

Final Evaluation Findings

Waquoit Bay National Estuarine Research Reserve

September 2003 through April 2007



Office of Ocean and Coastal Resource Management
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Waquoit Bay National Estuarine Research Reserve
CZMA §312 Final Evaluation Findings

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I. EXECUTIVE SUMMARY

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 NOAA's Office of Ocean and Coastal Resource Management (OCRM) to conduct periodic performance reviews or evaluations of federally-approved National Estuarine Research Reserves. The review described in this document examined the operations and management of the Waquoit Bay National Estuarine Research Reserve (WBNERR) during the period of September 2003 through April 2007. The Massachusetts Department of Conservation and Recreation (DCR) administers WBNERR.

This document describes the evaluation findings of the OCRM Director with respect to WBNERR during the review period. These evaluation findings include discussions of major accomplishments as well as recommendations for program improvement. The fundamental conclusion of this evaluation is that DCR is successfully implementing and enforcing the federally-approved WBNERR.

The evaluation team documented a number of the reserve's accomplishments during the review period. WBNERR and DCR made several improvements in reserve staffing. WBNERR produced a well-written revised management plan within the prescribed timeframe. The reserve and the Massachusetts Coastal Zone Management Program (MCZMP) significantly improved their coordination and communication with each other. WBNERR's geographic information system capability provided tools for managing geographical data as well as opportunities for cooperative projects in resource management, planning, restoration and education. The Research and Monitoring Program engaged in many collaborative partnerships and attracted high-caliber, innovative research to the reserve. The Education and Outreach Program offered excellent K-12 and professional teacher development activities that closely correlated with the reserve's research priorities. The Massachusetts Coastal Training Program is a strong partnership among WBNERR, MCZMP and the Woods Hole Oceanographic Institution Sea Grant Program. The reserve also acquired more than 100 acres of land, 95 of which were incorporated into its boundary with the approval of the revised management plan.

The evaluation team also identified areas where the reserve and its programs could be strengthened. OCRM's recommendations are in the form of four Program Suggestions. The evaluation team did not identify any Necessary Actions. Recommendations address staffing, facilities, Reserve Advisory Committee and communication.

II. PROGRAM REVIEW PROCEDURES

A. OVERVIEW

NOAA's Office of Ocean and Coastal Resource Management (OCRM) began its review of the Waquoit Bay National Estuarine Research Reserve (WBNERR) in February 2007. The §312 evaluation process involves four distinct components:

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

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

Necessary Actions address programmatic requirements of the Coastal Zone Management Act's (CZMA) implementing regulations and of the federally-approved WBNERR. Each Necessary Action must be implemented by the specified date.

Program Suggestions describe actions that OCRM believes would improve the program, but they are not currently mandatory. If no dates are indicated, the Massachusetts Department of Conservation and Recreation (DCR) is expected to address the recommendations by the time of the next regularly-scheduled evaluation.

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

Failure to address Necessary Actions may result in a future finding of non-adherence and the invoking of interim sanctions, as specified in CZMA §312. Program Suggestions that are reiterated in consecutive evaluations to address continuing problems may be elevated to Necessary Actions. OCRM will consider the findings in this evaluation document when making future financial award decisions relative to WBNERR.

B. DOCUMENT REVIEW AND ISSUE DEVELOPMENT

The evaluation team reviewed a wide variety of documents prior to the site visit, including: (1) the 2004 WBNERR final evaluation findings; (2) the federally-approved

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Environmental Impact Statement and program documents; (3) financial assistance awards and work products; (4) semi-annual performance reports; (5) official correspondence; and (6) relevant publications on natural resource management issues in Massachusetts.

Based on this review and on discussion with OCRM, the evaluation team identified the following priority issues:

- WBNERR's major accomplishments during the review period;
- Status of WBNERR's general administration, including grants, financial management and staffing;
- Status and visibility of research, monitoring, 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 and operation;
- Status of the management plan revision;
- Status of WBNERR's coordination with other federal, state and local agencies;
- WBNERR's role with local communities and its integration with partners; and
- Manner in which DCR and WBNERR have addressed the recommendations contained in the previous §312 evaluation findings released in 2004. WBNERR's assessment of how it has responded to each of the recommendations in the 2004 evaluation findings is located in Appendix B.

C. SITE VISIT TO WBNERR

Notice of the scheduled evaluation was sent to DCR, WBNERR, relevant federal regulatory and environmental agencies, members of Massachusetts' congressional delegation and regional newspapers. In addition, a notice of OCRM's "intent to evaluate" was published in the Federal Register on February 27, 2007.

The site visit to Massachusetts was conducted on May 8-10, 2007. Ms. Rosemarie McKeeby, Evaluation Team Leader, OCRM National Policy and Evaluation Division; Ms. Doris Grimm, WBNERR Specialist, OCRM Estuarine Reserves Division; and Ms. Sharon McKenna, Assistant Manager, Jacques Cousteau NERR (New Jersey) composed the evaluation team.

During the site visit, the evaluation team interviewed WBNERR staff, senior DCR officials, and representatives from other state agencies, local governments, nongovernmental organizations, community groups, academia and research institutions. Appendix C lists people and institutions contacted during this review.

As required by the CZMA, OCRM held an advertised public meeting on May 8, 2007, at 6:00 p.m., at the WBNERR Visitors' Center, 149 Waquoit Highway, East Falmouth, Massachusetts. The meeting gave members of the general public the opportunity to express their opinions about the overall operation and management of WBNERR. Appendix D lists individuals who registered at the meeting. OCRM's responses to written comments submitted during this review are summarized in Appendix E.

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The evaluation team gratefully acknowledges the critical support of WBNERR staff with the site visit planning and logistics.

III. RESERVE DESCRIPTION

NOAA's Office of Ocean and Coastal Resource Management (OCRM) designated the Waquoit Bay National Estuarine Research Reserve (WBNERR) in 1988. The Massachusetts Department of Conservation and Recreation (DCR) is the administrative lead agency for the reserve. As such, DCR provides matching funds for OCRM financial assistance awards and is responsible for WBNERR's operations and management. WBNERR is positioned within DCR's Division of State Parks and Recreation.

WBNERR is located on the south shore of Cape Cod, Massachusetts, in the towns of Falmouth and Mashpee. Waquoit Bay serves as a nursery and home to a variety of finfish; it also supports a cadre of diadromous fish. Invertebrates commonly found in the bay include quahogs, soft-shell clams and blue crabs. Waquoit Bay also maintains populations of sea ducks, ospreys and harbor seals.

WBNERR includes approximately 300 acres of salt marsh. Estuarine channels and tidal creek habitats link the open bay to smaller, more tidally-restricted salt ponds and associated marshes. The reserve's channels and tidal creek beds are home to ribbed mussels, blue crabs and lady crabs.

Approximately two and half miles of beach and sand dunes extend along the southern shore of the reserve's Washburn Island and South Cape Beach State Park. A portion of South Cape Beach is used for public recreation, and the rest is undeveloped. Freshwater marsh species at the beach include the common cattail, reed grass, twig rush and water lily. The marshes sustain a variety of waterfowl as well as upland species such as game and song birds, opossums, raccoons and white-tailed deer.

Coastal plain streams are important sources of water for upland species and are prime habitat for fish, turtles, ducks and geese. At WBNERR, the Quashnet River supports alewife, blueback herring and American eel. The river also maintains one of the last remaining sea-run brook trout populations in the country.

