

**FINAL EVALUATION FINDINGS**  
**ACE BASIN NATIONAL ESTUARINE RESEARCH RESERVE**  
**SOUTH CAROLINA**

*February 2006 – May 2011*

May 2012



Office of Ocean and Coastal Resource Management  
National Ocean Service  
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## I. EXECUTIVE SUMMARY

The Coastal Zone Management Act (CZMA) of 1972, as amended, established the National Estuarine Research Reserve System (NERRS). Sections 315 and 312 of the CZMA require the National Oceanic and Atmospheric Administration (NOAA) to conduct periodic performance reviews or evaluations of all federally approved National Estuarine Research Reserves (NERRs). The review described in this document examined the operation and management of the ACE Basin National Estuarine Research Reserve during the period of February 2006 through May 2011. The ACE Basin National Estuarine Research Reserve (ACE Basin NERR or Reserve) is administered by the South Carolina Department of Natural Resources (DNR or Department).

This document describes the evaluation findings of the Director of NOAA's Office of Ocean and Coastal Resource Management (OCRM) with respect to ACE Basin NERR during the review period. These evaluation findings include discussions of major accomplishments as well as recommendations for program improvement. The fundamental conclusion of the findings is that South Carolina DNR is successfully implementing and enforcing its federally approved NERR.

The evaluation team documented a number of ACE Basin NERR accomplishments during this review period. Notable Reserve efforts include providing opportunities for low income children to visit the Reserve and learn about estuaries; developing a volunteer program, Botany Bay Buddies, and cultivating a group of dedicated volunteers who staff Botany Bay Plantation six days a week; creating a CTP internship position which has enabled the CTP program to evaluate and expand its activities; providing trainings that have led to changes in state and local government regulations; creating the popular new adult education series, Coastal Exploration; and adaptively managing Botany Bay Plantation to balance public access and the protection of natural and cultural resources.

In addition to these numerous accomplishments, the evaluation team identified several areas where the Reserve and its programming could be strengthened. The findings contain one necessary action that must be addressed by the date identified and three program suggestions that describe actions that OCRM believes ACE Basin NERR could take to improve or enhance its program but that are not mandatory. The necessary action requires the state to align its cooperative agreement expenditures with the federal cooperative agreement cycle by July 1<sup>st</sup>, 2013. Suggestions include encouraging the research and monitoring program to work with coastal managers and other partners to identify and address priority research and monitoring needs. The education program is engaged in many ongoing programs and activities throughout ACE Basin and opportunities exceed capacity. Therefore, OCRM encourages the Reserve to conduct a market analysis and needs assessment and to develop a strategic plan for education and outreach activities that specifies priority areas and strategies for growth. In addition, OCRM encourages the Reserve to continue to adaptively manage Botany Bay Plantation and work with partners to develop solutions for identified issues.

## II. PROGRAM REVIEW PROCEDURES

### A. Overview

NOAA began its review of ACE Basin NERR in February 2011. The §312 evaluation process involves four distinct components:

1. An initial document review and identification of specific issues of particular concern;
2. A site visit to South Carolina including interviews and a public meeting;
3. Development of draft evaluation findings; and
4. Preparation of the final evaluation findings, partly based on comments from the state regarding the content and timetables of recommendations specified in the draft document.

The recommendations made by this evaluation appear in boxes and bold type and follow the findings section where facts relevant to the recommendation are discussed. The recommendations may be of two types:

**Necessary Actions** address programmatic requirements of the CZMA's implementing regulations and of the ACE Basin NERR approved by NOAA. These must be carried out by the date(s) specified;

**Program Suggestions** denote actions that the OCRM believes would improve the program, but which are not mandatory at this time. If no dates are indicated, the state is expected to have considered these Program Suggestions by the time of the next CZMA §312 evaluation.

A complete summary of accomplishments and recommendations are outlined in Appendix A.

Failure to address Necessary Actions may result in future finding of non-adherence and the invoking of interim sanctions, as specified in CZMA §312(c). Program Suggestions that are reiterated in consecutive evaluations to address continuing problems may be elevated to Necessary Actions. The findings in this evaluation document will be considered by NOAA in making future financial award decisions relative to the ACE Basin NERR.

### B. Document Review and Issue Development

The evaluation team reviewed a wide variety of documents prior to the site visit, including (1) the federally approved 1992 Management Plan and program documents; (2) Draft Management Plan dated February 2011; (3) financial assistance awards and work products; (4) semi-annual performance reports; (5) official correspondence; (6) previous evaluation findings; and (7) relevant publications on natural resource management issues in South Carolina.

Based on this review and on discussions with OCRM's Estuarine Reserves Division, the evaluation team identified the following priority issues:

- The Reserve's general administration, including grants and fiscal management
- Implementation and status of the Management Plan
- Facilities development and operations planning
- Implementation of the Reserve's research, stewardship, monitoring, coastal training, and education programs
- Reserve staffing and needs
- The manner in which the Reserve coordinates with other governmental and non-governmental organizations and programs in the state and region
- Major accomplishments and challenges during the review period
- The state's response to the previous evaluation findings dated July 2006

### **C. Site Visit to South Carolina**

Notification of the scheduled evaluation was sent to ACE Basin NERR and DNR. In addition, a notice of NOAA's "Intent to Evaluate" was published in the *Federal Register* on March 16, 2011 and was published in a regional newspaper.

The site visit to South Carolina was conducted May 2-6, 2011. Carrie Hall, Evaluation Team Leader, OCRM National Policy and Evaluation Division and Bree Murphy, ACE Basin NERR Program Specialist, OCRM Estuarine Reserves Division formed the evaluation team.

During the site visit, the evaluation team interviewed ACE Basin NERR staff and a number of partners including federal, state, and local government staff, educators, and nongovernmental representatives. Appendix B lists persons and institutions contacted during this review.

As required by the CZMA, NOAA held an advertised public meeting during the evaluation on May 4, 2011, at 6:30 p.m., at the Environmental Learning Center, Oyster Row Lane, Edisto Island, SC United States 29438. The public meeting is to give members of the general public the opportunity to express their opinions about the overall operation and management of ACE Basin NERR. Appendix C lists persons attending the public meeting.

The excellent support of ACE Basin NERR staff with the site visit's planning and logistics is gratefully acknowledged.

### III. RESERVE PROGRAM DESCRIPTION

NOAA's Office of Ocean and Coastal Resource Management designated the ACE Basin NERR in 1992. The lead agency is the South Carolina Department of Natural Resources (DNR), Marine Resources Division (MRD).

The ACE Basin is one of the largest undeveloped estuaries on the East Coast, comprising approximately 350,000 acres. The ACE Basin NERR is comprised of 99,308 acres and is located in parts of Charleston, Colleton, and Beaufort counties about 45 miles south of Charleston, where the Ashepoo, Combahee, and Edisto rivers drain into St. Helena Sound. The Edisto River, with its headwaters beginning below the fall line in South Carolina, has the largest watershed of the three rivers. It is the primary source of materials eroded from upland areas and supplied to the ACE Basin. The smaller Ashepoo and Combahee rivers originate from swamps on the coastal plain and also contribute large amounts of freshwater, as well as dissolved and suspended materials, to St. Helena Sound.

The ACE Basin is unique for its relatively undeveloped quality, ecological integrity, and the large amount of privately held wilderness areas. However, for all its biological diversity, the ACE Basin is not considered pristine but is rather a working landscape system. Historically this land was important to the economy of its inhabitants from Native Americans to English settlers, who became prosperous in such industries as farming, cotton, rice, timber, and seafood. Plantation grounds and impoundments are still clearly evident in the area. Many plantations were maintained as hunting preserves as the rice and timber industries declined and much of the population was leaving the area around the 1900s. The rice fields and logging forests attracted game animals, including migratory waterfowl and deer, and the impoundments were maintained to attract wildlife. This early practice of land conservation still holds today as much of the ACE Basin area is protected by state ownership or protective easements.

Habitats within the ACE Basin Reserve include salt marshes, brackish marshes, tidal flats, maritime forests, and pine-mixed hardwoods. Many threatened or endangered species are found in the ACE Basin, including the southern bald eagle, wood stork, loggerhead sea turtle, alligator, and short-nosed sturgeon. Game animals inhabit the upland areas and are actively managed by many landowners. Managed wetlands attract waterfowl to migration patterns and wintering habitat along the Atlantic Flyway.

The Reserve allows uses such as camping, paddle sports, bird watching, hunting, trapping, and commercial and recreational fishing. Bennett's Point is where the Reserve's research field station (the Michael McKenzie Field Station) is located. The Edisto Interpretive Center at Edisto Beach State Park is the access point for public groups and serves the area in providing a broader context for the area's natural and cultural resources.

## **IV. REVIEW FINDINGS, ACCOMPLISHMENTS, AND RECOMMENDATIONS**

### **A. Operations and Management**

#### **1. Reserve Administration and Staff**

Most Reserve staff members generally work “off-site” at the MRD offices and Marine Resources Research Institute (MRRRI) at the Fort Johnson campus on James Island. The NOAA National Centers for Coastal Ocean Science (NCCOS) Center for Coastal Environmental Health and Biomolecular Research and the NCCOS Hollings Marine Lab, a unique partnership of governmental and academic agencies including NOAA's National Ocean Service, the National Institute of Standards and Technology, the South Carolina Department of Natural Resources, the College of Charleston, and the Medical University of South Carolina, are also co-located at the Fort Johnson campus. Staff members also work at the Edisto Interpretive Center at Edisto Beach State Park and conduct educational programs. The stewardship program staff are based out of the Michael McKenzie Field Station where research and educational activities are also conducted.

