

Final Evaluation Findings

Grand Bay National Estuarine Research Reserve

June 1999 – February 2004



Office of Ocean and Coastal Resource Management
National Ocean Service
National Oceanic and Atmospheric Administration



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I. EXECUTIVE SUMMARY

A. OVERVIEW

The Coastal Zone Management Act (CZMA) of 1972, as amended, established the National Estuarine Research Reserve System. Sections 312 and 315 of the CZMA require the National Oceanic and Atmospheric Administration (NOAA) to conduct periodic performance reviews or evaluations of federally approved National Estuarine Research Reserves (NERR). The first evaluation of the Grand Bay National Estuarine Research Reserve (GBNERR) examined the operation and management of the reserve from its designation in June 1999 through February 2004. The Mississippi Department of Marine Resources (DMR) administers GBNERR.

This document describes the evaluation findings of the Director of NOAA’s Office of Ocean and Coastal Resource Management with respect to GBNERR during the review period. The fundamental conclusion of this evaluation is that DMR is successfully implementing and enforcing its federally approved NERR. The recommendations made by this evaluation appear in **boxes** and follow the relevant section of findings. Two types of recommendations are possible: (1) Necessary Actions address programmatic requirements and *must* be implemented by the indicated date; and (2) Program Suggestions describe actions that NOAA believes DMR should take to improve the program but that are not currently mandatory. Program Suggestions that are reiterated in consecutive evaluations due to continuing problems may be elevated to Necessary Actions. If no dates are indicated, DMR is expected to address the recommendations by the time of the next §312 evaluation. This document contains four Program Suggestions and no Necessary Actions. NOAA will consider the findings of this evaluation when making future financial award decisions regarding GBNERR.

B. SUMMARY OF ACCOMPLISHMENTS

The evaluation team documented a number of GBNERR’s accomplishments during the review period. These include:

Issue Area	Accomplishment
Initial Program Implementation	Strong progress in staffing, program execution and facilities development during the latter half of the review period has clearly improved reserve institutionalization.
Staff	During the review period, GBNERR made progress in staffing by hiring a full complement of well-qualified, dedicated staff. Reserve staff coordinate well internally and externally and have proven a critical resource in the progress that the reserve has made in program implementation.

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Strategic Plan	In 2003, GBNERR developed a strategic plan that clearly defines its mission, values, goals, objectives and vision. The plan will provide overarching guidance for the reserve as its core programs continue to grow.
Facilities	GBNERR has made notable progress on planning for new, sustainably designed, permanent facilities, including completion of an excellent facilities master plan and preparation of a construction request for qualifications.
Environmental Cooperative Science Center	The Research and Monitoring Program is an active participant in and supporter of the Environmental Cooperative Science Center. Despite initial difficulties in partnership implementation, the program worked closely with Jackson State University faculty and students to initiate several important research projects.
Research Projects	The Research and Monitoring Program significantly increased its research and monitoring efforts throughout the review period and engaged a variety of partners in unique, collaborative projects.
Coastal Training Program	The Education, Interpretation and Outreach Program initiated the Coastal Training Program. The Coastal Training Program Coordinator has a clear sense of how to develop and implement the program.
Education Projects	The Education, Interpretation and Outreach Program developed innovative education projects that address program goals and involve a variety of partners.
Prescribed Fire	The Stewardship Program, in cooperation with the U.S. Fish and Wildlife Service, initiated a prescribed fire management plan to restore the reserve’s wet pine savanna and pine flatwoods habitat. The program also developed a fire effects bibliography and worked with the Education, Interpretation and Outreach Program to offer a Prescribed Fire Academy for the media.

C. SUMMARY OF RECOMMENDATIONS

In addition to the accomplishments listed above, the evaluation team identified several areas where the program could be strengthened. Recommendations are all in the form of Program Suggestions. The evaluation team did not identify any Necessary Actions. Areas for program improvement include:

#	Program Suggestions
1	NOAA strongly encourages GBNERR to develop a strategy and timeline for revising its management plan, which should be completed prior to the reserve’s next regularly scheduled evaluation. NOAA also encourages GBNERR to evaluate existing Memoranda of Understanding with its partners during the management plan revision. The status of the management plan’s revision process should be described in GBNERR’s semi-annual performance reports.

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2	NOAA strongly encourages GBNERR to work with Grand Bay National Wildlife Refuge to develop a Memorandum of Understanding that clearly describes all roles and responsibilities regarding the new facilities.
3	NOAA encourages GBNERR to continue its efforts to coordinate with Grand Bay National Wildlife Refuge and to explore alternatives for improving coordination.
4	NOAA strongly encourages the Research and Monitoring Program to develop a strategy and timeline for completing the site profile, which should be completed prior to GBNERR's next regularly scheduled evaluation. The status of the site profile's progress should be described in GBNERR's semi-annual performance reports.

II. PROGRAM REVIEW PROCEDURES

A. OVERVIEW

The National Oceanic and Atmospheric Administration (NOAA) began its review of the Grand Bay National Estuarine Research Reserve (GBNERR) in December 2003. The §312 evaluation process involves four distinct components:

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

B. DOCUMENT REVIEW AND ISSUE DEVELOPMENT

The evaluation team reviewed a wide variety of documents prior to the site visit, including: (1) the federally approved Environmental Impact Statement and program documents; (2) financial assistance awards and work products; (3) semi-annual performance reports; (4) official correspondence; and (5) relevant publications on natural resource management issues in Mississippi.

Based on this review and on discussions with NOAA's Office of Ocean and Coastal Resource Management (OCRM), the evaluation team identified the following priority issues:

- Major accomplishments during the review period;
- Status of the reserve's general administration, including grants, fiscal management and staffing;
- Status and visibility of research, education and stewardship programs, including local and system-wide initiatives such as the System-wide Monitoring Program and the Coastal Training Program;
- Status of facilities development;
- Process for management plan revision;
- Status of reserve's coordination with other federal, state and local agencies; and
- Reserve's role at the local level and integration with its partners.

C. SITE VISIT TO MISSISSIPPI

Notification of the scheduled evaluation was sent to the Mississippi Department of Marine Resources (DMR), GBNERR, relevant federal environmental agencies, members of Mississippi's Congressional Delegation and regional newspapers. In addition, a notice of NOAA's "Intent to Evaluate" was published in the *Federal Register* on December 24, 2003.

The site visit to Mississippi was conducted on March 24-26, 2004. Ms. Rosemarie McKeeby, Evaluation Team Leader, OCRM National Policy and Evaluation Division; Ms. Erica Seiden, GBNERR Specialist, OCRM Estuarine Reserves Division; and Dr. Scott Phipps, Research Coordinator, Weeks Bay National Estuarine Research Reserve, composed the evaluation team.

During the site visit, the evaluation team interviewed GBNERR staff, senior DMR and other state officials, coastal researchers, environmental educators, civic group representatives and private citizens. Appendix A lists persons and institutions contacted during this review.

As required by the Coastal Zone Management Act, NOAA held an advertised public meeting on March 24, 2004, at 6:30 p.m., at the East Jackson County/Orange Grove Community Center, 9313 Old Stage Road, Moss Point, Mississippi. The meeting gave members of the general public the opportunity to express their opinions about the overall operation and management of GBNERR. Appendix B lists individuals who registered at the meeting.

The crucial support of GBNERR staff with the site visit planning and logistics is gratefully acknowledged.

