

Grand Bay National Estuarine Research Reserve

Project Title: Fiscal Year 2015 Grand Bay NERR Operations Proposal

Recipient Name: Mississippi Department of Marine Resources (DMR)

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INTRODUCTION

The Grand Bay National Estuarine Research Reserve (NERR) is located in the State of Mississippi and is administrated by the Mississippi Department of Marine Resources (DMR). The following proposal outlines tasks and outcomes in operations, research and monitoring, education, training, and stewardship activities from July 1, 2014 through December 31, 2015. The MDMR is requesting \$595,000 in federal funds matched by \$256,000 in state funds from the Mississippi Tidelands Trust Fund. The proposal indirect rate for this fiscal year is 15% which is less than half of the 31.47% MDMR indirect cost rate. Programmatic efforts at the NERR are focused on habitat protection, water quality and climate change and are consistent with the National Estuarine Research Reserve System's (NERRS) 2011-2016 Strategic Plan and the 2013-2018 Grand Bay NERR Management Plan. Tasks and outcomes presented are linked to strategies/actions identified in the Grand Bay Management Plan. Program income from this award is anticipated in the form of registration fees for participation in certain events and workshops. This program income is over and above the requested funding and will be used only to enhance Reserve activities and will be expended prior to the completion of the award. Recent program highlights have previously been reported to NOAA for the FY13 Grand Bay NERR Operations Award in project progress reports.

In August 2014, a new Director, Dr. Ayesha Gray, was hired. In addition, a new CTP Coordinator, Dr. Sarah Harrison, was hired in October 2014 and the Coastal Ecologist position with Stewardship was filled in November 2014 by Mike Archer. Two full time positions were added in this award as state positions which were contractors supported by other funds previously. The positions provide support for the NERR's System-wide Monitoring Program (SWMP; NERR Resource Specialist II, Cher Griffin) and Training (NERR Resource Specialist I, Holland Lamier). Dr. Harrison resigned in July 2015 to take a position in Washington, DC with the American Fisheries Society. Margo Posten was hired in October 2015. The CTP effort continues to grow and engage additional partners to assist in implementation of our training objects. Several new training related partner awards have been received that will enhance our abilities to expand training opportunities. At the end of December 2015, our Stewardship Coordinator, Will Underwood, resigned to take a position with the Alabama Department of Conservation and Natural Resources.

The Grand Bay NERR is located on the Gulf of Mexico which is home to some of the nation's most productive shellfish and finfish waters and their supporting coastal wetlands. The Gulf Coast is rich in natural resources and many generations have depended on these resources for their livelihoods. Coastal resources sustain a growing economy, and contribute greatly to the culture and heritage that define Mississippi. The Grand Bay NERR's state partner, MDMR, was created by the legislature as a new state agency in 1994, and manages coastal resources through the authority of the Commission on Marine Resources. The MDMR is dedicated to enhancing, protecting and conserving the marine interests of Mississippi for present and future generations. It manages all marine life, public trust wetlands, adjacent uplands and waterfront areas for the long-term recreational, educational, commercial and economic benefit of everyone.

ADMINISTRATION

Task 1 – Provide Appropriate Administrative Support and Management

The Director, Coordinators and MDMR were responsible for providing adequate administrative support and management by recruiting, hiring, and retaining quality staff; providing appropriate supervision and management; assisting staff in pursuing and acquiring funding to achieve management plan goals; and completing and submitting all required proposals, progress reports and performance data to NOAA to support continued operations. Progress reports included the NOAA Performance Measures, which monitor number of students reached, number of K-12 programs offered, and volunteer hours contributed to the NERR.

Outcome 1 – Provide Project Oversight and Supervision

The Director and MDMR will provide administrative support and management for NERR projects and operation. The Director and MDMR will ensure grant compliance and overall program success. Reserve staff will include Marine Director – Dr. Ayesha Gray; Marine Administrators – Jennifer Buchanan, Will Underwood (resigned), and Margo Posten; Resource Specialists IV – Kim Cressman, Lindsay Spurrier, Rick Ranew, and Ron Cole; Resource Specialist III – Mike Archer; Resource Specialists II – Jay McIlwain and Cher Griffin; Resource Specialist I – Holland Lamier; and, Administrative Assistant VI – Cassy McInnis. The Research Coordinator is a contract position with Mississippi State University (MSU) and other contractors will be used (Shelby Barrett, NERR Intern) to help meet program goals. The Facilities Maintenance position was transitioned to a full-time state position from a part-time contractor position and filled by transfer of Brian Hurst. This position is still supported with other state funds, not the operations award. We are meeting our management plan strategies and actions by recruiting and hiring quality staff, providing appropriate supervision and management, and then seeking opportunities for additional funding to do projects, acquire additional staff and better meet management plan objectives.

Management Plan Strategies/Actions:

- Quality staff will be recruited, hired and retained.
- The manager and sector coordinators will provide supervision of staff as appropriate.
- Staff will seek adequate funding support to implement strategies and actions relating to priorities as described in the management plan.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 2 – Submit Semi-Annual Performance and Progress Reports

Semi-annual project progress reports are being submitted by the Director and MDMR. Additionally, the required performance measures are also being submitted to NOAA Office for Coastal Management (OCM) via the Ocean and Coastal Resource Management (OCRM) performance measures and the research databases.

Outcome end date: December 2016

Outcome Status: 33%

Outcome 3 – Demonstrate Progress toward Key Programmatic Metrics and Targets

The Reserve utilized three (3) Section 312 evaluation metrics with associated targets that were approved by NOAA OCRM National Policy and Evaluation Division during the last award and will report progress on these measures annually, per OCM guidelines. Activities relative to these performance measures are being monitored and reported.

Outcome end date: December 2016

Outcome Status: 50%

The Reserve will collect metrics for the following 312 performance criteria:

Performance Measure 1: From 2012-2017, number of K-12 students who participate in Grand Bay NERR programs and are made aware of, and understand, the importance of stewardship and conservation in our coastal estuaries and the potential impacts from climate change.

Target: From 2012-2017, 1500 K-12 students participate in Grand Bay NERR programs and are made aware of and understand the importance of stewardship and conservation in our coastal estuaries and the potential impacts from climate change.

Progress to Date:

FY2012	6,588
FY2013	3,453
FY2014	857
FY2015	<u>490</u>
Total to Date:	11,388

Performance Measure 2: From 2012-2017, number of Coastal Training Program workshops and training programs held utilizing reserve or partner specific research, stewardship data, or stewardship expertise to address reserve priorities of water quality, climate change and habitat protection. **Target:** From 2012-2017, 30 CTP workshops and training programs held utilizing reserve or partner specific research, stewardship data, or stewardship expertise to address reserve priorities (water quality, climate change and habitat protection).

Progress to Date:

FY2012	22
FY2013	19
FY2014	8
FY2015	<u>0</u>
Total to Date:	49

Performance Measure 3: From 2012-2017, number of volunteer hours contributed in support of reserve education/training, research and stewardship activities. **Target:** From 2012-2017, 2500 volunteer hours are contributed in support of reserve education/training, research and stewardship activities.

Progress to Date:

FY2012	2,444
FY2013	391
FY2014	26
FY2015	<u>2055</u>
Total to Date:	4916

Outcome 4 – General Operations - Supplies and Contracts to Support Reserve Activities

Programs and projects have the necessary supplies and equipment to be successfully implemented. The Director with the assistance of the Administrative Assistant ensured staff supply and equipment needs were met, as per this award. Additionally, all subcontractors' work was monitored and reviewed for quality of performance and compliance. This outcome included administrative supplies (paper products, toner, binders/binding products, office supplies and other office necessities), boating supplies (push poles, life jackets, etc.) as well as other field supplies. Additionally, contracts for electricity, facility cleaning, building maintenance, vehicle and boat repair, etc. were in place to support Reserve activities. Facilities electricity was supported by other state funds outside of this award.

Management Plan Strategies/Actions:

- The manager will secure funding support to adequately maintain the basic levels of operation and maintenance for facilities and equipment/vessels/vehicles.
- The manager will seek funding support to repair and purchase new vessels, trailers, equipment and vehicles needed in support of Reserve priorities.
- Staff will continue to support and maintain, and if possible expand green building features of the facility.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 5 – Creating a Fully Integrated Team and Collaborative Workplace

Regular on-site collaborations between the Director, Coordinators and the team members occurred in the form of Monday 'standups' meetings, project team meetings, and monthly meetings between the Director and Coordinators. All efforts to integrate work among sectors was pursued. Support and collaborative activities across all sectors was encouraged along with support and collaborative activities with MDMR. Collaborations during this reporting period included providing assistance to the MDMR during the search for a crashed plane and the latest harmful algal bloom.

Management Plan Strategies/Actions:

- Staff Activities will be integrated across sectors to implement actions relating to Reserve priorities, providing a collaborative workplace.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 6 – Technical Support to Programmatic Sectors on Priority Activities

The Director and MDMR provided technical support to the sectors by providing needed trainings for staff members (e.g., R, MSAccess, GIS). Trainings may be provided by MDMR, outside sources, or in-house through contracted services. The Director maintained adequate staffing and funding to support Reserve operations and maintenance. The MDMR provided additional support for facilities operations, maintenance and repair.

Management Plan Strategies/Actions:

- Adequate staffing will be maintained to support the required level of physical infrastructure for monitoring at the Reserve.
- The manager will secure funding support to adequately maintain the basic levels of operation and maintenance for facilities and equipment.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 7 – Increase Volunteer Support to the Reserve

The Outreach Team (CTP, Education) added capacity to support Reserve activities with volunteers. Volunteers were actively recruited and trained to work on trail construction, monitoring activities, and assistance with outreach activities.

Management Plan Strategies/Actions:

- The manager will encourage staff to generate volunteer opportunities and work cooperatively with the volunteer coordinator to implement Reserve priorities.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 8 – Increase Community Input to NERR through Implementation of GBCC

During this reporting period, we organized and established the Grand Bay Community Collaborative (GBCC; determined membership) and designed the process for gathering input from this group. We also set the introductory meeting for the Collaborative for February 18, 2016. Regular meetings will occur at least quarterly. The Director, Coordinators and staff will work with the GBCC to communicate and transfer information about the Reserve and solicit input to be incorporated into Reserve programming as appropriate.

Management Plan Strategies/Actions:

- Reserve staff will seek input and advice from advisory committees to promote Reserve priorities.

Outcome end date: June 2016

Outcome Status: 33%

Outcome 9 – Foster Partnerships in Support of Reserve Priorities

The Director worked to establish, maintain and expand partnerships to support Reserve priorities, including encouraging and supporting team efforts to work with a variety of new and established partners. Partnerships included collaborating on education, training, stewardship or research opportunities; promoting the use of Reserves facilities for a variety of groups; and, providing letters of support and collaborating technical expertise with partners to seek external funding opportunities. We worked with partners in response to the Ecological Effects of Sea Level rise NOAA funding opportunity and the NERRS Science Collaborative, as well as NOAA's Community Resilience program. We are also working to establish new projects in partnership with the MDMR Coastal Zone Management program which will result in proposal development and submission for NOAA's Marine Debris program.

Management Plan Strategies/Actions:

- The manager will seek and maintain partnerships that support Reserve priorities.
- The manager will generate funding and technical support for programming by working with partners.

- The manager will engage local government officials, civic groups and schools to promote Reserve activities and priorities.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 10 – Prepare and Participate in Section 312 Program Evaluation

The Grand Bay NERR prepared for the Section 312 program evaluation by completing the information request from the Office for Coastal Management. We also participated in meetings with the evaluation team to address questions about the information request. The deliverable for this outcome was submitted to the Office for Coastal Management on December 5, 2015. Through the engagement with the Office for Coastal Management and internal and external partners, the Grand Bay NERR will provide preparation and participation for a meaningful evaluation to inform and improve program effectiveness.

Outcome End Date: December 2015

Outcome Status: 50%

Task 2 – Provide Staff Development and Training

NERR staff participated in meetings relative to the operation and performance of Grand Bay NERR, as well as represented the NERR and MDMR, as necessary, to accomplish goals and objectives of the NERR. Reserve staff hosted and attended the NERRS Annual Meeting in October 2015 in Mobile, AL. Staff also assisted with the meeting's field trips to Grand Bay. Staff also will attend the Gulf of Mexico Alliance All Hands Meeting in June 2016, National Marine Educators Association Meeting, Bays and Bayous Conference, Gulf Estuarine Research Federation Meeting, Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative, meetings and other local, state, sector or regional meetings as necessary. The Director attend the Regional Program Managers Meeting in January 2016 at Mission-Aransas NERR.

Management Plan Strategies/Actions:

- The manager will provide opportunities and support for staff to attend professional meetings and to serve on technical committees and boards.
- The manager will represent the Reserve on professional boards and committees.

Outcome 1 – NERRS/NERRA Annual Meeting in Mobile, AL

The Director, Coordinators, and several members of the team attended the annual meeting for NERRS/NERRA in Mobile, AL (October 2015) to discuss program priorities, projects, and opportunities for collaboration. Information gained at the meeting was valuable to the NERR for accomplishing goals and objectives at the site and system levels. The Reserve also hosted a field trip during this meeting to host NERRS/NERRA at Grand Bay.

Outcome end date: December 2015
Outcome Status: 100%

Outcome 2 – National Marine Educators Association

Up to two (2) Education staff members will attend the National Marine Educators' Association (NMEA) meeting in June 2016 in Newport, RI to interact with other education professionals and learn new and innovative approaches to education topics.

