

**MEMORANDUM OF UNDERSTANDING FOR COOPERATIVE MONITORING,
RESTORATION, AND RESEARCH CONCERNING SUBMERGED AQUATIC
VEGETATION HABITAT IN COASTAL NORTH CAROLINA**

Among the

North Carolina Department of Environment and Natural Resources

Albemarle – Pamlico National Estuary Program
Division of Coastal Management
North Carolina National Estuarine Research Reserve
Division of Marine Fisheries
Division of Water Quality
Division of Water Resources
Ecosystem Enhancement Program

North Carolina Department of Transportation

North Carolina Wildlife Resources Commission

Elizabeth City State University

University of North Carolina – Coastal Studies Institute

The University of North Carolina at Chapel Hill – Institute of Marine Sciences

The University of North Carolina Wilmington

North Carolina State University

North Carolina Sea Grant

East Carolina University

Duke University

College of William & Mary – Virginia Institute of Marine Science

North Carolina Coastal Federation

The Nature Conservancy

United States Department of Agriculture

Natural Resources Conservation Service

United States Department of the Interior

U.S. Fish and Wildlife Service
National Park Service

This Memorandum of Understanding (MOU) is entered into by the North Carolina Department of Environment and Natural Resources (NCDENR) [Albemarle – Pamlico National Estuary Program (APNEP), Division of Coastal Management (DCM), North Carolina National Estuarine Research Reserve (NCNERR), Division of Marine Fisheries (DMF), Division of Water Quality (DWQ), Division of Water Resources (DWR), Ecosystem Enhancement Program (EEP)]; North Carolina Department of Transportation (NCDOT); North Carolina Wildlife Resources Commission (NCWRC), Elizabeth City State University (ECSU); University of North Carolina - Coastal Studies Institute (UNC-CSI); The University of North Carolina at Chapel Hill - Institute of Marine Sciences (UNC-IMS); The University of North Carolina Wilmington (UNCW); North Carolina State University (NCSU); North Carolina Sea Grant (NCSG); East Carolina University (ECU); North Carolina Coastal Federation (NCCF); The Nature Conservancy (TNC); United States Department of Agriculture [Natural Resources Conservation Service]; and the United States Department of the Interior (DOI) [U.S. Fish and Wildlife Service (FWS) and National Park Service (NPS)].

I. PURPOSE

This MOU establishes the general framework for cooperation and participation among the cooperators in the research, monitoring, and restoration concerning submerged aquatic vegetation (SAV) along the coast of North Carolina and southeastern Virginia from Back Bay, Virginia Beach, Virginia (VA) south through Rich Inlet on the Pender/New Hanover County, North Carolina (NC) line.

Submerged aquatic vegetation (SAV), often referred to as sea grass, is a major fish habitat in coastal North Carolina and southeastern Virginia providing life supporting essentials to many species of economically important fishery and forage species. The North Carolina Marine Fisheries Commission has by rule [15QA NCAC 31 (20)] designated SAV as a critical habitat in coastal waters. SAV is also important habitat for migratory birds, particularly wintering waterfowl. Numerous scientific studies document the crucial role that SAV plays in the life history of many economically important fishery and forage species and wintering waterfowl. A combination of scientific and anecdotal information indicate conclusively that the extent and coverage of SAV has greatly declined in coastal North Carolina and southeastern Virginia, probably due to a combination of natural and human causes. Current research, monitoring, and restoration efforts within North Carolina and Virginia are fragmented and inadequate to address management needs.

II. STATEMENT OF MUTUAL BENEFIT AND INTERESTS

All of the cooperating agencies have an interest in monitoring the status of SAV for fish and wildlife habitat, as an indicator of water quality, or as an indicator of the impact of development along the coast. They also have an interest in restoring SAV where practical for fish and wildlife habitat and to mitigate the impacts of development.

