Narragansett Bay
National Estuarine Research Reserve

Management Plan

2010 – 2015

Audubon Society
of Rhode Island

Narragansett Bay National Estuarine Research Reserve

Management Plan
2010 – 2015

This management plan has been developed in accordance with NOAA regulations, including all provisions for public involvement. It is consistent with the congressional intent of Section 315 of the Coastal Zone Management Act of 1972, as amended, and the provisions of the State of Rhode Island Coastal Zone Management Program.

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This Management Plan is the result of a collaborative effort undertaken by Reserve staff, RIDEM's Scott Millar, Bruce DiGennaro of the Essex Partnership and numerous other stakeholders. The Reserve is grateful for thoughtful guidance and support from Cory Riley and the other staff members at NOAA's Estuarine Reserves Division.

Valuable input from other state employees, resource professionals and stakeholders was solicited in a number of different ways. A series of facilitated focus group meetings were convened with local professionals working in the fields of estuarine research, education, stewardship, and training. The Reserve's Senior Advisory Committee provided useful comments on the Plan's overall focus and direction. In addition, a great deal of input was gathered by a Prudence Island property owner telephone surveydeveloped by Dr. Judy A. Van Wyk of the University of Rhode Island in cooperation with Reserve staff and Prudence Island residents Bob Marshall and Harry Sterling. Finally, a thanks to Mark Pfeifer for the Plan's formatting and graphic design.

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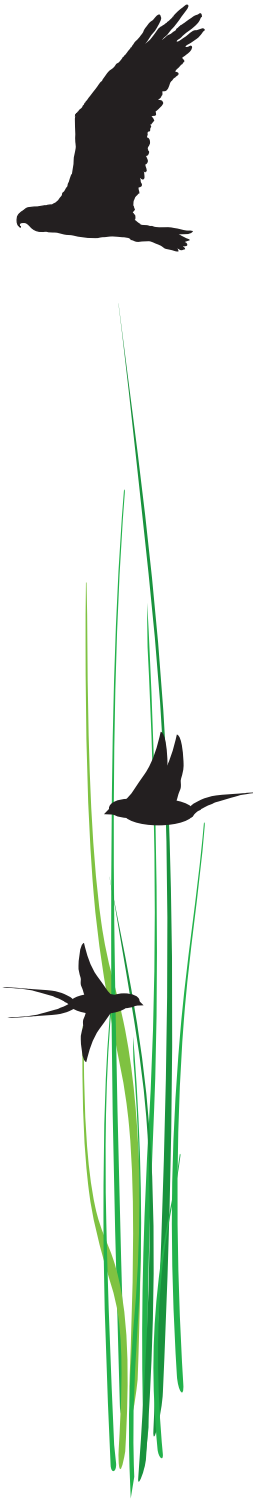

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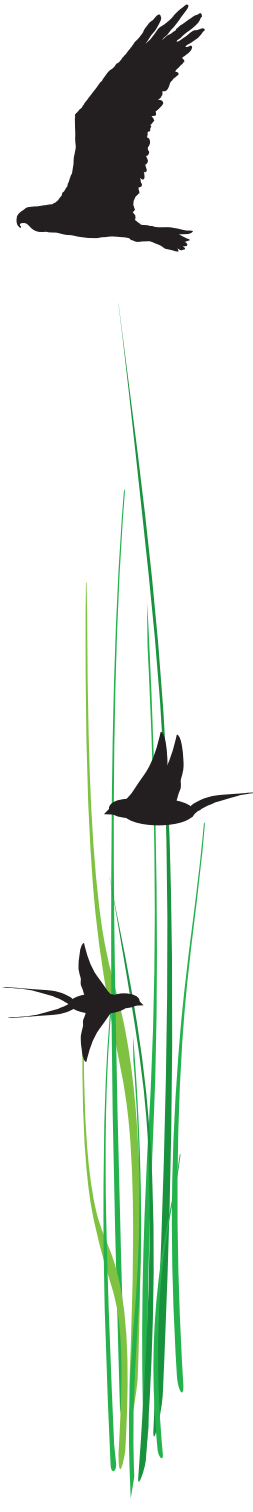

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ACRONYMS AND ABBREVIATIONS

ASRI	Audubon Society of Rhode Island
CDMO	Centralized Data Management Office
CDMs	Coastal Decision-Makers
CRMC	Coastal Resources Management Council
CTP	Coastal Training Program
CZMA	Coastal Zone Management Act
EDC	Environmental Data Center
ERD	Estuarine Reserves Division
GRF	Graduate Research Fellowship
GSO	Graduate School of Oceanography
NBEP	Narragansett Bay Estuary Program
NBNERR	Narragansett Bay National Estuarine Research Reserve
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRCS	Natural Resources Conservation Service
OCRM	Ocean and Coastal Resource Management
RIDEM	Rhode Island Department of Environmental Management
RIEMC	Rhode Island Environmental Monitoring Collaborative
SAV	Submerged Aquatic Vegetation
SWMP	System Wide Monitoring Program
URI	University of Rhode Island

