredge material deposition, horse grazing). Minor restoration such as litter cleanup, erosion control, or reestablishment of original shoreline vegetation may be undertaken where necessary to enhance the research and education value to the reserve. Only native species recognized as part of the local ecosystems may be planted.

Because the NCNERR components fall under a number of different and sometimes overlapping jurisdictions among state and local agencies, coordination and cooperation among all authorities is essential. The reserve will coordinate with these regulatory agencies concerning activities that may potentially impact the reserve components.

Though the four components are generally encompassed by the preceding discussion and the use requirements listed in the North Carolina Administrative Code (Appendix C), there are a number of site-specific policies. The following policies have been developed with the assistance of the local advisory committees and SRD. Review of the use standards at a given component will be part of annual local advisory committee meetings.

a. Recreation

Policy: *Traditional recreational uses of each component shall be allowed to continue as long as they do not disrupt the natural integrity of the component or any research or education projects.*

The four components have long been used by area residents and visitors for swimming, fishing, hunting, nature study, and hiking. This tradition of use has created a strong local pride in and attachment to the natural and aesthetic values of each component. Recreation, research, and education are all compatible uses if they are properly managed. Allowing recreation to continue promotes full use of the reserve's resources, but research and education programs still take top priority and will be protected from any undue disturbances.

Policy: *No visitor shall disturb research projects or research equipment within a component.*

Research is the reserve's highest-priority use and must receive absolute protection. Disrupting research efforts would impair the effective long-term management of the reserve and other coastal resources.

Policy: *Users of the reserve shall not disturb nor remove any live animals (except for fish, shellfish, game animals, furbearers, or waterfowl--see fishing and hunting policies) or vegetation at any component unless it is part of an approved research or education project. All pets must be under control at all times.*

Removal and destruction of vegetation can lead to serious long-term damage to the ecosystems found in the reserve by promoting erosion and sedimentation. Disturbing nesting birds and other animals can interfere with their natural habits, possibly causing the animals to leave the Reserve, thus diminishing diversity. Signs will be posted stating these rules. Any interpretive/education trails eventually established within the reserve will be compatible with this policy of respecting the integrity of the reserve in general.

Policy: *Camping or fires in designated areas are only allowed by written permission from DCM. All users must pack out their own trash.*

Restriction of camping and fires protect the Reserve's delicate habitats from disturbance and destruction. Camping at the Zeke's Island, Rachel Carson, and Currituck Banks components will only be permitted for research projects that require overnight stays for observations or data gathering. Wilderness camping on Masonboro Island will be allowed within one or more designated areas that have posted rules.

Policy: *Hunting may be permitted in the reserve in accordance with current local, state, and federal wildlife regulations. More stringent regulations will be pursued if hunting conflicts with research and education uses or threatens the reserve's wildlife populations.*

Existing WRC and U.S. Fish and Wildlife Service regulations set season, bag limits, and limits on methods of taking for popular game species found at the reserve components (e.g., migratory waterfowl, marsh hens, doves, deer, and other game). These regulations, properly enforced, are adequate to maintain wildlife populations in the reserve. If the reserve coordinator and local advisory committees deem more stringent regulations to be necessary, the DCM will petition the WRC and the Secretary of the Department of Environment, Health, and Natural Resources to adopt appropriate restrictions in accordance with departmental procedures.

Policy: *A small public beach recreation area may be established within the Currituck Banks component in order to facilitate low intensity, day-use beach recreation that is compatible with general reserve objectives and promotes reserve education objectives.*

The proposed small day-use recreation area, if established within the Currituck Banks component, will not be a state park or general purpose recreation facility. Rather, it will be a limited area in the southeastern portion of the component that will meet local recreation needs (primarily those of the Currituck County area) while promoting reserve education purposes. The area will be located and used so as not to impair research objectives of the reserve, not to harm sensitive environmental resources, and not to unduly affect neighboring land uses. Recreation facilities will not include overnight camping nor any intensive development of the component. An appropriate buffer strip will be provided between any recreation facilities and adjacent residential development. Any support facilities that are eventually provided on this site (e.g., such as a small parking lot and restrooms) shall be installed only after consultation with the local advisory committee, Currituck County, NOAA, and adjacent property owners. This effort shall be a joint venture between the state and Currituck County. Such support facilities shall also be part of the interpretive education program developed for the component.

b. Off-Road Vehicles/Access

Policy: *At the Zeke's Island component, power-driven, off-road vehicles (other than boats, emergency vehicles, and law enforcement vehicles) are allowed only in designated areas on the barrier spit.*

The barrier spit is the only part of the component that is easily accessible to users of off-road-vehicles (ORVs). Confining ORVs to this area does not diminish other uses within the component. The islands and marshes will thus be protected, while traditional users, such as fishermen, retain access to the inlet. Special areas for bird breeding and wintering will be marked to avoid impacts from vehicles and foot traffic.

Policy: *No power-driven vehicles (except boats) shall be used within the Rachel Carson Component except during emergency/enforcement, dredging, or horse management operations.*

Unauthorized power vehicles (e.g., motorcycles and ORVs) have created problems on Carrot Island and Town Marsh by frightening animals and trampling vegetation. The Town of Beaufort has an ordinance that prohibits motor vehicles on these islands. Traditional use of boats with motors on the component's estuarine waters is not affected by this policy.

Policy: *At the Currituck Banks Component, reserve operation shall not reduce current levels and rights of public access to properties located between the component and the Virginia State Line.*

Since there is no road across the Currituck Banks Component, the associated ocean beach has traditionally been used by residents and property owners for access to the north. County off-road-vehicle regulations currently limit this access corridor to the ocean beach seaward of the dunes. These current rights of access are essential to allow landowners to reach tracts north of the component and south of Virginia, as federal regulations now restrict access through the Back Bay National Wildlife Refuge to certain permanent residents of the Currituck Banks. The planned Ocean Hill development road that will exit onto the component property will provide a link between the ocean beach and paved roads in the Corolla area.

When the beach is impassable due to high water levels, access across the component for property owners to the north will be extended to include back dune areas. The previously mentioned Ocean Hill development road will also be part of this "high water" route.

If at some point in the future driving along the beach conflicts with reserve objectives (e.g., conflicts for environmental reasons, recreational beach uses, or research/education uses) it will be the responsibility of the state to make available replacement upland access and to do so prior to any restriction of current beach driving. Any such action will be taken only after full consultation and coordination with the Local Advisory Committee, Currituck County, NOAA, adjacent landowners, and current users of the beach who also own land between the component and the Virginia state line.

Access across the component shall be for the purpose of providing a vehicular route to and from properties located between Corolla and the Virginia state line. At no time shall the component be used to provide through access to Virginia (except for emergencies and the currently permitted beach driving access to the north allowed to permanent residents). Should improved access to properties located between the reserve site and Virginia ever be provided from the north, access across the component may be terminated. Improvement of internal access within those subdivisions north of the component shall not affect provision of access across the reserve site.

Policy: *Off-road-vehicles at the Zeke's Island and Currituck Banks shall normally operate only on the flat, sandy beach area; driving over dunes and disturbing vegetation is prohibited. Vehicles shall use designated dune crossovers at the Zeke's Island Component. Vehicles using the Currituck Banks Component during flooded beach conditions shall follow interdunal flats and avoid vegetated areas. Drivers shall avoid posted areas of nesting birds. Drivers shall observe a 35 miles (56 km) per hour speed limit and slow to 15 mph (24 kph) when within 100 feet (32 m) of any pedestrian at these components.*

The destruction of plants and sand dunes accelerates erosion on barrier beaches and diminishes the reserve's natural productivity and habitat diversity. The beach and dune areas are popular nesting sites for numerous waterbirds, such as skimmers and terns. These nesting areas shall be posted at the Zeke's Island Component. Bird nests, eggs, and chicks are very hard to detect, even for a person on foot, and can be easily destroyed by ORVs driving in nest areas. Also, disturbing nesting birds for long periods of time may keep adults off the nests and cause eggs and chicks to die from exposure. During the nesting season, the reserve staff will assist the state park ranger in marking nesting sites at Zeke's Island. Area(s) near New Inlet will also be posted to serve as wintering and breeding sites for piping plovers.

Policy: *Between May 1 and October 31, off-road-vehicles at the Zeke's Island Component may only use the sound-side route along the barrier spit. Red-filtered lights must be used at night. Vehicles may not drive on the beach and crossing over must be done on foot. Off-road-vehicles permitted on Masonboro Island (for research, enforcement, or emergency purposes only) should only operate in the intertidal beach zone during this time period.*

The beaches of Fort Fisher and Masonboro Island are nesting grounds for sea turtles, primarily Atlantic loggerhead, that come shore to lay eggs at night during high tides May 1 to August 31. White lights from vehicles or buildings keep them from coming ashore and nesting. Lights also cause newly hatched turtles (they may hatch as late as October 31) to crawl in the wrong direction when they emerge from the nests. Tire tracks on the beach can impede or mis-direct hatchlings on their way to the ocean.

c. Fishing and Hunting

Policy: *Fishing, shellfishing, and hunting may occur within the limits of local and state laws. Hydraulic dredging or "clam kicking" is prohibited within the reserve.*

Sport and commercial fishing and hunting will generally be allowed to continue within the reserve, subject to existing regulations on bag limits, seasons, and gear limits. Collection of all migratory birds requires a U.S. Fish and Wildlife permit as well as a WRC license. At the Currituck Banks Component, traditional hunting and fishing in the sound waters and commercial fishing along the oceanfront ("haulseining") will not be prohibited. In order to maintain ecosystem diversity and protect the natural integrity of the site, hunting and trapping of certain species on uplands portions of the component may be necessary. If these rights do not exist currently, they may be extended on a case-by-case basis in consultation with the reserve coordinator, local advisory committee, and the WRC.

Hydraulic dredging to harvest shellfish destroys underwater habitats by severe disturbance of estuarine bottoms and vegetation plus sedimentation of adjacent shellfish beds. Hydraulic dredging is prohibited in the reserve according to existing DMF Regulations (N.C. Administrative Code, Title 15, Subchapter 3B, Section .0900 -- "Clams", Section .1000 -- "Scallops").

Policy: *Certain areas of the reserve may be closed to commercial and recreational fishing and shellfishing to provide undisturbed sites for research and fisheries reproduction.*

Once research better documents the reserve's submerged habitats and the species they support, certain portions of components may be closed to shellfishing and fishing. Such closings might benefit commercial fishing by providing excellent nursery areas and spawning areas. Similarly, a researcher might propose a project that calls for an undisturbed, submerged habitat to study fish, shellfish, plants, and their ecological relationships. Authority to close certain areas of the reserve rests in the DMF. When the reserve coordinator and the local advisory committees find such a closing to be warranted, the DCM will petition the DMF for such a closing in accordance with the existing regulations (for example, N.C. Administrative Code, Title 15, Subchapter 3B, Section .011 --"Research Sanctuary").

d. Disposal of Dredge Material

Policy: *Dredge material disposal shall be allowed to continue at the Rachel Carson and Masonboro Island components, but only within existing disposal areas and designated easements. All spoil operations must comply with the North Carolina Coastal Area Management Act (G.S. 113A-100 et seq.), Dredge and Fill Act (G.S. 113-229), and Section 404 of the Federal Water Pollution Control Act (33 USC 1251 et. seq.). Spoil disposal sites must be located, designed, and managed to prevent sedimentation of marshes, intertidal flats, and submerged lands. All dredge material shall be placed in a manner consistent with the best technology available for the prevention of mosquito and other disease vector breeding. If mosquito breeding occurs, steps will be taken to control such breeding. All dredging proposals shall be reviewed by the reserve staff, local advisory committees, and any other interested parties.*

The U.S. Army Corps of Engineers (COE) retains perpetual easements along Taylor's Creek at Rachel Carson and along the AIWW at Masonboro Island. The periodic deposition of dredge material has maintained the uplands of Carrot Island, Town Marsh, and certain portions of Masonboro Island in early stages of plant succession that provide a valuable nesting habitat for many species of birds. Periodic material deposition keeps vegetation limited to grasses and sparse forbs, which is an ideal nesting habitat for a variety of colonial and solitary-nesting birds. Dredge material deposition on the ocean beach at the Masonboro Island Component will not effect the estuary as the dredge material will be washed back into the longshore transport of sediments.

Policy: *Dredge material deposition shall not occur during the critical nesting times of sea turtle and ground-nesting shorebirds. If dredging is unavoidable during that time period, it shall be contingent upon prior and concurrent monitoring for nesting activity.*

The courting and nesting season of shorebirds in the Rachel Carson and Masonboro Island components extends from the end of April through September. This roughly coincides with the sea turtle nesting season, which extends from May 1 through November 15. Deposition of dredge material during the nesting season can negatively impact these animal populations. Seasonal monitoring of shorebird and sea turtle nesting activities shall be a priority activity.

e. Feral Horses

Policy: *The State of North Carolina is the lawful owner of the feral horses on the Rachel Carson Component. However, the state does not own the horses that roam the Currituck Banks Component.*

The State Office of General Counsel (within DEH&NR) has determined that the horses found on the islands composing the Rachel Carson Component are owned solely by the state. The horses on Currituck Banks roam many properties and thus are not claimed by the state.

Policy: *Scientific studies of feral horses population structure, feeding habits, and impacts on reserve habitats shall be used to determine how to manage these animals at the Rachel Carson and Currituck Banks components.*

Information gathered from studies of the horses on the components plus additional data from similar studies (e.g., Cape Lookout National Seashore, N.C. and Chincoteague National Wildlife Refuge, Va.) will be used to determine proper management. The primary goal of the NCNERR is to manage the components for research that will improve coastal management decisionmaking. The horses are very popular with many coastal residents. However, these animals represent a management conflict because they are an introduced species that consume marsh vegetation vital to estuarine productivity. Any decision on horse management (e.g., removal, veterinary care, provision of food or water) will be reviewed by the DEH&NR, NOAA, and members of the pertinent local advisory committee.

3. Existing State and Local Regulations/Jurisdictions Affecting the NCNERR

a. North Carolina Coastal Area Management Act

The North Carolina Coastal Area Management Act or CAMA (G.S. 113A-100 et seq.; NCAC - DEH&NR/DCM - T15: 07) was passed in 1974 and established an agency (DCM) and governor-appointed commission (Coastal Resources Commission or CRC) to regulate development and certify locally-adpoted and use plans in 20 coastal counties of North Carolina. Thus, any development done within the reserve will be carefully coordinated with the planning and permit review staff of DCM so as to conform to CAMA. The activities described in this plan are consistent with the goals and objectives of the North Carolina Coastal Management Program.

b. North Carolina Coastal Reserve Act (see Appendix G)

The Coastal Reserve Act (G.S. 113A-129.1 - 129.3) was passed in 1989 and formally established a state program to preserve certain coastal areas (including the NCNERR components) for research, education, and other consistent public uses. Management of the Coastal Reserve shall "... be carried out in coordination with National Estuarine Reserve Research System."

c. North Carolina Coastal Reserve Rules (see Appendix C)

These departmental rules (NCAC - DEH&NR/DCM - T 15: 70) were established in 1986 to define the purpose, responsibilities, functions, components, and use requirements of the Coastal Reserve. The Coastal Reserve includes the four NCNERR components plus two other sites (Permuda Island and Buxton Woods). The reserve use requirements (T15: 070.0200) specify general management standards within the component boundaries.

d. State Nature Preserves Act (see Appendix H)

On September 16, 1987 the reserve components were dedicated as State Nature Preserves by Governor James Martin. The letter of allocation lists a number of criteria that are already encompassed by the use requirements of the Coastal Reserve Rules (see c above) as well as the policies described in this management plan.

e. Public Trust Doctrine

This general doctrine is derived from case and common law, but is referred to in the state general statues (G.S.

113-131A-E; 145.1) pertaining to the DEH&NR. In essence, marine and estuarine resources are part of the public domain and therefore owned by the state (except for certain situations such as valid state Board of Education grants). This principle is important relative to reserve acquisition since the majority of a given component consists of intertidal/subtidal lands which, according to public trust, are already in state ownership. As a consequence, acquisition efforts have only been focused on upland tracts within each component.

f. Division of Marine Fisheries

The DMF has the primary charge of regulating commercial and recreational taking of fish and shellfish within the state, including the reserve components. DMF enforcement officers patrol the reserve components as part of their jurisdictions and may assist the reserve staff with enforcement matters per an existing MOU (see Appendix F.3).

g. Wildlife Resources Commission

The WRC has enforcement responsibility concerning the taking of game animals (including inland fishes) and enforcement of boating regulations. WRC enforcement officers also patrol the reserve components as part of their duties. In addition, there is an existing MOU (see Appendix F.11) between the DCM and WRC.

h. Cultural Resources

All archaeological historic property located on or recovered from state-controlled lands is the property of the state. The North Carolina Department of Cultural Resources has responsibility for mapping, study and preservation of archaeological historic property. Any proposed development within the reserve will involve consultation with this department.

i. Land Use and Zoning

Applicable county and municipal zoning regulations will be considered in the management of the NCNERR. Management will also be consistent with land use policies and land classifications adopted as part of local land use plans.

Zeke's Island: This component is bisected by two counties, New Hanover and Brunswick (see Figure 4). The New Hanover County portion of the component is not zoned for

development since it is prone to flooding. The county includes a "Conservation" classification to encompass coastal areas within the 100-year flood zone or CAMA-defined Areas of Environmental Concern (also see Masonboro Island below). In Brunswick County, the Zeke's Island Component is also not zoned, but is classified as "Conservation" land due to the high potential for flooding.

Rachel Carson: The Town of Beaufort has zoned this component as OS: open space for public use. The Carteret county land use plan classifies the component as "Conservation - Public Land."

Currituck Banks: Currituck County zoned upland portions of the component R-01: single family residences or planned unit development. The county land use plan classifies the reserve land as "Conservation."

Masonboro Island: The upland areas are zoned R-20: low-density, single density, single family residences. New Hanover County classifies this component as "Conservation" land.

4. Surveillance, Enforcement, and Maintenance

Protection of the resources of the NCNERR is essential to its long-term survival and its value for research and education. Policies stated in previous sections of the management plan control manipulation of habitats by researchers and control other disruptions (e.g., habitat disturbance, littering, species removal) by all users of the reserve. This section of the plan presents policies for enforcement of these policies and for maintenance of the reserve.

a. Surveillance and Enforcement

Policy: *The reserve staff and enforcement personnel from other state and local agencies shall periodically visit each component to identify and investigate possible violations of reserve policies. Until site managers can be placed at all components, the reserve will rely on researchers, members of the local advisory committees, and other users of the sites to report any problems.*

Time and budget limitations keep the DCM and other state and local enforcement agencies from maintaining a continuous presence at each component in the NCNERR. Therefore, all users of the reserve must exercise responsibility for obeying the management policies stated in this plan, for reporting any violations of the policies, and for cooperating with the reserve staff and state and local enforcement personnel.

Policy: *The Division of Coastal Management, Division of Marine Fisheries, Division of Parks and Recreation, Wildlife Resources Commission, and local law enforcement agencies shall cooperate in the enforcement of reserve use standards listed in the North Carolina Administrative Code (see Appendix C) as well as applicable state and local laws.*

Each component in the NCNERR falls into a number of different, sometimes overlapping, jurisdictions of local and state law enforcement agencies. Such overlap demands strong lines of communication and a strong sense of cooperation on the part of the enforcement agencies.

At Zeke's Island, the DEH&NR has assigned management responsibilities for patrol and enforcement of the barrier spit to the Division of Parks and Recreation (see Appendix F.11). In addition, the New Hanover County Sheriff has jurisdiction throughout the Zeke's Island and Masonboro Island components. The Town of Beaufort Police and Carteret County Sheriff Department respond to problems at the Rachel Carson Component. Currituck Banks is within the jurisdiction of Currituck County Sheriff, who has a deputy stationed in Corolla. The WRC has authority to patrol the lands and waters of the entire reserve to enforce their regulations. Likewise, the DMF patrols the sites to enforce marine fisheries regulations.

Policy: *When deemed necessary, the Division of Coastal Management shall enter into cooperative agreements with pertinent law enforcement agencies to clarify enforcement jurisdictions and responsibilities.*

Each reserve component has in the past experienced some difficulty with response to law enforcement calls. This difficulty has arisen largely from a lack of understanding on the part of enforcement authorities regarding which agency should respond to a given problem. Cooperative agreements will help to clarify each agency's role relative to the reserve and thus coordinate and expedite enforcement of reserve use standards.

b. Maintenance

Policy: *At the present time, the North Carolina National Estuarine Research Reserve shall rely on volunteer efforts to maintain the quality of the components. The reserve staff will coordinate periodic litter collections using local volunteers.*

Periodic litter cleanups are necessary to maintain the quality of the natural habitats within the reserve. Most visitors to the components treat the areas with respect, but some people thoughtlessly leave trash behind. There is also a considerable amount of debris that is deposited on the ocean and estuarine beaches by the tides. Cleanup efforts will be publicized to stimulate increased participation and decrease litter problems.

I. Facilities Development and Equipment

Facilities enhance access to the reserve and provide support for research and education programs. The number and type of facilities needed varies with the intended use of particular components. Basic equipment required to operate reserve components and to facilitate research and education is also included in this section.

Existing facilities, primarily the North Carolina Aquariums and the North Carolina Maritime Museum, function as visitor centers for the majority of the public wishing to receive information about the reserve. Exhibits, brochures, and field trips are available at these sites.

In addition, a conference/research center that would house the reserve staff may be built on UNCW property located directly across from Masonboro Island. This facility would be the base of reserve operations and would contain the UNCW Center for Marine Science Research. Other state facilities (e.g., Division of Shellfish Sanitation) may be housed on the same property.

Construction of facilities within the reserve boundaries will be conducted only upon joint approval by NOAA and the state. Advice will be sought from the appropriate local advisory committee(s). Construction will be performed causing as little environmental disturbance as possible. Sediment control regulations will be adhered to carefully. Permeable rather that impermeable surfaces will be used wherever possible.

It will be the longterm objective of the NCNERR to provide the following general facilities at some or all the components:

- Access to the reserve sites, including, trails and boardwalks;

- Staff office space; and

- Public information/interpretation areas.

A brief description of current facilities and development needs for the future are described below.

1. Zeke's Island

The component includes a rock jetty, barrier beach, islands, marshes, and a tidal lagoon. Its proximity to the NCA-FF provides ideal opportunities for research and education.

Current facilities include:

- a small parking lot and public boat ramp (maintained by the N.C. Wildlife Resources Commission [WRC]) at the terminus of U.S. 421;

- a rock jetty ("The Rocks") that supports foot traffic and extends several miles from the WRC parking lot to Zeke's Island and through the reserve into the adjacent Smith Island complex;

- an ORV road, Ramsgate Road, which runs approximately four miles (6.4 km) along the sound side of the barrier spit (including crossovers to the ocean beach route) to New Inlet; and

- information and boundary signs.

The Zeke's Island component will not have any more development with the possible exception of repair to certain portions of the jetty where footing is difficult due to slippery, algae-covered surfaces that have been eroded down to the high tide water level. Educational displays will be placed at the NCA-FF.

2. Rachel Carson

Facilities for this component are located in Beaufort, just across Taylor's Creek from Town Marsh. These items include:

- Office and boat dock for the Educational Specialist at the North Carolina Maritime Museum (NCMM);

- Exhibits, visitor information area, and education facilities in the NCMM;

- Information signs (located at the intersection of Front and Queen streets) along Taylor's Creek; boundary signs are posted on the island;

No other facilities are planned for this component.

3. Currituck Banks

This component is located on a formerly remote portion of the North Carolina Outer Banks which is currently undergoing dramatic development of resort homes and planned unit developments. The nearest education/research facility is the NCA-RI in Manteo, some 46 miles (74 km) to the south, where reserve exhibits have been developed and public information materials are distributed. Reserve information and boundary signs have been erected on the component.

The only possible development on the component may be a small day-use area for beach users. Such a facility would be placed in the southeastern corner of the property and would consist of a small parking lot and restrooms only, no overnight use nor intensive recreation development will be allowed. Interpretive information would also be provided at this facility. An appropriate buffer strip will be provided between the day use area and adjacent residential development. A ten-foot wide easement extending through the Ocean Hill development will route visitors to the beach.

4. Masonboro Island

This component currently consists of an undeveloped barrier island that will receive special emphasis on research and education because of the proximity to UNCW and presence of the reserve coordinator and research specialist. Facilities within the component may include:

- Boundary and information signs;

- Marsh boardwalk-observation area; and

- Conference/research center (located on UNCW property - see Figure 10).

The conference/research center would be developed in conjunction with UNCW and the reserve program. The intended function of this structure would not compete with the educational activities of the NCA-FF, but would complement estuarine awareness in the area. The entire Center for Marine Science Research would be housed in the building along with the offices of the reserve coordinator and research specialist. Ideally, the center will include:

- Two story building
- Parking area
- Administrative offices
- Identification signs
- Research laboratories
- Conference room with audio-visual accessories
- Restrooms with showers
- Reception area for visitors
- Library
- Storage areas
- Mechanical room
- Electrical room
- Break room or kitchen
- Handicapped-accessible design
- Boat dock with boardwalk and pier
- Equipment yard and building

J. Boundaries and Acquisition Plan

Boundaries for NCNERR components must include "an adequate portion of the land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation" (Federal Register, Vol. 55, no. 141, Section 921.11). These areas must be discrete enough to be effectively managed, but large enough to make long-term research possible. To help focus management efforts, site boundaries encompass two zones: key land and water areas (core areas) and buffer zones.

NOAA's Guidelines for Establishing Proposed Boundaries for National Estuarine Reserves define core areas as areas which contain "critical estuarine ecological units for research purposes, encompassing a full range of significant physical, chemical, and biological factors contributing to the diversity of fauna, flora, and natural processes occurring within the estuary." The core area is "so vital to the functioning of the

estuarine ecosystem that it must be under state control sufficient to ensure the long term viability of the reserve for research on natural estuarine processes... [These areas] should encompass resources that are representative of the total ecosystem which, if compromised, could endanger the research objectives of the reserve." A buffer zone is defined as an "area adjacent to or surrounding the core and on which the integrity of the core depends. This area protects the core and provides additional protection for estuarine dependent species."

Site surveys have been conducted to establish boundaries for each NCNERR component. Acquisition strategies to establish adequate state control have been established to provide long-term protection for reserve resources within these boundaries. Types of acquisitions have included land donations, bargain sales, and purchases. Condemnation has been necessary in a few instances when the value of a key tract is in irreconcilable dispute or to resolve convoluted title circumstances.

1. Zeke's Island

a. Key Land and Water Area (Core)

The core area in the Zeke's Island Component (Figure 4) consists of tidal basin waters, creeks, and marshes (916 acres /336 ha). These highly productive estuarine waters are used regularly for sport and commercial fishing as well as recreation purposes.

b. Buffer Area

Upland communities including ocean beach dunes, shrub thicket, and maritime forest comprise the buffer area (249 acres/100 ha) of this component. The ocean beach on the barrier spit receives the most public use.

c. Acquisition

The entire 1,165-acre (466 ha) component was donated to the state in 1980 by Mr. Walter Davis. No additional acquisition is planned since all adjacent lands are also in state ownership and managed for protection of natural resources.

2. Rachel Carson

a. Key Land and Water Area (Core)

Within the Rachel Carson Component (see Figure 6), tidal flats, creeks, and marshes within the Middle Marshes,

Carrot Island, Town Marsh, Bird Shoal, and Horse Island area comprise the core area (2,280 acres/912 ha). These waters are regularly harvested for shellfish by local residents.

b. Buffer Area

The primary example of buffer area within the component is the dredge material deposits along Taylor's Creek on the north edge of the complex. There are also areas of beach, dunes, shrub thickets, and a remnant of maritime forest at the east end of Carrot Island. Total buffer area is 345 acres (138 ha).

c. Acquisition

Most of the 2,625-acre (1050 ha) component was acquired by a series of bargain sales and purchases between 1985-1989. The Middle Marshes complex and Guthrie Shoal had to be condemned to settle title complexities.

3. Currituck Banks

a. Key Land and Water Area (Core)

The delimited portion of Currituck Sound (Figure 8) and the associated marshes constitute the core area (625 acres/250 ha) of the component. The sound waters contain extensive mud and sand flats covered in some areas by submerged aquatic vegetation.

b. Buffer Area

The upland dunes, shrub thicket, maritime forest, and interdunal ponds include the buffer communities of the component. These uplands (335 acres/134 ha) are characterized primarily by dense woody vegetation intermingled with numerous seasonal wetlands. This mosaic of habitats effectively restricts public use to the ocean beach area.

c. Acquisition

The Currituck Banks uplands were acquired in 1985 by two bargain sales. No further acquisition is planned.

4. Masonboro Island

a. Key Land and Water Area (Core)

The back-island sounds plus associated tidal creeks and marshes comprise the core area (4,427 acres/1,771 ha) of this component (Figure 10). This non-riverine estuary is an important local source of shellfish and serves as a nursery area for numerous finfishes.

b. Buffer Area

Masonboro Island proper constitutes the buffer area (619 acres/248 ha) and consists of a narrow barrier of low-lying dunes, shrub thicket, maritime forest, and spoil areas along the waterway. The natural portion of upland buffer area is frequented by local residents, particularly the beach areas at the north and south ends of the island. The buffer area also includes 51 acres (20 ha) owned by UNCW and located across the waterway from the island.

c. Acquisition

Acquisition of this component has been a slow and complex process that began in 1985. The island was divided into 86 tracts with each tract typically in multiple ownership. With the exception of a single tract donation by the New Hanover County, all other landowners wished to sell their properties. Most properties were purchased at fair market value, but condemnation was used to acquire the largest tract (57 acres / 23 ha) when no compromise on price was reached following extensive negotiations. The remaining tracts on the island will be purchased with assistance from a local conservation group, the Society for Masonboro Island (SMI). The state currently owns approximately sixty percent of the island's natural upland area. The SMI will make local contacts with the numerous property owners and assign options to the state. Condemnation may be used to acquire remaining tracts that are not donated or purchased on a willing-seller basis.

