

Final Evaluation Findings

Hudson River National Estuarine Research Reserve

New York



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

The Coastal Zone Management Act (CZMA) of 1972, as amended, established the National Estuarine Research Reserve System (NERRS). Sections 312 and 315 of the CZMA requires the National Oceanic and Atmospheric Administration (NOAA) to conduct periodic performance reviews or evaluations of all federally approved National Estuarine Research Reserves (NERRs). The review described in this document examined the operation and management of the Hudson River National Estuarine Research Reserve (HRNERR or Reserve) during the period of October 2004 through December 2008. The Hudson River National Estuarine Research Reserve is administered by the New York Department of Environmental Conservation (DEC).

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

The evaluation team documented a number of HRNERR accomplishments during this review period. The Reserve continues to provide the local and regional resource management community with strong science-based information for coastal decision-making and planning. Notable Reserve efforts during this evaluation period included: the renovation of the Norrie Point Environmental Center; growth of the education and outreach program including the development of new science-based educational programming; maintenance and development of long term monitoring data sets; implementation of the Coastal Training Program; and completion of a Hudson River change analysis, mapping and classification of the River's shorelines, and mapping of benthic habitat.

In addition to these numerous accomplishments, the evaluation team identified a few areas where the Reserve and its programming could be strengthened. All recommendations for HRNERR are in the form of Program Suggestions, and describe actions that OCRM believes HRNERR could take to improve or enhance the program but that are not mandatory. As mentioned above, HRNERR has had many achievements during this review period, including the implementation of new Reserve programming. This program development motivated evaluation recommendations that address Reserve capacity and identify opportunities for program enhancement. Suggestions thus include developing a strategic plan for education program growth, tracking research within the Reserve, pursuing new communication methods, and finding a source of state funding to support the Research and Education Coordinator positions.

II. REVIEW PROCEDURES

A. OVERVIEW

NOAA began its review of HRNERR in September 2008. The §312 evaluation process involves four distinct components:

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

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

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

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

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

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

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 1993 Management Plan and program documents; (2) financial assistance awards and work products; (3) semi-annual performance reports; (4) official correspondence; (5) previous evaluation findings; and (6) relevant publications on natural resource management issues in New York.

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

- The Reserve's general administration, including grants and fiscal management;
- Status of the Management Plan;
- Facilities development and operations planning;
- Implementation of the Reserve's research, monitoring, and education programs;
- Reserve staffing and needs;
- The manner in which the Reserve coordinates with other governmental and non-governmental organizations and programs in the state and region; and
- Major accomplishments during the review period.

C. SITE VISIT TO NEW YORK

Notification of the scheduled evaluation was sent to DEC, HRNERR, relevant federal environmental agencies, and regional newspapers. In addition, a notice of NOAA's "Intent to Evaluate" was published in the *Federal Register* on November 18, 2008.

The site visit to New York was conducted December 1-4, 2008. Carrie Hall, Evaluation Team Leader, OCRM National Policy and Evaluation Division; Amy Clark, HRNERR Program Specialist, OCRM Estuarine Reserves Division; and Mike Deluca, Reserve Manager, Jacques Cousteau NERR, NJ formed the evaluation team.

During the site visit, the evaluation team interviewed HRNERR staff, DEC management and staff, and other state officials, coastal researchers, educators, students, and nongovernmental representatives. Appendix B lists persons and institutions contacted during this review.

As required by the CZMA, NOAA held an advertised public meeting during the evaluation on December 3, 2008, at 7:00 p.m., at the Norrie Point Environmental Center, 256 Norrie Point Way Staatsburg, New York. The public meeting is to give members of the general public the opportunity to express their opinions about the overall operation and management of HRNERR. The meeting was unattended.

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

III. RESERVE PROGRAM DESCRIPTION

NOAA's Office of Ocean and Coastal Resource Management (OCRM) approved the Hudson River National Estuarine Research Reserve (HRNERR or Reserve) in 1982. The New York Department of Environmental Conservation (DEC) is the lead agency responsible for the operation and management of the Reserve. The Reserve is managed in cooperation with four other state agencies: Office of Parks, Recreation and Historic Preservation (OPRHP); Palisades Interstate Parks Commission (PIPC); Office of General Services (OGS); and Department of State (DOS).

HRNERR includes nearly 5,000 acres of tidal wetlands and uplands at four sites (or components) located along 100 miles in the Hudson River between Albany and New York City. The Reserve contains diverse plant and animal communities that are biogeographically-representative of the southern New England sub-region of the Virginian Province. The components are (from north to south):

Stockport Flats: Located on the east bank of the river, north of the Town of Hudson, NY, in Columbia County, Stockport Flats is a five-mile, narrow mosaic of wetlands and shorelands. Nutten Hook, at the northernmost end, was added to the Reserve in 1992 for its ecological and cultural interpretive value. Stockport Creek is located to the south, one of the ten largest tributaries to the Hudson Estuary. The 1,500-acre component, administered by DEC, OGS, and OPRHP, includes the Hudson River Islands State Park.

Tivoli Bays: Also located on the eastern side of the river in the town of Red Hook in Dutchess County, the 1,700-acre Tivoli Bays component is a large freshwater tidal wetland surrounded by an extensive upland buffer of undeveloped woods and fields. Stony Creek and Saw Kill are shallow, fast-flowing streams that empty into the North and South Bay, respectively. The Bard College Field Station overlooks Tivoli South Bay. The component is administered by DEC and OGS. Since 1850, a train line has run along an embayment skirting the western side of Tivoli Bays, and bridge openings in North Bay and South Bay have restricted both river access and water exchange and have accelerated sedimentation in the bays.

Iona Island: The Iona Island and marsh complex is located in the Town of Stony Point in Rockland County on the western side of the river, six miles south of West Point. Iona Island itself is composed of bedrock, contains adjoining tidal and brackish marshes, intertidal mudflats, and tidal swamp at the mouth of Doodletown Brook, the component's principal tributary. The 556-acre site is part of Bear Mountain State Park, a component of the Palisades Interstate Park system. Iona Island has been designated by the National Park Service as a National Natural Landmark.

Piermont Marsh: Located on the west bank in the Town of Orangetown in Rockland County, Piermont contains one of the Hudson's largest remaining native brackish tidal marsh covering approximately 1,000 acres. Most of Piermont Marsh is within the Tallman Mountain State Park, part of the Palisades Interstate Park system. The northern end of the marsh is managed by DEC and OGS administers an additional 75 acres.

IV. REVIEW FINDINGS, ACCOMPLISHMENTS AND RECOMMENDATIONS

A. OPERATIONS AND MANAGEMENT

1. Reserve Administration and Staffing

The Reserve is managed by the New York State Department of Environmental Conservation (DEC), as the lead agency, in cooperation with four other state agencies. The policies, agency responsibilities, and the institutional framework for the management of the Reserve were formalized in a 1982 Memorandum of Understanding. The four state agencies that play a supporting role in managing the Reserve are:

Office of Parks, Recreation and Historic Preservation (OPRHP) manages Reserve lands under its jurisdiction at Tallman Mountain State Park, Bear Mountain State Park and Hudson River Islands State Park in conformance with the Reserve's management plan. The OPRHP is responsible for managing New York lands within the Palisades Interstate Park. The OPRHP Taconic Region partners with the Reserve in the operation and maintenance of the Norrie Point Environmental Center, an OPRHP building located in Margaret Lewis Norrie State Park.