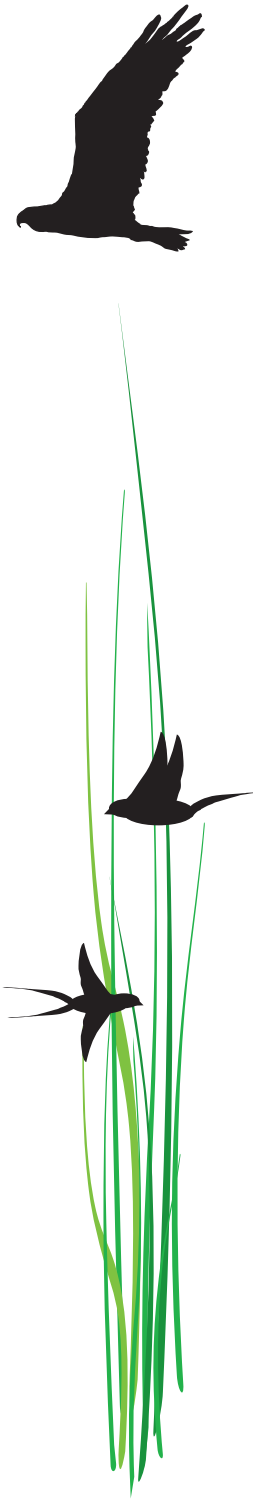
EXECUTIVE SUMMARY

The Narragansett Bay National Estuarine Research Reserve (hereinafter referred to as Reserve or Narragansett Bay Reserve) is part of a national network of protected areas established to promote informed management of the Nation's estuaries and coastal habitats through research and education. This network, otherwise known as the National Estuarine Research Reserve System (hereinafter referred to as Reserve System or NERRS) was established under Section 315 of the Coastal Zone Management Act of 1972 (16 U.S.C. section 1451 et seq.). Federal regulations, 15 C.F.R. Part 921.13, governing administration of the Reserve System requires that every five years each Reserve have a National Oceanic and Atmospheric Administration (NOAA)-approved management plan. This 2010-2015 Management Plan was prepared in accordance with NOAA guidelines (NOAA, 2006) to comply with these Federal regulations. As part of the Reserve System, the Narragansett Bay Reserve is administered by the Estuarine Reserves Division (ERD) of NOAA through a Federal-State partnership. NOAA provides funding and program guidance, while the State of Rhode Island (State) manages Reserve properties and provides essential administrative support and funding. The lead state agency is the Rhode Island Department of Environmental Management (RIDEM). Additional assistance is provided by local partners, including the Town of Portsmouth, RI (as the local jurisdiction), the Audubon Society of Rhode Island and the Prudence Conservancy. The Narragansett Bay Reserve is currently located on several islands situated within the geographic center of Narragansett Bay. The Reserve consists of nine separate property units located on Prudence, Patience and Hope islands. The Reserve also has jurisdiction of submerged lands adjacent to all properties up to a depth of 18 feet with the exception of the Blount property unit and Potters Cove. Two additional property units documented in this Plan represent a significant boundary expansion for the Reserve. These include the 28 acre Dyer Island and the 128 acre Ballard property on Prudence Island. The State purchased Dyer Island in 2002 with the aid of Federal funds for inclusion into the Reserve. The Ballard property was acquired by the State in 2009, also with the aid of federal funds. Since the approval of the previous Management Plan in 1998, the Reserve has grown and matured in a number of significant ways. In addition to the two property acquisitions noted above, a number of major improvements were made to Reserve facilities. The caretaker and scientist cottages were upgraded and the second phase of the headquarters building renovation was completed. The headquarters renovation added additional office and laboratory space as well as a small conference room and garage/workshop. Programmatically, the Reserve became fully staffed with a single full-time manager and full-time positions for each program sector (research, education, training, and stewardship), including the implementation of a very successful Coastal Training Program. With these expanded facilities and staff, the Reserve has been able to establish itself as a valued partner in the coastal management and education community of Rhode Island by bringing signature products and expertise to our local stakeholders while protecting coastal habitat for long-term research and education. The purpose of the 2010-2015 Management Plan is to provide an overall framework to guide planning and decision-making for the Reserve over the next five years. It is not intended to be an action plan, but to provide enough flexibility to take advantage of opportunities as they arise. In accordance with NOAA guidelines, the Plan is specifically designed to:

1. Provide a vision and framework to guide Reserve activities during a five year period;

2. Enable the Reserve and NOAA to track progress and realize opportunities for growth;

3. Present Reserve goals, objectives, and strategies for meeting the goals to constituents;



NBNERR headquarters.

4. Guide program evaluations under Section 312 of the Coastal Zone Management Act (CZMA); and

5. Enable the Reserve to acquire infrastructure and land acquisition funds.

Programmatic operations at the Reserve are also guided by the principles governing the entire Reserve System. In addition to specific requirements noted in section 315 of the Coastal Zone Management Act (CZMA), operations at each Reserve must be consistent with the mission, goals and priorities described in the NERRS 2005 – 2010 Strategic Plan (Appendix B).

Reserve System Mission: *To practice and promote coastal and estuarine stewardship through innovative research and education, using a system of protected areas.*

The 2010-2015 Management Plan was developed through a collaborative effort involving Reserve staff and stakeholders over a seventeen-month period between December 2005 and July 2008. Resource professionals involved in research, education, training, and stewardship at the Reserve and elsewhere in Rhode Island were engaged through a series of facilitated Focus Group meetings with Reserve staff. These meetings were designed to identify management issues and solicit input for the Plan. Specific Focus Group meetings were held to discuss research and monitoring, education and outreach, stewardship, and coastal training. In addition to engaging resource professionals, the Reserve commissioned a telephone survey designed and conducted by the University of Rhode Island to solicit input from local individuals who live or own property on Prudence Island. This input allowed the Reserve to identify many management issues within the Bay and watershed that could be addressed by the unique interdisciplinary approach of its programs. These broad issues include: wastewater and stormwater management, coastal and watershed development, invasive species management, and natural resources management. Throughout the development of the Plan, several challenges emerged that strongly influence how the Reserve works toward achieving its goals. These challenges apply to all aspects of Reserve operations and strongly influenced the development of the objectives and strategies in this plan. These challenges include: island access, public awareness, and ticks and tick-borne disease. An important result of this process was the identification of a niche in coastal management that is particularly well addressed by the Narragansett Bay Reserve. The nexus of Federal programmatic mandates, geographic location, interdisciplinary capacity and local need resulted in a new vision for the Narragansett Bay Reserve. This new vision - “To be a valued leader, partner and resource helping to sustain a healthy Narragansett Bay and its watershed through the collection, synthesis, interpretation and application of research and monitoring data” – is eminently achievable and builds upon Reserve strengths. This new vision is also consistent with the Reserve’s mission - “To preserve, protect and restore coastal and estuarine ecosystems of Narragansett Bay through long-term research, education and training”.

The unique goals developed for the Narragansett Bay Reserve (Table 1) are consistent with the goals described in the 2005-2010 NERRS Strategic Plan. The objectives and strategies developed for this Plan work toward these goals while simultaneously taking into account the challenges and capacities of the Reserve.

Table 1. Narragansett Bay Reserve Vision, Mission, and Goals

Narragansett Bay Vision, Mission, and Goals

Vision: To be a valued leader, partner and resource helping to sustain a healthy Narragansett Bay and its watershed through the collection, synthesis, interpretation and application of research and monitoring data.

Mission: To preserve, protect and restore coastal and estuarine ecosystems of Narragansett Bay through long-term research, education and training.

Goals:

- Strengthen the protection and management of representative estuarine ecosystems within Narragansett Bay to advance estuarine conservation, research and education.
- Increase the use of Reserve science and sites to address priority coastal management issues within Narragansett Bay and its watershed.
- Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

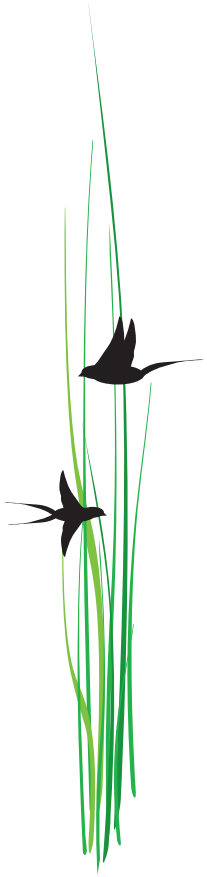
Reserve Program Goals and Objectives

Program objectives are organized according to the three Reserve goals. Each objective has an alphanumeric suffix identifying the specific Reserve sector that most contributes toward that objective.

R = Research and Monitoring	E = Education
S = Stewardship	T = Coastal Training Program
I = Infrastructure	A = Administration
P = Public Access	B = Boundary expansion and land acquisition

1. Strengthen the protection and management of representative estuarine ecosystems within Narragansett Bay to advance estuarine conservation, research and education.

- Encourage and assist in a multi-agency approach to research, monitoring, and science-based ecosystem management - R3
- Protect the ecological integrity of the land and water resources of the Reserve using an ecosystem-based management approach - S1
- Promote conservation by integrating the products, programs and expertise of other reserve sectors into stewardship activities to increase stakeholder engagement and understanding - S2
- Support and enhance watershed-wide stewardship programs by developing partnerships that share resources and leverage funds - S3



• Acquire property or property rights on select Narragansett Bay islands to expand Reserve boundaries for the long-term preservation of estuarine and coastal habitats - B1

2. Increase the use of Reserve science and sites to address priority coastal management issues within Narragansett Bay and its watershed.