Outcome end date: December 2016
Outcome Status: 0%

Outcome 3 – Coastal and Estuarine Research Federation in Portland, OR

The Director attended the Coastal and Estuarine Research Federation (CERF) national meeting in November 2015 in Portland, OR and learned about cutting edge restoration science and stewardship technology. The CERF 2015 scientific program offered timely, exciting and diverse information on a vast array of estuarine and coastal subjects. Presentations examined new findings within CERF's traditional scientific, education and management disciplines and encourage interaction among coastal and estuarine scientists and managers. There were also several presentations that highlighted work occurring in Grand Bay. Additionally, the Director worked with colleagues from Western Oregon University, Oregon Sea Grant, and Germano & Associates to provide poster and talk sessions that link art and science called *Artistic Pathways to Scientific Understanding*. These sessions were very successful, pulling in presenters from across the country, who provided creative and effective science communications using art. The session was also full with about 75-80 people attending. The response was enormous and supportive and CERF invited our team to include these sessions in CERF 2017.

Outcome End Date: December 2015
Outcome Status: 100%

Outcome 4 – Regional Program Managers' Meetings with NERRS and OCM

The Director attended the regional program managers' meeting in Corpus Christi, TX in January 2016 to coordinate with NOAA and other managers on programmatic activities and collaborations between programs. We identified several innovative project ideas including work on oyster shell recovery and marine debris. Collaborations at this meeting are likely to result in development of several new projects in the upcoming year.

Outcome End Date: June 2016
Outcome Status: 100%

Outcome 5 – Local, Regional, State Professional Development

The NERR team will continue to attend meetings, workshops, and trainings dedicated to professional development including the “Building a Robust and Versatile NERRS-IOOS Coastal Observing Network: A workshop to strengthen a solidify the NERRS-IOOS Partnership” meeting in January and SWMP Water Quality training in February. Future meetings may include travel to Gulf of Mexico Alliance Priority Issue Team (PIT) to address priority issues within the Gulf of Mexico and other activities associated with the Gulf of Mexico Alliance. Team members will continue to connect and gather input and feedback from colleagues, and new skills at these meetings and trainings.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 6 – NOAA Program Managers’ Meeting in Washington, DC

The Director will attend this meeting in Washington, DC in March 2016 to exchange ideas and information with colleagues from the other NERRs and OCM programs. The meeting will provide an opportunity to broaden understanding of emerging issues in coastal resource management and coordinate with NOAA and other program partners on future budgets and program direction.

Outcome End Date: March 2016

Outcome Status: 0%

RESEARCH

Task 3 – Implement and Support the System-Wide Monitoring Program

The Research Coordinator provided oversight of the System-wide Monitoring Program (SWMP) and facilitated collaborations with partners to find applications for these data. The SWMP Coordinator and SWMP Technician supported implementation of the program and analysis of these data for coastal management applications. The SWMP team is responsible for deploying and servicing all instrumentation and ensuring samples receive timely analysis. Eight (8) dataloggers were calibrated and maintained to collect data which were formatted and transmitted in accordance with the YSI instrument operations manuals and the CDMO’s “YSI 6000/6600 Datalogger Standard Operating Procedures” manual. Datalogger instruments were deployed to capture spatial variability in water quality parameters across the Reserve. Probes were maintained and updated as necessary on existing instrumentation. A Campbell Scientific weather station continued to be calibrated and maintained in accordance with Weather Standard Operating Procedure manual. Nutrient monitoring occurred at the four (4) SWMP datalogger stations, with replicate monthly baseline grab samples collected at all stations and monthly diel samples at one annually designated station. Analyses for ammonium, nitrate, nitrite, orthophosphate and chlorophyll *a* were performed on-site by our SWMP Coordinator and Technician. All SWMP sampling locations and data can be viewed in near-real-time on the Grand Bay NERR website at www.grandbaynerr.org.

The Reserve worked with federal, state and local partners to employ SWMP data where applicable and synthesized these data and translated findings for improved coastal management applications. Most recently these data helped the Reserve understand the extent and duration of an extended increase in phosphate from a nearby fertilizer factory. The SWMP dataset is open to the public and was used by fisherman, researchers and coastal managers. SWMP task objectives are to continue collection of water quality data in the Grand Bay NERR and watershed using a combination of YSI 6600 and EXO data sondes and other equipment. QA/QC data were transmitted to Centralized Data Management Organization (CDMO). Four (4) YSI units and the ISCO Nutrient sampler were deployed to collect water quality data and report results according to standardized SWMP protocols. Data from the Campbell Scientific CR1000 weather station were collected and transmitted to the CDMO, in accordance with the weather Standard Operating Procedure Manual. Additionally, the dataloggers were telemetered using the YSI web-based delivery system, *EcoNet*.

Reserve staff who worked to complete the following outcomes includes Dr. Mark Woodrey, (Research Coordinator - contractor), Kim Cressman (SWMP Coordinator – NERR Specialist IV), Ron Cole (Mercury Technician – NERR Specialist III), and Cher Griffin (SWMP Technician – NERR Specialist I). We also collaborated with a variety of external researchers from various local institutions of higher learning.

Outcome 1 – High Quality Meteorological and Water Quality Instrumentation and Data

We used four YSI 6600 sondes and four EXO sondes at our water quality monitoring stations to produce our high quality data. We will purchase the newer EXO sondes as our 6600 are retired to maintain the highest quality instrumentation. We purchased two additional EXO sondes and will transition the Bayou Cumbest station to these in early 2016. The EXO is the new model from YSI and has been accepted (and is recommended) by the CDMO for SWMP use. YSI 6600 sondes are no longer being upgraded given the shift to EXO sondes. Standard water quality data were collected at four (4) stations every 15 minutes. Sondes were regularly deployed, retrieved, calibrated, and maintained as necessary by the SWMP Coordinator and Technician. Water samples were collected in order to assess nutrient concentrations (nitrate, nitrite, phosphate, and ammonia) and chlorophyll *a* concentrations, monthly at all stations and hourly over 24 hour at the Bangs Lake site in 2014.

Weather data were collected every 15 minutes according to standard protocols. The weather station was maintained and instruments calibrated as needed. Data from water quality stations and the weather station were transmitted via telemetry. Telemetry equipment received regular maintenance. Quality control and assurance procedures were rigorously applied to all water quality and weather data and all data submission deadlines were met.

Management Plan Strategies/Actions:

- The Reserve research staff will work with and support the Grand Bay NERR SWMP Coordinator to monitor water quality and meteorological conditions throughout the Reserve.
- The Reserve research staff will work to support, maintain and replace laboratory equipment (e.g., deionized water system, refrigerators/freezers, drying oven and spectrophotometer, etc.) and biological monitoring sampling station markers, as needed to support long-term monitoring.
- The Reserve research staff will work to support and maintain SWMP stations and associated infrastructure, including but not limited to pilings, sonde sleeves and real-time telemetry.

Outcome End Date: December 2016

Outcome Status: 50%

Outcome 2 – Utilize SWMP Data in Research, Restoration and Habitat Protection Projects

The SWMP weather and water quality data were used in hydrodynamic models, to assessing water level changes at the Reserve, to determine historic pollution levels and to support a variety of research projects (see bullets below). The Reserve continued to provide extensive nutrient sampling data to the Mississippi Department of Environmental Quality and NOAA relating to high levels of phosphates that have been continually found within the Reserve after Hurricane Isaac in 2012. Levels began to decline over this reporting period although they have not declined to 2005 levels, when the initial spill occurred. The local fertilizer plant in Pascagoula, MS declared bankruptcy in October 2014 and ceased fertilizer manufacturing in December 2014. Presently DEQ is still investigating the release and high levels recorded within the Reserve and NOAA is preparing a case for damages to the Reserve. Phosphate levels dropped following cessation of fertilizer production in early 2015. Water level data from our SWMP stations continued to be applied to climate modeling efforts to better understand changes in biodiversity in response to sea level rise through projects such as the University of Central Florida/ NOAA *Ecological Effects of Sea Level Rise* and the Mississippi State University/Gulf Coastal Plains & Ozarks LCC *Clapper Rails as Indicators of Desired Ecological State for Gulf Coast Tidal Marshes* as well as some future watershed restoration initiatives. SWMP data were provided to the DMR/MDEQ team using NRDA funding to restore oyster resources to the Bangs Lake area.

To address issues of elevated phosphate levels in and around the Grand Bay NERR, we formed The Phosphate Working Group with partners from Dauphin Island Sea Lab, the University of West Florida, the University of Southern Mississippi's Gulf Coast Research Laboratory, and the Mississippi Department of Environmental Quality. This group continued to work to understand phosphate dynamics in the area to facilitate mitigation/remediation activities, preparing a pre-proposal to be submitted to the 2015-16 National Science

Collaborative RFP.

Projects using SWMP data during this reporting period included:

- Dauphin Island Science Collaborative project: *Impacts of Land Use Change and Nitrogen Source Shifts Over Time: Building Capacity for Collaborative Research Leadership at the Grand Bay Reserve*
- EPA Risk Assessment Project: *Development of a Decision-Support Tool to Assess the Risk of Habitat Degradation Following Watershed Land Use Changes*
- National Science Collaborative grant with the San Francisco Bay NERR entitled “Mud on the Move”
- University of Central Florida/ NOAA *Ecological Effects of Sea Level Rise*
- USGS *Effects of Macroclimatic Drivers on Coastal Wetland Ecosystems Along the Northern Gulf of Mexico*

Management Plan Strategies/Actions:

- The Reserve research staff will work to facilitate and conduct research on the natural variability of ecosystems and the potential impacts of human disturbances.
- The Reserve research staff will meet annually with area resource agencies (e.g., MDMR, USFWS, MDWFP, etc.) to share information on research program and management implications of research results.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 3 – Understanding Our Estuaries through Standardized Data Collection

As part of a national system, water quality, nutrient and weather data were collected and sent by the SWMP technician to the Centralized Data Management Organization (CDMO) according to SWMP protocol. The monitoring program for nutrients and chlorophyll consisted of monthly replicate grab samples at the four (4) datalogger locations and a 24-hour diel samples from a single datalogger site. Data were available on Grand Bay and the CDMO’s website in near real-time as all SWMP equipment was telemetered. Salinity, DO, temperature and turbidity probes and other required supplies were purchased during this reporting period. All SWMP activities were completed as per standardized protocol. See narrative under Task #3, Outcome #2 for additional details.

Management Plan Strategies/Actions:

- The Reserve research staff worked to facilitate and conduct research on the natural variability of ecosystems and the potential impacts of human disturbances.
- The Reserve staff worked to quantify distribution, abundance and variability of estuarine faunal communities.
- The Reserve staff worked to develop predictive models to determine how natural and man-made disturbances may impact coastal habitats in the future.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 4 – Quality Assurance/Quality Control Evaluation

Water quality, nutrient and weather data were sent to the CDMO according to SWMP protocol by the SWMP Coordinator. Data were made available to users in near real-time via telemetered equipment. All SWMP activities were completed as per SOPs. Data were authenticated following guidelines of the CDMO.

Outcome End Date: December 2016

Outcome Status: 50%

Outcome 5 – Water Quality and Nutrient Analysis

SWMP Coordinator and Technician performed in-house analysis of all water and nutrient samples. All samples were analyzed at the Reserve laboratory as per standardized procedures and timelines. Data were also submitted to the CDMO on or before all calendar deadlines.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 6 – Informed Local and State Water Quality Policies

The Reserve provided SWMP water quality information to local and state entities to support efforts relating to sea level rise monitoring, oyster harvest, storm water management and understanding pollution levels, specifically nutrient "pollution" (e.g. phosphorus from industrial sources). Some of these efforts related to other funded projects (DISL Science Collaborative, EPA Risk Assessment Decision Support Tool and the NOAA Ecological Effects of Sea Level Rise – see Task #3, Outcome #2 above). Nutrient data were provided to MS DEQ regarding a nearby release of phosphate. Partners and staff continued to meet with local decision-makers and stakeholders to share results of these ongoing research and

monitoring efforts.

Management Plan Strategies/Actions:

- The Reserve research staff will meet annually with area resource agencies (e.g., MDMR, USFWS, MDEQ, etc.) to share information on research program and management implications of research results.

Outcome End Date: June 2016

Outcome Status: 50%

Task 4 – Implement Research and Monitoring Program

This task includes coordination and facilitation of research and monitoring activities at the Grand Bay NERR, including maintaining coordination with scientists in the Gulf of Mexico region, developing new research opportunities for Grand Bay, working with collaborators on potential NERRS Science Collaborative projects and continued facilitation of outside research projects. The NERR team provided support for a variety of research efforts at the Reserve relating to specific habitats and species. During this reporting period, we tracked 30+ research projects being conducted at the NERR. Current monitoring and research efforts at the Grand Bay NERR include secretive marsh bird monitoring, diamondback terrapin monitoring, effects of watershed development on water quality and biota, estuarine fish monitoring, effects of elevated phosphate levels on benthic invertebrate communities, and ecological effects (i.e., on flora and fauna) of sea-level rise.

Coordination with the Environmental Cooperative Science Center (ECSC) continued. The Grand Bay NERR Research Coordinator worked with the Grand Bay ECSC Coordinator to engage faculty and graduate students involved in ECSC-related research projects. Atmospheric and depositional mercury monitoring also continued at the Reserve in partnership with the NOAA Air Resources Laboratory and the Mississippi Department of Environmental Quality.