Palisades Interstate Parks Commission (PIPC) is a private governing body established by interstate compact and supported by public funds from New York and New Jersey to manage regional park lands, two of which are included in the Reserve.

Office of General Services (OGS) has jurisdiction over state lands that are now or were formally under water, including considerable acreage in the Reserve, some of which will likely be transferred to DEC and OPRHP in the future.

Department of State (DOS) is the home of New York's Coastal Management Program (NYSCMP or Coastal Program). DOS staff from this program interact with the Reserve on a range of coastal management issues in the region related to resource protection, restoration, public access, and waterfront revitalization.

The Reserve is managed through both a programmatic and geographically based management scheme. The Reserve is programmatically housed in the DEC Office of Natural Resources under the Division of Fish, Wildlife and Marine Resources, within the Bureau of Marine Resources' Marine Habitat Protection Section. Apart from DEC's central organizational structure, the State has been divided administratively into geographic regions, within which agency-wide priorities and plans are implemented. Organizationally and for staff reporting purposes, the Reserve operates out of DEC Region 3 and staff report through the Regional Supervisor of Natural Resources to the Regional Director. Tivoli Bays, Iona Island, and Piermont Marsh are located within DEC Region 3. The Reserve also works with DEC Region 4 as Stockport Flats is located within this DEC Region.

The Reserve receives annual funding through DEC from NOAA to support and carry out the mission of the Reserve. In addition, the Hudson River Valley Greenway, a nonprofit and state agency, accepts and administers selected research and monitoring cooperative agreements, including funds from NOAA for system-wide monitoring. During the evaluation period, the Reserve has had difficulty spending funds in a timely manner and has regularly requested extensions to grants. The state procurement and contracting system can add a significant amount of time to the initiation and completion of a project. OCRM encourages DEC to continue to work with state leadership to pursue streamlining approval of contracting and procurement requests to ensure federal funds are spent in a timely manner.

The Reserve is staffed by eight full-time personnel, three part-time staff, and two 10-month interns. Reserve staff are funded through a variety of mechanisms including state funds, federal and state funds through a contract with the New England Interstate Water Pollution Control Commission (NEIWPCC), and state and federal funds through a contract with Cornell University. Only the Program Manager position and part-time Facility Maintainer position are state funded, civil service positions. During the evaluation period, the Reserve was able to add a half-time Science Education Specialist position which is shared with the Hudson River Estuary Program (*see Section C*). However, the Reserve lost state funding for a key position, the Research Coordinator Position. The National Estuarine Research Reserve System is a federal-state partnership. OCRM asks to see state commitment to the program demonstrated through the funding of core Reserve positions: Reserve Manager, Research Coordinator, and Education Coordinator. OCRM acknowledges that many state budgets, including New York's have been affected by the recession, but encourages the state to continue to explore options to convert the core Education Coordinator and in particular, the Research Coordinator, to state funded positions (*see Section B for further discussion of the Research Coordinator position*).

2. Facilities

At the beginning of the evaluation period, the Reserve's base of operation was on the shore of Tivoli South Bay at the Bard College Field Station. The Reserve shared space, field and lab equipment, and an archive of scientific and historical information with Hudsonia, Ltd., a research and education based non-profit organization. The prior evaluation found that it was critical that the Reserve move to larger facilities, as the Field Station was overcrowded and perhaps unsafe as it was being used. In addition to lacking adequate office space for staff, the Field Station did not have space to hold workshops, classroom trainings, or space for exhibits for the general public. Lack of appropriate facilities was limiting opportunities for HRNERR to fulfill the National Estuarine Research Reserve System's mission to encourage research and provide educational opportunities for students, teachers, and the general public.

The Reserve worked throughout the evaluation period to complete the design and renovation of the 10,000 square foot Norrie Point Environmental Center with substantial federal and state support. Throughout the design and renovation process, the Reserve worked closely with its state partner OPRHP to keep the project moving forward. In January 2007, the Reserve moved into its new facilities and in the spring of 2008, a laboratory renovation was completed. The center is located within Margaret Lewis Norrie State Park (not on Reserve property) and is

operated under the terms of a memorandum of understanding between DEC and OPRHP. The center includes public exhibits, a wet classroom, two large meeting spaces, staff offices, and a research lab. The new facilities have enabled the Reserve to provide diverse public, K-12, and professional development activities. The research and monitoring programs have expanded with the addition of a long-term monitoring station at Norrie Point and sufficient work and lab space for staff, interns, and visiting scientists. OCRM commends the Reserve for finding a new facility and successfully renovating the Norrie Point Environmental Center which has allowed the Reserve to expand its educational and training activities and to provide more support to researchers.

Accomplishment: The Reserve renovated and moved into the Norrie Point Environmental Center which provides the necessary space and facilities to serve a wider range of audiences.

In addition to the new center, the Reserve has continued to use the Bard College Field Station on a less intensive basis. The Field Station is used by research fellows and other researchers. The Reserve has also maintained a public presence in the Tivoli Village Hall at the Tivoli Bays Visitor Center, located just north of the Tivoli Bays site (*see Section C*).

3. Program Integration

Reserve staff work together across sectors to successfully address a range of issues including: managing invasive species; providing science-based information to state and local government employees and officials; and assisting communities with assessing their vulnerability to climate change and developing adaptation strategies. The previous evaluation found that there was a need for more staff participation in program planning and prioritization in order to increase opportunities for focused, collaborative activities that address interrelated objectives. During the evaluation period, the Reserve Manager implemented a coordinated strategic planning process that involved staff in program planning and prioritization. These efforts have increased coordination across sectors, and examples of sector collaboration are highlighted throughout the evaluation findings. Reserve staff coordinate across two major topic areas, habitat and education, and meet regularly to develop work plans and budgets and to track progress. Reserve staff also include training and outreach in research and stewardship grant proposals. OCRM commends the HRNERR for increasing coordination across Reserve sectors and maximizing the impact of the Reserve's capabilities.

Accomplishment: HRNERR has successfully implemented a process to increase coordination of activities across sectors and Reserve staff have demonstrated increased coordination through a number of cross-sector activities.

4. Partnerships

The Reserve Manager and staff have built and sustained many long term partnerships in the Hudson Valley region. These relationships and partnerships are essential to the success of the Reserve's education, coastal training, research, monitoring, and stewardship programs.

A key long-term partnership has been with DEC's Hudson River Estuary Program (HREP or Estuary Program). The HREP is a regional partnership whose mission is to conserve natural resources, promote full public use and enjoyment of the river, and clean up pollution in the Hudson River. To achieve this mission, the Estuary Program and its partners developed the Hudson River Estuary Action Agenda for 2005-2009, outlining actions that needed to be taken to achieve twelve goals. The Reserve has assisted the Estuary Program in carrying out the action agenda and in particular, has the primary responsibility for implementing Goal Two: *Conserve, protect, and, where possible, enhance critical river and shoreline habitats to assure that the life cycles of key species are supported for human enjoyment and to sustain a healthy ecosystem.* In addition, the Reserve and Estuary Program have partnered together on many stewardship and educational activities and have begun to work with communities to address climate change.