• Contribute to status and trends assessments and forecasting of environmental quality by tracking short-term variability and long-term changes in abiotic and biological parameters at the Reserve and within Narragansett Bay – R2

• Improve opportunities to support and conduct basic and applied research within the Reserve – R1

• Continue to provide coastal resource managers, the scientific community and general education practitioners with appropriate scientific and technical information to foster informed decision making – R4

• Optimize educational use of the Narragansett Bay Research Reserve and its facilities with a focus on the Reserve's ecological and cultural significance – E2

• Provide and maintain the infrastructure needed to fully meet the Reserve's mission – I1

• Maintain and improve the administrative framework to efficiently support Reserve programs, goals and objectives – A1

3. Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

• Increase public awareness, understanding and appreciation of the Narragansett Bay estuary by designing, implementing and supporting high-quality, science-based education programs for K-16 and community education audiences - E1

• Increase the knowledge and skill levels of coastal decision-makers so their decisions may better preserve and protect the natural resources of Narragansett Bay and its watershed – T1

• Enhance collaboration, coordination and communication among trainers who provide coastal decision-makers with training and technical support on issues related to the Bay and its watershed – T2

• Facilitate networking and information exchange between coastal decision-makers both within and between communities - T3

• Ensure that knowledge and skills acquired by coastal-decision are applied effectively - T4

• Provide and enhance opportunities for public access while protecting the ecological health of Reserve habitats – P1

• Increase the use of high quality NBNERR and NERRS estuary, water quality data and climate change education products by formal and informal educators in the Narragansett Bay watershed – E3

1.0 INTRODUCTION

The Narragansett Bay National Estuarine Research Reserve (Reserve) is part of a national network of protected areas established to promote informed management of the Nation's estuaries and coastal habitats. This network, otherwise known as the National Estuarine Research Reserve System (Reserve System), was established under Section 315 of the Coastal Zone Management Act of 1972 (16 U.S.C. section 1461 et seq.).

Federal regulations, 15 C.F.R. Part 921.13, governing administration of the Reserve System require that every five years each reserve have a National Oceanic and Atmospheric Administration (NOAA)-approved management plan. This 2010-2015 Management Plan was prepared in accordance with NOAA guidelines (NOAA, 2006) to comply with these Federal regulations.

A cultural and natural history tour of NBNERR and Prudence Island.

1.1 Purpose and Scope of the Plan

The purpose of the 2010-2015 Management Plan is to provide an overall framework to guide planning and decision-making for the Reserve over the next five years. In accordance with NOAA guidelines, the Plan is specifically designed to:

1. Provide a vision and framework to guide Reserve activities during a five year period;

2. Enable the Reserve and NOAA to track progress and realize opportunities for growth;

3. Present Reserve goals, objectives, and strategies for meeting the goals to constituents;

4. Guide program evaluations under Section 312 of the Coastal Zone Management Act (CZMA); and

5. Enable the Reserve to acquire infrastructure and land acquisition funds.

1.2 National Estuarine Research Reserve System

The Reserve System is administered by the Estuarine Reserves Division (ERD) of the Office of Ocean and Coastal Resource Management (OCRM) within NOAA. The Division defines operating principles and guidelines, sets standards for system-wide programming, and provides support for each Reserve. The establishment of system-wide programming and standards applicable to all Reserves provides opportunities for enhanced coastal management at a national level and value-added resources available to each individual Reserve. The Reserve System currently consists of 27 reserves in 22 states and territories, protecting over one million acres of estuarine lands and waters (Fig 1.1).

Figure 1.1 - The National Estuarine Research Reserve System. Unfilled dots indicate locations of existing reserves, and filled dots indicate proposed reserves.

1.2.1 Reserve System Guidance

Federal Regulation:

First and foremost, operations at each Reserve must be consistent with the Federal guidelines stated in the NERRS regulations, 15 C.F.R. Part 921.1(a) of the CZMA. These define the mission of the National Estuarine Research Reserve System as: the establishment and management, through Federal-State cooperation, of a national system of Estuarine Research Reserves representative of the various regions and estuarine types in the United States. Estuarine Research Reserves are established to provide opportunities for long-term research, education, and interpretation. Federal regulations, 15 C.F.R. Part 921.1(b), also provide five specific goals for the reserve system:

(1) Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources;

(2) Address coastal management issues identified as significant through coordinated estuarine research within the System;

(3) Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation;

(4) Promote Federal, State, public and private use of one or more Reserves within the System when such entities conduct estuarine research; and

(5) Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

Reserve System 2005-2010 Strategic Plan:

Consistent with federal regulations of the CZMA, the Reserve System 2005 – 2010 Strategic Plan provides further guidance to help focus reserve activities by defining a vision, mission and goals. It also provides a set of guiding principles and prioritizes broad coastal management issues. However, this framework allows individual reserves to develop management plans suited to their unique needs while maintaining a national identity. The basic elements of the NERRS 2005-2010 Strategic Plan are:

NERR System Vision: Healthy estuaries and watersheds where coastal communities and ecosystems thrive.

NERR System Mission: To practice and promote coastal and estuarine stewardship through innovative research and education, using a system of protected areas.

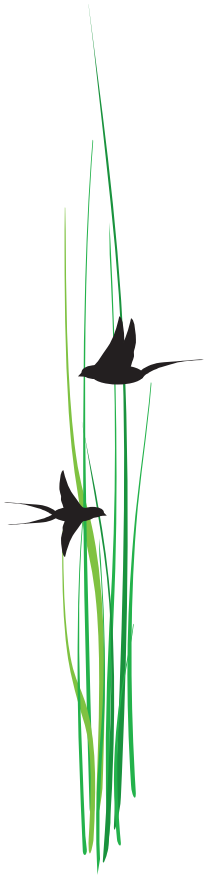
NERR System Goals:

1. Strengthen the protection and management of representative estuarine ecosystems to advance estuarine conservation, research and education,

2. Increase the use of reserve science and sites to address priority coastal management issues,

3. Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Salt marsh hay in a NBNERR marsh.



Guiding Principles:

- Strong partnerships between NOAA, state agencies and universities and other local partners are critical to the success of the reserve system.
- The reserve system integrates science, education and stewardship on relevant topics to maximize the benefits to coastal management.
- Reserves serve as a catalyst and a focal point for demonstrating and facilitating objective problem solving and best management practices.
- Reserves engage local communities and citizens to improve stewardship of coastal areas.
- Reserves implement an ecosystem-based management approach.

2005-2010 National Priority Management Issues:

- Land use and population growth,
- Water quality degradation,
- Habitat loss and alteration,
- Changes in biological communities.

1.2.2 Biogeographic Regions

NOAA has identified eleven distinct biogeographic regions and 29 subregions in the U.S., each of which contains several types of estuarine ecosystems (15 C.F.R. Part 921, Appendix I and II). When complete, the Reserve System will contain examples of estuarine hydrologic and biological types characteristic of each biogeographic region. As of 2010, the reserve system includes 27 approved Reserves with two additional Reserves in the process of designation (Figure 1.1).

1.2.3 Reserve Designation and Operation

Under Federal law (16 U.S.C. Section 1461), a state can nominate an estuarine ecosystem for Research Reserve status so long as the site meets the following conditions:

1. The area is representative of its biogeographic region, is suitable for long-term research and contributes to the biogeographical and typological balance of the System;

2. The law of the coastal state provides long-term protection for the proposed Reserve's resources to ensure a stable environment for research;

3. Designation of the site as a Reserve will serve to enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation; and

4. The coastal state has complied with the requirements of any regulations issued by the Secretary [of Commerce].

Reserve boundaries must include an adequate portion of the key land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation. If the

proposed site is accepted into the Reserve System, it is eligible for NOAA financial assistance on a cost-share basis with the state. The state exercises administrative and management control, consistent with its obligations to NOAA, as outlined in a memorandum of understanding (Appendix A). A reserve may apply to NOAA's ERD for funds to help support operations, research, monitoring, education/interpretation, stewardship, development projects, facility construction, and land acquisition.

1.3 Reserve Setting

With the acceptance of this Management Plan, the Narragansett Bay Research Reserve will include property units on the islands of Prudence, Patience, Hope and Dyer, all of which are located in the geographic center of Narragansett Bay (Fig. 1.2). Therefore, many of the management issues facing the Bay are also of concern to the Reserve.

