

CONSERVING THE NATION'S COASTS AND ESTUARIES

*A Strategic Plan for the
National Estuarine Research
Reserve System:
A State and Federal Partnership*



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National Estuarine Research
Reserve System:
A State and Federal Partnership
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U.S. DEPARTMENT OF COMMERCE
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**National Estuarine
Research Reserve
System**





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THE NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

The National Estuarine Research Reserve System (NERRS or the System), a state-federal partnership, is a nationwide network of state owned and managed coastal protected areas designated and supported by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). The sites (Fig. 1) represent the diverse estuarine and estuarine-like systems of America's oceanic and Great Lakes coasts, setting them aside for long-term scientific and education programs that provide information essential to the public and coastal management decision-makers. The System is authorized by Section 315, National Estuarine Research Reserve System, of the Coastal Zone Management Act of 1972, as amended (CZMA).

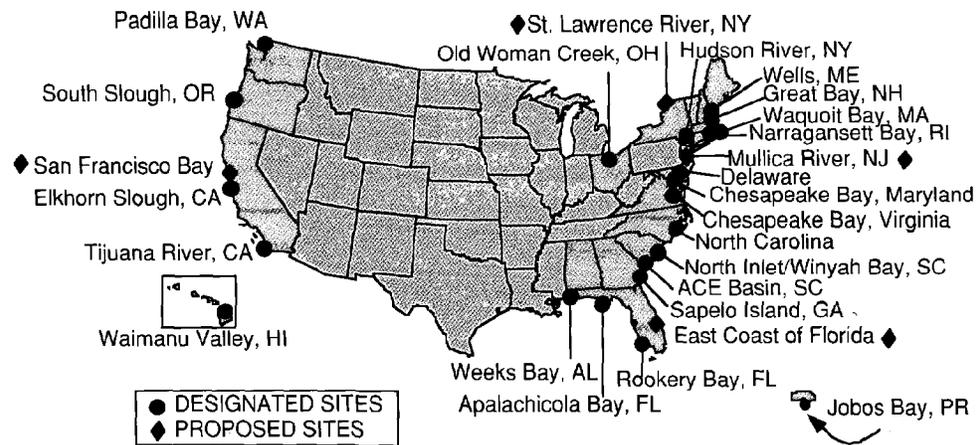


Fig. 1: National Estuarine Research Reserve System as of October, 1994

This plan for the system is a collaborative effort of state and federal NERRS program managers and specialists and clearly articulates the Program's mission, goals, and policies. It is based on the policies and objectives of the CZMA and 20 years of experience in implementing these at each estuarine research reserve and the national program level. It reflects our shared view of the System's future and its significant role in the protection and management of our nation's estuarine and coastal ecosystems.



PROGRAM HISTORY

Section 315 of the Coastal Zone Management Act of 1972 authorized the establishment of "estuarine sanctuaries" to serve as field laboratories for the conduct of research and education related to enhancing coastal management. The first estuarine sanctuary was designated in 1974 by the U.S. Department of Commerce, NOAA, in South Slough, Oregon, a 4,637 acre sub-embayment of Coos Bay. In 1985 the Congress amended the CZMA, changing the name of the Program to the National Estuarine Research Reserve System and increasing the research dimension of the program. Over the past two decades approximately one new reserve has been designated per year. As of October 1, 1994, 22 reserves have been designated, placing nearly 425,000 acres of estuarine waters, wetlands, and uplands into active management and stewardship. These 22 reserves represent 17 of the 29 biogeographic subregions identified by the program in 1981 (Fig. 2, page 9).

THE IMPORTANCE OF OUR COASTS AND ESTUARIES

America's coasts, estuaries, and oceans are among its most valuable natural, economic, and cultural resources. They are a significant generator of economic value, as illustrated by sources cited in the Coastal Ocean Policy Roundtable's report, *The 1992 Coastal Status Report: A Pilot Study of the U.S. Coastal Zone and its Resources* (September 1992, Newark, Delaware):

- Domestic commercial fisheries catch in 1989 was 8,463 million pounds valued at \$3.2 million.
- Nearly 22 million people fished recreationally in U.S. marine and Great Lakes waters in 1985 contributing over \$4.9 billion to coastal economies in trip expenditures alone.
- In 1985 approximately \$6.1 billion was spent on the purchase of new and used boats of all types; \$11 billion were expended on motors, engines, accessories, safety equipment, fuel, insurance, docking, maintenance, launching, storage, repairs, and club membership.
- Over 5,000 marinas were in operation in 26 states, territories, and the District of Columbia.
- America's 190 seaports, with 1,915 seaport terminals offering 3,180 berths for commercial carriers, handled over 60,000 vessel entrances and clearances in 1988, with foreign cargo alone valued at over \$400 billion in exports and imports.



Estuaries are important producers of sustainable natural resources

America's coasts and oceans are important not only for their obvious economic value in the form of lively urban waterfronts, ports, fisheries, and opportunities for recreation and tourism, but also for their aesthetic value as a source of continual renewal of the human spirit. Whether it's the passing flight of sea-birds, the rush of wind in dune grasses, or the flash of silver-sided fish swimming by, these are resources that nourish the human soul as well as the body. They are the very foundation of human culture. We have lived near the seas, used their resources, and worked and traveled on them since before recorded history. Today our challenge is to assure that the growing global population can live in harmony with the coastal and ocean environment while benefiting materially from its richness. We must learn how to coexist with a coral reef, improve our methods of using the land, and develop and encourage an ethic of treating the world's resources with a sense of personal stewardship.