The HREP also provides staffing support and funding for three positions. The HREP has enabled the Reserve to fill seven full-time and one part-time position through the Estuary Program's administrative contract with New England Interstate Water Control Commission (NEIWPCC), a not-for-profit interstate agency that serves and assists its member states in New England and New York to promote cleaner water.

The Reserve has partnered with The Nature Conservancy (TNC) on a variety of projects including dam removal, invasive species control, and climate change adaptation planning. One particular project of interest is Rising Waters, a TNC led program to assist communities in the Hudson River assess likely impacts from climate change and to develop adaptation strategies to protect the Hudson Valley's environment, economy, and quality of life from threats associated with climate change. The project has engaged community leaders and people from a broad array of sectors, such as emergency responders, railroad companies, waterfront business owners, insurers, wastewater treatment plant operators, government agencies, and environmental groups, in developing adaptive strategies. The Reserve Manager is an active member of the steering committee and the Reserve has provided support through coastal training programs and research and monitoring of impacts in the Hudson Valley.

During the evaluation period, the Reserve continued its long standing partnership with the Village of Tivoli. Although the Reserve now has a new environmental center, it has continued to partner with the Village to keep the Tivoli Bays Visitor Center open and active, and supported a range of programming (*see Section C*). The Tivoli Free Library is across the hall from the visitor center and the librarian often assists visitors when Reserve staff are not onsite. A walking trail approximately 2½ miles in length connects the visitor center to the Tivoli Bays enhancing public access to the Reserve. OCRM commends the Reserve for developing and maintaining close partnerships throughout the Hudson Valley region that maximizes the impact of its research and monitoring, stewardship, education, and coastal training programs.

The Reserve has also worked closely with the OPRHP Taconic Region during the evaluation period to develop the Norrie Point Environmental Center. The opening of the center provides additional opportunities for partnership between the Reserve and the OPRHP. During the evaluation site visit, the OPRHP regional park manager noted that her staff would soon be

moving into a renovated historic school with space to hold groups of 200 plus people, enabling the Reserve to hold larger events. OPRHP was also interested in collaborating on education and outreach activities around invasive species and partnering with the Reserve to develop trails and interpretive signage to enhance educational opportunities in the area surrounding the center.

Reserve staff also work with NOAA partner programs. The Reserve partnered with the New York Coastal Management Program to identify and map *significant coastal fish and wildlife habitat* which will be incorporated into state policy. The Coastal Program and Reserve are both engaged in addressing climate change through complementary initiatives, as well as through staff work on the New York State Sea Level Rise Task Force. During the evaluation site visit, the Coastal Program and Reserve discussed opportunities for future partnerships around climate change. For example, the Coastal Program has a local grant program that enables communities to apply for assistance to address different issues including climate change adaptation. The Reserve may be able to encourage communities to apply for and/or assist them with implementing adaptation projects that are funded. The Coastal Program also noted the untapped value of the Reserve's research and monitoring efforts in addressing their need to better understand the impacts of development along the shoreline. OCRM encourages the Reserve to continue to explore potential collaboration opportunities around climate change and land use management and planning with the Coastal Program.

5. Management Plan

Reserves are required by federal regulation to have a current NOAA-approved management plan (15 C.F.R. Part 921.13). The plans describe the reserves' goals, objectives and management issues, as well as strategies for research, education and interpretation, public access, construction, acquisition and resource preservation, and, if applicable, restoration and habitat manipulation. A management plan has four valuable functions: (1) to provide a vision and framework to guide reserve activities during a five year period; (2) to enable the reserve and NOAA to track progress and realize opportunities for growth; (3) to present reserve goals, objectives, and strategies to constituents; and (4) to guide program evaluations. Regulations also require that a reserve's plan be updated every five years.

At the time of the site visit, the Reserve's management plan was long overdue for revision. Previous evaluation findings in 1999 and 2005 included a Necessary Action requiring the Reserve to develop an updated management plan. The Reserve submitted an updated draft Management Plan to OCRM in December of 2008 for review. Since the site visit, the Reserve has modified the Management Plan in response to comments and it was approved in September 2009.

B. RESEARCH AND MONITORING PROGRAM

The goal of the HRNERR's research and monitoring program, as stated in the 1993 Management Plan, is to "promote research and monitoring that will increase knowledge of the biological, physical, and chemical components of the Hudson River ecosystem, and human impacts on the Hudson River ecosystem; to monitor the effectiveness of management actions; and to promote

improved resource management and protection through effective communication of research results to those responsible for management.” During the evaluation time period, the research and monitoring program has promoted and increased ecosystem assessment efforts and monitoring, conducted research, communicated scientific findings to managers resulting in more effective management, and mentored 39 students.

The Program is staffed by: a Research Coordinator charged with the management and development of research and monitoring programs, promotion of partnerships, and dissemination of scientific information to scientists, educators, and managers; a part-time Assistant who assists the Research Coordinator with the water quality monitoring program; and until 2007, a Research Assistant responsible for implementing the System-wide Monitoring Program. When state funding for the Research Coordinator position was lost (one of three key positions required by the National System for program implementation) the Reserve reallocated the federal funds that supported the Research Assistant position to the Research Coordinator position, effectively eliminating the Research Assistant position.

The Research Assistant was responsible for administering the NERRS System-wide Monitoring Program (SWMP), a national initiative implemented at every reserve. Reserves with an approved SWMP receive funds through a cooperative agreement, specifically to conduct the Program. OCRM recommends that each Reserve have at least a SWMP Research Assistant and a part-time SWMP technician to ensure the Program is implemented successfully. The redirection of federal funds from the Research Assistant position to the Research Coordinator position has meant that the Research Assistant’s duties have now transferred to the Research Coordinator, greatly limiting the time the Research Coordinator can spend conducting research, building partnerships, mentoring students, and assisting with bringing science to decision makers, which are all key to implementing the Reserve’s mission. The evaluation team met with Reserve partners, who stated that they had an increasing need for the Reserve’s research and monitoring results, in particular around habitat loss, restoration activities and climate change, and the Reserve’s ability to disseminate information to key audiences such as local decision makers. Partners noted that the loss of the Research Assistant position limited the Reserve’s ability to contribute regionally, and that there was a need for both a full-time Research Coordinator and a full-time research assistant.

The Reserve’s reduced staff has also limited the Reserve’s ability to establish Surface Elevation Tables (SETs) at SWMP sites. The installation of SETs would allow the Reserve to monitor accretion and submergence rates and provide the information needed to better understand at what point accretion rates will no longer keep up with sea level rise. Several partners noted the importance of knowing accretion and submergence rates when designing restoration projects and The Nature Conservancy noted their interest in partnering with HRNERR to establish SETs. With the loss of state funding for the Research Coordinator position, OCRM is concerned that the Reserve will not be able to fully implement its research and monitoring programs and will continue to monitor the situation. If DEC is unable to fund a Research Coordinator position with general funds due to budget shortfalls, DEC and the Reserve should pursue other possible avenues of funding such as funding from trust funds, enforcement penalties, or other mechanisms.