III. INDIVIDUAL COOPERATORS BENEFITS AND INTERESTS

North Carolina Department of Environment and Natural Resources (NCDENR)

The NCDENR and its agencies noted below are responsible for implementing the North Carolina Coastal Habitat Protection Plan (CHPP) as adopted by the North Carolina Environmental Management, Marine Fisheries, and Coastal Resources commissions. The CHPP identifies SAV as one of the primary fish habitats in North Carolina, and recommends implementation of programs as provided in this MOU.

Albemarle – Pamlico National Estuary Program (APNEP) North Carolina Department of Environment and Natural Resources (NCDENR)

The United States Environmental Protection Agency (EPA) and the State of North Carolina established the APNEP in 1987 as the Albemarle – Pamlico Estuary Study. The original purpose of the study was to describe the condition of the estuaries in the vicinity of the Albemarle and Pamlico Sounds and develop a Comprehensive Conservation and Management Plan (CCMP). The study has evolved to the APNEP. The plan recommends strategies that local communities can implement to reduce the impact of development on the estuarine ecosystem. APNEP continues to fund monitoring and restoration projects in the sounds and demonstrate ways to mitigate the effects of development. This MOU will focus the cooperators' resources (e.g., expertise, funding) to meet APNEP goals. These same goals are shared with many other agencies. The APNEP provides overall leadership, coordination, and management for the activities under this MOU.

Division of Coastal Management (DCM) North Carolina Department of Environment and Natural Resources (NCDENR)

The Division of Coastal Management works to protect, conserve, and manage North Carolina's coastal resources through an integrated program of planning, permitting, education, and research. This MOU will benefit the DCM by developing information to support its research function and help track the progress of its planning and permitting function.

North Carolina National Estuarine Research Reserve (NC-NERR) Division of Coastal Management (DCM) North Carolina Department of Environment and Natural Resources (NCDENR)

The North Carolina National Estuarine Research Reserve (NCNERR) manages the four components of the NCNERR (Currituck Banks in Currituck County, Rachel Carson in Carteret County, Masonboro Island in New Hanover County, and Zeke's Island in New Hanover and Brunswick Counties) for research, education, and compatible, traditional uses. The National Estuarine Reserve System (NERRS) is working to develop protocols and fund mapping and monitoring SAV within the boundaries of the 26 reserves across the country as an expansion of the NERRS System-wide Monitoring Program. As part of this national effort, the NCNERR research, education (K-12, community outreach, and coastal decision-makers), GIS, and stewardship programs have the expertise to map, monitor, and manage for SAV within its boundaries, and to educate different audiences about the importance and status of SAV. The MOU will multiply the NCNERR abilities by pooling resources and provide the NCNERR with the coast-wide SAV perspective.

Division of Marine Fisheries (DMF)
North Carolina Department of Environment and Natural Resources (NCDENR)

The Division of Marine Fisheries is responsible for the stewardship of the state's marine and estuarine fishery resources through regulation, enforcement, research and monitoring, and habitat protection. DMF protects habitat by developing Coastal Habitat Protection Plans to conserve and protect important marine fisheries habitat. This MOU will benefit the DMF by providing for the assessment of the extent of SAV in the state on a regular basis to track the progress of its planning function.

Division of Water Quality (DWQ)
North Carolina Department of Environment and Natural Resources (NCDENR)

The Division of Water Quality is responsible for statewide regulatory programs in groundwater and surface water protection and for assessing Use Support of our state's waters. Use Support is a measure of whether water quality is sufficient to support uses such as fishing and swimming. This MOU will benefit the DWQ by providing for the assessment of the extent of SAV in the state on a regular basis and increasing potential use of SAV as a biological water quality indicator to track the progress of its regulatory functions and in assessing Use Support.

Division of Water Resources (DWR)
North Carolina Department of Environment and Natural Resources (NCDENR)

The Division of Water Resources is responsible for river basin management, water supply assistance, water conservation, and water resource development. DWR conducts special studies on instream flow needs and serves as the State liaison with federal agencies on major water resource related projects. This MOU will benefit the DWR by providing for the assessment of the extent of SAV in the state on a regular basis to guide its analysis of water resource management.