THE STATUS OF OUR COASTS AND ESTUARIES TODAY

Many of America's coastal and ocean resources, despite their importance to the nation, are declining in quantity, quality, and variety. Wetlands continue to be lost; fisheries are declining; coastal storms inflict serious damage to coastal property and threaten lives; and less land is available for water-dependent uses as our finite coasts are used for non-water-dependent purposes. Our coastal ecosystems are exhibiting signs of stress:

- More than one third of the nation's waters classified for shellfishing had some form of harvest restriction during 1990 — an increase of six percent since 1984 — due largely to the impact of poorly planned coastal development.
- Overfishing, habitat loss, and pollution have reduced populations of virtually all estuarine and inshore species of fish to historically low levels.



Estuaries serve a variety of uses, many of which may conflict



Demands for coastal resource use continue to increase; competition is fierce and uses are often conflicting. More and more people continue to live and work near the coast, and use our coastal resources.

- In Florida, coastal towns are growing four times faster than the United States as a whole.
- In California, populations of ten coastal counties have grown at least 20 percent over the last decade.
- Population density along U.S. coasts is ten times greater than inland.

Trends point towards substantial population growth and other increasing pressures on coastal resources into the next century. Although various government management programs have slowed the rate of resource destruction and harmful modification of coastal resources, pressures are increasing and often overwhelm existing institutions and resources alike. As these trends continue, the direct as well as the cumulative and secondary impacts of coastal development on coastal resources will be high and the maintenance of high quality resources will be costly.

- Coastal development will continue to modify shorelines, change estuarine and coastal water circulation, increase coastal erosion and thereby increase the risk to lives and property from coastal storms, and modify or completely destroy important habitats, including wetlands, seagrass beds, and entire coastal ecosystems, such as the coral reef/seagrass/mangrove ecosystems of the Florida Keys and Florida Bay.
- Coastal development associated with population growth will increase sediment loads as well as nutrient and toxic discharges which will further degrade coastal waters and areas of important ecological value.
- Marine recreation is already the fastest-growing sector of the economies of many coastal regions. Demands for the maintenance of a high-quality environment for coastal recreation and access to special areas will increase significantly.



The threat of increased stress on resources is significant. NOAA estimates that by the year 2000 in the coastal regions of this country alone:

- The demand for potable water will increase by at least 10 percent.
- The demand for energy will increase by at least 12 percent.
- Sewage will increase by 18 percent.
- Trash will increase by 19 percent.
- 7 million more houses will be constructed.
- 11 million more cars will be on coastal highways.

We must take action if our coastal resources are to be sustained. The National Estuarine Research Reserve System, with its emphasis on resource stewardship, monitoring of estuarine conditions, management-oriented research, technical information transfer, and environmental education is an important part of the solution to these problems.



Traditional ways of life, as well as the healthy natural resources on which they depend, are threatened by rapid development



THE FUTURE

Both the urgency of need and the role the reserve system can play have been recognized. The Review Panel on the National Estuarine Research Reserve System, in the transmittal of their recent report on the System (*Building a Valuable National Asset: An Assessment by the Review Panel on the National Estuarine Research Reserve System*, Center for Marine Policy Study, Graduate College of Marine Studies, University of Delaware, Newark, DE, October 1993) to NOAA stated:

Given the major importance of the estuaries of our nation and the wide variety of management problems facing U.S. coastal areas, we find that the NERRS program is even more significant today than when it was created more than two decades ago. Improved cost effective stewardship of our invaluable coastal resources — be they fish, wetlands, or beaches and dunes — depends upon increased scientific understanding of the estuaries and how they function. The NERRS is creating a system of representative estuarine sites to serve exactly that function.

The Panel also found that —

it is time for a new phase of NERRS to begin — one that moves beyond site acquisition and development to focus on better definition of the national goals and objectives served by the program, and, at the same time, preserves the state-federal partnership which provides much of the central driving force for the overall effort.

Accepting this challenge and considering the recommendations of the Review Panel, state and federal staff have worked as partners to develop this Strategic Plan for the National Estuarine Research Reserve System, clarifying our mission, goals, and objectives to guide program actions as a national system.



MISSION

The National Estuarine Research Reserve System is a protected areas network of federal, state, and community partnerships which serve to promote informed management of the Nation's estuarine and coastal habitats through linked programs of stewardship, public education, and scientific understanding.

The Reserve System's state and federal partners have identified five goals to guide our actions in support of this mission.

GOAL 1: REPRESENTATIVE PROTECTED AREAS

Establish, manage, and maintain a national network of protected areas representing the diverse biogeographic and typological estuarine ecosystems of the United States.

GOAL 2: PARTNERSHIP

Mobilize federal, state, and community resources to mutually define and achieve coastal protection and management goals and objectives.

GOAL 3: INFORMED MANAGEMENT AND STEWARDSHIP

Operate the NERRS as a national program contributing to informed, integrated management of the Nation's coastal ecosystems.

GOAL 4: SCIENTIFIC UNDERSTANDING THROUGH RESEARCH

Design and implement a comprehensive program of scientific research to address coastal management issues and their fundamental underlying processes.

GOAL 5: EDUCATION

Design and implement a comprehensive program of education and interpretation based on solid scientific principles to strengthen the understanding, appreciation, and stewardship of estuaries, coastal habitats, and associated watersheds.



**Goal 1
REPRESENTATIVE
PROTECTED
AREAS**

**Establish, manage,
and maintain a
national system of
protected areas
representing the
diverse biogeo-
graphic and typo-
logical estuarine
ecosystems of the
United States.**

Statutory Authority

The Secretary may designate an area as a national estuarine reserve if ... 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 ... and the law of the coastal State provides long-term protection for reserve resources to ensure a stable environment for research. (Section 315(b)(2)(A) and (B) of the CZMA)

For purposes of the NERRS, NOAA has divided the coastal United States into 11 biogeographic regions and 29 subregions (see sidebar on page 10 and Fig. 2 below). Within these are a wide variety of associated typologies consisting of two attributes: ecosystem types (types of shorelands, transition areas, and submerged bottoms) and physical characteristics (geologic, hydrographic, and chemical). Currently, 17 of the Nation's biogeographic subregions, and important typologies within subregions, are represented by the System.