Program Suggestion: OCRM strongly encourages DEC and the Reserve to pursue state funding for the Research Coordinator position to ensure that both the research program and System-wide Monitoring Program are successfully implemented.

1. Reserve Research

The Reserve's research program focuses on the development of baseline data and knowledge about river habitat functions for the Reserve and greater Hudson River Estuary and the continuation of long-term monitoring programs and datasets. Reserve research and monitoring results are used by managers to support science-based management decisions. For example, staff conducted a breeding bird monitoring study at four Hudson River tidal marshes and compared the results to a study done 18 years before. The study results documented a dramatic decline of breeding birds at Iona Island which coincided with the expansion of an invasive variant of *Phragmites australis*. The Reserve's Stewardship Program next developed and tested a *P. australis* removal process, using herbicide in Tivoli North, which resulted in an approximately 95 percent reduction of *P. australis* after three years. Reserve staff partnered with the PIPC to conduct similar eradication efforts on 10 acres at Iona Island marsh. Prior to this experiment, State Parks was avoiding the use of herbicides and instead was using plastics to try to knock down *P. australis* which was not working well. Several managers the evaluation team met with stated the Reserve's research demonstrating the negative impacts of the invasive *P. australis* and the success of the eradication process provided the impetus needed to move forward with similar projects. OCRM commends HRNERR for conducting research and stewardship projects which have led to the implementation of successful management techniques.

The NERRS serves as living laboratories for on-site staff, visiting scientists and graduate students and platforms for long-term research and monitoring, as well as reference sites for comparative studies. To accomplish this goal, the research program maintains close partnerships with researchers and institutions in the region, such as the Cary Institute of Environmental Studies, and has provided support to dozens of scientists. The Norrie Point Environmental Center's new 1,000 sq ft laboratory provides additional space for estuarine scientists to conduct research and new opportunities to encourage research within Reserve boundaries.

HRNERR's research program not only provides scientists with the support necessary to conduct research but they also serve as an important link between scientists, state policy makers and regulators. The evaluation team heard from researchers that the Reserve's partnerships with other agencies were very important in getting their research findings to decision makers and managers. For example, at the time of the site visit, the Cary Institute had just completed the first year of a grant to look at tidal wetlands and how they affect water quality. Reserve staff invited DEC wetlands staff to participate in the study to actively engage them in research and learning. The research and estuary training programs also partnered with the HREP and Cary Institute to develop an Ecology Short Course for DEC natural resources staff. The program was delivered to 130 people through onsite workshops and through four webinars to four remote sites, in the fall of 2008.

In the past, HRNERR tracked the use of the Reserve sites by visiting researchers through monitoring of permit applications submitted to partner agencies. Over time, partner agencies discontinued their practice of submitting permits to the Reserve. Reinstating, or developing new, processes for tracking research will provide HRNERR with knowledge of the full scope of research being conducted in the Reserve and may help avoid user conflicts; minimize the impacts of research activities on Reserve sites; minimize impacts of any land management activities on research sites; allow the Reserve to play a stronger role in facilitating the sharing of information between scientists and managers; and the information may be used to better understand and to communicate to others, the full value of the Reserve.

Program Suggestion: OCRM encourages the Reserve to track research within Reserve boundaries and to determine the most effective method(s) of tracking research.

2. System-wide Monitoring Program (SWMP)

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

The HRNERR continues to successfully implement SWMP and has expanded the program beyond the minimum requirements. Three water quality data loggers have been deployed from May 1999 to the present at Tivoli Bays, and a fourth has been deployed from 2002 to the present to record dissolved oxygen, turbidity, temperature, water level, pH, salinity, and conductivity at half-hour intervals within Tivoli Bays and the Saw Kill and Stony Creek. A fifth site, Norrie Point and its adjacent tributary, the Indian Kill, was added in July 2008. The Reserve also continues to implement a long-term water quality monitoring program it began at all four site components in 1991. The program includes monthly sampling of surface waters flowing in and out of the marshes combined with more intensive sampling within the watersheds to identify local inputs of sediments and nutrients.

Several other highlights of the Reserve's monitoring program are:

- The Reserve has maintained an operational weather station since April 1999. During the evaluation period, HRNERR began to transmit real-time data through satellite telemetry for the weather station and Tivoli south and north water quality stations.
- The Reserve has continued an ongoing partnership, since 2002, with Simon's Rock at Bard College to monitor nekton at the Tivoli Bays. The purpose of the program is to assess the inter-annual variability and document long-term trends in resident fish populations and anadromous fishes using the Tivoli Bays.
- The Reserve inventoried submerged aquatic vegetation (SAV) in 1997, 2002, and again in 2007. A new SAV volunteer field-monitoring program carried out by kayakers in partnership with the Cary Institute, HREP, and New York Sea Grant was developed.

- HRNERR monitored wetland vegetation changes by comparing aerial photography obtained in 2005 to an older inventory of plant communities in the Reserve.

Research and monitoring staff have begun to explore new ways of analyzing and applying monitoring results to land use management and climate change adaptation decisions. For example, when monitoring data showed increased chloride levels in tributaries of the Hudson River, the Research staff asked the Coastal Training Program (CTP) Coordinator to develop a training focused on the increased chloride levels found in tributaries of the Hudson River. The CTP Coordinator brought in experts from Canada and EPA to talk about sources of chlorides and the impacts of salt from road run-off and the need to monitor salt inputs at peak run-off. Research and monitoring staff have also analyzed data to provide information to managers to help them better understand the likely impacts of climate change, such as increased cyanobacteria blooms. Staff analyzed cyanobacteria data, going back to 1993, in relation to water temperature data. The results showed that a couple of degrees increase in water temperature leads to increased blooms. OCRM commends the Reserve for its ongoing commitment to monitoring and documenting conditions and changes and for exploring new ways of using monitoring data.

Accomplishment: The Reserve's long-term monitoring program enables scientists to better understand how estuaries function and to predict how these systems will change in response to anthropogenic influences.

The Reserve is a contributing partner to the Hudson River Environmental Conditions Observing System (HRECOS), a network of real-time monitoring stations on the Hudson River Estuary. The stations are located from Schodack Island to the New York/New Jersey harbor and monitor hydrologic and meteorologic parameters ever quarter hour. HRECOS is a collaborative partnership among government agencies, foundations, and the research community. The Reserve established two additional high resolution weather and water quality monitoring sites at Norrie Point and Piermont Pier in 2008 that feed into HRECOS. The Norrie Point site is operated by Reserve staff and the Piermont Pier site is operated by Columbia University's Lamont Doherty Earth Observatory. These data are accessible to the public at: www.hrecos.org.

3. Site Profile

NERRS implementing regulations require each reserve to develop a comprehensive site profile. A site profile is designed to: (1) compile scientific datasets relating to the reserve, (2) characterize the physical and biotic components of the environment, (3) synthesize the known ecological relationships within the reserve and its watershed, (4) trace the impact of natural and human disturbances, and (5) explore the need for future research, education, and management initiatives.