K. Public Access

1. Policy

The state reserve use requirements (see Appendix C) specify public access and use standards. The reserve is generally open to public day uses that are compatible with the research and education goals and objectives of the program. Enforcement of rules is achieved by assistance from the pertinent law enforcement agencies.

2. Current Access Rules and Schedules

a. Zeke's Island

The Zeke's Island component may be reached by: 1. driving on an ORV trail routed along the barrier spit portion of the site, 2. walking on the rock jetty ("The Rocks") to Zeke's Island, and 3. by private boat launched from the WRC boat ramp at the end of U.S. 421. The NCA-FF takes groups to the jetty on field trips. The barrier spit area is patrolled by a ranger based at Carolina Beach State Park per a memorandum of understanding between the DCM and the DPR. Law enforcement assistance is available through the state Division of Marine Fisheries (DMF) and the sheriffs of Brunswick and New Hanover counties.

b. Rachel Carson

This component can only be reached by boat. Field trips to the islands are scheduled by the NCMM or the reserve education specialist during the spring - fall. Law enforcement assistance is provided by the Beaufort Police Department, the Carteret County Sheriff, and the DMF.

c. Currituck Banks

Primary access to the component is by four-wheel-drive vehicle via either the ocean beach or along a road to be built in the near future through the Ocean Hill subdivision. The western portion of the component is also accessible from the mainland by boating across Currituck Sound. A north-south utility corridor along the west edge of the upland area is walkable, but numerous holes and wet areas make it impassable for motorized vehicles. The site is patrolled by the Currituck County Sheriff and by the U.S. Fish and Wildlife Service, manager of the nearby Currituck Banks National Wildlife Refuge.

d. Masonboro Island

This component is only accessible by boat. Once on the island, only foot traffic is permitted on the uplands (vehicles are only permitted for emergency, enforcement, or research purposes). Primary use areas are at the north and south ends of the island, close to the nearby towns of Wrightsville Beach and Carolina Beach, respectively. There is no regular patrol on the island, but the property is within the jurisdiction of the New Hanover County Sheriff as well as DMF and WRC enforcement officers.

L. Proposed Implementation Timetable

The following table outlines the timetable for implementation of the management plan. Table 1 outlines the development of reserve operations, facilities, staff needs for the reserve.

Table 1. Implementation: Operations, and Facilities, and Staff

Year	Overall NCNERR	Zeke's Island	Rachel Carson	Currituck Banks	Masonboro Island
1	- Move reserve program to Wilmington - Hire research specialist - Revise management plan - Increase research and education coordination - Revise signage and exhibits - Planning for 2nd year	- Increase management presence - Increase education activities with NCA-FF and local school systems	- Hire education specialist/site manager (federal funds) - Daily management presence - Increase education activities: on-site and outreach with NCMM, NCA-PKS and local school systems - Test feral horses for EIA	- Augment education activities with NCA-RI and local school systems	- Designate component - Augment education activities with NCA-FF and local school systems - Continue acquisition
2	- Develop monitoring plans for all components - Staff participation in research and education workshops - Compile all monitoring and research data on computer - Planning for 3rd year	- Develop self-guided tour brochure - Develop volunteer program - Augment education programs	- Convert ed. spec./site mgr. to state funding - Expand education duties to include all components - Develop volunteer program	- Develop self-guided tour brochure	- Coordinate research and education activities with UNCW and NCA-FF - Develop volunteer program - Develop self-guided tour brochure - Continue acquisition
3	- Request enforcement officer for Zeke's I./Masonboro I. components - Continue to augment research and education - Planning for 4th year	- Initiate monitoring	- Initiate monitoring	- Initiate monitoring	- Initiate monitoring - Complete acquisition
4	- Prepare site plan for conference/ research center in conjunction with UNCW - Develop stronger ties with regional reserves in research, monitoring, and education - Planning for 5th year				
5	- Build research/ conference center				

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Acknowledgements

This management plan has been made possible by the cooperative efforts of many individuals and agencies. We would especially like to thank Gloria Crowell, Rich Shaw, and Roger Schecter for their assistance.

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LIST OF APPENDICES

APPENDIX A

Typology and Biogeography of the NCNERR Components

Typology and Biogeography of the
North Carolina National Estuarine Research Reserve Components

	Masonboro Island	Zeke's Island	Rachel Carson	Currituck Banks
BIOGEOGRAPHY Region/Subregion	Carolinian/ N. Carolinas	Carolinian/ N. Carolinas	Carolinian/ N. Carolinas	Virginian/ Middle Atlantic
TYPOLOGY Ecosystem Types				
Maritime Forest	+	+	-	+
Coastal Shrublands	+	+	+	+
Coastal Grasslands	+	+	+	+
Coastal Marshes	+	+	+	+
Intertidal Beaches	+	+	+	+
Intertidal Mud and Sand Flats	+	+	+	+
Subtidal Softbottoms	+	+	+	+
Subtidal Grassbeds	+	-	+	+
Physical Characteristics				
Basin Type	exposed coast shelt. coast embayment	exposed coast shelt. coast lagoon/t. rv.	shelt. coast tidal river	exposed coast shelt. coast embayment
Basin Stucture	bar-bound	bar-bound c. p. estuary	coastal plain estuary	bar-bound
Inlet Type	permanent	temporary	permanent	temporary
Bottom Type	sand	sand	sand	sand
Circulation	non-stratified	non-stratified	non-stratified	non-stratified
Tides	semi-diurnal	semi-diurnal	semi-diurnal	wind/storm
Freshwater	surface/grd. water	surface/grd. water	surface/grd. water	surface/grd. water
Chemistry				
Salinity	pos. estuary	pos. estuary	pos. estuary	pos. estuary
Salinity Zone	euhaline to polyhaline	euhaline	euhaline	mixohaline/ oligohaline
ph regime	circumneutral	circumneutral	circumneutral	alkaline

+ = present
- = absent

APPENDIX B

State Assignment of Management Responsibility

North Carolina Department of Natural Resources & Community Development

James B. Hunt, Jr., Governor — Joseph W. Grimsley, Secretary

March 14, 1983

MEMORANDUM

TO: KEN STEWART

FROM: JOE GRIMSLEY

RE: MANAGEMENT OF ESTUARINE SANCTUARIES

We are now in the final stages of acquiring title to the bulk of our estuarine sanctuary site at Carrot Island and all of the Zeke's Island site is now in state ownership. We will begin acquisition of the Currituck Banks site within the next few months, with Masonboro Island to follow next year.

As we have to be completing the federally required management plans for each sanctuary site in the near future, it is important that we have clearly established lines of responsibility within the Department for the management of these four estuarine sanctuary sites.

I am assigning lead management responsibility for the sites to the Office of Coastal Management. You will have responsibility for funding acquisition, grant administration, liaison with the State Property Office and the Attorney General's office on acquisition, preparation of management, research and education plans for each site, and oversight of the overall system. I am also directing that you carefully coordinate your activities with all affected divisions within the Department. Since the management and use of the sanctuaries, particularly day to day operational requirements, will likely involve several divisions, (particularly Parks and Recreation at Zeke's Island and perhaps Wildlife Resources Commission staff at Currituck) it is important that we carefully and cooperatively work together on this. Where possible, we must use existing management resources so as to avoid duplication and get the best possible use of limited funding for sanctuary management.

JG/aw

cc: Jim Stevens

APPENDIX C

Departmental Rules for the NCNERR

SUBCHAPTER 7O - NORTH CAROLINA COASTAL RESERVE

SECTION .0100 - GENERAL PROVISIONS

.0101 STATEMENT OF PURPOSE

The principal purposes of the North Carolina Coastal Reserve and supporting programs are to:

(1) preserve coastal ecosystems representative of the various biogeographic regions and typologies in North Carolina and to make them available for continuous future study of the processes, functions, and influences which shape and sustain the coastal ecosystems;

(2) provide new information on coastal ecosystem processes to decisionmakers as a basis for the promotion of sound management of coastal resources;

(3) provide a focal point for educational activities that increase the public awareness and understanding of coastal ecosystems, effects of man on them, and the importance of the coastal systems to the state and the Nation;

(4) accommodate traditional recreational activities, commercial fishing, and other uses of the Reserve as long as they do not disturb the Reserve environment and are compatible with the research and educational activities taking place there.

History Note: Statutory Authority G.S. 113-3; 113-8; 143B-10;
Eff. July 1, 1986;
Amended Eff. April 1, 1988.

.0102 DEFINITIONS AS USED IN THIS SUBCHAPTER

Definitions as used in this Subchapter are:

(1) "Coastal Reserve" means those coastal land and water areas set aside to be maintained in their natural state for research, education and compatible recreation and enjoyment of natural and scenic beauty.

(2) "Estuary" means that part of a river or stream or body of water having unimpaired connection with the open sea, where sea water is measurably diluted with fresh water derived from land drainage.

(3) "Research Reserve" means a group of areas or components, each of which may include all or the key land and water portion of an estuary and adjacent transitional areas and uplands, constituting to the extent feasible a natural unit, set aside as a natural field laboratory to provide long-term opportunities for research, education, and interpretation of the ecological relationships within the area. The Coastal Reserve includes the Estuarine Research Reserve.

(4) "Reserve" means any area designated pursuant to this Subchapter.

History Note: Statutory Authority G.S. 113-3; 113-8; 143B-10;
Eff. July 1, 1986;
Amended Eff. April 1, 1988.

.0103 RESPONSIBILITIES: DUTIES OF THE COASTAL RESERVE PROGRAM

The Coastal Reserve Program of the Division of Coastal Management shall be responsible for managing and protecting the North Carolina Coastal Reserve; for promoting and coordinating research and educational programs at the components while allowing for compatible traditional uses; for maintaining a management plan for the Reserve; for maintaining cooperative agreements with scientific, educational, and resource management agencies and private citizens that will assist in the management of the Reserve; and for providing new information on coastal processes to coastal management decisionmakers.

History Note: Statutory Authority G.S. 113-3; 113-8; 143B-10;
Eff. July 1, 1986;
Amended Eff. April 1, 1988.

.0104 STATE AND LOCAL COASTAL RESERVE ADVISORY COMMITTEES

Advisory committees shall be established for each individual Reserve component. The committees shall advise the Reserve coordinator. Members of the committees shall include researchers, educators,

managers, and citizens that use or are affected by the Reserve. The committees shall be appointed by the Secretary of the Department of Natural Resources and Community Development.

History Note: Statutory Authority G.S. 113-3; 113-8; 143B-10;
Eff. July 1, 1986;
Amended Eff. April 1, 1988.

.0105 RESERVE COMPONENTS

The North Carolina Coastal Reserve includes the following components:
(1) Zeke's Island
(2) Rachel Carson
(3) Currituck Banks
(4) Masonboro Island
(5) Permuda Island
(6) Buxton Woods

The North Carolina National Estuarine Research Reserve includes components (1)-(4).

Detailed boundary maps for each component are maintained and available for inspection at the Division of Coastal Management, 512 North Salisbury Street, Raleigh, North Carolina.

History Note: Statutory Authority G.S. 113-3; 113-8; 143B-10;
Eff. July 1, 1986;
Amended Eff. April 1, 1988.

SECTION .0200 - MANAGEMENT: USE AND PROTECTION OF THE NORTH CAROLINA COASTAL RESERVE

.0201 MANAGEMENT PLAN

The Division of Coastal Management shall prepare a management plan for the Reserve. The management plan shall contain specific policies for research, education, and traditional uses at each component. The Secretary of the Department of Natural Resources and Community Development shall approve the management plan and its revisions. The Division of Coastal Management shall monitor and manage the components and report to the secretary violations of the approved plan and any other situations that may be harmful to the natural resources of the Reserve.

History Note: Statutory Authority G.S. 113-3; 113-8; 143-341; 143-342; 143B-10;
Eff. July 1, 1986;
Amended Eff. April 1, 1988.

.0202 RESERVE USE REQUIREMENTS

The following use requirements shall apply to all of the components of the Reserve:

(1) The essential natural character of the Reserve shall be maintained.

(2) Traditional recreational uses within each component shall be allowed to continue as long as the activities do not disrupt the natural integrity of the Reserve or any research or educational projects. Incompatible traditional uses shall include:

(a) fishing, hunting, or trapping activities not allowed by state regulations;

(b) target shooting;

(c) hydraulic clam dredging within Reserve boundaries;

(d) use of vehicles off designated corridors at components where vehicles are allowed for upland transportation according to the management plan; and

(e) production of noise disruptive to local wildlife and the aesthetic enjoyment of the Reserve as a natural area.

(3) No user shall disturb a research project or research equipment in place at the Reserve.

(4) Camping or any form of habitation, whether on the uplands, wetlands, or waters within Reserve boundaries, shall not be allowed without the written permission of the Division of Coastal Management.

(5) Personal property not authorized by the management agency may not be placed within the boundaries of the Reserve for more than two consecutive days.

(6) Users of the Reserve shall not disturb or remove any live animals, except those allowed by state hunting and fishing regulations as they apply to the Reserve, or vegetation within the Reserve unless such action is part of a research or educational project approved by the management agency.

(7) Persons wishing to engage in scientific research or collection of natural materials within the Reserve shall first secure written permission from the management agency.

(8) No activity shall be allowed which might pollute any stream or body of water in the Reserve. Acts of pollution shall include:

(a) Deposition of solid materials not indigenous to the local coastal ecosystem; and

(b) Discharge of liquids other than uncontaminated estuarine water.

(9) No other acts or uses which are detrimental to the maintenance of the property in its natural condition shall be allowed including, but not limited to, disturbances of the soil, mining, commercial or industrial uses, timber harvesting, ditching and draining, deposition of waste materials.

History Note: Statutory Authority G.S. 143B-10;
Eff. July 1, 1986;
Amended Eff. April 1, 1988.

APPENDIX D

Federal Reserve Regulations

DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

15 CFR Part 921

[Docket No. 70874-0133]

National Estuarine Reserve Research System Program Regulations

AGENCY: Office of Ocean and Coastal Resource Management (OCRM), National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce.

ACTION: Interim final rule.

SUMMARY: The regulations revise existing rules for national estuarine reserves in accordance with the Coastal Zone Management Reauthorization Act of 1985 (title IV, subtitle D, Pub. L. 99-272) and recommendations contained in the U.S. Department of Commerce, Office of Inspector General Report No. F-726-5-010, "Opportunities to Strengthen the Administration of the Estuarine Sanctuary Program." Effective with the signing of Public Law 99-272 on April 7, 1986, the name of the Estuarine Sanctuary Program changed to the National Estuarine Reserve Research System Program; estuarine sanctuary sites are now referred to as national estuarine research reserves. These regulations revise the process for designation of research reserves. Greater emphasis is placed on the use of reserves to address national estuarine research and management issues, and to make maximum use of the System for research purposes through coordination with NOAA and other Federal and state agencies which are sponsoring estuarine research. Additional emphasis is also given to providing financial assistance to states to enhance public awareness and understanding of estuarine areas by providing opportunities for public education and interpretation. The regulations provide new guidance for delineating reserve boundaries and new procedures for arriving at the most effective and least costly approach to acquisition of land. Clarifications in the total amount of financial assistance authorized for each national estuarine reserve, and criteria for withdrawing the designation of a reserve, have also been added.

DATES: *Effective Date:* These interim final regulations are effective July 23, 1990.

Comments: Comments are invited and will be considered if submitted on or before September 21, 1990.

ADDRESSES: Mr. Joseph A. Uravitch, Chief; Marine and Estuarine Management Division; Office of Ocean and Coastal Resource Management, NOS/NOAA; 1825 Connecticut Avenue NW.; Suite 714; Washington, DC 20235, (202) 673-5126.

FOR FURTHER INFORMATION CONTACT: Mr. Joseph A. Uravitch, (202) 673-5126.

SUPPLEMENTARY INFORMATION:

I. Authority

This notice of interim final rulemaking is issued under the authority of section 315(a) of the Coastal Zone Management Act of 1972 as amended, 16 U.S.C. 1461 (the Act). The National Estuarine Reserve Research System has been operating under regulations published June 27, 1984 (49 FR 26510).

II. General Background

On October 28, 1988 (53 FR 43816) NOAA published proposed regulations for continued implementation of the National Estuarine Reserve Research System (NERRS) Program pursuant to section 315 of the Act, 16 U.S.C. 1461. Written comments were accepted until December 30, 1988. These comments have been considered in preparing these final regulations. A summary of the significant changes to the proposed regulations is presented below.

These interim final regulations establish the Program's mission and goals and revise procedures for selecting, designating and operating national estuarine research reserves.

III. Changing the Name and Emphasis of the Program

The 1985 Coastal Zone Management Act and its amendments established the National Estuarine Reserve Research System (System). The System consists of (1) each estuarine sanctuary designated prior to April 7, 1986 which is the date of enactment of the Coastal Zone Management Reauthorization Act of 1985, and (2) each estuarine area designated after the Act. The term estuarine sanctuary no longer appears in regulations; the term research reserve or reserve appears in its place.

The Mission Statement for the System is much the same as for the National Estuarine Sanctuary Program which existed prior to the 1985 amendments. However, the goals for the National Estuarine Reserve Research System stress the use of reserve sites for promotion and coordination of estuarine research on a national level as the highest priority and reason for establishing the System. The protection and management of estuarine areas and resources are clearly intended to support the research mission, not as ends in themselves. Consultation by the Secretary with other Federal and state agencies to promote use of one or more reserves within the System by such agencies when conducting estuarine research is also a clearly defined goal of the System. The regulations also emphasize the use of a reserve's natural resources and ecology to enhance public awareness and understanding of estuarine areas, and to provide suitable opportunities for public education and interpretation. This education goal has been elevated to become one of the essential criteria for designation of a reserve.

IV. Revision of the Procedures for Selecting, Designating and Operating National Estuarine Research Reserves

(A) *Revision of Designation Criteria.* The Coastal Zone Management Reauthorization Act of 1985 established, for the first time, statutory criteria for designating an area as a national estuarine research reserve. An area may be designated by the Secretary of Commerce as a national estuarine research reserve if:

(1) the Governor of the coastal state in which the area is located nominates the area for that designation; and

(2) the Secretary finds that:

(A) the area is a representative estuarine ecosystem that is suitable for long-term research and contributes to the biogeographical and typological balance of the System;

(B) the law of the coastal State provides long-term protection for reserve resources to ensure a stable environment for research;

(C) designation of the area as a reserve will serve to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation; and

(D) the coastal State in which the area is located has complied with the requirements of any regulations issued by the Secretary to implement this section.

Some of these criteria for designation are either new or substantially more specific than those contained in the former regulations. For example, under these regulations the Governor of a coastal state must nominate an estuarine area for designation, and findings are required that the law of the coastal state provides long-term protection for reserve resources to ensure a stable environment for research and that designation of the area will serve to enhance public awareness and understanding of estuarine areas. The criteria in the existing regulations have been revised accordingly.

(B) *Revision of Site Criteria and Procedures.* The criteria for selecting an estuarine area for designation as a national estuarine research reserve have been expanded to provide guidance for determining boundaries for the proposed site. The Office of Inspector General Report No. F-726-5-010 criticized the lack of specific guidelines for setting limits on boundaries around estuarine sanctuaries to ensure that only land essential to the mission of the program be included inside the sanctuary. References in the existing regulations to ensure that the boundaries encompass an adequate portion of the key land and water areas of the natural system to approximate an ecological unit are too vague, particularly since terms are not defined. The proposed regulations define key land and water areas as a "core area" within the reserve which is so vital to the functioning of the estuarine ecosystem that it must be under a level of control sufficient to ensure the long-term viability of the reserve for research on natural processes. The determination of key land and water areas must be based on scientific knowledge of the area. The concept of a "buffer" zone to protect the core area and provide additional protection for estuarine-dependent species has also been defined in the regulations. The buffer zone may include an area necessary for facilities required for research and interpretation, and additionally, to accommodate a shift of the core area as a result of biological, ecological or geomorphological change which reasonably could be expected to occur. States will be required to use scientific criteria to justify the boundaries selected for a proposed site.

The information requirements for NOAA approval of a proposed site under existing regulations were confusing and now have been clarified.

NOAA has recognized the need to conduct studies to develop a basic description of the physical, chemical, and biological characteristics of the site. As a result, states may now be eligible for Federal funding of these studies after NOAA approval of a proposed site.

(C) *Management Plan Development.* Once NOAA approves the proposed site and decides to proceed with designation, the state must develop a draft management plan. The contents of the plan, including the memorandum of understanding (MOU) between NOAA and the state, are specified in the regulations. The acquisition portion of the plan has been greatly expanded to implement recommendations in the Office of Inspector General Report No. F-726-5-010. It is proposed that states be required to justify the use of fee simple acquisition methods and make greater use of non-fee simple methods to conserve expenditure of funds. For each parcel, both in the core area and the buffer zone, states must determine, with appropriate justification (1) the minimum level of control(s) required, (2) the level of existing state control, and (3) the level of additional state control(s) required; states must also examine all reasonable alternatives for attaining the additional level of control required, perform a cost analysis of each, and rank, in order of cost, the alternative methods of acquisition which were considered. The cost-effectiveness assessment must also compare short-term and long-term costs. The state shall give priority consideration to the least costly method(s) of attaining the minimum level of long-term control required, which is sufficient to meet the statutory requirement that "the law of the coastal state provides long-term protection for reserve resources to ensure a stable environment for research. See 16 U.S.C. § 1461(b)(2)(B).

(D) *Financial Assistance Awards for Site Selection and Post Site Selection.* The first of five types of awards under the National Estuarine Reserve Research System is for site selection and post-site selection, which includes preparation of a draft management plan (including MOU) and the collection of information necessary for preparation of the environmental impact statement. The maximum total Federal share of these awards has been raised to $100,000 as described in § 921.10. Of this amount, up to $25,000 may be used to conduct the site selection process as described in § 921.11. After NOAA's approval of a proposed site and decision to proceed with the designation process, the state may expend (1) up to $40,000 of this amount to develop the draft management plan and collect information for preparation of the environmental impact statement; and (2) up to the remainder of available funds to conduct studies to develop a basic description of the physical, chemical, and biological characteristics of the site.

(E) *Financial Assistance Awards for Acquisition, Development, and Initial Management.* The regulations divide eligibility for financial assistance awards for acquisition and development into two phases. In the initial phase, states are working to meet the criteria required for formal research reserve designation, *i.e.*, establishing adequate state control over key land and water areas in accordance with the draft management plan and preparing a final management plan. In this predesignation phase, funds are available for acquiring interest in land, which is the primary purpose of this award, and for minor construction (*e.g.*, nature trails and boat ramps), preparation of architectural and engineering plans and specifications, development of the final management plan, and hiring a reserve manager and other staff as necessary to implement the NOAA approved draft management plan.

The length of time for this initial phase of acquisition and development may be up to three years. After the site receives Federal designation as a national estuarine research reserve, the state may request additional financial assistance to acquire additional property interests (*e.g.*, for the buffer zone), for construction of research and interpretive facilities, and for restorative activities in accordance with the approved final management plan.

The Coastal Zone Management Reauthorization Act of 1985 specifies that the amount of financial assistance provided with respect to the acquisition of land and waters, or interests therein, for any one national estuarine research reserve may not exceed an amount equal to 50 per centum of the costs of the lands, waters, and interests therein or $4,000,000, whichever amount is less.

The amount of Federal financial assistance provided under the regulations for development costs directly associated with major facility construction (*i.e.*, other than land acquisition) for any one national estuarine research reserve must not exceed 50 per centum of the costs of such construction or $1,500,000, whichever amount is less.

(F) *Financial Assistance Awards for Operation and Management.* The amount of Federal financial assistance available to a state to manage the reserve and operate programs consistent with the mission and goals of the National Estuarine Reserve Research System has been raised from $50,000 to $70,000 for each twelve month period. Up to ten per cent of the total award (Federal and state) each year may be used for construction-type activities.

(G) *Financial Assistance for Research.* The Coastal Zone Management Reauthorization Act of 1985 specifically affects the conduct of the System's research program by establishing the requirement for developing Estuarine Research Guidelines for the conduct of research within the system and specifying what these guidelines shall include. The legislation also requires the Secretary of Commerce to require that NOAA, in conducting or supporting estuarine

research, give priority consideration to research that uses reserves in the System, and that NOAA consult with other Federal and state agencies to promote use of one or more reserves by such agencies when conducting estuarine research.

The research guidelines, which are referred to in the regulations, but are not part of them, state that NOAA will provide research grants only for proposals which address research questions and coastal management issues that have highest national priority as determined by NOAA, in consultation with prominent members of the estuarine research community.

One significant addition to the regulations is that research awards are available on a competitive basis to any coastal state or qualified public or private person, thus making it possible for public or private persons, organizations or institutions to compete with coastal states and coastal state universities for NOAA research funding to work in research reserves.

(H) *Financial Assistance for Monitoring.* The Coastal Zone Management Reauthorization Act of 1985 authorizes the award of grants for the purposes of conducting research and monitoring. While objectives in estuarine research and estuarine monitoring are mutually supportive, monitoring is generally designed to provide information over longer time frames and in a different spatial context. Consequently a separate subpart addressing specifically the development and implementation of monitoring projects has been included in the regulations.

(I) *Financial Assistance Awards for Interpretation and Education.* The Coastal Zone Management Reauthorization Act of 1985 authorizes the award of grants for the purposes of conducting educational and interpretive activities. To stimulate the development of innovative or creative interpretive and educational projects and materials which will enhance public awareness and understanding of estuarine areas, the regulations provide for funds to be available on a competitive basis to any coastal State entity. These funds are provided in addition to any other funds available to a coastal state under these regulations.

Categories of potential educational and interpretive projects include:

(1) Design, development and distribution/placement of interpretive or educational media (*i.e.*, the development of tangible items such as exhibits/displays, publications, posters, signs, audio-visuals, computer software, and maps, which have an educational or interpretive purpose, and techniques for making available or locating information concerning reserve resources, activities, or issues);

(2) Development and presentation of curricula, workshops, lectures, seminars, and other structured programs or presentations for on-site facility or field use;

(3) Extension/outreach programs; or

(4) Creative and innovative methods and technologies for implementing interpretive or educational projects.

Interpretive and educational projects may be oriented to one or more research reserves or the entire System. Those projects which would benefit more than one research reserve, and, if practical, the entire National Estuarine Reserve Research System, shall receive priority consideration for funding.

V. Summary of Significant Comments on the Proposed Regulations and NOAA's Responses

NOAA received comments from 16 sources. Reviewers included Federal and state agencies, academic institutions, and the National Estuarine Research Reserve Association. The comments of the National Estuarine Research Reserve Association (NERRA) are a summary of comments submitted to NERRA by most of the managers of the existing and proposed national estuarine research reserves. All comments received are on file at the Marine and Estuarine Management Division, Office of Ocean and Coastal Resource Management and are available at that office for review upon request. Each of the major issues raised by the reviewers has been summarized and NOAA's responses are provided under the relevant subheading in this section.

General:

Three reviewers recommended that more emphasis be placed on developing an information network among research reserves and between research reserves and research and educational groups and institutions. Two of these reviewers noted the absence in the proposed regulations of a paragraph which had addressed this subject in the existing regulations (49 FR 26502, June 27, 1984). The deleted paragraph concerned the development and Federal administration of a research and education information exchange network for the System.

Response: NOAA agrees. The section referring to information exchange between NOAA and the Reserves has been reinstated in § 921.1(h).

Specific:

Section 921.1—Mission, Goals, and General Provisions

Proposed § 921.1(c)—One reviewer suggested the deletion of the first sentence of this provision which states, "National estuarine research reserves shall be open to the public." This reviewer noted that in multiple component reserves some components may not be appropriate for general public access; either because of the purpose or emphasis of management at that site (*e.g.*, research) or due to the limited interest which the managing entity has in the component (*e.g.*, a conservation easement which does not provide for unlimited public access). This reviewer expressed concern that state denial of general public access at such components of a reserve could be challenged on the basis of this provision.

Response: Consistent with the goal of the National Estuarine Reserve Research System to "enhance public awareness and understanding of the estuarine environment and provide suitable opportunities for public education and interpretation," public access should be allowed to the greatest extent possible permitted under State and Federal law within national estuarine research reserves. However, the statement, "National estuarine research reserves shall be open to the public", does not require that all components of a multi-component reserve or the entire area within the boundaries of a single component reserve be open to the general public unconditionally. The last sentence of § 921.1(c) reads, "Consistent with resource protection and research objectives, public access may be restricted to certain areas within a research reserve." Where unconditional public access is not consistent with resource protection and research objectives as stated in the approved management plan (*e.g.*, public access would interfere with reserve research or is likely to diminish the value of reserve resources for future research) it must be limited accordingly. Just as certain areas are identified in reserve management plans as being more or less sensitive to public access impacts in single component reserves, the same is true of components in multi-component reserves. Frequently in management plans for multi-component reserves one or more components will be identified as those for which the relative management emphasis will be public education and interpretation. Similarly, other components are identified as those

which emphasize research and resource protection.

Proposed § 921.1(d) and § 921.1(e)—Seven reviewers commented on these provisions. These comments ranged from one sentence requesting clarification to approximately six pages of comments dedicated to these provisions alone. These comments also ranged from expressing concern or objection regarding the proposed limitations on habitat manipulation to suggesting a more restrictive approach.