In addition to aquatic resources, the reserve encompasses more than 1,200 acres of uplands, including pine barrens and sandplain grasslands. Barrens typically include a dense understory of scrub oak and huckleberry beneath pitch pines, and patches of blueberry, bearberry, sweetfern and lichen often grow between the oaks. Sandplain grasslands contain a variety of prairie grasses and the bird's foot violet.

IV. REVIEW FINDINGS, ACCOMPLISHMENTS AND RECOMMENDATIONS

A. OPERATIONS AND MANAGEMENT

1. Staffing

Reserve staff are responsible for the Waquoit Bay National Estuarine Research Reserve's (WBNERR) on-site development and daily operations and management. Permanent reserve staff at the time of the site visit included the Reserve Manager, Research Coordinator, Assistant Research Coordinator, Geographic Information System (GIS) Coordinator, Education Coordinator, Outreach Educator, Coastal Training Program (CTP) Coordinator, Volunteer Coordinator, Events Coordinator,¹ Facilities Supervisor and Facilities Repairer. In the summer, WBNERR's permanent staff is augmented by seasonal staff, including two Island Managers, a Shorebird Manager, an Interpretive Naturalist, two Science School Directors,² a seasonal laborer, four summer workers and five lifeguards. WBNERR is fortunate to have a very professional, enthusiastic staff. Their commitment to their work was evident throughout the site visit and was a critical factor in the progress that the reserve made during the review period.

The Massachusetts Department of Conservation and Recreation (DCR) made several improvements in hiring and staffing at the reserve since the last evaluation. First, recognizing WBNERR's unique requirements, DCR appointed a specific Human Resources Liaison to work with the reserve. The liaison serves as WBNERR's single point of contact for hiring questions and information about the status of particular vacancies. The appointment has significantly improved communication about human resources issues between the reserve and DCR. WBNERR is the only site within DCR's Division of State Parks and Recreation that works directly with a Human Resources Liaison; all other state parks must address human resources issues through the appropriate regional structures.

As noted previously, WBNERR's operations depend upon a significant complement of seasonal staff each summer. The reserve advertises its seasonal positions in winter and selects its preferred candidates in early spring. In WBNERR's 2004 evaluation findings, the evaluation team noted that by the time the reserve received approval from DCR to fill seasonal vacancies, the best candidates had often accepted other positions. During the current review period, DCR began providing the reserve with the annual seasonal staff roster earlier each year. This has greatly improved WBNERR's ability to fill seasonal vacancies with its preferred candidates.

¹ The Events Coordinator and Volunteer Coordinator are job-sharing positions that are equivalent to one full-time position.

² The Science School Directors are supported by the Citizens for the Protection of Waquoit Bay, the reserve's Friends Group.

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Accomplishment: DCR made improvements in hiring and staffing at the reserve. The department appointed a specific Human Resources Liaison to work directly with WBNERR and also began providing the reserve with the annual seasonal staff roster earlier each year.

While the seasonal hiring process at DCR has improved, serious delays in filling other positions at the reserve continue. During the review period, some positions remained vacant for more than a year before they were filled. At the time of the evaluation site visit, the reserve had seven unfilled positions: Fiscal Administrator, administrative intern, Research Technician, research intern, Stewardship Coordinator, stewardship intern and laborer.³ Clearly, a significant number of vacancies that take a great deal of time to fill creates a hardship for existing staff, who are expected to continue to provide the reserve's full complement of programs and services. During the site visit, the evaluation team discussed this issue with DCR's State Parks Cape Cod District Manager and WBNERR's Human Resources Liaison. It appears that the delays are an agency-wide issue resulting from a complicated hiring system that requires clearance from many people not only in DCR, but also throughout the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA).⁴ All positions, regardless of funding source or duration, are subject to the same hiring system. The reserve's Human Resources Liaison noted that a consultant was assessing EOEEA's hiring system.

1. Program Suggestion: While recognizing that DCR's ability to affect the hiring system required by EOEEA is limited, the Office of Ocean and Coastal Resource Management (OCRM) continues to urge that the department explore potential methods of reducing the time that positions at the reserve remain unfilled. In order to ensure continuity of the reserve's programs and services, vacancies should be filled as expeditiously as possible.

During the site visit, reserve staff, DCR leadership and the evaluation team discussed perceptions of staff turnover at the reserve. For example, to much of DCR's leadership, it appears that WBNERR experiences high staff turnover. This view is understandable; indeed, WBNERR does have greater staff turnover than most state parks. However, as a NERR, the reserve has positions available in research, education and stewardship that are excellent opportunities for young people just beginning their careers. It is to be expected that after spending a few years in such positions, people will move on to the next steps in their respective career paths. In contrast, key professional positions at the reserve such as the Reserve Manager, Research Coordinator, Education Coordinator, CTP Coordinator and Stewardship Coordinator do not experience the same degree of turnover as the other positions.

³ Following the evaluation site visit, DCR filled four of the vacant positions, including the Fiscal Administrator.

⁴ EOEEA is the umbrella agency that contains DCR and other environmental departments in Massachusetts.

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2. Facilities

Headquarters Site

WBNERR's headquarters site, often referred to as the Sargent Estate, is located at the head of Waquoit Bay. Built between 1880-1890 in the Shingle Style of late Victorian construction, the main house has sixteen rooms. The Sargent family used the house as a "summer cottage" until it was damaged by a hurricane in 1938. Subsequently, the main house remained unoccupied for nearly 50 years until it was acquired by the Commonwealth of Massachusetts in 1987. In addition to the main house, the Sargent Estate includes a carriage house, gate house and boat house that the reserve has adapted for its use.

Main House: The Main House serves as WBNERR's Visitors' Center. The first floor contains a large meeting room, an exhibit center and some storage space. The second floor provides office space for reserve staff. The house's cellar and attic are used for storage.

Carriage House: Primarily used for research, the Carriage House features a large space that is set up as a classroom and laboratory. It also includes a shower room, furnace room, two-bay storage area, shop area and office. The building sits on a concrete slab and has attic storage space.

Gate House: The Gate House mainly serves as a dormitory for visiting students and researchers. The house has two floors with a small cellar and attic. The Gate House includes a kitchen, sitting room, bathrooms and sleeping accommodations for 12.

Boat House: The Boat House features a large space that functions as a library and meeting room. It also includes some office space. The cellar is used to store boats and research equipment.

South Cape Beach State Park

The 462-acre South Cape Beach State Park contains several facilities within its intensive recreational use area, including beachfront, boardwalks, a contact station and a 200-car parking lot. The park also features several trails used by the reserve's Education and Outreach Program.

Washburn Island

The 286-acre Washburn Island includes a variety of trails as well as several unimproved camping areas.

WBNERR's 2004 evaluation findings recommended that the reserve analyze future facility needs and incorporate those needs into a revised facilities plan. In accordance with that suggestion, WBNERR updated its facilities plan and included it as part of the revised management plan. Based on its analysis, the reserve plans to pursue three major construction projects: a conference center, a dock and a maintenance shop.

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WBNERR currently has limited meeting space in the Main House and Boat House; 25 people can be seated at tables, and 60 can be accommodated with stadium-style seating. However, with the successful Massachusetts CTP drawing increasingly larger audiences, the reserve frequently finds itself unable to host meetings and workshops at its facilities. Thus, WBNERR plans to add a conference center that will include meeting space for at least 125, a kitchen, storage and additional office space. The center will be constructed according to green building principles and will incorporate environmentally-sustainable features such as bamboo flooring, solar heating and energy-efficient appliances.