Ecosystem Enhancement Program (EEP)
North Carolina Department of Environment and Natural Resources (NCDENR)

The mission of the Ecosystem Enhancement Program is to "restore, enhance, preserve and protect the functions associated with wetlands, streams and riparian areas, including but not limited to those necessary for the restoration, maintenance and protection of water quality and riparian habitats throughout North Carolina". This MOU will benefit the EEP by providing for the assessment of the extent of SAV on a regular basis to track the progress of its restoration function.

North Carolina Wildlife Resources Commission (NCWRC)

The North Carolina Wildlife Resources Commission is responsible for the wise use, conservation, and management of the state's wildlife and inland fisheries resources. It accomplishes its goals through scientifically sound resource management, assessment and monitoring, and applied research. This MOU will give the NCWRC information on the condition of fish and wildlife habitat by assessing the extent of SAV in the coastal area on a regular basis.

North Carolina Department of Transportation (NCDOT)

The North Carolina Department of Transportation is responsible for providing a safe and integrated transportation system that enhances the state while protecting and improving the state's natural resources. It accomplishes its environmental protection goals through natural resource investigations, obtaining environmental permits, developing wetland and stream mitigation plans, and implementing the construction of mitigation sites. This MOU will give the NCDOT some of the information it needs on the condition of natural resources by assessing the extent of SAV in the state on a regular basis.

Elizabeth City State University (ECSU)

Elizabeth City State University and its Geological, Environmental and Marine Science (GEMS) Department educates students in marine biology and techniques to monitor biological resources. The department faculty conducts research on the factors contributing to the decline of SAV. The MOU will make technical expertise, access to facilities and equipment, and financial resources from many agencies available to the faculty, staff, and students. The GEMS staff will provide remote sensing, photo-interpretation, and mapping services to all partners in this program.

University of North Carolina – Coastal Studies Institute (UNC-CSI)

Located on the Outer Banks of North Carolina, UNC-CSI was founded in 2003 by the University of North Carolina system. The CSI mission includes conducting novel research, offering educational opportunities and providing outreach in coastal and marine science and management to a wide variety of audiences in North Carolina and beyond. The MOU will foster continued cooperation between UNC-CSI faculty and staff and other organizations conducting work directly and indirectly related to SAV in the APNEP region. UNC-CSI offers high quality laboratory space and facilitates field research for organizations conducting work in the northern coast of North Carolina.

The University of North Carolina at Chapel Hill – Institute of Marine Sciences

The Institute of Marine Sciences is an off campus unit of The University of North Carolina at Chapel Hill. The Institute's mission is to serve the state and nation through the conduct of high quality basic and applied marine sciences research, the training of students and young scientists, and the provision of professional expertise and leadership in marine issues ranging from local to global scale. Institute faculty are actively involved in addressing important scientific questions related to the nature, use, development, protection, and enhancement of marine resources, developing and applying technologically-advanced approaches to field, laboratory, and analytical problems, communicating research results and new technologies to professional and public audiences and providing consultative assistance to facilitate the application of new knowledge to practical marine problems and marine policy. The Institute offers expertise in coastal water quality, marine ecology, coastal geology and physical oceanography. The MOU will formalize the broad partnerships in the APNEP area to assess the status and trends of SAV and will facilitate the involvement of Institute faculty in these efforts.

The University of North Carolina Wilmington – Department of Biology and Marine Biology (UNCW-DBaMB)

The Department of Biology and Marine Biology (BaMB) at the University of North Carolina Wilmington supports an undergraduate program, with an emphasis on hands-on involvement of undergraduates in research, as well as a nationally recognized Master's Program and a new Ph.D. in Marine Biology. Faculty members are involved in a variety of research interests including coastal and estuarine ecology, marine botany and environmental biology. The coastal location of UNCW and the research facilities of the Center for Marine Science (CMS), which include seawater-supplied mesocosms and extensive vessel support, allow students and faculty to take advantage of the wide array of local coastal and offshore habitats. BaMB and CMS faculty are involved with research related to the distribution, physiological ecology, conservation biology and restoration of SAV. This MOU will provide additional opportunities for participation and collaboration in coastal monitoring and protection efforts in the APNEP region of North Carolina and Virginia.