The Research Coordinator continued to be a full-time contract employee. Mississippi State University contributes 50% of this salary, with the balance being paid via a contract administered by DMR through this grant. The Stewardship Sector is also involved extensively in various research and monitoring projects. Research and stewardship staff members worked as a team at Grand Bay, working together on several projects (i.e., fish surveys, SWMP, sentinel site monitoring, etc.).

Transfer of the technical understanding and knowledge of coastal resources at the Reserve continued to be utilized to minimize impacts on water quality, habitats, ecological processes, and flora and fauna. The important goal of transferring technical information into management was accomplished by the research staff in several ways including: (1) the Research Coordinator participated on several technical committees and advisory boards such as the Adaptation and Science Management Team of the Gulf Coast and Ozarks Landscape Conservation Cooperative, the Gulf of Mexico Vulnerability Assessment, and research staff participated on various Gulf of

Mexico Alliance Priority Issue Teams; (2) co-authored peer-reviewed publications and made presentations at technical and non-technical conferences (see list of research staff publications and presentations below); and, (3) participated in Grand Bay NERR-specific events National Estuaries Day and conducted Adventure Quencher Birding Trips.

Outcome 1 – Facilitate Research

The NERR team facilitated research in three ways: team coordination and collaboration; facilitation and submission of extra-mural grants, and site visits for researchers working at, or interested in working at, the NERR. The NERR team continued to coordinate and collaborate on Grand Bay projects including quarterly fish sampling, vegetation monitoring and tracking, long-term wet and dry deposition of atmospheric mercury, emergent marsh, SAV, erosion, sea level rise and marsh sediment monitoring. The second component for building the research program at Grand Bay included the facilitation and submittal of extra-mural grant proposals, so the NERR team continued to develop projects that enhance our objectives and mission in compliment with ongoing operations. During this reporting period, the NERR Team was Co-PIs on one proposal submission: *Forecasting Impacts of Altered Water Levels Associated with Climate Change: Need for High Resolution Local-scale Models for Improved Understanding of the Relationships Between Marsh Elevation and Biological Communities (Submitted to NOAA-NCCOS Office)*. Finally, we continued to provide site visits and tours of the Reserve and associated facilities to enhance research facilitation. During this reporting period, we conducted site visits for Randy Wilson (Migratory Bird Program – U.S. Fish and Wildlife Service), Dr. John Tirpak (Gulf Restoration Program, U.S. Fish and Wildlife Service) Melanie Driscoll (Bird Conservation Program, National Audubon Society, and Dr. Peter Frederick (University of Florida). The Research Coordinator continued to provide technical supervision of NERR research staff, including the ECSC Site Coordinator.

Management Plan Strategies/Actions:

- The Reserve research staff continued to provide technical advice to visiting scientists relating to research priorities, data and conducting research at the Grand Bay NERR.
- The Reserve research staff shared potential funding opportunities with external researchers.
- The Reserve research staff continued to be actively engaged in partnerships with USFWS, MDMR, universities and other groups to address research priorities at the Grand Bay NERR/NWR.
- The Reserve research staff continued to work with partners to seek additional funding to support Reserve research priorities.
- The Research Coordinator and the NERR team presented at least one scientific seminar annually at local and regional academic institutions and laboratories, and research-oriented government agencies – providing an overview of the Grand Bay NERR program, describing research monitoring projects and promoting the use of Reserve facilities for their activities.

- The Reserve research staff promoted the availability and use of facilities and equipment by external researchers by making presentations at scientific conferences, coastal management symposia and training workshops.
- The Reserve research staff worked with administrative staff to accommodate the needs of visiting researchers as appropriate through policies relating to the use of dormitory, research labs, offices and boats.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 2 – Promote the Grand Bay NERR Involvement in Externally Funded Projects

Efforts were made to coordinate Externally Funded work with scientists, educators and end-users. Staff (research coordinator, stewardship coordinator, CTP coordinator and education coordinator) continued to be directly involved in an EPA funded project with the Gulf of Mexico Program, the University of Alabama, Southern Illinois University-Carbondale, and U.S. Fish and Wildlife Service to investigate the effects of prescribed fire on the upslope migration of emergent marsh vegetation. In addition, Reserve staff facilitated the development of a National Science Collaborative pre-proposal focusing on the fate and effects of phosphate in and around the grand bay NERR. The Reserve research team continued to host meetings, interact with partners, assist with project outreach and with project-associated field work.

Management Plan Strategies/Actions:

- The Reserve research staff will actively submit grants as PIs and/or Co-PIs;
- The Reserve research staff shared potential funding opportunities with external researchers;
- The Reserve research staff actively engaged in partnerships with USFWS, MDMR, universities and other groups to address research priorities at the Grand Bay NERR/NWR; and
- The Reserve research staff worked with partners to seek additional funding to support Reserve research priorities.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 3 – Coordinate Environmental Cooperative Science Center (ECSC)

The Environmental Cooperative Science Center (ECSC) is funded through June 2016. The partner institutions for the ECSC include: Florida A&M University (lead), Texas A&M University-Corpus Christi, Creighton University, Delaware State University, Jackson State

University, and the University of Texas-Brownsville. Other partners include: Apalachicola, Grand Bay, and Mission-Aransas NERRs; Flower Garden Banks National Marine Sanctuary; and, the Gulf of Mexico Alliance (GOMA). The ECSC Coordinator will work with the NERR team to support ongoing research efforts and facilitate collaborative efforts between the NERR team and ECSC partners. The ECSC will engage the NERR team by seeking and executing opportunities to collect information or data to support the mission of both organizations. For example, the ECSC is currently interested in acquiring aerial and satellite imagery which will be used by the NERR team in habitat mapping and other projects.

During this reporting period, three sampling trips were completed for three ECSC graduate students from Jackson State University; sample collection was completed for one graduate student at Florida A&M University. Logistical and technical support were provided for ECSC affiliated faculty and students working at the Reserve.

Christina Mohrman was a member of the core planning team and worked as teaching staff for ECSC Center Wide Core Competency (CWCC) Training held in July, 2015 at the Mission-Aransas NERR, Texas. The CWCC is an intensive, week-long course that provides undergraduate and graduate ECSC students with an overview of coastal research techniques, ecosystem modeling, policy, and law. Students spent time in the field, lab, and classroom completing activities across the ECSC's four focal areas (ecosystem processes, ecosystem characterization, forecasting and modeling, and human dimensions). Students also learned about a local coastal management issue through field trips and presentations from local experts. The 2016 CWCC is scheduled for August 3-7 in Ocean Springs, Mississippi.

The ECSC continued to increase the number of education and outreach activities Centerwide, especially with middle school through undergraduate students in underrepresented minority groups. As part of this effort, the Grand Bay ECSC site coordinator was directly involved in education and outreach activities (~10 during this reporting period), including collaborations with the NERR Education Coordinator.

Management Plan Strategies/Actions:

- The Reserve research staff will actively engage in partnerships with USFWS, MDMR, universities and other groups to address research priorities at the Grand Bay NERR/NWR.
- The research staff will work to complete a "Conceptual Ecosystem Model for the Grand Bay NERR" to assist with identification of key ecological linkages and research data gaps within the Reserve.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 4 – Increase Effectiveness of NERRS Research Database

Ten new projects were added to the national NERR project database during this reporting period. In addition, reserve staff continued to add additional projects as well as provide regular updates to include abstracts and publications.

Management Plan Strategies/Actions:

- The Reserve research and stewardship staffs continued to maintain a comprehensive list of past and current Grand Bay research, monitoring and stewardship projects; Reserve list was coordinated and synchronized with the national NERR project database.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 5 – Increase Understanding through Bio-monitoring Efforts at NERR

Efforts included conducting Grand Bay NERR specific bio-monitoring/research projects (e.g., fishes, invertebrates and marshbirds, etc.), conducting field surveys and lab processing, including database revision and preliminary data analyses. We also presented results of Grand Bay NERR projects at various local, state, regional, and national meetings. Further, we continued to publish peer-reviewed and technical reports and initiated the preparation of several new manuscripts for submission in 2016.

Management Plan Strategies/Actions:

- The Reserve research and stewardship staff continued to maintain a list of inventory and research needs for Reserve or management units.
- The Reserve staff continued projects to quantify distribution, abundance and variability of estuarine faunal communities.
- The Reserve research staff continued to facilitate and conduct research on the natural variability of ecosystems and the potential impacts of human disturbances.
- The Reserve staff began projects to develop predictive models to determine how natural and man-made disturbances may impact coastal habitats in the future
- The Reserve research staff collaborated with the stewardship staff to evaluate the existing SAV monitoring program and refine sampling efforts to better-fit local conditions and needs.
- The Reserve staff continued to communicate with external researchers and collaborators to facilitate the submission final reports and publications of their

research for inclusion in the Reserve Resources Room holdings.

- The Reserve research staff will meet annually with area resource agencies (e.g., MDMR, USFWS, MDWFP, etc.) to share information on research program and management implications of research results.

Presentations

The NERR Research Team made multiple presentations at meetings and led field trips for different user groups to share scientific knowledge with the technical community and the public. Presentations and field trips by Grand Bay Reserve staff (bolded text) are noted below:

- **Woodrey, M.S.** et al (7 co-authors). 2015. The Use of Structured Decision Making to Inform the Development of a Gulf of Mexico-wide Bird Monitoring Program. Department of Entomology and Wildlife-University of Delaware Seminar Series, 1 December 2015, Newark, DE (ORAL).
- Wilson, K.R., E. Smith, E., K. Arend, N. Dix, L. Hice-Dunton, M. Ferner, S. Schooler, and **M.S. Woodrey**. 2015. Improving estimates of sediment carbon density across marsh types and spatial scales. 2015 Coastal and Estuarine Research Federation Meeting, 8-12 November 2015, Portland, OR (ORAL)
- Adams, E.M., J. Feura, R.J. Cooper, S.A. Rush, and **M.S. Woodrey**. 2015. Sensitivity of Clapper Rail populations to changes in fecundity and survival: an individual-based modeling approach. 2015 Southeast Partners in Flight Meeting, 2-6 November 2015, Lafayette, LA (ORAL)
- **Woodrey, M.S.** 2015. Why Tidal Marsh Birds? In *On Research, Monitoring, Ecology & Conservation of Southeastern U.S. Tidal Marsh Birds Symposium*, 2015 Southeast Partners in Flight Meeting, 2-6 November 2015, Lafayette, LA (ORAL)
- **Woodrey, M.S.** 2015. A proposed Monitoring Scheme for GoM Tidal Marsh Birds. In *On Research, Monitoring, Ecology & Conservation of Southeastern U.S. Tidal Marsh Birds Symposium*, 2015 Southeast Partners in Flight Meeting, 2-6 November 2015, Lafayette, LA (ORAL)
- Carmichael, R., J. Hall, E. Hieb, P. Dimens, E. Darrow, and **K. Cressman**. 2015. Sedimentary records of recurrent phosphate spills to a coastal estuary. 2015 Coastal and Estuarine Research Federation Meeting, 8-12 November 2015, Portland, OR (ORAL)
- **Mohrman, C.** and M. Lamb. 2015. Building a Pipeline to NOAA Science Careers: Environmental Cooperative Science Center Field-based Graduate Student Training, Education, and Outreach Activities. NERRS Annual Meeting, 25 October, Mobile, AL (POSTER)
- Lamb, M., **C. Mohrman**, and J. Shalles, C. Jagoe. 2015. Turtle nesting research at the Apalachicola and Grand Bay NERR Sites. NERRS Annual Meeting, 25 October, Mobile, AL (POSTER)
- **Woodrey, M.S.** 2015. A citizen/scientists perspective on sea level rise. Connecting

Science to Citizens Workshop on Sea Level Rise, 7 October 2015, Moss Point, MS (ORAL).

- **Woodrey, M.S.**, K. Wilson, E. Smith, K. Arend, N. Dix, L. Hice-Dunton, M. Ferner, and S. Schooler. 2015. Spatial Variability in Carbon Storage Within and Across Marshes of the National Estuarine Research Reserve System (NERRS), USA: A Comparison of Methodologies and Coastal Regions. Blue Carbon: A Management Tool for Conservation and Restoration of Coastal Wetlands Workshop, 10 September 2015. Moss Point, MS (ORAL).
- Battaglia, L.L., J.A. Cherry, and **M.S. Woodrey**. 2015. Does local loss of resilience in coastal plant communities promote broad scale resilience through landward migration? 6th World Conference on Ecological Restoration: Towards Resilient Ecosystems: Restoring the Urban, the Rural and the Wild, 23-27 August 2015, Manchester, United Kingdom (ORAL)

Publications

In addition to the activities noted above, the Grand Bay NERR research staff (bolded text) authored and/or co-authored the following technical and general publication(s) to sharing scientific knowledge with the broader scientific community as well as the public:

- Grigas, D., J. Lehrter, J. Cebrian, Y. Chen, B. Ehmen, and **M. Woodrey**. 2015. Effects of stormwater pipe size and rainfall on sediment and nutrients delivered to a coastal bayou. *Water Environment Research* 87:796-804.
- Watson, A., J. Reece, B.E. Tirpak, C.K. Edwards, L. Geselbracht, **M. Woodrey**, M. LaPeyre, and P.S. Dalyander. 2015. The Gulf Coast Vulnerability Assessment: Mangrove, Tidal Emergent Marsh, Barrier Islands, and Oyster Reef. 132 p. <http://gulfcoastprairielcc.org/science/science-projects/gulf-coast-vulnerability-assessment>
- Morris, K.M., M.S. Woodrey, S. G. Hereford, E.C. Soehren, T.C. Conkling, and S.A. Rush. *In Revision*. Yellow Rail (*Coturnicops noveboracensis*) Occupancy in the Context of Fire in Mississippi and Alabama. *Waterbirds*.
- Mohrman, C.F. and J.D. Tappa. *In Preparation*. First documented predation of adult Mississippi Diamondback Terrapins (*Malaclemys terrapin pileata*) by Raccoons (*Procyon lotor*).
- Mohrman, C.F. R. Burris, and T. Floyd. *In Preparation*. Non-regulatory approaches to reduce diamondback terrapin (*Malaclemys terrapin*) mortality in the blue crab (*Callinectes sapidus*) fishery.