A fixed or floating dock in front of the Boat House would provide the reserve with convenient vessel access as well as with a research platform. During the site visit, the evaluation team witnessed the limitations of WBNERR's existing boat access. Currently, before researchers can begin loading their equipment, they must maneuver a dinghy from the beach into the water, row to a moored boat, attach the dinghy to the boat, and bring the boat and dinghy to shore in order to pull the dinghy onto the beach. A dock would afford researchers with a more efficient means of accessing the reserve's boats. The dock would also serve as a research platform for a variety of scientific instruments.

During discussions about the reserve's need for a dock, WBNERR staff noted that gaining regulatory approval may be difficult due to Waquoit Bay's designation as a Massachusetts Area of Critical Environmental Concern (ACEC).⁵ New, private docks and piers are prohibited within ACECs that do not have approved resource management plans. Currently, the Waquoit Bay ACEC does not have such a plan. The towns of Falmouth and Mashpee are responsible for developing a resource management plan for the Waquoit Bay ACEC. Reserve staff noted that if the towns decide to develop an ACEC resource management plan, the reserve will work with them to create a plan that protects the area's critical resources while allowing for a research dock.

Given the challenges in obtaining regulatory approval for a new private dock on Waquoit Bay, the reserve has begun to consider other options. For example, as the categorical restriction on new docks does not apply to public water-dependent structures, one option is to seek approval for a public dock. Unfortunately, public access conflicts with the need to safeguard the integrity of ongoing research at the reserve. Increased public access to the water would also be difficult to accommodate due to the availability of parking and landside access.⁶ Other options include seeking a variance from the Massachusetts Department of Environmental Protection (DEP) or obtaining a permit for a floating dock.

⁵ ACECs are places that receive special recognition because of the quality, uniqueness and significance of their natural and cultural resources. These areas are nominated at the community level and are reviewed and designated by the EOEEA Secretary.

⁶ The only access to the waterfront at WBNERR is down a narrow, steep staircase.

2. Program Suggestion: OCRM encourages WBNERR to continue its assessment of the feasibility of constructing a dock at reserve headquarters. As part of the assessment, WBNERR should systematically examine all practical alternatives, including potential partnerships that might allow the reserve to share use of an existing structure.

WBNERR's construction plan also highlights the need for an expanded maintenance shop that could accommodate the reserve's larger vessels. Currently, there is no indoor space in which to scrape and paint hulls or to maintain outboard motors. Additionally, the reserve's trucks are kept outside, which makes winter maintenance, such as attaching and removing snow plows, difficult.

3. Management Plan

The National Estuarine Research Reserve System (NERRS) regulations require each reserve to have an OCRM-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 the 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 also describe the reserve's intended strategies for research, education and interpretation, public access, construction, acquisition and resource preservation, and restoration. Additionally, the plan is required to describe staff roles in each of these areas.

WBNERR completed its revised management plan in 2006. The plan describes the reserve's history, assets, programs and administrative structures. It also outlines a strategy for achieving the reserve's mission over the next five years. According to the revised management plan, WBNERR's mission is to improve the stewardship of the region's estuarine and coastal watershed ecosystems. The reserve's vision is to be recognized as a vital regional resource for coastal management expertise provided through: (1) coastal ecosystem research and monitoring; (2) management and stewardship; and (3) education and training for coastal communities, organizations and individuals. WBNERR's goals are to:

- Improve the understanding of coastal ecosystems and the human influences on them;
- Improve environmental literacy in communities to enable environmentally-sustainable decision-making;
- Demonstrate sustainable stewardship of land and water ecosystems within the reserve to serve as a model for community stewardship in the region;
- Foster dialogue and development of coastal ecosystem management solutions through sustained community engagement; and
- Improve the operations, infrastructure and stature of the reserve.

Accomplishment: WBNERR produced a well-written revised management plan within the prescribed timeframe. The comprehensive plan will provide overarching guidance for the reserve as it continues to evolve. Such planning and guidance will allow WBNERR to operate proactively and to respond to challenges and emerging issues more effectively.

4. Reserve Advisory Committee

In the NERRS, Reserve Advisory Committees (RAC) play an important role in the federal-state partnership. Generally, the purpose of a RAC is to counsel a reserve's lead state agency regarding the preparation and implementation of specific reserve plans. A RAC composed of diverse and dedicated individuals also can significantly assist a reserve in furthering its mission and increasing its visibility.

WBNERR has not had a functioning RAC in place for some time. According to the reserve's 2006 management plan, WBNERR's original RAC was especially useful during the reserve's initial years. Over time, the needs of the reserve changed, and the RAC became less involved with the reserve's activities. Following a three-year period during which the RAC did not meet, WBNERR initiated a process to re-establish a RAC with broader membership and new objectives. The reserve submitted a list of RAC nominees to the DCR Commissioner and EOEEA Secretary for approval in 2003. Unfortunately, the effort to reconstitute the RAC stalled during the current review period. In addition to the benefits described above, a WBNERR RAC with a diverse membership that includes local representatives could further strengthen the reserve's links to the community and local involvement in the reserve.

3. Program Suggestion: OCRM strongly recommends that WBNERR and DCR take the steps necessary to re-establish a representative RAC as soon as possible.

5. Grants Management

OCRM awards grants to federally-approved reserves for operations and management, research and monitoring, education and outreach, stewardship, construction and acquisition. During the review period, WBNERR satisfactorily managed its federal funding, achieved desired results from funded tasks and successfully built upon established projects. OCRM also requires reserves to submit semi-annual performance reports for each grant; the reports present consolidated information about accomplishments related to a reserve's financial assistance awards. WBNERR submitted performance reports containing necessary information on schedule during the review period.

6. Coordination and Communication

WBNERR coordinates well among its programs and with external partners. The reserve's staff collaborate with and assist one another with program planning and

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implementation, resulting in the integration of WBNERR's core programs. During the site visit, the evaluation team was pleased to see key linkages among the programs that are essential to the reserve's mission. WBNERR also emphasizes coordination with external partners such as universities, state agencies, local governments and communities. Evaluation participants often praised the reserve's expertise and collaborative approach as well as the work achieved as a result of WBNERR's assistance.

During the review period, WBNERR and the Massachusetts Coastal Zone Management Program (MCZMP) significantly improved their coordination and communication with each other. For example, WBNERR, DCR and MCZMP collaborated on an assessment of the reserve's placement within the department. MCZMP and WBNERR began participating in each other's administrative meetings. The reserve has also included MCZMP in its Research Advisory Group. The Reserve Manager and the Research Coordinator gave a presentation about WBNERR's programs to MCZMP. They also scheduled additional meetings to ensure coordination of the reserve and coastal program in areas such as research, coastal decision-maker training and habitat restoration.

Accomplishment: WBNERR and MCZMP significantly improved their coordination and communication with each other during the review period.

While encouraged by WBNERR's improved coordination and communication with MCZMP during the review period, the evaluation team noted that a significant opportunity remains for the reserve to improve communication with other parts of EOEEA. For example, a week before the evaluation site visit, the Massachusetts CTP held a workshop on financing wastewater solutions for Cape Cod that attracted more than 125 local decision-makers. The workshop and resulting information likely would have been of great interest and pertinence to other parts of EOEEA, such as appropriate DEP leadership and staff. WBNERR is a leader in efforts to address critical coastal management issues such as climate change and eutrophication, and DCR's sister agencies within EOEEA should be aware of the reserve's relevant programs. WBNERR and DCR should identify where communication between the reserve and other parts of EOEEA may occur directly, instead of through DCR's considerable chain of command.