North Carolina State University – Center for Marine Science and Technology (NCSU-CMAST)

The Center for Marine Science and Technology (CMAST) at North Carolina State University and located in Morehead City, NC educates undergraduate and graduate students in the interdisciplinary nature of basic and applied coastal research in NC and throughout the world. Marine ecologists at NCSU and CMAST have technical expertise to map seagrass remotely and provide *in situ* ground-truthing, monitor seagrass population dynamics, sample organisms residing in seagrass, conduct water quality monitoring and modeling, and provide guidance in experimental design and statistical analyses of ecological data. NCSU and CMAST can also provide expertise in watershed and food-web modeling, as well as physical oceanography as it pertains to SAV population dynamics and seed dispersal. The MOU will make technical expertise, access to facilities and equipment, and financial resources from many agencies available to NCSU/CMAST faculty, staff, and students, and will also facilitate NCSU/CMAST participation in studying and conserving Virginia and North Carolina's shared natural resources in Pamlico and Albemarle Sound.

North Carolina Sea Grant (NCSG)

North Carolina Sea Grant's mission is to enhance the sustainable use and conservation of ocean and coastal resources to benefit communities, the economy and the environment. Sea Grant continues to place a high value on research and extension programming on SAV topics. In particular, water quality and fisheries habitat issues are priorities identified by Sea Grant's advisory board and national strategic plan. This MOU will strengthen NC Sea Grant's efforts and complement current and future projects.

East Carolina University (ECU)

The Department of Biology at ECU educates students in biology and techniques to monitor biological resources, especially aquatic estuarine resources. The Institute for Coastal and Marine Resources (ICMR) at ECU conducts grant-funded research into the biology, geology, and human dimensions of the coastal zones in North Carolina and around the world. Both units of the university have special technical expertise and vessels that can support field research. One new approach involves using an acoustical method of remote sensing to survey submerged aquatic vegetation. They have on staff expert scientists who can collect and

interpret those acoustic data, relating these to ground-truth and other types of (optical) remote sensing data. Because light attenuates faster than sound in water, acoustic approaches hold great promise for rapid and accurate surveys of SAV resources. Both Biology Department and ICMR's faculties conduct research on a variety of biological systems including fish habitat. The MOU will make technical expertise, access to facilities and equipment, and financial resources from many agencies available to the ECU Biology and ICMR faculty, staff, and students. This MOU will facilitate the Department of Biology's and Institute for Coastal and Marine Resources participation in studying and conserving Virginia and North Carolina's shared natural resources in Pamlico and Albemarle Sound.

Duke University - Marine Laboratory

The research, monitoring, conservation and restoration of critical habitat in the coastal waters of North Carolina, in this case submerged aquatic vegetation (SAV), is central to the research and education mission of the Marine Laboratory and Division of Coastal Systems Science and Policy, Nicholas School of the Environment, Duke University. The MOU creates a new and comprehensive infrastructure that enhances the mission and assures the cooperation of the Marine Laboratory and Division of Coastal Systems Science and Policy.

College of William & Mary - Virginia Institute of Marine Science (VIMS)

The mission of the Virginia Institute of Marine Science is to provide objective policy guidance and to support informed management of coastal resources in the greater mid-Atlantic region. VIMS serves agencies at all levels of government as well as the general citizenry. In fulfilling its mission, VIMS engages in applied research and outreach education across many disciplines with the goal of making integrated resource management a practical reality by providing advice from an ecosystem perspective. The Center for Coastal Resource Management (CCRM) at VIMS is responsive to the needs of coastal resource managers and proactive in guidance for policy makers. This MOU will facilitate interstate coordination in monitoring and managing Virginia and North Carolina's shared natural resources.

North Carolina Coastal Federation

North Carolina Coastal Federation (NCCF) is a non-profit citizens-based conservation organization with over 7,000 citizen members. NCCF's goals include the preservation, protection and restoration of North Carolina's estuarine natural resources and water quality. The MOU and participation in the partnership allows NCCF to develop a greater scientific understanding about SAV species, which will be extremely valuable in the Federation's efforts to protect and restore SAV resources and the waters that support their habitats.