1.3.1 Narragansett Bay Ecology

The Bay and its watershed as they exist today were largely shaped by the repeated advance and retreat of glaciers beginning with the Pleistocene epoch approximately three million years ago. The last of these glaciers, the late Wisconsin ice sheet, covered the region 18,000 years ago and finally retreated 10,000 to 12,000 years ago. The terminal moraine of this last glacial event reached just south of the mouth of the Bay, to Long Island, Block Island, Martha's Vineyard, and Nantucket. Narragansett Bay lies within the ancient Narragansett Basin and is composed of three drowned river valleys which are now identified as the East and West passages and the Sakonnet River. Below layers of sediment, the Bay is lined with sedimentary and conglomerate bedrock from the Pennsylvanian period. The Bay is also home to more than 30 distinct islands ranging in size from the 27,649 acre Aquidneck Island to the 0.5 acre Whale Rock. Conanicut and Prudence islands are the second and third largest in the Bay.

Today the Bay is a temperate, well-mixed estuary whose boundaries are located mostly within the state of Rhode Island. The Bay essentially bisects Rhode Island in a north-south direction with metropolitan Providence at its head and Newport on Aquidneck Island at the mouth of the Bay (Fig. 1.2). The dominant rivers entering into Narragansett Bay include the Providence, Seekonk, Palmer, Barrington, and Taunton rivers. The shoreline includes numerous coves and embayments, with Mount Hope and Greenwich Bays as the largest. The effects of the glaciers are also clearly seen along the shoreline of Narragansett Bay (and the Reserve), which is dominated by narrow cobble beaches. Sandy beaches are primarily limited to a relatively few small areas in Narragansett Bay proper. The famous rocky New England shore is also found in Narragansett Bay, along the southern extent of Conanicut Island, Brenton Point on Aquidneck Island, and along Hope and Prudence Islands. Other shoreline types common in Narragansett Bay include fringing and meadow salt marshes in low-energy, depositional areas, and human-modified and bulkheaded shorelines.

The naturally deep waters of the East Passage provide access for large vessels as far north as Prudence Island, and then dredged channels allow further passage to ports on the Providence and Taunton rivers. Historically, this access has contributed greatly to the industrial development of several major cities within the 1,657 square mile watershed. Approximately 40% of the watershed falls within the state of Rhode Island and includes the cities of Providence, Woonsocket, Cranston, Warwick, and Newport. The remaining 60% of the watershed falls within Massachusetts and includes the cities of Worcester, Fall River, Taunton and Brockton.

Narragansett Bay receives freshwater inputs from a variety of sources including rivers, groundwater, direct precipitation, wastewater treatment facilities and combined sewer overflows (CSOs). These inputs vary substantially on multiple time scales, but generally the greatest input is in the winter and the lowest in the summer. Although river flow is quite variable, it contributes on average, 2,400 million gallons per day (MGD). This is approximately 80 percent of the freshwater entering the Bay. Together the Blackstone, Taunton, and Pawtuxet rivers

First-hand beach ecology at Sandy Beach on Prudence Island.

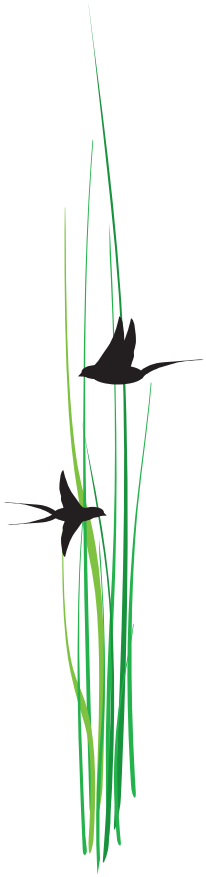
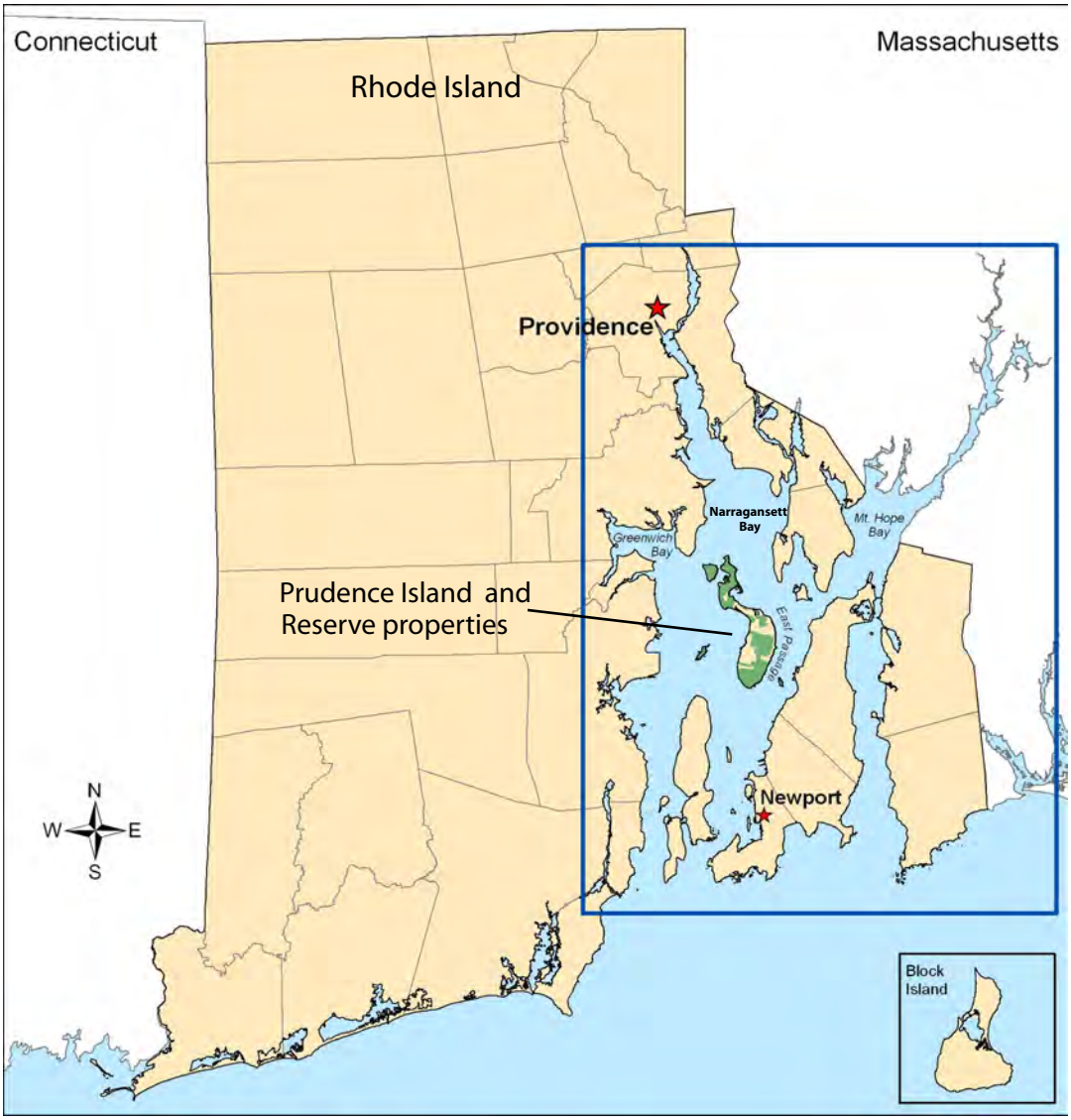


Figure 1.2 - Map of Rhode Island and Narragansett Bay. Reserve properties are shaded in green.