4. Program Suggestion: OCRM strongly recommends that DCR and WBNERR work together to improve communication among the reserve and DCR's sister agencies within EOEEA.

B. RESEARCH AND MONITORING PROGRAM

WBNERR fosters research on coastal ecosystems by providing a dedicated, stable environment as a platform for scientific investigations. The reserve's Research and Monitoring Program offers researchers an estuarine base of operations, facilities and a range of logistical support. The program maintains an extensive research archive with environmental and societal data that provide a detailed context for research. The Research and Monitoring Program also obtains information about key regional coastal management issues to help focus research on community needs. Subsequently, research

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results supply feedback to the reserve's adaptive resource management activities and are incorporated into WBNERR's education and training programs. The Research and Monitoring Program's current priorities are: (1) water quality, eutrophication and watershed land-use; (2) climate change, sea level rise and shoreline change; and (3) ecosystem response to natural variability and human impacts.

1. System-wide Monitoring Program

Participation in and contribution to system-wide efforts such as planning, development and implementation are important aspects of being part of the NERRS. National programs and initiatives are developed in collaboration with all reserves and OCRM. One example of such an effort is the System-wide Monitoring Program (SWMP). The goal of SWMP is to identify and 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 reserves the flexibility to assess coastal environmental management issues of regional or local concern. Designed to enhance the value and vision 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:

- **Abiotic Variables:** SWMP 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 the Centralized Data Management Office (CDMO) at the University of South Carolina's Belle W. Baruch Institute for Marine Biology and Coastal Research. The CDMO provides additional quality control for data and metadata. It also compiles and disseminates the data and summary statistics via the Internet,⁷ where researchers, coastal managers and educators can readily access the information.
- **Biotic Variables:** As funds become available, the reserve system 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 changes over space and time. Other aspects that could be incorporated include monitoring of infaunal benthic communities and plankton communities.
- **Habitat Mapping and Change:** This component of SWMP will be developed to identify changes in coastal ecological conditions with the goal of tracking and

⁷ <http://cdmo.baruch.sc.edu>.

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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.

During the review period, the Research and Monitoring Program maintained four long-term SWMP water quality stations and one weather station. Staff: (1) conducted monthly nutrient sampling and analysis at the water quality stations; (2) applied quality assurance, quality controls and data management consistent with SWMP protocols; and (3) made timely submissions to the CDMO. WBNERR's SWMP is the framework that allows the reserve to serve as a natural laboratory. The program supplies real-time and archived meteorological and water quality information to reserve staff, visiting researchers and surrounding communities. WBNERR's SWMP currently includes all three components:

- **Abiotic Variables:** The reserve's four long-term water quality monitoring stations measure temperature, conductivity, salinity, dissolved oxygen, water level, pH, turbidity and fluorescence every 30 minutes. Monthly sampling to measure dissolved nitrogen, dissolved phosphorus and chlorophyll occurs at one of the stations. The meteorological station measures air temperature, relative humidity, barometric pressure, wind speed and direction, precipitation and photosynthetically-active radiation every 15 minutes.
- **Biotic Variables:** During the review period, the Research and Monitoring Program began monitoring biotic variables through periodic surveys of the reserve's salt marsh and macroalgae using aerial imagery and GIS mapping. The program expects to repeat the surveys, which are designed to detect change over time, at two- to five-year intervals.
- **Landuse and Habitat Mapping and Change:** The reserve's periodic salt marsh and macroalgae surveys are also useful for habitat mapping and change.

2. Graduate Research Fellows

The NERRS Graduate Research Fellows (GRF) Program supports management-related research projects that enhance scientific understanding of the reserve system, provide information needed by reserve managers and coastal decision-makers, and improve public awareness and understanding of estuarine ecosystems and management issues. 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. Each reserve is provided funding to support up to two fellows at a time, and 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 reserves. Research priorities include:

- The effects of nonpoint source pollution on estuarine ecosystems, and the role of estuarine ecosystems in mitigating this pollution;
- Evaluative criteria and/or methods for estuarine ecosystem restoration;

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- The importance of biodiversity and the effects of invasive species on estuarine ecosystems;
- Mechanisms for sustaining resources within estuarine ecosystems; and
- Socioeconomic research on estuarine ecosystems.

GRFs work with the host reserve's Research Coordinator to develop a plan for participation in the reserve's Research and Monitoring Program. Fellows are asked to provide up to 15 hours a week of research assistance to the host reserve.

WBNERR supported six GRFs during the review period. The Research Coordinator recruited and advised potential GRF applicants. He also engaged the reserve's outgoing GRFs in discussing their research findings. Examples of GRF projects at the reserve include "Macroalgal blooms in Waquoit Bay: the relative influence of nitrogen loads and grazers and links to watersheds," "Species-specific patterns in bivalve larval supply to Waquoit Bay," and "The influence of land use within the Waquoit Bay watershed on the quantity and lability of organic nitrogen to estuaries." It is also notable that beginning in July 2007, the Research and Monitoring Program will host one of five recipients of the NERRS' first social science fellowship opportunity. WBNERR's social science fellow will investigate "Climate as common ground: outreach and research with religious institutions to enhance environmental literacy and stewardship in the Waquoit Bay area." OCRM recognizes the Research and Monitoring Program for hosting high-quality GRFs during the review period and encourages it to continue recruiting strong graduate researchers to the reserve.

3. Geographic Information System

WBNERR's GIS Coordinator is responsible for accurately maintaining GIS data produced by the reserve. Collected through geographic positioning systems, remote sensing and calibration, the data occurs in a variety of formats and is documented according to Federal Content Standards for Digital Geospatial Data. In addition to data maintenance, the GIS Coordinator assists all reserve staff in using the data by producing maps that are used for research, education, stewardship and planning.

The Research and Monitoring Program supports local GIS users by coordinating periodic Upper Cape GIS meetings that promote discussion, data exchange and problem solving between town governments and organizations such as the U.S. Geological Survey (USGS). The GIS Coordinator also assists local organizations with complementary missions. For example, the GIS Coordinator produced maps in support of the Falmouth Coastal Resources Working Group, a body formed by the Town Selectmen in response to growing concern about beach erosion and shoreline maintenance costs.

Additional examples of the Research and Monitoring Program's GIS work during the review period include:

- Researching available habitat cover data sets and beginning habitat classification in the reserve using the NERRS Habitat Classification System;

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- Merging and editing submerged and emergent vegetation datalayers in preparation for inclusion in the reserve's habitat classification maps; and
- Editing existing datalayers with upgraded ArcInfo software that allows greater accuracy and data integrity.

Accomplishment: The application of GIS at the reserve has enhanced the precision and usefulness of data produced for ongoing projects such as habitat classification.

4. Research Partnerships

Emphasis on partnerships and collaboration is a strength of the Research and Monitoring Program. Research at the reserve is conducted: (1) internally by Research and Monitoring Program staff; (2) externally by visiting scientists; and (3) collaboratively between the reserve and other institutions. The primary objective of internal research and monitoring is to maintain the reserve as a natural laboratory by providing critical environmental and societal information about Waquoit Bay. External research topics range from basic research on biology and the physical environment to applied research on specific coastal management questions. Collaborative research focuses on filling information gaps identified by the reserve or on addressing regional coastal management issues.