The Reserve remains an excellent fit with DNR and MRD and its capabilities are highly valued by MRD management. MRD is very supportive of the Reserve and the co-location of staff facilitates cooperation and integration. The evaluation team met with MRD administrators who explained how the Reserve benefited their programs and emphasized that the Reserve is an “integral part of how we do business.” Benefits discussed included the use of the Reserve as a reference site for MRD research and monitoring activities; incorporating Reserve research and monitoring into fishery and shellfish management decisions; use of Reserve monitoring data to conduct research, and use of the McKenzie field station for sampling and monitoring. In addition, as MRD has consolidated, its other programs have increasingly come to rely on the Reserve for outreach and education activities.

The Reserve manager oversees the Outreach and Support Division within MRD which includes both Reserve and MRD outreach staff. The division supports MRD management and research efforts by conducting outreach to the general public, legislators, and stakeholder groups on issues such as new fishing regulations; providing training on key topics such as water quality and land management; and working with MRD scientists to incorporate outreach into research proposals.

At the time of the site visit, the Reserve was staffed by 14 full- and part-time employees. The Reserve has benefited from little turnover during the review period. The manager, research coordinator, and education coordinator positions are funded with state funds, 11 positions are funded by federal funds, and one position is funded through external funds. With decreases in DNR funding, Reserve staff have taken on additional duties to support MRD. The Reserve Manager now oversees the Reserve and Outreach Division and 25 percent of his time is dedicated to non reserve activities. The education coordinator continues to oversee the state-wide Discovery Boat Program, and 75 percent of the research coordinator's time is dedicated to managing MRRRI's Sustainable Seafood Mariculture Section.

The previous evaluation included a recommendation that the Reserve and MRD investigate providing administrative support to the Reserve and the Reserve now has 20 percent of one administrative staff person's time. The responsibilities of the administrator continue to grow and the Reserve was recently able to create a half-time position to support the Reserve manager. The position was to assist with the development and coordination of initiatives and activities such as Reserve coastal resiliency efforts. The Reserve was able to fill this position soon after the site visit but this new staff member has since replaced the CTP coordinator, who left in the fall of 2011, and the half-time Reserve support position remains vacant. OCRM encourages MRD and the Reserve to fill the half-time position administrative support or pursue other opportunities to provide needed support for administering the Reserve.

The Reserve has a diverse 20-member advisory committee, representing local business, education, science, forestry, fisheries, tourism, nonprofit conservation, non-governmental organizations, and private landowner communities. The advisory group meets every six months and the Reserve uses the meetings to provide updates on Reserve activities and to engage partners in Reserve initiatives. Informal discussions at the end of the meeting are used by the Reserve to identify opportunities for assisting partners. The advisory committee also provided input into the development of the 2011-2016 management plan.

## **2. Cooperative Agreement and Grants Management**

OCRM awards the State of South Carolina federal funds through annual cooperative agreements for the implementation and enhancement of the ACE Basin NERR and the Reserve is required to submit semi-annual performance reports. The Reserve's progress reports provide limited information for some tasks regarding the specific activities completed and outcomes. OCRM encourages the Reserve to submit progress reports that include full descriptions of specific activities and outcomes completed for each task during the reporting period.

ACE Basin NERR cooperative agreement expenditures for federally funded staff positions and other budget items has become "off-cycle" from the federally funded cooperative agreement. There is a significant delay in expending the federal funds, over six months for many tasks in the fiscal year 2010 cooperative agreement. NERR annual operations cooperative agreements are intended to be completed within 12 months. While NOAA often approves state requests to extend cooperative agreements, these extensions are not guaranteed. This practice creates difficulty in tracking and reporting the expenditure of federal funds, increasing the possibility of co-mingling of funds between grant awards.

**Necessary Action: The Reserve must align the state's NERR annual operations cooperative agreement expenditures with the federal cooperative agreement cycle by July 1<sup>st</sup>, 2013.**

## **3. Management Plan**

Reserves are required by Federal regulation to have a current NOAA-approved management plan (15 C.F.R. sec. 921.13). The plans describe the reserves' goals, objectives, and management issues, as well as strategies for research, education and interpretation, public access,

construction, acquisition, and resource preservation, and, if applicable, restoration and habitat manipulation. A management plan has four valuable functions (1) to provide a vision and framework to guide reserve activities during a five year period; (2) to enable the reserve and NOAA to track progress and realize opportunities for growth; (3) to present reserve goals, objectives, and strategies to constituents; and (4) to guide program evaluations. Regulations also require that a reserve's plan be updated every five years.

During the evaluation period, the Reserve initiated a strategic planning effort and rewrote its 1992 management plan. During the Reserve's initial development, the focus of the program was supporting the land acquisition efforts of the ACE Basin Taskforce. The Taskforce has been very successful in conserving lands within the ACE Basin and the Reserve is now focused on program development and addressing priority issues. The new management plan reflects this change in focus and was formally approved by NOAA in July 2011.

The Reserve has three goals in the 2011-2016 Management Plan:

1. Strengthen the role of the reserve as a leader in ensuring the long term protection of the biological, cultural, and historical resources of the ACE Basin NERR
2. Improve the ability of the ACE Basin community to act as good stewards of the ACE Basin
3. Enhance the capacity of the reserve to act as an important contributor to the ACE Basin community, DNR, and NERRS

Each goal has 1-3 objectives and implementation strategies and the responsible sectors for implementing each strategy are identified. The management plan also focuses on four priority issues: (1) habitat conservation, (2) water quality, (3) public access, and (4) community resilience.

#### **4. Facilities**

During the evaluation period, the Reserve completed several facility improvement projects.

- An outdoor classroom at the McKenzie Center allows the Reserve to accommodate multi-classroom school groups.
- Water and electrical service to the dock and outdoor classroom at the McKenzie Center have improved the usability of the facilities.
- New barracks at the Edisto Interpretive Center provide overnight facilities for teacher trainings, visiting researchers, education interns, and other staff.
- New exhibits at the Edisto Island Environmental Learning Center provide visitors with information on the ACE Basin NERR and NERRS.

The McKenzie field station contains office space and the stewardship coordinator, reserve biologist, and part-time administrative support position have their main offices at the facility. A concern raised in the previous evaluation was the low level of facility use by researchers and the findings recommended that the Reserve investigate reasons for the under-utilization of the field station and implement marketing, facility modifications, and other strategies accordingly to encourage increased use. To improve the facility for researchers, the Reserve made upgrades to

the station and dock and staff have promoted the availability of facilities through word of mouth. The stewardship coordinator, who is located on-site, was given the responsibility of managing the field station and attracting researchers to the site. The changes have resulted in the use of the facility by non-Reserve researchers increasing by approximately 400 percent.

Although use of the McKenzie field station has increased dramatically, opportunities to increase the usage remain. The McKenzie field station was not built with the intent of providing a full range of laboratory facilities like those available at the Fort Johnson campus, but the lack of some basic lab amenities such as distilled water, may discourage some researchers from using the facility. OCRM acknowledges that funding for future facility improvements may be challenging, as the legislative funds supporting facility improvement have decreased approximately 85 percent. However, OCRM encourages the Reserve to continue to improve usage through engagement with researchers to identify key limitations and to address limitations as appropriate and/or to implement additional marketing activities or other strategies that would increase the utility and use of the facility.

## **5. Visibility**

The Reserve partners and works closely with other organizations in the region to accomplish its goals, in particular through the ACE Basin Taskforce. Previous evaluation findings have noted that the ACE Basin NERR does not have a strong identity as a separate entity and that the Reserve was not seen as distinct from the ACE Basin Taskforce. To help address this issue the Reserve revamped its website, developed a logo that is included on all printed materials, and included information on the Reserve and NERRS in new exhibits at the Edisto Island Interpretive Center.

Although the Reserve has made significant strides toward increasing its visibility, the Reserve still struggles with being recognized as a distinct entity both within and outside of DNR. The Reserve will likely continue to be challenged as some Reserve staff members conduct the same tasks both at a state wide scale for MRD and for the ACE Basin Reserve. OCRM encourages the Reserve to consider and develop other methods for increasing the visibility of the Reserve and NERRS. The Reserve may wish to pursue opportunities such as providing Reserve merchandise in the gift shop at the Learning Center, installing additional signage to identify Reserve boundaries, using newer media tools such as Facebook and Twitter, ongoing website updates, and/or other methods to better promote ACE Basin NERR and build the Reserve's identity.

## **B. Research and Monitoring Program**

The Reserve System's research and monitoring program provides a stable environment for research through long-term protection of Reserve resources; addresses coastal management issues through coordinated estuarine research within the System; and collects and makes available information necessary for improved understanding and management of estuarine areas.

The research program's specific strategies which support the Reserve's goals as stated in the 2011 management plan are:

- Participate fully in the NERR System-wide Monitoring Program (SWMP)
- Broaden the reserve's research portfolio by encouraging and enabling non-SWMP research activities
- Build a better understanding of land-use in the ACE Basin
- Engage fully in the ACE Basin NERR Advisory Committee, CTP coordinating committee facilitating exchange of information with community leaders representing all facets of our program
- Build relationships that support Reserve programs through participation in initiatives with partners
- Support the NERRS through participation in system-wide efforts

Four research priorities are also identified (1) habitat and ecosystem coastal processes, (2) anthropogenic influences on estuaries, (3) species management, and (4) social science and economics. The Reserve's overarching priority issue areas and research priority areas do not directly align.

The Reserve's research and monitoring program is staffed by a quarter-time research coordinator, research biologist, System-wide Monitoring Program (SWMP) biologist, and SWMP technician. The SWMP technician position was vacant at the time of the site visit. The Reserve's monitoring program is well integrated with MRD's monitoring and research programs. During the evaluation period, the research program has conducted research and monitoring in ACE Basin's Scott's Creek to support coastal decision-making, supported the maintenance and improvement of 13 SET stations within the Reserve, and the GIS program has developed key products that support partner and other sector efforts.