III. RESERVE PROGRAM DESCRIPTION

A. THE NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM (NERRS)

The Coastal Zone Management Act of 1972, as amended, established a system of reserves that are funded cooperatively by the National Oceanic and Atmospheric Administration (NOAA) and the host states or territories, which manage the reserves. The NERRS has two primary missions: (1) to establish and maintain, through federal and state cooperation, a national system of reserves representative of various biogeographic regions in the United States; and (2) to conduct long-term research, educational and interpretive activities in support of national coastal management priorities.

Toward those missions, reserve sites are selected to represent the range of biogeographic regions, estuarine types and coastal management challenges occurring throughout the Nation. To date, NOAA has designated 26 reserves that collectively protect more than one million acres of estuarine land and water. Two additional sites currently are in various stages of the designation process.

B. THE GRAND BAY NATIONAL ESTUARINE RESEARCH RESERVE (GBNERR)

1. Reserve Site Description

GBNERR encompasses 18,400 acres of land and water east of Pascagoula in the vicinity of Bangs Lake, Bayou Cumbest and Bayou Heron in Jackson County, Mississippi. The majority of lands within the reserve's boundaries are owned by the Mississippi Department of Marine Resources (DMR), the Office of the Mississippi Secretary of State (SOS) and the U.S. Fish and Wildlife Service (USFWS). The state lands are part of the Mississippi Coastal Preserves Program, a state-designated system of key estuarine areas. The federal lands are part of the Grand Bay National Wildlife Refuge.

The reserve is composed of one of the largest, relatively undisturbed estuarine marsh and pine savanna habitats remaining along the northern Gulf of Mexico, which supports several botanical species of concern such as pitcher plants, orchids and glassworts. GBNERR's salt pannes, salt marshes, bayous, oyster reefs and seagrass beds provide critical habitats for the region's important commercial and recreational species of fish and migratory birds. These habitats serve as nursery areas as well as breeding and feeding grounds for shrimp, red drum, speckled trout, oysters, great blue herons and others. Additionally, sea turtles and bottlenose dolphins forage in the deeper waters of the reserve.

The reserve also is archaeologically significant. A recent survey of GBNERR revealed at least 16 Native American earth and shell middens. Through examinations of ancient pottery shards and other artifacts, scientists have determined that the Grand Bay area was first occupied more than 4,500 years ago.

2. Reserve Administration

GBNERR was designated in 1999 and is administered by DMR, which provides financial, human resources, legal and enforcement support for the reserve. GBNERR is located within DMR's Office of Coastal Ecology. Other branches within the Office of Coastal Ecology are Wetland Permitting and Consistency, Mitigation Compliance, Coastal Zone Management, Coastal Resources Management Plan and Coastal Preserves.

DMR administers GBNERR with input and policy guidance from the reserve's Management Board. The Board is composed of representatives of DMR, SOS, USFWS, The Nature Conservancy, Mississippi State University, University of Southern Mississippi and the GBNERR Citizens' Advisory Committee. The reserve's Research Advisory Committee and Education Advisory Committee provide additional input.

IV. REVIEW FINDINGS, ACCOMPLISHMENTS AND RECOMMENDATIONS

A. OPERATIONS AND MANAGEMENT

1. Initial Program Implementation

In accordance with the Coastal Zone Management Act, a state may nominate an estuarine ecosystem for National Estuarine Research Reserve (NERR) status provided that the site meets several conditions:

- The site is representative of its biogeographic region, is suitable for long-term research and contributes to the biogeographical and typological balance of the National Estuarine Research Reserve System (NERRS);
- The law of the coastal state provides long-term protection for the site's resources, ensuring a stable environment for research;
- Designation of the site will result in enhanced public awareness and understanding of estuarine areas and opportunities for public education and interpretation; and
- The coastal state has complied with the requirements of NERRS regulations.

The approval of a proposed reserve's Final Environmental Impact Statement (FEIS), which also serves as the reserve's first management plan, is a principal component of the designation process. The Mississippi Department of Marine Resources (DMR) coordinated the development of the Grand Bay National Estuarine Research Reserve's (GBNERR) FEIS with the assistance of Mississippi State University's (MSU) Coastal Research and Extension Center and four technical committees. Each committee was responsible for one of the four integral sections of the management plan: (1) Administration, (2) Research and Monitoring, (3) Education and Outreach and (4) Stewardship. The Administration Committee contributed to the design of the reserve's administrative framework, including several procedures for reserve operations and management. The Research and Monitoring Committee outlined details for the reserve's research and monitoring plans as well as a process for developing the reserve's site profile. The Education and Outreach Committee drafted the structure of the reserve's education, outreach and volunteer plans. The Stewardship Committee collaborated on the identification of the fundamental elements of resource management at the reserve. After five years of coordinated efforts by a wide variety of stakeholders,¹ NOAA approved the reserve's FEIS and designated GBNERR as the NERRS' 24th reserve in June 1999.

Following designation, GBNERR experienced some delays in hiring essential staff and implementing all aspects of core programs. However, during the latter part of the review period, GBNERR made great strides in staffing, program execution and facilities

¹ Agencies and organizations involved in GBNERR's designation include the Mississippi Department of Marine Resources, Office of the Mississippi Secretary of State, Mississippi State University, U.S. Fish and Wildlife Service and The Nature Conservancy.

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development. At the time of the evaluation site visit, the reserve: (1) had a full complement of well-qualified staff; (2) was implementing critical aspects of its research, education and stewardship programs and (3) had expanded its temporary facilities and developed a facilities master plan. The National Oceanic and Atmospheric Administration (NOAA) congratulates GBNERR and its partners on the initial institutionalization and implementation of reserve programs and encourages continued strong progress in program and facilities development.

ACCOMPLISHMENT: Strong progress in staffing, program execution and facilities development during the latter half of the review period has clearly improved reserve institutionalization.

2. Staff

Reserve staff are responsible for on-site development, operations and management of GBNERR. During the review period, GBNERR made progress in staffing by filling all of its core positions and other positions with well-qualified individuals. Staff at the time of the site visit included the Reserve Manager, Research Coordinator, System-wide Monitoring Program Coordinator, two contract researchers, Education Coordinator, Coastal Training Program Coordinator, Stewardship Coordinator and Administrative Assistant. DMR fully funds four of these positions. GBNERR staff must be recognized for their perseverance, creativity and dedication to research and education. The staff's commitment to and enthusiasm for their work were evident throughout the site visit and have been critical factors in the progress that the reserve has made in program implementation. Staff also coordinate well among reserve programs and with external partners. NOAA commends GBNERR for hiring a full complement of well-qualified personnel and encourages DMR to continue to provide funding support for reserve staff.

ACCOMPLISHMENT: During the review period, GBNERR made progress in staffing by hiring a full complement of well-qualified, dedicated staff. Reserve staff coordinate well internally and externally and have proven a critical resource in the progress that the reserve has made in program implementation.

3. Management Board

As noted in §III-B-2, GBNERR's administrative framework includes a Management Board composed of representatives from DMR, Office of the Mississippi Secretary of State, U.S. Fish and Wildlife Service, The Nature Conservancy, MSU, University of Southern Mississippi and the reserve's Citizens Advisory Committee. The purpose of the Management Board, working through reserve staff and other partners, is to provide guidance to implement the policies of the reserve's management plan and to provide recommendations to DMR. The Management Board's objectives are to:

- Ensure a conducive setting for research and monitoring through long term protection of the reserve;

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- Enhance public awareness and understanding of the reserve and provide public education opportunities;
- Provide opportunities for the results of the reserve's research and monitoring activities to be communicated to coastal decision-makers, and
- Protect the integrity of the reserve through the implementation of its management plan.