The Reserve published its site profile in 2005, successfully addressing a program suggestion in the previous evaluation findings. The site profile compiles more than 25 years of research and monitoring information about the Reserve and recommendations for research and monitoring over the next decade.

The site profile is available to researchers and other interested parties upon request. The Reserve does not currently have the site profile available on its website, nor is there a description of the site profile with a notice that it is available upon request. OCRM encourages the Reserve to place the site profile on its website and to advertise the site profile in appropriate venues.

4. Graduate and Undergraduate Research Fellowships

The Reserve continues to be actively engaged in the education and training of both undergraduate and graduate students and promotes the Reserve sites as valuable research locations. In addition to participating in the NERRS Graduate Research Fellowship Program, the HRNERR is a collaborative partner in the Tibor T. Polgar Fellowship Program, which is underwritten by the Hudson River Foundation and administered by both the Reserve and the Foundation to fund eight (total) undergraduate and graduate fellows per year. The Reserve also collaborates with New York Sea Grant in the Cooperative Research Fellowship Program, sharing in both costs and administration. During the period covered by this evaluation and through these three fellowship programs, Reserve staff oversaw the work of 39 graduate and undergraduate fellows, 12 of whom conducted research projects at Reserve sites. GRF research projects have targeted important management issues including investigating processes that regulate zebra mussel populations and analyzing sediments to determine past anthropogenic and climatic effects in order to better understand possible future changes to sediment inputs. OCRM commends HRNERR for its significant commitment to providing learning opportunities and mentoring students.

C. EDUCATION, INTERPRETATION AND OUTREACH

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

HRNERR's education and interpretation (education) program's goals, as described in the 1993 Management Plan, are to:

- Promote use of the Reserve's sites as outdoor classrooms for instruction in the natural and physical sciences, social sciences, and local history;
- Provide resource managers with scientific information pertinent to the management and protection of Hudson River estuarine resources;
- Augment environmental education efforts by regional school districts as they pertain to the ecology of the Hudson estuary and its tidal wetlands; and
- Increase public awareness of the National Estuarine Research Reserve System and the Hudson River NERR.

The HRNERR provides educational opportunities for the general public, K-12, teachers, and community groups. During the beginning of the evaluation period, the Reserve was located at

the Bard College Field Station which does not have the space or facilities for educational or training activities. The Reserve's move to the Norrie Point Environmental Center, with its spacious classroom facilities, has allowed for the expansion and strengthening of the Reserve's education program. The Reserve further capitalized on this expansion by adding a part time science educator who has developed and implemented new educational programming for school groups. During the evaluation period, the Reserve has capitalized on its new facilities to provide additional environmental educational programming for regional school districts, developed new outdoor events to increase student and general public understanding of Hudson River estuarine resources, and increased awareness of the HRNERR.

The education program is staffed by: (1) an Education Coordinator who manages education and interpretive programs and promotes partnerships and translation of scientific information for the general public; (2) a Reserve Educator who delivers public canoe trips and other programs for the general public, formal education groups, and other special interest groups, assists with the training and supervision of Student Conservation Association (SCA) interns, and provides graphic design and web expertise; (3) a half-time Science Education Specialist, shared with the Hudson River Estuary Program who assists with the development and delivery of science-based programming at the Norrie Point Environmental Center and throughout the Estuary; and (4) two 10-month Education Assistant positions filled by the SCA.

1. K-12 Education

The Reserve's education program has significantly expanded with the opening of the Norrie Point Environmental Center and access to classroom space. To ensure the Reserve was able to quickly capitalize on the addition of classroom space, a half-time Science Education Specialist was hired and new hands on science based programs were piloted and expanded. The Reserve's education program focuses on middle and high school students, complementing the HREP's focus on elementary school education.

Reserve Education staff have partnered with the stewardship and research and monitoring programs to develop innovative educational programs that engage local students in conducting research and stewardship activities. One successful example is a juvenile eel survey which was conducted in the spring of 2008, by a small team of high school students from Poughkeepsie High School, an underserved high school. The students were responsible for deploying nets to collect or sample the juvenile eels as they migrated up the estuary; they counted, weighed, and released the eels and measured other environmental factors such as temperature and tides. The students were all volunteers who consistently showed up to work on the project and sometimes brought along interested family members to learn more. The evaluation team met with two students who stated that the experience led them to pursue science fieldwork coursework at the college level. In addition, several students began working with elementary school children and encouraging their interest in science. In the fall of 2008, this model was expanded to include a juvenile Chinese mitten crab survey. OCRM commends HRNERR for engaging students in research and stewardship activities and fostering student's interest in science and natural resource management.

Accomplishment: HRNERR has developed innovative educational programming that has inspired students to pursue careers in science and natural resource management.

The Reserve's education program builds upon special events to maximize their impact. HRNERR hosts two field sites for *A Day in the Life of the Hudson Estuary*, an event which generates and coordinates student observations along the entire length of the Hudson River Valley. The event also engages Reserve staff and scientists in the region who work side-by-side with the students. Statewide, the event had 2,700 participants in 2008 and has its own website (www.ideo.columbia.edu/edu/k12/snapshotday/) which contains data from 2003 to the present. The Reserve holds teacher trainings to prepare teachers to make the most of the day and staff have helped develop *A Day in the Life* lesson plans that meet state curriculum standards. The evaluation team also met with several middle school teachers and were impressed at the extent to which student's *Day in the Life* experiences were incorporated into lesson plans across different subjects throughout the year. In addition to developing lesson plans, the Reserve education staff also provides support to teachers who want to develop their own lesson plans.

The Reserve System has developed long term monitoring datasets that document changes and the current state of the Hudson River Estuary. One of the challenges the Reserve System faces is putting data and information in formats that teachers can easily access and use and to develop lesson plans that guide students in analyzing data. HRNERR education staff have assisted teachers with incorporating local, relevant data through *A Day in the Life of the Hudson River* trainings. The teachers the evaluation team met with expressed interest in further incorporating data sets into their lessons plans, in particular, information from projects their students were working on, such as the eel surveys. OCRM encourages the Reserve to continue to find opportunities to incorporate long term monitoring data into educational programming.

The NERRS has developed a K-12 Estuarine Education Program (KEEP) to help students learn about essential coastal and estuarine concepts, develop data literacy skills, and strengthen problem solving skills. In the Hudson River region, HREP is leading an effort to develop a K-12 curriculum and their efforts are supported by Reserve education and research staff. The Reserve could explore how KEEP concepts and curriculum might be incorporated into regional curriculum development.

HRNERR has begun to explore and expand distance learning opportunities, as nearby school districts no longer have funding for buses and field trips. One program the Reserve has developed is SWaMPing the Classroom, an interactive web based program for middle school students. The development of web based distance learning opportunities for middle and high school students is a relatively new endeavor. There are challenges including: the need for the Reserve to upgrade its bandwidth; lack of technological capabilities at some schools; teachers who are uncomfortable with distance learning; and the need to ensure students are prepared before sessions. The evaluation team met with teachers who emphasized the need to make online learning "real" and link it to activities. For example, students could combine watching a video of core samples being taken with actively dissecting the samples at their school. OCRM commends the Reserve for developing innovative distance learning opportunities and encourages

Reserve staff to share their knowledge and experiences throughout the NERRS and to draw upon other Reserve's experiences to further enhance their program.