The research program biologist has supported the national program through participation on the Habitat Mapping and Oversight Committee and as the GIS representative on the Data Management Committee. In addition, the research program biologist has represented the NERRS on the Federal Geographic Data Committee Coastal and Marine Ecological Classification Standard workgroup ensuring NERRS knowledge and needs were represented on the interagency committee.

## **1. Research Program**

The research program and other Reserve sectors have continued a long-term project with the local community looking at changes near the causeway in Scott's Creek. The construction of the causeway has caused the surrounding marsh to fill in, resulting in more flooding. During the previous evaluation period, DNR conducted an assessment of hydrologic conditions in the tidally restricted Scott Creek and monitored sediment erosion/accretion rates in salt marshes in the Reserve. In 2006, the CTP held a public symposium reviewing the results of the research on potential effects of removing the causeway at Scott Creek. The event was well attended with seventy five members of the general public attending. The Reserve is planning to conduct short and long term marsh studies and will monitor the Scott Creek watershed and map the area every

year to monitor changes in habitat, particularly spartina. The research biologist is also working on a Vertical Control Plan to enable increased understanding of habitat change in relationship to sea level rise. This information will also enable the Reserve to better understand what will happen as sea level rises.

A number of outside researchers have also used the Reserve to conduct research. Projects include:

- Evaluation of factors impacting the decline of blue crabs in the ACE Basin (Clemson University)
- Influence of predators on oyster reef community structure and resultant ecosystem function at a biogeographic scale, using Reserves from North Carolina to Florida (University of Georgia)
- Effects of different tidal regimes in structuring the arthropod communities in the *Spartina alterniflora* food web (University of Houston)
- Development of a salt intrusion model for the South Edisto river in the ACE Basin (University of Delft)
- Testing snail-*Spartina* interactions in multiple South Carolina marsh systems (College of Charleston)

The management plan identifies “broaden the reserve’s research portfolio by encouraging and enabling non-SWMP research activities” as a strategy. The Reserve has conducted research and monitoring in Scott’s Creek to support coastal decision-making and partnered with CTP to bring the results to the public. However, the research program is not actively engaged in identifying key coastal management issues and supporting research and monitoring efforts to address these identified issues.

OCRM encourages the research program to consider the priority issue areas of the Reserve and research program and to engage with partners, including coastal managers, to identify priority research needs and gaps. Priorities should also be chosen with consideration of national system and management plan priorities. The research program could then conduct research to address priority needs and gaps and take a leadership role in reaching out to partners and building new partnerships to encourage other scientists to conduct priority research. The research program may wish to consider the development of an advisory council and to use the council’s assistance in identifying key needs and gaps and drawing researchers to the Reserve to address priorities. The research program may also wish to update the site profile with a section focusing on recommendations for future research and monitoring to encourage research that supports Reserve priorities.

OCRM also encourages the research coordinator to engage and contribute towards national level research initiatives that have implications at the Reserve level. The Reserve should also consider dedicating resources towards updating the NERRS Research Database, at the time of the site visit there was only one research project uploaded. The database allows the NERRS to answer questions from outside parties about the types of research that are being conducted in the reserves and serves as a resource to NERRS and ERD staff when funding opportunities arise.

**Program Suggestion: OCRM encourages the Reserve to strengthen its research program by (1) identifying priority research needs and gaps through engagement with local partners, including coastal managers, while also considering NERRS and Reserve priorities; (2) coordinate and conduct research that addresses identified priorities; and (3) proactive outreach to other researchers to facilitate research that addresses identified priorities.**

## **2. Monitoring Program**

The Reserve is part of the NERRS System-wide Monitoring Program (SWMP) and conducts additional estuarine monitoring activities, mostly in partnership with MRD. The goal of SWMP is to identify and track short-term variability and long-term changes in estuarine water quality, habitat, and land use in each reserve. The data gathered through SWMP provides standardized information about how estuaries function and change over time, enabling scientists to gain a better understanding of how human activities and natural events can change coastal ecosystems.

The Reserve is fully implementing its abiotic monitoring and maintains four SWMP monitoring stations at Big Bay, St. Pierre, Fishing Creek, and Mosquito Creek. The St. Pierre Creek SWMP station is also paired with a meteorological station and both are telemetered using a GOES satellite-based telemetry system and provide real-time data. Analysis of SWMP samples is conducted by MRD.

The ACE Basin NERR has often served as a pilot site for beta testing and technical evaluations for SWMP related products and procedures. The Reserve piloted a RASL based telemetry system at two water quality monitoring stations. Although the RASL based telemetry system was not chosen for use by the national system, the Reserve continues to maintain the two RASL based water quality monitoring stations. OCRM encourages the Reserve to explore the process of switching over the water quality monitoring stations to a GOES telemetry system so that the data meet SWMP requirements and better link into the Integrated Ocean Observing System.

The data from SWMP monitoring stations are valued by Reserve partners and several partners have assisted with expanding and maintaining monitoring stations. The U.S. Fish and Wildlife Service partnered with the Reserve to install a sturdier YSI deployment mount at the Fishing Creek monitoring station and the Nemour Foundation helps maintain a non SWMP water quality station at Combahee.

The Reserve' SWMP data is used by a variety of partners for research, management decisions, and education. For example:

- SWMP abiotic data are used by DNR Inshore Fisheries Section to evaluate the impacts of low water temperatures on fish recruitment
- The education program has used SWMP data in educational programming
- The stewardship program has incorporated SWMP information into adult education programs
- Land managers use the salinity data to determine when to flood their rice fields

The Reserve also serves as an important site for other state monitoring efforts.

- MRD monitors oyster recruitment and early growth annually
- Monthly inshore finfish monitoring has been conducted by MRD for over 15 years
- South Carolina Estuarine and Coastal Assessment Program, a collaboration between MRD and DHEC with assistance from federal agencies, monitors the condition of the state's estuarine habitats and provides periodic reports

In 1998, the SC DNR Geological Survey installed a series of sediment elevation tables (SETs) in the Reserve and has regularly collected elevation data to help determine the effects of sea level rise on the southern coast of South Carolina. The Reserve has provided key financial support to help maintain this system. The NERRS is also incorporating SET monitoring within the biological monitoring program and SET protocols will be adopted system-wide. OCRM encourages the Reserve to work with the NOAA's National Geological Survey and the NERRS to explore how the system-wide SET protocols and accuracy of the geodetic control network compare to, and could potentially align with, the SET protocols the SC DNR Geological Survey has been using in ACE Basin since 1998. The SET records are unique along the coast but the data has currently not been widely used by researchers. OCRM encourages the Reserve to explore and implement strategies to advertise the availability of the SET dataset and attract researchers that interested in incorporating the SET data into their research. In addition, OCRM also encourages the Reserve to consider the addition of SET stations at the existing upper biomonitoring areas within the Scott Creek study areas. These SET's should be installed in accordance to NOAA guidance and protocol.

### **3. Site Profile**

NERRS implementing regulations require each reserve to develop a comprehensive site profile. A site profile is designed to (1) compile scientific datasets relating to the reserve, (2) characterize the physical and biotic components of the environment, (3) synthesize the known ecological relationships within the reserve and its watershed, (4) trace the impact of natural and human disturbances, and (5) explore the need for future research, education, and management initiatives. ACE Basin NERR completed its site profile in 2001 and it is available on-line in html format. As noted in *Section 1. Research Program*, the research program is strongly encouraged to consider updating the site profile to conform with NERRS site profile guidance and to include a section focusing on recommendations for future research and monitoring to fill identified needs and gaps.

### **4. Graduate and Undergraduate Research Fellowships and Internships**

The Reserve continues to be actively engaged in the education and training of graduate students. During the evaluation period, the Reserve sponsored four NERRS Graduate Research Fellows (GRFs). The NERRS GRF Program is a system-wide program that supports masters or doctoral students' management-related research projects that (1) enhance scientific understanding of the reserve system, (2) provide information needed by reserve managers and coastal decision-

makers, and (3) improve public awareness and understanding of estuarine ecosystems and management issues. In addition to the GRF fellowship, the Reserve has also hosted fellow(s) through South Carolina Sea Grant and the College of Charleston Masters of Environmental Science Program.

NERRS GRF research projects were:

<b>Year</b>	<b>Fellow</b>	<b>Project Title</b>
2006	A. Green	<i>Maternal transfer of mercury in Carolina Diamondback terrapins</i>
2007	K. Johnston	<i>The influence of meteorological and substrate factors upon embryonic outcomes of <i>Caretta caretta</i> nests in South Carolina</i>
2008	S. Crickenberger	<i>Larval development and potential for range expansion of the non-indigenous barnacle <i>Megabalanus coccopoma</i></i>
2009	W. Kanapaux	<i>Assessing visitor use impact in Botany Bay Plantation WMA using an adaptive management framework</i>

The Reserve also hosted a fellow funded through South Carolina Sea Grant, J. Hein, who studied the comparative impact of the invasive parasitic species, *Anguillicoloides crassus* on the American eel populations between the ACE Basin and North Inlet-Winyah Bay (NI-WB) NERRs and the Cooper River. The Reserve also hosted a University of Charleston graduate student, S. Hunter, who developed a best management practices brochure for methods to reduce nonpoint source pollution; conducted several workshops for citizens; and updated a groundwater dataset for Edisto Island private wells. The Reserve recruited two new GRFs for 2011 who will study *Blue Crab Recruitment and Survival in the ACE Basin* and *Social Valuation of Ecosystem Services in the ACE Basin, SC*. The research program has also coordinated a summer internship program for minority students funded through an NSF grant, “Minorities in Marine and Environmental Science.”