Outcome end date: June 2016

Status: 50%

Outcome 6 – Increase Information Transfer to Scientific and Public Communities

The NERR team members actively transferred relevant coastal management issue-related

data to various audiences including the scientific, management, and public communities. Recognized as valued experts relative to Reserve priorities and coastal management issues, the research staff continued to be actively involved in a variety of activities to promote the use of Grand Bay NERR research products. Activities pursued by staff included serving on technical advisory panels, graduate student committees, and education and CTP sector workshops and activities.

Management Plan Strategies/Actions:

- The Reserve research staff provided advisory services to researchers, resource managers, local communities and the public.
- The Reserve research staff provided technical advice to visiting scientists relating to research priorities, data and conducting research at the Grand Bay NERR.
- The Reserve research staff published the results of research and monitoring projects.
- Reserve-specific research findings were incorporated into the content of experiential programs.
- The Research Coordinator conducted at least one annual field trip for post-graduate classes affiliated with a local or regional academic institution.
- The Reserve research staff provided citizen/student volunteer opportunities through research and monitoring projects.
- The Reserve research staff contributed scientific data to support and enhance reserve-led targeted decision-maker workshops in addressing local issues.
- The Reserve research staff made effective presentations of research findings to scientists, educators, decision-makers, citizens, etc. through the Reserve Coastal Training Program workshops.
- The Reserve research staff participated in meetings/workshops, when appropriate, with federal, state, local resource management agencies and municipalities to keep them informed of current research efforts and issues.
- The Reserve research staff contributed scientific data to support and enhance Reserve-led education and training activities to increase understanding of coastal resources/management issues.
- The Reserve research staff effectively presented research findings during education and training activities.

Technical Advisory Panels

Reserve research staff sit on the following advisory panels:

- National Academy of Sciences Study – Guidelines for Restoration Monitoring in the Gulf of Mexico Region
- Gulf of Mexico Alliance Priority Issue Teams including Wildlife and Fisheries, Observations and Monitoring, Water Quality and Education and Engagement
- Mississippi Master Naturalist Program, Mississippi State University - Coastal Research and Extension Center
- Technical Committee Member, Adaptation and Science Management Team, Gulf Coast Plains and Ozarks Landscape Conservation Cooperative
- Technical Advisory Team for the East Gulf Coastal Plain Joint Venture, U.S. Fish and Wildlife Service
- Science Council for the BioDiversity Research Institute
- Scientific Advisory Board for the Gulf Coast Bird Observatory
- Migratory Bird Workgroup of the National Estuarine Research Reserve System
- Landbird Monitoring, Evaluation, and Research Team of the Gulf Coast Joint Venture, U.S. Fish and Wildlife Service
- Advisory Committee of the Coastal Training Program, Grand Bay National Estuarine Research Reserve
- Field Associate, Mississippi Museum of Natural Science
- National Diamondback Terrapin Working Group
- SWMP Meteorological Technician Expert Team
- Technical Committee for SWMPrats.net Team

Graduate Student Committees

The Grand Bay NERR Research Team Supported the following Graduate Student during this reporting period:

- Jared Feura, M.Sc. Candidate, Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Starkville, Mississippi: 2014-present.
- Hayley Tumas, Ph. D. Candidate, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Georgia: 2013-present.
- Tim Freiday, M.Sc. Candidate, Department of Entomology and Wildlife, University of Delaware, Newark, Delaware: 2015-present.

Education Activities, CTP Workshops & Field Trips

- Green Building Tour and discussion for University of South Alabama Marine Conservation Biology Class visit – 12 November 2015; 9 participants
- Judge for Moss Point High School Science Fair – 19 November 2015; 94 participants
- Organized and led a ‘Winter Grassland Bird’ field trip for the Inland Bird Banding Association, Mississippi Sandhill Crane National Wildlife Refuge, Gautier, MS – 14 November 2015; 35 participants
- Organized and led a Grand Bay NERR bird-watching trip – 5 December 2015; 15 participants

Externally Funded Grants

- None to report for this period

Outcome end date: June 2016

Outcome Status: 50%

Outcome 7 – Facilitate Mercury Monitoring and Research

Mercury monitoring and research continued with our collaborative project with NOAA/Air Resources Laboratory scientists Drs. Winston Luke, Mark Cohen, and Steve Brooks. The Atmospheric Mercury Deposition Monitoring Station at the Grand Bay NERR continued to collect dry-deposition data to determine various species of airborne mercury. Data were downloaded remotely, and analyzed by Air Resources Laboratory scientists and atmospheric modelers. This station is part of NOAA's Atmospheric Mercury Network.

A wet-deposition station is co-located at the site, which is part of the National Atmospheric Deposition Program's Mercury Deposition Network, and National Trends Network. Rainwater collection began in March 2010 will continued through 2016. The station is managed directly by the staff at the Grand Bay NERR in consultation with the MDEQ and atmospheric scientists at the NOAA Air Resources Laboratory. Total mercury and methyl mercury in rainfall were measured.

We continued to collaborate with PhD. Candidate David McLagan at the University of Toronto Scarborough, who is testing passive air samplers for elemental mercury. Nine passive air samplers were deployed throughout late 2015 into 2016 at the Grand Bay station, as well as other sites around the world, to study the effectiveness of passive air sampling for atmospheric elemental mercury.

Outcome End Date: June 2016

Outcome Status: 50%

TRAINING

Task 5 – Implement Coastal Training Program (CTP)

Aligned with the 2013 Grand Bay NERR Management Plan, the CTP “fosters informed decision making and resource management across the coastal landscape by enhancing the decision-making abilities of professional audiences whose actions influence the management of natural resources along the north-central Gulf Coast.” The main goals of Grand Bay NERR CTP are:

Goal 1. Decision-makers will recognize CTP as a reliable source of information and skill-building opportunities.

Goal 2. Decision-makers will recognize that their actions and decisions impact Mississippi's coastal resources.

Goal 3. Decision-makers will utilize CTP products and services to make decisions about challenging coastal management issues.

Goal 4. Decision-makers will increase the diversity of professional contacts and opportunities for collaboration through participation in CTP activities.

The CTP 2013-2018 Program Strategy and the 2013 Grand Bay NERR Management Plan provide the foundation for CTP activities. During this award period, CTP activities will focus on three (3) focus areas:

- Climate change: Work with citizens and their communities to communicate a message that addresses understanding, adapting, and mitigating potential impacts of climate change.
- Habitat protection: Develop partnerships to implement comprehensive management of resources, addressing acquisition, restoration and enhancement, resource protection, public access and resource manipulation; and communicate the issues relating to Reserve threats and sharing information with citizens and their communities regarding best practices to manage and protect coastal resources.
- Water quality: Communicate water quality conditions at the Reserve and issues relating to maintaining water quality to citizens and their communities.

Current staff resources permit the CTP to provide 8-15 training events per year. Given the existing demand for workshops by multiple target audiences and the increased geographic scope of the program, it will be necessary to seek resources to support additional staff.

The Grand Bay CTP's primary priority audiences include local officials and staff, natural resource managers, and coastal scientists who work in coastal Mississippi. Within the three (3) focus areas, priority training topics for CTP activities will be driven by the needs of its audiences.

These needs will be identified through formal and informal needs assessments, feedback from CTP events, local partner events, and general coastal management issues in Mississippi. An informal CTP Needs Assessment Survey was conducted in 2011, in conjunction with Weeks Bay NERR, to determine training needs of coastal stakeholders.

The CTP Coordinator and/or CTP staff worked with Reserve staff to develop new workshops and to actively support Reserve-wide initiatives including current and future Science Collaborative projects and future proposal development. The CTP Coordinator and/or CTP staff also worked with other Reserves in the Gulf of Mexico to develop workshops and grant proposals, increase collaboration, and reduce duplication of effort.

Task 8 of this document reflects the collaborative nature of the Reserve's climate-associated

work. While referenced under additional tasks, Task 8 reporting will detail our climate-related work.

Information about CTP programs, services, outcomes, and agreed-upon performance metrics are reported in semi-annual progress reports in accordance with system-wide performance review procedures. The CTP task also includes supplies for training events, speaker honoraria, space rental fees, and transportation services to successfully implement program activities. The main staff persons working on training activities is Margo Posten (CTP Coordinator – MDMR Marine Administrator II). She began work on October 21, 2015. Holland Lamier, Outreach Specialist, assisted with training activities during the absence of a CTP Coordinator.

Outcome 1 - Increase Knowledge of Water Quality, Climate Change, and Habitat Protection

The CTP Coordinator and/or staff offered training opportunities that meet the needs of local audiences, fulfill the goals and focus area priorities of the 2013 Management Plan, and highlight the Reserve's habitats, monitoring programs, and projects. This included at least three (3) workshops and/or training events that feature local coastal environmental systems science and research for coastal decision makers and on sustainable coastal development practices for coastal decision makers.

Primary training issues addressed by the CTP included, but were not limited to, the reserve focus areas of habitat protection, water quality, and climate change. The CTP Coordinator and/or CTP staff provided advisory services and assisted coastal communities, so they can better address local resource management issues and will serve on various advisory committees as they are encountered, including the GOMA-Coastal Community Resilience Team and the Gulf of Mexico Climate Outreach Community of Practice as those committee positions become available.

During this reporting period, training topics included Coastal Resiliency Series (e.g., Wilderness First Aid, etc.), Blue Carbon Workshop, Connecting Scientists to Citizens Regarding Sea Level Rise workshops (2), Ecological Effects of Sea Level Rise Workshop. At least three workshops: the Blue Carbon workshop; Connecting Science to Citizens; and, the Ecological Effects of Sea Level Rise Workshop featured science and research on local coastal and estuarine systems, including sustainable coastal development practices, to help inform local decision makers regarding local resource management issues.

The CTP Coordinator and/or staff also worked on numerous grants during this reporting period:

- A Gulf of Mexico Coastal Training Program Initiative (EPA GOP funding)
- Connecting Scientists to Citizens Regarding Sea Level Rise (GOMA funding)
- Ecological Effects of Sea Level Rise in the Northern Gulf of Mexico (NOAA)
- Gulf of Mexico Ecosystem Restoration Practitioner's Forums (GOMA funding)

- Regional Living Shorelines Construction Technical Bulletins for Contractors (GOMA funding)
- Saving Money and Enhancing Resilience: Assisting Communities through the 2013 Community Rating System (GOMA funding)
- Will Reintroduction of Fire along Coastal Gradients Promote Lateral Migration of Marsh and Enhance Biodiversity? (EPA GOP funding)
- All-hazards Disaster Response Exercise (NOAA funding)

We will also be updating our stakeholders on progress with research findings from the DISL NERRS Science Collaborative and EPA Risk Assessment projects at Grand Bay, and other research projects relating to habitat, water quality improvements, and climate change.

Management Plan Strategies/Actions:

- The CTP staff will provide advisory services to decision-makers, resource managers, local communities and the public.
- The CTP staff will integrate with the Reserve's research, stewardship and education programs to communicate current management information and outreach needs that will be useful in development of sector projects that are timely and relevant to the coastal training program.
- The CTP staff will distribute the results of Reserve research, stewardship, and education projects to applicable resource management audiences and decision-makers.
- The CTP staff will assist local communities working with partnerships to provide expertise/advise, workshops, and information on funding opportunities to address local resource management issues.
- The CTP will offer at least eight workshops per year that address the scientific and skill needs of local decision-makers. These workshops will foster informed local decision-making by transferring relevant science-based information, tools, and skill building opportunities to targeted audiences. The primary targeted audiences are local officials and staff, resource managers, and coastal scientists.
- The CTP staff will design training events to focus on Reserve priorities and local resource management issues.
- CTP workshops will be designed to encourage and facilitate networking between participants.
- The CTP staff will seek to provide decision-makers with the information and

training needed to make science-based, informed resource management decisions relating to local issues.

- The CTP staff will provide participants with information regarding funding opportunities to address resource management needs.

Outcome End Date: June 2016

Outcome Status: 60%

Outcome 2 - Improved Capacity of Coastal Training Program Within Reserve System

The CTP Coordinator and/or CTP staff participated in Reserve system workshops, specifically partnerships and collaborations with NERRs regionally and nationally, to share information and programming relating to national priorities, specifically climate change, habitat protection, and water quality. The Reserve is a part of a regional project, A Gulf of Mexico Coastal Training Program Initiative, awarded to Weeks Bay Foundation from the EPA Gulf of Mexico Program. The purpose of this project is to foster collaboration between the five Gulf CTPs to address regional issues affecting the health of the Gulf of Mexico. The program includes funding for three years to support a Regional CTP Coordinator who will help increase the quantity and quality of beneficial public outcomes linked to the EPA Gulf of Mexico Program. The Regional CTP will help the five Gulf CTPs connect the needs of the EPA Gulf of Mexico Program, other regional organizations, the Gulf States, and local communities to provide targeted professional workshops and technical assistance, including one workshop a year for the Reserve. The proposed workshop for this funding year was a Blue Carbon Workshop.