One reviewer expressed strong support for an outright prohibition on habitat manipulation, whether for management or research, except for restoration activities where such restoration can avoid long-term adverse impacts. Another reviewer commented extensively on this provision; expressing strong objections to a prohibition on habitat manipulation activities for management purposes. This reviewer stated that the "preservation" of a habitat requires active management involving habitat manipulation.

One reviewer requested clarification of the difference between restoration activities and habitat manipulation for research or management purposes. One reviewer suggested criteria for assessing the degree of "manipulation" a proposed research project may involve. One reviewer requested clarification of the intent of this provision and how it may apply to: (1) actions necessary to protect public health; (2) protection of existing species; and (3) allowance for restorative activities for historical preservation. One reviewer stated that whatever type of habitat manipulation determined allowable by NOAA, day-to-day site management decisions are best made by the professional staff of each reserve.

One reviewer requested clarification of the intent of this provision and of the differences between habitat manipulation for research, habitat manipulation for management, and habitat manipulation for restoration. This same reviewer stressed the primary importance of the ecological and representative integrity of a reserve.

Response: The mission of the National Estuarine Reserve Research System, as stated in § 921.1(a), "is the establishment and management, through Federal-state cooperation, of a national system of estuarine research reserves *representative of the various regions and estuarine types in the United States*" (emphasis added). The first Secretarial finding required for designation of an estuarine area as a national estuarine reserve under section 315(b)(2)(A) of the Act, 16 U.S.C. 1461(b)(2)(A), is that "the area is a *representative estuarine ecosystem that is suitable for long-term research and contributes to the biogeographical and typological balance of the System*" (emphasis added).

The primary intent of § 921.1(d) and § 921.1(e) is to restrict and allow activities involving habitat manipulation to the degree necessary to ensure that reserves are, and continue to be, *representative estuarine ecosystems*. It is this mission and requirement of the statute, that the System goals of § 921.1(b) are meant to support. This mission and requirement of the statute, is the foundation upon which the System is built, the primary basis on which estuarine areas are selected and designated as reserves, and the underlying principle with which all other aspects of reserve development and operation must be consistent. As one reviewer stated, in no case should the ecological or representative integrity of a reserve be comprised.

Habitat manipulation activities conducted for a purpose other than (1) restoring the representative integrity of a reserve or (2) estuarine research, are not consistent with this requirement of the statute or the mission of the System. A reasonable limitation on the nature and extent of habitat manipulation activities conducted as a part of estuarine research is necessary to ensure that the representative integrity of a reserve is protected. Likewise, reasonable exceptions to these limitations on habitat manipulation activities are appropriate for reasons of public health and the protection of other sensitive resources (e.g., endangered/threatened wildlife and significant historical and cultural resources). If habitat manipulation is determined to be necessary in such a case, then such activities should be limited so as not to significantly impact the representative and ecological integrity of the reserve.

Contrary to the assertion of one reviewer, the intent of designating and managing a research reserve is not to "preserve" that particular habitat in a stasis condition. Estuarine ecosystems are naturally dynamic habitats which we have yet to fully understand. NOAA's intent in designating estuarine areas as national estuarine research reserves is to protect the representative character of each individual reserve and thereby establish a national system of estuarine areas representative of the biogeographic regions and estuarine types of the United States. These representative estuarine research reserves then provide opportunities for long-term research, education, and interpretation.

Generally, it is NOAA's belief that, given the less-than-perfect state of knowledge regarding both the functioning of estuarine ecosystems and the effects of natural and anthropogenic change that manipulation should be carefully limited within estuarine research reserves. Outside the context of a carefully planned, and peer reviewed, research or restoration activity, NOAA believes that habitat manipulation for management purposes involves a significant risk to the representative integrity and character of a national estuarine research reserve. As a result, the phrase in the proposed regulations "habitat manipulation for resource management purposes" is intended to mean habitat management for the promotion of a particular species or habitat, or for some purpose other than research involving or restoration of a representative "natural" estuarine ecosystem.

NOAA acknowledges that much research involves some degree of manipulation of the resource(s) and habitat(s) which are the subject of study. In this regard, reserves are not intended to be "control" habitats only, and some degree of habitat manipulation is recognized as an essential aspect of much important estuarine research. However, research activities conducted within a reserve should not involve manipulative activities that, because of their nature or extent, would significantly impair the "natural" representative value (i.e., representative character) of the reserve.

NOAA also acknowledges that restoration efforts may involve extensive habitat manipulation activities. Many estuarine areas have undergone some ecological change as a result of human activities (*e.g.*, hydrological changes, intentional/unintentional species composition changes—introduced and exotic species, etc.). In those areas designated as national estuarine research reserves, such changes may have diminished the representative character and integrity of the site. Where restoration of such degraded areas is determined necessary within this context, such activities must be carefully planned. Much research is necessary to determine the "natural" representative state of an estuarine area (*i.e.*, an estuarine ecosystem minimally affected by human activity or influence). Frequently, such restoration activities provide excellent opportunities for management oriented research.

In response to reviewers requests for clarification and consistent with the response provided above, § 921.1(d) and

§ 921.1(e) have been revised appropriately.

Proposed § 921.1(f)—(1) One reviewer recommended that a formula be established that would "pre-determine the minimum level (percentage) of funds that would be set aside within the total [System] budget for specific categories (Research, Education, Monitoring, Operation/Management, Acquisition, and Development)." In addition, this same reviewer recommended that the allocation of acquisition/development funds should be made on the basis of greatest need measured against predetermined criteria.

Response: NOAA acknowledges that under certain conditions establishment of predetermined percentages for allocating funds among programmatic categories could provide greater predictability in the distribution of Federal funds among reserves. However, the advantages of such an approach depend on a predictability in both the level of annual appropriations as well as major acquisition and development needs for the Reserve system. The uncertainties in appropriation levels and acquisition needs are sufficient enough to make an allocation formula among the six major funding categories (research, education, monitoring, predesignation, acquisition/development, operations) unfeasible.

NOAA attaches primary importance to long term support for the operational needs at each reserve as described in § 921.32 of these regulations, and to fulfilling the research, education and monitoring objectives of the program. unlimited eligibility for these for the awards.

(2) Four reviewers expressed concern or objection to limiting the funding eligibility of any one reserve under any type of award, particularly operation/management awards. These reviewer's comments ranged from general concern to recommending that all funding caps be removed from all types of awards. These reviewers also stated their general concern regarding a perceived lack of long term Federal financial commitment to the System.

Response: Annual appropriations are limited, not unlimited. Funding eligibility limits for each reserve have been established in regulations only where determined appropriate and necessary for the establishment and on-going support of the mission and goals of the System. These regulations establish annual eligibility limits for operations ($70,000 per year, per reserve) and program-life limits for site acquisition ($4 million per reserve). Funding eligibility limits have not been established for research, monitoring, and education grant funds. See subparts F, G, H. Site acquisition limits are statutory. (16 U.S.C. 1461(e)(3)(A))

Funding limits ensure that some funding is available for those types of awards which support most directly the mission and goals of the System (*i.e.*, generally, after designation of a reserve, the competitive awards). As importantly, funding limits are necessary to ensure that available funds are awarded in a relatively fair and proportional manner among national estuarine research reserves. In the absence of such limits, one or a few research reserves could receive the bulk of available funds at the expense of all other reserves. These limits prevent such a substantially disproportionate distribution of limited funding.

At present, some of the existing research reserves in the System are approaching the eligibility limits for acquisition and facility development awards, while most have received less than 50 per cent, and a number less than 25 per cent, of the eligibility limits of these type of awards—a difference between these categories of approximately one to three million dollars. These differences are justifiable on the basis of relative need, reserve size, property values, construction costs, etc. A greater difference in relative allocation of funds between reserves would favor disproportionally some reserves and, as a result, be detrimental to the System as a whole.

Eligibility limits are established for the purposes noted above and not to unreasonably restrict a research reserve from access to available Federal funds. On the basis of NOAA's experience in administering Federal financial assistance for the System and because of comments from many research reserves, the eligibility limit for operation/management awards was raised to a maximum of $70,000 per site per year. In response to comments on the proposed regulations, the eligibility limit for major facility construction has been raised 50 per cent in these final regulations (see response under proposed § 921.31 below).

Proposed § 921.1(g)—One reviewer disagreed with the requirement that land already in a protected status can be included within a reserve only if the managing entity commits to long-term non-manipulative management.

Response: NOAA believes this requirement is necessary consistent with the mission and goals of the System. Essentially this same subject is discussed in the response to comments on proposed § 921.1(d) and § 921.1(e). In order to clarify the intent of this provision, NOAA has revised this sentence to include a reference to the revised § 921.1(d) and § 921.1(e).

Section 921.2—Definitions

Proposed § 921.2(b)—It was noted that the Secretary of Commerce recently delegated authority for matters relating to National Estuarine Research Reserves to the Under Secretary for Oceans and Atmosphere.

Response: NOAA agrees with the recommended modification and has changed references from the Assistant Administrator to the Under Secretary throughout.

Proposed § 921.2(d)—One reviewer recommended a modification to the second sentence of the definition of estuary to include the term measurably diluted with freshwater rather than minimally diluted.

Response: NOAA agrees with the recommended modification the recommended term "minimal" should be the term "measurable". The definition has been changed accordingly.

Proposed § 921.2(e)—Five reviewers stated that some confusion has resulted in the reversed order of the terms research and reserve in the name of the System, National Estuarine Reserve Research System, and the name of each individual reserve, national estuarine research reserve.

Response: NOAA acknowledges that some confusion has arisen as a result of this difference. However, this is statutory language which only can be changed by amending the Act.

Section 921.4—Relationship to Other Provisions of the Coastal Zone Management Act.

It was noted that the existing program regulations describe this section as "Relationship to other provisions of the Coastal Zone Management Act and to the National Marine Sanctuary Program". Text describing the relationship between the Reserve and Sanctuary Programs was omitted. New marine sanctuaries and estuarine research reserves are being designated in close geographic proximity to one another and therefore improved coordination between the two programs is warranted.

Response: NOAA agrees. The revision of the Section heading and text should be adopted and strengthened. The omission of this information from the proposed regulations was an oversight. The Section heading and text have been revised appropriately.

Section 921.10—General

Proposed § 921.10(a)—Five reviewers objected to two or more states which

share a biogeographic region being limited to the development of a single reserve, even if it was a multicomponent reserve with components in each respective state (*e.g.*, Maryland and Virginia in the Chesapeake Bay subregion of the Virginia biogeographic region). These reviewers specifically objected to the eligibility limit on land acquisition funding (see § 921.10(b) and § 921.20) as it applies to any individual reserve, single or multiple component.

Response: NOAA agrees. Some of the System's biogeographic subregions are represented by more than one reserve in more than one state. As a result, in the case of a biogeographic region (see Appendix 1) shared by two or more states, each such state should be eligible for Federal financial assistance to establish a national estuarine research reserve within their respective portion of the shared biogeographic region. Section 921.10(a) has been amended to reflect this revision. Because of this revision, the phrase which begins "In the case of a multicomponent national estuarine * * *" in § 921.10(a), § 921.31, and § 921.32(c) is no longer necessary and has been deleted.

Proposed § 921.10(b)—Two reviewers commented that NOAA should consider a higher eligibility limit or relative greater funding for awards to multi-component reserves than to single component reserves.

Response: NOAA disagrees. Funding for the System is limited. A State elects to establish a multi-component reserve or expand a single component reserve with full knowledge of the identical eligibility limits on any individual reserve, whether single or multiple component. Establishing separate funding eligibility limits for, or disproportionally funding, multicomponent reserves would be likely to have a significant adverse impact on single component reserves and, as a result, the System as a whole. Further, acquisition and development funds are limited by the Act.

Section 921.11—Site Selection

Proposed § 921.11(c)(2)—One reviewer recommended that the last sentence be revised to eliminate reference to "a natural system."

Response: NOAA agrees that a minor revision is necessary to clarify the intent of this sentence. The sentence has been revised in a manner consistent with corresponding clarifying revisions to § 921.1(d) and § 921.3(e).

Proposed § 921.11(c)(3)—Three reviewers commented on the concept of "core" and "buffer" areas or zones. Two of these reviewers recommended deleting the concept of a buffer zone. The remaining reviewer recommended extensive revisions to the subsection to provide guidance on where habitat manipulation would be allowed.

Response: After careful review of this subsection, NOAA does not believe that the buffer zone concept should be deleted or that substantive revisions are appropriate. The basic approach presented is sound. A critical concept and distinction between the two areas which may have been overlooked is that key land and water areas ("core") and a buffer zone will likely require significantly different levels of control (see § 921.13 (a)(7)). In addition to the basic principles established in the regulations, NOAA has developed more detailed boundary guidance which is available to states attempting to conduct the difficult process of boundary delineation of a proposed site.

Proposed § 921.11(c)(5)—One reviewer recommended amending this site selection principle to include "the support of ongoing or planned management activities in nearby estuaries, including those in the National Estuary Program."

Response: NOAA considers § 921.11(c)(5) to encompass this concern in that the State is required to demonstrate how the proposed site is consistent with existing and potential land and water uses. Both the designation by NOAA of a reserve under the Act and management plans developed through the National Estuary Program of the U.S. EPA are submitted to the States for a determination of consistency under section 307(c)(1) of the Coastal Zone Management Act of 1972, as amended. NOAA views this mechanism as an effective means for ensuring that Reserves support and advance the relevant coastal and estuarine management objectives including those of the National Estuary Program. Therefore, § 921.11(c)(5) has been amended to make more specific our intent that the site support estuarine management objectives.

Section 921.12—Post Site Selection

Proposed § 921.12(a)—Two reviewers recommended a separate type of award for monitoring that would provide long-term support for these activities.

Response: NOAA agrees. A new subpart G—Monitoring has been added to the regulations (subparts G and H of the proposed regulations being relettered as subparts H and I, respectively; and the section numbers being renumbered accordingly). Initial funding for basic characterization of the physical, geological, chemical, and biological characteristics of the site will continue to be provided under § 921.12—Post site selection. In addition, however, under the new subpart G, NOAA may provide financial assistance on a competitive basis for each phase of a monitoring program. These grant awards will be separate from those provided for estuarine research under subpart F.

Section 921.13—Management Plan and Environmental Impact Statement Development

Proposed § 921.13(a)(7)—Three reviewers provided comment on the acquisition plan guidance of this subsection. Two reviewers requested additional guidance on what constitutes "adequate state control" and commented that the requirement to assess the cost effectiveness of control alternatives is excessively burdensome. The remaining reviewer stated that having four million dollars in funds available for land acquisition is not consistent with the requirement to conduct an assessment of the cost effectiveness of acquisition alternatives.

Response: What constitutes "adequate State control" is dependent on site-specific circumstances and requirements. The most efficient use of available acquisition funds can only be ensured through the identification of reasonable control, or acquisition alternatives and an assessment of their relative cost and effectiveness. This does not necessarily mean that the least costly option in dollars is the alternative that must be selected. It does mean, however, that all reasonable control alternatives should be thoroughly examined and their relative costs identified. The development of an acquisition plan is an allowable cost (Federal or matching share). Four million dollars is not "available," but is the eligibility limit for land acquisition funds for any one reserve. Regardless of the amount of funding available, for land acquisition, a thorough assessment of acquisition alternatives and their cost effectiveness is necessary to ensure responsible and efficient use of Federal grant funds. At a minimum the degree of state control must provide adequate long term protection to ensure for reserve resources a stable environment for research.

Proposed § 921.13(a)(11)—One reviewer stated that NOAA's responsibility to make a consistency determination should be made clear early in the regulations.

Response: NOAA agrees. A reference to § 921.30(b) has been added to this subsection to clarify NOAA's consistency determination responsibilities early in preparation of the management plan.

Section 921.20—General

Proposed § 921.20—Two reviewers requested a clarifying revision to the last sentence of this subsection; the addition of the phrase "to a coastal state."

Response: NOAA agrees and the section has been revised accordingly.

Section 921.21(e)—Initial Acquisition and Development Awards

Two reviewers provided comment on this section. The first reviewer requested clarification that the provision regarding de-designation of a site applies only to properties acquired with Federal funds. The second reviewer stated that the provision to compensate the Federal government for its share of the acquisition cost in the event of de-designation, may be contrary to overall coastal protection objectives because the state may have to sell the property to development interests in order to fully compensate the Federal interest.

Response: Regarding the first comment, NOAA does not believe additional clarification is necessary. This subsection states specifically that these provisions apply to "any real property acquired in whole or part with Federal funds * * *." The second commenter acknowledges correctly that these requirements are designed to accomplish the goals of the National Estuarine Research Reserve System and that this provision helps ensure that reserves maintain the standards established for the system and, if they do not, that a percentage of the fair market value is available to other reserves. It should also be noted that these provisions are not new and have been in place since the inception of the Reserve program through grant directives contained in OMB Circular A-102. The provisions in the Reserve regulations are taken directly from the A-102 Circular and apply to all real property acquired in whole or part with Federal funds. It should also be noted that there are other alternatives aside from sale of the property. In the event of de-designation the state may retain title or transfer title to the Federal government. In these instances it is likely that the resources of the reserve could continue to be protected. While none of these alternatives are inexpensive they do, as noted by the commenter, help ensure that the site continues to be managed and maintained in conformance with research reserve goals and objectives.

Section 921.30—Designation of National Estuarine Research Reserves

Proposed § 921.30(a)—Two reviewers provided comments on the designation criteria listed in this subsection. One reviewer recommended a change in (a)(4) at variance with the Act. The other reviewer recommended an addition to the designation findings to include a requirement that, in the case of a State which contains, in whole or part, a national estuary program convened pursuant to section 320 of the Clean Water Act, suitable consideration has been given to integration of research and public education programs of the estuarine research reserve and the national estuary program. It has also been noted that the final management plan as the governing document for subsequent operations and management of the reserve should contain the signed designation findings. Subpart (a) of this section should also be revised to show that the Under Secretary is responsible for designation of reserves in accordance with the delegation of that authority from the Secretary of Commerce.

Response: The terms for designation of a National Estuarine Research Reserve are set forth in the statute. NOAA agrees that research and education programs should be integrated between the Environmental Protection Agency's National Estuary Program and NOAA's National Estuarine Reserve Research System. This effort has already been initiated through a memorandum of understanding between the programs at the National level and is being pursued at the local level, where appropriate. Therefore, NOAA believes it does not require restatement in the program regulations. However, NOAA agrees that the management plan should contain the findings of designation and the regulations should show that the Under Secretary is responsible for designation. The regulations have been revised accordingly.

Section 921.31—Supplemental Acquisition and Development Awards

Proposed § 921.31—Four reviewers expressed concerns that the eligibility limit of $1,000,000 in Federal financial assistance for facility construction may not be adequate to meet anticipated long term needs and should be increased or eliminated.

Response: NOAA agrees. The eligibility limit for facility construction has been increased 50 percent to $1,500,000.

Section 921.32—Operation and Management: Implementation of the Management Plan

Proposed § 921.32(a-d)—Seven reviewers objected to the eligibility limit on operations and management awards. They noted that the statute contains no provision for withdrawal of Federal support for continued operation of the reserves. The termination of Federal support for the individual sites is viewed as a lack of Federal commitment to the long-term maintenance of a representative system of estuarine research and education sites.

Response: The Reserve Program was designed and continues to be a State-Federal partnership. The key to this partnership is the requirement that NOAA share with the State reserve program the financial needs associated with site designation, land acquisition, research, education and operations.

As discussed previously, appropriate eligibility limits ensure that funding is available for competitive research education and monitoring awards. If, as some reviewers suggested, NOAA removed the annual monetary ceiling for operations and other awards, an inequitable and disproportionate distribution of the limited funds for the program could result. Annual operational eligibility limits in addition to ensuring the availability of funds for competitive projects provide a stability and even distribution among designated and developing reserves. Consequently NOAA is retaining the eligibility limit of $70,000 for operations and management per site per year.

NOAA concurs with the reviewers' assertion that the statute does not direct the Federal Government to abandon its support and financial commitment to reserve operations at the conclusion of a prescribed period of time or when an arbitrary cumulative funding ceiling for Federal support of operations has been met. By imposing a fixed duration for Federal support of Reserve operations NOAA may undermine its ability to participate effectively with the Reserve system to address coastal and estuarine management issues of national significance. The previously proposed three year support per position allocated through a $420,000 operations ceiling also established a complex and burdensome administrative process which is further complicated when allocated among Reserves which have already received operations support, and the newly designated sites which have yet to receive such support. To simplify, streamline and improve NOAA's effectiveness in support of

Reserve operations, the three year restriction and other references to cessation of Federal support for operations and management at the reserves have been removed throughout the regulations.

Section 921.33—Boundary Changes, Amendments to the Management Plan, and Addition of Multiple-site Components

Proposed § 921.33(a)—One reviewer recommended deletion or substantial modification of this subsection to recognize the State's right and ability to appropriately plan and legislate its legal charge—the research reserve. In summary, this reviewer objected to NOAA's approval authority/requirement for activities discussed in this subsection. The reviewer suggested that it should be sufficient if the State provides NOAA an opportunity for review and comment on proposed changes.

Response: NOAA disagrees. NOAA is responsible for Federal oversight of the System and each designated research reserve. As long as a State wishes for a reserve to remain a part of the System and to retain Federal designation, NOAA will continue to require Federal approval of changes in that research reserve's boundaries and management.

General

Proposed § 921.40, § 921.41, and § 921.42—Several reviewers recommended clarification of the criteria to be used during performance evaluations. Performance criteria should clearly state what constitutes adequate or inadequate performance. One commenter provided a list of items suggested for inclusion in an evaluation. Three reviewers made suggestions on the composition of the evaluation team recommending non-Federal and private individual participation while another commenter suggested the regulations indicate criteria for choosing the members of the evaluation team. Finally a recommendation was offered that the evaluation stress integration of the Reserve program with other state coastal/research programs and that the regulations provide for other dispute resolution mechanisms short of litigation.

Response: The periodic evaluation of a national estuarine research reserve is central to NOAA's ability to ensure that reserve operation and management is being conducted in a manner fully consistent with program goals and objectives as defined in section 315 of the Act, 16 U.S.C. 1461, and its implementing regulations. The criteria for an evaluation corresponds directly with the program goals as specified in § 921.1 of these regulations. The five goals described in this section are nearly identical to the criteria proposed by one commenter. The commenter added cost-effectiveness in using Federal funds as an additional criteria which, while not directly stated as a program goal in the regulations is implicit in any evaluation of efficient management of the total reserve program.

It is not feasible to establish a checklist for any evaluation to predetermine what constitutes adequate versus inadequate performance. Each reserve has very unique administrative structures, environmental resources, and corresponding management needs. NOAA views the evaluation process to be a highly collaborative effort with the State such that the evaluation can be used to focus on particular and specific problem areas. It is not appropriate to attempt to construct a litmus test for inadequate or adequate performance which could reasonably anticipate the substantial variety of issues that are addressed in the evaluation process. NOAA would be justifiably criticized for applying an artificial measure against unique and site-specific circumstances.

NOAA agrees with the comments made regarding participation of other officials in the evaluation process. Such officials provide recommendations to NOAA on specific issues in the evaluation. To ensure that Reserve personnel are directly involved in selection of the evaluation team, § 921.40(c) has been revised to indicate that NOAA will consult with and request recommendations from the Reserve on the appropriate non-NOAA participants prior to the evaluation.

The recommendation that the evaluation examine coordination between the Reserve program and other coastal research efforts is fully consistent with NOAA objectives for the evaluation process and is currently considered under Reserve program criteria to "promote Federal, State, public and private use of one or more reserves within the System when such entities conduct estuarine research." NOAA however, does not agree with the comment that other dispute resolution mechanisms should be devised short of litigation in the event of an unfavorable evaluation that may lead to withdrawal of designation. The provisions contained in both § 921.41 and § 921.42 provide a lengthy and elaborate process for addressing major differences between the NOAA and the Reserve relative to suspension of financial assistance or withdrawal of designation. This process is expressly designed to avoid litigation on these issues. Therefore, NOAA does not agree that additional mechanisms for dispute resolution are warranted.

Proposed § 921.40(e)—Two reviewers recommended a ninety-day requirement for State submittal of an annual report instead of sixty days.

Response: NOAA agrees. Section 921.40(e) has been revised accordingly. NOAA also notes that this section indicates that inadequate annual reports will trigger a full scale performance evaluation. This provision is no longer needed since § 921.32 has been changed to provide long term eligibility for operations support. Evaluations consequently will be conducted generally at least every 3 years. The statement has therefore been deleted.

Section 921.50—General

Proposed § 921.50(a)—Four reviewers commented on this subsection. Three reviewers recommended that research funded under this subpart be allowed in an area larger than the boundaries of the research reserve. One of these reviewers also recommended that the managing entity of the reserve approve all research prior to NOAA funding. One reviewer expressed concern that funding eligibility is tied to NOAA approval of a final management plan.

Response: NOAA agrees that greater flexibility should be provided for the area in which federally funded research under this subpart may be conducted. The regulations have been revised to allow research activity in the immediate watershed of the reserve while still requiring the majority of funded activities to be conducted within the boundaries. NOAA also agrees that the managing entity of the reserve should directly indicate approval or disapproval of proposed research project. Currently each reserve is requested to review and assign priority to research projects proposed for the reserve. If a reserve does not approve of a particular project that information should be expressed directly to NOAA.

NOAA agrees that its review and approval of state submitted final management plans should be as expeditious as possible. However, consistent with NOAA's responsibility to ensure that reserve management is conducted in accordance with the mission and goals of the System, the need for an approved final management plan to qualify for NOAA funded research remains.

Section 921.51—Estuarine Research Guidelines

Proposed § 921.51—Five reviewers recommended that NOAA provide, at

minimum, a more detailed and specific description of the Estuarine Research Guidelines in the regulations. One reviewer objected to NOAA's role in establishing the research priorities for funding under this subpart.

Response: NOAA disagrees. Section 315 of the Act requires NOAA to develop guidelines, not regulations, for the conduct of research within the System. A basic description of these guidelines is provided in both the Act and the regulations. Including the guidelines themselves, or a more detailed and specific description of these guidelines, in the regulations would severely limit flexibility in their implementation. NOAA publishes the guidelines annually in the Federal Register and intends to continue to improve these guidelines within the relatively comprehensive standards of the Act. NOAA develops general research priorities on an annual basis in consultation with the estuarine research and resource management community. The agency foresees no advantage to including more specificity or detail than necessary in the Program regulations. The financial support provided under this subpart for Research is administered by NOAA. As a result, NOAA, in consultation with prominent members of the estuarine research community, will continue to determine research priorities for this funding.

Subpart G—Interpretation and Education

Section 921.60—General

Proposed § 921.60(a)—Two reviewers objected to the requirement that interpretive and education projects be conducted within the research reserve.

Response: NOAA did not intend to limit funding under this Subpart to activities conducted entirely within the boundaries of a research reserve, and has revised the statement to clarify the intent.

Proposed § 921.60(b)—One reviewer suggested NOAA require that all applications for interpretation and education awards be approved by the state.

Response: NOAA agrees that applications under this subpart should have the support of the state managing entity. The regulations have been revised accordingly.

Section 921.71—Allowable Costs

Proposed § 921.71(e)(2)—Two reviewers objected to a one year time limit prior to pre-acquisition being imposed on the allowability for state match of state lands already in a fully-protected status. The commenters noted that properties included within NERR boundaries, particularly the core area, will be subject to restricted uses, and these uses will be subject to NOAA approval (*e.g.*, research, construction, education). Since these properties add real value to the NERR System, but have diminished use for other purposes, they should be allowable as state match. These reviewers therefore recommended elimination of a one-year time limit.

Response: This provision has been adopted in the past to ensure that lands included within the Reserve system are acquired consistent with the purposes and objectives of the Reserve system and, as required by section 315(e)(3)(A) of the Act, to assure that the state has matched the amount of financial assistance provided by the Federal Government for the acquisition of land for a reserve. However, NOAA agrees that the imposition of a one-year time limit may not be the most effective or appropriate method to achieve this purpose. We have therefore eliminated this provision from the regulations a l instead allow inclusion of land and submerged lands already in the states' possession as state match irrespective of the date obtained by the state. However, calculation of the amount eligible as match for existing state owned lands will be made by an independent appraiser who will consider the value for match purposes of these lands by calculating the value of benefits foregone by the state, in the use of the land, as a result of new restrictions that may be imposed by Reserve designation.

Proposed § 921.71(e)(4)—One reviewer recommended elimination or simplification of the matching share criteria for research awards.

Response: The matching share requirement cannot be eliminated because it is required by statute. However, the matching share criteria has been simplified to be consistent with the provisions to § 921.50(a) of subpart F.

VI. Other Actions Associated With the Rulemaking

(A) *Classification Under Executive Order 12291.* NOAA has concluded that these regulations are not major because they will not result in:

(1) An annual effect on the economy of $100 million or more;

(2) A major increase in costs or prices for consumers; individual industries; Federal, state, or local government agencies; or geographic regions; or

(3) Significant adverse effects on competition, employment, investment, productivity, innovation or the ability of United States based enterprises to compete with foreign based enterprises in domestic or export markets.

These rules amend existing procedures for identifying, designating, and managing national estuarine research reserves in accordance with the Coastal Zone Management Reauthorization Act of 1985. They will not result in any direct economic or environmental effects nor will they lead to any major indirect economic or environmental impacts.

(B) *Regulatory Flexibility Act Analysis.* A Regulatory Flexibility Analysis is not required for this rulemaking. The regulations set forth procedures for identifying and designating national estuarine research reserves, and managing sites once designated. These rules do not directly affect "small government jurisdictions" as defined by Public Law 96-354, the Regulatory Flexibility Act, and the rules will have no effect on small businesses.