## **5. Geographic Information Systems (GIS)**

The Reserve’s GIS program is well developed and GIS products and analysis are used to support Reserve sectors and partners. The GIS program is staffed by the research biologist, with support from the MRD GIS Manager who manages the Reserve spatial layers and provides GIS services for projects.

The Reserve’s GIS program developed a complete map of the NERR boundary based on parcel data that was included in the new management plan. The GIS program also provides GIS assistance to Edisto Island Open Land Trust (EIOLT) and Edisto Island Preservation Alliance. (see also D. Coastal Training Program) The GIS program incorporates EIOLT acquisitions into the Reserve’s GIS systems and has prepared maps for grant applications and newsletters. The GIS program produced maps for EIOLT’s successful application for a National Scenic Byway designation for SC Highway 174 to promote and encourage tourism. The research biologist works with each sector to identify GIS products that can assist their programs. For example, the

research biologist developed maps documenting shoreline change for use in educational programming. The GIS program has also developed maps for other DNR staff to facilitate better management and improved public access.

**Accomplishment: The ACE Basin NERR GIS program developed a map of the NERR boundary that was included in the new management plan; provided technical assistance to Reserve non-profit partners assisting their land acquisition and economic development efforts in ACE Basin; and worked with sectors to identify and develop GIS products to assist their programs.**

ACE Basin is participating in the NERRS habitat mapping initiative and has completed pilot tests of the classification scheme in three areas. The NERRS habitat mapping initiative will create baseline habitat maps for all Reserves that will enable the Reserve to track and evaluate short-term variability and long-term changes in the extent and types of habitats within the Reserve and to examine how these changes are related to anthropogenic and climate stressors. The Reserve's habitat mapping initiative is focused on the Scott Creek watershed, complimenting additional ongoing programmatic efforts in the area.

### **C. Education and Volunteer Programs**

National Estuarine Research Reserves are federally designated “to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation.” The reserve system provides a range of educational programming to key audiences depending on watershed and community needs and the specific capacity of each reserve.

ACE Basin NERR's strategies for the education program as described in the 2011 Management Plan are:

- Engage fully in the ACE Basin NERR Advisory Committee, CTP Coordinating Committee facilitating exchange of information with community leaders representing all facets of our programs
- Conduct formal surveys of audiences
- Deliver timely, audience-driven, conservation-oriented information to support the public in protection of their resources (ex. Circle Hooks for Conservation, seminar series, monofilament recycling centers)
- Provide education programs to enhance the understanding, appreciation and conservation of estuaries for a broad spectrum of the public
- Encourage and support stewardship ethic by enabling hands-on activities for the general public
- Build relationships that support Reserve programs through participation in initiatives with partners
- Support the NERRS through participation in system-wide efforts
- Promote collaboration between local governments to assist effective land-use planning and solve complex environmental problems.

- Monitor and maintain the condition of reserve facilities and equipment
- Provide visitors to the Reserve with material and informational support.

The Reserve’s education program is staffed by an education coordinator who also oversees the Carolina Coastal Discovery Marine Education Program and an education specialist who works half-time as an education specialist for the Reserve leading field trips in ACE Basin on board the *Discovery* and half-time for the state. The Reserve added the half-time education specialist position to help meet the demand for the program. During the evaluation period the Reserve continued its popular boat educational programs, partnered with other organizations to offer teacher trainings, reviewed and ensured all curriculum met state standards, and developed new curricula to meet identified needs. The Reserve also developed a very successful new volunteer program, Botany Buddies, and volunteers are integral partners in the management of Botany Bay.

The education coordinator was very active in supporting education groups in the region including serving as a board member for the South Carolina Marine Educators Association and National Marine Educators Association; a committee member of the Marine Division Minorities in Marine and Environmental Science (the committee implements an NSF grant for a summer intern program), and chairing the Youth Mentoring Program at Memminger Elementary School. The education coordinator also supported NERRS education efforts and served as the education representative on the NERRS Strategic Committee and as a member of the Estuaries 101 workgroup and lead educator for Estuaries 101 “Principle 3” curriculum development.

## 1. K-12 Education

The education program provides quality educational programming that reaches approximately 3,000-4,000 school children every year. The education program works with local communities to weave estuarine education into the classroom in a fashion that meets local needs. One of the Reserve’s most popular programs is field trips on the education vessel *Discovery*. During field trips, students learn about topics such as estuarine and salt marsh ecology, the value of estuarine and salt marsh ecosystems, biology of animals and plants inhabiting the estuary, water quality data collection methods and the value of clean water, and identification of birds and other wildlife. In addition, students participate in land based studies such as salt marsh field study, marine geology, or phytoplankton and zooplankton studies.

Through a grant, the Reserve is able to provide free field trips for Title 1 schools. The ACE Basin area has a significant number of children from low income families. For many children the boat trip is their first trip to the coast and first experience with salt water and marine animals.

The Reserve also offers additional educational programs including:

- Programs provided in partnership with South Carolina Parks at the Edisto Island Interpretive Center which include “A Walk in the Woods,” “Beach Explorations,” and “Secrets of the Salt Marsh.”
- “Grasses in the Classes.” The curriculum was developed during the review period and highlights the sweet-grass plant and its role in the making of sweet grass baskets by the

indigenous Gullah people of South Carolina and Georgia. Currently, the program is being implemented in elementary and middle schools in Charleston, Colleton, and Beaufort Counties.

- ACE Basin NERR co-hosted an Estuary Live broadcast in 2007 with North Inlet-Winyah Bay NERR and engaged 2,800 students on topics related to South Carolina's estuaries.

DNR is interested in developing natural resource schools to integrate fish, wildlife, natural resources, outdoor skills, and conservation education into all aspects of the classroom to improve student achievement, behavior, critical thinking skills, ability to problem solve and attitudes and behaviors towards natural resources, fish, wildlife, outdoor activities, and conservation. The evaluation team met with a middle school principal and teacher who were part of a new initiative to develop a natural resources school within their Title 1 middle school. The education coordinator is supporting the local school district's effort and the Reserve conducted a teacher training for 20 of the teachers within the natural resources school after the site visit. The school is looking to the Reserve for additional assistance including teacher trainings and lesson plan development. OCRM commends the education program's support of the development of an innovative natural resources school.

**Accomplishment: The Reserve offers excellent educational programs at no cost for Title 1 schools enabling many students to learn about, and experience, estuaries for the first time.**

During the evaluation period, the education coordinator focused on improving the Reserve's lesson plans and aligning them with state educational standards. The education coordinator reviewed and modified existing lesson plans as necessary to align them with state standards. The education coordinator also developed the ACE Basin Activity Book with games, puzzles, and facts, to educate elementary and middle school students about ACE Basin.

The education program conducted a survey to assess curriculum needs and based on the results developed a lesson plan focused on fossils and geology. In addition, a phytoplankton lesson plan was in development at the time of the site visit. The education coordinator also regularly surveys teachers and other adults involved in education programs to determine what is working well and opportunities for improvement.

The education program has continued to work closely with the Colleton Museum including hosting summer camps and field trips to Edisto Island. The Reserve also continues to be a key partner in TEN, a teachers network that is led by the museum. TEN hosts monthly meetings with teachers to inform them of resources and programs, including those provided by ACE Basin. In addition, the Reserve assists TEN with providing multi-day teacher training workshops. The Reserve also partners with NI-WB Reserve to hold an annual summer teacher training based out of the McKenzie Field Station.

The education program is involved in numerous educational activities at multiple sites that require significant travel time between sites. The Reserve's management plan identifies the many educational and outreach activities the Reserve is engaged in, guiding principles, and education themes but doesn't lay out a process for prioritizing activities and areas of growth. With the

popularity of its many programs and logistical challenges, the education program could benefit from a comprehensive strategy to focus and guide the development of the program. OCRM encourages the Reserve to conduct a market analysis and stakeholder needs assessment and to evaluate the place of the Reserve in the larger education community and the strengths and limitations of their educational program. The market analysis, needs assessment, and program analysis could help guide the development of an education program strategic plan that prioritizes and guides the growth of the education program and would meet the system-wide KEEP requirement that all K-12 programs conduct a market analysis and needs assessment.

**Program Suggestion: OCRM encourages the Reserve to conduct a market analysis and needs assessment and to develop a strategic plan for education and outreach activities that specifies priority areas and strategies for growth.**

## 2. Volunteer Program

During the evaluation period, the Reserve was able to hire a part-time volunteer coordinator to develop and implement a volunteer program, Botany Bay Buddies. The volunteer coordinator has built a strong program that is supported by a cadre of enthusiastic and dedicated volunteers. Volunteers greet visitors and staff the beach parking area and entrance six days a week and conduct maintenance from painting to equipment repair. Volunteers are integral to managing and maintaining the Botany Bay Plantation. From January – June 2011, over 80 Botany Bay Buddies donated a total of over 4,400 hours of service. The evaluation team was very impressed by the enthusiasm and dedication of the volunteers.

Botany Bay Plantation is unique for its undisturbed beaches and the large number of shells found on the site. Volunteers were instrumental in the state legislature passing a ban on shelling at Botany Bay Plantation (*see also Section E. Stewardship*). Volunteers inform visitors about the site, its history, rules, and help visitors learn why shells need to remain in the ecosystem, ensuring that shells remain for future visitors to enjoy.