The Nature Conservancy

The Nature Conservancy protects the lands and waters to preserve the survival of plants, animals, and natural communities that represent the diversity of life on earth. It operates within a science-based plan that achieves tangible results. The Conservancy has been involved in preserving thousands of acres of habitat on the barrier islands and other areas on the Coastal Plain that protect submerged aquatic vegetation. The MOU will provide information on the effectiveness of the land preservation efforts in protecting SAV.

**Natural Resources Conservation Service (NRCS)
United States Department of Agriculture**

The USDA-Natural Resources Conservation Service helps conserve, maintain, and improve natural resources and the environment on private lands. It assists owners and operators of private land conserve their soil, water, and other natural resources by delivering technical assistance based on sound science. NRCS also administers financial assistance and easement programs of the 2002 Farm Bill. NRCS also conducts natural resource inventories to monitor land use and management changes at the watershed level. The MOU will provide one means to measure the effectiveness of the assistance NRCS provides on upland landscapes as it affects water quality and SAV, especially water clarity.

**National Oceanic and Atmospheric Administration (NOAA)
United States Department of Commerce**

The National Oceanic and Atmospheric Administration, through the National Ocean Service's Center for Coastal Fisheries and Habitat Research in Beaufort, North Carolina, focuses on estuarine processes, nearshore and ocean ecosystems biological productivity, the dynamics of coastal and reef fishery resources, and the effects of anthropogenic influences on resource productivity. The MOU multiplies the Center's ability to monitor SAV as part of estuarine ecosystems by pooling the cooperator's human, technical, and fiscal resources

**U.S. Fish and Wildlife Service
United States Department of the Interior**

The U.S. Fish and Wildlife Service is responsible for the management of Federal trust species to include migratory birds (including waterfowl), threatened and endangered species, anadromous fish of special concern to the Service, and marine mammals which may utilize SAV as a food source or cover for escape or nurseries. The MOU provides a partnership to share the workload and financial cost of monitoring SAV on which these species depend.

**National Park Service
United States Department of the Interior**

The National Park Service preserves the natural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. It applies scientific information to park management decisions to preserve park resources and promotes parks as centers for broad scientific and scholarly inquiry to benefit society. The MOU will give the National Park Service access to information on SAV off the coast of its 59,506 acres and 126 miles of national seashores in North Carolina.

IV. ACTION PLAN

1. The undersigned state government, federal government, academic, and other entities will establish a comprehensive long-term program with the following goal:

Manage and conserve Submerged Aquatic Vegetation habitats in the coastal areas of North Carolina and southeastern Virginia in a comprehensive manner through cooperative research, monitoring, restoration and educational activities.

2. To achieve this goal, the partners under this MOU will work together to reach the following objectives:
 - a. Conduct research on the role of SAV in the coastal ecosystem and natural and human influences on SAV health, productivity, and coverage;
 - b. Regularly monitor the extent and coverage of SAV in the coastal waters of North Carolina and southeastern Virginia as described below;
 - c. Regularly monitor the health, status, and trends of SAV in the coastal waters of North Carolina and southeastern Virginia as described below;
 - d. Restore SAV in those areas where restoration seems likely to succeed; and
 - e. Educate the public concerning SAV through specific products, programs, and provision of results of monitoring and research.
3. To manage the program, the undersigned agencies will establish a committee of technical experts to plan and coordinate a comprehensive, cooperative program for long-term monitoring, restoration, and research concerning SAV in coastal North Carolina and southeastern Virginia.
4. This program will encompass the coastal waters of North Carolina and southeastern Virginia from Back Bay to northern Currituck Sound west through the Albemarle Sound system and the Chowan and lower Roanoke rivers; Pamlico Sound and its western tributaries; the Core/Bogue sounds complex; and White Oak and New rivers, south through the Rich Inlet system on the Pender/New Hanover County, North Carolina line.
5. Work will include the following types of activities:
 - a. Monitoring of extent and coverage of SAV on a 3 to 5 - year cycle;
 - b. Annual monitoring of the health and productivity of SAV at a series of sites throughout the coastal area;
 - c. Restoration of SAV at selected sites;
 - d. Research on
 - 1) relationships among SAV and fisheries resources;
 - 2) growth and productivity of SAV under the range of conditions occurring in coastal North Carolina and southeastern Virginia;
 - 3) effects of human activities in the water and on land on survival, growth, and productivity of SAV; and
 - 4) SAV restoration techniques; and
 - e. Education concerning functions, status, trends, and human impacts on SAV.
6. The Albemarle-Pamlico National Estuary Program in the North Carolina Department of Environment and Natural Resources will provide management and coordination services for the cooperative SAV program.
7. Nothing in this Memorandum of Understanding shall obligate any of the signatories to expend funds. However, all partners in this program are encouraged to work together and provide funding and other assistance to accomplish the program's goals as provided above.