The Management Board provides overall input and program guidance to the reserve by: (1) establishing and pursuing a strategic direction for the reserve consistent with NERRS and state guidance; (2) ensuring implementation of the reserve's strategic plan; (3) making partnership resources available to the reserve; (4) coordinating partners' efforts and working cooperatively across agencies; (5) assisting with core staff hiring; and (6) establishing ad hoc committees to work on special projects as needed.

4. Strategic Plan

In 2003, GBNERR developed a three-year strategic plan identifying the reserve's mission, core values, goals, objectives and vision of success. As described in the strategic plan, GBNERR's mission is to increase the understanding of coastal resources through long-term research and monitoring and to transfer this knowledge using education and interpretation programs to foster informed decision-making and coastal resource management. The reserve's core values include: (1) partnership; (2) acquisition of property from willing sellers; (3) leading by example; (4) open and honest communication; and (5) striving for excellence. The reserve's goals are to:

- Establish conditions for a successful research program, including monitoring, site characterization, Research Advisory Committee and research cooperatives;
- Establish a sense of place among targeted audiences by interpreting the relevance of research results and resource management through the development and implementation of hands-on programs and exhibits;
- Acquire all available lands within the reserve boundary and keep them open for public use while managing them with partners according to best management practices; and
- Fully implement the research, education and resource management components of the reserve through appropriate and effective staffing, funding, facilities and operational independence.

In part, the GBNERR's vision of success includes serving as focal point for substantial estuarine research designed to provide a greater understanding of the reserve's ecology. The reserve anticipates that educators will transfer technical information and research data to coastal decision-makers for them to make well-informed choices. GBNERR also envisions becoming a center for coastal resource management, with adequate funding and staff to support a wide array of programs. NOAA congratulates GBNERR for developing a strategic plan that clearly defines its mission, values, goals, objectives and vision. The plan will provide overarching guidance for the reserve as its core programs continue to grow.

ACCOMPLISHMENT: In 2003, GBNERR developed a strategic plan that clearly defines its mission, values, goals, objectives and vision. The plan will provide overarching guidance for the reserve as its core programs continue to grow.

5. Management Plan

NERRS regulations require each reserve to have a NOAA-approved management plan that must be updated every five years. A reserve's management plan has three primary functions: (1) to provide a framework for the direction and timing of the reserve's programs; (2) to allow a reserve manager to assess how successfully the reserve's goals have been met and to determine any necessary changes in direction; and (3) to guide programmatic evaluations of the reserve. The plan must describe the reserve's goals, objectives and management issues. It must also identify the reserve's intended strategies for research, education and interpretation, public access, construction, acquisition and resource preservation, restoration and manipulation. Additionally, the plan is required to describe staff roles in each of these areas.

GBNERR's revised management plan, reflecting the reserve's vision and strategy for 2005-2010 was due in 2004. At the time of the evaluation site visit, the reserve had developed an outline for the revised management plan and had directed grant funds to this mandatory task. GBNERR anticipates revising its management plan with an emphasis on further integrating the reserve's core programs. NOAA strongly encourages GBNERR to develop a strategy and timeline for revising its management plan. NOAA also encourages GBNERR to evaluate existing Memoranda of Understanding with its partners during the management plan revision. Current Memoranda of Understanding may require updating given the projected growth of the reserve's core programs during the next five years.

1. PROGRAM SUGGESTION: NOAA strongly encourages GBNERR to develop a strategy and timeline for revising its management plan, which should be completed prior to the reserve's next regularly scheduled evaluation. NOAA also encourages GBNERR to evaluate existing Memoranda of Understanding with its partners during the management plan revision. The status of the management plan's revision process should be described in GBNERR's semi-annual performance reports.

6. Facilities

As is common for relatively new reserves, GBNERR has been operating from temporary facilities since designation. Current facilities include: (1) a raised double-wide trailer that houses the reserve's offices and lab space, (2) a circular shell drive, (3) storage sheds, (4) an existing house that serves as dormitory for researchers and (5) a fenced storage area for boats and vehicles.

In 2003, the reserve received a \$5.9 million congressional appropriation for construction of permanent facilities. GBNERR unveiled the master plan for the new facilities at a press conference held in December 2003. The facilities design merges the new buildings

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harmoniously into GBNERR's natural surroundings. The master plan describes a central facility with additional satellite facilities that will allow visitors to explore the various habitats and resources of the reserve. Following the guidelines of the U.S. Green Building Council, the new facilities will incorporate energy efficient and environmentally sound construction materials and techniques. In Spring 2004, the reserve prepared a request for qualifications to provide architectural and professional services for construction of the new facilities. GBNERR anticipates that the permanent facilities will be completed in 2006. NOAA congratulates GBNERR for making notable progress on planning for new, sustainably designed, permanent facilities, including completion of an excellent facilities master plan and preparation of a construction request for qualifications.

ACCOMPLISHMENT: GBNERR has made notable progress on planning for new, sustainably designed, permanent facilities, including completion of an excellent facilities master plan and preparation of a construction request for qualifications.

During the evaluation site visit, it became clear to the evaluation team that both reserve staff and local citizens are eagerly awaiting construction of and have high expectations for the new permanent facilities. The permanent facilities will enable the reserve to conduct its core programs more effectively and will provide a unique window to the estuary for the public. Staff hope that the state of the art facilities will enhance the reserve's visibility and concomitantly attract more partners. Clearly, the facility will provide an excellent platform for regional estuarine science and interpretation and could serve as a regional training center. However, the reserve recognizes that completing the construction of the new facilities on time and within budget will be a challenge.

Through a partnership with USFWS, the new facilities will be constructed on federal properties at the reserve's current office location and will house the GBNERR and Grand Bay National Wildlife Refuge (GBNWR) offices. Approximately eight to ten USFWS staff will share the building with reserve staff. The transition from the current, temporary facilities to the operation and maintenance of permanent, joint facilities will require a great deal of coordination and collaboration between GBNERR and GBNWR staff. NOAA strongly encourages GBNERR to work with GBNWR to develop a Memorandum of Understanding that clearly describes all roles and responsibilities regarding the new facilities.

2. PROGRAM SUGGESTION: NOAA strongly encourages GBNERR to work with GBNWR to develop a Memorandum of Understanding that clearly describes all roles and responsibilities regarding the new facilities.

In addition to planning for permanent facilities, GBNERR and its partners also constructed a trail, boat launch and pier during the review period. The half-mile Oak Grove Trail, surrounded by a combination of pine savanna, flatwoods, marsh, open water and bayou, is particularly popular with birders and photographers. The reserve's Education, Interpretation and Outreach Program coordinated with GBNWR to develop signs for the trail. The Bayou Heron Boat Launch and Pier is also very popular with the

local community and has raised the reserve's visibility. NOAA congratulates GBNERR for the successful completion of these construction projects.

7. Program Coordination

GBNERR coordinates well among reserve programs and with external partners. Not only are the reserve's core programs well established and strong, but they regularly collaborate with and assist one another. During the site visit, the evaluation team was pleased to see key linkages among the programs that are essential to the reserve's mission of maintaining a stable environment in which to conduct research and translate it to the public. GBNERR also emphasizes coordination with external partners such as the Mississippi Coastal Management Program and other DMR bureaus, other state agencies, the local community, academia and industry. NOAA commends GBNERR for its strong commitment to coordination among its core programs and with a wide variety of external partners and encourages it to continue such efforts.