**Accomplishment: The creation of the Botany Buddies volunteer program and the dedication of the volunteers have been integral to the maintenance and management of Botany Bay.**

## D. Coastal Training Program

The Coastal Training Program (CTP) is designed to inform coastal decision-making, improve coastal stewardship at local and regional levels through the application of science-based knowledge, and increase dialogue and collaboration among decision-makers. Planning for the program includes establishing a training advisory committee, conducting a market survey of training providers and an audience needs assessment, developing a program strategy that outlines priority coastal issues to be addressed, prioritizing target audiences, and creating a marketing plan.

ACE Basin NERR's CTP was fully implemented in April 2003 and is staffed by a full-time CTP coordinator and a graduate student intern through a partnership with the College of Charleston. The overall goals of the Reserve's CTP, taken from the 2007 Program Strategy are:

- Support land protection initiatives through facilitation and information exchange with communities.
- Conduct formal and informal needs assessments of the coastal decision maker audience to better understand training needs and preferences.
- Equip coastal decision makers with the information and tools necessary for informed decisions about coastal issues of concern.
- Advocate partnerships and understanding between parties to promote collaborative planning.
- Encourage and support integration among sectors through coordinated planning and communication.
- Share expertise and resources with partners and parent organization.

During the evaluation period, the CTP supported community led planning and land protection efforts, provided trainings on numerous topics and in particular, provided extensive trainings and support to bring research results on the effectiveness of low-impact-development (LID) techniques on improving storm water quality to local and state officials, and initiated local dialogue on improving preparation and planning for hazards.

## 1. Program Development and Evaluation

During the evaluation period, the CTP developed a one-year internship program, funded by DNR, with the College of Charleston. Interns have provided valuable assistance to the CTP and expanded the Reserve's capacity to conduct trainings and complete special projects such as a formative evaluation of the CTP. The internship provides students with the opportunity to apply what they have learned through their Master's degree program and learn on the ground skills such as partnership building and project management.

**Accomplishment: ACE Basin NERR developed a CTP internship that has enabled the program to expand its programming while providing valuable training to masters students.**

The CTP partnered with North Inlet-Winyah Bay (NI-WB) NERR to complete the *Training Needs Assessment of Professional Decision Makers in the Coastal Counties of South Carolina* which was completed in 2006. The survey was developed and sent to approximately 1,500 municipal and county elected, appointed, and staff officials, as well as over 200 developers, engineers, and architects. The assessment provides current and targeted information on important coastal issues, information needs, and the workshop style and timing preferences of target audiences. The assessment has not only served as a resource to guide the development of both South Carolina CTPs, but it was highlighted by other partners as a valuable resource they used to guide their program development.

Based on the formal and informal needs assessments, the ACE Basin CTP offers information and training on a wide variety of critical coastal issues such as coastal growth and development,

water resource management, habitat protection, community planning, sustainable development, and stormwater management. Training formats vary and include seminars, hands-on skill training, workshops, lectures, and technology demonstrations. The CTP serves a mix of federal, state, county, regional, and local staff and officials, business, university, community, and nongovernmental organizations.

During the evaluation period, the CTP coordinator made significant contributions to the national CTP. The CTP coordinator served on numerous national CTP workgroups including CTP Planning and Implementation, CTP Mentoring, CTP Visioning, and CTP External Review and served as chair of the CTP Performance Monitoring Workgroup. In addition, the CTP Coordinator served as Secretary for the NERRA Executive Committee and as the CTP representative on the NERRS Strategic Committee. The CTP coordinator mentored the new NI-WB CTP Coordinator and developed a database to streamline management of contact information and meeting logistics that has been adopted by other programs. OCRM commends the ACE Basin NERR CTP Program for its significant effort and contributions towards the development of the national CTP.

The CTP completed a formative evaluation of its program in 2009 to determine program outcomes and influence. The CTP intern, with the guidance of the CTP coordinator, developed an evaluation process that included a survey of past participants and interviews of key stakeholders. The survey found that 99 percent of respondents indicated their level of knowledge increased; 91 percent indicated they were able to apply the knowledge and concepts they learned in their workplace; and 21 percent of respondents indicated they were able to implement changes in their workplace or community based on their participation in a CTP event. The results were published in a report: *Stakeholder Analysis of the ACE Basin Coastal Training Program: Evaluating Program Impacts within Coastal Decision Makers' Communities in Southern Coastal Counties of South Carolina*. The results of the evaluation demonstrate the success of the CTP in bringing science to coastal decision makers and that some participants were able to use the trainings to make changes in their workplace or community.

## **2. Partnerships**

The CTP partners with other organizations to provide quality training, share costs, and increase contact with the intended audience. The CTP is a member of the South Carolina Coastal Information Network (SCCIN), a collaborative group of training providers in South Carolina who work together to increase their reach, leverage resources, and minimize duplication of efforts. The group meets every two months and provides a forum for collaborative planning. SCCIN also hosts a website where members post planned training events.

The ACE Basin CTP has a collaborative relationship with NOAA's Coastal Services Center (CSC), assisting with the development of new CSC training modules and hosting CSC led training workshops. The CTP works closely with the NI-WB NERR and the programs write an annual plan for developing and delivering trainings. The two programs share an advisory group and most training events are hosted at both reserves to ensure that attendees from all along the coast can easily attend.

During the evaluation period, the CTP has increased technical assistance and capacity building efforts within DNR with a focus on facilitating discussions with, and improving buy-in of, stakeholders. For example, the CTP coordinator helped plan a discussion between agency staff and crab fishermen over possible legislation changes and assisted in the development of a future visioning and strategic planning discussion with the DNR Marine Advisory Committee. The CTP coordinator has also assisted DNR staff with developing education products specific to audience needs and coordinating MRDs outreach messages.

The CTP is also a member of the Ashley Cooper Stormwater Education Consortium, a partnership between NPDES Phase II communities, universities, agencies, and non-profits working together to implement a regional, watershed-scale stormwater runoff education program in the Charleston urbanized area. The effort is spearheaded by Clemson University's Carolina Clear Program. The communities within the ACE Basin are not NPEDES Phase II communities but the Consortium and CTP share workshops to provide their audiences with more learning opportunities. The evaluation team met with the Consortium coordinator who noted that he highly valued the CTP coordinator's assistance in developing events and that by working with SCCIN and the CTP he was able to accomplish more, as they were already established and respected in the region.

### **3. Trainings**

The CTP trainings are highly valued by local and regional coastal decision makers, partners and MRD. In particular, partners noted that free and low cost trainings were very important in the current economic environment; interactions with colleagues were very valuable and led to collaborative cross agency work; and having practitioners and regulatory staff at the same workshops allowed them to develop relationships and gain a common understanding of the topic.

During the review period, CTP become an approved program provider for the South Carolina Planning Education Advisory Committee. South Carolina code requires that unless expressly exempted, every locally appointed planning and zoning official and professional employee must attend a minimum of six hours of orientation training and three hours of continuing education. The certification has expanded the visibility and reach of the program.

#### *Stormwater Management and Low Impact Development (LID)*

Stormwater management and LID has been a key focus area of the CTP and communities within the ACE Basin have begun to adopt and implement new stormwater regulations to improve water quality. The CTP has continued to build on existing training and knowledge to move stormwater management forward.

In January of 2009, as part of an ongoing partnership with the South Carolina Sea Grant, University of South Carolina, and NOAA Hollings Marine Laboratory, the CTP helped plan and host a seminar on stormwater ponds and LID practices in South Carolina. At the seminar, county and municipal staff, engineers, architects, developers, consultants, and regulators discussed options for improvement and concerns. Information from the focus groups was used to develop a

white paper “Assessment of stormwater management in coastal South Carolina: A focus on stormwater ponds and low impact development practices (LID).”

A “Low Impact Development Resource” DVD was released in 2009. The DVD is aimed at professionals in the development field and has a number of chapters covering the installation and design of specific LID techniques, including bioswales and pervious pavers.

The Oak Terrace Preserve is a redeveloped community in north Charleston. The developer partnered with researchers to incorporate LID techniques into the design and construction of the community. Researchers compared the performance of LID installations to more traditional stormwater management techniques in a similar community. The CTP worked with the researchers, developer, and other SCCIN members to develop and host training workshops to share the study’s results with coastal decision makers. Through the study it was also found that homeowners were interested in a guide for maintaining LID installations. The CTP published a “Low Impact Development Maintenance” which provides guidelines for the maintenance of LID practices within Oak Terrace Preserve.

In March 2009, the ACE Basin CTP hosted a two day conference *Sustainable Development in Coastal South Carolina* promoting sustainable development through comprehensive plans, ordinances, codes, and regulations in partnership with DNR, Town of Hilton Head Island, Beaufort County, Town of Bluffton, South Carolina Sea Grant, DHEC-OCRM, Carolina Clear, Congress for the New Urbanism - Carolinas, and Urban Land Institute – SC Chapter. Audience members included elected and appointed officials, municipal and county staff, developers, architects, engineers, coastal managers, and non-profit staff interested in overcoming the current barriers to using LID and new urbanism techniques. As a result of discussions at the conference, CTP decided to spearhead an effort to develop a LID manual for the coast of South Carolina.

In January 2011, ACE Basin NERR partnered with South Carolina Sea Grant, Carolina Clear, NI-WB NERR, and DHEC-OCRM to hold three scoping events. The scoping events provided attendees with background information on local resources and work in the region and gathered input from stakeholders on what information would be most helpful in a LID manual, how participants would use a LID manual, and the most user friendly option for organizing content. The events were attended by county and municipal planners, stormwater staff, developers, engineers, architects, regulators, and consultants, ensuring a wide range of opinions and perspectives were gathered. After the scoping events, writing workgroups were formed to compile existing resources and determine the extent of new writing necessary to complete the manual. Partners the evaluation team met with stressed the importance of the guide and that they hoped it would be completed soon. The guide is planned for release in 2012 and the CTP is planning to hold implementation workshops after the release.