2. Community Education

During the evaluation period, Reserve staff designed and developed interpretive exhibits for the new Norrie Point Environmental Center. The initial public exhibits were installed in 2007 and live displays have been gradually enhanced. The center's exhibits are open to the general public and are also used by education staff when working with school groups. The center allows the Reserve to play a larger role in the community and engage the general public in educational activities. The Reserve has also added new programs including a monthly seining program and monthly interpretive walks in the winter to early spring months.

The Reserve's cornerstone public and community outreach activity is guided canoe trips and about 36 trips are offered annually. During the trips, Reserve staff provide information on the Hudson River ecosystem and Reserve scientists and others often participate and discuss their research and stewardship activities. The canoe trips have been highlighted in a feature segment of the Empire State Outdoors, a DEC public television series and are very popular. To ensure that the Reserve is continuing to reach new audiences, the Reserve sets aside trips for new participants. At the time of the site visit, the evaluation team was pleased to hear that Reserve staff were looking into strategically targeting audiences, such as local government staff and municipal officials, to maximize the impact of the limited trips.

The HRNERR education program began to evaluate the success of the canoe program in 2005 with a simple form completed by participants immediately after the trip. The Reserve found that participants rate their knowledge and appreciation of wetlands higher after the trips and that the greatest jump in knowledge and appreciation occurs with first time participants. Repeat visitors continue to rank their knowledge higher than the general population. The education program began evaluating the results of school programming in 2008 and at the time of the site visit, was planning to evaluate and receive feedback from groups that participated in initial distance learning efforts. OCRM commends the Reserve's education program for evaluating the success of their programming on an ongoing basis.

In addition to the Norrie Point Environmental Center, the Reserve also has a Visitor Center at Tivoli Bay. During the previous evaluation period, the Reserve worked with the Town to develop the *Doorway to the Bays* interpretive exhibit and educational programming. An SCA intern provides monthly programming for children and family groups and assists with the Village of Tivoli's Summer Recreation Program each summer. In 2006 a new program, Wild Wednesdays, featuring live estuarine animals, was added. Reserve staff also support Tivoli Bay Talks, monthly lectures on topics of interest to the community. The talks are filmed and are available on the internet and broadcast on local public TV where they are the most popular local show. Although programming has grown at the Tivoli Bay Visitor Center, the Village would like to see more educational programming at the visitor center including: more classroom activities paired with field activities; teacher workshops; the development of "kits" for various grade levels; and the Village would like to work with the Reserve to update and expand the

exhibits. The Reserve relies on SCA interns to provide programming at the Tivoli Bay Visitor Center. During the evaluation period, a five-month SCA intern position was lost and a 10-month SCA intern position has been lost since, limiting the Reserve's ability to provide educational programming. Since the evaluation site visit, Reserve education staff have met with Village partners to prioritize programming.

Throughout the site visit, the evaluation team heard from many Reserve partners how much they valued the educational opportunities provided by the Reserve and their desire to expand the opportunities to additional students. OCRM commends the Reserve for developing and conducting high quality educational programming, although the high demand means the Reserve can't meet everyone's needs. There are also competing demands for education staff time such as community outreach, providing teacher trainings, and assistance with curriculum development. The Reserve's Management Plan identifies the many educational and outreach activities the Reserve is engaged in but does not lay out a process for prioritizing growth. In order to better focus program growth, OCRM encourages the Reserve to conduct a formal, or informal, stakeholder needs assessment and to evaluate the strengths and limitations of their education and outreach program. The needs assessment and program evaluation could help guide the development of a more detailed strategic plan that prioritizes and guides the growth of the education and outreach program.

Program Suggestion: OCRM encourages the Reserve to prioritize activities based on local needs and program strengths and to develop a strategic plan for education and outreach activities that specifies priority areas and strategies for growth.

The Reserve has many unique and interesting educational, research, training, and stewardship activities that could be highlighted to the general public, DEC staff and management, other state agencies, decision makers, and non-profits. Throughout the evaluation site visit, the evaluation team heard from local decision makers and partners the value of the Reserve's services. Currently, the Reserve's website provides basic information about the Reserve. OCRM encourages the Reserve to identify audiences and explore new communication methods to reach different audiences. Possible communication methods include an enhanced website, regular newsletter, an annual accomplishments report, a local list serve, articles in agency newsletters, invitations to Reserve events, and press releases. In communicating about reserve activities and plans, the Reserve should highlight any benefits and efficiencies gained from such activities. Enhanced communication efforts could also help distinguish the Reserve's mission and activities from other groups operating in the region.

Program Suggestion: OCRM encourages the Reserve to develop new methods of communicating the Reserve's mission and activities to priority audiences to more effectively communicate the value of the Reserve and NERRS.

D. COASTAL TRAINING PROGRAM

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

HRNERR's ETP was fully implemented in August 2004. The Coastal Training Program completed an updated Strategy for the Hudson River Estuary Training Program for 2008–2011 and submitted it in May 2008 to the CTP Oversight Committee. The overall goal of the Reserve's ETP, taken from the 2004 Strategy is to “enhance informed decision-making on estuarine issues by providing training and access to scientific and technical information to audiences that influence the management of estuary resources.” The ETP has reached decision makers throughout the Hudson River Valley on key issues and provided them with information and training needed to make more informed decisions. During the evaluation period, the Reserve had over 1,700 in attendance at different training events. The HRNERR ETP has focused on key issues including estuarine habitat protection, invasive species, climate change, restoring fish habitat, and building process skills such as project design and evaluation. The Estuary Training Program is staffed by an ETP Coordinator and an SCA intern who provides support for the Mile-a-Minute Vine project.

HRNERR staff work both estuary wide and within Reserve boundaries to address invasive species. In 2003, state legislation was passed to create a NYS Invasive Species Task Force to provide recommendations to the state on how to best address invasive species. Among the Task Force's recommendations was the formation of Partnerships for Regional Invasive Species Management (PRISMs) to coordinate invasive species management functions. PRISMS are tasked with: coordinating partner efforts; recruiting and training citizen volunteers; developing and delivering education and outreach programs and materials; establishing early detection and monitoring networks; and implementing direct eradication and control efforts. The Reserve helped bring together groups throughout the region to establish two of the PRISMS: the Capital District PRISM and the Lower Hudson PRISM. The PRISMs, although unfunded, have provided a forum for partners to come together to address invasive species.

Prior to the establishment of the Lower Hudson PRISM, the Reserve ETP led the development of a coordinated response to the mile-a-minute vine, a fast growing invader that covers other vegetation and tree seedlings reducing their access to sunlight, often killing or weakening native vegetation. Two HRNERR sites were in the vine's range. In 2005, the Reserve's ETP held a workshop for 50 people to learn about the natural history of mile-a-minute vine and to share information about occurrences, control, monitoring and data management. In 2006, the Reserve also held a *Mile-a-Minute Project of the Hudson River: Training for Weed Watchers and Busters* workshop for 65 potential volunteers who learned about identification, monitoring, and mechanical control. The ETP program offered other invasive species management training to

NYS agency staff in partnership with OPRHP. Once the Lower Hudson PRISM was established, it adopted the mile-a-minute project as its first program, supported by a Reserve SCA intern who provided ongoing support to the project and worked with restoration coordinators from various organizations to hold control days. OCRM supports HRNERR's commitment to invasive species management and their work with partners to address this important issue.