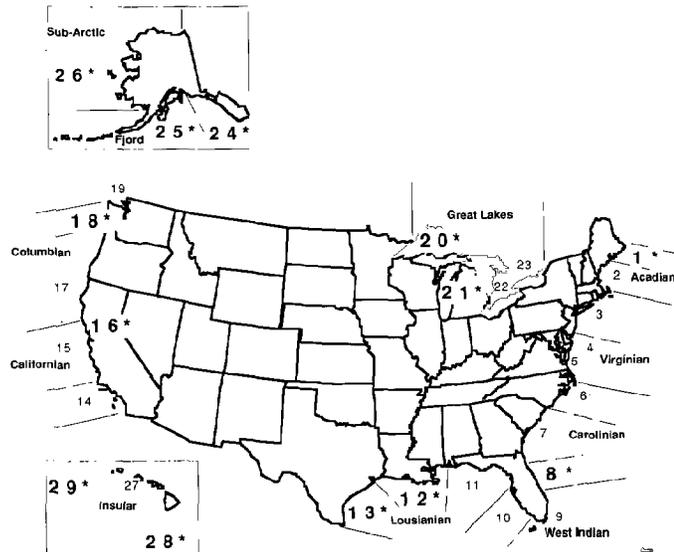


Fig. 2: NERRS Biogeographic Regions
** Regions not currently represented*



**Biogeographic Classifications
as Defined in NERRS
Regulations**

Acadian

1. Northern Gulf of Maine
2. Southern Gulf of Maine

Virginian

3. Southern New England
4. Middle Atlantic
5. Chesapeake Bay

Carolinian

6. Northern Carolinas
7. South Atlantic
8. East Florida

West Indian

9. Caribbean
10. West Florida

Louisianian

11. Panhandle Coast
12. Mississippi Delta
13. Western Gulf

Californian

14. Southern California
15. Central California
16. San Francisco Bay

Columbian

17. Middle Pacific
18. Washington Coast
19. Puget Sound

Great Lakes

20. Lake Superior
21. Lakes Michigan & Huron

Lake Erie

Lake Ontario

Fjord

24. Southern Alaska
25. Aleutian Islands

Sub-Arctic

26. Northern Alaska

Insular

27. Hawaiian Islands
28. Eastern Pacific Islands
29. Western Pacific Islands

States work in cooperation with NOAA to identify potential new reserves. They are officially nominated by a state's governor for designation by the Secretary of the U.S. Department of Commerce. Completion of the national system, as currently envisioned, will require: the identification of new sites; the designation and initial establishment of these sites; and management of new and existing reserves at a fully operational level that enables them to meet program mission and goals.

- ◆ **Complete the Reserve System relative to estuarine biogeography and typology.**
 - Evaluate existing biogeographic/typologic classification including boundaries of designated sites within the present system (plus existing marine sanctuaries and other coastal natural areas/programs that affect regional protection).
 - Convene external review committee composed of scientists, state representatives, and other members that represent the various reserve uses to select and prioritize sites to fill "gaps" in the System.
 - Determine roles of reserves in protection of biodiversity.
- ◆ **Support the designation process to ensure necessary sites are added to the System.**
 - Work with states containing potential reserve sites to obtain state and local support for their designation and long-term management.



Efficient Management

Program performance is a continuing concern for the System. The program evaluation process, as required in Section 312 of the CZMA, is the primary means by which NOAA ensures adherence of the reserves to CZMA programmatic requirements. Evaluations are generally performed at each site once every three years. The overall management of each reserve is evaluated on three general criteria: (1) adherence to the approved Final Management Plan (FMP); (2) adherence to the terms of Federal financial assistance awards; and (3) adherence to required actions from previous Section 312 evaluations. Specific evaluation criteria include the state's implementation of:

- research plan
- education and interpretation plan
- public access plan
- facility development plan
- acquisition plan
- resource protection plan

- Ensure state commitment to long-term support and management of the reserve and its component program activities.
- Provide the state and federal financial support to ensure sites are designated in a timely manner.
- Provide the state and federal staff to ensure sites are designated in a timely manner.
- Explore options for inclusion of other protected areas within reserve boundaries or within watersheds to fulfill program missions while reducing overall costs to the taxpayer.
- ◆ **Ensure national system and site standards are clearly defined and reserves are properly managed.**
 - Provide the federal financial support to implement all aspects of a national program.
 - Provide the federal staff support to implement all aspects of a national program.
 - Review and revise, as needed, the implementing Federal Regulations for NERRS.
 - Maintain a continuing process of national and reserve-specific evaluation and review.
 - Maintain a continuing, active, participatory planning process to proactively address national coastal resource management and program specific issues.



Summary of Designated Reserve Lands and Waters

<u>Site</u>	<u>Acreage</u>
Apalachicola	193,758
ACE Basin	136,600
Chesapeake Bay, MD	4,848
Chesapeake Bay, VA	4,434
Delaware	8,600
Elkhorn Slough	1,400
Great Bay	5,280
Hudson River	4,838
Jobos Bay	2,800
Narragansett	4,950
North Carolina	10,000
North Inlet	9,080
Old Woman Creek	571
Padilla Bay	10,700
Rookery Bay	12,550
Sapelo Island	6,111
South Slough	4,700
Tijuana River	2,500
Waimanu	3,600
Waquoit Bay	2,250
Weeks Bay	3,028
<u>Wells</u>	<u>1,600</u>
Total	434,198

- Develop staffing, facilities, and service criteria and standards to define when a designated reserve is fully operational.
- Use these standards and criteria as a basis for site development, designation, operation, planning, and evaluation.