The CTP has also offered many other trainings related to stormwater and LID including:

- “Addressing Bacterial Contamination through Stormwater BMPs”
- “Beyond Pipe and Pond: Research Based Stormwater System Design Workshop”
- “Cistern Installation Demonstration”
- “Rainwater Harvesting: Stewardship of a Priceless Resource”

- “Pervious Concrete: Hydrological and Structural Design and Construction”
- “Use of Pervious Concrete in Stormwater Management”
- “Impact of Stormwater Management on the Community”
- “LID Stormwater Management Practices: Design and Installation Demonstrations”

As a result of CTP and partner efforts, DHEC rewrote their rules so that developers are able to, and encouraged, to use LID techniques. Local governments have also revised their regulations to enable and encourage the use of LID techniques.

The evaluation team met with CTP partners and users who identified a variety of ongoing needs around stormwater and LID. Needs identified include:

- Training for regulators and the private sector including how LID techniques work, the cost savings associated with LID techniques, and the importance of stormwater management to public health and the county.
- Training for coastal decision makers, an important audience that is hard to reach. Specific recommendations included hosting short 20-30 minute evening training programs in concert with other meetings or through webinars targeted to coastal decision makers.
- Training for homeowners on the importance and maintenance of LID installations.

OCRM encourages the CTP to continue to assess and prioritize needs to provide trainings for various stakeholders in order to achieve improved water quality and stormwater management.

### *Edisto Island*

The CTP was approached by local citizens from Edisto Beach and Edisto Island who were interested in preserving their rural and agricultural way of life through community driven growth management and proactive initiatives to preserve their community’s historical and cultural heritage and natural beauty. The citizens were interested in forming a more formal organization to further their vision. The CTP coordinator worked with citizens to assist them with developing and implementing a process to create and manage a new organization, the Edisto Island Preservation Alliance (EIPA). The CTP coordinator also developed training workshops to support the community’s efforts including “Coastal Community Planning and Development Training Edisto Island.”

The Reserve CTP and GIS programs and NOAA Coastal Services Center worked with the EIPA to pilot a participatory GIS process using CSC’s Habitat Priority Planner tool. The project engaged community stakeholders through paper map exploration, technology demonstrations, data gap identification, data gathering and analysis, and map production. The process helped the community visualize target areas to conserve, which included existing conserved lands, lands at risk for being subdivided, and land that would protect water quality. Community members used the project results to convince the county to abolish “settlement zones,” zones that allowed for the subdividing and developing of land without a public process. In addition, the gathering of important historical, cultural, and scenic points along Highway 174 supported the community’s successful application for a National Scenic Byway designation to promote tourism. The CTP Coordinator and CSC have presented the Edisto Island case study in multiple venues to encourage the use of participatory GIS as a community tool.

The CTP also worked with the Edisto Island Open Land Trust (EIOT) to support their efforts to protect Edisto Island. The CTP hosted a training “Preserving Your Land With a Conservation Easement” which led to at least eight conservation easements being pursued in the southern region of the ACE Basin. EIOT also provides the Reserve with GIS coordinates for new easements within the Reserve boundary and the Reserve’s GIS program has provided conservation maps and GIS analysis of land cover to support their land protection efforts.

### *Shoreline Change*

The ACE Basin NERR and SCCIN partners planned and hosted three Shoreline Change workshops for coastal decision-makers. The purpose of the workshops was to provide current knowledge on climate change, sea level, and erosion impacts on the shoreline of South Carolina, as well as to initiate dialogue at the local scale on the needs of communities. The information from the events was synthesized and incorporated into a formal report, *South Carolina’s Changing Shoreline: Implications for the future* by the ACE Basin CTP intern and the information will serve as an informal needs assessment for future plans for outreach on this and related topics. The CTP is planning to partner with Sea Grant and NI-WB NERR to do an assessment of local government hazard needs.

In June of 2010 at the request of the City of Beaufort, the CTP partnered with NOAA CSC to host a workshop “Roadmap for Adapting to Coastal Risk.” Through the training, the community characterized their exposure to current and future hazards and assessed how existing planning and policy efforts might integrate this information to address community issues. Climate was incorporated into the discussion as one of the long term threats to the region. Participants included emergency managers, loss prevention specialists in the resort industry, and municipal and county officials and staff.

**Accomplishment: The CTP’s trainings and technical assistance have led to changes in state and local stormwater regulations and active pursuit of at least eight conservation easements.**

## **E. Stewardship Program**

Stewardship is a functional role at each reserve, involving aspects of research, monitoring, education, policy, and implementation of resource management actions. Stewardship provides long-term protection of natural resources within the system and serves to model responsible resource management practices to coastal communities.

The Reserve’s stewardship and natural resource protection strategies, as described in the 2011 Management Plan, are:

- Conduct a resource inventory of significant features (biological, historical, cultural, etc...) for all reserve properties
- Assess level and type of human activities on managed lands
- Establish a plan for public access that is consistent with wildlife needs
- Develop and implement strategies for managing “species of concern”

- Support land protection initiatives throughout the ACE Basin
- Respond to “events of concern” (spills, strandings, marsh die-off, etc.) within and adjacent to the reserve
- Engage fully in the ACE Basin NERR Advisory Committee, CTP Coordinating committee facilitating exchange of information with community leaders representing all facets of our programs
- Conduct formal surveys of audiences
- Deliver timely, audience-driven, conservation-oriented information to support the public in protection of their resources (ex. Circle Hooks for Conservation, seminar series, monofilament recycling centers)
- Provide education programs to enhance the understanding, appreciation and conservation of estuaries for a broad spectrum of the public
- Encourage and support stewardship ethic by enabling hands-on activities for the general public
- Build relationships that support Reserve programs through participation in initiatives with partners
- Support the NERRS through participation in system-wide efforts
- Promote collaboration between local governments to assist effective land-use planning and solve complex environmental problems
- Reserve planning clearly communicates staff roles
- Encourage staff interaction among sectors
- Staff actively share their expertise and resources with our partners, particularly our parent organizations
- Monitor and maintain the condition of reserve facilities and equipment
- Identify equipment and facility needs, then plan and implement fixes
- Provide visitors to the Reserve with material and informational support

The Stewardship program is staffed by a stewardship coordinator and reserve biologist. During the evaluation period, the stewardship program developed popular new community education programs and conducted wildlife protection and land management activities.

The reserve biologist obtained a law enforcement commission which has expanded the Reserve’s ongoing law enforcement options for patrolling and protecting ACE Basin. The reserve biologist also coordinates with DNR law enforcement staff and the field station provides a site for regional law enforcement meetings.

The stewardship coordinator represents the Reserve on numerous community groups such as the South Carolina Aquarium Advisory Board, Parris Island Community Review Committee, Carolina Wildlife Care Wildlife Rehabilitation Center, and South Carolina Native Plant Society Board. The stewardship coordinator is not currently active in any NERRS workgroups but may wish to consider joining the community education workgroup or other appropriate workgroup(s) to share expertise and knowledge with the system and learn from other programs.

The stewardship program partners with the coastal training and education programs to conduct and support educational activities. Stewardship staff support *Discovery* educational programs and field activities and ACE Basin Teacher workshops. The stewardship and coastal training programs work together to develop and host workshops on topics such as invasive species, rain water harvesting, and water quality issues.

## **1. General Public Education and Outreach**

MRD relies on the Reserve to serve as link to surrounding communities and user groups. The stewardship program works directly with members of the community including local community leaders and fishermen. The stewardship coordinator is a trusted member of the local community and is able to explain MRD activities to the public and bring the public's concerns to MRD leadership.

During the evaluation period, the stewardship program has developed successful new community education programs and continued to offer popular programs.

### *Coastal Exploration Series*

The stewardship program developed the popular Coastal Exploration Series to provide adult education opportunities and promote stewardship of the ACE Basin. The classes take place in both field and lecture settings. Classes offered include "Impoundments Management and Wildlife," "Eastern Diamondback Rattlesnakes," "Historical Rice Culture and Gullah Heritage," "Human Impacts on Coastal Wildlife," and "Horseshoe Crabs and Shorebirds." The ACE Basin area draws many new retirees and several evaluation participants highlighted the importance of the Coastal Exploration classes in helping them learn about their new home.

### *Biologist for a Day*

The stewardship program has also developed the Biologist for the Day Program which brings community leaders out in the field with MRD employees to assist with monitoring activities such as trammel netting and electrofishing. Community leaders are able to learn more about DNR and its research and monitoring activities and ask questions they may have. The Reserve strategically targets community leaders for participation in the program.

### *Ecotour Operator Presentations*

Local ecotour operators bring visitors to the Reserve to enjoy the natural resources. The stewardship program has reached out to local ecotour operators and has hosted several ecotour operator presentations focusing on natural resources and responsible use. The program holds workshops focused on topics such as marine mammals, seabirds/shorebirds, and estuary health.

### *South Carolina Oyster Restoration and Enhancement Program (SCORE)*

The Reserve is an active participant in DNR's SCORE program, a community-based habitat restoration and monitoring program, that helps restore oysters while educating the community on how oysters improve water quality, control erosion, and provide habitat for other commercially-important shellfish and fish species. The stewardship coordinator has worked with troubled youth and partnered with volunteer groups, to plant recycled oyster shells in the intertidal zone in order to promote the formation of self-sustaining oyster reefs. Projects have been completed at Edisto Island, Hunting Island, and Hutchinson Island.