The CTP Coordinator attended the NERRS national meeting and will be involved nationally in NERRS working groups as the opportunity is presented. .

Outcome End Date: June 2016

Outcome Status: 60%

Outcome 3 - Effectively Communicate with Local Audiences and Partners

The CTP Coordinator and/or CTP staff helped to keep audiences and partners up-to-date about CTP workshops and Grand Bay NERR events by maintaining the Grand Bay NERR website, the regional Gulf of Mexico Coastal Training website, the Grand Bay NERR Facebook page, the Grand Bay NERR Twitter account, and contributing articles to the MDMR and Grand Bay NERR newsletters so that audiences are aware of upcoming CTP events and also have access to information about the Reserve. The CTP Coordinator and/or staff also continued to manage and keep up-to-date the CTP email list and utilize this list to communicate workshops and events to local partners and audiences.

The CTP Coordinator and/or CTP staff continues to distribute and present the results of Grand Bay NERR-related training and Reserve research, stewardship, and education projects

to applicable resource management audiences and decision-makers at various meetings present at local government meetings and to professional organizations relating to CTP activities and Reserve. As these projects develop, the CTP Coordinator with assistance from CTP staff will work on collaborative reports about the training project, research results, transfer of information, and effective techniques. To date, no work has occurred on reports or publications.

Management Plan Strategies/Actions:

- The CTP coordinator will serve on at least two relevant technical advisory committees/panels/boards.
- The CTP staff will make poster and oral presentations on Grand Bay NERR-related training and outreach projects at various meetings, including GOMA, Community of Practice, Grand Bay NERR Research Symposium, and other local regional or national meetings.
- The CTP coordinator will contribute at least one peer-reviewed education/training project for publication.
- The CTP staff will contribute to reports and articles on training project/techniques for publication.
- The CTP staff will integrate the results of Grand Bay research and stewardship projects relating to Reserve priorities to applicable resource management audiences through professional sharing, workshops, printed materials, website, and social media.
- The CTP staff will inform the public of activities through the MDMR and Grand Bay NERR newsletters. The CTP coordinator will make presentations at local government meetings and to professional organizations relating to CTP activities and Reserve priorities (e.g., Jackson County Board of Supervisors, Moss Point City Council, Mississippi Commission on Marine Resources, etc.)

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 4 - Partner with Organizations to Train Specific Audiences

The CTP Coordinator and/or CTP staff sought partners to co-sponsor workshops by providing meeting space, access to expert speakers, meeting facilitation, or lodging for participants. The CTP at the Grand Bay NERR continues its coordination and sponsorship efforts with such organizations as: The Nature Conservancy (TNC), Mississippi Department of Marine Resources (MDMR), National Oceanic and Atmospheric Administration (NOAA), USFWS National Conservation Training Center (NCTC), Mississippi Department of

Environmental Quality (DEQ), NOAA Disaster Response Center (DRC), Gulf Community of Practice, NOAA Coastal Services Center, Sea Grant Programs, The Gulf of Mexico Alliance (GOMA), The Gulf of Mexico Foundation, EPA National Estuaries Programs, the Weeks Bay Foundation, the Alabama Coastal Foundation, Apalachicola NERR, Mission-Aransas NERR, Rookery Bay NERR, Weeks Bay NERR, and other national NERRs as well as other regional and local governments, academia, non-profits, business, and non-governmental organizations (NGO).

Staff worked with these groups to develop new training opportunities and to implement existing commitments. Partnering activities are aimed at collaborating with other groups, to combine expertise to effectively inform audiences on issues relating to reserve priorities. These efforts will lead participants in our programs to become more prepared for climate change impacts in local communities and to better protect and manage natural resources and water. In order to develop new and continue current partnerships, the CTP Coordinator will serve on at least two (2) relevant technical advisory committees, panels, or boards when the opportunity is encountered (e.g., GOMA-Coastal Community Resilience Team and the Gulf of Mexico Climate Outreach Community of Practice), and continues to seek out expert trainers, researchers, and partners to provide technical assistance when organizing workshops and events.

The CTP Coordinator and/or CTP staff continues to develop an agenda for each training session that encourages and facilitates networking between attendees and offer at least two (2) training events each year that are targeted at diverse audiences to encourage networking opportunities.

Management Plan Strategies/Actions:

- The CTP staff will actively engage in new and continuing partnerships with agencies, universities and other groups to address Reserve priorities.
- The CTP staff will work with partners to seek additional funding to support Reserve priorities.
- The CTP staff will promote and encourage the use of facilities by partners, decision-makers, civic groups and other organizations.
- The CTP coordinator will seek out subject-matter experts with excellent communication skills when developing workshops and other events.
- The CTP staff will provide 25 workshops and training programs that use Reserve or partner specific research and monitoring/stewardship data or expertise to address Reserve priorities.
- The CTP coordinator will seek partners to co-sponsor workshops. Partnerships could serve to provide meeting space, access to expert speakers, meeting

facilitation, lodging for participants, travel support, workshops supplies and participant refreshments, etc.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 5 - Evaluate/Track Success of Program Participation

The CTP Coordinator and/or CTP staff evaluated trainings to ensure that 75% of local decision-makers have demonstrated an increased understanding and are using the information to better manage and integrate new skills, knowledge, and perspectives into their work. The CTP Coordinator and/or CTP staff also utilizes the feedback from Needs Assessments, post-event evaluations, and mid-term follow-up surveys on a continuous basis to identify program successes, lessons learned, and new opportunities for advanced information, and skill-based training. Since early 2000, NERRS Education Coordinators, CTP Coordinators, the CTP Oversight Committee, and a CTP Performance Measures Workgroup have worked hard to develop a logic model and framework for measuring performance of the Coastal Training Program. The CTP logic model has helped focus program development efforts and identify common indicators for tracking progress in this emerging program. While there is a process underway to develop an over-arching logic model for the NERRS, the CTP logic model provides a framework for monitoring progress towards addressing Goal One of the 2003 NERRS Strategic Plan: "To improve coastal decision making by generating and transferring knowledge about coastal ecosystems."

As the CTP continues to develop and mature, it is increasingly important to track progress at a system-wide level, in order to:

- Quantify the types of audiences reached;
- Provide quantifiable data for program evaluation;
- Assess effectiveness in meeting the goals and objectives of the CTP;
- Assess participant satisfaction with different training methodologies;
- Identify and establish significant trends in audiences and issues that could influence NERRS policy and strategic planning and other organizations and programs that target coastal decision makers;
- Attract partners interested in working with a successful program;
- Increase accountability to constituents and stakeholders; and
- Document achievements for use in fund-raising efforts.

Grand Bay NERR continues to collect and report all pertinent performance measures as

developed by the CTP Oversight Committee and required by NOAA.

Management Plan Strategies/Actions:

- CTP workshops will include post-event evaluations that are used to assess participants' achievement of short-term outcomes relating to the training.
- The CTP staff will seek feedback from workshop participants regarding the mid- and long-term outcomes relating to the use of workshop information.
- The CTP staff will use results of post-event surveys to improve future workshop offerings.

Outcome End Date: June 2016

Outcome Status: 50%

EDUCATION

Task 6 – Implement Education and Outreach Activities

The education program of the Reserve provided on-site and off-site educational activities for a diverse set of audiences. This includes the transfer of research and monitoring information to appropriate audiences, development and production of curricula, use of educational products and web sites and the coordination of on-site education programs at the Grand Bay NERR with the schools and other educational programs. The Reserve's Education Coordinator (EC) coordinated these activities. The Grand Bay Coastal Resources Center allows for much greater on-site programming to occur, utilizing the classrooms, surrounding Reserve land and water and the interpretative area. Education programs were evaluated by conducting pre and post event surveys when applicable.

Task 8 of this document reflects the collaborative nature of the Reserve's Climate associated work. While referenced under additional tasks, Task 8 reporting details our climate related work.

Special projects included participating in several coastal environmental activities detailed below. We also continue to participate in other coastal environmental education efforts i.e. Earth Day, National Estuaries Day, Public Lands Day, etc.

We implemented an environmental education program including in-school activities, on-the-road outreach (coordinated by our staff educator, NERR Resource Specialist III), lectures, programs, presentations, field trips, curricula, outreach materials, web site and other supporting materials for groups, agencies, educators and citizens. This component focused on education and outreach for visitors to the Reserve by various education, community and coastal decision-making groups to familiarize them with the Reserve and Reserve programs. Reserve

staff organized visits to local and regional schools, community groups, colleges, government organizations, etc. to promote Reserve programs. Programs focused on habitat protection, water quality and climate change. This task involved use of portable education and presentation displays.

Additional education program funding may be provided through partnerships or grants from B-WET, Gulf of Mexico Alliance (GOMA), Gulf of Mexico Program, USFWS Coastal Program and MS Coastal Program and MS Tidelands Program.

The education sector will be implemented with supervisory and technical support from the Reserve Manager, Administrative Assistant and other staff or partners as appropriate. The primary education staff members are Jennifer Buchanan (Education Coordinator – MDMR Marine Administrator I) and Rick Renew (K-16 Specialist – NERR Resource Specialist III); however, when needed, many of the research and stewardship staff members as well as volunteers will often act as educators as well.

Outcome 1 – Increased Ecological Understanding through Community Education Programs

A general community education program included activities that focused on the biodiversity, ecology, environmental issues and/or culture heritage found within the coastal and estuarine watersheds within and adjacent to the Reserve. Targeted audiences included individuals, families, clubs, civic organizations and visitors to our region. Activities included field trips, tours and evening programs. In order to assess the attendee's experiences and to adaptively manage/design future events, a verbal assessment was given in order to get feedback. Monthly community education programs (Adventure Quenchers-AQ) were offered, relating to the Reserve focus areas of habitat protection, water quality and climate change.

The Reserve staff partnered with the USA National Phenology Network (NPN) to design a citizen science opportunities along the new stewardship trail for community members called Nature's Notebook and Picture Post. During this period, the EC has worked with the staff of NPN to plan a regional workshop for educators, such as other EC's and master naturalists to train them on how to implement phenology trails on their conservation lands this coming February.

Community Programs hosted or exhibited at during this past grant reporting period include:

- Creating Monarch Butterfly Pathways (AQ)
- Bugfest at Crosby Arboretum
- Jackson County Fair
- Owls and other Nocturnal Animals of South Mississippi (AQ)
- Seaside with a Scientist on National Estuaries Day (AQ)
- Mississippi Coastal Cleanup (AQ)
- Winter Birding Excursion through the Reserve (AQ)
- Sandhill Crane Festival

- Christmas in the Pass
- Annual Star Party and Community Open House to celebrate the Geminids Meteor Shower (AQ)

Management Plan Strategies/Actions:

- The Reserve will provide and promote onsite outdoor experiential learning and recreational opportunities such as hiking, boating, fishing, photography and bird watching to educate the public on the importance of conserving coastal resources and move them towards estuary and ocean literacy.
- Staff will manage signage, presentations and exhibits at the Reserve to provide timely and accurate information to increase the public's understanding of sustainable practices and key environmental issues.
- The education coordinator will coordinate at least one Adventure Quencher community education activity each month in order to promote estuary, ocean or climate literacy.
- The education staff will coordinate or participate in at least four off-site community or outreach events each year that promote estuary and ocean and/or climate literacy.
- The Reserve will develop/adopt tools for assessing community programs by the end of 2014.

Outcome End Date: June 2016

Outcome Status: 60%

Outcome 2 – Partnerships with Local Educators to Support Reserve Priorities

Partnerships to support Reserve priorities were established, maintained and expanded which contributed to our implementation of a basic education program including lectures, presentations, and field trips. Education staff coordinated with local marine and estuarine education organizations to develop complementary programs that can be shared. The Staff coordinate with local and regional colleges and universities to promote the Reserve as a “living laboratory”. Partnerships included:

- Reserve Ed Specialist participated in the Southern Association of Marine Educators (SAME) annual meeting in Louisiana.
- Reserve Outreach Specialist presented at Mississippi Science Teachers Association.
- Reserve EC helped plan and implement the annual meeting of the Mississippi Environmental Education Alliance (MEEA) – the EC currently serves as the Past-

President on the Board.

- EC partnered with the MDMR's MS Gulf Coast Heritage Program and Mississippi Public Broadcasting to begin developing a heritage-themed video about the History of the lands within and near the Reserve.
- Gulf of Mexico Alliance - EC is currently the State of Mississippi's Environmental Education Co-Lead and is helping develop Action Plan III.
- The Reserve EC coordinated with the other ECs in the system to help plan and implement the national NERRS Ed sector meeting in October. All staff coordinated to make the educational tour of Grand Bay NERR during the national meeting a grand success.