As noted in §III-B-1, the federal lands component of GBNERR is part of GBNWR. The GBNWR Manager is co-located with GBNERR staff, and the reserve and refuge often must work closely together on respective program implementation. As described throughout these findings, the two programs do collaborate well on projects such as prescribed fire management. However, as may be expected with two programs operating under differing agency procedures, at times coordination can be somewhat difficult and projects may take longer than initially envisioned to complete. During the site visit, both the Reserve Manager and the Refuge Manager recognized that coordination between the two programs could be improved. NOAA encourages GBNERR to continue its efforts to coordinate with GBNWR and to explore alternatives for improving coordination. For example, the reserve might hold an informational session for certain USFWS regional staff. Such a session might: (1) describe the similarities and differences between the reserve and refuge; (2) discuss the reserve's and refuge's visions for the next five years; and (3) solicit input from USFWS staff on methods to improve coordination.

3. PROGRAM SUGGESTION: NOAA encourages GBNERR to continue its efforts to coordinate with GBNWR and to explore alternatives for improving coordination.

B. RESEARCH AND MONITORING PROGRAM

GBNERR's Research and Monitoring Program has made good progress since designation and is based upon four principles: (1) understanding the biological, physical and cultural parameters of the reserve's environments as well as their interactions and interdependencies; (2) assessing causes and effects of ecosystem disturbance; (3) developing the most efficient methods for utilizing and disseminating research results; and (4) encouraging the internal and external exchange of scientific data with GBNERR's Education, Interpretation and Outreach Program, the NERRS, academia, resource agencies and other interested groups.

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GBNERR developed its research goals with regard for site specific resource management issues and research needs. Throughout development of the Research and Monitoring Program, the reserve considered the need to promote basic and applied research activities as well as to efficiently and effectively incorporate research results into its management and preservation decision-making processes. The resultant research goals were designed to support preservation, protection and understanding of Grand Bay's ecological integrity by:

- Enhancing scientific understanding of the interactions and inter-relationships of living organisms and their physical environment;
- Developing the capability to determine spatial and temporal ecological patterns and their variability within the Grand Bay system;
- Promoting citizen involvement in research and monitoring efforts;
- Encouraging scientists to conduct both basic and applied research at GBNERR;
- Promoting sound coastal zone management through scientific research; and
- Utilizing research data to support outreach efforts and to affect public perception and interaction with the environment.

1. System-wide Monitoring Program (SWMP)

Participation in and contribution to system-wide efforts such as planning, development and implementation of system-wide programs are important aspects of being part of the NERRS. National programs are developed in collaboration with all reserves and NOAA. One example of a system-wide effort is SWMP. The goal of SWMP is to track short-term variability and long-term changes in estuarine water quality, habitat and land use in each reserve. The data gathered through SWMP provides information about how estuaries function and change over time, enabling scientists to predict how these systems will respond to anthropogenic changes.

SWMP provides critically needed, standardized information on national estuarine environmental trends while allowing the flexibility to assess coastal environmental management issues of regional or local concern. Designed to enhance the value of the NERRS as a system of national reference sites, this program has three components and a phased approach to implementation. The three components are:

- (1) **Abiotic Variables:** SWMP currently measures pH, conductivity, temperature, dissolved oxygen, turbidity, water level and atmospheric conditions. In addition, the program collects monthly nutrient and chlorophyll samples and monthly diel samples at one SWMP data logger station. Each reserve uses a set of automated instruments and weather stations to collect these data for submission to a centralized data management office.
- (2) **Biotic Variables:** As funds become available, the reserve system also will incorporate monitoring of organisms and habitats into SWMP. The first aspect likely to be incorporated will quantify vegetation (e.g., marsh vegetation, submerged aquatic vegetation) patterns and their change over

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space and time. Other aspects that could be incorporated include monitoring infaunal benthic communities and plankton communities.

- (3) **Habitat Mapping and Change:** This component of SWMP will be developed to identify changes in coastal ecological conditions with the goal of tracking and evaluating changes in coastal habitats and watershed land use. The main objective of this element will be to examine the links between watershed land use activities and coastal habitat quality.

Although NOAA has provided funding for SWMP to GBNERR since 2000, the Research and Monitoring Program began implementing SWMP in 2003. The reserve's SWMP Coordinator attended training early in the year. Staff strategically selected potential monitoring sites throughout the reserve, constructed data sonde sleeves for four monitoring sites and purchased five data sondes.² The SWMP Coordinator collected test data sets at two of the monitoring sites for approximately six weeks during the summer. Following the departure of the SWMP Coordinator, the program lapsed for several months.

A new SWMP Coordinator was hired in November 2003 and conducted an assessment of GBNERR's SWMP. The examination revealed that the data sonde sleeve mounts needed repair and that additional sondes were required for sonde rotation and continuous data collection. Once necessary repairs to the sleeve mounts were made, the Research and Monitoring Program began collecting test data sets at two sites in January 2004. The SWMP Coordinator attended training, and the reserve purchased additional sondes in February.

At the time of the evaluation site visit, two additional sondes were placed in the field to complete the four site data set. The deployment scheme was chosen to be representative of the system as a whole and to reflect data from three subwatersheds: one with little development, one with residential development operating with septic systems, and one with industrial development. Data sondes were being rotated, and water quality data collected during February and March was being prepared for the Centralized Data Management Office's review. Additionally, final site selection for the weather station was underway. The SWMP Coordinator reported that the reserve would collect weather data during the summer, and that the data sondes and the weather station would be linked to the Visitors' Center through telemetry before the end of the year. The telemetry will be facilitated by a partnership with Dauphin Island Sea Lab in Alabama. During the evaluation site visit, the SWMP Coordinator noted that there might be future opportunities for collaboration with other potential partners in Alabama, such as Weeks Bay NERR. While GBNERR experienced some setbacks with implementation of SWMP, the program made good progress during the six months preceding the evaluation site visit. NOAA acknowledges the reserve's progress in implementing SWMP water quality data collection and encourages it to implement weather data collection expeditiously.

² GBNERR purchased four data sondes for monitoring and one for quality assurance/quality control.

2. Site Profile

NERRS implementing regulations require each reserve to develop a comprehensive site profile. The reason for developing a site profile is to enhance research efforts by generating inventory information and assimilating baseline data about a reserve's resources and habitats. A site profile is designed to: (1) compile scientific datasets relating to the reserve, (2) characterize the physical and biotic components of the environment, (3) synthesize the known ecological relationships within the reserve and its watershed, (4) trace the impact of natural and human disturbances, and (5) explore the need for future research, education and management initiatives.

GBNERR has identified two stages in the completion of its site profile:

- **Environmental Characterization:** This stage requires a literature search and review of all existing research and field data. The environmental characterization also involves the compilation of all information that describes the geology, biology, chemistry, geomorphology and hydrology of the reserve.
- **Site Profile Development:** This stage requires a synthesis of information gathered during the environmental characterization. The resultant document will illustrate the reserve in terms of its resources, management issues, constraints and research needs.

At the time of the evaluation site visit, GBNERR's site profile was in the environmental characterization stage. The Research and Monitoring Program had collected a great deal of information and had worked with partners, such as the University of Southern Mississippi's Gulf Coast Research Lab, to identify data gaps. The program plans to continue the necessary field work for both terrestrial and aquatic species inventories, based upon data gaps. Following completion of field work, the reserve intends to hire a contractor to compile all the site profile information that has been collected over the past several years and to combine this information with relevant research relating to Grand Bay's species and habitats. NOAA strongly encourages GBNERR to develop a strategy and timeline for completing the site profile.