The Research Coordinator proactively tracks the reserve's many research projects. At the time of the evaluation site visit, 30 investigative research projects were underway at the reserve: 8 internal, 13 external and 9 collaborative. Examples of innovative research investigations at the reserve include developing a reactive barrier for remediating nitrogen in groundwater and real-time plankton identification.

Cooperative research efforts with universities and other institutions highlight WBNERR as an excellent site for coastal research while also increasing awareness of coastal resource management needs within the research community. The Research and Monitoring Program maintains relationships with many academic and private research institutions, as well as with government agencies engaged in coastal science. When exploring research partnerships and collaborative efforts, the Research and Monitoring Program promotes the reserve's expertise in providing effective education and outreach for research results. Some of the Research and Monitoring Program's partners include the University of Massachusetts at Boston, Boston College, Boston University, Woods Hole Oceanographic Institution, MCZMP, Massachusetts Division of Marine Fisheries (DMF), USGS and Buzzards Bay National Estuary Program. During the evaluation site visit, the Research and Monitoring Program noted that it was working to further expand and improve its links with DCR, MCZMP, DMF and other science institutions. OCRM recognizes the Research and Monitoring Program for its emphasis on collaboration and encourages it to continue its efforts to broaden and strengthen its many partnerships.

Accomplishment: The Research and Monitoring Program engages in many collaborative partnerships and attracts high-caliber, innovative research to the reserve. A significant amount of research at the reserve is conducted by external researchers.

C. EDUCATION AND OUTREACH PROGRAM

WBNERR has a strong Education and Outreach Program that strategically targets diverse audiences. The program offers teacher training courses, in-service teacher training, classroom programs and field work. The Education and Outreach Program's primary objective is to increase individuals' understanding of estuarine systems and their own role as coastal stewards. Promoting scientific literacy is a secondary purpose of the program. The Education and Outreach Program's offerings also adhere to the Massachusetts Frameworks for Science Education and link programs and lessons to key academic concepts identified by the state. Program staff involve students and other learners in inquiry-oriented investigations where they interact with their teachers and peers. While teachers are a major target audience for the Education and Outreach Program, it also works with students from elementary through undergraduate levels and offers a variety of opportunities for community members to learn about coastal topics.

1. K-12 and Professional Teacher Development

The Education and Outreach Program's K-12 offerings focus on geology and coastal processes, eutrophication, climate change and renewable energy, which correlate with the reserve's research priorities. The K-12 education programs emphasize learning by addressing real environmental issues and interacting with natural phenomena, including regular comparisons between Waquoit Bay and the students' home ecosystems. For example, education staff use topographic maps to introduce coastal habitats or to demonstrate proper siting for a wind turbine. They then teach the students to use topographic maps of their own areas.

Technology education, including collecting, analyzing, and interpreting data is another important aspect of the reserve's K-12 education programs. Technology education provides links to SWMP, the Integrated Ocean Observing System and a content area that Massachusetts' teachers are required to present. For example, the Education and Outreach Program incorporates SWMP data into math and science classes offered at the reserve. Exercises using SWMP data introduce students to the types of data available through the NERRS and allow them to practice analysis and interpretation. Students are then encouraged to develop their own questions and comparisons using SWMP data.

The Education and Outreach Program strongly emphasizes professional teacher development and offers a variety of high-quality teacher training opportunities, including graduate credit courses. The program also targets pre-service teachers to help them incorporate estuarine and coastal elements into their curricula. Teacher training programs highlight topics such as renewable energy, climate change, coastal processes, eutrophication and estuarine ecology. Additionally, the Education and Outreach Program

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encourages teachers to understand and model good stewardship behavior. Therefore, lessons for both summer teacher training programs and in-service training emphasize stewardship behavior and focus on local issues. The local focus ensures that lessons are relevant and useful to teachers engaging students in real-world problem solving.

Accomplishment: The Education and Outreach Program offers high-quality K-12 education and professional teacher development that are closely correlated with the reserve’s research priorities as well as with state education standards. K-12 programs engage students in learning by addressing significant regional environmental issues and by incorporating data and findings from the Research and Monitoring Program. The Education and Outreach Program also targets pre-service teachers to help them incorporate estuarine and coastal elements into their curricula.

2. Coastal Training Program

CTP is an important aspect of a reserve’s Education and Outreach Program. The program is designed to: (1) inform coastal decision-making; (2) improve coastal stewardship at local and regional levels by increasing the application of science-based knowledge and skills by coastal decision-makers; and (3) increase dialogue and collaboration among coastal 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, prioritizing target audiences, and creating a marketing plan.

CTP at WBNERR is known as the Massachusetts CTP (MCTP), and it represents a close partnership among the reserve, MCZMP and Woods Hole Oceanographic Institution Sea Grant Program. MCTP’s mission is to foster sound science-based coastal decision-making by serving as a link between research, education, policy and local communities. MCTP activities include targeted training and education that is directly responsive to the needs of the coastal management community and provides the best available information.

MCTP is directed by the WBNERR-based CTP Coordinator in association with a Steering Committee that includes representatives from MCZMP and Woods Hole Oceanographic Institution Sea Grant Program. The MCTP Advisory Group, which consists of nine local coastal leaders in science, management, advocacy and education, assists the Steering Committee. The Advisory Group, which meets with the Steering Committee several times a year, serves a variety of functions: (1) helping to set MCTP priorities and developing workplans; (2) identifying education and training needs throughout the state; (3) exploring effective ways to publicize and promote coastal training opportunities; and (4) collaborating on future MCTP activities.

MCTP uses assessments and evaluations to improve the program’s ability to meet audience needs. Identifying the coastal management community’s priority training needs is one of the MCTP Coordinator’s primary responsibilities. Therefore, she maintains

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regular dialog with the Steering and Advisory Committees and other key partners in the fields of coastal management, science, education and advocacy. The MCTP Coordinator also works with the reserve research and stewardship staff and other contacts within the scientific community to stay abreast of emerging science and technology. Additionally, MCTP undertakes both informal and formal needs assessments to help the program provide current and targeted information to coastal decision-makers. For example, the Steering Committee completed a market analysis to inventory coastal training providers and conducted three separate formal audience assessments to determine the needs of local government officials, nonprofit organizations and shellfish aquaculturists.

Information gathered through informal and formal needs assessments is used to shape MCTP activities. Following a workshop or event, staff evaluate the degree to which the program satisfied audience needs. Program evaluations help MCTP to provide better training programs in the future and to identify new training topics. At the conclusion of each workshop, all participants are asked to complete an evaluation form that incorporates the reserve system-wide evaluation criteria. Staff also make note of significant discussion points and analyze the evaluations to learn which aspects of the workshop were most appreciated, which could be enhanced, and what other topics or formats should be considered.