Management Plan Strategies/Actions:

- Education staff will provide technical/advisory services pertaining to educational issues such as outdoor classroom design, schoolyard projects, environmental and science fairs, curriculum development, etc., to area school administrators, teachers and local community members as requested.
- Education staff will publish and/or present education papers, posters and/ or presentations in journals, at professional conferences or at public events as opportunities arise.
- Education staff will participate in professional organizations (i.e. NMEA and its local chapter, SAME, North American Association for Environmental Education (NAAEE) and its local chapter the MEEA, the National and Mississippi Science Teachers Associations) throughout the year.
- The education staff will coordinate with NOAA to more fully market the Reserve System over the next five years in order to increase visitation at the Reserve and promote the opportunities available for partnering with our staff of environmental education specialists.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 3 –Promotion of the NERRS Through Increased Reserve Visibility

The staff promoted the Reserve through a variety of avenues including but not limited to: on-site and off-site presentations, interactive lectures and presentations, social networking and the continuously updated website. The Reserve provided an exhibit and educational materials to the nearby I-10 Welcome Center which will be viewed by tens of thousands of people. Reserve publications (books, posters, informational materials, web and social posts) also contributed to increasing the Reserve's visibility. The staff worked with the Coastal Nature Destination Group to promote both ecotourism and environmental education at

Environmental/Nature Centers located within Jackson County.

The Outreach Team helped with educational programming and social networking. All staff continues to contribute to the social networking and website posts. Additionally, the staff of the Reserve appear on the local television news programs to promote the Reserve's resources and programs.

Specific activities include:

- The Outreach Specialist compiles and distributes a seasonal e-newsletter
- The Outreach Specialist and various staff members regularly contributes timely information through their popular Facebook page and website
- The EC serves on the local education and outreach committee of two ecotourism/nature tourism groups.
- The EC coordinated with the local tourism bureau to sponsor the GoogleTrekker's visit to the Reserve,
https://maps.google.com/intl/ALL_ALL/maps/about/partners/streetview/trekker/
Google Trekker is a useful tool that could be applied at all the Reserves to increase the visibility of the system
- The annual Seaside with a Scientist AQ is produced annually to share Research/Stewardship activities and findings with community members.

Management Plan Strategies/Actions:

- Reserve educators will develop and distribute timely, regionally relevant and audience-appropriate educational products that interpret the results of Reserve research and other coastal resource issues.
- Reserve educators will use information gathered from monitoring, feedback from social networking sites and synthesized data from surveys and other assessment tools to enhance and expand existing programming and develop new products for the Reserve's target audiences.
- NERR will maintain and update information such as a calendar of events, current news and educational resources on the Reserve's web site (www.grandbaynerr.org) and social media sites.
- Reserve staff, in cooperation with the MDMR Public Relations Office, will produce a quarterly NERR online newsletter beginning in 2014 to promote the Reserve and its resources.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 4 –Implementation and Facilitation for Field Trips for K-12

The K-16 Program Specialist coordinates and implements Reserve educational programming with area schools while the EC coordinates Professional Teacher Development opportunities for educators. We will partner with other nearby environmental centers and youth camps such as the Mississippi Gulf Coast Community Center (MGCCC), the University of Southern Mississippi (USM) and the Boys and Girls Clubs to facilitate onsite field experiences for their spring and summer camps and teacher workshops. The Reserve is building a new freshwater waterfront outdoor classroom that will be useful to conduct learning opportunities for schools and other groups. Students will not be able to compare and contrast fresh and saltwater habitats. The new boat will be outfitted for large group tours and will allow us to take larger groups out into the bayous for field adventures. Other targeted groups will include festivals, science fairs, schools, science clubs, Envirothon, etc. and specific activities including but not limited to:

- The Reserve partnered with the other Gulf EC's on a BWET grant for the Gulf of Mexico Region to host a TOTE workshop in each of the Reserves this past summer. Although our Reserve completed their TOTE workshop during the last grant period, the Reserve's EC assisted the ECs at the Mission Aransas and Apalachicola Reserves during their TOTEs
- The Education Specialist traveled to many of the local schools to deliver On-The-Road programs on topics that support the goals of the Reserve
- Education staff members host many onsite field experiences for students from the surrounding counties
- The EC is partnering with the Mississippi Soil and Water Conservation Commission to plan a regional training session for Envirothon teams and the University of Southern Mississippi to plan the Region VI Science and Engineering Fair
- The EC and Stewardship staff continue to work to complete the Stewardship Trail
- The EC and Director successfully applied to the National Park Foundation to receive an *Every Kid in a Park* grant to bring the fourth graders from all the Boys and Girls Clubs in Mississippi's three coastal counties to the Reserve this coming summer for an outdoor experience.
- Promoted our Microscope and Enviroscope Lending Library to schools.
- Partnered with local educators in MEEA to plan and host the annual environmental education conference, to plan a Teachers on the Estuary TOTE (on wetlands and watersheds) and one other Professional Teacher Development (PTD) Workshops on Private Eye. Each will include an introduction to our Estuaries 101 Curriculum and other NOAA resources. The TOTE and Private Eye workshops will be held this coming June.

Management Plan Strategies/Actions:

- The education staff will establish and/or maintain existing partnerships with NGOs such as the LTMCP and the PRAC, centers of higher learning such as the USM, MSU, Mississippi Gulf Coast Community College's (MGCCC) Estuarine Education Center and the University of Southern Alabama as well as other state and federal agencies such as the MDEQ, Gulf Islands National Seashore and NOAA's Pascagoula Lab to develop and enhance education programming pertaining to the NERR's priority issues.
- Reserve educators will partner with local schools and universities to provide field-based environmental programs for their students and educators .
- Reserve educators and administrators will seek additional partners to help fund programs that will provide for student field trips to the Reserve (i.e. GOMA, Bay-Watershed Education Training (B-WET), MDMR Tidelands and MDEQ).

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 5 – Increased Knowledge by Publication and Distribution of Educational Material

In order to educate the public on coastal issues and raise awareness for the importance of conserving our estuarine/coastal resources the Reserve staff will distribute materials such as plant and bird guides and other educational materials at the Reserve, preferably through our website and via social media and by hard copy when necessary. The staff will also collaborate to create an online (with limited printing) newsletter highlighting the activities of the Reserve. The staff of the Reserve will also produce educational one-pagers, posters and brochures on an as-needed basis.

- The Outreach Specialist compiles and distributes a seasonal e-newsletter.
- The Outreach Specialist and various staff members regularly contributes timely information through their popular facebook page and website.
- A new general field guide that will address common plant and animal species of Mississippi's coastal habitats is currently being planned with the MDMR.

Management Plan Strategies/Actions:

- The Staff will regularly partner with MDMR to promote education programs especially in southeastern Mississippi and southwestern Alabama.
- Reserve staff, in cooperation with MDMR, will produce a quarterly NERR online newsletter beginning in 2014 to promote the Reserve and its resources.

Outcome End Date: June 2016

Outcome Status: 50%

STEWARDSHIP

Task 7 – Implement Stewardship Activities to Monitor, Maintain, and Restore Coastal Habitats

Stewardship activities at Grand Bay are grounded in the three (3) reserve focus areas of climate change, habitat protection and water quality. Effective stewardship is necessary to reach the long-term vision of the Grand Bay NERR that coastal ecosystems of the Gulf of Mexico will be conserved and valued. In addition to managing natural resources, an important goal of the Stewardship sector is to provide opportunities for various audiences to better understand and appreciate the natural resources found on the Reserve. An important aspect of the Reserve's work is to demonstrate best management practices that other professionals, local decision-makers and the general public can apply in their own communities. Additionally, it is vital that stewardship and resource management activities are consistent with maintaining the integrity of the site for long-term research and monitoring. The Reserve provides an ideal laboratory for examining landscape changes related to human population growth, natural disasters and impacts from climate change. Monitoring environmental changes, sensitive habitats and species provides information on the status and health of our resources. Resource management is driven by science and based upon the principles of adaptive resource management and applying current methods in restoration science to restore and enhance impaired habitats. Long-term monitoring allows an evaluation of the effectiveness of restoration activities and functional integrity of natural processes. Staff actively monitors changes in habitats over time, invasive species, fire managed areas and species-specific occurrences.

The Reserve actively pursues direct upland restoration and enhancement activities and partnerships (i.e. mechanical clearing, hydrologic restorations, fire management and invasive species management) in cooperation and coordination with the USFWS, which owns large portions of land within the Reserve boundaries. The focus in estuarine habitats is primarily on resource monitoring and demonstration of best management practices such as living shoreline installations. Examples of activities closely coordinated between the Reserve and NWR include trail development/maintenance, invasive species mapping/treatment, fire management/mechanical treatment, habitat evaluation/mapping and restoration planning.

The team works together to share resources and personnel across sectors which allows for greater flexibility and productivity in meeting the shared. In particular, implementation of the NERRs sentinel site protocol at Grand Bay has evolved as a collaborative effort. The Stewardship Coordinator oversees the vertical control aspect of the project and the

implementation of emergent marsh monitoring. In addition, stewardship staff provides GIS support for research staff. Stewardship staff will work with partners to conduct resource management, monitoring and restoration science activities, including prescribed fire, invasive species control, storm debris cleanup, trail creation and maintenance and habitat mapping. Specific stewardship staff includes a Will Underwood (Stewardship Coordinator – MDMR Marine Administrator II), Lindsay Spurrier (GIS Coordinator – NERR Resource Specialist IV), Mike Archer (Sentinel Site Coordinator – NERR Resource Specialist III), and Jay McIlwain (Stewardship Technician – NERR Resource Specialist II).

Task 8 of this document reflects the collaborative nature of the Reserve's Climate associated work. While referenced under additional tasks, Task 8 reporting will detail our climate related work.

Outcome 1- Better Understand the Ecological Status of the Reserve by Monitoring At-Risk Resources and Resources of Interest

Stewardship staff worked to maintain and enhance resource monitoring activities on the Reserve. The long-term submerged aquatic vegetation monitoring effort was re-evaluated through the process of Structured Decision Making, with input from local and regional experts, to ensure that the effort was worthwhile and meets the goals of the NERR as outlined in the management plan. Erosion monitoring continued, with emphasis on understanding storm impacts on shoreline erosion. Ground based photo-monitoring of Reserve habitats was formalized and permanent stations were established to allow for staff and volunteer participation in this effort using the photo-post method. Ecotonal elevation and vegetation monitoring was implemented at the transition from marsh to slash-pine upland. Additionally, a standardized monitoring route and data collection form was established for regular elucidation of the visual condition of the estuary.

- Re-evaluate SAV monitoring using Structured Decision Making – Stewardship staff have developed plan to evaluate existing data related to SAV and have identified partners to include in re-implementing SAV monitoring.
- Continue erosion monitoring, focusing on storm impacts – Quarterly measurements of erosion rates have continued, with additional sites added to reflect sentinel site locations.
- Establish permanent photo-post stations – No progress to date.
- Establish ecotonal elevation and vegetation monitoring – Work plan and field methods are in progress for data collection to commence in second quarter of 2016.
- Established visual monitoring route and created data form.

Management Plan Strategies/Actions:

- Stewardship staff will evaluate the existing submerged aquatic vegetation (SAV) monitoring program and refine sampling efforts to better fit local conditions and needs.
- Stewardship staff will work to standardize and expand photo-monitoring efforts including game camera surveys, photo-station monitoring and plant photo database. Stewardship staff will continue quarterly shoreline erosion monitoring efforts on the Reserve.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 2- Improve Ecological Integrity of Reserve by Monitoring and Controlling Selected Invasive Species within Reserve Boundaries.

Stewardship staff monitored, mapped, and attempted to control *Phragmites* infestations on state-owned parcels within the Reserve. Limited efforts were made to control cogon grass and Chinese tallow tree in an opportunistic manner. Stewardship staff also continued to support research efforts related to the invasive red-bay wilt fungus. Over the last five (5) years the Reserve has spent an average of \$4,000 a year on equipment and chemicals. This figure does not include man-hours.

- Map and initiate control on *Phragmites* infestations – Mapping of infestations on Point Aux Chenes continued in conjunction with quarterly erosion mapping.
- Control Chinese tallow and cogon grass in visitor use areas - Cogon grass in vicinity of visitor use areas was mowed to reduce seed set.
- Support research efforts related to red-bay wilt fungus – Lab space and support has been provided for Mississippi State University researchers John Riggins and John Formby

Management Plan Strategies/ Actions:

- Stewardship staff will work with partners including the USFWS to identify, track, monitor and, where appropriate, manage invasive species.

Outcome end date: June 2016

Outcome Status: 50%

Outcome 3 – Enhance Resource Management and Conservation by Participating in and Initiating Restoration Efforts in Coastal Habitats and Providing Technical Expertise for Restoration Activities

Three (3) Stewardship staff maintained capabilities as wildland firefighters to support efforts of the USFWS and MDMR Coastal Preserves burning programs. Limited burning was

initiated on state owned parcels within the Reserve to meet research objectives and maintain telemetered communication with SWMP stations. Other restoration efforts were supported through the provision of elevation, erosion, and vegetation data and products produced through Sentinel Site monitoring and other monitoring activities as well as by providing technical expertise.

- Maintain wildland firefighting capabilities – Stewardship staff participated in annual fire-line refresher course and work capacity test as part of maintaining certification.
- Conduct prescribed burns on limited state-owned parcels – monitored a wildfire on state owned parcels, we prescribed a burn on the only state owned parcel possible last year, maintaining ability to burn when new parcels are acquired.
- Provide support for coastal restoration activities – Stewardship associate provided support to USFWS restoration efforts by participating in prescribed burn activities on refuge parcels.

Management Plan Strategies/Actions:

- Stewardship staff will work with other Reserve staff and partners to plan and implement acquisition, habitat restoration and enhancement projects within the targeted watershed through a variety of potential funding sources including the Deepwater Horizon NRDA and/or RESTORE Act funding to the Gulf Coast region.