V. CONTRIBUTIONS BY COOPERATORS

This MOU does not obligate any of the cooperators to contribute funds, equipment, supplies, labor, or technical expertise at any specific level. Most of the cooperators are currently contributing one or more of those resources. By signing the MOU, the cooperators acknowledge the need for those resources and express a willingness to contribute as their legal authorities, budgets and staff allow.

The general operating framework of this MOU is to utilize the Albemarle – Pamlico National Estuary Program to coordinate and manage the monitoring and restoration and serve as a repository for grants to support the monitoring and restoration, and staff resources of scientific and technological organizations within the study area to perform the monitoring.

Specific needs include:

Program management.

Staff to interpret and digitize aerial photographs and interpret digital images, monitor SAV beds in the field, and produce hard copy maps and reports.

Equipment (computers, plotters, digitizing tablets, boats, water quality monitoring equipment) and supplies (paper, ink, fuel, etc.) to conduct monitoring.

Contract services (aerial photography flights, digitizing services, SAV planting services) to conduct monitoring and restoration.

Funds to support staff and purchase supplies, equipment, and contract services.

Technical expertise such as general guidance on monitoring and restoration, and specific guidance on interpretation of aerial photography and digital images and SAV identification.

Local knowledge of SAV beds and access to the SAV beds.

Access to the water from public and private land.

Use of boats and staff to operate boats to monitor SAV beds in the field.

VI. PRINCIPAL CONTACTS

Bill Crowell, Director
Albemarle – Pamlico National Estuary Program
North Carolina Department of Environment and Natural Resources
1601 Mail Service Center
Raleigh, NC 27699-1601
919-715-1327

Charles Jones, Director
Division of Coastal Management
North Carolina Department of Environment and Natural Resources
400 Commerce Avenue
Morehead City, NC 28557
252-808-2808

Rebecca Ellin, Manager
North Carolina National Estuarine Research Reserve
400 Commerce Avenue
Morehead City, NC 28557

Preston Pate, Director
Division of Marine Fisheries
North Carolina Department of Environment and Natural Resources
P.O. Box 769
Morehead City, NC 28557
252-726-7021

Alan Klimek, Director
Division of Water Quality
North Carolina Department of Environment and Natural Resources
1617 Mail Service Center
Raleigh, NC 27699-1617
919-733-7015

John Morris, Director
Division of Water Resources
North Carolina Department of Environment and Natural Resources
1611 Mail Service Center
Raleigh, NC 27699-1611
919-733-4064

Bill Gilmore, Director
Ecosystem Enhancement Program
North Carolina Department of Environment and Natural Resources
1652 Mail Service Center
Raleigh, NC 27699-1652
919-715-1412

Richard Hamilton, Executive Director
North Carolina Wildlife Resources Commission
1722 Mail Service Center
Raleigh, NC 27699-1722

Dr. Gregory Thorpe, Manager
Project Development and Environmental Analysis Branch
North Carolina Department of Transportation
1500 Mail Service Center
Raleigh, NC 27699-1500
919-733-2520

Dr. Francisco San Juan, Chairman
Department of Geological, Environmental, and Marine Science
Elizabeth City State University
Campus Box 971
Elizabeth City, NC 27909
252-335-3375