MCTP has been very successful in providing scientific data, practical training and outreach materials on topics such as wastewater management, coastal landscaping using native plants, management of docks and piers, salt marsh restoration, atmospheric nitrogen deposition, nutrient loading and eutrophication, renewable energy use, and local initiatives to respond to global climate change. For example, in order to improve coastal water quality, CTP has assisted communities to improve their understanding of nitrogen loading by providing training on the following topics: Cape Cod watershed management, Massachusetts Wetlands Protection Act, nitrogen from the air, septic systems and alternatives, Cape Keepers Speakers Bureau and From Your Backyard to the Bay course, stormwater workshops, and wastewater financing. Key outcomes of these training sessions include:

- Supporting the Cape Cod Water Protection Collaborative;
- Supporting development of the Cape Keepers Speakers Bureau;
- Facilitating development of solutions to Cape Cod's wastewater problem; and
- Increasing attention to the role of atmospheric deposition in nitrogen loading.

To strengthen the breadth and depth of MCTP offerings, the program continually seeks to develop new strategic partnerships. For example, during the review period, MCTP began an exciting new partnership with the Massachusetts Association of Conservation Commissions (MACC). The Association is dedicated to supporting and training conservation commissions throughout the state, including 78 coastal conservation commissions. The MACC realized that it was not supporting coastal conservation commissions adequately, so it conducted a detailed needs assessment with WBNERR as a key partner. As a result, MCTP and MACC are developing a detailed training course targeted specifically at coastal conservation commissioners. The MACC partnership

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serves as one example of how MCTP works with partners to develop training courses and to expand the geographic reach of its programs through partners' existing networks of coastal decision-makers.

Accomplishment: MCTP is a strong partnership among WBNERR, MCZMP and Woods Hole Oceanographic Institution Sea Grant Program. The program holds successful coastal decision-maker workshops on key coastal issues, fosters increased communication and understanding among its target audiences, and develops innovative new partnerships.

3. Community Education

The goal of the reserve's community education efforts is to foster behavioral change that leads to resource conservation and advances the mission of the reserve. Thus, community education targets audiences whose personal choices directly impact the integrity of the Waquoit Bay Estuary and its associated watershed. Events like the reserve's Watershed Block Party are intended to raise awareness of environmental issues and values. Activities also include in-depth courses for community members such as "Cape-Friendly Landscaping" and "Green Home and Business: Focus on Energy."

The Community Education Program provides a variety of interpretive opportunities. For example, the Junior Ranger Program is part of a statewide summer program for children eight to twelve years old. During "Creature Feature," staff set up a table at South Cape Beach State Park to reach people who ordinarily would not visit the reserve's headquarters. "Saturday Open House" was instituted to bring families into the Visitors' Center to learn about WBNERR's core programs.

The Community Education Program also offers several activities that it categorizes as "environmental entertainment." For example, "Evenings on the Bluff," sponsored by the Citizens for the Protection of Waquoit Bay, feature professional entertainers who use songs, stories or comedy to convey environmental information. Generally, one "Evening on the Bluff" each season is presented by members of the Wampanoag Tribe and includes traditional song and dance as well as a discussion of the tribe's relationship to Waquoit Bay.

During the review period, Education and Outreach Program staff attended and sponsored several training events on how to use a more targeted, results-oriented, research-based approach to community education. As a result, staff has begun engaging in more complete planning and follow-up for each program. For example, the Education and Outreach Program is increasing the use of community-based social marketing, which encourages behavior change through programs that: (1) identify barriers; (2) apply the tools of behavior change, commitment, prompts, norms, communication and incentives; and (3) remove external barriers. At the time of the evaluation site visit, Education and Outreach Program staff also noted that they were considering methods of reaching traditionally underserved audiences.

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4. Volunteer Program

Volunteers can be a great asset to a reserve, providing critical support for operations and programming. Among other tasks, volunteers can assist permanent staff with: (1) operating the Visitors' Center, (2) performing administrative tasks, (3) assisting with facility maintenance and public access improvement projects, (4) assisting with research and monitoring projects, and (6) serving as RAC members. Additionally, as a strong link to the local community, volunteers also can provide invaluable outreach for a reserve. WBNERR has a formal Volunteer Program, and volunteers support many programs at the reserve. They participate in water quality and shorebird monitoring and act as trail stewards and docents. Volunteers also help organize events, provide administrative support and assist with maintenance activities.

The Volunteer Program actively recruits volunteers each spring through press releases, articles in local publications, recruiting events, open houses and community education events. WBNERR's Volunteer Program also has strong partnerships with the Senior Environmental Corps and AmeriCorps Cape Cod. Representatives from both groups met with the evaluation team and described the benefits of partnering with the reserve.

In collaboration with WBNERR's other programs, the Volunteer Program provides many training opportunities to ensure that volunteers fully and accurately represent the reserve to the public. Training activities include informational sessions with staff, courses on the reserve's priority issues, and workshops describing the reserve's core programs. Volunteers receive WBNERR's site profile as well as a training manual for Visitors' Center docents. Several volunteers noted that they felt very comfortable with the training they received before participating in reserve events and programs.

WBNERR has between 125-150 volunteers ranging in age from 12-90. At the time of the evaluation site visit, the Volunteer Coordinator was examining the reserve's volunteer list to determine which of the volunteers are currently active. The Volunteer Coordinator also noted that she had begun to place greater emphasis on recruitment, retention and recognition of volunteers. She was also exploring possibilities for targeting new partners, such as birding groups on Cape Cod, for special projects. OCRM recognizes WBNERR for operating a formal Volunteer Program and encourages the reserve to continue its recent efforts to enhance the program and to develop new program partnerships.

D. STEWARDSHIP PROGRAM

WBNERR's Stewardship Program works to protect Waquoit Bay's resources through zoning, regulatory mechanisms, land management, managed public access, restoration and acquisition. Adaptive natural resource management at the reserve is guided by research results and is shared throughout the region through education and training. The reserve also serves as a model of resource management practices for similar coastal areas throughout the region.

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During the current evaluation review period, WBNERR's long-time Reserve Manager retired, and the Stewardship Coordinator subsequently was promoted to Reserve Manager. Following his promotion, the Stewardship Program was without a Stewardship Coordinator for the remainder of the review period. The Stewardship Coordinator was one of seven vacancies at the reserve at the time of the evaluation site visit. As noted previously in these findings, OCRM expects that WBNERR and DCR will work to fill the Stewardship Coordinator position, as well as the other existing vacancies at the reserve, as quickly as possible.

1. Land Acquisition

Research at WBNERR has shown that land-use change, particularly residential development, in the Waquoit Bay Watershed has resulted in drastic impacts to estuarine resources. Thus, the preservation of undeveloped land in and around the watershed is a key component of the reserve's Stewardship Program. Land acquisition by the reserve provides increased opportunities for research and education activities. It also benefits coastal communities by preserving aesthetic values, controlling recreational access, limiting increases in traffic, and protecting drinking water resources. WBNERR's land acquisition activities are implemented in conjunction with the Mashpee National Wildlife Refuge Conservation Partnership.

With the approval of its revised management plan in 2006, WBNERR added nearly 100 acres of newly-acquired land to the reserve's boundary:

- Two Childs River properties totaling 19 acres located just upstream of tidal influence. The properties include coastal pine and oak woodland habitat as well as a unique coastal low-gradient stream habitat.
- The 35-acre Abigail Brook parcel located immediately adjacent to the easternmost portion of the reserve in the vicinity of the upper Great River. The parcel includes pine and oak woodland and an important riparian buffer.
- The 10-acre Phinney property located near the Quashnet River in the central portion of the Waquoit Bay watershed. The property includes pine and oak woodland characteristic of coastal uplands in the area.
- The 31-acre NStar parcel located near the Quashnet River in the central portion of the Waquoit Bay Watershed. The parcel is immediately adjacent to the reserve's Quashnet River property and includes a variety of coastal upland and wetland habitats, including some vernal pool and freshwater wetland habitat not previously represented in the reserve.