4. PROGRAM SUGGESTION: NOAA strongly encourages the Research and Monitoring Program to develop a strategy and timeline for completing the site profile, which should be completed prior to GBNERR's next regularly scheduled evaluation. The status of the site profile's progress should be described in GBNERR's semi-annual performance reports.

3. Graduate Research Fellowships (GRF)

The NERRS GRF Program supports management related research projects that enhance scientific understanding of reserve's estuarine systems, provides information needed by reserve managers and coastal decision-makers, and improves public awareness and understanding of estuarine ecosystems and management issues.

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GRF funds are available on a competitive basis to students enrolled in a full-time Masters or Doctoral program at accredited colleges and universities in the United States. Fellowships may be funded for up to three years. Applicants must address one of the nationally significant research priorities established by the NERRS and conduct research in one or more of the reserves. Research priorities include:

- (1) The effects of nonpoint source pollution on estuarine ecosystems and the role of estuarine ecosystems in mitigating this pollution;
- (2) Evaluative criteria and/or methods for estuarine ecosystem restoration;
- (3) The importance of biodiversity and the effects of invasive species on estuarine ecosystems;
- (4) Mechanisms for sustaining resources within estuarine ecosystems; and
- (5) Economic, sociological and anthropological research on estuarine ecosystems.

GBNERR began hosting GRFs in 2002 and had supported a total of five students by the time of the evaluation site visit. GRF projects at the reserve have ranged from studying the effects of invertebrate grazer density manipulations on widgeongrass exposed to nutrient enrichment to developing guidelines for the production of a Grand Bay hydrology and water quality simulation model. NOAA commends the Research and Monitoring Program for hosting excellent GRFs during the latter part of the review period and encourages it to continue recruiting strong graduate researchers to the reserve.

4. Environmental Cooperative Science Center (ECSC)

NOAA established the ECSC in 2001 with six minority serving institutions as a part of its Education Partnership Program. The ECSC will help address ecological and coastal management issues at five reserves and one National Marine Sanctuary.³ Partner reserves were selected as a result of their proximity to ECSC member institutions and existing research, education and outreach activities involving member institutions. ECSC has four primary, interrelated goals: (1) increase the number of underrepresented minorities in atmospheric, environmental and oceanic sciences by training students and expanding the capacity of faculty from member institutions to participate in NOAA related research; (2) develop tools, including conceptual models, to assess the response of coastal ecosystems and communities to perturbation and develop measurement programs to monitor critical system attributes; (3) improve the scientific basis for coastal resource management; and (4) facilitate community education and outreach relating to the function and significance of coastal ecosystems.

As a participating partner in the ECSC, GBNERR's Research and Monitoring Program has collaborated with Jackson State University (JSU) to meet the goals of the Center. Given that GBNERR and ECSC are relatively young programs, there were some understandable difficulties associated with implementation of the partnership. The Research and Monitoring Program has worked closely with JSU faculty and students to

³ Partner reserves are GBNERR, Apalachicola NERR (FL), ACE Basin NERR (SC), Delaware NERR and Chesapeake Bay NERR (MD). The Florida Keys National Marine Sanctuary is the partner sanctuary.

improve the communication and planning required for successful field work. These worthwhile efforts resulted in several important research projects.

In November 2002, JSU and GBNERR held a conceptual modeling workshop focused on GBNERR in Biloxi, Mississippi. GBNERR, JSU, DMR and other ECSC participating institutions organized the workshop, which was attended by 67 people representing a variety of stakeholders including local communities, the Mississippi Department of Environmental Quality, The Nature Conservancy, NASA's Stennis Space Center and several academic institutions. Participants developed matrices in order to identify and assess critical, cross-cutting ecological and sociological issues at GBNERR. At the time of the evaluation site visit, the Research and Monitoring Program was developing a manuscript summarizing the modeling effort and its outcomes to be published as part of a special supplement in an environmental sciences journal.

In October 2003, JSU and GBNERR conducted a remote sensing flyover of the reserve. The flyover included a significant upland component that involved collaboration with the Sandhill Crane National Wildlife Refuge in studying fire management effects on habitat quality and a new look at invasive species, such as cogongrass and Chinese tallow, in upland systems. A local magnet middle school sent more than two dozen students and two teachers to assist in ground-truthing for the invasive species tasks and in the characterization of the Sandhill Crane National Wildlife Refuge's fire regime systems. JSU also added a new course on Image Interpretation, emphasizing remote sensing applications such as the GBNERR remote sensing flyover.

JSU initiated a project to assess the dynamics of fecal coliform bacteria in GBNERR. In collaboration with DMR and the reserve, JSU is examining the spatial and temporal patterns in fecal coliform levels in GBNERR related to salinity and shellfish conditions. The project includes data analysis to evaluate the influence of interannual variations in climatic factors on fecal coliform levels in the sampling areas. Information from this study will assist the design of a fecal coliform monitoring program at the reserve. The results of the project also have the potential to improve shellfish management in the area. NOAA applauds the Research and Monitoring Program's continuing participation in and support of the ECSC.

ACCOMPLISHMENT: The Research and Monitoring Program is an active participant in and supporter of the ECSC. Despite initial difficulties in partnership implementation, the program worked closely with JSU faculty and students to initiate several important research projects.

5. Research Projects

The Research and Monitoring Program initiated and facilitated many research and monitoring efforts during the review period. Examples include:

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Outside Researchers Only:

- An evaluation of new techniques for the control of cogongrass – Dr. John Byrd, MSU
- Application of the Marshland Upwelling System to treat domestic wastewater in sensitive coastal areas – Dr. Kelly Rusch and Dr. Ronald Malone, Louisiana State University
- The Nitrogen economy of the pitcher plant *Saracennia rosea* at GBNERR/NWR – Gantt Boswell, University of New Orleans

Collaborative Projects:

- An ecotoxicology study of ospreys nesting in four watersheds associated with Grand Bay NERR – Dr. Mark Woodrey, GBNERR, lead; Angel Wynn and Dr. Mark Harwell, Florida A&M University
- Population dynamics of oysters (*Crassostrea virginica*) in GBNERR – Chris May, GBNERR, lead; Auburn University
- Development of Geographic Information System and acquisition of data layers for research and monitoring purposes – Chris May, GBNERR, lead; Dr. Greg Carter, Gulf Coast Geospatial Center, University of Southern Mississippi

GBNERR/NWR Staff Only:

- Mammal and bird use of salt panne and shell midden habitats of GBNERR
- Development of a monitoring program for *Phragmites australis* throughout GBNERR/NWR
- Development of a monitoring program for coastal erosion at GBNERR/NWR

During the review period, the Research and Monitoring Program planned a particularly innovative effort, known as the BioBlitz, for Spring 2004. The BioBlitz was envisioned as an annual one-day comprehensive biological inventory hosted by GBNERR that would bring together numerous experts, volunteers and other stakeholders to conduct a 24-hour survey of the reserve and adjacent lands and waters. The purpose of the survey was to generate interest in the biodiversity of the area by non-biologists and to document the thousands of plant and animal species that occur at Grand Bay. In planning the BioBlitz, the Research and Monitoring Program anticipated that the effort would produce a high level of interest in the resources and the number of species found at Grand Bay. Major sponsors of the event included DMR, NOAA, USFWS, ChevronTexaco Pascagoula Refinery, Mississippi-Alabama Sea Grant Consortium and Mississippi Power Company. The public was invited to observe the scientists' activities, interact with them and to participate in other organized educational activities. Additionally, classroom teachers were invited to use the BioBlitz as a way to integrate biodiversity into their curriculums. NOAA congratulates the Research and Monitoring Program for significantly increasing its research and monitoring efforts throughout the review period and for engaging a variety of partners in unique, collaborative projects.