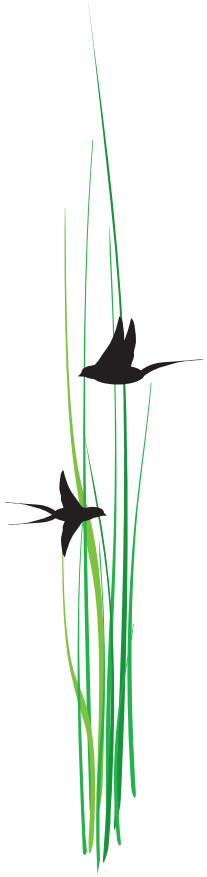


account for 63 percent of this total. A number of smaller rivers make very minor contributions. The remaining freshwater inputs include direct precipitation (13 percent; 310 MGD) and wastewater treatment facilities (9 percent; 248 MGD) (Ries, 1990). Lesser inputs of freshwater are from Combined Sewer Overflows (CSOs) and groundwater, respectively. These freshwater inputs to the Bay result in a salinity gradient that ranges on average between 24 parts per thousand (ppt) in the Providence River to 32 ppt at the mouth of the Bay (Kremer and Nixon, 1978). However, salinities can be substantially lower in the surface waters at the head of the Bay and in landward areas of small coves, embayments and salt marshes, especially after heavy rain events.

Ecologically, Narragansett Bay is considered to be a phytoplankton-dominated system. The waters adjoining the Reserve are relatively deep and phytoplankton is the major contributor to primary production. However, microphytobenthos, macroalgae and halophytes (*Spartina* community) are also significant producers. Approximately 6% of the Bay's eelgrass (*Zostera marina*) is also found in Reserve waters, primarily in one large bed abutting the southeast shore of Prudence Island. The subtidal waters support a diverse benthic community of mollusks, crabs and worms. The northern quahog (*Mercenaria mercenaria*) is the most commercially important species, with a smaller fishery for the American lobster (*Homarus americanus*). A menhaden fishery is also seasonally important.

Narragansett Bay also provides important habitats at different times of the year for estuarine birds and marine mammals. From spring through fall, many of the Bay's islands, including Hope and Dyer islands in the Reserve, function as rookeries for colonial wading birds. Prominent species within this assemblage include Herring and Great Black-backed Gulls (*Larus argentatus* and *Larus marinus*, respectively), Great Egret (*Ardea alba*), Snowy Egret (*Egretta thula*), Glossy Ibis (*Plegadis falcinellus*) and Double-crested Cormorant (*Phalacrocorax auritus*). Small numbers of American Oystercatchers (*Heamatopus palliates*) also nest annually within the Bay, including on Dyer Island.

In winter, many areas of the Bay are used for foraging and resting by winter waterfowl and harbor seals (*Phoca vitulina*). Over twenty distinct seal haul-out sites have been identified in Narragansett Bay. One of the most important sites occurs within the Reserve, on a clump of rocks near the T-wharf; counts of over 60 seals at one time have recently been recorded at this site. Seals also haul-out on rocks adjacent to Dyer and Hope islands, although seal numbers at Dyer Island are consistently low, and only a few counts have ever been made at Hope Island due to logistical issues. In terms of winter waterfowl, surveys over the last six years illustrate that the Bay provides important overwintering habitats for a diverse assemblage of birds, including Greater Scaup (*Aythya marila*; 95% of the total Bay-wide count was found within the Reserve), Gulls, American Black Duck (*Anas rubripes*), Mallard (*Anas platyrhynchos*), Common Eider (*Somateria mollissima*), Canada Goose (*Branta canadensis*), Brant (*Branta bernicla*), Common Goldeneye (*Bucephala clangula*), Bufflehead (*Bucephala albeola*) and Red-breasted Merganser (*Mergus serrator*).



1.4 Management Issues and Ecological Impacts to the Bay

Narragansett Bay and its watershed have been subjected to varying degrees of human alteration for many thousands of years. However, environmental change began to rapidly accelerate with the advent of European colonization in the 17th century. Rapid population growth resulted in increasingly large tracts of land being cleared for farming or grazing. Additional population growth within the watershed and the onset of the industrial revolution in the 19th century also resulted in many permanent changes to the Bay. As with other areas of New England, Rhode Island became a center for commerce and manufacturing. This shift led to the damming of nearly all the Bay's tributaries, the dredging of shipping channels, and increased pollution entering the Bay. In addition, marshes and wetlands were filled or ditched and shorelines were hardened and developed. Currently, the Narragansett Bay watershed is one of the most urbanized major watersheds in the northeast. While the metropolitan Providence area has the greatest extent of impervious cover within the watershed, other urban centers contribute, resulting in an overall impervious cover of 13% (Fig. 1.3). This value exceeds the 10% impervious cover widely recognized as the threshold above which environmental impacts become significant. With the advent of environmental regulation in the latter half of the 20th century, many of the practices and policies adversely affecting the Bay were either eliminated or modified. However, the Bay still faces a number of threats to its health and resiliency from current practices as well as from the legacy of past industrialization. These practices can be grouped into the broad categories of coastal and watershed development, wastewater and stormwater management, natural resources management, and lack of invasive species management. While some of these activities cannot be eliminated, their impacts to the Bay can be reduced or mitigated with the right information and the desire to make a difference. The Narragansett Bay Reserve serves this role by collecting needed information and making it available to the appropriate audiences for more informed decision-making. Although estuaries are naturally dynamic places, and ecological responses to management actions can often be slow and subtle, the effects of global climate change on estuarine ecology are uncertain. Reserve programs work toward reducing this uncertainty through research and education in order find solutions to these problems.

1.4.1 Issues and Impacts

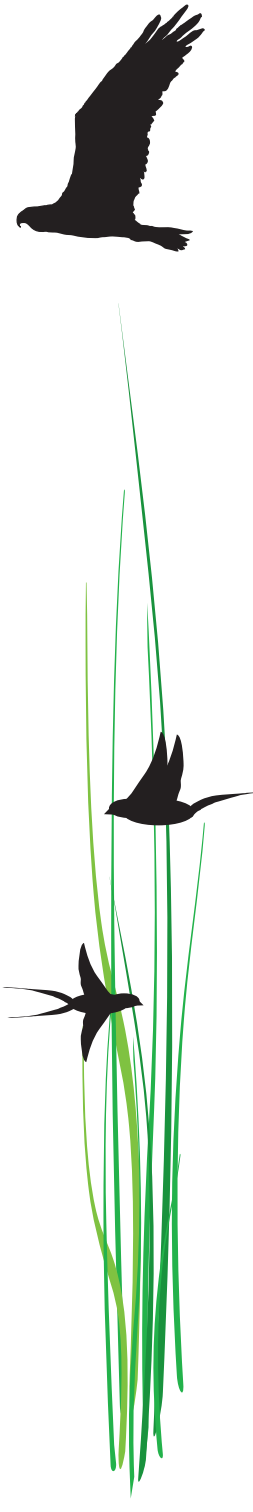
- **Wastewater and Stormwater Management:**

Perhaps the most important and yet most difficult problem to solve is poor water quality because it affects the Bay in a number of different ways and stems from many different sources. While raw sewage and toxic metals are no longer intentionally dumped directly into the water, further improvements in wastewater management, while ongoing, have been slow. High nutrient loads from sewage treatment plants and groundwater still contribute to excessive phytoplankton growth, low dissolved oxygen concentrations and occasional fish kills in many areas of the Bay. While plans are underway to reduce the nutrient concentrations at some treatment plants, the Bay is not a homogeneous body of water and receives inputs from a number of different sources. As a result, consensus among coastal managers regarding the best strategies for solving these problems has not been reached. The Reserve, along with its partners, routinely collects biological and water quality data to help assess the temporal and spatial conditions throughout the Bay. These data contribute toward a better understanding of water quality and nutrient dynamics in the Bay, allowing coastal managers to make more informed decisions.

In addition to the chronic nutrient-related problems noted above, heavy rain events result in a different suite of problems. In many urban areas, extremely old water management systems carry both rainwater and sewage together to the sewage treatment plants. During heavy rains this combined volume of water overwhelms treatment plants thereby flushing raw sewage directly into the Bay. The resulting high bacterial levels lead to a number of impacts such as the closure of public beaches and restrictions to shellfish harvesting. Currently several initiatives are underway to reduce these impacts. The primary sewage treatment plant for the City of Providence is phasing in the use of massive underground tunnels for the temporary storage of this water until it can be properly processed. Water quality data collected by the Reserve will help managers assess the success of this and other projects. Despite these improvements, wastewater treatment facilities, along with other coastal infrastructure, will be more at risk to inundation as sea levels rise.