WBNERR also acquired a conservation easement on approximately seven acres of open space owned by the Town of Mashpee. Additionally, by the time of the evaluation site visit, WBNERR had acquired another 12 acres of land in addition to the lands incorporated into the reserve as part of the revised management plan. OCRM recognizes WBNERR and DCR for the patience and perseverance required to complete these acquisitions successfully.

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Accomplishment: WBNERR acquired more than 100 acres of land, 95 of which were incorporated into the reserve boundary with the approval of the revised management plan. The reserve's acquisitions during the review period are a significant accomplishment, particularly given the difficulty of acquiring land on Cape Cod.

2. Restoration

The Waquoit Bay Watershed, like most coastal areas in the Northeast, has a long history of human alteration. Even protected areas within the reserve that appear “natural” have been altered from their pre-colonial condition. WBNERR’s Stewardship Program engages in several efforts to restore ecological function to disturbed areas. Examples of the Stewardship Program’s restoration work are described below.

Eutrophication is the most significant issue affecting Waquoit Bay. Continually increasing nitrogen loads from wastewater, fertilizer and atmospheric sources have led to drastic habitat shifts. Eelgrass habitat, once plentiful, is now completely missing from the main bay and is disappearing from the few subembayments where it remains. Monitoring data collected at the reserve has been incorporated into linked watershed-embayment models that the Massachusetts Estuaries Project is using to calculate Total Maximum Daily Loads (TMDL) for nitrogen. The Stewardship Program has also contributed to the Massachusetts Estuaries Project by reviewing and commenting on reports and offering technical assistance with nitrogen-loading models. The Stewardship Program promotes nutrient reduction through programs that educate watershed residents about the source of the problem and potential solutions. Additionally, the reserve and its partners actively pursue opportunities to protect open space and to maintain vegetative cover that helps intercept nitrogen.

The Quashnet River is Waquoit Bay’s largest tributary. It was historically famous for its anadromous fish runs of river herring and native sea-run brook trout. It also supports a catadromous run of American eels. A combination of human impacts, including dam construction, overfishing and intense agricultural practices, degraded the river’s habitat. Trout Unlimited and the Massachusetts Department of Fish and Wildlife have worked for more than 30 years to reclaim the Quashnet River as a trout stream. The Stewardship Program has contributed to the restoration effort by planting and monitoring experimental revegetation plots, providing technical guidance regarding revegetation and habitat structures, coordinating AmeriCorps group project days, and assisting with restoration monitoring.

Road construction significantly limited the flow of saltwater onto the salt marsh at the southeast corner of Waquoit Bay. The altered flow may have caused the loss of salt marsh cordgrass and salt marsh hay, which were subsequently replaced by the common reed. Less desirable as wildlife habitat, the common reed produces less material for the detrital food chain and is considered a fire hazard because it dries at the end of the growing season. The Stewardship Program worked closely with MCZMP and the Town of Mashpee to assess the problem and to consider options that would restore tidal flow to

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the constricted marsh area. The partners decided to remove two narrow culverts and to replace them with a bridge and a larger culvert. The Stewardship Program plans to continue existing monitoring efforts in the area to assess the restoration's effectiveness.

3. Shorebird Monitoring

Two shorebird species of concern, the piping plover and the least tern, are found within WBNERR. Piping plovers nest in limited numbers on South Cape Beach and the beach at the southern end of Washburn Island. Because their eggs are laid on the ground and are well-camouflaged, people often accidentally damage or destroy them. They are also easily accessible to predators. The Stewardship Program's seasonal Shorebird Manager tallies adult bird pairs as well as egg and fledgling numbers. She also works in cooperation with the Massachusetts Department of Fisheries, Wildlife and Environmental Law Enforcement and the Massachusetts Audubon Society to train volunteers to recognize signs of plover mating and nesting activity and to construct predator exclusion fences to protect eggs and hatchlings. Volunteers also inform beachgoers about risks to the birds' nests and chicks from dogs, flying kites and other beach activities.

Least terns are found at South Cape Beach, where they have historically nested. Roseate terns, common terns, willets and American oystercatchers also feed at South Cape Beach and may nest there as well. The Stewardship Program monitors the activities of all five species.

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V. CONCLUSION

For reasons stated herein, I find that Massachusetts is adhering to the programmatic requirements of the National Estuarine Research Reserve System in the operation of the federally-approved Waquoit Bay National Estuarine Research Reserve (WBNERR).

The reserve has made notable progress in the following areas: staffing; management plan; coordination and communication; geographic information system; research partnerships; K-12 and professional teacher development; coastal training program; and land acquisition.

These evaluation findings also contain four recommendations. The recommendations are all in the form of Program Suggestions. The evaluation team did not identify any Necessary Actions. The Program Suggestions should be addressed before 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 Appendix A.

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

/s/ David M. Kennedy
David M. Kennedy
Director, Office of Ocean and
Coastal Resource Management

September 6, 2007
Date

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VI. APPENDICES

Appendix A. Summary of Accomplishments and Recommendations

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

Issue Area	Accomplishment
Staffing	DCR made improvements in hiring and staffing at the reserve. The department appointed a specific Human Resources Liaison to work directly with WBNERR and also began providing the reserve with the annual seasonal staff roster earlier each year.
Management Plan	WBNERR produced a well-written revised management plan within the prescribed timeframe. The comprehensive plan will provide overarching guidance for the reserve as it continues to evolve. Such planning and guidance will allow WBNERR to operate proactively and to respond to challenges and emerging issues more effectively.
Coordination and Communication	WBNERR and MCZMP significantly improved their coordination and communication with each other during the review period.
Geographic Information System	The application of GIS at the reserve has enhanced the precision and usefulness of data produced for ongoing projects such as habitat classification.
Research Partnerships	The Research and Monitoring Program engages in many collaborative partnerships and attracts high-caliber, innovative research to the reserve. A significant amount of research at the reserve is conducted by external researchers.
K-12 and Professional Teacher Development	The Education and Outreach Program offers high-quality K-12 education and professional teacher development that are closely correlated with the reserve’s research priorities as well as with state education standards. K-12 programs engage students in learning by addressing significant regional environmental issues and by incorporating data and findings from the Research and Monitoring Program. The Education and Outreach Program also targets pre-service teachers to help them incorporate estuarine and coastal elements into their curricula.
Coastal Training Program	MCTP is a strong partnership among WBNERR, MCZMP and Woods Hole Oceanographic Institution Sea Grant Program. The program holds successful coastal decision-maker workshops on key coastal issues, fosters increased communication and understanding among its target audiences, and develops innovative new partnerships.