Outcome End Date: June 2016

Outcome Status: 75%

Outcome 4- Enhance Geospatial Data Management and Assessment/Support of Research and Management

This task includes the continued maintenance and support of the desktop GIS at Grand Bay NERR and the acquisition of additional data layers (landownership, updated imagery, etc.) relating to Research and Stewardship activities and producing maps and charts for presentation and website use at the Reserve. This technical assistance is being provided by a full-time NERR GIS/Stewardship staff member, with oversight provided by the Stewardship Coordinator with input from other sector coordinators and the manager. The GIS staff implemented metadata standards and followed data sharing procedures to maintain and disseminate high quality geospatial datasets created at Grand Bay NERR.

- Continued maintenance and management of geospatial data collected in the field
- Updated NERR spatial database: parcel ownership, marsh plots, erosion shorelines, reef restoration
- Provided support for visiting researchers by providing training and use of equipment including survey grade GPS (Trimble GeoXH), RTK GPS (Trimble R8 and R10), and other

surveying tools (Sokkia Total Station) – gave a day long training to NERR System Staff during Annual Meeting on Leica Sprinter and RTK equipment

- Make use of NERR Leica DNA03 Digital Barcode Level for continued maintenance of the Grand Bay Sentinel Site

Management Plan Strategies/Actions:

- Stewardship staff will provide technical and logistical support to facilitate research and stewardship projects.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 5 – Increase Geospatial Analysis/LIDAR/Remote Sensing to Enhance and Support Research and Monitoring Activities

Geospatial data, including LIDAR and other remotely sensed datasets, was used to complete analyses that support Stewardship and Research efforts at Grand Bay NERR. Products provided multi-layered visual representations, photos, maps, charts, and other images of the reserve for use by all sectors. Products were utilized to support a variety efforts at the NERR and elsewhere, including, but not limited to the Sentinel Site Planning, NRDA Restoration Planning, NRDA Injury Assessment, LiDAR and remote sensing interpretation, Habitat Mapping, Vertical Infrastructure leveling/completion, land acquisition, and other local planning efforts.

- Collect geo-referenced imagery of areas of interest using balloon-based camera platform in both color and infrared – geo-reference imagery is now being collected using Unmanned Aerial Systems in partnership with Mississippi State University. We flew 2 missions in the past 6 months in response to a wildfire.
- Continue collection and analysis of high resolution topographic and bathymetric elevation using Trimble R8 RTK GPS, Leica levels, and Sokia Total Station – The R8 was utilized to collect elevations at each marsh plot, and for quarterly erosion monitoring
- Perform analysis of data using ESRI ARC GIS platform – Analysis of UAS imagery for marsh fire regeneration research in partnership with Mississippi State University and analysis of Sentinel Site imagery for single species classification maps
- Continue fine spatial scale measurements of tidal datums using Hobo loggers and YSI loggers – Strategy to deploy Hobo loggers at central SET at each site discussed and methodology for deployment and data management to come.

Management Plan Strategies/Actions:

- Stewardship staff will provide technical and logistical support to facilitate research and stewardship projects.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 6 – Geospatial Analysis to Support Habitat Mapping Using NERRS Classification

Geospatial data layers relating to Research and Stewardship activities at the Reserve, including ground-truthing, continued to be collected and utilized as needed. Habitat maps were periodically modified as new imagery and ground-truthed data were acquired and utilized. An updated Grand Bay NERR habitat map using remotely sensed imagery completed with higher resolution maps developed for areas of interest, around Sentinel Site SETs.

Stewardship staff coordinated with multiple organizations to produce various habitat maps. The NOAA CCAP office worked with Stewardship staff to produce a habitat map for NERR target watershed based on 2012 WorldView imagery. The high res CCAP is anticipated to be completed by end of 2015. We have also had conversations with Mississippi State University about flying an Unmanned Aerial Vehicle (UAV) to collect aerial imagery during peak growing season 2015. There is also an effort to collect aerial imagery, either WorldView2 or 3, through the ECSC. All imagery acquisitions will occur in 2015.

- Analysis of WorldView 3 image for NERRS Classification and habitat map

Management Plan Strategies/Actions:

- Stewardship staff will provide technical and logistical support to facilitate research and stewardship projects.
- Stewardship staff will work to develop an approved Habitat Mapping and Change Plan and complete a baseline habitat map.

Outcome End Date: June 2016

Outcome Status: 25%

Outcome 7- Enhanced Visitor Access to the Reserve

The Stewardship Coordinator in partnership with the Reserve Manager and other Reserve staff worked to repair and modify a large tour boat to be used for educational and research related activities. The boat should allow for increased access to marsh habitats for visitors and may provide a platform for research and restoration activities. Stewardship staff worked to begin construction of savanna trail at the coastal resources center to provide enhanced visitor access.

- Work continues on building boardwalk from visitors center out into pine savanna

Management Plan Strategies/Actions:

- Stewardship staff will coordinate with USFWS and other partners to develop and maintain boat ramps, trails, firebreaks and parking areas.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 8 – Grand Bay NERR Natural Resources, Activities, Products and Services are Valued by Targeted Audiences or User Groups

Stewardship staff provided factual and relevant information to audiences and user groups related to the natural history of the Grand Bay area as well as management, research and monitoring activities to promote the valuation of natural resources by these groups. In coordination with other sectors, staff will work to plan and implement the NERRs habitat series.

- Stewardship staff participated in several outreach and education events including National Estuaries Day, provided tours for national extension conference, and interacted with other visitors to the reserve.
- Stewardship Coordinator gave presentation to Master Naturalist class

Management Plan Strategies/Actions:

- Stewardship staff will work to engage and encourage outside groups to use the facility through a variety of outreach efforts including opportunities for community involvement in stewardship activities (invasive plant control, coastal cleanup, etc.), hosting of college level natural resource field trips and natural history presentations.
- Stewardship staff will work to provide factual and relevant information to audiences and user groups related to the natural history of the Grand Bay area as well as management, research and monitoring activities to promote the valuation of natural resources by these groups.

Outcome End Date: June 2016

Outcome Status: 50%

Task 8 – Implement Integrated Resilience and Climate Change Related Activities

The Reserve, state and local communities aim to increase their capacity to understand, adapt and mitigate for impacts from climate change related impacts. To accomplish this, Reserve staff worked within the local communities to implement various aspects of the NERRS Climate Change Initiative, NOAA and NERRS Sentinel Sites programs, Community of Practice, and other related projects/initiatives. As in the past, much of this work was integrated in the work activities of several staff members across sectors. The planning and reporting of the outcomes

proposed were integrated across all sectors at the Reserve and with multiple partners, including: The University of Alabama (Sea Grant applications, projects), Southern Illinois University (Sea Grant applications, research projects), Dauphin Island Sea Lab (Sea Grant applications, projects, Science Collaborative applications, project), USGS National Wetlands Center (research projects), the University of Central Florida (Ecological Effects of Sea Level Rise in the Northern Gulf of Mexico project), and NOAA's Sentinel Site Initiatives (Gulf NERRs, NOAA and others to be determined).

The Reserve continued to build its research and Sentinel Site monitoring capacity. Staff worked to increase the use of this system and related data by other researchers and to work with education and outreach efforts to share these data with local communities. Those whose time was allocated to this task are: the Reserve Manager; and, the Coordinators. The entire staff will collaborate on these outcomes.

Outcome 1 – Increase Science-based Understanding of Climate Change-related Ecological Effects

A better science-based understanding of local ecological impacts of climate change and sea level rise were achieved by staff implementing various aspects of the NOAA Sentinel Site and NERRS Climate Change Initiatives as well as other partner research projects at the Reserve. In addition to NERR-specific activities, collaborations with the University of Alabama, MDMR, Southern Illinois University, GOMA, University of Southern Mississippi, USGS National Wetlands Center and University of Central Florida on climate-focused research projects continue.

The NERR team will initiate a planning effort to assess the viability and interest in the Mississippi and Alabama coastal areas to conduct a tidal marsh climate vulnerability study. A planning meeting will be set with interested researchers and managers from the two (2) states to explore the feasibility of such a study.

Management Plan Strategies/Actions:

- The NERR team has (with MSU) and will continue to actively engage in partnerships with USFWS, MDMR, universities and other groups to address research priorities at the Grand Bay NERR/NWR.
- The Reserve staff has worked to facilitate and conduct research on the natural variability of ecosystems and the potential impacts of human disturbances through the phosphate research project.
- The Reserve staff will work to develop predictive models to determine how natural and man-made disturbances may impact coastal habitats in the future.
- Reserve stewardship and research staff will coordinate efforts to complete an approved Sentinel Site plan by the end of 2013.

- Stewardship staff, with assistance from the research staff, in coordination with NGS partners has continued vertical control efforts as they relate to the NERRS Sentinel Site guidance; continued the use of leveling equipment. Staff attended tide station training to maintain connection to NAVD88 through NOAA calculated datums.
- The Reserve research staff, in conjunction with the stewardship staff, has and will continue to support and maintain SETs, CORS, water level monitors and tidal gauge infrastructure in support of Sentinel Site activities.
- The Reserve staff will work collaboratively to develop and implement NERRS Sentinel Site monitoring effort (including infrastructure and biological monitoring).
- The Reserve staff will work collaboratively to develop, implement and conduct research projects to describe the natural variability of ecosystems and the potential impacts of climate change.

Outcome end date: June 2016

Outcome Status: 25%

Outcome 2 – Implement, Maintain, and Expand Sentinel Site Monitoring Network in accordance with accepted protocols.

Stewardship staff, with assistance from Research staff, worked over several years to install and maintain infrastructure and monitoring activities to establish Grand Bay as a NERRs Sentinel Site. Efforts will continue during this grant period, with a focus on emergent marsh monitoring, elevation control efforts, and production of data products. The implementation of the NERR sentinel site protocol at Grand Bay has evolved as a collaborative effort.

The Stewardship Coordinator oversees the vertical control aspect of the project and the implementation of emergent marsh monitoring. In addition, stewardship staff provides GIS support for research staff. In this spirit of collaboration and to maintain clarity and structure for outside readers, some stewardship actions will be included in the research and monitoring chapter. Specific activities to be addressed include:

- Implement emergent marsh monitoring in association with surface elevation tables – Emergent marsh monitoring plots have been installed and measured.
- Continue production of detailed digital elevation models of marsh platform – elevation points were taken at marsh plots and will be incorporated into Digital Elevation Models (DEM)
- Continue production of interpolated vegetation surfaces – Re-ran with new DEMs
- Continue collection of near-shore bathymetric data – *No progress to date*
- Continue collection of quarterly surface elevation measurements – Quarterly measurements as scheduled.

- Continue collection of accretion profiles – Quarterly measurements as scheduled.
- Produce peer-reviewed publication of plant distribution and elevation – Manuscript in review

Management Plan Strategies/Actions:

- Stewardship and research staff will coordinate to complete an approved Grand Bay NERR Sentinel Site Plan and implement components including:
 - emergent marsh monitoring
 - measure local scale tidal datums
- Stewardship staff in coordination with National Geodetic Survey (NGS) and other partners will continue vertical control efforts as they relate to the NERRS Sentinel Site guidance including the following activities:
 - complete approved Vertical Control Plan
 - periodic GPS surveys of surface elevation tables
 - periodic digital leveling of temporary tide gauge and Continuously Operating Reference -Station (CORS)
 - periodic GPS surveys of SWMP stations
 - creation of digital elevation models using Real Time Kinematic (RTK) GPS
 - bathymetric mapping of near-shore waters using RTK GPS
- Stewardship staff will maintain and improve access to surface elevation tables.
- Stewardship staff will maintain access to and periodically verify status of published vertical control benchmarks.

Outcome end date: June 2016

Outcome Status: 75%

Outcome 3 – Increase Knowledge of Climate Change/Sea Level Rise

The CTP Coordinator offered training opportunities that met the needs of local audiences and fulfill the goals and focus area priorities of the 2013 Management Plan related to climate change. During this funding period, the following workshops were offered using funds from the following grants:

- A Gulf of Mexico Coastal Training Program Initiative (EPA GOP funding)

- Connecting Scientists to Citizens regarding Sea Level Rise (GOMA funding)
- Saving Money and Enhancing Resilience: Assisting Communities Through the 2013 Community Rating System (EAP GOP funding)
- Will Reintroduction of Fire along Coastal Gradients Promote Lateral Migration of Marsh and Enhance Biodiversity? (EPA GOP funding)
 - Ecological Effects of Sea Level Rise in the Northern Gulf of Mexico (NOAA funding)

The CTP Coordinator also worked with Reserve staff to develop and implement a Sentinel Site Outreach Plan. This Plan builds on the feedback that was collected from stakeholders during the 2013 Research Symposium.

Management Plan Strategies/Actions:

- The CTP staff, through a variety of platforms, will share the results of science-based information and specific Reserve research and monitoring relating to climate change and sea level rise with management audiences. Training topics may include: planning for climate change, climate change communication, climate change adaptation, conducting climate change vulnerability assessments and the science of climate change.
- The CTP staff will provide audiences with information and tools to better understand, adapt and mitigate the effects of climate change.

Outcome End Date: June 2016

Outcome Status: 60%

Outcome 4- Improved Partnerships Related to Coastal Resilience

The NERR team served on various workgroups and worked with partners such as the Gulf of Mexico Alliance, Sea Grant, MDMR, NOAA, USGS and EPA to support coastal resilience efforts along coastal Mississippi.

Management Plan Strategies/Actions:

- The CTP staff will work with partners to present relevant data and information to local communities on potential effects of climate change and sea level rise on natural and manmade communities.
- Staff Activities will be integrated across sectors to implement actions relating to Reserve priorities, providing a collaborative workplace.
- The manager will seek and maintain partnerships that support Reserve priorities.