(C) *Paperwork Reduction Act of 1980.* This rule contains collection of information requirements subject to Public Law 96-511, the Paperwork Reduction Act (PRA), which have already been approved by the Office of Management and Budget (approval number 0648-0121). Public reporting burden for the collections of information contained in this rule is estimated to average 2,012 hours per response for management plans and related documentation, 1.25 hours for performance reports, and 15 hours for annual reports and work plans. These estimates include the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of these collections of information, including suggestions for reducing this burden, to Richard Roberts, Room 1235, Department of Commerce, Washington, DC 20230, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503. ATTN: Desk Officer for NOAA.

(D) *Executive Order 12612.* These interim final rules do not contain policies which have sufficient Federalism implications to warrant preparation of a Federalism Assessment pursuant to Executive Order 12612. However, the provisions of the rules setting forth what a state must do or agree to do in order to qualify for the various types of Federal financial assistance available under the rules have been reviewed to ensure that the

rules grant the states the maximum administrative discretion possible in the administration of the National Estuarine Reserve Research System policies embodied in the qualification requirements. In formulating those policies, the NOAA worked with affected states to develop their own policies with respect to the use of National Estuarine Research Reserves. To the maximum extent possible consistent with the NOAA's responsibility to ensure that the objectives of the National Estuarine Reserve Research System provisions of the Coastal Zone Management Act are obtained, the rules refrain from establishing uniform national standards. Extensive consultations with state officials and organizations have been held regarding the financial assistance qualifications imposed. Details regarding awards of financial assistance have been discussed above under the heading "REVISION OF THE PROCEDURES FOR SELECTING, DESIGNATING AND OPERATING NATIONAL ESTUARINE RESEARCH RESERVES" and are not repeated here. Likewise comments from the states regarding qualifications and responses and changes to the regulations regarding same were set forth under the heading SUMMARY OF SIGNIFICANT COMMENTS ON THE PROPOSED REGULATIONS AND NOAA'S RESPONSES. It should be noted that some of the states commented in opposition to conditions or language required by law or by Office of Management and Budget Circular A-102. NOAA does not have the discretion to change such language or conditions.

(E) *National Environmental Policy Act.* NOAA has concluded that publication of these interim final rules does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement is not required.

(F) *Administrative Procedure Act.* These interim final regulations are effective July 23, 1990. To the extent that these regulations relate to grants and cooperative agreements the requirements of the Administrative Procedure Act 5 U.S.C. 553 do not apply. To the extent that any substantive provision does not involve grants or cooperative agreements no useful purpose would be served by delaying the effective date for 30 days. No rights of the participants in this Federal program will be adversely effected by immediate implementation. To the contrary state recipients of financial assistance through this program have submitted program applications that anticipate immediate implementation of these regulations. Public comments on these interim final regulations are invited and will be considered if submitted on or before September 21, 1990.

List of Subjects in 15 CFR Part 921

Administrative practice and procedure, Coastal zone, Environmental impact statements, Grant programs—Natural resources, Reporting and recordkeeping requirements, Research.

(Federal Domestic Assistance Catalog Number 11.420, National Estuarine Reserve Research System)

Dated: July 10, 1990.

Virginia K. Tippie,

Assistant Administrator for Ocean Services and Coastal Zone Management.

For the reasons set forth in the preamble, 15 CFR part 921 is revised to read as follows:

PART 921—NATIONAL ESTUARINE RESERVE RESEARCH SYSTEM REGULATIONS

Sec.

Authority: Sec. 315, Public Law 92-583, as amended; 86 Stat. 1280 (16 U.S.C. 1461).

Subpart A—General

§ 921.1 Mission, goals and general provisions.

(a) The mission of the National Estuarine Reserve Research System is the establishment and management, through Federal-State cooperation, of a national system of estuarine research reserves representative of the various regions and estuarine types in the United States. Estuarine research reserves are established to provide opportunities for long-term research, education, and interpretation.

(b) The goals of the program for carrying out this mission are to:

(1) Ensure a stable environment for research through long-term protection of estuarine reserve resources;

(2) Address coastal management issues identified as significant through coordinated estuarine research within the System;

(3) Enhance public awareness and understanding of the estuarine environment and provide suitable opportunities for public education and interpretation;

(4) Promote Federal, state, public and private use of one or more reserves within the System when such entities conduct estuarine research; and

(5) Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

(c) National estuarine research reserves shall be open to the public to

the extent permitted under State and Federal law. Multiple uses are allowed to the degree compatible with the research reserve's overall purpose as provided in the management plan (see § 921.13) and consistent with paragraphs (a) and (b) of this section. Use levels are set by the individual state and analyzed in the management plan. The research reserve management plan shall describe the uses and establish priorities among these uses. The plan shall identify uses requiring a state permit, as well as areas where uses are encouraged or prohibited. Consistent with resource protection and research objectives, public access may be restricted to certain areas within a research reserve.

(d) Habitat manipulation for research purposes is allowed consistent with the following limitations. Manipulative research activities must be specified in the management plan, be consistent with the mission and goals of the program (see paragraphs (a) and (b) of this section) and the goals and objectives of the affected research reserve, and be limited in nature and extent to the minimum manipulative activity necessary to accomplish the stated research objective. Manipulative research activities with a significant or long-term impact on reserve resources require the prior approval of the state and the National Oceanic and Atmospheric Administration (NOAA). Manipulative research activities which can reasonably be expected to have a significant adverse impact on the estuarine resources and habitat of a reserve, such that the activities themselves or their resulting short- and long-term consequences compromise the representative character and integrity of a reserve, are not allowed. Habitat manipulation for resource management purposes is not permitted within national estuarine research reserves, except as allowed for restoration activities consistent with paragraph (e) of this section. NOAA may allow an exception to this prohibition if manipulative activity is necessary for the protection of public health or the preservation of other sensitive resources which have been listed or are eligible for protection under relevant Federal or state authority (*e.g.*, threatened/endangered species or significant historical or cultural resources). If habitat manipulation is determined to be necessary for the protection of public health or the preservation of sensitive resources, then these activities shall be specified in the Reserve Management Plan and limited to the reasonable alternative which has the least adverse and shortest term impact on the representative and ecological integrity of the reserve.

(e) Under the Act an area may be designated as an estuarine reserve only if the area is a representative estuarine ecosystem that is suitable for long-term research. Many estuarine areas have undergone some ecological change as a result of human activities (*e.g.*, hydrological changes, intentional/unintentional species composition changes—introduced and exotic species). In those areas proposed or designated as national estuarine research reserves, such changes may have diminished the representative character and integrity of the site. Although restoration of degraded areas is not a primary purpose of the System, such activities may be permitted to improve the representative character and integrity of a reserve. Restoration activities must be carefully planned and approved by NOAA through the Reserve Management Plan. Historical research may be necessary to determine the "natural" representative state of an estuarine area (*i.e.*, an estuarine ecosystem minimally affected by human activity or influence). Frequently, restoration of a degraded estuarine area will provide an excellent opportunity for management oriented research.

(f) NOAA may provide financial assistance to coastal states, not to exceed 50 percent of all actual costs or $4 million whichever amount is less, to assist in the acquisition of land and waters, or interests therein. NOAA may provide financial assistance to coastal states not to exceed 50 percent of all actual costs for the management and operation of, and the conduct of educational or interpretive activities concerning, national estuarine research reserves (see subpart I of this part). NOAA may provide financial assistance to any coastal state or public or private person, not to exceed 50 percent of all actual costs, to support research and monitoring within a national estuarine research reserve. Five types of awards are available under the National Estuarine Reserve Research System Program. The predesignation awards are for site selection, draft management plan preparation and conduct of basic characterization studies. Acquisition and development awards are intended primarily for acquisition of interests in land and construction. The operation and management award provides funds to assist in implementing the research, educational, and administrative programs detailed in the research reserve management plan and is reflective of the joint State-Federal partnership in the preservation and protection of estuarine resources. The research and monitoring awards provide funds to conduct estuarine research and monitoring within the System. The educational and interpretive award provides funds to conduct estuarine educational and interpretive activities within the System.

(g) Lands already in protected status managed by other Federal agencies, state or local governments, or private organizations can be included within national estuarine research reserves only if the managing entity commits to long-term non-manipulative management consistent with paragraphs (d) and (e) of this section in the reserve management plan. Federal lands already in protected status cannot comprise the key land and water areas of a research reserve (see § 921.11(c)(3)).

(h) To assist the states in carrying out the Program's goals in an effective manner, the National Oceanic and Atmospheric Administration (NOAA) will coordinate a research and education information exchange throughout the national estuarine research reserve system. As part of this role, NOAA will ensure that information and ideas from one reserve are made available to others in the system. The network will enable reserves to exchange information and research data with each other, with universities engaged in estuarine research, and with Federal and state agencies. NOAA's objective is a system-wide program of research and monitoring capable of addressing the management issues that affect long-term productivity of our Nation's estuaries.

§ 921.2 Definitions.

(a) *Act* means the Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 *et seq.* Section 315 of the Act, 16 U.S.C. 1461, establishes the National Estuarine Reserve Research System.

(b) *Under Secretary* means the Under Secretary for Oceans and Atmosphere, U.S. Department of Commerce, or designee.

(c) *Coastal state* means a state of the United States, in or bordering on, the Atlantic, Pacific, or Arctic Ocean, the Gulf of Mexico, Long Island Sound, or one or more of the Great Lakes. For the purposes of these regulations the term also includes Puerto Rico, the Virgin Islands, Guam, the Commonwealth of the Northern Marianas Islands, the Trust Territories of the Pacific Islands, and American Samoa (see 16 U.S.C. 1453(4)).

(d) *Estuary* means that part of a river or stream or other body of water having

unimpaired connection with the open sea, where the sea water is measurably diluted with fresh water derived from land drainage. The term also includes estuary-type areas with measurable freshwater influence and having unimpaired connections with the open sea, and estuary-type areas of the Great Lakes and their connecting waters. See 16 U.S.C. 1453(7)).

(e) *National Estuarine Research Reserve* means an area that is a representative estuarine ecosystem suitable for long-term research, which may include all or the key land and water portion of an estuary, and adjacent transitional areas and uplands constituting to the extent feasible a natural unit, and which is set aside as a natural field laboratory to provide long-term opportunities for research, education, and interpretation on the ecological relationships within the area (see 16 U.S.C. 1453(8)) and meets the requirements of 16 U.S.C. 1461(b). This includes those areas designated as national estuarine sanctuaries under section 315 of the Act prior to the date of the enactment of the Coastal Zone Management Reauthorization Act of 1985 and each area subsequently designated as a national estuarine research reserve.

§ 921.3 National Estuarine Reserve Research System biogeographic classification scheme and estuarine typologies.

(a) National estuarine research reserves are chosen to reflect regional differences and to include a variety of ecosystem types. A biogeographic classification scheme based on regional variations in the nation's coastal zone has been developed. The biogeographic classification scheme is used to ensure that the National Estuarine Reserve Research System includes at least one site from each region. The estuarine typology system is utilized to ensure that sites in the System reflect the wide range of estuarine types within the United States.

(b) The biogeographic classification scheme, presented in Appendix I to this part, contains 27 regions. Figure 2 graphically depicts the biogeographic regions of the United States.

(c) The typology system is presented in Appendix II to this part.

§ 921.4 Relationship to other provisions of the Coastal Zone Management Act.

(a) The National Estuarine Reserve Research System is intended to provide information to state agencies and other entities involved in addressing coastal management issues. Any coastal state, including those that do not have approved coastal zone management programs under section 306 of the Act, is eligible for an award under the National Estuarine Reserve Research System (see § 921.2(c)).

(b) For purposes of consistency review by states with a federally approved coastal zone management program, the designation of a national estuarine research reserve is deemed to be a Federal activity, which, if directly affecting the state's coastal zone, must be undertaken in a manner consistent to the maximum extent practicable with the approved state coastal zone program as provided by section 1456(c)(1) of the Act, and implementing regulations at 15 CFR part 930, subpart C. In accordance with section 1456(c)(1) of the Act and the applicable regulations NOAA will be responsible for certifying that designation of the reserve is consistent with the State approved coastal zone management program. The State must concur with or object to the certification. It is recommended that the lead State agency for reserve designation consult at the earliest practicable time, with the appropriate State officials concerning the consistency of the proposed national estuarine research reserve.

(c) The National Estuarine Research Reserve Program will be administered in close coordination with the National Marine Sanctuary Program (Title III of the Marine Protection Research and Sanctuaries Act, as amended, 16 U.S.C. 1431–1445), also administered by NOAA. Title III authorizes the Secretary of Commerce to designate discrete areas of the marine environment as marine sanctuaries to protect or restore such areas for their conservation, recreational, ecological, historical, research, educational or esthetic values. National marine sanctuaries and estuarine research reserves may not overlap, though they may be adjacent.

Subpart B—Site Selection, Post Site Selection and Management Plan Development

§ 921.10 General.

(a) A state may apply for Federal financial assistance for the purpose of site selection, preparation of documents specified in § 921.13 (draft management plan and environmental impact statement (EIS)) and the conduct of research necessary to complete basic characterization studies. The total Federal share of this group of predesignation awards may not exceed $100,000, of which up to $25,000 may be used for site selection as described in § 921.11. Federal financial assistance for preacquisition activities under § 921.11 and § 921.12 is subject to the total $4 million for which each reserve is eligible for land acquisition. In the case of a biogeographic region (see Appendix I to this part) shared by two or more states, each state is eligible for Federal financial assistance to establish a national estuarine research reserve within their respective portion of the shared biogeographic region. Financial assistance application procedures are specified in subpart I of this part.

(b) In developing a research reserve program, a state may choose to develop a multiple-site research reserve reflecting a diversity of habitats in a single biogeographic region. A multiple-site research reserve also allows the state to develop complementary research and educational programs within the individual components of its multi-site research reserve. Multiple-site research reserves are treated as one reserve in terms of financial assistance and development of an overall management framework and plan. Each individual site of a proposed multiple-site research reserve shall be evaluated both separately under § 921.11(c) and collectively as part of the site selection process. A state may propose to establish a multiple-site research reserve at the time of the initial site selection, or at any point in the development or operation of the estuarine research reserve, even after Federal funding for the single site research reserve has expired. If the state decides to develop a multiple-site national estuarine research reserve after the initial acquisition and development award is made for a single site, the proposal is subject to the requirements set forth in § 921.33(b). However, a state may not propose to add one or more sites to an already designated research reserve if the operation and management of such research reserve has been found deficient and uncorrected or the research conducted is not consistent with the Estuarine Research Guidelines in accordance with the provisions of subparts E and F of this part. In addition, Federal funds acquisition of a multiple-site research reserve remains limited to $4,000,000 (see § 921.20). The funding for operation of a multiple-site research reserve is limited to $70,000 per year (see § 921.32(c)) and preacquisition funds are limited to $100,000 per reserve.

§ 921.11 Site selection.

(a) A state may use up to $25,000 in Federal funds to establish and implement a site selection process which is approved by NOAA.

(b) In addition to the requirements set forth in subpart I of this part, a request

for Federal funds for site selection must contain the following programmatic information:

(1) A description of the proposed site selection process and how it will be implemented in conformance with the biogeographic classification scheme and typology (§ 921.3);

(2) An identification of the site selection agency and the potential management agency; and

(3) A description of how public participation will be incorporated into the process (see § 921.11(d)).

(c) As part of the site selection process, the state and NOAA shall evaluate and select the final site(s). NOAA has final authority in approving such sites. Site selection shall be guided by the following principles:

(1) The site's contribution to the biogeographical and typological balance of the National Estuarine Reserve Research System. NOAA will give priority consideration to proposals to establish reserves in biogeographic regions or subregions that are not represented in the system (see the biogeographic classification scheme and typology set forth in § 921.3 and appendices I and II to this part);

(2) The site's ecological characteristics, including its biological productivity, diversity of flora and fauna, and capacity to attract a broad range of research and educational interests. The proposed site must be a representative estuarine ecosystem and should, to the maximum extent possible, be an estuarine ecosystem minimally affected by human activity or influence (see § 921.1(e));

(3) Assurance that the site's boundaries encompass an adequate portion of the key land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation. Boundary size will vary greatly depending on the nature of the ecosystem. Research reserve boundaries must encompass the area within which adequate control has or will be established by the managing entity over human activities occurring within the reserve. Generally, reserve boundaries will encompass two areas: key land and water areas (or "core area") and a buffer zone. Key land and water areas and a buffer zone will likely require significantly different levels of control (see § 921.13(a)(7)). The term "key land and water areas" refers to that core area within the reserve that is so vital to the functioning of the estuarine ecosystem that it must be under a level of control sufficient to ensure the long-term viability of the reserve for research on natural processes. Key land and water areas, which comprise the core area, are those ecological units of a natural estuarine system which preserve, for research purposes, a full range of significant physical, chemical and biological factors contributing to the diversity of fauna, flora and natural processes occurring within the estuary. The determination of which land and water areas are "key" to a particular reserve must be based on specific scientific knowledge of the area. A basic principle to follow when deciding upon key land and water areas is that they should encompass resources representative of the total ecosystem, and which if compromised could endanger the research objectives of the reserve. The term "buffer zone" refers to an area adjacent to or surrounding key land and water areas and essential to their integrity. Buffer zones protect the core area and provide additional protection for estuarine-dependent species, including those that are rare or endangered. When determined appropriate by the state and approved by NOAA, the buffer zone may also include an area necessary for facilities required for research and interpretation. Additionally, buffer zones should be established sufficient to accommodate a shift of the core area as a result of biological, ecological or geomorphological change which reasonably could be expected to occur. National estuarine research reserves may include existing Federal or state lands already in a protected status where mutual benefit can be enhanced. However, NOAA will not approve a site for potential national estuarine research reserve status that is dependent primarily upon the inclusion of currently protected Federal lands in order to meet the requirements for research reserve status (such as key land and water areas). Such lands generally will be included within a research reserve to serve as a buffer or for other ancillary purposes;

(4) The site's suitability for long-term estuarine research, including ecological factors and proximity to existing research facilities and educational institutions;

(5) The site's compatibility with existing and potential land and water uses in contiguous areas as well as approved coastal and estuarine management plans; and

(6) The site's importance to education and interpretive efforts, consistent with the need for continued protection of the natural system.

(d) Early in the site selection process the state must seek the views of affected landowners, local governments, other state and Federal agencies and other parties who are interested in the area(s) being considered for selection as a potential national estuarine research reserve. After the local government(s) and affected landowner(s) have been contacted, at least one public meeting shall be held in the area of the proposed site. Notice of such a meeting, including the time, place, and relevant subject matter, shall be announced by the state through the area's principal news media at least 15 days prior to the date of the meeting and by NOAA in the Federal Register.

(e) A state request for NOAA approval of a proposed site (or sites in the case of a multi-site reserve) must contain a description of the proposed site in relationship to each of the site selection principles (§ 921.11(c)) and the following information:

(1) An analysis of the proposed site based on the biogeographical scheme/typology discussed in § 921.3 and set forth in appendices I and II to this part;

(2) A description of the proposed site and its major resources, including location, proposed boundaries, and adjacent land uses. Maps, including aerial photographs, are required;

(3) A description of the public participation process used by the state to solicit the views of interested parties, a summary of comments, and, if interstate issues are involved, documentation that the Governor(s) of the other affected state(s) has been contacted. Copies of all correspondence, including contact letters to all affected landowners must be appended;

(4) A list of all sites considered and a brief statement of the basis for not selecting the non-preferred sites; and

(5) A nomination of the proposed site(s) for designation as a National Estuarine Research Reserve by the Governor of the coastal state in which the area is located.

§ 921.12 Post site selection.

(a) At the time of the state's request for NOAA approval of a proposed site, the state may submit a request for up to $40,000 of the total $100,000 allowed for predesignation funds to develop the draft management plan and for the collection of the information necessary for preparation of the environmental impact statement. At this time, the state may also submit a request for the remainder of the predesignation funds for research necessary to complete a basic characterization of the physical, chemical and biological characteristics of the site approved by NOAA. The state's request for these post site selection funds must be accompanied by the information specified in subpart I of this part and, for draft management plan

development and environmental impact statement information collection, the following programmatic information:

(1) A draft management plan outline (see § 921.13(a) below); and

(2) An outline of a draft memorandum of understanding (MOU) between the state and NOAA detailing the Federal-state role in research reserve management during the initial period of Federal funding and expressing the state's long-term commitment to operate and manage the national estuarine research reserve.

(b) The state is eligible to use the funds referenced in § 921.12(a) after the proposed site is approved by NOAA under the terms of § 921.11.

§ 921.13 Management plan and environmental impact statement development.

(a) After NOAA approves the state's proposed site, the state may request to use additional predesignation funds for draft management plan development and the collection of information necessary for the preparation by NOAA of the environmental impact statement. The state shall develop a draft management plan, including an MOU. The plan will set out in detail:

(1) Research reserve goals and objectives, management issues, and strategies or actions for meeting the goals and objectives;

(2) An administrative section including staff roles in administration, research, education/interpretation, and surveillance and enforcement;

(3) A research plan, including a monitoring design;

(4) An education/interpretive plan;

(5) A plan for public access to the research reserve;

(6) A construction plan, including a proposed construction schedule, general descriptions of proposed developments and preliminary drawings, if appropriate. Information should be provided for proposed minor construction projects in sufficient detail to allow these projects to begin in the initial phase of acquisition and development. If a visitor center, research center or any other facilities are proposed for construction or renovation at the site, or restorative activities which require significant construction are planned, a detailed construction plan including preliminary cost estimates and architectural drawings must be prepared as a part of the final management plan; and

(7) An acquisition plan identifying the ecologically key land and water areas of the research reserve, ranking these areas according to their relative importance, and including a strategy for establishing adequate long-term state control over these areas sufficient to provide protection for reserve resources to ensure a stable environment for research. This plan must include an identification of ownership within the proposed research reserve boundaries, including land already in the public domain; the method(s) of acquisition which the state proposes to use—acquisition (including less-than-fee simple options) to establish adequate long-term state control; an estimate of the fair market value of any property interest—which is proposed for acquisition; a schedule estimating the time required to complete the process of establishing adequate state control of the proposed research reserve; and a discussion of any anticipated problems. In selecting a preferred method(s) for establishing adequate state control over areas within the proposed boundaries of the reserve, the state shall perform the following steps for each parcel determined to be part of the key land and water areas (control over which is necessary to protect the integrity of the reserve for research purposes), and for those parcels required for research and interpretive support facilities or buffer purposes:

(i) Determine, with appropriate justification, the minimum level of control(s) required (*e.g.*, management agreement, regulation, less-than-fee simple property interest (*e.g.*, conservation easement), fee simple property acquisition, or a combination of these approaches;

(ii) Identify the level of existing state control(s);

(iii) Identify the level of additional state control(s), if any, necessary to meet the minimum requirements identified in (a)(7)(i); of this section;

(iv) Examine all reasonable alternatives for attaining the level of control identified in (a)(7)(iii) of this section, and perform a cost analysis of each; and

(v) Rank, in order of cost, the methods (including acquisition) identified in paragraph (a)(7)(iv) of this section.

An assessment of the relative cost-effectiveness of control alternatives shall include a reasonable estimate of both short-term costs (*e.g.*, acquisition of property interests, regulatory program development including associated enforcement costs, negotiation, adjudication, etc.) and long-term costs (*e.g.*, monitoring, enforcement, adjudication, management and coordination). In selecting a preferred method(s) for establishing adequate state control over each parcel examined under the process described above, the state shall give priority consideration to the least costly method(s) of attaining the minimum level of long-term control required. Generally, with the possible exception of buffer areas required for support facilities, the level of control(s) required for buffer areas will be considerably less than that required for key land and water areas. This acquisition plan, after receiving the approval of NOAA, shall serve as a guide for negotiations with landowners. A final boundary for the reserve shall be delineated as a part of the final management plan;

(8) A resource protection plan detailing applicable authorities, including allowable uses, uses requiring a permit and permit requirements, any restrictions on use of the research reserve, and a strategy for research reserve surveillance and enforcement of such use restrictions, including appropriate government enforcement agencies;

(9) If applicable, a restoration plan describing those portions of the site that may require habitat modification to restore natural conditions;

(10) A proposed memorandum of understanding (MOU) between the state and NOAA regarding the Federal-state relationship during the establishment and development of the national estuarine research reserve, and expressing a long-term commitment by the state to maintain and manage the research reserve in accordance with section 315 of the Act 16 U.S.C. 1461, and applicable regulations. In conjunction with the MOU and where possible under state law, the state will consider taking appropriate administrative or legislative action to ensure the long-term protection and operation of the national estuarine research reserve. The MOU shall be signed prior to research reserve designation. If other MOUs are necessary (such as with a Federal agency or another state agency), drafts of such MOUs also must be included in the plan; and

(11) If the state has a federally approved coastal zone management program, documentation that the proposed national estuarine research reserve is consistent to the maximum extent practicable with that program. See § 921.4(b) and § 921.30(b).

(b) Regarding the preparation of an environmental impact statement (EIS) under the National Environmental Policy Act on a national estuarine research reserve proposal, the state shall provide all necessary information to NOAA concerning the socioeconomic and environmental impacts associated with

implementing the draft management plan and feasible alternatives to the plan. Based on this information, NOAA will prepare the draft EIS.

(c) Early in the development of the draft management plan and the draft EIS, the state shall hold a meeting in the area or areas most affected to solicit public and government comments on the significant issues related to the proposed action. NOAA will publish a notice of the meeting in the Federal Register 15 days prior to the meeting. The state shall be responsible for publishing a similar notice in the local media.

(d) NOAA will publish a Federal Register notice of intent to prepare a draft EIS. After the draft EIS is prepared and filed with the Environmental Protection Agency (EPA), a Notice of Availability of the DEIS will appear in the Federal Register. Not less than 30 days after publication of the notice, NOAA will hold at least one public hearing in the area or areas most affected by the proposed national estuarine research reserve. The hearing will be held no sooner than 15 days after appropriate notice of the meeting has been given in the principal news media and in the Federal Register by NOAA and the state, respectively. After a 45-day comment period, a final EIS will be prepared by NOAA.

Subpart C—Acquisition, Development, and Preparation of the Final Management Plan

§ 921.20 General.

The acquisition and development period is separated into two major phases. After NOAA approval of the site, draft management plan and draft MOU, and completion of the final EIS, a state is eligible for an initial acquisition and development award(s). In this initial phase, the state should work to meet the criteria required for formal research reserve designation; *e.g.*, establishing adequate state control over the key land and water areas as specified in the draft management plan and preparing the final management plan. These requirements are specified in § 921.30. Minor construction in accordance with the draft management plan may also be conducted during this initial phase. The initial acquisition and development phase is expected to last no longer than three years. If necessary, a longer time period may be negotiated between the state and NOAA. After research reserve designation, a state is eligible for a supplemental acquisition and development award(s) in accordance with § 921.31. In this post-designation acquisition and development phase, funds may be used in accordance with the final management plan to construct research and educational facilities, complete any remaining land acquisition, and for restorative activities identified in the final management plan. In any case, the amount of Federal financial assistance provided to a coastal state with respect to the acquisition of lands and waters, or interests therein, for any one national estuarine research reserve may not exceed an amount equal to 50 percent of the costs of the lands, waters, and interests therein or $4,000,000, whichever amount is less. The amount of Federal assistance for development and construction activities is $1,500,000.

§ 921.21 Initial acquisition and development awards.

(a) Assistance is provided to aid the recipient in:

(1) Acquiring a fee simple or less-than-fee simple real property interest in land and water areas to be included in the research reserve boundaries (see § 921.13(a)(7); § 921.30(d));

(2) Minor construction, as provided in paragraphs (b) and (c) of this section;

(3) Preparing the final management plan; and

(4) Up to the point of research reserve designation, initial management costs, *e.g.*, for implementing the NOAA approved draft management plan, preparing the final management plan, hiring a reserve manager and other staff as necessary and for other management-related activities. Application procedures are specified in subpart I of this part.

(b) The expenditure of Federal and state funds on major construction activities is not allowed during the initial acquisition and development phase. The preparation of architectural and engineering plans, including specifications, for any proposed construction, or for proposed restorative activities, is permitted. In addition, minor construction activities, consistent with paragraph (c) of this section also are allowed. The NOAA-approved draft management plan must, however, include a construction plan and a public access plan before any award funds can be spent on construction activities.

(c) Only minor construction activities that aid in implementing portions of the management plan (such as boat ramps and nature trails) are permitted during the initial acquisition and development phase. No more than five (5) percent of the initial acquisition and development award may be expended on such facilities. NOAA must make a specific determination, based on the final EIS, that the construction activity will not be detrimental to the environment.

(d) Except as specifically provided in paragraphs (a) through (c) of this section, construction projects, to be funded in whole or in part under an acquisition and development award(s), may not be initiated until the research reserve receives formal designation (see § 921.30). This requirement has been adopted to ensure that substantial progress in establishing adequate state control over key land and waters areas has been made and that a final management plan is completed before major sums are spent on construction. Once substantial progress in establishing adequate state control/acquisition has been made, as defined by the state in the management plan, other activities guided by the final management plan may begin with NOAA's approval.

(e) For any real property acquired in whole or part with Federal funds for the research reserve the state shall execute suitable title documents to include substantially the following provisions, or otherwise append the following provisions in a manner acceptable under applicable state law to the official land record(s):

(1) Title to the property conveyed by this deed shall vest in the [recipient of the award granted pursuant to section 315 of the Act, 16 U.S.C. 1461 or other NOAA approved state agency] subject to the condition that the designation of the [name of National Estuarine Reserve] is not withdrawn and the property remains part of the federally designated [name of National Estuarine Research Reserve].