- **Coastal and Watershed Development:**

While Rhode Island's overall population has not increased substantially in recent years, it has been redistributed through increased coastal development. Current estimates indicate that as much as 25% of the Bay's shoreline has been hardened or modified (Keller et al., 1996). Continued development and increases in sea level may dramatically increase this modification as local property owners seek to preserve their land. Coastal development and shoreline hardening eliminates or damages vital shoreline habitats already threatened. While seemingly disconnected, natural shorelines provide many ecosystem services, including serving as nursery habitat for a number of commercially and recreationally important fish species. While living shoreline techniques are growing increasingly popular, their contribution to all shoreline modification projects remains small. Local municipalities are only just beginning to discuss ways to mitigate and adapt to sea level rise. Poorly regulated development throughout the watershed also threatens vital habitat and impacts the quality and quantity of freshwater reaching the Bay. Untreated stormwater runoff also enters the estuary through many other routes, bringing with it sediment and a suite of toxic compounds. Likely increases in storm intensity and frequency as a result of climate change further exacerbate the effects of impervious cover on Bay and river ecosystems. The CTP and RIDEM are providing training and tools to help decision-makers minimize habitat destruction, fragmentation and impervious cover through alternative development strategies. These techniques also reduce the rapid flow of water to the Bay during high rain events. Changes in regulations affecting the management of stormwater are currently being instituted. The CTP makes the information available to stakeholders in a practical and useful way.



Indian Springs on Prudence Island.

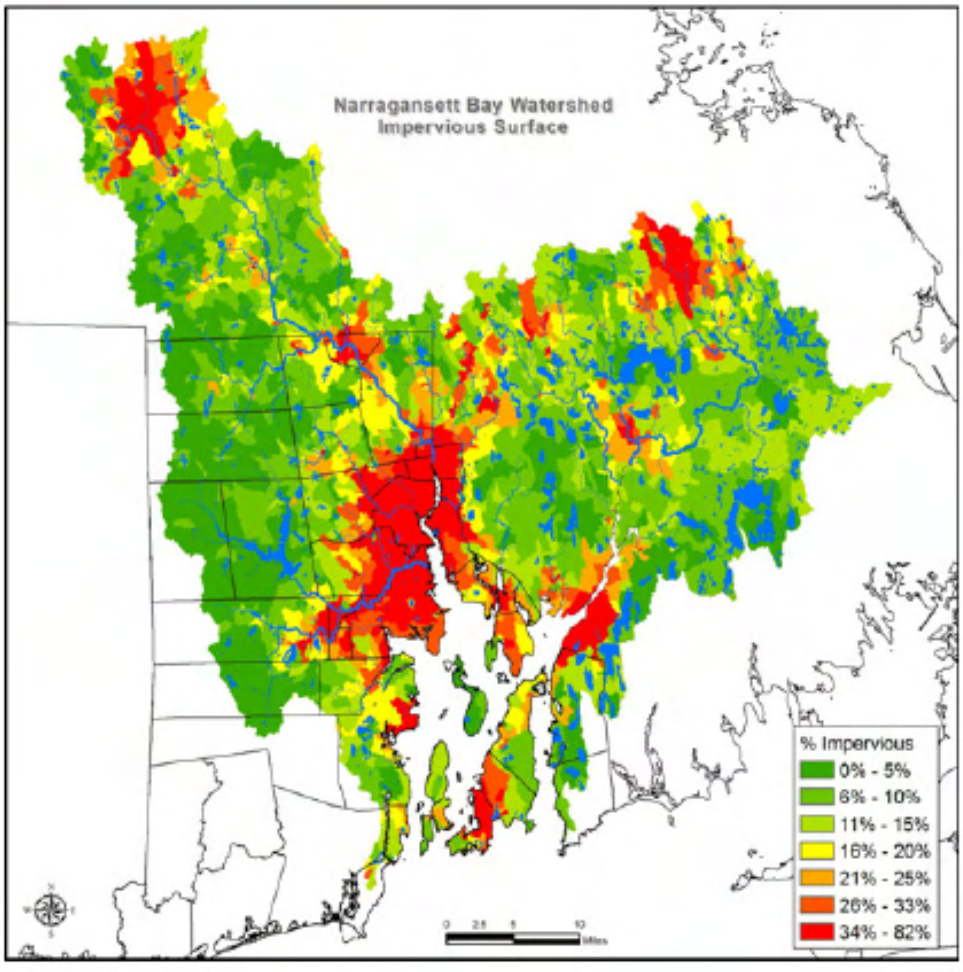
- **Invasive Species Management:**

As with most areas in the US, the ecological threats from terrestrial, aquatic and marine invasive species continue to increase. Invasive species can reduce native species diversity and ecosystem resiliency, displace commercially important species and impact natural resource utilization and local economies. The threats from invasive species are also compounded by global climate change. Even small changes in climate (variation in temperature and rainfall) may further increase this threat by changes in spawning season, species ranges, etc. Some of these alterations may cascade throughout the ecosystem leading to widespread change. The Reserve contributed to the development of Rhode Island's recently approved Aquatic Invasive Species Management Plan which provides a framework for various state agencies and organizations to coordinate and prioritize activities. The Reserve works within its boundaries and throughout the Bay to monitor and detect invasive species, actively eliminate species where possible, and train decision-makers and the public about ways to minimize their introduction. Several species of invasive terrestrial plants have dramatically altered and degraded large forest area within the Reserve. Species of note include asiatic bittersweet, and autumn olive. Programs and projects developed by the Reserve to mitigate their effects can serve as demonstration projects. Methods and lessons learned can be exported throughout the watershed.

- **Natural Resources Management:**

Natural resources management includes a broad array of activities that range from habitat and species monitoring to active management and restoration. Within the Reserve a number of habitats and species are managed to maintain a diverse and healthy ecosystem and to preserve species and habitats that are at risk throughout the watershed. Removal of invasive species and maintenance of terrestrial and estuarine habitats within the Reserve also benefit the entire region. For example, the Reserve along with a number of partners, recently contributed to a full-scale highly accurate assessment of eelgrass and found that while the present distribution and extent of eelgrass beds within Narragansett Bay represent a fraction of the area they once occupied, some of the largest beds are found in Reserve waters. Because this type of assessment is expensive and labor intensive, Reserve staff are piloting an efficient and cost effective rapid sampling protocol that can be used to tract changes in its distribution on an annual basis. The Reserve is also a vital partner working to assess the success of various salt marsh restoration techniques at various locations throughout the Bay. Finally, deer management on Prudence Island is a high priority for the Reserve because of the various negative impacts caused by overpopulation. Because deer are vectors for ticks and tick borne diseases, a high deer population increases concerns.

Figure 1.3 - Map of Impervious Cover within the Narragansett Bay Watershed.



1.5 Reserve Components and Resources

The Reserve was designated in 1980, becoming the seventh reserve in the NERRS. Reserve habitats are representative of the Southern New England Sub-region of the Virginian biogeographic region. Sites in this region contain diverse aquatic and estuarine habitats including lowland streams, coastal marshes, cobble and rocky shores and muddy bottoms. Because Reserve properties are located in the middle of Narragansett Bay, their ecosystems are also strongly influenced by the surrounding Narragansett Bay and its watershed.