### *South Carolina Master Naturalist Program*

The stewardship program offers classes as part of the South Carolina Master Naturalist Program and “graduate classes” for program graduates. The program has over 500 graduates and approximately 100 are active members in the Lowcountry Master Naturalist Association.

The stewardship program has capitalized on the program and used this pool of engaged and trained citizens to assist with programs such as wildlife monitoring. When the stewardship program needs assistance with projects, the stewardship coordinator e-mails master naturalist volunteers and other interested citizen volunteers. The volunteers have assisted with surveys of the American oystercatchers, least terns, Wilson’s plovers, piping plovers, mottled ducks, bald eagles, ospreys, sea turtles, and wading birds, and oyster reefs. Volunteers have also assisted with tagging and monitoring horseshoe crabs.

The stewardship program has also partnered with other organizations to conduct stewardship activities. For example, the stewardship program worked with the the Harbor Island Home Owners Association to develop a shorebird monitoring program along Harbor Island.

The evaluation team met with the Lowcountry Master Naturalist Association president and he noted that the organization had many volunteers who enjoyed participating in Reserve stewardship activities and volunteers were eager to provide additional assistance. In order to take advantage of this enthusiasm though, Reserve staff need to develop and define specific projects. OCRM encourages the Reserve to consider how volunteers could assist with additional priority activities and initiatives.

<p><b>Accomplishment: The Reserve created the Coastal Exploration Series, a popular community education program, and developed a cadre of trained volunteers who assist the stewardship program with various monitoring projects.</b></p>
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## **2. Wildlife Protection**

The stewardship program has undertaken a variety of initiatives to better protect wildlife. The stewardship program has enhanced shorebird protection through seasonal nest area closures as well as education through signage, community patrols, and other communication with the public such as presentations highlighting shorebird conservation efforts. The Reserve has documented successful nesting on Botany Bay Plantation, Otter Island, and Harbor Island.

The stewardship program has also worked to raise manatee awareness and coordinated sign placement along waterways to educate the public regarding the presence of manatees and boating rules and regulations. Stewardship staff give presentations to groups on manatee life history and appropriate public behavior around manatees. Stewardship staff also respond to emergency wildlife calls including marine mammal strandings, sea turtle strandings, and wildlife entanglement in fishing gear.

### 3. Management of Botany Bay Plantation

During the evaluation period, the state acquired the 4,688 acre Botany Bay Plantation which became part of the Reserve with the approval of the 2011-2016 Management Plan in July of 2011. The property is co-managed by the Reserve and the SC Department of Parks, Recreation and Tourism. The property provides important habitat for numerous wildlife species, including critical nesting habitat for the federally threatened loggerhead sea turtle and the state threatened least tern. The lands contain significant cultural resources and several sites are listed on the National Register of Historic Places. The beaches of Botany Bay Plantation are unspoiled and the beach has an exceptional covering of shells due to its previous isolation.

With the acquisition of the property and its opening for public use, the Botany Bay volunteers began to see an impact on the shell coverage of the beach. The Reserve conducted a study to measure the impacts of visitor use and found that the shell coverage was significantly reduced near visitor entrance points. DNR worked with the community and state legislature and the legislature passed the state's first regulation limiting the removal of shells to two quarts per day. After the regulations went into effect, volunteers found that most visitors were not familiar with the approximate volume of two quarts and felt there were still impacts to shell coverage. DNR again conducted an assessment of the impacts of shell collection. As the shell coverage continued to be impacted, DNR worked with the local community and South Carolina legislature and the legislature passed regulations banning shelling along the 2-mile stretch of Botany Bay which took effect January 2010. The new regulations are clear and make enforcement easier. OCRM commends the ACE Basin Reserve, SC Department of Parks, Recreation and Tourism, and Botany Bay Buddies for their partnership and successful management of the Botany Bay Plantation.

The Botany Bay volunteers continue to remain concerned about visitor behavior at night after volunteers leave. Public access is officially allowed until sundown. The Reserve has installed trip cameras along the trail to document the number of people visiting the beach at night and what they are carrying in and out. After this study is concluded, the Reserve will determine if a significant problem exists and if additional actions are necessary to manage public access. Another concern raised by volunteers at the public meeting was the lack of bathroom facilities. Volunteers were not in agreement on whether or not the state should provide facilities such as bathrooms and trash cans. The Reserve is currently designated a wildlife management area and visitor facilities are not provided at wildlife management areas. Those visitors interested in having public access facilities may choose to go to the nearby state park.

**Accomplishment: The Reserve is adaptively managing Botany Bay Plantation and balancing public access with protection of Botany Bay's natural and cultural resources.**

**Program Suggestion: OCRM encourages ACE Basin NERR to continue to adaptively manage Botany Bay Plantation, i.e. conducting research on the impacts of visitor use and carrying capacity of Botany Bay Plantation, as well as working with partners to anticipate management challenges and develop solutions to address identified problems.**

#### **4. Public Access**

The Reserve offers numerous opportunities to enjoy a variety of outdoor recreational opportunities such as hiking, canoeing, birding, and hunting. During the evaluation period, the Reserve built a new trail highlighting Spanish Mount, a shell midden, at Edisto State Park and developed interpretive signs for the Botany Bay Park beach trail.

The Reserve has properties throughout the region with multiple access points and visitors had no one place to go for information on access points and the associated amenities and activities at each site. To address this gap, the education coordinator developed a brochure that lists access points within the Reserve and the associated facilities and activities. The brochure is available at Edisto Beach State Park, Hunting Island Nature Center, and on the Reserve's website.

The Reserve and partners are interested in planning for increased visitor use. The evaluation team heard from several evaluation participants that with so many new people moving to the area, there is a strong need to create awareness about the ACE Basin and a sense of ownership needs to be developed and cultivated. Evaluation participants recommended the development of an inventory and information about access to the islands within the Reserve. An inventory could help visitors appreciate ACE Basin resources while directing them to appropriate access locations and lessening impacts to Reserve resources.

The Reserve also has a GRF student who is developing a proactive decision making plan for managing visitor use impacts in the ACE Basin NERR, specifically on Botany Bay Plantation and Otter Island. The focus of the plan is on the response of the biological and soil environment to different frequency, duration, and magnitude of impacts. OCRM encourages the Reserve in its efforts to monitor and plan for increased visitor use to ensure a balance between appropriate access and protection of resources.

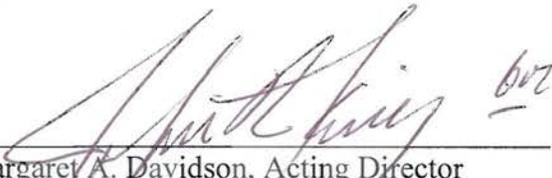
## V. CONCLUSIONS

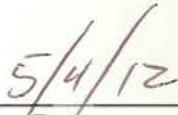
For the reasons stated herein, I find that the South Carolina DNR is adhering to the programmatic requirements of the National Estuarine Research Reserve System in the operation of its approved ACE Basin National Estuarine Research Reserve.

DNR and ACE Basin NERR have made notable progress in the following areas: producing GIS products relevant to Reserve staff and partners; developing a volunteer program, Botany Buddies, who are integral partners in the management of Botany Bay Plantation; providing CTP trainings and technical assistance that have led to changes in local regulations and improvements in managing stormwater; creating a new CTP intern position to support the CTP; creating the Coastal Exploration series a very popular education program for the public; and adaptively managing Botany Bay.

The findings contain one necessary action and three recommendations in the form of program suggestions. The state must address the necessary action by July 1<sup>st</sup>, 2013. The program suggestions should be addressed before the next regularly scheduled program evaluation, but they are not mandatory at this time. Summary tables of program accomplishments and recommendations are provided in the Appendix A.

This is a programmatic evaluation of ACE Basin NERR that may have implications regarding the state's financial assistance awards. However, it does not make any judgment on or replace any financial audits.

  
Margaret A. Davidson, Acting Director  
Office of Ocean and Coastal Resource Management

  
Date

## VII. APPENDICES

### Appendix A. Summary of Accomplishments and Recommendations

#### Accomplishments

Issue Area	Accomplishment
GIS Program	The ACE Basin NERR GIS program developed a map of the NERR boundary that was included in the new management plan; provided technical assistance to Reserve non-profit partners assisting their land acquisition and economic development efforts in ACE Basin; and worked with sectors to identify and develop GIS products to assist their programs.
K-12 Education	The Reserve offers excellent educational programs at no cost for Title 1 schools enabling many students to learn about, and experience, estuaries for the first time.
Volunteer Program	The creation of the Botany Buddies volunteer program and the dedication of the volunteers have been integral to the maintenance and management of Botany Bay.
Staffing	ACE Basin NERR developed a CTP internship that has enabled the program to expand its programming while providing valuable training to masters students.
Coastal Training	The CTP's trainings and technical assistance have led to changes in state and local stormwater regulations and active pursuit of at least eight conservation easements.
Community Education	The Reserve created the Coastal Exploration Series, a popular community education program, and developed a cadre of trained volunteers who assist the stewardship program with various monitoring projects.
Land Management	The Reserve is adaptively managing Botany Bay Plantation and balancing public access with protection of Botany Bay's natural and cultural resources.

#### Recommendations

Recommendations are in the form of Necessary Actions (NA) or Program Suggestions (PS).