◆ **Proactively address reserve stewardship issues.**

- Recognize resource stewardship as a primary function of reserves.
- Ensure adequate boundaries and/or levels of state control for each reserve during management plan revisions (i.e., every five years) and evaluations under §312 of the CZMA.
- Develop programs and partnerships to address management issues within and outside of reserve boundaries including strong linkages to state CZM programs for site protection.
- Define reserve policies concerning habitat manipulation, restoration and exotic species management.
- Serve as an advocate for estuarine health by facilitating information exchange on stewardship issues.
- Encourage and promote “best management practices” (BMPs) in all stewardship endeavors.



**Goal 2
PARTNERSHIP**

Mobilize federal, state and community resources to mutually define and achieve coastal protection and management goals and objectives.

Statutory Authority

The Congress finds and declares that it is the national policy ... to encourage the participation and cooperation of the public, state and local governments, and interstate and other regional agencies, as well as of the Federal agencies having programs affecting the coastal zone, in carrying out the purposes of this title; (and) to encourage the coordination and cooperation with and among the appropriate Federal, State, and local agencies and international organizations ... in collection, analysis, synthesis, and dissemination of coastal management information, research results, and technical assistance to support State and Federal regulation of land use practices affecting the coastal and ocean resources of the United States. (CZMA Section 303(4) and (5))

Interdependence at the ecological level must be paralleled by governmental systems if we are to address ecosystem protection and management issues comprehensively. The partnerships between the federal and state governments are the cornerstones and founding principles of the NERRS under the CZMA.

To be successful, reserves must exist as partnerships — with the academic, research, and education communities; with resource users and private resource protection advocates; with nearby towns and cities; with other state and regional agencies; and with their federal partners.

- ◆ **Maintain a strong state component of the NERRS partnership**
 - Provide funding, on-site state staff and other resources necessary to implement the management plan including site management, stewardship, operations, education, monitoring, and research functions.



Selected NERRS Partners

In addition to a broad network of local governments, school districts, universities, state coastal, natural resource, parks and recreation, planning, fish and game, environmental, historic, and education agencies, reserves are involved on a day-to-day basis with a broad range of public and private partnerships including:

*American Littoral Society
Atlantic Coast Conservation Association
Audubon Society
Chesapeake Corporation
Coastal Ocean Program
Coastal States Organization
Coast Guard Auxiliary
Daedalus
Ducks Unlimited
Elkhorn Slough Foundation
Estuarine Research Federation
Falmouth Garden Club
Federal Highway Administration
Fish & Wildlife Foundation
Global Change Program
Great Bay Trust
The Greenway Conservancy
Gulf of Maine Aquarium
Gulf of Maine Council
Gulf of Mexico Program
Hudson River Foundation
Izaak Walton League
(cont.)*

- Ensure reserves' plans, activities, and programs will be integrated with those of state coastal zone management and other relevant state agencies.
- States with reserves will plan jointly through the National Estuarine Research Reserve Association (NERRA) to address specific program operational issues.



Partners in Education: Chesapeake Bay NERR (MD), state, and county

- ◆ **Maintain a strong NOAA federal component of the NERRS partnership**
 - Define the program roles of NOAA's federal partnership office, OCRM and its component divisions and staff.
 - Define and, when appropriate, standardize federal program policies and goals.



MORE PARTNERS

Laudholm Trust
Marine Advisory Service,
NOAA
Monterey Bay Aquarium
National Aeronautics and
Space Administration
National Estuary Program,
EPA
National Marine Fisheries
Service, NOAA
National Marine Sanctuary
Program, NOAA
National Science Founda-
tion
National Wildlife Federa-
tion
The Nature Conservancy
Pro Estero
PROBEA
Prudence Conservancy
Save the Bay
Sea Grant
Sierra Club
Tacoma Hunting and
Fishing Club
Trout Unlimited
US Air Force
US Bureau of Indian Affairs
US Bureau of Land Man-
agement
US Coast Guard
US Department of Energy
US Environmental Protec-
tion Agency
US Fish and Wildlife
Service
US Forest Service
US Geological Survey
US Navy
US Soil Conservation
Service

- Ensure that sufficiently-trained federal staff are assigned to address national program and reserve support functions.
- Advocate reserve interests in the resolution of interagency disputes.
- Support reserves in resource protection disputes.
- Pursue partnerships for the NERRS with other NOAA programs.
- Oversee the grant awarding process.

◆ **Maintain strong NOAA-state activities at the reserve and national program levels**

- Continue the NOAA-state dialogue to achieve the long-term vision of the program through the development and implementation of strategic and operational plans.
- Identify site and national program resources available for potential redirection.
- Establish and use appropriate NOAA-state consultation groups.
- Jointly target specific activities and agencies for cooperative action in resource management, research, and education.
- Jointly sponsor thematic conferences and make presentations at conferences of other organizations.



Volunteers

NERRS operations rely on significant volunteer support. The most recent survey (1992) showed nearly 700 volunteers formally participating.

<u>Reserve</u>	<u>Number</u>
ACE Basin	12+
Apalachicola	5+
Chesapeake Bay - MD	30+
Chesapeake Bay - VA	10+
Delaware	0
Elkhorn Slough	100+
Great Bay	100+
Hudson River	10+
Jobos Bay	20
Narragansett Bay	10
North Carolina	5+
North Inlet - Winyah Bay	0
Old Woman Creek	30+
Padilla Bay	5+
Rookery Bay	20
Sapelo Island	0
South Slough	30+
Tijuana River	20+
Waimanu	0
Waquoit Bay	100
Weeks Bay	38
Wells	150+

This valuable service is supplemented by countless hundreds of others volunteering on an intermittent basis.



Volunteers Assist with Coastal Cleanup, Wells NERR

◆ **Maintain strong partnerships with our volunteer community**

- Reinforce existing reserve-specific and NERRS-specific partnerships.
- Establish linkages with other volunteer efforts (e.g., Adopt-a-Beach).
- Foster positive public visibility by publicizing the effectiveness of volunteer programs.
- Provide a national volunteer coordinator function within OCRM.