The ETP works closely with the other Reserve sectors and provides outreach and training to complement and enhance their programs. For example, the ETP partnered with the stewardship program to hold a workshop to identify alternatives to conventional shoreline stabilization techniques. The workshop was delivered by Reserve staff and the contractors who wrote the technical guidance document, *Hudson River Shoreline Restoration Alternatives Analysis*. The ETP also worked with the research, stewardship, and education sectors to address the invasive Chinese mitten crab and held a workshop for researchers, natural resource managers, and invasive species experts who came together to learn about the invasive crab, and to discuss how they could collaborate on monitoring and research efforts. Another example, discussed in Section B, is the development of a workshop at the request of the research and monitoring program, focused on increased chloride levels shown in monitoring data.

The ETP has also worked closely with NOAA's Coastal Service Center to bring process based trainings to the region. Workshops held have included Managing Visitor Use, Public Issues and Conflict Management, and Project Design and Evaluation. During the site visit, many partners noted that the skills they learned from the process trainings had enabled them to work more efficiently and effectively.

Reserve partners consistently praised the value of the ETP and discussed how the training workshops had provided skills and information to assist them in their jobs and in achieving their agencies' mission. Many of the partners the evaluation team met with had attended multiple trainings. OCRM commends the Reserve for holding workshops on key coastal issues and process skills that are valued throughout the region.

Accomplishment: The Reserve's Coastal Training Program holds successful coastal decision-maker workshops on key coastal issues, fosters increased communication and understanding among its target audiences, develops critical skills, and develops innovative new partnerships.

The State of New York has had to cut funding to state agencies and many staff are unable to drive to workshops. In order to continue to provide training to state employees, the ETP is exploring new methods of delivery including webinars and video conferencing. As discussed in Section B, distance learning opens new opportunities but there are also challenges, such as limited access to ports. OCRM commends the ETP for exploring new methods of training delivery and encourages the sharing of ETP distance learning experiences throughout the NERRS and to draw upon other Reserve's experiences to further enhance their program.

E. STEWARDSHIP PROGRAM

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

The goal of the Reserve's resource protection (stewardship) program, as described in the 1993 Management Plan, is "the protection of the natural integrity of the ecosystem(s) within the research reserve from disruptive activities occurring inside and outside of the reserve's boundaries." During the review period, the HRNERR developed and administered various stewardship projects focusing on improved public access, monitoring and removal of invasive species, shoreline change and benthic habitat mapping, and restoring habitats.

The Stewardship Program is staffed by: an Administrative Coordinator who coordinates site stewardship, resource protection and maintenance activities at Nutten Hook, Stockport Flats, and Piermont Marsh; a Hudson River Estuary Habitat Restoration Coordinator who promotes science-based habitat restoration in the Hudson River Estuary, provides technical assistance on restoration projects and serves as a liaison to the Hudson River Natural Resource Damage Claim Restoration Technical Work Group; and a Hudson River Estuary Benthic Habitat Coordinator who coordinates the benthic mapping program. In addition, a part-time Facility Maintainer provides maintenance services at Norrie Point.

The Administrative Coordinator plays a lead role in coordinating land stewardship activities across three Reserve sites. The Administrative Coordinator works closely with the Reserve's land managing partners, OPRHP, OGS, and DEC, to identify stewardship priorities, to develop annual work plans to address priorities, and to determine funding sources. Stewardship activities range from road and trail maintenance to invasive species control, to managing visitor use.

1. Hudson River Estuary

The Reserve is leading several projects to better understand the Hudson River Estuary including a historic change analysis of the Hudson River, shoreline mapping, and benthic mapping. The Reserve, in partnership with the HREP, coordinated with federal and state agencies to undertake a historic change analysis of the Hudson River, in order to evaluate candidate restoration sites. The project included digitizing Hudson River Improvement Charts created by the USACE maps from 1907 to 1911. These detailed surveys are used in a GIS analysis of River morphology change and resulting loss of shallow and intertidal habitats, including those at Stockport flats.

The HRNERR also completed the mapping and classification of Hudson River shorelines from the Tappan Zee Bridge to the Troy Dam and developed a GIS database with additional descriptive data. The Reserve used the information collected to design a shoreline engineering alternative analysis to identify soft engineered shoreline designs that would reduce erosion and protect property while providing maximum habitat value for estuarine species. The shoreline

mapping study and GIS database are being used by Reserve partners to identify areas for restoration.

The Reserve manages an effort to map the benthic habitat of the Hudson River, a project that is being conducted in partnership with the HREP and many academic and agency partners. HRNERR has completed the mapping of the deep areas of the Hudson River and is moving forward with securing full funding to continue mapping areas that are less than four feet deep. The Reserve has developed a public website with an interactive online map, to display data about the Hudson River's sedimentary floor in its geographic context (www.dec.ny.gov/pubs/212.html). HRNERR staff also develop customized information upon request to assist with in-river construction planning projects, permit reviews, or research projects. The benthic mapping effort has led to the discovery of old oyster beds that were active over 500 years ago. Based on the information from the benthic mapping study, the DEC obtained funding to assess whether oyster beds might successfully be restored; this study was ongoing at the time of the site visit.

Reserve staff are also working with DEC fisheries staff to build upon completed physical assessments of the Hudson River Estuary to understand the spatial and temporal relationships among fish and their physical environment. The Reserve along with Rutgers University staff and DEC's Hudson River Fisheries Unit, deployed the underwater vehicle REMUS to locate spawning sturgeon and linked this information to the physical environment as described by products of the benthic mapping project and submerged aquatic vegetation mapping project. The stewardship program is looking to expand this effort and to put in buoys to monitor where sturgeon are located and how they use the habitat, to determine what habitat needs to be protected and managed. OCRM commends the Reserve for undertaking the River morphology change analysis, mapping and classification of the shorelines, and mapping of benthic habitat, ensuring the data is public, and building upon the initial results to design studies to further our understanding of the estuary.

Accomplishment: The stewardship program has managed several projects that have greatly increased our knowledge of the Hudson River Estuary including a Hudson River historic change analysis, mapping and classification of the shorelines, and mapping of benthic habitat. The information is being used by managers to inform a range of activities from restoration projects to permitting decisions.

2. Restoration and Invasive Species

Stewardship program staff are actively involved in habitat restoration and invasive species management projects. Staff partnered with Bard College to install an eel ladder on the Saw Kill, a tributary to Tivoli South Bay and managed the installation, maintenance, and monitoring of the ladder for three years in order to develop recommendations on eel ladder design. The Education Program assisted with the monitoring of glass eel migrations (*see Section C*). The Reserve has also provided technical assistance and helped bring partners together to complete dam removal projects. The stewardship program often partners with other sectors to address invasive species within the Reserve. The stewardship program has demonstrated a successful technique to

manage *Phragmites* (see *Section B*), worked to stop the spread of the mile-a-minute vine (see *Section C*), and helped track the spread of the Chinese mitten crab (see *Section D*).