Reserve land holdings currently include nine property units located on three islands situated in the geographic center of Narragansett Bay (Fig. 1.4.). Seven of these units are located on Prudence Island, including the South End and North End Prudence Units, which are the two largest units in the Reserve. With the exception of three very small (<1% area) private in-holdings remaining on Patience Island, the remaining property and all of Hope Island are included in the Reserve. With the acceptance of this Management Plan, two significant properties will be added to the Reserve. These are the 28 acre Dyer Island and the 128 acre Ballard property on Prudence Island. Dyer Island was purchased by the State in 2002 while the Ballard Property was acquired in 2009. Both are fully owned by the State, but the Prudence Conservancy maintains a conservation easement on the Ballard property. Both include habitats of exceptional quality and value that will add research and educational opportunities for the Reserve.

Hope and Dyer Islands are completely uninhabited. Prudence Island remains mostly undeveloped, but supports small clusters of residential housing and other limited development. The year-round human population on Prudence Island is approximately 150 people, although this peaks to approximately 2,000 people at times during the summer. The island is only reached by a public ferry, water taxi or private vessel. Most of the year, ferry service is infrequent with only two trips early in the morning and two in the late afternoon.

The State fully owns all of the units, with the exception of the Prudence Conservancy Unit which is owned by the Prudence Conservancy, a local land trust. The State does however hold a conservation easement on the property. Table 1.1 lists the acreage, ownership and date of acquisition for each property unit. The Reserve also bounds all estuarine waters surrounding coastal units out to a depth of 18 feet, except for waters adjacent to the Blount Unit on central Prudence Island (Fig.1.4).

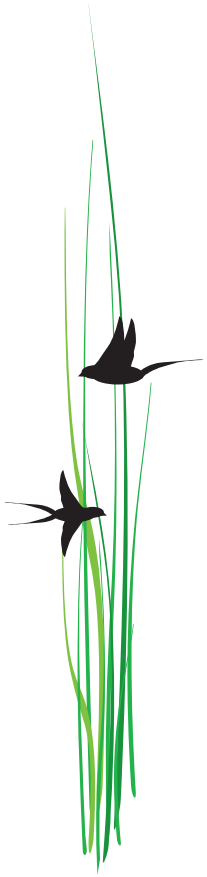
Most of Prudence Island, Hope Island, and Patience Island were extensively farmed in the 1700s and early 1800s. The land has since reverted to second-growth forest except for residential areas along the eastern shore, Prudence Park on the Island's west side and sections of the former U.S. Navy Base which is now the southern portion of the Reserve. These areas have been repeatedly disturbed by man's activities, including residential and recreational use. Consequently, certain characteristics of these ecosystems reflect this past activity including the prevalence of terrestrial invasive species.

1.5.1 Management Structure

The Rhode Island Department of Environmental Management (RIDEM) is the lead state agency managing the Reserve. Administratively, the Reserve program is currently located within the Division of Planning and Development (P&D) under the supervision of the Administrator of the Sustainable Watersheds Program. The Division of P&D supports the facilities construction and land acquisition functions of the Reserve program. Additional divisions within RIDEM provide necessary support. For example, the Office of Management Services provides both fiscal and contract administration support. Other divisions such as Enforcement, Fish and Wildlife, and Forest and Environment also contribute services and expertise. Locally, the Reserve is situated within the Town of Portsmouth, RI, which provides some security and maintenance functions. The Reserve Manager is a full-time State employee and is responsible for all on-site operations. The Administrator of the Sustainable Watersheds Program is a State employee and contributes significant time to Reserve programs, particularly the CTP. Of the other six full-time positions, only the Parks Caretaker Supervisor is a State employee. The remaining core staff positions are employed through a cooperative agreement with the Audubon Society of Rhode Island (ASRI). However, these staff members report to, and are supervised by, the Reserve Manager. An additional five part-time and seasonal staff help support the Reserve in a variety of capacities. An overall Reserve Advisory Committee (RAC) was convened to provide input on the development of this plan. However, the Reserve will only convene this group on an as-needed basis when broad policy decisions are necessary. RAC membership includes representation from relevant RI state agencies, universities, NGOs, and local governments among others. Each Reserve sector also convened a sector-specific focus group to gather input during the development of this plan. With the exception of the standing CTP Advisory Committee, focus groups for the other sectors will only convene on an as-needed basis.

1.5.2 Facilities

The Reserve provides a number of facilities and resources to support its research, education and stewardship programs. It also provides access and opportunities for the general public to enjoy, learn about and appreciate Reserve habitats in a responsible way. The Reserve headquarters building is located within the South Prudence unit (South End) of the Reserve and provides approximately 5000 square feet of lab and office space as well as a small conference room, visitor center and workshop. Located within the same building complex is a small ADA-accessible cottage renovated to serve as a dormitory for up to 12 individuals. An adjacent cottage provides temporary housing for visiting scientists or other temporary workers. A three-bay garage houses much of the maintenance equipment for the Reserve and serves as a workshop. In addition, the Reserve inherited a very large World War II-era pier located at the South End. This pier, called the T-wharf, was built for offloading munitions to Navy battle ships but now provides excellent fishing opportunities and serves as the location for two of the Reserve's water quality monitoring stations. Due to its age and condition, the T-wharf is no longer capable of docking very large vessels, and because of its size, is not currently configured for smaller vessels. The Reserve maintains two small floating docks to provide vessels up to 30 feet access to the Reserve. One is located adjacent to the T-wharf at the South End and the other is located at Potters Cove at the North End. Both are limited to temporary docking for visitor transfer. The Reserve maintains a number of walking and biking trails throughout its properties. Finally, the Reserve maintains several types of vehicles for research and educational programs, including a 23-foot research vessel.



Looking northeast towards the Mt. Hope Bridge.

1.5.3 Reserve Unit Descriptions

Table 1.1 Reserve Property Units Listed by Year Acquired, Acreage and Ownership. Year acquired reflects when the property was obtained, not necessarily the year it was incorporated into the Reserve. Additional, smaller parcels were acquired in later years and merged with the North and South Prudence Units. Dyer Island and the Ballard property will be added to the Reserve with the approval of this Management Plan.

Unit Name	Year Acquired	Acres (land only)	Owner (s)
Blount	1974	18	State of RI
Hope Island	1975	70	State of RI
North Prudence	1978	717	State of RI
South Prudence	1980	785	State of RI
Patience Island	1980	167	State of RI
Barre	1988	120	State of RI
Little	1991	52	State of RI
Heritage	1992	291	State of RI
Prudence Conservancy	1992	166	Prudence Conservancy
Dyer Island	2002	28	State of RI
Ballard	2009	128	State of RI

Each Reserve unit is unique in its available habitats and species composition. A brief description of each unit is shown below.

North Prudence Unit (717 acres land)

This tract includes extensive coastal marshes—notably Coggeshall Marsh and Sheep Pen Marsh—coastal grassland, coastal shrubland and forested areas. The land areas are fringed with intertidal beaches and sand and mud flats. The water boundary out to the 18–foot isobath includes almost 900 acres of subtidal soft bottoms and subtidal plants represented by an eelgrass bed southwest of Sheep Pen Cove. The historic North Farm educational site is located here.

Barre Unit (120 acres land)

This area encompasses approximately 35 acres of the Nag Creek south coastal marsh, 24 acres of subtidal soft bottom, and a few acres of fringing coastal shrublands. The remaining acres comprise an area consisting primarily of maritime forest with a freshwater stream (Mill Creek) and several acres of freshwater wetlands.

Little Unit (52 acres land)

This unit contains approximately 51 acres of soft bottom, 33 acres of Nag Creek marsh and about six acres of intertidal beaches. The remainder of the land is surrounding coastal grassland and coastal shrubland.

Heritage Unit (291 acres land)

This unit is composed primarily of maritime forests and approximately 80 acres of wetlands. Schoolhouse Swamp is contained within this unit and is located in the upper reach of the Mill Creek watershed. The primary groundwater wells providing drinking water to the majority of island residents are located within this watershed.