**National Ocean Service
(NOS) Partnership Grants**

In 1994, NOAA's NOS initiated a program to foster partnerships between NOAA and other organizations. Tijuana River NERR, one of the initial participants, is developing a Geographic Information System (GIS) that will be based on ecological, rather than international, borders. A binational team of educators, managers, planners, and sociologists will guide the development of the GIS to provide relevant information that will meet the planning and management needs of all affected communities. The GIS will be developed by researchers at San Diego State University and El Colegio de la Frontera. Other partners include California Sea Grant, the Planning Department for the County of Tijuana, San Diego Association of Governments, County of San Diego, Centro de Investigacion Cientifica y de Educacion, la Universidad de Baja California, Instituto de Culturas Nativas de Baja California, and the International Boundary Water Commission.

- ◆ **Maintain Strong Partnerships with the Public and Private Sectors**
 - Take federal and state action to form partnerships targeting specific priority agencies and organizations at the state and national levels.
 - Clarify relationships among individual reserves, state coastal zone management agencies, other state agencies, national marine sanctuaries, and other federal programs.
 - Take action to strengthen or form partnerships with federal, state, and local agencies, private institutions, academic institutions, advocacy and conservation organizations, and the private sector.
 - Design a national campaign aimed at private corporate philanthropy; obtain "lead gift" to inaugurate it.



**Goal 3
INFORMED
COASTAL MAN-
AGEMENT AND
STEWARDSHIP**

Operate the NERRS as a national program contributing to informed, integrated management of the Nation's coastal ecosystems.

Statutory Authority

The Congress finds and declares that it is the national policy ...to encourage coordination and cooperation with and among the appropriate Federal, State, and local agencies and international organizations ... in collection, analysis, synthesis, and dissemination of coastal management information, research results, and technical assistance to support State and Federal regulation of land use practices affecting the coastal and ocean resources of the United States. (CZMA Section 303(5))

The National Estuarine Research Reserve System's role in strengthening the protection and management of the Nation's coastal and estuarine resources will operate at four levels: national, regional, state, and local.

National services will be provided by, or coordinated by, the NOAA headquarters office, with appropriate participation from the reserves.

- ◆ **Serve as national, regional, and local centers of information, expertise, and training that support state, local, private, and other community needs**
 - Develop the NERRS as a national network of regional testing grounds for applied coastal management techniques.
 - Serve as points of contact and outreach for NOAA, state, and other relevant agencies and organizations.
 - Provide opportunities to test new methods of monitoring, research, education, and restoration management strategies.



Species of Concern

Reserves provide habitat for a number of federally and state endangered or threatened species.

Among the fauna species identified at reserves so far are:

*Atlantic Loggerhead Turtle
Green Sea Turtle
Hawksbill Sea Turtle
Atlantic Ridley Turtle
Alabama Red-bellied Turtle
Gopher Tortoise
Finback Whale
West Indian Manatee
Shortnose Sturgeon
American Alligator
Indigo Snake
Black Pine Snake
Florida Black Bear
Florida Panther
Indiana Bat
Gray Bat
Southern Bald Eagle
California Brown Pelican
Light-footed Clapper Rail
California Least Tern
Least Bell's Vireo
Wood Stork
Peregrine Falcon
Bachman's Warbler
Belding's Savannah Sparrow
Southeastern Snowy Plover
Piping Plover
Florida Sandhill Crane
Scrub Jay
Southeastern Kestrel
Red-cockaded Woodpecker*



Reserves Protect Threatened and Endangered Species such as this Light-footed Clapper Rail

- Develop a strategy for identifying the needs of coastal decision-makers, particularly state CZM programs, the NERRS statutory partner.
- Serve as a source of advice to NOAA and other governmental agencies about mitigation, damage assessment, and restoration of coastal habitats under such authorities as Superfund, the National Coastal Wetlands Protection, Restoration and Management Act, etc.
- Serve as a regional source of information for public or private entities to ensure that ongoing or proposed actions maintain long-term sustainability of those resources.



Watershed Planning Partnerships

South Slough NERR staff have been active participants in the Coos Watershed Association, a council established to promote watershed planning and enhancement. Members of the watershed association include representatives from the Port of Coos Bay, Oregon Department of Forestry, Bureau of Land Management, as well as local citizens. The Association provides a framework to coordinate and promote use of proven management practices designed to support environmental integrity and economic stability throughout the Coos Watershed. The Association is also implementing a series of remediation projects designed to restore in-stream structure and winter habitat for dwindling stocks of anadromous fish. Many other watershed planning partnerships exist within the System.

- Maintain an effective program of technical assistance, both reserve-specific and nationally-coordinated, based on research to promote informed coastal management decisions.
- Serve as a regional source of objective and integrated information on the role of estuaries in marine ecosystems, the role of governments in their protection and management, and the need for individual responsibility and stewardship.
- Develop and implement a sustained relationship between NERRS and other coastal decision makers.
- Fully integrate NERRS sites and expertise into the development and implementation of environmental regulations at the national, regional, state, and local levels.
- Proactively address land use issues within reserve boundaries, or that could potentially affect reserve resources.



**Goal 4
SCIENTIFIC UN-
DERSTANDING
THROUGH RE-
SEARCH**

**Design and imple-
ment a comprehen-
sive program of
scientific research
to address coastal
management issues
and their fundamen-
tal underlying pro-
cesses.**

Statutory Authority

The Secretary shall develop guidelines for the conduct of research within the System that shall include ... a mechanism for identifying, and establishing priorities among, the management issues that should be addressed through coordinated research within the System ... and (establish) common research principles to guide development of research programs within the System. (CZMA Section 315(c))

The Secretary shall ... promote and coordinate the use of the System for research purposes including — requiring that the National Ocean and Atmospheric Administration, in conducting and supporting estuarine research give priority consideration to research that uses the System; and consulting with other Federal and State agencies to promote use of one or more reserves within the System by such agencies when conducting estuarine research. (CZMA Section 315(d))

The NERRS Strategic Plan for Research, Site Characterization, and Monitoring (the Research Plan) represents a comprehensive, interdisciplinary approach to scientific and technical aspects of coastal management problems. This plan is derived heavily from two pivotal NOAA documents:

First, the Research Plan reflects the major programmatic initiatives described by the NOAA Strategic Plan's Coastal Ecosystems Health component (1995-2005) including activities to: (1) integrate operations for coastal ecosystem management, (2) enhance ecosystem assessment activities, (3) develop a national comprehensive monitoring program, (4) increase scientific understanding, and (5) provide a strong information base for informed public policy decision making.