3. Public Access

During the evaluation period, HRNERR has undertaken several projects to improve public access. The development of the Norrie Point Environmental Center has provided both increased organized and informal public walk-in opportunities to learn more about the Reserve and to access the Reserve and area surrounding the center. Reserve staff have developed and installed new educational displays and, at the time of the evaluation site visit, were working on the addition of a display focused on the Reserve's monitoring program. HRNERR is also hoping to further enhance public access at Norrie Point through the installation of displays near the catwalk and creation of self guided walks. In addition to the improvements made at Norrie Point, the Reserve created a pocket park with three interpretive signs and installed an accessible parking area at Piermont Marsh. At Tivoli Bays, the Reserve restored a historic graveyard in partnership with Bard College. OCRM commends the Reserve for the development of public access facilities and encourages the Reserve in its efforts to further enhance public access around the center.

4. Land Acquisition

The Reserve developed an updated land acquisition plan for its 2009 Management Plan identifying numerous parcels of land for acquisition, the majority within the existing Reserve boundary. In some cases, the parcels are owned by private landowners and some parcels are held by OGS and ownership would be transferred to DEC.

NOAA provides two sources of funding to assist Reserve's with acquiring land to benefit the Reserve's mission. Section 315 funds, administered by OCRM's Estuarine Reserve Division, are available for acquiring property and construction projects within the Reserve boundary to strengthen protection of key land and water areas; to enhance long-term protection of the areas for research and education; and to provide for facility and exhibit construction. The grants are competitive.

The Coastal and Estuarine Land Conservation Program (CELCP), housed within OCRM, provides matching funds to state and local governments to protect coastal and estuarine lands considered important for their ecological, conservation, recreational, historical or aesthetic values. At the state level, the CELCP is managed by the New York Coastal Program. During the selection process, priority is given to parcels that are identified by Reserves for acquisition. During the first competitive round of CELCP, one of New York's three proposals was for funds to expand the boundaries and assure the ecological integrity of the Reserve's Stockport Flats component, the northern-most of the Reserve's four components and located in the tidal freshwater reaches of the Hudson River Estuary. Since the evaluation, CELCP legislation was passed in 2009 setting aside 15 percent of CELCP funds for land acquisition projects for Reserve buffer areas and areas within the watershed. OCRM encourages the Reserve to continue to apply

for NOAA funding for eligible projects in order to fulfill its land acquisition plan and New York's CELCP Plan.

7. CONCLUSIONS

For the reasons stated herein, I find that the State of New York is adhering to the programmatic requirements of the National Estuarine Research Reserve System in the operation of its approved Hudson River National Estuarine Research Reserve.

HRNERR has made notable progress in the following areas: development of the new Norrie Point Environmental Center, expansion of educational programming, the implementation of the Reserve's Coastal Training Program, expansion and maintenance of monitoring programs, research and education surrounding invasive species management, and shoreline mapping and shoreline functional analysis.

The findings contain four recommendations in the form of Program Suggestions. The Program Suggestions should be addressed before the next regularly scheduled program evaluation, but they are not mandatory at this time. Summary tables of program accomplishments and recommendations are provided in the Appendix A.

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

APPENDIX A: HRNERR'S RESPONSE TO 2004 EVALUATION FINDINGS

Operations and Management

PROGRAM SUGGESTION (Staffing): The Department of Environmental Conservation should continue to pursue its previous commitment to identify a secure source of state funding for the Education Coordinator position.

HRNERR Response: The DEC made no progress in linking the Education Coordinator position to a secure source of state funding.

PROGRAM SUGGESTION (Staffing): The Reserve should establish an ongoing process for staff participation in program planning and prioritization, which will increase opportunities for focused, collaborative activities that address interrelated objectives.

HRNERR Response: The Reserve expanded its collaborative internal planning process to promote such staff participation. This occurs now as interdisciplinary work planning and review by two staff teams and various workgroups that have overlapping memberships.

PROGRAM SUGGESTION (Facilities, Facilities Plan, and Infrastructure): The Reserve and the Department of Environmental Conservation are strongly encouraged to follow through with efforts to move the Reserve offices and work spaces out of the current Bard College Field Station configuration and complete whatever tasks are necessary for the transfer to the Norrie Point facility. The facilities plan should be revised to reflect these conditions and possible solutions as a part of the ongoing management plan revisions.

HRNERR Response: The facilities plan was revised. In 2007, with substantial support from NOAA, NYS DEC and the NYS Office of Parks, Recreation and Historic Preservation, the Reserve completed its move to the newly renovated Norrie Point Environmental Center. In 2008 the research laboratory renovation was also completed.

NECESSARY ACTION (Facilities, Facilities Plan, and Infrastructure): No connector road between Ferry Road and Ice House Road at Nutten Hook at the Stockport Reserve component that would cross sensitive ecological and cultural resource areas or that would prevent the public from accessing publicly owned property should be constructed. Such construction is inconsistent with Reserve objectives. The Reserve must report on the status of this issue in cooperative agreement performance reports.

HRNERR Response: No connector road has been built or actively pursued by NYS at the Nutten Hook property. The Reserve reported on the status of this issue in selected performance reports.

NECESSARY ACTION (Management Plan): The Reserve must complete, finalize, and submit the revised management plan to OCRM according to the following schedule: a) By April 1, 2006, submit a revised draft plan to OCRM for review at the same time it is

submitted for state interagency review. b) By August 1, 2006, finalize the management plan.

OCRM will then publish a Federal Register notice regarding the management plan revision and authorize the Reserve to have the document printed. The Reserve is responsible for printing and distributing the final revised management plan. The Reserve must provide OCRM with: 1) documentation that the document has been submitted for printing, and 2) a copy of the final document on a compact disc. The document must also be posted electronically on the Department of Environmental Conservation/Hudson River Reserve web site at this time. Failure to meet this Necessary Action could result in the withholding of supplemental funding for biomonitoring and/or IOOS projects in FY 06 or subsequent years.

HRNERR Response: The Reserve submitted two draft management plans to ERD and New York State agency staff for internal review during the review period. A complete draft plan was submitted to ERD in December, 2008 and made available for agency and public review; the Federal Register Notice for the Final Management Plan was published in summer, 2009. The final plan has been posted on the Reserve's web site.

Research and Monitoring

PROGRAM SUGGESTION (Site Profile): The Reserve is urged to complete the site profile as expeditiously as possible in keeping with its estimated time frame for completion in June 2005.

HRNERR Response: The Ecological Profile of the Hudson River NERR was published in 2005, compiling more than 25 years of research and monitoring information about the Reserve.

Education and Outreach

PROGRAM SUGGESTION (Education and Outreach Programs): Because of the cross-cutting nature of communications and outreach activities, the Reserve should consider development of a communications and outreach strategy or plan to, among other objectives, target and prioritize outreach to specific user groups and audiences and appropriately match user groups with specific mechanisms of outreach and level of informational/data detail.

HRNERR Response: The Reserve has well-developed strategies for education and training activities, although no formal communications plan. While this is an excellent idea, limited staff resources have constrained the development and implementation of such a plan. Most communications now occur as electronic postings or communications.