ACCOMPLISHMENT: The Research and Monitoring Program significantly increased its research and monitoring efforts throughout the review period and engaged a variety of partners in unique, collaborative projects.

C. EDUCATION, INTERPRETATION AND OUTREACH PROGRAM

Historically, Grand Bay was largely overlooked as a potential focus area for environmental education programs. This lack of recognition is attributable to the estuary's rural character, general inaccessibility and lack of facilities. Therefore, GBNERR's Education, Interpretation and Outreach Program has emphasized improving access to the reserve's wide range of habitats and maximizing the educational opportunities offered by the site's unique biological, geological, hydrological, archaeological and historical characteristics.

Since designation, the Education, Interpretation and Outreach Program has done much to implement activities in keeping with its six primary goals:

- Develop on-site and community outreach programs;
- Encourage appropriate groups to utilize the reserve for educational experiences;
- Promote education programs that address both basic estuarine science and applied topics relative to coastal management issues;
- Develop educational opportunities and programs that target a broad range of adult audiences from throughout the public and private sectors;
- Provide and maintain the necessary resources to support on-site education and interpretation programs; and
- Encourage and promote the participation of students, volunteers, local industry and the general public in research and monitoring programs.

1. Coastal Decision-maker Workshops (CDMWs)

A priority of GBNERR's Education, Interpretation and Outreach Program is developing educational opportunities and programs that target a broad range of diverse adult audiences from both the public and private sectors. One of the program's primary mechanisms for reaching adult audiences is through CDMWs. The purpose of CDMWs is to provide current environmental information to local decision-makers. Examples of specific issues that the program has addressed through CDMWs include assessing environmental impacts, managing ecosystems through prescribed fire,⁴ identifying coastal plants and understanding littoral rights. The program's CDMWs have been effective in conveying scientific information about priority environmental issues to government officials, policy-makers and the public. NOAA applauds the Education, Interpretation and Outreach Program's efforts to target diverse audiences with its CDMWs and encourages the program to continue offering workshops focusing on timely and significant coastal management issues to a wide variety of audiences.

⁴ The Education, Interpretation and Outreach Program also developed a video to accompany the CDMWs on prescribed fire.

2. Coastal Training Program (CTP)

The CTP, which builds upon the success and experience of the CDMWs, is a key component of the NERRS education efforts. The CTP is designed to improve coastal stewardship at local and regional levels by increasing the application of science-based knowledge and skills by coastal decision-makers and to increase dialogue and collaboration among decision-makers. Planning for the program includes:

- Establishing a training advisory committee;
- Conducting a market survey of training providers and an audience needs assessment;
- Developing a program strategy that outlines priority coastal issues to be addressed during the next three to five years; and
- Prioritizing audiences that the reserve plans to target with relevant programs, as well as a marketing plan.

In Spring 2004, GBNERR hired a CTP Coordinator. The new CTP Coordinator spent her first week in the position attending the Annual NERRS Education Coordinators' Meeting, which provided her with an excellent opportunity to hear from reserves that are implementing CTP. During the site visit, it was evident to the evaluation team that the CTP Coordinator had a clear sense of how to conduct the steps necessary for program implementation. The CTP Coordinator noted that her first effort was to form a CTP Advisory Committee to help guide the new program. She envisioned holding the first meeting of the CTP Advisory Committee, where participants would review market analysis questions, in April. Finalization of the market analysis questions was planned for May, and the needs assessment was planned for July and August. The CTP Coordinator expected that these steps would be complete by March 2005. She also indicated that there was potential for joint training efforts with the Weeks Bay NERR in Alabama. NOAA applauds the Education, Interpretation and Outreach Program for its work to initiate the CTP and encourages it to continue program development and implementation.

ACCOMPLISHMENT: The Education, Interpretation and Outreach Program initiated the CTP. The CTP Coordinator has a clear sense of how to develop and implement the program.

3. Volunteer Program

Given that GBNERR is a comparatively new reserve without permanent facilities, it is understandable that the Education, Interpretation and Outreach Program has yet to develop a formal Volunteer Program. At reserves throughout the NERRS, volunteers assist staff with many duties, including:

- Operating the Visitors' Center;
- Performing administrative tasks;

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- Assisting with facility maintenance, public access improvement projects and research and monitoring projects;
- Providing staff support for programming, workshops and special projects; and
- Serving as members on various advisory committees.

During the site visit, the Education Coordinator noted that she hoped to increase the role of volunteers at GBNERR when the permanent facilities are complete. As a strong link to the local community, volunteers provide invaluable outreach for a reserve. Given that volunteers can be a significant asset to reserve operations and programming, NOAA encourages the Education, Interpretation and Outreach Program to develop a Volunteer Program as soon as practicable.

4. Education Projects

The Education, Interpretation and Outreach Program has conducted many projects during the review period. Examples include:

On-site and Community Outreach

- The program developed a traveling exhibit about the reserve that is appropriate for use at local, regional and national meetings. The program also created a reserve brochure and is partnering with Sea Grant to design the GBNERR website.
- The Education Coordinator annually serves as a co-organizer for Celebrate the Gulf, a marine education festival celebrating National Estuaries Day that draws between 1,000 and 3,000 attendees.
- The program organizes a year-end GBNERR holiday open house for the community and reserve partners.
- The program works with GBNERR staff to include a page of “NERR Notes” in each issue of DMR’s quarterly newsletter.

On-site Educational Experiences

- The program collaborated with the J.L. Scott Marine Education Center at the University of Southern Mississippi to provide canoes and a trailer for teacher workshops as well as other education and outreach programs.
- The program and the J.L. Scott Marine Education Center share an educator dedicated to promoting estuarine education through field experiences.
- The program assisted with planning for the GBNERR BioBlitz by inviting classroom teachers to use the event as a way to integrate biodiversity into their curricula by incorporating activities appropriate for school students into the agenda.

Education Programs and Science

- The program coordinates DMR's annual Excellence in Marine Sciences Award, which is presented at the Regional Science and Engineering Fair, and the Education Coordinator serves on the Science Fair Task Force.
- The program supports the local Hurricane Bowl, a regional and national ocean science quiz bowl for high school students.
- GBNERR co-sponsored the state chapter meeting of North American Association of Environmental Educators and, at the time of the site visit, the Education Coordinator was assisting with the organization of the international meeting scheduled for Fall 2004.
- The reserve is a major co-sponsor of the Coastal Development Strategies Conference with DMR's Comprehensive Resource Management Plan.

NOAA applauds the Education, Interpretation and Outreach Program for developing innovative education projects that address program goals and involve a variety of partners.

ACCOMPLISHMENT: The Education, Interpretation and Outreach Program developed innovative education projects that address program goals and involve a variety of partners.