Dr. Nancy M. White, Director
University of North Carolina - Coastal Studies Institute
217 Budleigh Street
P.O. Box 699
Manteo, NC 27954
252-475-3545

Dr. Richard A. Luettich, Jr., Director
The University of North Carolina at Chapel Hill – Institute of Marine Sciences
3431 Arendell Street
Morehead City, NC 28557
252-726-6841

Dr. Robert Roer, Dean of the Graduate School and Research
Department of Biology and Marine Biology
University of North Carolina Wilmington
601 S. College Rd.
Wilmington, NC 28403-5955
910-962-4117

Dr. David B. Eggleston, Director
Center for Marine Sciences and Technology
North Carolina State University
303 College Circle
Morehead City, NC 28557
252-222-6301

Dr. Michael Voiland, Director
North Carolina Sea Grant
North Carolina State University
100-B 1911 Building
Campus Box 8605
Raleigh, NC 27695-8605
919-515-2455

Dr. Ronald Newton, Chairman
Department of Biology
East Carolina University
Greenville, NC 27858-4353
252-328-2418

Dr. William H. Queen
Institute for Coastal and Marine Resources
East Carolina University
Greenville, NC 27858-4353
252-328-6220

Dr. Michael Orbach, Director
Marine Laboratory
Nicholas School of the Environment and Earth Sciences
Duke University
135 Duke Marine Lab Road
Beaufort, NC 28516-9721
252-504-7655

Dr. Kirk Havens, Assistant Director
Center for Coastal Resources Management
Virginia Institute of Marine Science
P.O. Box 1346
Gloucester Point, VA 23062-1346
804-684-7380

Todd Miller, Executive Director
North Carolina Coastal Federation
3609 Highway 24 (Ocean)
Newport, NC 28570
252-393-8185

Dr. Sam Pearsall, Director of Science
North Carolina Chapter
The Nature Conservancy
One University Place, Suite 290
4705 University Drive
Durham, NC 27707
919-403-8558

Mary Combs, State Conservationist
Natural Resources Conservation Service
4405 Bland Road, Suite 205
Raleigh, NC 27609
919-873-2101

Sam Hamilton, Regional Director, Southeast Region
U.S. Fish and Wildlife Service
United States Department of the Interior
1875 Century Boulevard
Atlanta, GA 30345
404-679-4000

Marvin Moriarty, Regional Director, Northeast Region
U.S. Fish and Wildlife Service
United States Department of the Interior
300 Westgate Center Drive
Hadley, MA 01035-9589
413-253-8200

Mike Murray, Superintendent
Cape Hatteras National Seashore
1401 National Park Drive
Manteo, NC 27954
252-473-2111

Robert Vogel, Superintendent
Cape Lookout National Seashore
131 Charles Street
Harkers Island, NC 28531
252-728-2250

VI. MODIFICATION

This MOU may be amended from time to time by mutual, written agreement of the parties.

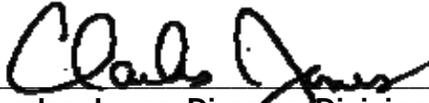
VII. EFFECTIVE DATE

This MOU shall become effective when executed by all of the parties. The MOU may be executed in one or more counterparts, each of which will be considered an original document when copies of all signatures, which may be obtained by electronic, scanned pdf submissions to APNEP, from all parties are attached.

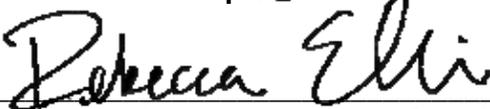
VIII. SIGNATURES



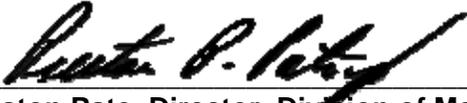
Bill Crowell, Director, Albemarle – Pamlico National Estuary Program
North Carolina Department of Environment and Natural Resources