Second, the NERRS Research Plan also reflects guidance from the draft NOAA/OCRM Strategic Plan (Goal #5 - Research and Monitoring) to “develop an inte-



Research Synthesis Document

A report developed by Sanctuaries and Reserves Division analyzed the first decade of OCRM-funded research in the Reserve System. Among the findings:

Number of Projects Funded:

156

Diversity of Principle Investigators:

Academic	213
Federal	10
State Agency	23
Other	12

Diversity of Participating Institutions:

Academic	50
Federal	3
State Agency	10
Other	5

Length of Project Funding:

<u>Length</u>	<u># Projects</u>
1 year	129
2 years	21
3 years	5
4 years	1

Note: Information on non-OCRM funded research had not been compiled at the time of plan publication.

grated research and monitoring capability that identifies and addresses management questions through the utilization of National Marine Sanctuaries, National Estuarine Research Reserves, and federal, state, academic, public and private partnerships.”



Wetland Delineation in Chesapeake Bay NERR in Virginia

RESEARCH OBJECTIVES

The research section of the Research Plan was developed for the purpose of designing and implementing a comprehensive program of long-term scientific inquiry to address both fundamental processes and significant coastal management issues within estuaries and estuarine ecosystems.



Research Activities

Researchers at NERRS sites have undertaken studies concerning many significant basic and applied research topics, including:

*Point Source Pollution
Nonpoint Source
Pollution
Hydrodynamic Modeling
Habitat Mapping
Floral and Faunal
Inventories
Land Erosion and
Accretion
Mangrove Restoration
Salt Marsh Restoration
Shore Protection
Measures
Water Quality Monitoring
Weather Monitoring
Algal Blooms
Population Dynamics
Microbial Processes
Sea Level Rise
Exotic Species Control
Health of Commercially-
Important Species
Wetland-River
Interactions
Sediment
Characterization
Estuarine Productivity
Effects of Human
Disturbance
Bathymetric Mapping
Nutrient Cycling
Impacts of Management
Activities
Ecological Succession
Economic Valuation
Archaeological Surveys*

- ◆ **Promote opportunities for original applied research focused on the improvement of coastal zone management through specific technical problems**
 - Develop, refine, and update the NERR system-wide research agenda to focus on the technical assessment and resolution of management problems within estuaries and coastal ecosystems.
 - Facilitate cooperation and communication between coastal resource managers and academic researchers (connect specific questions to general principles).

- ◆ **Promote opportunities for original basic research toward the advancement of a basic understanding of estuarine processes.**
 - Maintain financial and logistic support for scientific investigations through continued operation of the OCRM/SRD competitive research program.
 - Seek matching fund contributions from other agencies and organizations to increase the base of support for competitive research awards.
 - Encourage other agencies to provide direct funds and support for research conducted within NERRS, both through the competitive grants process and other areas of collaboration.
 - Develop and maintain a long-term database on reserve habitats, resources, and environmental trends that will attract, enhance, and sustain future research projects.



Research Partners

Universities

Auburn University
Boston University
California State University
Case Western Reserve U.
Duke University
Florida State University
Heidelberg College
Kent State University
Louisiana State U.
North Carolina State U.
Ohio State University
Portland State University
Rutgers University
San Diego State U.
Smith College
Stanford University
University of Alabama
University of California at Santa Cruz
University of Florida
University of Georgia
University of Maine
University of Maryland
University of Massachusetts
University of Michigan
University of New Hampshire
University of North Carolina
University of Oregon
University of Puerto Rico
University of Rhode Island
University of Washington
Virginia Institute of Marine Science
Woods Hole Oceanographic Institution
Yale University

- ◆ **Enhance the infrastructure of the Reserve System to ensure its long-term utility to agency scientists and outside investigators**
 - Secure the SRD staff position of Research Coordinator with responsibilities to promote research opportunities and facilitate on-site scientific investigations.
 - Develop a program for on-site funding of graduate-level scholarships or fellowships to support estuarine research at the national level that is linked to use of the reserves.
 - Ensure that all reserves have on-site access to necessary field equipment, adequate laboratory facilities, and suitable overnight accommodations.

- ◆ **Investigate and develop new administrative and analytical approaches to integrate appropriate technical information into the coastal resource management decision-making process**
 - Institute a procedure to communicate the results and implications of scientific investigations to the on-site manager and education coordinator.
 - Facilitate the transmission of results in a usable form to coastal managers.
 - Promote dissemination of research findings through traditional means of scientific communication (abstracts, seminars, technical reports and publications).
 - Periodically synthesize the results of independent research investigations carried out on related topics at reserve-specific and national levels.



**Additional Research
Partners**

State Agencies

Florida Dept. of Environmental Protection
Maine Dept. of Conservation
Maryland Dept. of Natural Resources
New Hampshire Fish and Game Department
New York State Dept. of Environmental Conservation
North Carolina Dept. of Environment, Health, and Natural Resources
Ohio Dept. of Natural Resources
Oregon Dept. of Fish and Wildlife
Oregon Div. of State Lands
Puerto Rico Dept. of Natural and Environmental Resources
Rhode Island Dept. of Environmental Mgmt.
Washington State Department of Ecology

Other Institutions

Center for Energy and Environmental Research
Elkhorn Slough Foundation
Hudsonia Limited
Inst. of Ecosystem Studies
Institute of Tropical Forestry
Marine Environmental Sciences Consortium
Norwalk City Schools
Pacific Fisheries Enhancement Corporation
Smithsonian Institution

**SITE INVENTORY AND
CHARACTERIZATION OBJECTIVES**

The environmental characterization section of the Research Plan seeks to enhance research efforts by developing inventory information and synthesizing baseline data concerning estuarine resources and habitats administered by the System.