D. STEWARDSHIP PROGRAM

During the last several years, the NERRS has focused on developing a stewardship component to complement its existing research and education programs. The primary goals of GBNERR's Stewardship Program are to: (1) acquire all available lands within the reserve boundary; (2) keep acquired lands accessible to the public; and (3) manage acquired lands with partners according to best management practices to address natural fire, hydrologic regime, native species and other relevant issues. In order to achieve these goals, the reserve has developed the following objectives:

- Continue existing partnerships for land acquisition;
- Participate in development and promotion of GBNWR's public use plan;
- Write a communication plan with GBNWR to promote public use of the property;
- Work in conjunction with all landowners within and adjacent to the reserve boundaries to implement a fire management plan and to formulate similar plans for other management activities, including the protection of cultural resources; and
- Coordinate with state and federal agencies to enforce the public use and other regulations within reserve boundaries.

During the review period, the Stewardship Program addressed many significant resource management issues at the reserve. Careful planning and involvement of partners has been a hallmark of each of the program's efforts. NOAA commends the Stewardship

Program for its many resource management projects that involve partners and meet the program's goals. Several examples of the program's efforts are described below.

1. Land Acquisition

While the majority of lands within the reserve are publicly held, GBNERR has committed to pursuing acquisition opportunities, including the purchase of inholdings and parcels contiguous to its boundaries. The Stewardship Program's key acquisition priority is existing inholdings within the reserve's core area. The program will acquire other lands after careful consideration of the type and quality of the habitat; any proposed boundary expansion will require an appropriate rationale. The Stewardship Program will acquire lands only through willing seller negotiations and will employ fee simple acquisition and conservation easements to acquire additional lands.

Fee simple acquisition is GBNERR's preferred method of land protection. The reserve favors fee simple interest because: (1) it provides opportunities to implement the reserve's education, research and monitoring objectives; (2) it consolidates smaller tracts, allowing for more effective resource management activities such as controlled burning; and (3) it provides the greatest assurance of long-term resource protection. Fee simple interest may be achieved through unconditional purchase, donation, tax forfeiture or land exchange.

GBNERR also may use conservation easements, particularly for inholdings in the buffer areas, to secure management agreements that advance the reserve's objectives. The Stewardship Program will consider the use of long-term, low-cost leases to fulfill certain management or access needs. Cooperative agreements are binding, generally no-cost arrangements that allow the reserve to conduct activities on a parcel without acquiring any other legal interest in the property.

During the review period, the Stewardship Program began developing a priority land acquisition plan for the reserve. The plan, which is being developed in conjunction with the Mississippi Coastal Management Program and other reserve partners, will include recommendations for acquisition funding opportunities. The Stewardship Coordinator noted that the reserve will likely acquire land as it becomes available, but that the plan will guide decision-making when financial resources are more limited than available land. NOAA congratulates the Stewardship Program for initiating development of a land acquisition plan for GBNERR and encourages it to complete the plan as soon as possible.

2. Invasive Species Control

A significant focus area for GBNERR's Stewardship Coordinator is invasive species control. Several invasive, non-indigenous species of plants and animals are present at GBNERR. Two invasive species of concern, Chinese tallow and cogongrass, have established themselves within the reserve. In particular, cogongrass is highly invasive and adapts well to disturbed habitat, such as construction areas. While there are no established protocols for the removal of Chinese tallow or cogongrass, the Stewardship

Program, in collaboration with USFWS, has engaged in prescribed burns and both mechanical and chemical treatments to control these invasive plants. The program monitors treated areas for change in order to determine the most effective means of controlling the plants. All removal efforts emphasize the return of an area to its original, natural habitat. The Stewardship Coordinator noted that one of the program's goals is to assist other government agencies as well as private landowners with invasive species management. NOAA encourages the Stewardship Program to continue its efforts to control invasive species at the reserve and to assist partners with invasive species management.

3. Prescribed Fire

One of the Stewardship Program's primary challenges is restoring the wet pine savanna and pine flatwoods habitat along the northern portion of the reserve. The historic suppression of fire in these habitats has led to a significant deterioration in habitat quality. Typically, fire suppression in pine savanna and pine flatwoods causes overgrowth of shrubs and trees that leads to changes in soil conditions and loss of herbaceous species. Restoration and maintenance of these habitats require initial tree thinning and periodic prescribed fire. USFWS has set a goal of treating between 2,000 and 3,000 acres annually for prescribed fire management of pine savanna and pine flatwood habitat. Some of the treated areas will be within GBNERR. The Stewardship Program has developed a fire management plan and a fire effects bibliography. Additionally, the program worked closely with the Education, Interpretation and Outreach Program to offer a Prescribed Fire Academy for the media, as described in §IV-C-1.

One of the difficulties the Stewardship Program has encountered with prescribed burn management is a lack of trained personnel. At the time of the site visit, there was only one fire crew,⁵ based at the nearby Sandhill Crane National Wildlife Refuge, accessible to the reserve. In order to address this issue, DMR applied for and received a \$500,000 grant to start a fire cooperative. DMR envisions using the cooperative to train people in prescribed burns so that temporary fire crews could be created for short periods of time as needed. NOAA commends DMR for this innovative approach and congratulates the Stewardship Program for its work to restore unique reserve habitats through prescribed fire management.

ACCOMPLISHMENT: The Stewardship Program, in cooperation with USFWS, initiated a prescribed fire management plan to restore the reserve's wet pine savanna and pine flatwoods habitat. The program also developed a fire effects bibliography and worked with the Education, Interpretation and Outreach Program to offer a Prescribed Fire Academy for the media.

⁵ Given that the fire crew based at Sandhill Crane National Wildlife Refuge is responsible for a region stretching throughout several states, its availability is necessarily quite limited.

4. Shoreline Erosion

Another challenge for the Stewardship Program is erosion. GBNERR is a naturally retrograding river delta. Since the Escatawpa River was captured by the Pascagoula River, the original delta has retrograded an estimated 1.5 miles from its farthest extent in the Mississippi Sound. When a hurricane breached a pass between what are now Petit Bois and Dauphin Islands, it created an unlimited fetch for waves from the Gulf of Mexico to pass unimpeded through the Mississippi Sound. This greatly increased the rate of erosion on the relict Escatawpa River delta to its current rate of between three and ten meters per year. Since that time, the Grand Batture Islands have disappeared, the Rigolets have virtually eroded away, the Point aux Chenes headlands have eroded hundreds of feet and Point aux Chenes Bay has changed from an enclosed brackish estuarine bay to an open, saline bay in Mississippi Sound. Historically, estuaries along the Mississippi coast have responded to sea level rise and erosion by migrating inland. However, GBNERR is bounded to the west by a major industrial complex and to the north by major transportation corridors; both of which effectively confine the estuary within its current boundaries and prevent the estuary from migrating. Consequently, while the erosion processes acting upon the estuary are mostly natural, the estuarine system's response to erosion is significantly affected by human perturbations bordering the reserve.

The saltmarshes that dominate GBNERR were initially established and maintained by sediments delivered by the Escatawpa River. Thus, similar to the Grand Batture Islands, marshes fronting the Mississippi Sound have suffered high erosion rates as the delta has retrograded. Erosion along the shoreline of Point aux Chenes Bay has been exacerbated by the tendency for marsh substrate to be undercut during low tides and then broken by wave action during high tides. The Stewardship Coordinator noted that coastal erosion monitoring was greatly needed. The Mississippi Department of Environmental Quality had monitored erosion for more than ten years, but the program was discontinued due to a budget shortfall. At the time of the site visit, the Stewardship Program was planning for small scale erosion monitoring and demonstration projects. NOAA encourages the Stewardship Program to continue such efforts.

V. CONCLUSION

For the reasons stated herein, I find that Mississippi is adhering to the programmatic requirements of the National Estuarine Research Reserve System in the operation of its approved Grand Bay National Estuarine Research Reserve.