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Land Acquisition	WBNERR acquired more than 100 acres of land, 95 of which were incorporated into the reserve boundary with the approval of the revised management plan. The reserve’s acquisitions during the review period are a significant accomplishment, particularly given the difficulty of acquiring land on Cape Cod.
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In addition to the accomplishments listed above, the evaluation team identified several areas where WBNERR could be strengthened. Recommendations are in the form of Program Suggestions. The evaluation team did not identify any Necessary Actions. Areas for improvement include:

Issue Area	Program Suggestion
Staffing	While recognizing that DCR’s ability to affect the hiring system required by EOEEA is limited, OCRM continues to urge that the department explore potential methods of reducing the time that positions at the reserve remain unfilled. In order to ensure continuity of the reserve’s programs and services, vacancies should be filled as expeditiously as possible.
Facilities	OCRM encourages WBNERR to continue its assessment of the feasibility of constructing a dock at reserve headquarters. As part of the assessment, WBNERR should systematically examine all practical alternatives, including potential partnerships that might allow the reserve to share use of an existing structure.
Reserve Advisory Committee	OCRM strongly recommends that WBNERR and DCR take the steps necessary to re-establish a representative RAC as soon as possible.
Coordination and Communication	OCRM strongly recommends that DCR and WBNERR work together to improve communication among the reserve and DCR’s sister agencies within EOEEA.

Appendix B. WBNERR's Response to 2004 Evaluation Findings

#1. Program Suggestion: WBNERR should continue to work with state partners to assure Waquoit Bay watershed land acquisition priorities are addressed and included in the Massachusetts Coastal and Estuarine Land Conservation Program Plan and the WBNERR management plan.

WBNERR and DCR participated in the Massachusetts CELCP Plan. WBNERR's revised management plan includes an updated WBNERR Land Acquisition Plan. DCR and WBNERR continue to be active in the Mashpee National Wildlife Refuge Conservation Partnership and with land acquisition in Waquoit Bay Watershed. Nearly 100 acres of newly-acquired land was added to WBNERR's boundary in the 2006 revised management plan and 12 additional acres have been acquired since then.

#2. Program Suggestion: WBNERR should analyze future facility needs and incorporate these needs into a revised facilities plan.

A facilities plan, including a research dock and coastal training and conference facility, was included in the 2006 revised management plan.

#3. Program Suggestion: DCR should consider funding other WBNERR positions or utilities and maintenance costs so that OCRM award funding could be used for programs and projects.

The revised management plan calls for DCR to fund other staff positions when resources are available and other more highly prioritized statewide DCR staffing needs have been met.

#4. Program Suggestion: WBNERR and DCR should agree on a staffing and hiring plan (based on needs identified in WBNERR's management plan) to address deficiencies in personnel needs. WBNERR and DCR Human Resources should explore opportunities to increase interaction between staff and increase effectiveness of communication.

The revised management plan includes a staffing plan and calls for DCR to fund other staff positions when resources are available and other more highly-prioritized statewide DCR staffing needs have been met.

WBNERR was assigned a human resources contact in 2006, facilitating regular and open communication between WBNERR and DCR Human Resources.

#5. Program Suggestion: DCR should provide WBNERR with the necessary means to fill seasonal positions in an expeditious manner so that the reserve can take advantage of hiring the best and brightest summer interns.

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The annual seasonal staff roster is now available earlier than in previous years. Improvement was made in the time necessary to make seasonal staff appointments.

#6. Program Suggestion: DCR should modify the approval process to ensure timely acquisition of equipment and supplies, especially since such equipment and supplies requests have already been approved through the annual OCRM grants process. Within three months of receiving the final evaluation findings, DCR should submit a strategy to OCRM for addressing this issue.

A new system for processing payments was implemented in 2005 and is working well.

#7. Program Suggestion: DCR and WBNERR should develop a plan to address issues that have been problematic in the past, specifically: reserve placement within the agency, staffing, equipment and supply needs, communication and visibility, and overall support and recognition from parent agency. A plan should be submitted to OCRM within six months of receiving final evaluation findings.

WBNERR worked with the Division of State Parks Regional Director and MCZMP in 2006 to develop a WBNERR placement plan. WBNERR is offering training to DCR in the Division of State Parks, Division of Urban Parks and Recreation and beyond.

#8. Program Suggestion: Although MCZMP and WBNERR work well together, the two programs are encouraged to take a more strategic approach to coordination and continue to ensure the science meets managers' needs and research supports management and improved decision-making statewide.

This issue was addressed in the 2006 revised management plan. WBNERR worked with MCZMP in 2006 to develop a reserve placement plan that facilitated interaction with MCZMP. MCZMP participates in WBNERR administrative meetings. MCZMP included in WBNERR Research Advisory Group. WBNERR and MCZMP continue to work together on the Coastal Training Program, restoration and some research activities.

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Appendix C. People and Institutions Contacted

State of Massachusetts Representatives

Name	Title	Affiliation
Brendan Annett	Reserve Manager	WBNERR
Nancy Church	Volunteer and Interpretive Coordinator	WBNERR
MaryKay Fox	Assistant Research Coordinator	WBNERR
Pat Harcourt	K-12 Educator	WBNERR
Allan Morris	Facilities Manager	WBNERR
Joan Muller	Education Coordinator	WBNERR
Robin Porter	GIS Coordinator	WBNERR
Tonna Marie Rogers	CTP Coordinator	WBNERR
Laurie Tompkins	Events Coordinator	WBNERR
Heather Warchalowski	Shorebird Manager	WBNERR
Chris Weidman	Research Coordinator	WBNERR
Christine Berry	Land Protection Specialist	DCR
Stephanie Cooper	Acting Chief of Staff	DCR
Claire D'Angelo	Fiscal Services Specialist	DCR
Ken Foley	Acting Director of State Parks	DCR
Kristin Karl-Karnahan	Interpretive Programs Chief	DCR
Don Matinzi	State Parks Cape Cod District Manager	DCR
Amy Nelson	Regional Interpretive Coordinator	DCR
Brian Shanahan	State Parks Southeast Regional Director	DCR
Raul Silva	Deputy Chief Engineer	DCR
George Trubianno	Budget Director	DCR
Karen Valeri	Human Resources Specialist	DCR
Chris Williams	Deputy Chief Ranger	DCR
Bruce Carlisle	Acting Director	MCZMP

Local Government Representatives

Name	Affiliation
Augusta McKusick	Cape Cod Water Protection Collaborative
Rick York	Town of Mashpee Shellfish Department

Academic Representatives

Name	Affiliation
Dr. Matt Charette	Woods Hole Oceanographic Institution
Dr. Scott Gallagher	Woods Hole Oceanographic Institution
Judy McDowell	Woods Hole Oceanographic Institution Sea Grant Program
Patti Parker	Woods Hole Science Technology and Education Partnership
Mary Jane Curran	Cape Cod Community College
Dr. Ken Foreman	Marine Biological Laboratory, Ecosystems Center

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Lynn Parks	Falmouth Public Schools
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Nongovernmental Organization Representatives

Name	Affiliation
Ellen Jedrey	Massachusetts Audubon Society
Melissa Lowe	Massachusetts Audubon Society
Gretchen Glaub	AmeriCorps Cape Cod
Arthur Neal	Senior Environment Corps
Chris Powicki	Cape and Islands Renewable Energy Collaborative
Kenneth Pruitt	Massachusetts Association of Conservation Commissions
Margaret Russell	The 300 Committee Land Trust

Other Representatives

Name	Affiliation
Ken Duffy	WBNERR Volunteer
Bill Geise	WBNERR Volunteer

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Appendix D. People Attending the Public Meeting

Name	Affiliation
Jayne Abbott	Citizens for the Protection of Waquoit Bay
Tom Abbott	Citizens for the Protection of Waquoit Bay

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Appendix E. OCRM's Response to Written Comments

OCRM did not receive any written comments regarding the Waquoit Bay National Estuarine Research Reserve during the course of the evaluation.