- The manager will generate funding and technical support for programming by working with partners.
- The manager will engage local government officials, civic groups and schools to promote Reserve activities and priorities.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 5 – Increased Understanding of Climate Change/Sea Level Rise and Resiliency through Community and K-12 Education Programs

The Reserve develop, sponsored and/or implemented education programs that included activities generally focused on climate change, water quality and resiliency and more specifically include information on sea level rise and resiliency. Targeted audiences included individuals, families, clubs, civic organizations, visitors as well as formal and informal educators. Activities included field trips, tours, evening programs and On-the-road classroom visits. In order to assess the attendee's experiences and to adaptively manage/design future events, either written or verbal assessments were given and analyzed whenever possible in order to get the necessary feedback.

During the annual meeting of the Mississippi Environmental Education Alliance in October the Reserve co-sponsored a training session of *Project Learning Tree's* Secondary Environmental Education Module entitled *Southeastern Forests and Climate Change*. Over 25 formal and informal educators were certified in this training including the Reserve's EC.

The September Adventure Quencher/National Estuaries Day event was designed so that we can take people out in the marsh and explain to them how the marshes are being monitored for sea level rise and how seaside landscapes need to be wisely developed to allow for the migration of marshes upslope and the design of resilient communities. Each monthly adventure quencher is used as an opportunity to reinforce the participants' knowledge of estuary and coastal resources and to encourage stewardship within their communities and onsite.

Weather/Climate issues are included in K12 education and outreach. K12 groups are assessed both before and after their events in the form of written pre and post tests. Community audiences are assessed verbally in the format of a short discussion session at the end of the event when feasible.

Management Plan Strategies/Actions:

- Reserve educators will partner with local schools and universities to provide field-based environmental programs for their students and educators

- Staff will manage signage, presentations and exhibits at the Reserve to provide timely and accurate information to increase the public's understanding of sustainable practices and key environmental issues.
- The Education Coordinator will coordinate at least one Adventure Quencher community education activity each month in order to promote estuary, ocean or climate literacy.
- The education staff will coordinate or participate in at least four off-site community or outreach events each year that promote estuary and ocean and/or climate literacy.

Outcome End Date: June 2016

Outcome Status: 60%

Outcome 6 – Increase State and Local Understanding of Climate Change Impacts through SWMP

Staff participated in implementation and collaboration on various aspects of the NOAA Sentinel Site Initiative and NERRS Climate Change Initiative, in an effort to better understand regional and local impacts of climate change and sea level rise. We were involved in the NOAA Northern Gulf Sentinel Site Implementation Plan and continued to upgrade components of our Sentinel Site infrastructure (leveling, fine scale water levels, and emergent marsh monitoring). Collaborations with University of Alabama, MDMR, University of New Orleans (UNO), University of Southern Illinois, USGS-National Wetlands Center, University of Southern Mississippi (USM) and University of Central Florida on climate-related projects continued and efforts with other collaborators for new projects were pursued. SWMP and tide gauge depth data were used in conjunction with surface elevation table data to better understand water elevation at the Reserve as it relates to sea level. Reserve data were also used by outside researchers in referenced projects.

Management Plan Strategies/Actions:

- The Reserve staff will work collaboratively to develop and implement NERRS Sentinel Site monitoring effort (including infrastructure and biological monitoring).
- The Reserve staff will work collaboratively to develop, implement and conduct research projects to describe the natural variability of ecosystems and the potential impacts of climate change.
- The Reserve staff will provide climate-related science and monitoring data to training and education programs to better inform coastal managers/ communities.

Outcome End Date: June 2016

Outcome Status: 50%

Outcome 7 – Increase Capacity to Measure Changes in Climate and Sea Level Rise

The Reserve continued to build monitoring capacity to better understand sea level rise by expanding the vertical infrastructure monitoring capabilities for SETs, CORS, tidal gauge and SWMP station improvements and periodic leveling. Some of this work has been completed by surveyors and maintained by NERR staff in conjunction with NOAA National Geodetic Survey staff. This equipment was operated by various staff and shared with the MDMR. Staff continued to work on a spatial distribution of plant communities monitoring program to evaluate long-term changes to distribution of marsh plant species at Grand Bay, which may be a result of changing water levels or other climate alterations. The Stewardship sector continues to install and maintain infrastructure and monitoring plots to increase capacity to measure changes in water level and track plant species movement. We have made continued use of NERR system geodetic equipment, including the Leica DNA03 level.

- Boardwalk maintenance continue to Surface elevation tables (SETs)
- Accretion sites relayed as needed
- Biomass component of Sentinel Site initiated, field work completed, lab analysis in progress

Management Plan Strategies/Actions:

- The Reserve research staff, in conjunction with the stewardship staff, has worked to support and maintain SETs, CORS, water level monitors and tidal gauge infrastructure in support of Sentinel Site activities.
- The Reserve staff has and will continue to work collaboratively to develop and implement NERRS Sentinel Site monitoring effort (including infrastructure and biological monitoring).
- The Reserve staff will provide climate-related science and monitoring data to training and education programs to better inform coastal managers/ communities.

Outcome End Date: June 2016

Outcome Status: 50%

Task 9 - Unmanned Aerial Systems (UAS) Imagery Acquisition Roadmap

Current emerging technology uses remotely controlled unmanned aerial vehicles to carry sensors which record an array of information. This includes high resolution aerial images (including Infra-Red and Ultra-Violet), and LiDAR. The advantage of these new systems is that the end user has more input about how data are gathered: what area, how often, what frequency, which tide cycle, what time of year, leaf-on or -off, what sensor, and what altitude

from the ground, etc. Customized, timely, high resolution data can be used to further estuarine and upland research and monitoring of the impacts of climate change by more accurately discriminating between distinct species and developing high resolution habitat maps. These data can also be used to develop effective stewardship management practices such as responding to natural and man-made disasters (including responding to oil spills and monitoring coastal storm impacts), or accessing information about remote location. They can also help in informing local/regional decision makers and educate the public of all ages by the use of remotely sensed data.

Stewardship staff will be involved in a study in collaboration with NOAA's National Weather Service River Forecast Centers in the Gulf of Mexico, the National Marine Fisheries Service Office of Protected Resources, the NOAA Office of Unmanned Aerial Systems, and the University of Mississippi (as part of the Northern Gulf Institute). The GIS Coordinator will be responsible for coordinating with the partners, arranging field logistics, participating in planning efforts, flights, imagery analysis/habitat map creation, and project evaluations.

The purpose of this study is to use the Reserve's sentinel site infrastructure and habitat mapping capacity to evaluate the ability of UAVs to:

- Discriminate vegetation types at a fine resolution
- Map terrapin habitat in the reserve
- Identify Kemp Ridley sea turtle strandings
- Evaluate the ease of obtaining a Certificate of Waiver or Authorization (COA) from the FAA to fly UAVs.

This project uses the Grand Bay NERR pilot as an example in developing a NERRS-specific document that will increase capacity building opportunities in using UAVs to support our national priorities. This document will describe:

- UAV technology and how it is currently being used in natural resource management
- Specific opportunities within the NERR system to use UAVs
- The present state of FAA regulations governing the use of UAV use, especially the use of small UAVs
- Potential regional partnerships such as other cooperative institutes and federal and state agencies to provide UAV technology, expertise, and support in drafting COA's.

The UAV roadmap will include a standardized work flow to guide reserve staff in identifying project goals, scope, timing, area, partner organizations, funding opportunities, data post-processing and management considerations. Also onsite policy templates could be produced to help each NERR work with their partner organization to determine where and when UAV's

would be allowed to be flown over their lands. As part of this project, sample UAV images and products will be showcased at FY 2016 annual meeting, along with a UAV flight demonstration.

- Workgroup assembled and monthly meetings in progress
- Outline of Roadmap under review by workgroup

Management Plan Strategies/Actions:

- Stewardship staff will work to complete a baseline habitat map
- Stewardship staff will work with other sectors to fully implement Sentinel Site monitoring according to appropriate system guidance

Outcome End Date: June 2016

Outcome Status: 50%

Task 10 - Implement Teachers on the Estuary (TOTE) Program

This task will implement and enhance the Teachers on the Estuary (TOTE) program at the Grand Bay NERR. The TOTE program addresses the findings of the NERR's education needs assessment by providing valuable and timely information regarding coastal resources and professional development skills needed by local and regional teachers. The target audiences are teachers from Mississippi, southeastern Louisiana, and southwestern Alabama. The key mechanisms of delivery of information are two- to three-day hands-on, field-oriented professional teacher development workshops. We will address the following environmental education themes or topic areas including coastal habitats and inhabitants, climate change impacts, environmental stewardship and healthy watersheds. We will engage the NERR team and local partners, such as MS Dept of Marine Resources, MS Dept of Environmental Quality, NOAA Pascagoula Lab, NOAA ECSC, University of Southern Mississippi, MS Environmental Education Alliance and Mississippi State University, to complete the TOTE workshops. We will include the following metrics for evaluation of the TOTE program in accordance with guidance from NOAA, number-of contact hours, number of teachers participating, etc.

Outcome 1 - Develop and Conduct a TOTE Coastal Habitats Workshop

The Reserve is partnering with the MEEA, The MS Museum of Natural Science, MS Departments of Marine Resources and Environmental Quality and the MS Secretary of State's Office to design, develop, fund and implement a 2.5 day TOTE workshop in early June after the school year is over (our K12 Needs Assessment indicated that this was one of the preferred times for teachers). This year's workshop will include a Project WET (Wonders of Wetlands) module and will address coastal wetland and watershed issues. Climate activities will be involved in this training. The agenda for this activity is currently being set.

Outcome End Date: June 2016
Percent Complete: 40%

Task 11 - Install and Improve Boardwalk Access to Sentinel Site Infrastructure

The NERR team will install and improve boardwalks to improve access to the Sentinel Site infrastructure.

Outcome 1 - New and Improved Boardwalk Access to Sentinel Site Infrastructure

The NERR team will install new boardwalks where they are needed to provide better access to the Sentinel Site infrastructure, as well as improving existing boardwalks.

Outcome End Date: June 2016
Outcome Status: 25%

ERD NERRS

https://www8.nos.noaa.gov/ERDPM/Education/Performx.aspx?ID=ouyA+bW7DF0=

Apps Suggested Sites Web Slice Gallery Best video downlo... theVideomate Mario LollyGame Facebook lightningnewtab Free Hotmail http--www.dfa.state... Imported From IE Google fedloan gulfport / biloxi furn... Small Space Living: ... Other bookmarks

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NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

Welcome Jennifer_buchanan Logout Change password

Reserve
Education Output Indicators
Manager Summary Report
Reports
Performance Measures National
Performance Measures Reserve(s)

NERRS Education Performance Output Indicators

* required fields

Reserve Grand Bay status Submitted Close

Federal funding award [Click Here!](#) 2015 Reporting Period July 1 - December 31

Students: Pre-K-20 learners	Number of participants	Contact Hours
Pre-K*	0	0
Elementary (K-5)*	250	1150
Middle School (6,7,8)*	218	315
High School (9,10,11,12)*	22	105
Undergraduate school (13-16)*	0	0
Graduate school (17-20)*	0	0
Grade level unknown*	0	0

Teachers & Educators Trained	Number of participants	Contact Hours
Pre-Service*	0	0
Pre-K*	0	0
Elementary (K-5)*	17	106
Middle School (6,7,8)*	27	194
High School (9,10,11,12)*	45	175
College*	0	0
Informal Educators*	15	240
Affiliation Unknown*		

Public	Number of participants	Volunteer Hours
Volunteers that serve in an education role*	7	50
Walk-in visitors at NERRS education/visitor center*	266	
Participants reached through public/outreach activities*	135385	
Participants reached through community education programs*	0	

Comments/Clarifications

The large numbers of participants reached through public outreach activities now reflects the visitors to our satellite exhibit in the local Welcome Center on I-10 and the people who watched our short Television appearance (134,744). We actually reached out to 641 people if you exclude those numbers.

2:56 PM
1/29/2016

Education Performance Measures Submitted Online to NOAA 1/29/2015 by Jen

Grand Bay FY15 Ops – July-Dec 2015 PM data

Volunteer and Research Measures

Reserve	Reporting Year	Reporting Period	Status
No Volunteer and Research Measures found.			

CTP Training Activities

Title of event	Start Date	Reserve	Region	Status
		Grand Bay	Gulf of Mexico	Draft
Blue Carbon: A Management Tool for Conservation and Restoration of Coastal Wetlands	9-10-2015	Grand Bay	Gulf of Mexico	Draft
Wilderness First Aid	8-06-2015	Grand Bay	Gulf of Mexico	Submitted
Connecting Science to Citizens: Sea Level Rise	8-14-2015	Grand Bay	Gulf of Mexico	Submitted
		Grand Bay	Gulf of Mexico	Draft
Ecological Effects on Sea Level Rise	7-28-2015	Grand Bay	Gulf of Mexico	Submitted

CTP Outcome Statements and Success Stories

Reserve	Region	Year	Month	Status
No records to display.				

CTP Technical Assistance

Reserve	Start Date	Title of Assistance	Status
No records to display.			

Education Output Indicators

Reserve	Reporting Year	Reporting Period	Status
Grand Bay	2015	July 1 - December 31	Submitted

Education Program Descriptions

Reserve	Year	Period	Program Type	Status
No records to display.				