These evaluation findings contain four recommendations. These recommendations are in the form of Program Suggestions that the Mississippi Department of Marine Resources should consider prior to the next regularly scheduled program evaluation, but they are not mandatory at this time. Program Suggestions that must be repeated in subsequent evaluations may be elevated to Necessary Actions. Summary tables of program accomplishments and recommendations are provided in the Executive Summary.

This is a programmatic evaluation of the Grand Bay National Estuarine Research Reserve that may have implications regarding the state's financial assistance awards. However, it does not make any judgment on or replace any financial audits related to the allowability or allocability of any costs incurred.

Eldon Hout
Director

Date

VI. APPENDICES

APPENDIX A. PERSONS AND INSTITUTIONS CONTACTED

Grand Bay National Estuarine Research Reserve Representatives

Name	Title
Jennifer Buchanan	Education Coordinator
Marian Dicas	Coastal Training Program Coordinator
J.R. Harrington	Administrative Assistant
Chris May	Stewardship Coordinator
Brad Ogle	Contract Researcher
Trisha Rodriguez	Contract Researcher
Dave Ruple	Reserve Manager
Christine Walters	System-wide Monitoring Program Coordinator
Mark Woodrey	Research Coordinator

**Grand Bay National Estuarine Research Reserve
Management Board Representatives**

Name	Title	Affiliation
Margaret Bretz		Office of the Mississippi Secretary of State
Bob Fairbank		Citizens Advisory Committee
Robbie Fisher		The Nature Conservancy
David Veal	Management Board Chairman	Mississippi State University

Mississippi Department of Marine Resources Representatives

Name	Title	Affiliation
Jan Boyd	Director	Coastal Ecology
Jeff Clark	Director	Coastal Preserves
Pat Daughdrill	Director	Administrative Services
Fred Deegen	Assistant Director	
Marcia Garcia		Coastal Resource Management Plan
Grant Larsen	GIS Specialist	Coastal Resource Management Plan
Joan Murphy		Coastal Resource Management Plan
Tina Shumate	Director	Coastal Resource Management Plan
Kara Vesa	Chief Financial Officer	

Federal Agency Representatives

Name	Title	Affiliation
Pon Dixon	Refuge Manager	U.S. Fish and Wildlife Service
Stan Hawkes	Volunteer	U.S. Fish and Wildlife Service
Tony Wilder	Fire Management Officer	U.S. Fish and Wildlife Service

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Local Government Representatives

Name	Title	Affiliation
Manley Barton	District One Supervisor	Jackson County Board of Supervisors

Academic Representatives

Name	Title	Affiliation
Sheila Brown		University of Southern Mississippi Marine Education Center
Greg Carter		University of Southern Mississippi Gulf Coast Geospatial Center
John Guyton		Mississippi State University Coastal Research and Extension Center
Mark LaSalle		Mississippi State University Coastal Research and Extension Center
LaDon Swann	Director	Mississippi-Alabama Sea Grant

Industry Representatives

Name	Title	Affiliation
Steve Renfroe	Public and Government Affairs Manager	ChevronTexaco Pascagoula Refinery

Community Representatives

Name	Title	Affiliation
Clyde Brown		Local Resident

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APPENDIX B. PERSONS ATTENDING THE PUBLIC MEETING

Name	Affiliation
Jan Barlow, Jr.	Grand Bay National Estuarine Research Reserve Citizens Advisory Committee
Clyde Brown	Grand Bay National Estuarine Research Reserve Citizens Advisory Committee
Don Glennon	Point-O-Pines
Greg Herman	<i>Sun Herald</i>
Chris LaGarde	Congressman Gene Taylor
Bess Moffatt	

APPENDIX C. NOAA'S RESPONSE TO WRITTEN COMMENTS

NOAA received five sets of written comments regarding the Grand Bay National Estuarine Research Reserve (GBNERR). The comments are summarized below and followed by NOAA's response.

Judith Breland
County Extension Director
Mississippi State University
Wiggins, Mississippi

Comment: Dr. Breland writes to support the efforts of GBNERR in providing research data and ecological educational information. She notes that individuals involved in education rely on research results in order to keep the public informed and young people educated. She concludes that she appreciates the work done by reserve staff.

NOAA's Response: NOAA agrees with Dr. Breland's comments regarding the importance of conducting research and translating the results to the public.

Janet Chapman
Water Quality Education Specialist
Mississippi Department of Environmental Quality
Jackson, Mississippi

Comment: Ms. Chapman writes to register her appreciation for the contribution that GBNERR makes to environmental education in Mississippi. She notes that she has cooperated with reserve staff on several occasions and has been pleased with the quality of their work and the vision they have for the natural resources of the state.

NOAA's Response: NOAA agrees with Ms. Chapman's comments regarding GBNERR's contribution to environmental education in Mississippi.

Jay Mengel
Gautier, Mississippi

Comment: Mr. Mengel writes that GBNERR is in a position to play an important role in preserving a critical coastal natural resource and to contribute to economic development, such as ecotourism, on the Mississippi coast. He applauds GBNERR's programs and looks forward to participating in the reserve's future efforts.

Mr. Mengel also writes that he is concerned that recently-introduced Mississippi legislation will allow gas drilling in GBNERR. He has worked for several years in shallow water gas fields in Louisiana and believes that gas drilling is neither safe nor unobtrusive. Mr. Mengel concludes that he does not want to see gas drilling in Mississippi's coastal waters.

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NOAA's Response: NOAA agrees with Mr. Mengel's comments regarding the reserve's role on the Mississippi coast.

At the time of the site visit, an amendment to Mississippi Senate Bill 2853 was introduced that would allow drilling in two lease blocks south of GBNERR's boundaries. Concurrently, an amendment to Mississippi House Bill 1634 was introduced that would allow drilling in three lease blocks south of the reserve and one lease block within GBNERR's boundaries. During the evaluation site visit, a number of organizations, including the Reserve Management Board, the Mississippi Department of Marine Resources and the Jackson County Board of Supervisors, noted that they were working to have the lease block within the reserve's boundaries removed when the bills come up for debate by conference committee. Following the site visit, the lease block in question was indeed dropped from consideration.

David Nelson
University of South Alabama
Department of Biology
Mobile, Alabama

Comment: Dr. Nelson writes to express his appreciation and support for National Estuarine Research Reserve System programs. He and his students have conducted research at Weeks Bay National Estuarine Research Reserve in Alabama. He has visited GBNERR with his herpetology class and is looking forward to the construction of GBNERR's permanent facilities. Given the lack of relatively undisturbed natural habitats available for ecological monitoring, Dr. Nelson believes that it will be important for GBNERR to expand its holdings as practical.

NOAA's Response: As described in these findings, NOAA agrees that GBNERR is an important area for research and monitoring and encourages the reserve to complete its priority land acquisition plan.

David Peacock
U.S. Department of Agriculture
Natural Resources Conservation Service

Dan Longino
Harrison Soil and Water Conservation District

Comment: Mr. Peacock and Mr. Longino write that their early contact with GBNERR was assisting with the design and clean up of the Bayou Heron boat launch and pier. They note that they have had positive interactions with the Grand Bay National Wildlife Refuge Manager and the GBNERR staff, and that all are clearly dedicated to successful restoration.

NOAA's Response: As described throughout these findings, NOAA agrees that GBNERR's staff is well-qualified and dedicated to the reserve's mission.