(2) In the event that the property is no longer included as part of the research reserve, or if the designation of the research reserve of which it is part is withdrawn, then NOAA or its successor agency, after full and reasonable consultation with the State, may exercise the following rights regarding the disposition of the property:

(i) The recipient may retain title after paying the Federal Government an amount computed by applying the Federal percentage of participation in the cost of the original project to the current fair market value of the property;

(ii) If the recipient does not elect to retain title, the Federal Government may either direct the recipient to sell the property and pay the Federal Government an amount computed by applying the Federal percentage of participation in the cost of the original project to the proceeds from the sale (after deducting actual and reasonable

selling and repair or renovation expenses, if any, from the sale proceeds), or direct the recipient to transfer title to the Federal Government. If directed to transfer title to the Federal Government, the recipient shall be entitled to compensation computed by applying the recipient's percentage of participation in the cost of the original project to the current fair market value of the property;

(iii) Fair market value of the property must be determined by an independent appraiser and certified by a responsible official of the state, as provided by Department of Commerce Regulations in 15 CFR part 24, and Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally assisted programs in 15 CFR part 11.

(f) Upon instruction by NOAA, provisions analogous to those of § 921.21(e) shall be included in the documentation underlying less-than-fee-simple interests acquired in whole or part with Federal funds.

(g) Federal funds or non-Federal matching share funds shall not be spent to acquire a real property interest in which the State will own the land concurrently with another entity unless the property interest has been identified as a part of an acquisition strategy pursuant to § 921.13(7) which has been approved by NOAA prior to the effective date of these regulations.

(h) Prior to submitting the final management plan to NOAA for review and approval, the state shall hold a public meeting to receive comment on the plan in the area affected by the estuarine research reserve. NOAA will publish a notice of the meeting in the **Federal Register**. The state shall be responsible for having a similar notice published in the local media.

Subpart D—Reserve Designation and Subsequent Operation

§ 921.30 Designation of National Estuarine Research Reserves.

(a) The Under Secretary may designate an area as a national estuarine research reserve pursuant to section 315 of the Act, if based on written findings the state has met the following requirements:

(1) The Governor of the coastal state in which the area is located has nominated the area for designation as a national estuarine research reserve;

(2) The area is a representative estuarine ecosystem that is suitable for long-term research and contributes to the biogeographical and typological balance of the System;

(3) Key land and water areas of the proposed research reserve, as identified in the management plan, are under adequate state control sufficient to provide long-term protection for reserve resources and to ensure a stable environment for research;

(4) Designation of the area as a reserve will serve to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation;

(5) A final management plan has been approved by NOAA and contains the signed copy of the designation findings;

(6) An MOU has been signed between the state and NOAA ensuring a long-term commitment by the state to the effective operation and implementation of the national estuarine research reserve; and

(7) The coastal state in which the area is located has complied with the requirements of these regulations.

(b) NOAA will determine whether the designation of a national estuarine research reserve in a state with a federally approved coastal zone management program directly affects the coastal zone. If the designation is found to directly affect the coastal zone, NOAA will make a consistency determination pursuant to section 307(c)(1) of the Act, 16 U.S.C. 1456, and 15 CFR part 930, subpart C. See § 921.4(b). The results of this consistency determination will be published in the **Federal Register** when a notice of designation is published. See § 921.30(c).

(c) NOAA will cause a notice of designation of a national estuarine research reserve to be placed in the **Federal Register**. The state shall be responsible for having a similar notice published in the local media.

(d) The term "state control" in § 921.30(a)(3) does not necessarily require that key land and water areas be owned by the state in fee simple. Acquisition of less-than-fee-simple interests (*e.g.*, conservation easements) and utilization of existing State regulatory measures are encouraged where the state can demonstrate that these interests and measures assure adequate long-term State control consistent with the purposes of the research reserve (see also § 921.13(a)(7); § 921.21(g)). Should the state later elect to purchase an interest in such lands using NOAA funds, adequate justification as to the need for such acquisition must be provided to NOAA.

§ 921.31 Supplemental acquisition and development awards.

After national estuarine research reserve designation, and as specified in the approved management plan, the state may request a supplemental acquisition and/or development award(s) for acquiring additional property interests identified in the management plan as necessary to enhance long-term protection of the area for research and education, for facility construction, for restorative activities identified in the approved management plan, and for administrative purposes. The amount of Federal financial assistance provided for supplemental development costs directly associated with facility construction other than land acquisition (*i.e.*, major construction activities) for any one national estuarine research reserve may not exceed $1,500,000 and must be matched by the state on a 50/50 basis. Supplemental acquisition awards for the acquisition of lands or waters, or interests therein, for any one National Estuarine Reserve may not exceed an amount equal to 50 per centum of the cost of the lands, waters, and interests therein or $4,000,000 whichever amount is less. In the case of a biogeographic region (see Appendix I to this part) shared by two or more states, each state is eligible for Federal financial assistance to establish a national estuarine research reserve within their respective portion of the shared biogeographic region. Application procedures are specified in subpart I of this part. Land acquisition must follow the procedures specified in § 921.13(a)(7), § 921.21 (e) and (f) and § 921.81.

§ 921.32 Operation and management: Implementation of the management plan.

(a) After the national estuarine research reserve is formally designated, the state is eligible to receive Federal funds to assist the state in the operation and management of the research reserve. The purpose of this Federally funded operation and management phase is to implement the approved final management plan and to take the necessary steps to ensure the continued effective operation of the research reserve.

(b) State operation and management of national estuarine research reserves shall be consistent with the mission, and shall further the goals, of the National Estuarine Research Reserve System (see § 921.1).

(c) Federal funds of up to $70,000 per year, to be matched by the state on a 50/50 basis, are available for the operation and management of the national estuarine research reserve, including the establishment and operation of a basic environmental monitoring program. In the case of a biogeographic region (see appendix I to

this part) shared by two or more states, each state is eligible for Federal financial assistance to establish a national estuarine research reserve within their respective portion of the shared biogeographic region (see § 921.10).

(d) Operation and management funds are subject to the following limitations:

(1) No more than $70,000 in Federal funds may be expended in a twelve month award period (*i.e.*, Federal funds for operation and management may not be expended at a rate greater than $70,000 per year);

(2) No more than ten percent of the total amount (state and Federal shares) of each operation and management award may be used for construction-type activities (*i.e.*, $14,000 maximum per year).

§ 921.33 Boundary changes, amendments to the management plan, and addition of multiple-site components.

(a) Changes in research reserve boundaries and major changes to the final management plan, including state laws or regulations promulgated specifically for the research reserve, may be made only after written approval by NOAA. If determined to be necessary, NOAA may require public notice, including notice in the **Federal Register** and an opportunity for public comment. Changes in the boundaries of the research reserve involving the acquisition of properties not listed in the management plan or final EIS require public notice and the opportunity for comment; in certain cases, an environmental assessment and possibly, an environmental impact statement, may be required. Where public notice is required, NOAA will place a notice in the **Federal Register** of any proposed changes in research reserve boundaries or proposed major changes to the final management plan. The state shall be responsible for publishing an equivalent notice in the local media. See also requirements of § 921.4(b) and § 921.13(a)(11).

(b) As discussed in § 921.10(b), a state may choose to develop a multiple-site national estuarine research reserve after the initial acquisition and development award for a single site has been made. Public notice of the proposed addition will be placed by NOAA in the **Federal Register**. The state shall be responsible for publishing an equivalent notice in the local media. An opportunity for comment, in addition to the preparation of either an environmental assessment or environmental impact statement on the proposal, will also be required. An environmental impact statement, if required, shall be prepared in accordance with section § 921.13 and shall include an administrative framework for the multiple-site research reserve and a description of the complementary research and educational programs within the research reserve. If NOAA determines, based on the scope of the project and the issues associated with the additional site, that an environmental assessment is sufficient to establish a multiple-site research reserve, then the state shall develop a revised management plan which, concerning the additional component, incorporates each of the elements described in § 921.13(a). The revised management plan shall address goals and objectives for all components of the multi-site research reserve and the additional component's relationship to the original site(s).

Subpart E—Performance Evaluation and Withdrawal of Designation

§ 921.40 Evaluation of system performance.

(a) Following designation of a national estuarine research reserve pursuant to § 921.30, periodic performance evaluations shall be conducted concerning the operation and management of each national estuarine research reserve, including the research and monitoring being conducted within the reserve and education and interpretive activities. Evaluations may assess performance in all aspects of research reserve operation and management or may be limited in scope, focusing on selected issues of importance. Performance evaluations in assessing research reserve operation and management may also examine whether a research reserve is in compliance with the requirements of these regulations, particularly whether:

(1) The operation and management of the research reserve is consistent with and furthers the mission and goals of the National Estuarine Reserve Research System (see § 921.1); and

(2) A basis continues to exist to support any one or more of the findings made under § 921.30(a).

(b) Generally, performance will be evaluated at least every three years. More frequent evaluations may be scheduled as determined to be necessary by NOAA.

(c) Performance evaluations will be conducted by Federal officials. When determined to be necessary, Federal and non-Federal experts in natural resource management, estuarine research, interpretation or other aspects of national estuarine research reserve operation and management may be requested by NOAA to participate in performance evaluations. If other experts are to be included in the evaluation, NOAA will first ask the state to recommend appropriate individuals to serve in that capacity.

(d) Performance evaluations will be conducted in accordance with the procedural and public participation provisions of the CZMA regulations on review of performance at 15 CFR part 928 (*i.e.*, § 928.3(b) and § 928.4).

(e) To ensure effective Federal oversight of each research reserve within the National Estuarine Reserve Research System the state is required to submit an annual report on operation and management of the research reserve during the immediately preceding state fiscal year. This annual report must be submitted within a ninety day period following the end of the state fiscal year. The report shall detail program successes and accomplishments, referencing the research reserve management plan and, as appropriate, the work plan for the previous year. A work plan, detailing the projects and activities to be undertaken over the coming year to meet the goals and objectives of the research reserve as described in the management plan and the state's role in ongoing research reserve programs, shall also be included.

§ 921.41 Suspension of eligibility for financial assistance.

(a) If a performance evaluation under § 921.40 reveals that the operation and management of the research reserve is deficient, or that the research being conducted within the reserve is not consistent with the Estuarine Research Guidelines referenced in subpart F of this part, the eligibility of the research reserve for Federal financial assistance as described in these regulations may be suspended until the deficiency or inconsistency is remedied.

(b) NOAA will provide the state with a written notice of the deficiency or inconsistency. This notice will explain the finding, assess the Federal role in contributing to the problem, propose a solution or solutions, provide a schedule by which the state should remedy the deficiency or inconsistency, and state whether the state's eligibility for Federal financial assistance has been suspended in whole or part. In this notice the state shall also be advised that it may comment on this finding and meet with NOAA officials to discuss the results of the performance evaluation and seek to remedy the deficiency or inconsistency.

(c) Eligibility of a research reserve for financial assistance under these regulations shall be restored upon written notice by NOAA to the state

that the deficiency or inconsistency has been remedied.

(d) If, after a reasonable time, a state does not remedy a deficiency in the operation and management of a national estuarine research reserve which has been identified pursuant to a performance evaluation under § 921.40(a), such outstanding deficiency shall be considered a basis for withdrawal of designation (see § 921.42).

§ 921.42 Withdrawal of designation.

(a) Designation of an estuarine area as a national estuarine research reserve may be withdrawn if a performance evaluation conducted pursuant to § 921.40 reveals that:

(1) The basis for any one or more of the findings made under § 921.30(a) in designating the research reserve no longer exists;

(2) A substantial portion of the research conducted within the research reserve, over a period of years, has not been consistent with the Estuarine Research Guidelines referenced in subpart F of this part; or

(3) A state, after a reasonable time, has not remedied a deficiency in the operation and management of a research reserve identified pursuant to an earlier performance evaluation conducted under § 921.40.

(b) If a basis is found under § 921.42(a) for withdrawal of designation, NOAA will provide the state with a written notice of this finding. This notice will explain the basis for the finding, propose a solution or solutions and provide a schedule by which the state should correct the deficiency. In this notice, the state shall also be advised that it may comment on the finding and meet with NOAA officials to discuss the finding and seek to correct the deficiency.

(c) If, within a reasonable period of time, the deficiency is not corrected in a manner acceptable to NOAA, a notice of intent to withdraw designation, with an opportunity for comment, will be placed in the **Federal Register**.

(d) The state shall be provided the opportunity for an informal hearing before the Under Secretary to consider NOAA's finding of deficiency and intent to withdraw designation, as well as the state's comments on and response to NOAA's written notice pursuant to § 921.42(b) and **Federal Register** notice pursuant to § 921.42(c).

(e) Within 30 days after the informal hearing, the Under Secretary shall issue a written decision regarding the designation status of the national estuarine research reserve. If a decision is made to withdraw research reserve designation, the procedures specified in § 921.21(e) regarding the disposition of real property acquired in whole or part with Federal funds shall be followed.

(f) NOAA may not withdraw designation of a national estuarine research reserve if the performance evaluation reveals that the deficiencies in management of the site are a result of inadequate Federal financial support.

Subpart F—Research

§ 921.50 General.

(a) To stimulate high quality research within designated national estuarine research reserves, NOAA may provide financial support for research which is consistent with the Estuarine Research Guidelines referenced in § 921.51. Research awards may be awarded under this subpart to only those designated research reserves with approved final management plans with the following exception: NOAA may award research awards under this subpart to reserves without final management plans that have been designated prior to the effective date of these regulations; in the absence of an approved final management plan, however these reserves will be eligible for research awards during only the first two years after the effective date of these regulations. Although this research may be conducted within the immediate watershed of the research reserve, the majority of research activities of any single research project funded under this subpart must be conducted within reserve boundaries. Research funds are primarily used to support management-related research that will enhance scientific understanding of the research reserve ecosystem, provide information needed by reserve managers and coastal management decision-makers, and improve public awareness and understanding of estuarine ecosystems and estuarine management issues. Research projects may be oriented to specific research reserves; however, research projects that would benefit more than one research reserve in the National Estuarine Reserve Research System are encouraged.

(b) Federal research funds under this subpart are not intended as a source of continuous funding for a particular project over time. Research funds may be used to support start-up costs for long-term projects if an applicant can identify an alternative source of long-term research support.

(c) Research funds are available on a competitive basis to any coastal state or qualified public or private person. A notice of available funds will be published in the **Federal Register**. Research funds are provided in addition to any other funds available to a coastal state under the Act. Federal research funds provided under this subpart must be matched equally by the recipient, consistent with § 921.81(e)(4) ("allowable costs").

§ 921.51 Estuarine research guidelines.

(a) Research within the National Estuarine Reserve Research System shall be conducted in a manner consistent with Estuarine Research Guidelines developed by NOAA.

(b) A summary of the Estuarine Research Guidelines is published in the **Federal Register** as a part of the notice of available funds discussed in § 921.50(c).

(c) The Estuarine Research Guidelines are reviewed annually by NOAA. This review will include an opportunity for comment by the estuarine research community.

§ 921.52 Promotion and coordination of estuarine research.

(a) NOAA will promote and coordinate the use of the National Estuarine Reserve Research System for research purposes.

(b) NOAA will, in conducting or supporting estuarine research other than that authorized under section 315 of the Act, give priority consideration to research that uses the National Estuarine Reserve Research System.

(c) NOAA will consult with other Federal and state agencies to promote use of one or more research reserves within the National Estuarine Reserve Research System when such agencies conduct estuarine research.

Subpart G—Monitoring

§ 921.60 General.

(a) To provide a systematic basis for developing a high quality estuarine resource and ecosystem information base for national estuarine research reserves and, as a result, for the System, NOAA may provide financial support for monitoring programs. Monitoring funds are used to support three major phases of a monitoring program: studies necessary for comprehensive site description/characterization, development of a site profile, and implementation of a monitoring program.

(b) Monitoring funds are available on a competitive basis to the state agency responsible for reserve management or qualified public or private person or entity designated by the Reserve. However, if the applicant is other than the managing entity of a reserve research (coastal state), that applicant must submit as a part of the application

a letter from the reserve manager indicating formal support of the application by the managing entity of the reserve. Monitoring awards will be made on the basis of a five-year performance period; and with initial funding for a twelve (12) month period; and with annual supplemental funding contingent on performance and appropriations under the Act. Monitoring funds are provided in addition to any other funds available to a coastal state under the Act. Federal monitoring funds must be matched equally by the recipient, consistent with § 921.81(e)(4) ("allowable costs").

(c) Monitoring projects funded under this Subpart must focus on the resources within the boundaries of the research reserve and must be consistent with the applicable sections of the Estuarine Research Guidelines referenced in § 921.51. Portions of the project may occur within the immediate watershed of the Reserve beyond the site boundaries. However, the monitoring proposal must demonstrate why this is necessary for the success of the project.

Subpart H—Interpretation and Education

§ 921.70 General.

(a) To stimulate the development of innovative or creative interpretive and educational projects and materials to enhance public awareness and understanding of estuarine areas, NOAA may fund interpretive and educational activities. Interpretive and educational awards may be awarded under this subpart to only those designated research reserves with approved final management plans with the following exception: NOAA may award research awards under this subpart to reserves without final management plans that have been designated prior to the effective date of these regulations; in the absence of an approved final management plan, however these reserves will be eligible for research awards during only the first two years after the effective date of these regulations.

(b) Educational and interpretive funds are available on a competitive basis to any coastal state entity. However, if the applicant is other than the managing entity of a research reserve, that applicant must submit as a part of the application a letter from the reserve manager indicating formal support of the application by the managing entity of the reserve. These funds are provided in addition to any other funds available to a coastal state under the Act. Federal interpretation and educational funds must be matched equally by the recipient, consistent with § 921.81(e)(4) ("allowable costs").

§ 921.71 Categories of potential interpretive and educational projects; evaluation criteria.

(a) Proposals for interpretive or educational projects will be considered under the following categories:

(1) Design, development and distribution/placement of interpretive or educational media (*i.e.*, the development of tangible items, such as exhibits/displays, publications, posters, signs, audio/visuals, computer software and maps which have an educational or interpretive purpose; and techniques for making available or locating information concerning research reserve resources, activities, or issues);

(2) Development and presentation of curricula, workshops, lectures, seminars, and other structured programs or presentations for facility or field use;

(3) Extension/outreach programs; or

(4) Creative and innovative methods and technologies for implementing interpretive or educational projects.

(b) Interpretive and educational projects may be oriented to one or more research reserves or to the entire system. Those projects which would directly benefit more than one research reserve, and, if practicable, the entire National Estuarine Reserve Research System, shall receive priority consideration for funding.

(c) Proposals for interpretive and educational projects in national estuarine research reserves will be evaluated in accordance with criteria listed below:

(1) Educational or interpretive merits;

(2) Relevance or importance to reserve management or coastal decisionmaking;

(3) Educational quality (*e.g.*, soundness of approach, experience related to methodologies);

(4) Importance to the National Estuarine Reserve Research System;

(5) Budget and Institutional Capabilities (*e.g.*, reasonableness of budget, sufficiency of logistical support); and

(6) In addition, in the case of long-term projects, the ability of the state or the grant recipient to support the project beyond this initial funding.

Subpart I—General Financial Assistance Provisions

§ 921.80 Application information.

(a) Only a coastal state may apply for Federal financial assistance awards for preacquisition, acquisition and development, operation and management, and education and interpretation. Any coastal state or public or private person may apply for Federal financial assistance awards for estuarine research or monitoring. The announcement of opportunities to conduct research in the reserve system appears on an annual basis in the Federal Register. If a state is participating in the national Coastal Zone Management Program, the applicant for an award under section 315 of the Act shall notify the state coastal management agency regarding the application.

(b) An original and two copies of the formal application must be submitted at least 120 working days prior to the proposed beginning of the project to the following address: Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration, Universal Building South, 1825 Connecticut Avenue, NW., Suite 714, Washington, DC 20235. The Application for Federal Assistance Standard Form 424 (Non-construction Program) constitutes the formal application for site selection, post-site selection, operation and management, research, and education and interpretive awards. The Application for Federal Financial Assistance Standard Form 424 (Construction Program) constitutes the formal application for land acquisition and development awards. The application must be accompanied by the information required in subpart B (predesignation) of this part, subpart C of this part and § 921.31 (acquisition and development), and § 921.32 (operation and management) as applicable. Applications for development awards for construction projects, or restorative activities involving construction, must include a preliminary engineering report. All applications must contain back up data for budget estimates (Federal and non-Federal shares), and evidence that the application complies with the Executive Order 12372, "Intergovernmental Review of Federal Programs." In addition, applications for acquisition and development awards must contain:

(1) State Historic Preservation Office comments;

(2) Written approval from NOAA of the draft management plan for initial acquisition and development award(s); and

(3) A preliminary engineering report for construction projects, or restorative activities involving construction.

§ 921.81 Allowable costs.

(a) Allowable costs will be determined in accordance with applicable OMB Circulars and guidance

for Federal financial assistance, the financial assistance agreement, these regulations, and other Department of Commerce and NOAA directives. The term "costs" applies to both the Federal and non-Federal shares.

(b) Costs claimed as charges to the award must be reasonable, beneficial and necessary for the proper and efficient administration of the financial assistance award and must be incurred during the award period.

(c) Costs must not be allocable to or included as a cost of any other Federally-financed program in either the current or a prior award period.

(d) General guidelines for the non-Federal share are contained in Department of Commerce Regulations at 15 CFR part 24 and OMB Circular A-110. Copies of Circular A-110 can be obtained from the Marine and Estuarine Management Division; 1825 Connecticut Avenue, NW., Suite 714; Washington DC 20235. The following may be used in satisfying the matching requirement:

(1) Site Selection and Post Site Selection Awards. Cash and in-kind contributions (value of goods and services directly benefiting and specifically identifiable to this part of the project) are allowable. Land may not be used as match.

(2) Acquisition and Development Awards. Cash and in-kind contributions are allowable. In general, the fair market value of lands to be included within the research reserve boundaries and acquired pursuant to the Act, with other than Federal funds, may be used as match. However, the fair market value of real property allowable as match is limited to the fair market value of a real property interest equivalent to, or required to attain, the level of control over such land(s) identified by the state and approved by the Federal Government as that necessary for the protection and management of the national estuarine research reserve. Appraisals must be performed accordin to Federal appraisal standards as detailed in Department of Commerce regulations at 15 CFR part 24 and the Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs in 15 CFR part 11. The fair market value of privately donated land, at the time of donation, as established by an independent appraiser and certified by a responsible official of the state (pursuant to 15 CFR part 24), may also be used as match. Land, including submerged lands already in the state's possession, may be used as match to establish a national estuarine research reserve. The value of match for these state lands will be calculated by determining the value of the benefits foregone by the state, in the use of the land, as a result of new restrictions that may be imposed by Reserve designation. The appraisal of the benefits foregone must be made by an independent appraiser in accordance with Federal appraisal standards pursuant to 15 CFR part 24 and 15 CFR part 11. A state may initially use as match land valued at greater than the Federal share of the acquisition and development award. The value in excess of the amount required as match for the initial award may be used to match subsequent supplemental acquisition and development awards for the national estuarine research reserve (see also § 921.20). Costs related to land acquisition, such as appraisals, legal fees and surveys, may also be used as match.

(3) Operation and Management Awards. Generally, cash and in kind contributions (directly benefiting and specifically identifiable to operations and management), except land, are allowable.

(4) Research, Monitoring, Education and Interpretive Awards. Cash and in-kind contributions (directly benefiting and specifically identifiable to the scope of work), except land, are allowable.

§ 921.82 Amendments to financial assistance awards.

Actions requiring an amendment to the financial assistance award, such as a request for additional Federal funds, revisions of the approved project budget or original scope of work, or extension of the performance period must be submitted to NOAA on Standard Form 424 and approved in writing.

Appendix I to Part 921—Biogeographic Classification Scheme

Acadian

1. Northern Gulf of Maine (Eastport to the Sheepscot River).
2. Southern Gulf of Maine (Sheepscot River to Cape Cod).

Virginian

3. Southern New England (Cape Cod to Sandy Hook).
4. Middle Atlantic (Sandy Hook to Cape Hatteras).
5. Chesapeake Bay.

Carolinian

6. Northern Carolinas (Cape Hatteras to Santee River).
7. South Atlantic (Santee River to St. John's River).
8. East Florida (St. John's River to Cape Canaveral).

West Indian

9. Caribbean (Cape Canaveral to Ft. Jefferson and south).
10. West Florida (Ft. Jefferson to Cedar Key).

Louisianian

11. Panhandle Coast (Cedar Key to Mobile Bay).
12. Mississippi Delta (Mobile Bay to Galveston).
13. Western Gulf (Galveston to Mexican border).

Californian

14. Southern California (Mexican Border to Point Concepcion).
15. Central California (Point Concepcion to Cape Mendocino).
16. San Francisco Bay.

Columbian

17. Middle Pacific (Cape Mendocino to the Columbia River).
18. Washington Coast (Columbia River to Vancouver Island).
19. Puget Sound.

Great Lakes

20. Western Lakes (Superior, Michigan, Huron).
21. Eastern Lakes (Ontario, Erie).

Fjord

22. Southern Alaska (Prince of Wales Island to Cook Inlet).
23. Aleutian Islands (Cook Inlet to Bristol Bay).

Sub-Arctic

24. Northern Alaska (Bristol Bay to Demarcation Point).

Insular

25. Hawaiian Islands.
26. Western Pacific Island.
27. Eastern Pacific Island.

Appendix II to Part 921—Typology of National Estuarine Research Reserves

This typology system reflects significant differences in estuarine characteristics that are not necessarily related to regional location. The purpose of this type of classification is to maximize ecosystem variety in the selection of national estuarine research reserves. Priority will be given to important ecosystem types as yet unrepresented in the reserve system. It should be noted that any one site may represent several ecosystem types or physical characteristics.

Class I—Ecosystem Types

Group I—Shorelands

A. *Maritime Forest-Woodland:* This type of ecosystem consists of single-stemmed species that have developed under the influence of salt spray. It can be found on coastal uplands or recent features, such as barrier islands and beaches, and may be divided into the following biomes:

1. *Northern Coniferous Forest Biome:* This is an area of predominantly evergreens such as the sitka spruce (Picea), grand fir (Abies), and white cedar (Thuja), with poor development of the shrub and herb layers, but high annual productivity and pronounced seasonal periodicity.

2. *Moist Temperate (Mesothermal) Coniferous Forest Biome:* Found along the west coast of North America from California to Alaska, this area is dominated by conifers, has a relatively small seasonal range, high humidity with rainfall ranging from 30 to 150 inches, and a well-developed understory of vegetation with an abundance of mosses and other moisture-tolerant plants.

3. *Temperate Deciduous Forest Biome:* This biome is characterized by abundant, evenly distributed rainfall, moderate temperatures which exhibit a distinct seasonal pattern, well-developed soil biota and herb and shrub layers, and numerous plants which produce pulpy fruits and nuts. A distant subdivision of this biome is the pine edaphic forest of the southeastern coastal plain, in which only a small portion of the area is occupied by climax vegetation, although it has large areas covered by edaphic climax pines.

4. *Broad-leaved Evergreen Subtropical Forest Biomes:* The main characteristic of this biome is high moisture with less pronounced differences between winter and summer. Examples are the hammocks of Florida and the live oak forests of the Gulf and South Atlantic coasts. Floral dominants include pines, magnolias, bays, hollies, wild tamarind, strangler fig, gumbo limbo, and palms.

B. *Coast Shrublands:* This is a transitional area between the coastal grasslands and woodlands and is characterized by woody species with multiple stems a few centimeters to several meters above the ground developing under the influence of salt spray and occasional sand burial. This includes thickets, scrub, scrub savanna, heathlands, and coastal chaparral. There is a great variety of shrubland vegetation exhibiting regional specificity:

1. *Northern Areas:* Characterized by Hudsonia, various ericaceous species, and thickets of Myrica, Prunus, and Rosa.
2. *Southeast Areas:* Floral dominants include Myrica, Baccharis, and Ilex.
3. *Western Areas:* Adenostoma, Arctophylos, and Eucalyptus are the dominant floral species.

C. *Coastal Grasslands:* This area, which possesses sand dunes and coastal flats, has low rainfall (10 to 30 inches per year) and large amounts of humus in the soil. Ecological succession is slow, resulting in the presence of a number of serial stages of community development. Dominant vegetation includes mid-grasses (2 to 4 feet tall), such as Ammophila, Agropyron, and Calamovilfa, tall grasses (5 to 8 feet tall), such as Spartina, and trees such as the willow (Salix sp.), cherry (Prunus sp.), and cottonwood (Populus deltoides). This area is divided into four regions with the following typical strand vegetation:

1. Arctic/Boreal: Elymus;
2. Northeast/West: Ammophila;
3. Southeast/Gulf: Uniola; and
4. Mid-Atlantic/Gulf: Spartina patens.

D. *Coastal Tundra:* This ecosystem, which is found along the Arctic and Boreal coasts of North America, is characterized by low temperatures, a short growing season, and some permafrost, producing a low, treeless mat community made up of mosses, lichens, heath, shrubs, grasses, sedges, rushes, and herbaceous and dwarf woody plants. Common species include arctic/alpine plants such as Empetrum nigrum and Betula nana, the lichens Cetraria and Cladonia, and herbaceous plants such as Potentilla tridentata and Rubus chamaemorus. Common species on the coastal beach ridges of the high arctic desert include Dryas intergrifolia and Saxifrage oppositifolia. This area can be divided into two main subdivisions:

1. *Low Tundra:* characterized by a thick, spongy mat of living and undecayed vegetation, often with water and dotted with ponds when not frozen; and

2. *High Tundra:* a bare area except for a scanty growth of lichens and grasses, with underlying ice wedges forming raised polygonal areas.

E. *Coastal Cliffs:* This ecosystem is an important nesting site for many sea and shore birds. It consists of communities of herbaceous, graminoid, or low woody plants (shrubs, heath, etc.) on the top or along rocky faces exposed to salt spray. There is a diversity of plant species including mosses, lichens, liverworts, and "higher" plant representatives.