◆ **Develop site characterizations for all reserves within the NERR System**

- Identify NERRS-wide information gaps to be addressed by the Site Profiles.
- Develop a NERRS-wide milestone schedule for the completion of Site Profiles for all sites.
- Secure an adequate funding base to support writing, publication, and distribution of completed Site Profiles to agency researchers, academic investigators, and coastal zone managers.

MONITORING

The monitoring section of the Research Plan seeks to define criteria necessary to maintain long-term site integrity by establishing a national monitoring program with standardized sampling parameters. The monitoring program will be augmented by monitoring local variables to measure effectiveness in maintaining site integrity and link into/support/participate in national/regional network.

- ◆ **Develop, fund, and operate a comprehensive System-wide environmental monitoring program designed to describe, track, and**



Environmental Site Profiles

As part of the NERRS Research Program, individual reserves are expected to develop a comprehensive site profile. Development of this document involves compilation and synthesis of contemporary and historical research.

The profiles describe the biology, geomorphology, and hydrology of the reserve and surrounding areas. These documents provide researchers, students, managers, and the public with a detailed summary of what is known about a site, along with a discussion of issues of particular concern.

Site profiles have been completed for two reserves - Tijuana River, CA NERR and the Great Bay, NH NERR, with several more in progress.

predict long-term changes in the status, integrity, and biodiversity of estuarine ecosystems and coastal watersheds

◆ **Assessment and monitoring of estuarine and coastal biodiversity**

- Develop a three-phased monitoring program that incorporates information of direct relevance to the sites, the region, and the national system:

Phase I will constitute a comprehensive Water Quality Monitoring Program, in which basic environmental parameters are measured consistently across the NERRS, and are compiled, synthesized, summarized, and disseminated by a Centralized Data Management Office operated by a reserve site;

Phase II will constitute a broad-based Biodiversity Monitoring Program in which sites will design ecological surveys to assess the status and trends of locally, regionally, and nationally important critical habitats, species, and functions;

Phase III will constitute a long-term Land Use Change Analysis in which sites will assess patterns of change in human uses of surrounding watersheds, and relate those activities to environmental processes of immediate management concern (e.g., nonpoint pollution, habitat loss, introduced exotic species, etc.).

- Collect on-site baseline data to establish monitoring parameters and establish a standardized system to record and archive database information.



Program Development Grants

Several NERRS sites have traditionally experienced difficulty in obtaining competitive research funds. Contributing factors include a lack of (1) basic research infrastructure or equipment; (2) baseline site characterizations and monitoring data; and/or (3) preliminary project-specific data to form testable hypotheses. In order to correct this situation and foster a strong system-wide research program, SRD has initiated a program of grants to address the above deficiencies for individual sites. Priority consideration is given to sites not receiving competitive research grants during the previous two year period. The program was initiated in FY93 with widespread support from NERRS Research Coordinators and has resulted in grants to Weeks Bay NERR, Wells NERR, South Slough NERR, and Jobos Bay NERR in its initial two years.

- Promote research within reserves through accumulation of valuable baseline data:
 - Develop a national program for monitoring selected parameters to compile a long-term database directed towards assessing changes in estuaries;
 - Develop a database management program to provide information for researchers.
- Develop a System-wide program for monitoring protocol and data quality assurance/quality control.
- Implement, test, and refine estuarine habitat assessment protocols to improve monitoring capabilities within estuarine ecosystems.
- Achieve Long-Term Ecological Research (LTER or equivalent) site status for representative NERR sites within coastal bioregions.
- Integrate results from on-site monitoring, aerial photography, satellite imagery, and relevant research data within the context of a Geographic Information System (GIS).
- Integrate NERRS monitoring efforts with other programs (e.g., Status and Trends, EMAP, National Coastal Monitoring Act) and support other program application requirements (e.g., Coastal Nonpoint Source Pollution Control).
- Provide opportunities for volunteers to participate in activities associated with the NERRS monitoring program.



**Goal 5
EDUCATION**

Design and implement a comprehensive program of education and interpretation based on solid scientific principles to strengthen the understanding, appreciation, and stewardship of estuaries, coastal habitats, and associated watersheds.

Statutory Authority

The Secretary may designate an estuarine area as a national estuarine reserve if — ... the Secretary finds that ... 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. (CZMA Section 315(b)(2)(C))

Education, training, and outreach activities are conducted at the national, regional, state, and local level. These include a broad spectrum of activities ranging from training state and local permit administrators who must apply stewardship principles in daily work practice, to assisting teachers in meeting state continuing education requirements while bringing knowledge of estuaries into the classroom, to providing information and assistance to the general public on issues of individual and local importance.

The national office coordinates with other federal agencies, national education, scientific and environmental organizations, and interest groups. Each reserve is an active member of the local and regional education community and a representative of the state and NOAA stewardship community.

- ◆ **Develop education programs that will further the goals of the System**
 - Provide on-site and outreach educational experiences.
 - Educate about estuaries holistically to include ecological, cultural, historical, sociological, aesthetic, and economic perspectives.
 - Promote a sense of stewardship and individual responsibility.