Issue Area	Recommendation
Administration	<b>NA:</b> The Reserve must align the state's NERR annual operations cooperative agreement expenditures with the federal cooperative agreement cycle by July 1 <sup>st</sup> , 2013
Research	<b>PS:</b> OCRM encourages the Reserve to strengthen its research program by (1) identifying priority research needs and gaps through engagement with local partners, including coastal managers, while also considering NERRS and Reserve priorities; (2) coordinate and conduct research that addresses identified priorities; and (3) proactive outreach to other researchers to facilitate research that addresses identified priorities
Education	<b>PS:</b> OCRM encourages the Reserve to conduct a market analysis and needs assessment and to develop a strategic plan for education and outreach activities that specifies priority areas and strategies for growth
Land Management	<b>PS:</b> OCRM encourages ACE Basin NERR to continue to adaptively manage Botany Bay Plantation, i.e. conducting research on the impacts of visitor use and carrying capacity of Botany Bay Plantation, as well as working with partners to anticipate management challenges and develop solutions to address identified problems.

## Appendix B: ACE Basin NERR's Response to 2006 Evaluation Findings

**Program Suggestion:** The Reserve and MRD should investigate the options for hiring or otherwise providing some administrative support for the Reserve.

**ACE Basin NERR Response:** The Reserve has maintained administrative support at the McKenzie Center and added support at the Ft. Johnson office. Additional staff and interns have also been added to provide support for administrative and program functions.

**Necessary Action:** The Reserve must complete revisions to its management plan, including the incorporation of land acquired since the Reserve's designation. The final revised plan must be submitted to OCRM by November 30, 2006.

**ACE Basin NERR Response:** With assistance and encouragement from the Estuarine Reserves Division, the Reserve conducted a major revision of the original management plan. Significant changes included development of a strategic plan, which is integrated with SCDNR and NOAA\ERD plans; GIS-based update of Reserve and property boundaries. The Plan has been accepted by NOAA and DNR and is undergoing public review.

**Program Suggestion:** The Reserve should commit to increased use of the field station for research, investigate reasons for its under-utilization, and implement marketing, facility modifications, and other strategies accordingly to encourage increased use.

**ACE Basin NERR Response:** The Reserve continues to make the field station available at no cost to researchers working on projects of mutual interest. In 1996 Reserve staff began to more actively encourage use of the facility by colleagues and affiliated programs. Use of the facility by non-Reserve researchers has increased significantly during the period (Figure 1).

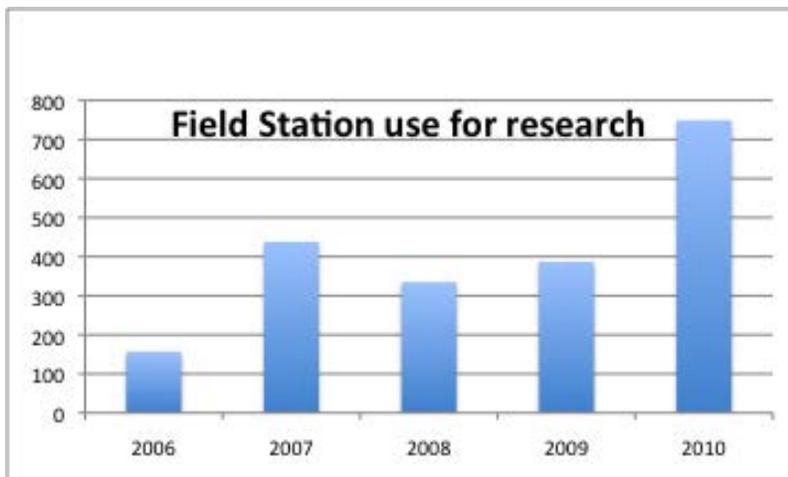


Figure 1. Use the McKenzie field station by non-Reserve researchers.

**Program Suggestion:** The Reserve should seek additional opportunities to collaborate with Sea Grant and the South Carolina Office of Ocean and Coastal Resource Management, particularly in areas of outreach and education.

**ACE Basin NERR Response:** The Reserve has continued to partner with OCRM and SeaGrant to ensure compliance with the Coastal Zone Management Program and efficiently and effectively deliver outreach services to coastal South Carolina. Reserve staff is currently collaborating with SeaGrant and SC-OCRM on numerous new initiatives to improve service provided to our audiences. These initiatives include:

- A partnership with SC Sea Grant to provide a graduate fellowship of \$10,000 for one year of research support for a MS or PhD student to conduct research in either of the two SC NERRs.
- Work with SeaGrant COSEE - SE partners in the planning and implementation of our ACE Basin Teacher Workshop.
- Partnership with SeaGrant COSEE - SE to develop a lesson curriculum that is similar to our “Sweet Grass in the Class curriculum. Instead of growing out and replanting sweet grass with the students, they utilize *Spartina alterniflora*, which is called “From Seeds to Shorelines”.
- Partnership with NI/WB NERR the Reserve to support travel for the OCRM liaison to participate in the NERRS annual and program managers’ meetings.
- Partnership with SC SeaGrant and OCRM as part of the South Carolina Coastal Information Network
- Coordination on CTP events, publications and projects with SeaGrant, OCRM, or many times both agencies. Selected recent efforts include:
  - South Carolina’s Changing Shoreline: Implications for the Future – both
  - Wetlands Permitting: Proper protocols and procedures – OCRM
  - Sustainable Development in Coastal South Carolina – both
  - Low Impact Development Stormwater Management Practices: Design and Installation Demonstrations – both
  - Stormwater Management in Coastal SC: Ponds and LID Practices – both
  - Developed a brochure on LID BMP and maintenance--SeaGrant
  - Partnering on upcoming needs assessment of climate concerns and general coordination on climate--both
- Membership on respective advisory committees

**Program Suggestion:** The Reserve should continue its efforts to maintain and promote its visibility and identify distinct from the greater ACE Basin geographic area and Project. The Reserve’s website should be updated and made available to the public as soon as possible, a Reserve logo or graphical identity should be used throughout its facilities and public information, and other strategies to promote the Reserve identity and activities should be developed.

**ACE Basin NERR Response:** In an effort to maintain and promote its visibility the Reserve launched a new website and developed a Reserve logo. The logo is used on printed materials produced by the Reserve.

## Appendix C. Persons and Institutions Contacted

### Reserve Staff

NAME	Title
Phil Maier	Program Manager
Louie Heyward	Education Coordinator
Al Segars	Stewardship Coordinator
John Leffler	Research Coordinator
Rebekah Walker	Coastal Training Program
Saundra Upchurch	Research Biologist
Bess Kellet	Volunteer Coordinator
Daniel Barrineau	Reserve Biologist
Justin Hart	SWMP Technician
Laton Sutley	CTP Intern

### Department of Natural Resources

NAME	Title
Robert Boyles	Deputy Director, MRD
David Whitaker	Assistant Deputy Director MRD
Robert Van Dolah	Director Marine Resources Research Institute
Mel Bell	Director, Office of Fisheries Management
Chantal Rice	Director, Operations
Dr. Mike Denson	Manager, Mariculture & Estuarine Finfish Section MRRI
Dr. Derk Berkquist	Manager, Environmental Science Section, MRRI
Dr. Dianne Greenfield	Manager, Algal Ecology Section, MRRI
Dr. Peter Kingsley-Smith	Manager, Shellfish Restoration and Management Section, MRRI
Larry DeLancey	Biologist, Crustacean and Wetlands Section, MRRI
Bill Roumillat	Inshore Fisheries Research Section, MRRI
William Doar	Field Geologist, Geological Survey
Dean Harrigal	State Land Manager

### University Partners

NAME	Organization
April Turner	South Carolina Sea Grant Consortium
David Joyner	Clemson Extension/Carolina Clear
Leigh Wood	North Inlet Winyah Bay NERR
Susan Lovelace	Hollings Marine Lab

### State Partners

NAME	Agency
Sam Chappellear	Wildlife and Freshwater Fisheries Regional Coordinator
Shannon Hicks	SCDHEC-OCRM

### Local Partners

<b>NAME</b>	<b>Organization</b>
<b>Dan Ahern</b>	<b>Beaufort County Stormwater Utility</b>
<b>Sarah Skigen</b>	<b>Town of Hilton Head Island</b>
<b>Amanda Flake</b>	<b>Beaufort County Planning Department</b>
<b>Linda Bridges</b>	<b>Town of Port Royal</b>
<b>Reed Armstrong</b>	<b>SC Coastal Conservation League</b>

### Other

<b>NAME</b>	<b>Organization</b>
<b>John Thomas</b>	<b>Sustainable Design, Inc. Consultant</b>
<b>Benjy Kennedy</b>	<b>Assistant Principal Colleton Middle School</b>
<b>Gary Brightwell</b>	<b>Director, Colleton Museum</b>
<b>Elaine Inabinett</b>	<b>Program Coordinator T.E.N.</b>
<b>Brandi Boseman</b>	<b>Teacher, Forest Circle Middle School</b>
<b>Mark Purcell</b>	<b>Manager, National Wildlife Refuge</b>
<b>Ernie Wiggers</b>	<b>Executive Director, Nemours Foundation</b>
<b>Dr. Chris Marsh</b>	<b>Executive Director, Spring Island</b>
<b>John Fisk</b>	<b>President, Lowcountry Master Naturalist Association</b>
<b>Diane Fisk</b>	<b>Lowcountry Master Naturalist Association</b>

## Appendix D: Persons Attending the Public Meeting

The following persons signed in at the public meeting.

<b>NAME</b>	<b>AFFILIATION</b>
<b>Marian Brailsford</b>	
<b>Jim Brailsford</b>	
<b>Terri Hardeman</b>	
<b>Bill Johnston</b>	
<b>Shelagh North-Coombes</b>	
<b>Tom Mason</b>	
<b>George Moor</b>	
<b>Ty Lenz</b>	
<b>Bud Skidmore</b>	<b>EIPA &amp; EICA</b>

## **Appendix E: OCRM's Response to Written Comments**

NOAA received no written comment regarding the evaluation of the ACE Basin NERR, South Carolina.