Group II—Transition Areas

A. *Coastal Marshes:* These are wetland areas dominated by grasses Poacea), sedges (Cyperaceae), rushes (Juncaceae), cattails (Typhaceae), and other graminoid species and is subject to periodic flooding by either salt or freshwater. This ecosystem may be subdivided into: (a) Tidal, which is periodically flooded by either salt or brackish water; (b) non-tidal (freshwater); or (c) tidal freshwater. These are essential habitats for many important estuarine species of fish and invertebrates as well as shorebirds and waterfowl and serves important roles in shore stabilization, flood control, water purification, and nutrient transport and storage.

B. *Coastal Swamps:* These are wet lowland areas that support mosses and shrubs together with large trees such as cypress or gum.

C. *Coastal Mangroves:* This ecosystem experiences regular flooding on either a daily, monthly, or seasonal basis, has low wave action, and is dominated by a variety of salt-tolerant trees, such as the red mangrove (Rhizophora mangle), black mangrove (Avicennia nitida), and the white mangrove (Laguncularia racemosa). It is also an important habitat for large populations of fish, invertebrates, and birds. This type of ecosystem can be found from central Florida to extreme south Texas to the islands of the Western Pacific.

D. *Intertidal Beaches:* This ecosystem has a distinct biota of microscopic animals, bacteria, and unicellular algae along with microscopic crustaceans, mollusks, and worms with a detritus-based nutrient cycle. This area also includes the driftline communities found at high tide levels on the beach. The dominant organisms in this ecosystem include crustaceans such as the mole crab (Emerita), amphipods (Gammaridae), ghost crabs (Ocypode), and bivalve molluscs such as the coquina (Donax) and surf clams (Spisula and Mactra).

E. *Intertidal Mud and Sand Flats:* These areas are composed of unconsolidated, high organic content sediments that function as a short-term storage area for nutrients and organic carbons. Macrophytes are nearly absent in this ecosystem, although it may be heavily colonized by benthic diatoms, dinoflagellates, filamentous blue-green and green algae, and chemosynthetic purple sulfur bacteria. This system may support a considerable population of gastropods, bivalves, and polychaetes, and may serve as a feeding area for a variety of fish and wading birds. In sand, the dominant fauna include the wedge shell Donax, the scallop Pecten, tellin shells Tellina, the heart urchin Echinocardium, the lug worm Arenicola, sand dollar Dendraster, and the sea pansy Renilla. In mud, faunal dominants adapted to low oxygen levels include the terebellid Amphitrite, the boring clam Playdon, the deep sea scallop Placopecten, the quahog Mercenaria, the echiurid worm Urechis, the mud snail Nassarius, and the sea cucumber Thyone.

F. *Intertidal Algal Beds:* These are hard substrates along the marine edge that are dominated by macroscopic algae, usually thalloid, but also filamentous or unicellular in growth form. This also includes the rocky coast tidepools that fall within the intertidal zone. Dominant fauna of these areas are barnacles, mussels, periwinkles, anemones, and chitons. Three regions are apparent:

1. *Northern Latitude Rocky Shores:* It is in this region that the community structure is best developed. The dominant algal species include Chondrus at the low tide level, Fucus and Ascophyllum at the mid-tidal level, and Laminaria and other kelplike algae just beyond the intertidal, although they can be exposed at extremely low tides or found in very deep tidepools.

2. *Southern Latitudes:* The communities in this region are reduced in comparison to those of the northern latitudes and possesses algae consisting mostly of single-celled or filamentous green, blue-green, and red algae, and small thalloid brown algae.

3. *Tropical and Subtropical Latitudes:* The intertidal in this region is very reduced and contains numerous calcareous algae such as Porolithon and Lithothamnion, as well as green algae with calcareous particles such as Halimeda, and numerous other green, red, and brown algae.

Group III—Submerged Bottoms

A. *Subtidal Hardbottoms:* This system is characterized by a consolidated layer of solid rock or large pieces of rock (neither of biotic origin) and is found in association with geomorphological features such as submarine canyons and fjords and is usually covered with assemblages of sponges, sea fans, bivalves, hard corals, tunicates, and other attached organisms. A significant feature of estuaries in many parts of the world is the oyster reef, a type of subtidal hardbottom. Composed of assemblages of organisms (usually bivalves), it is usually found near an estuary's mouth in a zone of moderate wave action, salt content, and turbidity. If light levels are sufficient, a covering of microscopic and attached macroscopic algae, such as kelp, may also be found.

B. *Subtidal Softbottoms:* Major characteristics of this ecosystem are an unconsolidated layer of fine particles of silt, sand, clay, and gravel, high hydrogen sulfide levels, and anaerobic conditions often existing below the surface. Macrophytes are either sparse or absent, although a layer of benthic microalgae may be present if light levels are sufficient. The faunal community is dominated by a diverse population of deposit feeders including polychaetes, bivalves, and burrowing crustaceans.

C. *Subtidal Plants:* This system is found in relatively shallow water (less than 8 to 10 meters) below mean low tide. It is an area of extremely high primary production that provides food and refuge for a diversity of faunal groups, especially juvenile and adult fish, and in some regions, manatees and sea turtles. Along the North Atlantic and Pacific coasts, the seagrass Zostera marina predominates. In the South Atlantic and Gulf coast areas, Thalassia and Diplanthera predominate. The grasses in both areas support a number of epiphytic organisms.

Class II—Physical Characteristics

Group I—Geologic

A. *Basin Type:* Coastal water basins occur in a variety of shapes, sizes, depths, and appearances. The eight basic types discussed below will cover most of the cases:

1. *Exposed Coast:* Solid rock formations or heavy sand deposits characterize exposed ocean shore fronts, which are subject to the full force of ocean storms. The sand beaches are very resilient, although the dunes lying just behind the beaches are fragile and easily damaged. The dunes serve as a sand storage area, making them chief stabilizers of the ocean shorefront.

2. *Sheltered Coast:* Sand or coral barriers, built up by natural forces, provide sheltered areas inside a bar or reef where the ecosystem takes on many characteristics of confined waters—abundant marine grasses, shellfish, and juvenile fish. Water movement is reduced, with the consequent effects of pollution being more severe in this area than in exposed coastal areas.

3. *Bay:* Bays are larger confined bodies of water that are open to the sea and receive strong tidal flow. When stratification is pronounced, the flushing action is augmented by river discharge. Bays vary in size and in type of shorefront.

4. *Embayment:* A confined coastal water body with narrow, restricted inlets and with a significant freshwater inflow can be classified as an embayment. These areas have more restricted inlets than bays, are usually smaller and shallower, have low tidal action, and are subject to sedimentation.

5. *Tidal River:* The lower reach of a coastal river is referred to as a tidal river. The coastal water segment extends from the sea or estuary into which the river discharges to a point as far upstream as there is significant salt content in the water, forming a salt front. A combination of tidal action and freshwater outflow makes tidal rivers well-flushed. The tidal river basin may be a simple channel or a complex of tributaries, small associated embayments marshfronts, tidal flats, and a variety of others.

6. *Lagoon:* Lagoons are confined coastal bodies of water with restricted inlets to the sea and without significant freshwater inflow. Water circulation is limited, resulting in a poorly flushed, relatively stagnant body of water. Sedimentation is rapid with a great potential for basin shoaling. Shores are often gently sloping and marshy.

7. *Perched Coastal Wetlands:* Unique to Pacific Islands, this wetland type, found above sea level in volcanic crater remnants, forms as a result of poor drainage characteristics of the crater rather than from sedimentation. Floral assemblages exhibit distinct zonation while the faunal constituents may include freshwater, brackish, and/or marine species. Example: Aunu'u Island, American Samoa.

8. *Anchialine Systems:* These small coastal exposures of brackish water form in lava depressions or elevated fossil reefs, have only a subsurface connection to the ocean, but show tidal fluctuations. Differing from true estuaries in having no surface continuity with streams or ocean, this system is characterized by a distinct biotic community dominated by benthic algae such as Rhizoclonium, the mineral encrusting Schizothrix, and the vascular plant Ruppia maritima. Characteristic fauna, which exhibit a high degree of endemicity, include the mollusks Theodoxus neglectus and T. cariosus, the small red shrimp Metabetaeus lohena and Halocaridina rubra, and the fish Eleotris sandwicensis and Kuhlia sandvicensus. Although found throughout the world, the high islands of the Pacific are the only areas within the U.S. where this system can be found.

B. *Basin Structure:* Estuary Basins may result from the drowning of a river valley (coastal plains estuary), The drowning of a glacial valley (fjord), the occurrence of an offshore barrier (bar-bounded estuary), some tectonic process (tectonic estuary), or volcanic activity (volcanic estuary).

1. *Coastal plains estuary:* Where a drowned valley consists mainly of a single channel, the form of the basin is fairly regular, forming a simple coastal plains estuary. When a channel is flooded with numerous tributaries, an irregular estuary results. Many estuaries of the eastern United States are of this type.

2. *Fjord:* Estuaries that form in elongated, steep headlands that alternate with deep U-shaped valleys resulting from glacial scouring are called fjords. They generally possess rocky floors or very thin veneers of sediment, with deposition generally being restricted to the head where the main river enters. Compared to total fjord volume, river discharge is small. But many fjords have restricted tidal ranges at their mouths, due to sills, or upreaching sections of the bottom which limit free movement of water, often making river flow large with respect to the tidal prism. The deepest portions are in the upstream reaches, where maximum depths can range from 600 m to 1200 m, while sill depths usually range from 40 m to 150 m.

3. *Bar-bounded Estuary:* These result from the development of an offshore barrier, such as a beach strand, a line of barrier islands, reef formations, a line of moraine debris, or the subsiding remnants of a deltaic lobe. The basin is often partially exposed at low tide and is enclosed by a chain of offshore bars or barrier islands, broken at intervals by inlets. These bars may be either deposited offshore or may be coastal dunes that have become isolated by recent sea level rises.

4. *Tectonic Estuary:* These are coastal indentures that have formed through tectonic processes such as slippage along a fault line (San Francisco Bay), folding, or movement of the earth's bedrock, often with a large inflow of freshwater.

5. *Volcanic Estuary:* These coastal bodies of open water, a result of volcanic processes, are depressions or craters that have direct and/or subsurface connections with the ocean and may or may not have surface continuity with streams. These formations are unique to island areas of volcanic origin.

C. *Inlet Type:* Inlets in various forms are an integral part of the estuarine environment, as they regulate, to a certain extent, the velocity and magnitude of tidal exchange, the degree of mixing, and volume of discharge to the sea. There are four major types of inlets:

1. *Unrestricted:* An estuary with a wide unrestricted inlet typically has slow currents, no significant turbulence, and receive the full effect of ocean waves and local disturbances which serve to modify the shoreline. These estuaries are partially mixed, as the open mouth permits the incursion of marine waters to considerable distances upstream, depending on the tidal amplitude and stream gradient.

2. *Restricted:* Restrictions of estuaries can exist in many forms: bars, barrier islands, spits, sills, and more. Restricted inlets result in decreased circulation, more pronounced longitudinal and vertical salinity gradients, and more rapid sedimentation. However, if the estuary mouth is restricted by depositional features or land closures, the incoming tide may be held back until it suddenly breaks forth into the basin as a tidal wave, or bore. Such currents exert profound effects on the nature of the substrate, turbidity, and biota of the estuary.

3. *Permanent:* Permanent inlets are usually opposite the mouths of major rivers and permit river water to flow into the sea. Sedimentation and deposition are minimal.

4. *Temporary (Intermittent):* Temporary inlets are formed by storms and frequently shift position, depending on tidal flow, the depth of the sea and sound waters, the frequency of storms, and the amount of littoral transport.

D. *Bottom Composition:* The bottom composition of estuaries attests to the vigorous, rapid, and complex sedimentation processes characteristic of most coastal regions with low relief. Sediments are derived through the hydrologic processes of erosion, transport, and deposition carried on by the sea and the stream.

1. *Sand:* Near estuary mouths, where the predominating forces of the sea build spits or other depositional features, the shores and substrates of the estuary are sandy. The bottom sediments in this area are usually coarse, with a graduation toward finer particles in the head of the estuary. In the head region and other zones of reduced flow, fine silty sands are deposited. Sand deposition occurs only in wider or deeper regions where velocity is reduced.

2. *Mud:* At the base level of a stream near its mouth, the bottom is typically composed of loose muds, silt, and organic detritus as a result of erosion and transport from the upper stream reaches and organic decomposition. Just inside the estuary entrance, the bottom contains considerable quantities of sand and mud, which support a rich fauna. Mud flats, commonly built up in estuarine basins, are composed of loose, coarse, and fine mud and sand, often dividing the original channel.

3. *Rock:* Rocks usually occur in areas where the stream runs rapidly over a steep gradient with its coarse materials being derived from the higher elevations where the stream slope is greater. The larger fragments are usually found in shallow areas near the stream mouth.

4. *Oyster shell:* Throughout a major portion of the world, the oyster reef is one of the most significant features of estuaries, usually being found near the mouth of the estuary in a zone of moderate wave action, salt content, and turbidity. It is often a major factor in modifying estuarine current systems and sedimentation, and may occur as an elongated island or peninsula oriented across the main current, or may develop parallel to the direction of the current.

Group II—Hydrographic

A. *Circulation:* Circulation patterns are the result of the combined influences of freshwater flow, tidal action, wind and oceanic forces, and serve many functions: nutrient transport, plankton dispersal, ecosystem flushing, salinity control, water mixing, and more.

1. *Stratified:* This is typical of estuaries with a strong freshwater influx and is commonly found in bays formed from "drowned" river valleys, fjords, and other deep basins. There is a net movement of freshwater outward at the top layer and saltwater at the bottom layer, resulting in a net outward transport of surface organisms and net inward transport of bottom organisms.

2. *Non-stratified:* Estuaries of this type are found where water movement is sluggish and flushing rate is low, although there may be sufficient circulation to provide the basis for a high carrying capacity. This is common to shallow embayments and bays lacking a good supply of freshwater from land drainage.

3. *Lagoonal:* An estuary of this type is characterized by low rates of water movement resulting from a lack of significant freshwater influx and a lack of strong tidal exchange because of the typically narrow inlet connecting the lagoon to the sea. Circulation, whose major driving force is wind, is the major limiting factor in biological productivity within lagoons.

B. *Tides:* This is the most important ecological factor in an estuary, as it affects water exchange and its vertical range determines the extent of tidal flats which may be exposed and submerged with each tidal cycle. Tidal action against the volume of river water discharged into an estuary results in a complex system whose properties vary according to estuary structure as well as the magnitude of river flow and tidal range. Tides are usually described in terms of their cycle and their relative heights. In the United States, tide height is reckoned on the basis of average low tide, which is referred to as datum. The tides, although complex, falls into three main categories:

1. *Diurnal:* This refers to a daily change in water level that can be observed along the shoreline. There is one high tide and one low tide per day.

2. *Semidiurnal:* This refers to a twice daily rise and fall in water that can be observed along the shoreline.

3. *Wind/Storm Tides:* This refers to fluctuations in water elevation to wind and storm events, where influence of lunar tides is less.

C. *Freshwater:* According to nearly all the definitions advanced, it is inherent that all estuaries need freshwater, which is drained from the land and measurably dilutes seawater to create a brackish condition. Freshwater enters an estuary as runoff from the land either from a surface and/or subsurface source.

1. *Surface water:* This is water flowing over the ground in the form of streams. Local variation in runoff is dependent upon the nature of the soil (porosity and solubility), degree of surface slope, vegetational type and development, local climatic conditions, and volume and intensity of precipitation.

2. *Subsurface water:* This refers to the precipitation that has been absorbed by the soil and stored below the surface. The distribution of subsurface water depends on local climate, topography, and the porosity and permeability of the underlying soils and rocks. There are two main subtypes of surface water:

a. *Vadose water:* This is water in the soil above the water table. Its volume with respect to the soil, is subject to considerable fluctuation.

b. *Groundwater:* This is water contained in the rocks below the water table, is usually of more uniform volume than vadose water, and generally follows the topographic relief of the land, being high below hills and sloping into valleys.

Group III—Chemical

A. *Salinity:* This reflects a complex mixture of salts, the most abundant being sodium chloride, and is a very critical factor in the distribution and maintenance of many estuarine organisms. Based on salinity, there are two basic estuarine types and eight different salinity zones (expressed in parts per thousand—ppt).

1. *Positive estuary:* This is an estuary in which the freshwater influx is sufficient to maintain mixing, resulting in a pattern of increasing salinity toward the estuary mouth. It is characterized by low oxygen concentration in the deeper waters and considerable organic content in bottom sediments.

2. *Negative estuary:* This is found in particularly arid regions, where estuary evaporation may exceed freshwater inflow, resulting in increased salinity in the upper part of the basin, especially if the estuary mouth is restricted so that tidal flow is inhibited. These are typically very salty (hyperhaline), moderately oxygenated at depth, and possess bottom sediments that are poor in organic content.

3. *Salinity zones (expressed in ppt):*

a. Hyperhaline—greater than 40 ppt.

b. Euhaline—40 ppt to 30 ppt.

c. Mixohaline: 30 ppt to 0.5 ppt.

(1) Mixoeuhaline—greater than 30 ppt but less than the adjacent euhaline sea.

(2) Polyhaline—30 ppt to 18 ppt.

(3) Mesohaline—18 ppt to 5 ppt.

(4) Oligohaline—5 ppt to 0.5 ppt.

d. Limnetic: Less than 0.5 ppt.

B. pH Regime: This is indicative of the mineral richness of estuarine waters and fall into three main categories:

1. Acid: Waters with a pH of less than 5.5.

2. Circumneutral: A condition where the pH ranges from 5.5 to 7.4.

3. Alkaline: Waters with a pH greater than 7.4.

[FR Doc. 90-16511 Filed 7-20-90; 8:45 am]
BILLING CODE 3510-08-M

APPENDIX E

Memoranda of Understanding

APPENDIX E.1

Memorandum of Understanding
NOAA and the State of North Carolina

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE STATE OF NORTH CAROLINA
AND
THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
CONCERNING THE
ESTABLISHMENT AND ADMINISTRATION OF
THE NORTH CAROLINA NATIONAL ESTUARINE SANCTUARY

WHEREAS, the State of North Carolina has determined that the waters and surrounding coastal habitats of the Zeke's Island, Masonboro Island, Rachel Carson, and Currituck Banks components provide unique opportunities for study of natural and human processes occurring within the estuarine ecosystems of the State and for increased public awareness and understanding of such systems, their natural values and benefits to society, and their susceptibility to degradation through natural phenomena and man's activities; and

WHEREAS, the Natural Oceanic and Atmospheric Administration (NOAA), U. S. Department of Commerce has concurred with that finding and pursuant to its authority under Section 315 of the Coastal Zone Management Act of 1972, as amended (CZMA), P.L. 92-583, 16 U.S.C. 1461, and in accordance with implementing regulations at 15 CFR 921.30, may designate these components as a National Estuarine Sanctuary; and

WHEREAS, the Governor of the State of North Carolina has designated the Division of Coastal Management (DCM) to act on behalf of the State in matters concerning the North Carolina National Estuarine Sanctuary (NCNES), the boundaries of which are delineated in the proposed Sanctuary Management Plan (Plan); and

WHEREAS, the DCM, as the agency designated in the Plan and by the State of North Carolina responsible for managing the NCNES, acknowledges the need and requirement for continuing State-Federal cooperation in the long-term management of the sites in a manner consistent with the purposes originally sought through their designation.

NOW, THEREFORE, in consideration of the mutual covenants contained herein it is agreed by and between the DCM and NOAA -- effective immediately for Sanctuary Components at Currituck Banks, Rachel Carson, and Zeke's Island, and in the case of Masonboro Island, on the date of its designation as a component of the NCNES -- as follows:

ARTICLE I: State-Federal Roles in Sanctuary Management

A. The DCM, as the principal contact for the State of North Carolina in all matters concerning the NCNES, will serve to ensure that the Sanctuary is managed in a manner consistent with the goals of the National Estuarine Sanctuary Program and the management objectives of the Plan. Its responsibilities for Plan implementation will include the following:

(1) Effect and maintain a process for coordinating the roles and responsibilities of all State agencies involved in the management of the Sanctuary, including but not limited to:

(a) Enforcement programs regulating water quality, fish and wildlife habitat protection, sport and commercial fisheries, and non-consumptive recreational activities;

(b) The administration of facilities, programs, and tasks related to Sanctuary management;

(c) Activities and programs conducted pursuant to the State's Federally-approved coastal management program authorized under Section 306 of the CZMA; and

(d) Research agenda developed and implemented in accordance with corresponding elements of the proposed Plan;

(2) As the Governor's designee under 15 CFR 921.50 and recipient State entity in matters concerning all financial assistance awards authorized under Section 315 of the CZMA, apply for, budget, and allocate such funds received for supplemental acquisition and development, operation and management, and research;

(3) Prepare and submit to NOAA for its approval an operational strategy which in coordination with the Plan describes how the State of North Carolina intends to meet its long-term commitment to the management of the Sanctuary. The strategy, at a minimum will describe the following:

(a) Specific mediation procedures and resolution mechanisms, developed, jointly with the Sanctuary Programs Division (SPD) within the Office of Ocean and Coastal Resource Management (OCRM), for reaching mutually acceptable solutions for correcting or avoiding conflicts requiring action under 15 CFR 921.35;

(b) The procedures developed in accordance with SPD guidelines and proposed by the State as a means for prescribing contingency responses to emergency conditions that exceed routine Plan implementation; and

(c) The Plan's continuing function, after Federal financial assistance for operations and management ends, as a vehicle for carrying out the mission of the national program; i.e., (i) how the State intends to coordinate Sanctuary management with its coastal resource management decisionmaking process; (ii) the anticipated work program, priorities, and sources of funding for ensuring the continued maintenance of the Sanctuary; and (iii) the means relied upon by the State to assure NOAA that real property acquired with Federal funds for the purposes of the Sanctuary will continue to be used in a manner consistent with 15 CFR 921.21(e);

(4) Serve as principal negotiator on issues involving proposed boundary changes and/or amendments to the Plan;

(5) Submit annual reports to NOAA on the Sanctuary describing, in accordance with 15 CFR 921.34, program performance in Plan implementation

and a detailed work program for the following year of Sanctuary operations, including budget projections and research efforts;

(6) Respond to NOAA's requests for information and to evaluation findings made pursuant to Section 312 of the CZMA; and

(7) In the event that it should become necessary, based on findings of deficiency, serve as the point-of-contact for the State or North Carolina in actions involving the possible withdrawal of Sanctuary designation, as provided at 15 CFR 921.35, the SPD within NOAA will serve to administer the provisions of Section 315 of the CZMA to ensure that the NCNES is managed in accordance with the goals of the National Estuarine Sanctuary Program and the Plan.

B. In carrying out its responsibilities, the SPD will:

(1) Subject to appropriation, provide financial assistance to the State, consistent with 15 CFR 921 Subparts D, E, and F, for managing and operating the Sanctuary;

(2) Serve as the point-of-contact for NOAA in discussions regarding applications for and any financial assistance received by the State under Section 315 of the CZMA, including any and all performance standards, compliance schedules, or Special Award Conditions deemed appropriate by NOAA to ensure the timely and proper execution of the proposed work program;

(3) Participate in periodic evaluations scheduled by OCRM in accordance with Section 312 of the CZMA to measure the State's performance in implementing the Plan and conditions of the award or complying with the Sanctuary designation and, where required, advise the appropriate OCRM staff of existing or emerging Sanctuary issues which might affect the State's coastal management program; and

(4) Establish an information transfer/exchange network cataloging all available research data and educational material developed on each site included within the national system of estuarine sanctuaries.

ARTICLE II: Real Property acquired for the purposes of the Sanctuary

A. The NCNES agrees to the conditions set forth at 15 CFR 921.21(e) which specify the legal documentation reqirements concerning the use and disposition of real property acquired for Sanctuary purposes with Federal funds under Section 315 of the CZMA.

ARTICLE III: Program Evaluation

A. During the period that Federal financial assistance is available for Sanctuary operations and management, the OCRM will schedule, pursuant to 15 CFR 921.34, periodic evaluations of the State's performance in meeting the conditions of such awards and progress in implementing the Plan and the provisions of this MOU. Where findings of deficiency occur, NOAA may initiate action in accordance with the procedures established at 15 CFR 921.35.

B. After Federal financial assistance under Section 315 of the CZMA is no longer available for the operation and management of the Sanctuary,

the OCRM will continue to evaluate, pursuant to Section 312 of the CZMA and the corresponding provisions of 15 CFR 921, the DCM's performance in implementing the Plan and strategy committing the State to the long-term management of the NCNES. Where findings of deficiency occur, NOAA may initiate action in accordance with the procedures established at 15 CFR 921.35.

IN WITNESS THEREOF, the parties hereto have caused this Memorandum to be executed.

David W. Owens

David W. Owens, Director
Division of Coastal Management
Natural Resources and Community Development
State of North Carolina

9/10/85
Date

S. Thomas Rhodes

S. Thomas Rhodes, Secretary
North Carolina Department of Natural Resources and Community Development
State of North Carolina

9/10/85
Date

Dr. Nancy Foster, Chief
Sanctuary Programs Division
Office of Ocean and Coastal Resources Management
National Oceanic and Atmospheric Administration
U. S. Department of Commerce

10/1/85
Date

for Peter L. Tweedt, Director
Office of Ocean and Coastal Resources Management
National Oceanic and Atmospheric Administration
U. S. Department of Commerce

10-10-85
Date

APPENDIX E.2

Memorandum of Understanding
Duke University Marine Laboratory and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the North Carolina Department of Natural Resources and Community Development/Division of Coastal Management and the Duke University Marine Laboratory.

Witnesseth

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of four sites on the North Carolina coast as the North Carolina National Estuarine Sanctuary, and

WHEREAS, the Rachel Carson Component of the North Carolina National Estuarine Sanctuary has been established on the Carrot Island-Bird Shoal complex opposite Beaufort, N. C., and

WHEREAS, the Department of Natural Resources and Community Development is responsible for developing a program to promote and encourage the use of this and other sanctuary sites for research and education, and

WHEREAS, the Marine Laboratory has used the site for decades in their research and educational programs and has faculty members serving on the State and Local Estuarine Sanctuary Advisory Committees, and

WHEREAS, a coordinated effort to provide and promote research and educational use of the Rachel Carson Component will be to the mutual benefit of both parties,

NOW THEREFORE, in consideration of the mutual benefits to be derived, the Signatories agree to the following:

1. The purpose of the Estuarine Sanctuary Program is the protection of lands for use as natural field laboratories and living classrooms in which to gather data and educate the people of North Carolina concerning natural and human processes occurring within North Carolina's estuaries.

2. The Sanctuary Management Plan for the Rachel Carson Component will provide a framework for conducting research and educational programs on the Sanctuary site. The Management Plan has been developed by the Estuarine Sanctuary staff and will be periodically reviewed by the State and Local Advisory Committees and concerned citizens and users of the Sanctuary.

3. The Signatories will adhere to the approved Management Plan in their research and educational activities within the Sanctuary.

4. The Marine Laboratory shall be fully and regularly consulted by the Sanctuary staff regarding research and educational opportunities and information as well as management policies pertaining to the Sanctuary.

5. Educational programs led by the Marine Laboratory's staff will stay within the area of the site designated for public access and shall not in any way interfere with research projects. However, specific visits to research sites may be accommodated by prior consultation and approval of the researcher(s) and the Estuarine Sanctuary Coordinator.

6. The staff of Marine Laboratory shall keep a log of their visitation to the site. These records will be filed periodically with the Sanctuary Coordinator. The Marine Laboratory staff will further notify the Sanctuary Coordinator as necessary of signs of overuse, vandalism, or other damage or deterioration.

Signed,

DUKE UNIVERSITY

Date October 22, 1985

H. Keith H. Brodie, President

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT

Date 9/20/85

for S. Thomas Rhodes, Secretary

APPENDIX E.3

Memorandum of Understanding
Division of Marine Fisheries and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the Division of Marine Fisheries and the Division of Coastal Management within the North Carolina Department of Natural Resources and Community Development.

WITNESSETH

WHEREAS, the State of North Carolina has recieved a grant from the United States Department of Commerce for acquisition and development of four components on the North Carolina coast (see Appendix A) as the North Carolina Estuarine Sanctuary, and

WHEREAS, the Division of Coastal Management is responsible for developing programs to promote research, education, and compatible traditional uses of the sites by coordination with other State agencies, and

WHEREAS, the Division of Marine Fisheries has shown support of the sanctuary program by their representation on local and State Sanctuary Advisory Committees, and

WHEREAS, the Division of Marine Fisheries has the responsibility to regulate the taking of fish and shellfish within the marine and estuarine waters of the State, and

WHEREAS, Marine Fisheries Inspectors are given jurisdiction over all offenses involving property owned, leased to, or managed by the Department in connection with the conservation of marine and estuarine resources by General Statute 113-136(b), and,

WHEREAS, a coordinated effort of site surveillance and enforcement of Marine Fisheries regulations and other rules and regulations as applicable to the North Carolina Estuarine Sanctuary will be to the mutual benefit of both Divisions,

NOW THEREFORE, in consideration of the mutual benefits to be derived, the signatories agree to the following:

1. The purpose of the estuarine sanctuary program is the protection of lands and waters for use as natural field laboratories and living classrooms in which to gather data and educate the public concerning North Carolina's estuaries.

2. The Sanctuary Management Plan provides a framework for conducting research and educational programs on the components. The plan has been developed by the estuarine sanctuary staff and will be periodically reviewed by the State and Local Advisory Committees and concerned citizens and users of the sanctuary components.