Education and Outreach Programs

Education and outreach programs in the reserves have taken a number of forms over the years, including:

*Teacher Training Workshops
Oil Spill Contingency Training
Interpretive Trails
Coastal Resource Management Workshops
Technical Assistance to Coastal Managers
Visitors Centers
School Field Trips
Brochures
Posters
Wildlife Guides
Nature Walks
Guided Canoe Trips
Youth Summer Programs
Curricula Development for Schools
Bilingual Materials
Mentor Programs
Audio/Visual Programs
Traveling Exhibits
University Courses
Adult Education Courses
Conferences
Dissemination of Research Results
Guest Lectures
Coastal Cleanups
Estuary Day activities
Earth Day activities*

- Address local, regional, state, and national coastal issues.
- Approach estuarine education through a perspective that includes watersheds, bioregions, and biogeographic regions.
- Increase understanding and appreciation of the National Estuarine Research Reserve System.

◆ **Target a culturally diverse audience of educators and students, environmental professionals, coastal resource decision-makers, and resource users**

◆ **Function as a "system of sites" to nationally coordinate estuarine education efforts**

- Coordinate education programs among reserve sites and between the sites and NOAA/SRD.
- Promote partnerships, leverage funds and resources, and coordinate with federal, state, and local agencies and organizations.

◆ **Develop NERRS as resource centers specializing in estuarine and watershed education**

- Develop and adopt standards to be pursued system-wide, taking into account the diversity of differences of each reserve site.
- Promote the NERRS as settings to engage people in learning about estuaries.



Coastal Resource Management Workshops

Coastal Resource Management Workshops are a series of one-day technical training workshops that are offered to environmental professionals involved in planning, regulation, and management. Rookery Bay NERR initiated the program and has been conducting these workshops bimonthly since 1989. Topics for workshops have included stormwater management, exotic plant control, mitigation banking, and watershed restoration. In 1993, the Florida Coastal Management Program provided assistance to expand the workshops statewide. Due to the success of these workshops, this program is now being expanded System-wide in partnership with state Coastal Zone Management Programs.

- Ensure that education programs incorporate innovative and appropriate technologies and education practices.
- Secure resources for effective and efficient programs.



Reserves Develop Education Programs for All Audiences

- ◆ **Capitalize on NERRS' ability to directly link education, research, stewardship, resource management, and restoration**
 - Facilitate an understanding of the scientific process and research results.
 - Provide information and expertise to decision-makers for wise use of coastal resources.
 - Use education as a proactive tool of resource protection and stewardship.



System-Wide Education Grants

The System offers grants for both education projects targeted for specific reserves and for education projects that benefit the system as a whole. One such system-wide program involves a cooperative effort with the National Geographic Society. In this project, coordinated by the Great Bay NERR in New Hampshire and involving 15 reserves, NERRS sponsors 75 schools across the country to participate in the Kids Network "What's in Our Water?" Program. Through KidsNet, fourth-, fifth-, and sixth-graders learn about pollution sources, sample their local drinking water, exchange information and observations, and formulate and test hypotheses with other schools using an on-line system designed by National Geographic. The program allows students to explore their estuarine environment through hands-on research and peer interaction while teaching telecommunications skills.

- Ensure education programs are compatible with resource management.
- Use historical information on cultural resources and coastal archaeology to illustrate the traditional uses of coastal habitats.
- ◆ **Ensure education priorities are based on program evaluation results**
 - Continually assess and evaluate educational programs and products and implement changes where needed.
 - Continually assess changes in the operating environment (resources, audiences, technologies, and threats on national and local levels) and respond to these changes as needed.
 - Coordinate the development of a system-wide evaluation program.
- ◆ **Encourage NERR education coordinators to be active participants in the education community**
 - Promote professional development for education coordinators.
 - Encourage participation in local, regional, state, and national associations.

Appendices

Appendix A

Glossary of Acronyms

CZM	coastal zone management
CZMA	Coastal Zone Management Act
NERR	National Estuarine Research Reserve (one site)
NERRA	National Estuarine Research Reserve Association
NERRS	National Estuarine Research Reserve System
NMFS	National Marine Fisheries Service
NMSP	National Marine Sanctuary Program
NOS	National Ocean Service
NOAA	National Oceanic and Atmospheric Administration
OCRM	Office of Ocean and Coastal Resource Management
SRD	Sanctuaries and Reserves Division of OCRM

Appendix B

NERRS Review Panel Recommendations

1. NOAA should initiate a focused effort to better articulate and implement a coherent and comprehensive national dimension for the NERRS program
2. NOAA should put in place a process to develop a nationally coordinated research agenda of management-related research needs
3. NOAA should design and adopt a "strategic planning process" for the NERRS program
4. NOAA should seek to significantly expand the funding available for management-related research within NERRS
5. NOAA, via NERRS, should provide leadership in creating a national estuarine coordinating capability within the federal government
6. NOAA should strive to develop the NERR System to be fully representative of all the important estuarine types found in the U.S.
7. The NERRS Education Program must be elevated to a more prominent position in the planning and operations of the System
8. NOAA should make a concerted effort within the Administration and with Congress to secure substantially increased funding for NERRS
9. NOAA should strive to further strengthen the partnership that exists with the states and with NERRA
10. NOAA should form a NERRS Program Office, possibly in closer organizational proximity to the CZM Program

Appendix B (cont.)

11. NOAA should embrace the nonprofit organizations that exist in support of NERRS and solicit their thoughts on ways to strengthen such groups
12. The NERRS Program staff should become acquainted with international programs having similar objectives
13. NOAA should reexamine its policies concerning multiple component reserves so as to ensure that each reserve has some central location and identity

Review Panel on the National Estuarine Research Reserve System. *The National Estuarine Research Reserve System: Building a Valuable National Asset. A Report to the National Oceanic and Atmospheric Administration*

Panel Members:

Dr. Franz E. Anderson, University of New Hampshire
Mr. William Eichbaum, World Wildlife Fund
Dr. Rosanne Fortner, Ohio State University
Mr. John Humke, The Nature Conservancy
Professor Robert Knecht, University of Delaware
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Mr. Allen Putney, U.S. Office of the International Union for the Conservation of Nature and Natural Resources
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Appendix C

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