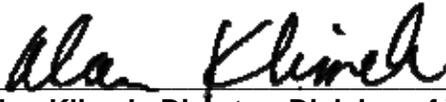
Charles Jones, Director, Division of Coastal Management
North Carolina Department of Environment and Natural Resources



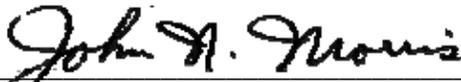
Rebecca Ellin, Manager, North Carolina National Estuarine Research Reserve
North Carolina Department of Environment and Natural Resources



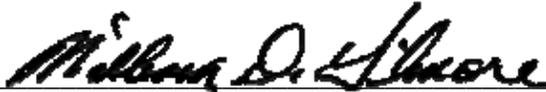
Preston Pate, Director, Division of Marine Fisheries
North Carolina Department of Environment and Natural Resources



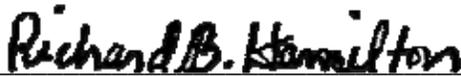
Alan Klimek, Director, Division of Water Quality
North Carolina Department of Environment and Natural Resources



John Morris, Director, Division of Water Resources
North Carolina Department of Environment and Natural Resources



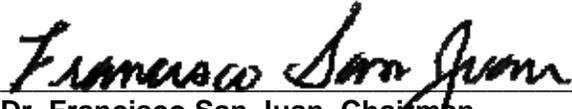
Bill Gilmore, Director, Ecosystem Enhancement Program
North Carolina Department of Environment and Natural Resources



Richard Hamilton, Executive Director
North Carolina Wildlife Resources Commission



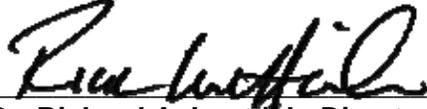
Dr. Gregory Thorpe, Manager
Project Development and Environmental Analysis Branch
North Carolina Department of Transportation



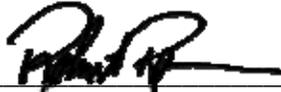
Dr. Francisco San Juan, Chairman
Department of Geological, Environmental, and Marine Science
Elizabeth City State University



Dr. Nancy M. White, Director
University of North Carolina - Coastal Studies Institute



Dr. Richard A. Luettich, Director
The University of North Carolina at Chapel Hill - Institute of Marine Sciences



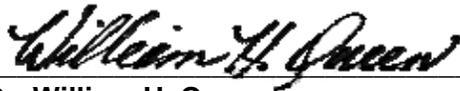
Dr. Robert Roer, Dean of the Graduate School and Research
University of North Carolina Wilmington – Department of Biology and Marine Biology



Dr. David B. Eggleston, Director
Center for Marine Sciences and Technology
North Carolina State University



Dr. Ronald Newton, Chairman
Department of Biology
East Carolina University



Dr. William H. Queen
Institute for Coastal and Marine Resources
East Carolina University



Dr. Michael Orbach, Director
Marine Laboratory
Duke University



Dr. John T. Wells, Dean and Director
Virginia Institute of Marine Science
College of William and Mary



Todd Miller, Executive Director
North Carolina Coastal Federation



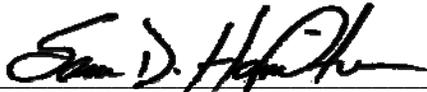
Dr. Michael Voiland, Director
North Carolina Sea Grant



Dr. Sam Pearsall, Director of Science
North Carolina Chapter, The Nature Conservancy



Mary Combs, State Conservationist
Natural Resources Conservation Service
United States Department of Agriculture



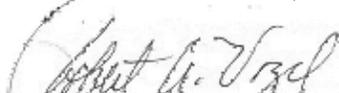
Sam Hamilton, Regional Director, Southeast Region,
U.S. Fish and Wildlife Service, United States Department of the Interior



Marvin Moriarty, Regional Director, Northeast Region,
U.S. Fish and Wildlife Service, United States Department of the Interior



Michael Murray, Superintendent, Cape Hatteras National Seashore,
National Park Service, United States Department of the Interior



Robert Vogel, Superintendent, Cape Lookout National Seashore,
National Park Service, United States Department of the Interior