3. The Management Plan includes policies on sanctuary use, surveillance, and enforcement. The policies pertaining to traditional and commercial fishing shall be in accordance with statutes (GS 113-182 and GS 143B-286) established by the Marine Fisheries Commission for the taking of fish and shellfish in the marine and estuarine waters of North Carolina.

4. Marine Fisheries Inspectors will routinely patrol the Sanctuary components under their jurisdictions. The Estuarine Sanctuary Coordinator will periodically contact the officers to discuss any significant problems associated with fishing or other uses of the sites.

5. The Division of Coastal Management may request the Division of Marine Fisheries to change the patterns of use within a site (e.g., establish a Research Sanctuary area within a sanctuary component) if necessary for research purposes or protection of natural resources.

6. The Estuarine Sanctuary Coordinator or his representative may request assistance from Marine Fisheries Law Enforcement personnel in matters where service of legal papers or arrests are anticipated because of violations of laws or regulations pertaining to use of sanctuary components (15 NCAC 70 .0202).

Signed,

DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT

Date 4/17/87

for S. Thomas Rhodes, Secretary

DIVISION OF MARINE FISHERIES

Date 4/22/87

William T. Hogarth

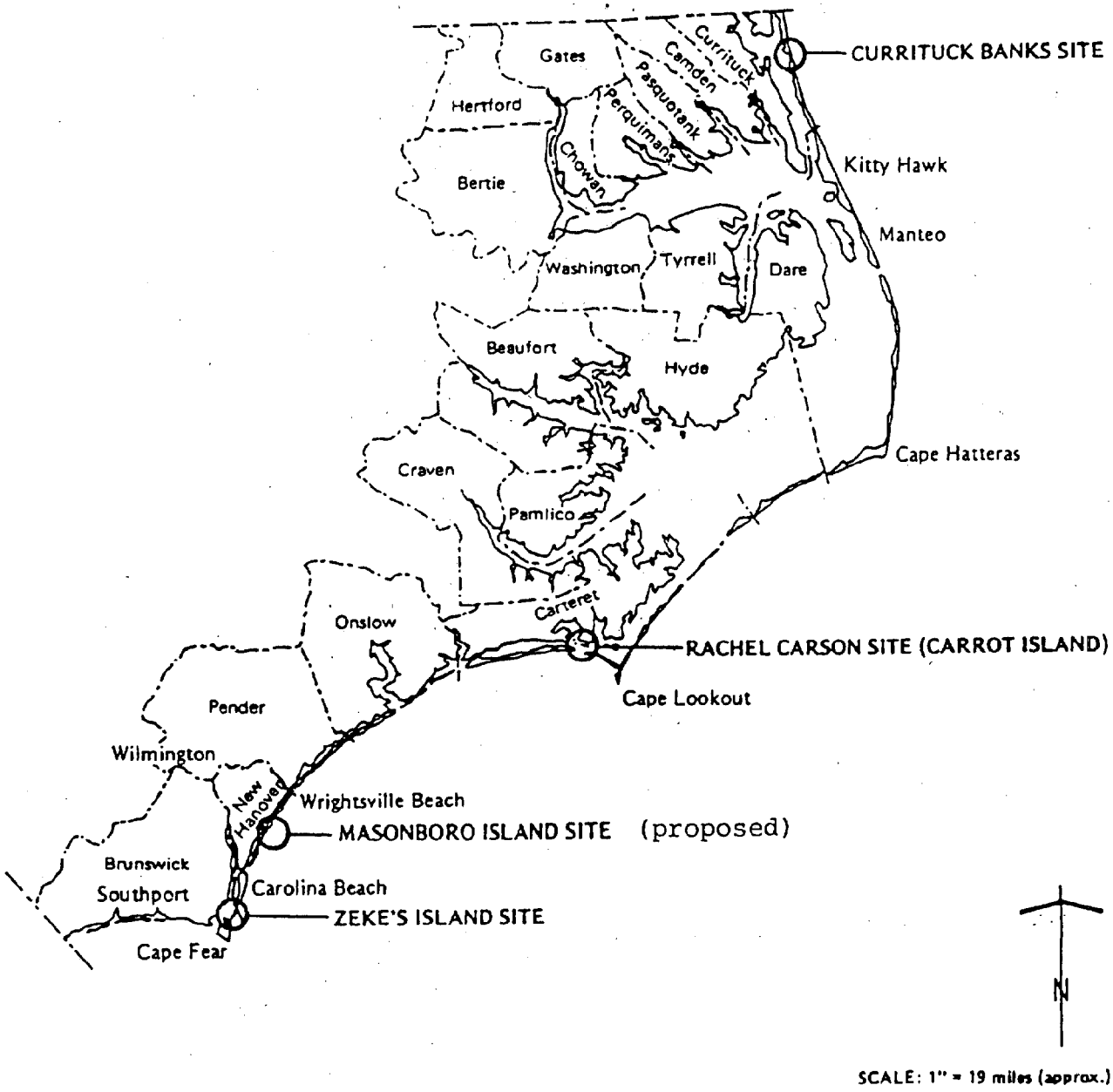
Dr. William T. Hogarth, Director

DIVISION OF COASTAL MANAGEMENT

Date 2/9/87

David W Owens

David W. Owens, Director



APPENDIX A : COMPONENTS OF THE NORTH CAROLINA NATIONAL ESTUARINE SANCTUARY

APPENDIX E.4

Memorandum of Understanding
North Carolina Maritime Museum and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the North Carolina Department of Natural Resources and Community Development/Division of Coastal Management and the North Carolina Department of Agriculture/North Carolina Maritime Museum.

WITNESSETH

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of four sites on the North Carolina coast as the North Carolina National Estuarine Sanctuary, and

WHEREAS, the Rachel Carson Component of the North Carolina National Estuarine Sanctuary has been established on the Carrot Island-Bird Shoal complex opposite Beaufort, N.C., and

WHEREAS, the Department of Natural Resources and Community Development is responsible for developing a program to promote and encourage the use of this and other sanctuary sites for public education, and

WHEREAS, the Department of Agriculture operates the North Carolina Maritime Museum in Beaufort for the purpose of providing public education on estuarine and marine resources, and

WHEREAS, a coordinated effort to provide and promote public educational use of the Rachel Carson Component of the Sanctuary will be to the mutual benefit of both Departments,

NOW THEREFORE, in consideration of the mutual benefits to be derived, the Signatories agree to the following:

1. The purpose of the estuarine sanctuary program is the protection of lands for use as natural field laboratories and living classrooms in which to gather data and educate the people of North Carolina concerning natural and human processes occurring within North Carolina's estuaries.

2. The Sanctuary Management Plan for the Rachel Carson Component will provide a framework for conducting research and educational programs on the sanctuary site. The management plan has been developed by the estuarine sanctuary staff and will be periodically reviewed by the Local and State Advisory Committees and concerned citizens and users of the Sanctuary.

3. The Signatories will adhere to the approved management plan in their on-site and off-site educational activities within the Sanctuary.

4. The North Carolina Maritime Museum shall be fully and regularly consulted by the sanctuary staff regarding educational opportunities and policies on the sanctuary site.

5. The staff of the Museum will continue existing on-site and off-site educational programs for the Sanctuary. The estuarine sanctuary staff will work with the Museum staff to expand these on-site programs and to develop off-site educational programs and materials (e.g., slide shows, exhibits, brochures) specifically for this site.

6. On-site educational programs led by the Museum's staff will stay within the area of the site designated for public access and shall not in any way interfere with research projects. However, specific visits to research sites may be accommodated by prior consultation and approval of the researcher(s) and the Estuarine Sanctuary Coordinator.

7. The staff of the North Carolina National Estuarine Sanctuary shall provide the Museum staff with periodic updates on the research and educational information available from the sanctuary sites as well as other sanctuary programs which might be applicable to the Museum's educational programs.

8. The staff of the Museum shall keep a log of their visitation to the site. These records will be filed periodically with the Sanctuary Coordinator. They will further notify the Coordinator as necessary of signs of overuse, vandalism, or other damage or deterioration.

Signed,

DEPARTMENT OF AGRICULTURE

DATE 3/1/85

James A. Graham, Commissioner

NORTH CAROLINA MARITIME MUSEUM

DATE 3/10/85

Charles R. McNeill, Director

DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT

DATE 2/26/85

S. Thomas Rhodes, Secretary

DIVISION OF COASTAL MANAGEMENT

DATE 2-26-85

David W. Owens, Director

APPENDIX E.5

Memorandum of Understanding
Division of Parks and Recreation and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the Division of Coastal Management and the Division of Parks and Recreation within the North Carolina Department of Natural Resources and Community Development.

WITNESSETH

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of four sites on the coast of North Carolina as the North Carolina National Estuarine Sanctuary, and

WHEREAS, the Zeke's Island Component of the Sanctuary has been established (see Appendix A) south of Fort Fisher, NC., and

WHEREAS, the Division of Coastal Management is responsible for developing programs to promote research, education, and traditional uses of the site by coordination with other state agencies, and

WHEREAS, the Division of Parks and Recreation manages adjacent state-owned lands comprising the Fort Fisher Management Area, and

WHEREAS, a coordinated effort to manage the Zeke's Island Component will be to the mutual benefit of both Divisions.

NOW THEREFORE, in consideration of the mutual benefits to be derived, the signatories agree to the following:

1. The purpose of the estuarine sanctuary program is the protection of lands for use as natural field laboratories and living classrooms in which to gather date and educate the public concerning North Carolina's estuaries.

2. The Sanctuary Management Plan provides a framework for conducting research and educational programs on the sanctuary site. The management plan has been developed by the estuarine sanctuary staff and will be periodically reviewed by the Local Advisory Committee and concerned citizens and users of the Sanctuary.

3. The Division of Parks and Recreation ranger stationed out of Carolina Beach State Park, will provide reconnaissance of the Zeke's Island component on a random basis during the weekly patrol of Baldhead Island. Obvious violations or pertinent management plan regulations will be enforced where practicable. Observed violations which cannot be easily enforced will be reported to other enforcement agencies and/or to the Sanctuary Coordinator. Daily patrol of the barrier spit will be maintained.

4. The Sanctuary Coordinator shall assist the Ranger thru administrative channels (e.g., the Attorney General's Office) with any management issues pertaining to the Component.

5. The Ranger and the Sanctuary Coordinator will regularly discuss the various visitor use issues concerning the Component.

6. This memorandum may be amended to include other cooperative management efforts by the two Divisions.

Signed,

DEPARTMENT OF NATURAL RESOURCES
AND COMMUNITY DEVELOPMENT

Date 7/24/85

for S. Thomas Rhodes, Secretary

DIVISION OF PARKS AND RECREATION

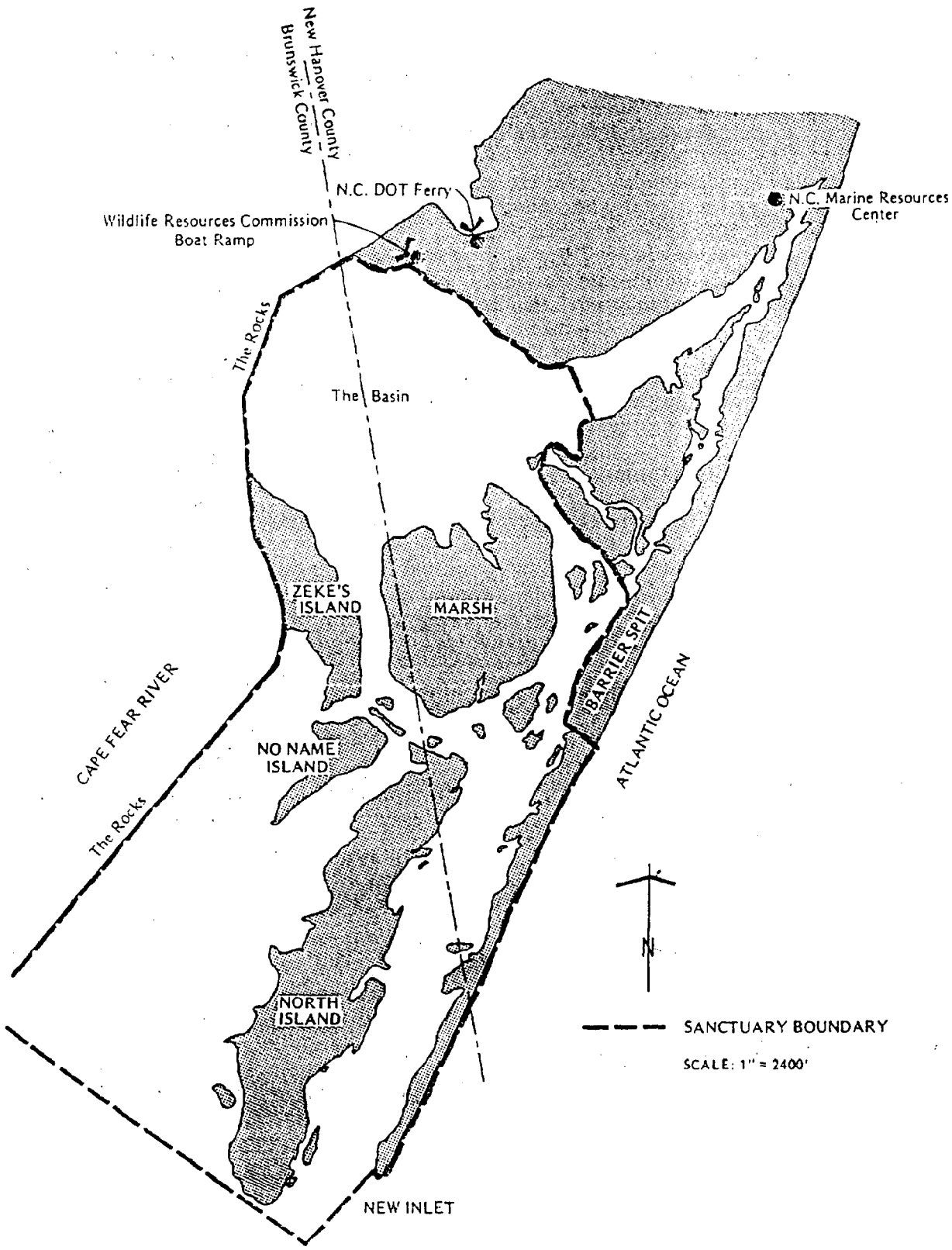
Date 7/16/85

William W. Davis, Director

DIVISION OF COASTAL MANAGEMENT

Date 7.16.85

David W. Owens, Director



APPENDIX A : PHYSIOGRAPHIC FEATURES OF THE ZEKE'S ISLAND SITE

APPENDIX E.6

Memorandum of Understanding
Office of Marine Affairs and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the North Carolina Department of Natural Resources and Community Development/Office of Coastal Management and the North Carolina Department of Administration/ Office of Marine Affairs.

WITNESSETH

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of sites on the North Carolina Coast (see Appendix A) as the North Carolina National Estuarine Sanctuary (the Sanctuary), and

WHEREAS, the purpose of such a grant is to create new opportunities for coordinated North Carolina estuarine research and public education (the Program), and

WHEREAS, such a program has wide public support, and

WHEREAS, the signatories have already evidenced support for the program since its inception in 1982 by scheduling public field trips to the Zeke's Island, Masonboro Island, Rachel Carson, and Currituck Banks components, and by providing use of the Marine Resources Center facilities for meetings concerning the Sanctuary,

NOW THEREFORE, in consideration of the mutual benefits to be derived from implementing this program, the signatories agree to the following:

1. The sites shown in Appendix A are hereby designated as the North Carolina National Estuarine Sanctuary.

2. The Sanctuary has a Management Plan which provides a framework for conducting research and educational programs. The Management Plan, (the Plan) is being developed by the Estuarine Sanctuary Staff and reviewed by the Local and State Advisory Committees (including representatives from the Office of Marine Affairs).

3. The Office of Marine Affairs shall be represented on each of the Sanctuary Advisory Committees.

4. The purpose of the Program is the protection of such lands for use as a natural field laboratory and living classrooms in which to gather data and educate the people of North Carolina concerning natural and human processes occurring within North Carolina's coastal estuaries.

5. The Signatories will adhere to the Management Plan in their on-site and off-site educational activities within the Sanctuary System.

6. The staff of the Marine Resources Center (the Center) will continue existing on-site and off-site educational programs for the Sanctuary sites. The Estuarine Sanctuary staff will work with the Center staff to expand these on-site programs and to develop off-site educational programs (e.g., slide shows, exhibits, brochures) specifically for the Sanctuary.

7. On-site educational programs led by the Centers' staff will stay within the areas of the site(s) designated for public access, and shall not in any way interfere with research projects. However, specific visits to research sites may be accomodated by prior consultation and approval of the researcher(s) and the Sanctuary Coordinator.

8. The staff of the North Carolina National Estuarine Sanctuary shall provide the Centers' staff with periodic updates on the research and educational information available from the Sanctuary sites as well as other Sanctuary Programs, which might be applicable to the Center's educational programs.

9. The staff of the Marine Resources Centers shall keep a log of their visitation at each site. These records will be filed periodically with the Sanctuary Coordinator. They will notify the Coordinator as necessary of signs of overuse, vandalism, or other damage or deterioration so that these may be attended to.

10. This Memorandum of Understanding shall continue in effect in perpetuity. In the event either signatory should desire to amend this Memorandum both signatories shall meet and discuss the effects of such amendments on both the Sanctuary and the staffs of the respective agencies.

When the signatories agree upon a mutually satisfactory alternative that enhances or at least preserves the research and education values and the integrity of the Sanctuary and its component sites this Memorandum will be suitably amended and signed.

Signed,

DEPARTMENT OF ADMINISTRATION

Date 12/28/84

Jane Smith Patterson
Jane Smith Patterson, Secretary

OFFICE OF MARINE AFFAIRS

Date 12/20/84

J. C. Jones, Director

DEPARTMENT OF NATURAL RESOURCES
AND COMMUNITY DEVELOPMENT

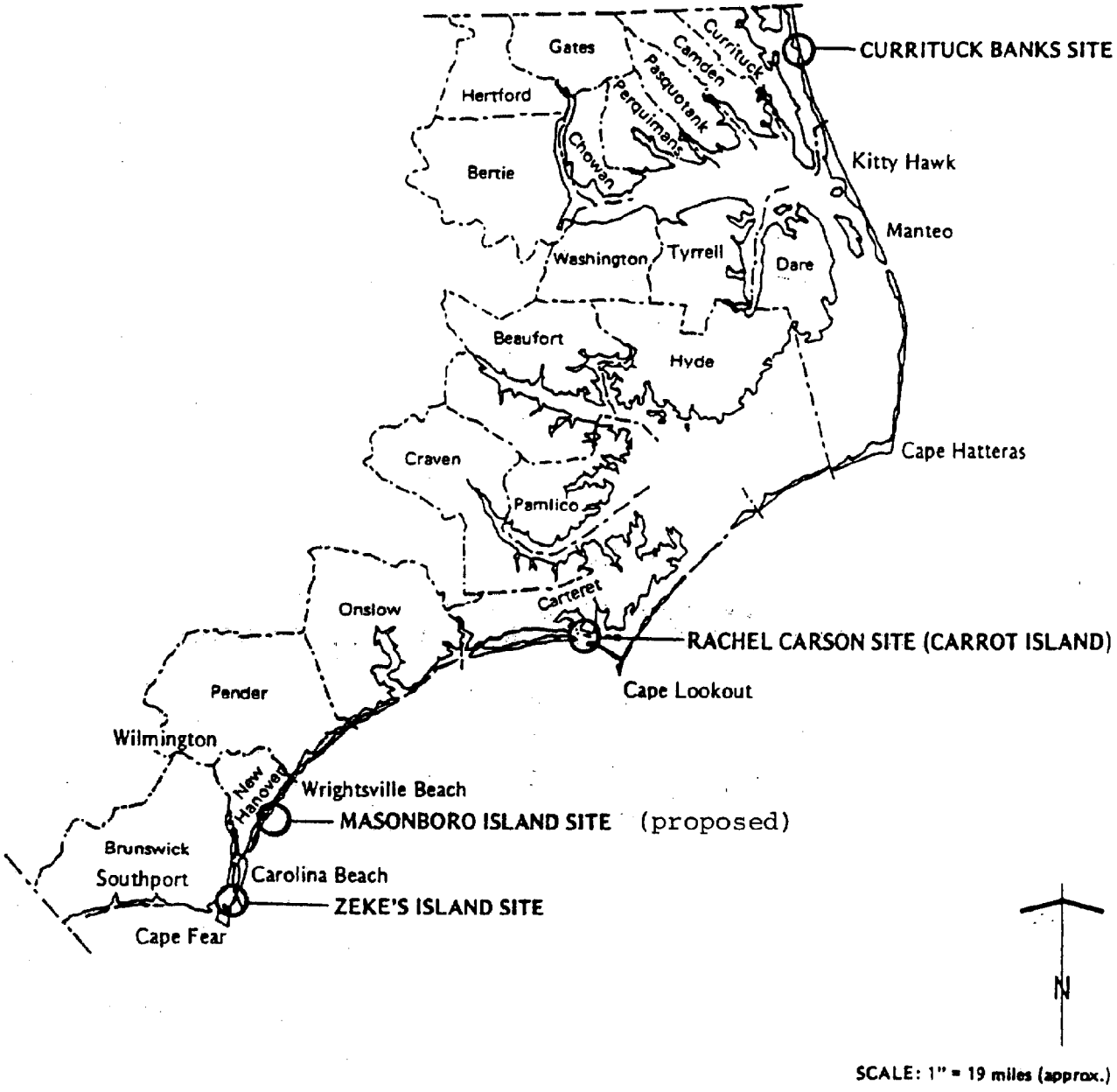
Date 12/20/84

James A. Summers
James A. Summers, Secretary

OFFICE OF COASTAL MANAGEMENT

Date 12.7.84

David W. Owens
David W. Owens, Director



APPENDIX A : COMPONENTS OF THE NORTH CAROLINA NATIONAL ESTUARINE SANCTUARY

APPENDIX E.7

Memorandum of Understanding
State Museum of Natural History and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the North Carolina Department of Natural Resources and Community Development/Division of Coastal Management and the North Carolina Department of Agriculture/ State Museum of Natural History.

WITNESSETH

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of four sites (see Appendix A) on the North Carolina coast as the North Carolina National Estuarine Sanctuary, and

WHEREAS, the Department of Natural Resources and Community Development is responsible for developing a program to promote and encourage the use of these sites for public education, and

WHEREAS, the Museum has established natural science education and faunal research programs, and

WHEREAS, a coordinated effort to provide and promote public educational and scientific use of the Sanctuary will be to the mutual benefit of both Departments,

NOW THEREFORE, in consideration of the mutual benefits to be derived, the signatories agree to the following:

1. The purpose of the estuarine sanctuary program is the protection of lands for use as natural field laboratories and living classrooms in which to gather data and educate the public concerning North Carolina's estuaries.

2. The Sanctuary Management Plan provides a framework for conducting research and educational programs on the sanctuary sites. The management plan has been developed by the estuarine sanctuary staff and will be periodically reviewed by the Local and State Advisory Committees and concerned citizens and users of the Sanctuary.

3. The Signatories will adhere to the approved management plan in their research activities and on-site and off-site educational programs involving the Sanctuary.

4. The State Museum of Natural History will be fully and regularly consulted by the sanctuary staff regarding research and educational opportunities and policies of the Sanctuary.

5. The estuarine sanctuary staff will work with the Museum staff to develop off-site educational programs and materials (e.g., slide shows, exhibits, brochures) specifically for the sites.

6. On-site educational programs led by the Museum staff will stay within the area of the sites designated for public access and will not in any way interfere with research projects. However, specific visits to research sites may be accommodated by prior consultation and approval of the researcher(s) and the Estuarine Sanctuary Coordinator.

7. The staff of the North Carolina National Estuarine Sanctuary will provide the Museum staff with periodic updates on the research and educational information available from the sanctuary sites as well as other sanctuary programs which might be applicable to Museum educational programs.

8. The Museum staff will keep a log of visitation to the Sanctuary. These records will be filed periodically with the Sanctuary Coordinator. They will further notify the Coordinator as necessary of signs of overuse, vandalism, or other damage or deterioration.

Signed,

NORTH CAROLINA DEPARTMENT
OF AGRICULTURE

DATE 5/15/85

James A. Graham, Commissioner

NORTH CAROLINA STATE MUSEUM
OF NATURAL HISTORY

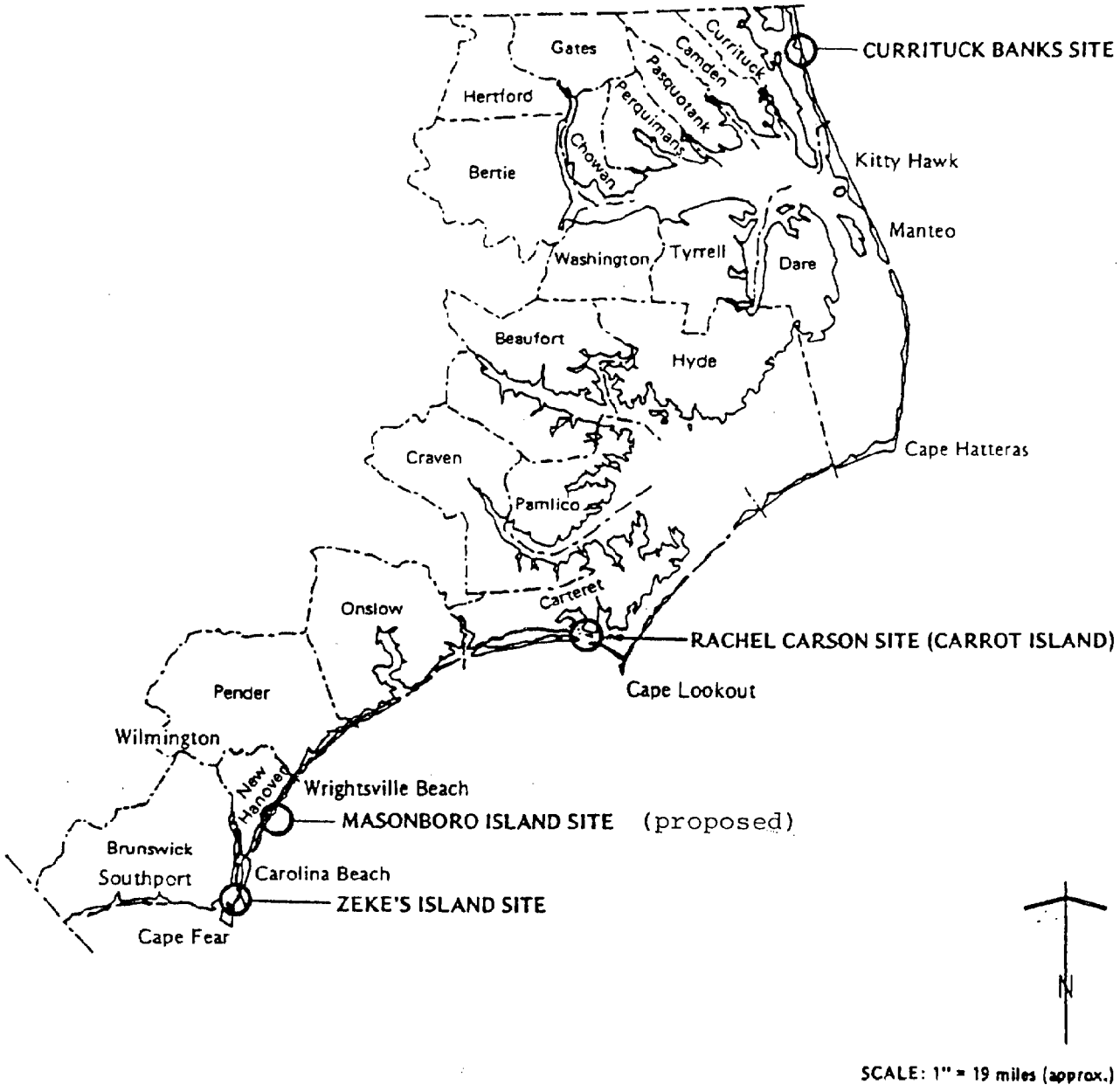
DATE 5-10-85

Dr. John B. Funderburg, Director

NORTH CAROLINA DEPARTMENT OF
NATURAL RESOURCES AND COMMUNITY
DEVELOPMENT

DATE 4/25/85

for S. Thomas Rhodes, Secretary
DEPUTY SECRETARY



APPENDIX A : COMPONENTS OF THE NORTH CAROLINA NATIONAL ESTUARINE SANCTUARY

APPENDIX E.8

Memorandum of Understanding
U.N.C. Sea Grant College Program and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the North Carolina Department of Natural Resources and Community Development/Division of Coastal Management and the University of North Carolina Sea Grant College Program.

WITNESSETH

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of four sites (see Appendix A) on the North Carolina coast as the North Carolina National Estuarine Sanctuary, and

WHEREAS, the Department of Natural Resources and Community Development is responsible for developing a program to promote and encourage the use of these sites for public education, and

WHEREAS, the Sea Grant College Program has as one of its goals the education of the public concerning estuarine and marine resources, and

WHEREAS, a coordinated effort to provide and promote research and public educational use of the Sanctuary will be to the mutual benefit of both agencies,

NOW THEREFORE, in consideration of the mutual benefits to be derived, the signatories agree to the following:

1. The purpose of the Estuarine Sanctuary Program is the protection of lands for use as natural field laboratories and living classrooms in which to gather data and educate the public concerning North Carolina's estuaries.

2. The Sanctuary Management Plan provides a framework for conducting research and educational programs on the Sanctuary sites. The management plan has been developed by the Estuarine Sanctuary staff and will be periodically reviewed by the Local and State Advisory Committees and concerned citizens and users of the Sanctuary.

3. The Signatories will adhere to the approved management plan in their on-site and off-site educational activities concerning the Sanctuary.

4. The Sea Grant Program and the Estuarine Sanctuary Program shall encourage the best researchers to conduct their research in and around the sites in accordance with National Estuarine Sanctuary Program regulations.

5. The Estuarine Sanctuary staff will work with the Sea Grant Education Specialist to develop off-site educational programs and materials (e.g., slide shows, exhibits, brochures) specifically for the sites.

6. On-site educational programs led by the Sea Grant staff will stay within the area of the site(s) designated for public access and will not in any way interfere with research projects. However, specific visits to research sites may be accommodated by prior consultation and approval of the researcher(s) and the Estuarine Sanctuary Coordinator.

7. The staff of the North Carolina National Estuarine Sanctuary will provide the Sea Grant Education Specialist with periodic updates on the research and educational information available from the Sanctuary sites which might be applicable to Sea Grant educational programs.

8. The Sea Grant Education Specialist will keep a log of visitation to the Sanctuary. These records will be filed periodically with the Sanctuary Coordinator. The Specialist will further notify the Coordinator if a given site exhibits signs of overuse, vandalism, or other damage or deterioration.

Signed,

UNIVERSITY OF NORTH CAROLINA
SEA GRANT COLLEGE PROGRAM

Date 14 Jan 86

B J Copeland
Dr. B. J. Copeland, Director

MARINE ADVISORY SERVICE

Date 1/14/86

James D. Murray
James D. Murray, Director

DEPARTMENT OF NATURAL RESOURCES
AND COMMUNITY DEVELOPMENT

Date 12/30/85

for S. Thomas Rhodes, Secretary

APPENDIX E.9

Memorandum of Understanding/Cooperative Agreement
University of North Carolina at Wilmington
and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the North Carolina Department of Natural Resources and Community Development/Division of Coastal Management and the University of North Carolina at Wilmington.

Witnesseth

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of four sites on the North Carolina coast as the North Carolina National Estuarine Sanctuary, and

WHEREAS, the Zeke's Island and Masonboro Island Components of the North Carolina National Estuarine Sanctuary have been established in New Hanover/ Brunswick Counties, and

WHEREAS, the Department of Natural Resources and Community Development is responsible for developing a program to promote and encourage the use of these and other Sanctuary sites for research and education, and

WHEREAS, the University of North Carolina at Wilmington has for years used both sites for research and educational activities and has faculty members on the State and Local Estuarine Sanctuary Advisory Committees, and

WHEREAS, a coordinated effort to provide and promote research and educational use of the Components will be to the mutual benefit of both parties,

NOW THEREFORE, in consideration of the mutual benefits to be derived, the Signatories agree to the following:

1. The purpose of the Estuarine Sanctuary Program is the protection of lands for use as natural field laboratories and living classrooms in which to gather data and educate the people of North Carolina concerning natural and human processes occurring within North Carolina's estuaries.

2. The Sanctuary Management Plan will provide a framework for conducting research and educational programs on the Sanctuary sites. The Management Plan has been developed by the Estuarine Sanctuary staff and will be periodically reviewed by the State and Local Advisory Committees and concerned citizens and users of the Sanctuary.

3. The Signatories will adhere to the approved Management Plan in their research and educational use of the Sanctuary.

4. The University shall be fully and regularly consulted by the Sanctuary staff regarding research and educational opportunites and information as well as management policies pertaining to the Sanctuary.

5. Educational programs led by the University staff will stay within the area of the site designated for public access and shall not in any way interfere with research projects. However, specific visits to research sites may be accommodated by prior consultation and approval of the researcher(s) and the Estuarine Sanctuary Coordinator.

6. The staff of the University shall keep a log of their visitation to the sites. These records will be filed periodically with the Sanctuary Coordinator. The University staff will further notify the Sanctuary Coordinator as necessary of signs of overuse, vandalism, or other deterioration.

Signed,

UNIVERSITY OF NORTH CAROLINA
AT WILMINGTON

Date 11/25/85

Dr. William H. Wagoner, Chancellor

UNIVERSITY OF NORTH CAROLINA
AT WILMINGTON, OFFICE OF RESEARCH
ADMINISTRATION

Date 11/20/85

Dr. John J. Manock, Director

NORTH CAROLINA DEPARTMENT OF
NATURAL RESOURCES AND COMMUNITY
DEVELOPMENT

Date 11/14/85

S. Thomas Rhodes, Secretary

COOPERATIVE AGREEMENT

The University of North Carolina at Wilmington proposes to enter into an agreement with the Division of Coastal Management to assist with the administration of the North Carolina Estuarine Research Reserve Program.

I. Purpose of the North Carolina Estuarine Research Reserve Program (NCERRP) and Mission of the Division of Coastal Management (DCM).

The purpose of the NCERRP is to acquire, develop, and manage natural field laboratories in which to study natural and human processes occurring within the coastal estuaries of North Carolina. The program preserves undisturbed areas, supports scientific research, encourages education within the reserve, and allows traditional uses that are compatible.

The Coordinator of this program ensures the effective management of North Carolina's multiple-site system and maintains continuous communication among Federal, State and Local participants. The activities associated with the position are self-directed, with priorities and tasks determined by individual judgment. The Coordinator's responsibilities include four ongoing segments:

-Federal grant administration
-Liaison among program participants, state agencies, and users of the sanctuary
-Development and updating resource management plans
-Program implementation

II. Mission and Objectives of the Center for Marine Science Research (CMSR) and the University of North Carolina at Wilmington (UNCW).

The mission of the CMSR is to promote basic and applied research. Specific goals are as follows:

A. To promote basic research in the fields of oceanography, coastal and wetland science, marine biotechnology and aquaculture, and marine biomedical and environment physiology;

B. To support publication of research findings and to aid information dissemination;

C. To provide technical support and other services which will create an environment conducive to developing multidisciplinary projects;

D. To support the University's instructional programs by providing opportunities for undergraduate and graduate training in marine-related research;

E. To initiate research efforts in the application of basic knowledge as a response to local, state, and national needs and to provide information to local, state, and federal agencies which can contribute to marine science policy decisions.

III. The Objectives of the Agreement.

The University of North Carolina at Wilmington is organized to conduct educational, research, and public services programs designed to benefit people of North Carolina and specifically people of the coastal region of North Carolina. The Division of Coastal Management is responsible for the administration of the North Carolina Estuarine Research Reserve Program which involves the implementation of management, educational, and research programs centered around these estuarine reserves. UNCW and DCM are mutually interested in and desire to cooperate in conducting the NCERRP which will be facilitated by utilizing resources available to both agencies. The specific objectives are:

A. To locate the Estuarine Research Reserve Program and the Program Coordinator on the Campus of the University of North Carolina at Wilmington in the Center for Marine Science Research in order to facilitate the use of University resources by the ERRP.

B. To facilitate cooperation between the University and the Division of Coastal Management in ensuring that the purpose of the ERRP is met.

C. To allow the Program Coordinator to interact with academic programs through the CMSR, and be available to assist with graduate research and the instructional program.

IV. The Agreement.

A. The Division of Coastal Management agrees to:

1. Provide funding for a program coordinator, an assistant coordinator and to support the program activities (ex. travel, printing, supplies, equipment and etc.) of the North Carolina Estuarine Research Reserve Program.

2. Consult with the Director of the Center for Marine Science Research in the selection of a coordinator who is qualified to contribute to the instructional programs of an appropriate academic department, and to assist graduate student research projects.

3. Allow the coordinator to contribute to the academic programs of the University by assisting with graduate student research training.

B. The University agrees to:

1. Provide office space and the usual utilities and services for the coordinator of the ERRP.

2. Permit the Coordinator use of laboratories, secretarial services, general equipment and materials on the same basis as faculty members at the University.

3. Make available to the Coordinator in accordance with University policy and procedures Computer Center services, boats, motors, trailers, motor vehicles and other services at the rate charged other university programs.

4. Encourage appropriate faculty and staff cooperation.

5. Recommend qualified personnel of the ERRP as adjunct members of an appropriate academic department and admit them to all faculty privileges appropriate to their rank and position.

V. Funding.

Each party's contribution to the ERRP budget shall be determined by mutual agreement prior to submission of biennial budget requests.

VI. Review.

The activities of the ERRP at UNCW will be reviewed annually by the Director of the Center for Marine Science Research at the University and the Director of the Division of Coastal Management to insure continued harmony with University and DCM objectives.

This agreement may be terminated by either party by giving notice to the other in writing at least sixty days prior to the proposed date of termination.

The Division of Coastal Management and the University of North Carolina at Wilmington agree to this Cooperative Agreement for the Administration of the North Carolina Estuarine Research Reserve Program beginning December 1, 1989.

For the Division of Coastal Management and the Department of Environment, Health and Natural Resources.

George T. Everett — November 22, 1989

Dr. George Everett , Director — Date

For the University of North Carolina at Wilmington

[signature] — 12/1/89

Dr. Charles L. Cahill
Vice Chancellor & Provost — Date

William H. Wagoner — 12/1/89

Dr. William H. Wagoner, Chancellor — Date

APPENDIX E.10

Memorandum of Understanding
The U.S. Fish and Wildlife Service, The Nature Conservancy,
and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

between

U.S. Fish and Wildlife Service,

The Nature Conservancy

and the

North Carolina Department of Natural

Resources and Community Development/

Division of Coastal Management

This Memorandum of Understanding serves as an expression of intent among three parties-in-interest, hereinafter called the Signatories: the U.S. Fish and Wildlife Service, The Nature Conservancy, and the North Carolina Department of Natural Resources and Community Development/Division of Coastal Management.

The authority to enter into this Memorandum of Understanding is 16 U.S.C. 661 (the Fish and Wildlife Coordination Act) and 16 U.S.C. 715k (the Migratory Bird Conservation Act).

Witnesseth:

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of four sites on the North Carolina coast known as the North Carolina National Estaurine Sanctuary, and

WHEREAS, the Currituck Banks Component has been established just north of Corolla, North Carolina, and

WHEREAS, the North Carolina National Estuarine Sanctuary Management Plan outlines policies for research, education, compatible traditional uses and management practices permitted on the Component, and

WHEREAS, the State of North Carolina, The Nature Conservancy, and the U.S. Fish and Wildlife Service own adjacent tracts of land in the area, namely: the U.S. Fish and Wildlife Service has established the Currituck National Wildlife Refuge, and The Nature Conservancy owns lands north of Corolla, and

WHEREAS, a coordinated effort to preserve and protect the Currituck Outer Banks will be to the mutual benefit of all parties.

NOW THEREFORE, in consideration of the mutual benefits to be derived, the Signatories agree to the following:

1. The Signatories will coordinate and cooperate to insure that management activities on their respective areas do not adversely affect the land, its wildlife, natural and scenic values, and each other's management programs.

2. When compatible, the Signatories agree to allow Estuarine Sanctuary research and educational programs on all tracts owned by the Signatories after proper issuance of permits by the appropriate party. The tracts will be technically included in the Sanctuary from research and educational standpoints; however, individual management prerogatives will be maintained by each Signatory for their respective property.

3. The Coordinator of the Estuarine Sanctuary Program shall regularly discuss proposed and ongoing research and educational activities on the properties managed by the other Signatories.

4. The Signatories agree that emergency upland access may be used by local residents only in the event that high water conditions prohibit the customary use of the ocean beach for access across the properties.

5. The Signatories agree to notify each other if any vandalism, misuse of property or other problems are observed on the respective tracts during routine patrols of the area.

6. The Signatories will be represented on the Currituck Banks Local Advisory Committee which will give input and management suggestions on the management of the Currituck Banks Component of the National Estuarine Sanctuary.

This Memorandum of Understanding will become effective upon execution of all Signatories and remain in effect for 5 years thereafter. This Memorandum of Understanding can be extended by mutual written agreement of all Signatories. Any Signatory may terminate this memorandum by providing sixty (60) days written notice to the other Signatories.

U.S. FISH AND WILDLIFE SERVICE

Date: June 24, 1986

Regional Director (James W. Pulliam, Jr.)

THE NATURE CONSERVANCY

Date: Aug 4, 1986

Thomas M. Massengale, Vice President

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT

Date: 7/14/86

S. Thomas Rhodes, Secretary

APPENDIX E.11

Memorandum of Understanding
Wildlife Resources Commission and Division of Coastal Management

MEMORANDUM OF UNDERSTANDING

This memorandum serves as an expression of intent between the Wildlife Resources Commission and the Division of Coastal Management within the North Carolina Department of Natural Resources and Community Development.

WITNESSETH

WHEREAS, the State of North Carolina has received a grant from the United States Department of Commerce for acquisition and development of four components on the North Carolina coast (see Appendix A) as the North Carolina National Estuarine Sanctuary, and

WHEREAS, the Division of Coastal Management is responsible for developing programs to promote research, education, and compatible traditional uses of the sites by coordination with other state agencies, and

WHEREAS, the Wildlife Resources Commission has the responsibility to regulate the taking of game and certain fish species, and

WHEREAS, the Wildlife Resources Commission has shown support of the sanctuary program by their representation on the State Sanctuary Advisory Committee, and

WHEREAS, a coordinated effort of site surveillance and enforcement of hunting regulations will be to the mutual benefit of both Divisions,

NOW THEREFORE, in consideration of the mutual benefits to be derived, the signatories agree to the following:

1. The purpose of the estuarine sanctuary program is the protection of lands for use as natural field laboratories and living classrooms in which to gather data and educate the public concerning North Carolina's estuaries.

2. The Sanctuary Management Plan provides a framework for conducting research and educational programs on the sanctuary site. The management plan has been developed by the estuarine sanctuary staff and will be periodically reviewed by the Local Advisory Committee and concerned citizens and users of the Sanctuary.

3. The Management Plan includes policies on sanctuary use, surveillance, and enforcement. The policies pertaining to traditional hunting shall be in accordance with those regulations (General Statues of N. C. Article 22, GS 113, 291-294) established by the Wildlife Resources Commission for the taking of game in North Carolina.

4. Wildlife Resources enforcement officers will routinely patrol the sanctuary sites under their jurisdictions. The Estuarine Sanctuary Coordinator will periodically contact the officers to discuss any significant problems associated with hunting at the sites.

5. The Division of Coastal Management may petition the Wildlife Resources Commission to change the hunting use within a site (e.g., shorten the hunting season in a sanctuary component) if necessary for research purposes or protection of natural resources.

Signed,

DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT

Sarah H. Umstead
Witness

for S. Thomas Rhodes, Secretary

WILDLIFE RESOURCES COMMISSION

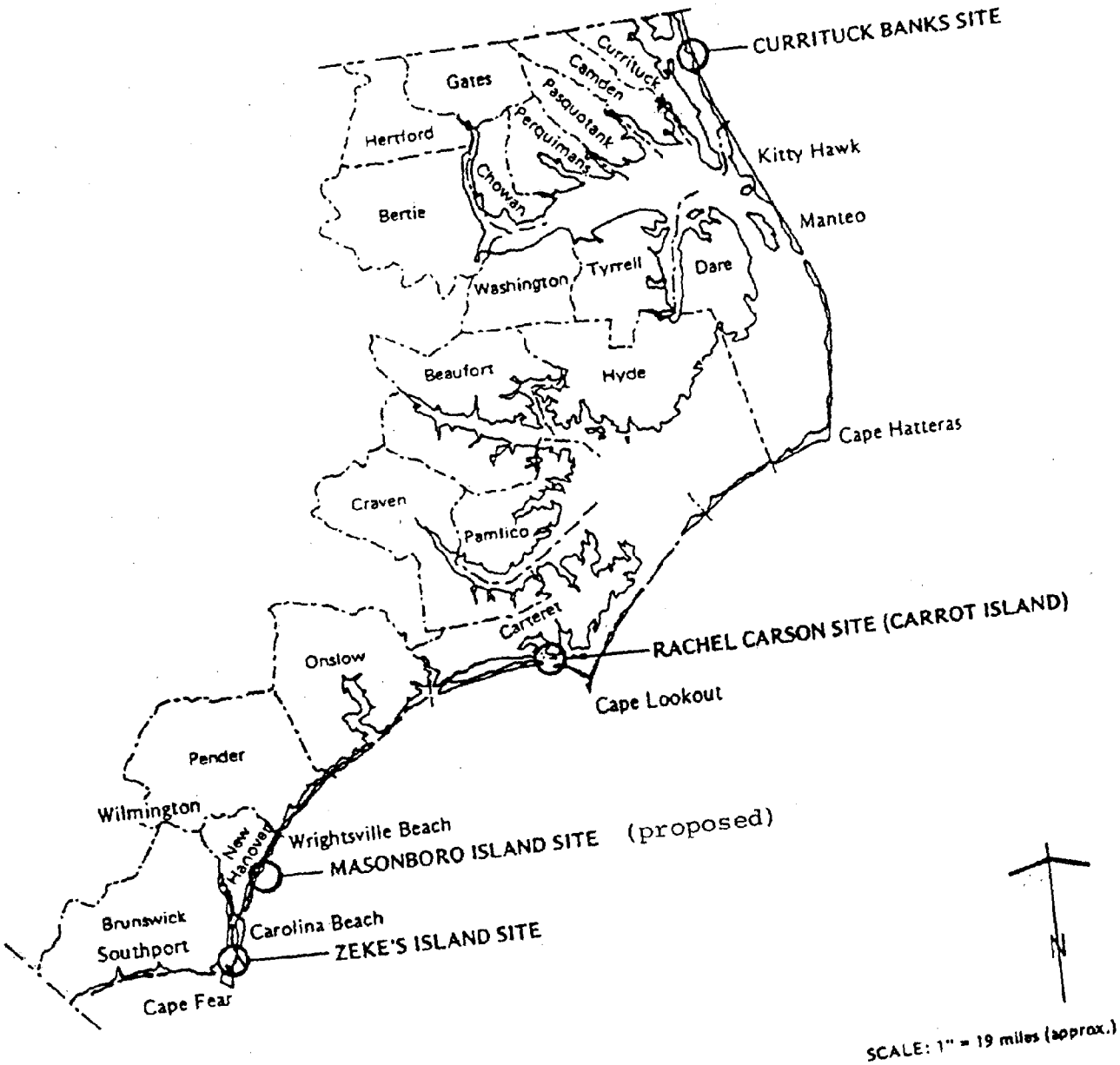
Delphia L. Thomas
Witness 7/17/85

W. Vernon Bevill
W. Vernon Bevill, Executive Director

DIVISION OF COASTAL MANAGEMENT

Date July 8, 1985

David W. Owens
David W. Owens, Director



APPENDIX A : COMPONENTS OF THE NORTH CAROLINA NATIONAL ESTUARINE SANCTUARY

APPENDIX F

Coastal Reserve Act

CASE NOTES

Trial Court without Jurisdiction. — The trial court was without jurisdiction in a declaratory judgment action to pass upon the question of whether subsection (d)(1)c of this section authorizes warrantless searches in violation of the Fourth Amendment where the plaintiffs did not allege that they had been subject to actual searches or that they had been fined for refusing access to investigators. Adams v. North Carolina Dep't of Natural & Economic Resources, 295 N.C. 683, 249 S.E.2d 402 (1978).

§ 113A-127. Coordination with the federal government.

All State agencies shall keep informed of federal and interstate agency plans, activities, and procedures within their area of expertise that affect the coastal area. Where federal or interstate agency plans, activities or procedures conflict with State policies, all reasonable steps shall be taken by the State to preserve the integrity of its policies. (1973, c. 1284, s. 1; 1975, c. 452, s. 5; 1981, c. 932, s. 2.1.)

§ 113A-128. Protection of landowners' rights.

Nothing in this Article authorizes any governmental agency to adopt a rule or issue any order that constitutes a taking of property in violation of the Constitution of this State or of the United States. (1973, c. 1284, s. 1; 1975, c. 452, s. 5; 1981, c. 932, s. 2.1; 1987, c. 827, s. 144.)

§ 113A-129: Reserved for future codification purposes.

Part 5. Coastal Reserves.

§ 113A-129.1. Legislative findings and purposes.

(a) Findings. — It is hereby determined and declared as a matter of legislative finding that the coastal area of North Carolina contains a number of important undeveloped natural areas. These areas are vital to continued fishery and wildlife protection, water quality maintenance and improvement, preservation of unique and important coastal natural areas, aesthetic enjoyment, and public trust rights such as hunting, fishing, navigation, and recreation. Such land and water areas are necessary for the preservation of estaurine areas of the State, constitute important research facilities, and provide public access to waters of the State.

(b) Purposes. — Important public purposes will be served by the preservation of certain of these areas in an undeveloped state. Such areas would thereafter be available for research, education, and other consistent public uses. These areas would also continue to contribute perpetually to the natural producitivity and biological, economic, and aesthetic values of North Carolina's coastal area. (1989, c. 344, s. 1.)

Editor's Note. — Session Laws 1989, c. 344, s. 3, makes this Part effective upon ratification. The act was ratified June 19, 1989.

§ 113A-129.2. Coastal Reserve Program.

(a) There is hereby created a North Carolina Coastal Reserve System for the purpose of acquiring, improving, and maintaining undeveloped coastal land and water areas in a natural state.

(b) This system shall be established and administered by the Department of Environment, Health, and Natural Resources. In so doing the Department shall consult with and seek the ongoing advice of the Coastal Resources Commission. The Department may by rule define the areas to be included in this system and set standards for its use.

(c) This system shall be established within the coastal area as defined by G.S. 113A-103(2).

(d) All acquisitions or dispositions of property for lands within this system shall be in accordance with the provisions of Chapter 146 of the General Statutes.

(e) All lands and waters within the system shall be used primarily for research and education. Other public uses, such as hunting, fishing, navigation, and recreation, shall be allowed to the extent consistent with these primary uses. Improvements and alterations to the lands shall be limited to those consistent with these uses. (1989, c. 344, s. 1; c. 727, s. 218(58).)

Effect of Amendments. — The 1989 amendment, effective July 1, 1989, substituted "Environment, Health, and Natural Resources" for "Natural Resources and Community Development" in subsection (b).

§ 113A-129.3. Coordination.

(a) To the extent feasible, this system shall be carried out in coordination with the National Estuarine Reserve Research System established by 16 U.S.C. § 1461.

(b) To the extent feasible, lands and waters within this system shall be dedicated as components of the "State Nature and Historic Preserve" as provided in Article XIV, Section 5, of the Constitution and as nature reserves pursuant to G.S. 113A-164.1 to G.S. 113A-164.11. (1989, c. 344, s. 1; c. 770, s. 47.)

Effect of Amendments. — The 1989 amendment, effective August 12, 1989, substituted "G.S. 113A-164.11" for "G.S. 164.11" in subsection (b).

§§ 113A-130 to 113A-134: Reserved for future codification purposes.

APPENDIX G

Dedication of the NCNERR as a State Nature Preserve

North Carolina
Department of Administration

James G. Martin, Governor

James S. Lofton, Secretary

June 5, 1987

Mr. S. Thomas Rhodes, Secretary
NC Department of Natural Resources
and Community Development
512 N. Salisbury Street
Raleigh, NC 27611

Re: Allocation of Property to the Department of Natural Resources and Community Development - Dedication of the North Carolina Natural Estuarine Research Reserve

Dear Secretary Rhodes:

Pursuant to Article 9A, Chapter 113A of the North Carolina General Statutes and pursuant to the authority vested in me by the Administrative Procedures Code approved by the Governor and Council of State on January 28, 1976, all State-owned lands within the areas hereinafter designated are hereby allocated to the Department of Natural Resources and Community Development:

Those State-owned real properties hereinafter collectively known as the North Carolina National Estuarine Research Reserve lands (previously referred to as the North Carolina National Estuarine Sanctuary), consisting of four components:

1. Zeke's Island located in Brunswick and New Hanover Counties;

2. The Rachel Carson component located in Carteret County;

3. Currituck Banks located in Currituck County; and

4. Masonboro Island located in New Hanover County, all of which are more specifically described in Exhibits A, B, C, D and E attached hereto and by reference made a part hereof.

THIS ALLOCATION IS MADE SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS:

1. As used in this Letter of Allocation the terms "natural area" and "nature preserve" shall have the same meaning as contained in North Carolina General Statutes 113A-164.3(3)(4) respectively.

2. Pursuant to North Carolina General Statutes 113A- 164.8, all State-owned lands lying within the above-designated areas are hereby dedicated as a nature preserve to be known collectively as the North Carolina National Estuarine Research Reserve (hereinafter the "reserve" or "preserve") for the purposes provided in the North Carolina Preserves Act, as amended, and other applicable law, and said State-owned land shall be held, maintained, and used exclusively for said purposes.

3. Primary Custodian. The Primary Custodian of the reserve will be the North Carolina Department of Natural Resources and Community Development, which will be responsible for managing the nature preserve in accordance with this letter of allocation (dedication) and the regulations set forth in 15 NCAC 12H .0301-.0403.

4. Primary Classification. The primary classification and purpose of the preserve shall be research, education, and compatible traditional uses.

5. Rules for Management.
   A. Character of Visitor Activity. The principal visitor activities in the preserve shall be research, walking, observing, fishing, and hunting. These activities shall be regulated to prevent disturbance of the preserve beyond that which it can tolerate without significant environmental degradation. Use of vehicles along designated corridors will be allowed only at the Zeke's Island and Currituck Banks components. Camping will be allowed only with the written permission of the Department of Natural Resources and Community Development.

   Activities and uses which are unrelated to those mentioned above are prohibited except as provided for herein or unless necessary to carry out the purposes of the preserve. Prohibited activities include, but are not limited to, construction not related to the preserve, commercial activities and development, agriculture and grazing of domestic animals, mineral exploration and development, dumping or changes in topography except by existing easements, the gathering of plant products except as provided for in approved research projects, and the removal, disturbance, molestation, or defacement of minerals, archaeological features, or natural features.

No exotic flora and no dogs, cats, or other animals, domestic or exotic, except hunting dogs, shall be brought into the preserve.

There shall be no fires, except as permitted by the Department of Natural Resources and Community Development, and there shall be no littering permitted.

B. Hunting and Fishing. Hunting and fishing shall be permitted on the preserve subject to regulation and management by the North Carolina Wildlife Resources Commission and the North Carolina Division of Marine Fisheries, such regulation and management to be consistent with protection of the natural diversity and primitive character of the preserve.

C. Orientation and Guidance of Visitors. The Custodian may maintain parking and access areas including boat landing and service roads for patrol, fire control, right-of-way, maintenance, and other management activities. Exhibits, programs, and printed materials may be provided by Custodian in service areas. Guide service and labeled nature trails may be provided by Custodian within the preserve.

D. Water Level Control. The purpose of any water level control shall be to maintain the natural water regime of the preserve. Water levels which previously have been altered by man may be changed by the Custodian for the restoration of natural conditions.

E. Disturbance of Natural Features. The cutting or removal of trees, dead or alive, or the disturbance of other natural features is prohibited, except that which is consistent with the purposes of this dedication, or is required under the terms of certain right-of-way easements between the State and public utility companies and governmental agencies, or is necessary for public safety.

F. Visitor Protection. Guardrails, fences, steps, and bridges may be provided by the Custodian when essential to the safety of a reasonably alert and cautious visitor. The Custodian shall have the right to erect such structures as may be necessary to protect the preserve from unwanted or excessive visitor traffic.

G. Control of Vegetational Succession. Control of vegetatational succession may be undertaken if necessary to maintain or restore a particular ecosystem or the preservation of threatened, rare, endangered, or unusual species.

H. Research and Collecting Permits. Any person wishing to engage in scientific research requiring collecting or otherwise affecting anything within the preserve shall first secure written permission from the Department of Natural Resources and Community Development.

I. Fences. Fences and barriers may be installed as necessary to further the purposes of the preserve.

J. Trails. The Custodian shall locate, build, and maintain trails which shall be adequate to provide for permitted use of the preserve, but otherwise such activities shall be kept to a minimum.

K. Other Structures and Improvements. The Custodian shall have the right to erect structures or facilities within the preserve, insofar as the same are consistent with the purposes of the preserve as stated in this dedication.

L. Management Plan. The North Carolina Department of Natural Resources and Community Development, as Primary Custodian of the preserve, shall be required to prepare and submit for approval to the Secretary of Natural Resources and Community Development a management plan for the preserve. This plan shall be subject to all the provisions of this dedication and shall additionally be consistent with the management principles set forth in the North Carolina Administrative Code 15 NCAC 12H .0403, 15 NCAC 70 .0202 and such other regulations as may be established from time to time by the Secretary of Natural Resources and Community Development. In any case where contradictions may arise between this instrument of dedication and other management regulations, the terms of this dedication shall take precedence.

6. Amendment and Modification. The terms and conditions of this dedication may be amended or modified upon approval of the Governor and Council of State. The lands dedicated to the North Carolina National Estuarine Research Reserve pursuant to this instrument may be removed from dedication upon the approval of the Governor and Council of State.

7. Permanent Plaque. The Custodian may erect and maintain a permanent plaque or other appropriate marker at a prominent location on the within described premises bearing the following statement: "This Area is Dedicated as a State Nature Preserve."

The Governor and Council of State have approved the dedication of the State-owned lands hereinabove described as the North Carolina National Estuarine Research Reserve to be held in trust by the Custodian for the uses and purposes expressed in the Nature Preserves Act at a meeting held in the City of Raleigh, North Carolina, on the 3rd day of February, 1987.

This allocation is made at no cost or consideration to the Department of Natural Resources and Community Development.

Best regards.

Sincerely,

James S. Lofton
Secretary of Administration

CONSENTED AND AGREED TO:

S. Thomas Rhodes, Secretary
North Carolina Department of
Natural Resources and
Community Development

☆ U.S. GOVERNMENT PRINTING OFFICE: 1991 — 281-559 /40402