Prudence Conservancy Unit (166 acres land)

This land is chiefly maritime forest but contains a portion of the Mill Creek watershed. The property also contains the historic Baker Farm site, which was continually operated from the early 1700s to 1930. The contiguous forest areas on both the Heritage and Prudence Conservancy tracts comprise the largest unoccupied forest area in the immediate Narragansett Bay region. This area has a pre-existing use by the Prudence Island Utility Commission. A water supply well is located just to the north of the historic farm site and a distribution line runs south from the well to a water storage tank on Broadway.

South Prudence Unit (785 acres land)

The shoreline of this unit includes coastal cliffs, intertidal beaches, subtidal soft bottoms and subtidal plants (including the largest eelgrass bed in the mid-Bay region). The remaining area is equally divided between freshwater wetlands, maritime forests and coastal shrubland. It also includes a locally rare pine barren mosaic habitat. About half of the area had been heavily disturbed by the presence of a U.S. Naval Station, which operated periodically from 1942 to 1972 as a Navy munitions storage facility. Artifacts of the Naval Station include numerous roads and firebreaks as well as 33 earth-covered storage bunkers. The Reserve's headquarters are located within this unit.

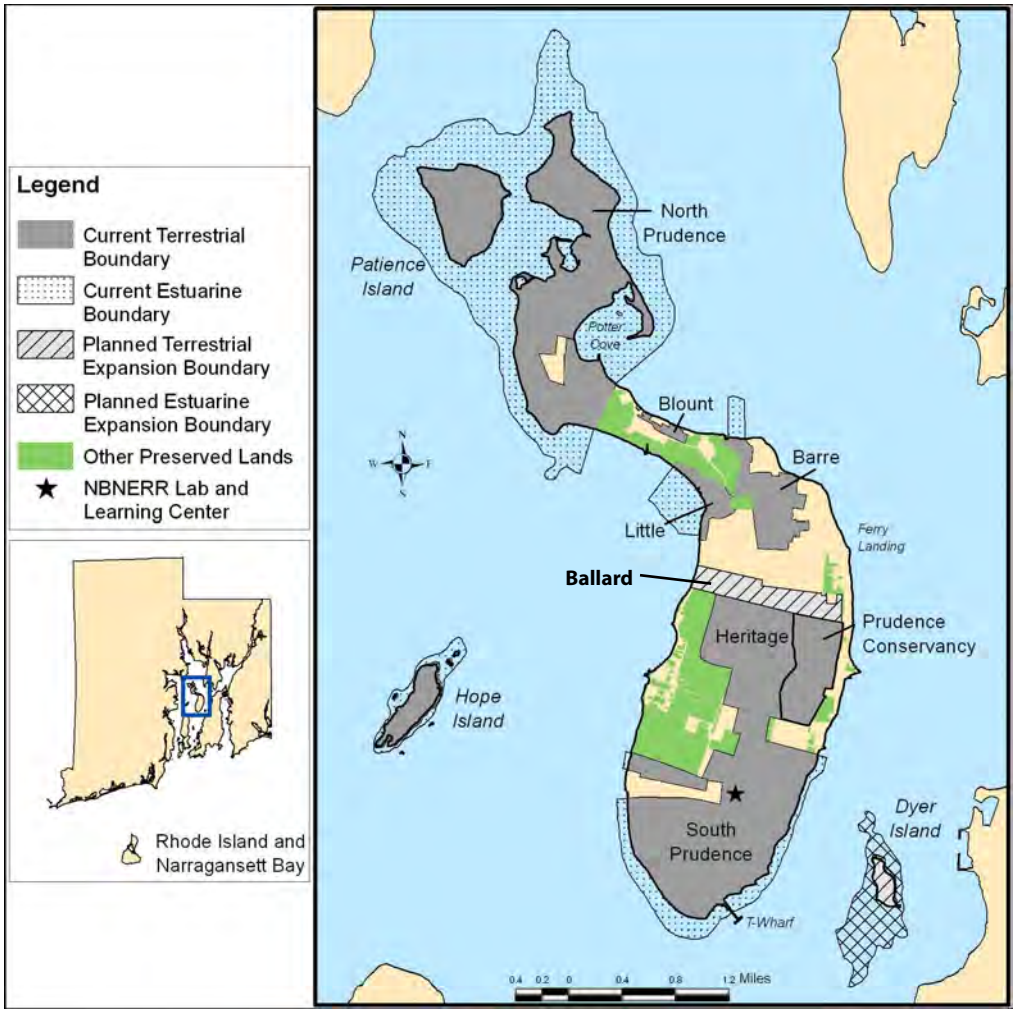


Figure 1.4. Estuarine Boundary and Terrestrial Units of the Narragansett Bay National Estuarine Research Reserve. GIS data sources courtesy of the Rhode Island Geographic Information System (RIGIS; www.edc.uri.edu/rigis/).

First tracks in a winter snowfall on Prudence Island.

Patience Island Unit (167 acres land)

This unit consists primarily of coastal shrubland and maritime forest, 10 acres of coastal marsh, a fringing intertidal beach and 480 acres of subtidal aquatic habitat with a soft bottom benthic environment.

Hope Island Unit (70 acres land)

The island consists mostly of coastal shrubland. However several coastal cliffs and small patches of intertidal beach support a regionally important shore bird rookery. The water boundary encompasses about 68 acres of subtidal soft bottoms.

Blount Unit (18 acres land)

This unit is comprised of upland vegetation types typical of the northern end of the island, including coastal cherry / eastern red cedar forest, and to a lesser extent coastal shrublands.

Dyer Island (28 acres land)

Approximately 86 percent of this island is comprised of coastal brushland. It also contains one of the last remaining un-ditched salt marshes in Narragansett Bay. Dyer Island is used as a rookery by a large mixed-species colony of gulls and a few pair of rare American Oystercatchers. Cobble shoreline and mud bottoms are also included in the submerged lands.

Ballard Unit (128 acres land)

This property is located at the northern boundary of three preserved parcels, the Reserve's Heritage and Prudence Conservancy units as well as a 250 acre preserve owned by the Audubon Society of Rhode Island (Fig. 1.5). This acquisition will permanently preserve a number of unique coastal habitats and move toward the creation of a permanent north-south greenway for the island. This property is predominantly forested with limited (< 20%) mixed early successional shrubland and grassland communities. A pine barrens mosaic, which is a dominant ridgeline feature of the island's landscape with a rich cultural history (locally referred to as the "desert"), extends into this parcel. A portion of the Mill Creek watershed, including the creek and its associated wetlands, is also located on this property. This property will present significant research and educational opportunities and will have easily accessible trails.

1.6 Programmatic Challenges

Throughout the development of this Management Plan, several challenges were consistently identified that strongly influence how the Reserve works and operates. These challenges apply to all aspects of the Reserve program and strongly influenced the development of our objectives and strategies.

Island Access

The most challenging issue facing the Reserve is its fairly remote location. Prudence Island and the Reserve's headquarters are only reached by private vessel or limited ferry service. The Reserve maintains a small research vessel that can be used for transport, and a water taxi service is available, but travel to the Reserve often requires a significant time commitment for anyone not already living or vacationing on Prudence Island. This presents significant challenges not only for the very basic operations of the Reserve, which include transportation of staff and the acquisition of supplies and services, but it creates significant but not insurmountable barriers for conducting research, education, and outreach activities on the Reserve. As a result, this plan outlines a variety of strategies that allow Reserve programs to adapt to these constraints.

On the ferry to Prudence Island.

Public Awareness

Throughout development of this Plan, the issue of limited public awareness of Reserve resources and programs was raised among various stakeholder groups. In part, this is the result of the Reserve's remote location. This limited awareness has led to under-utilized programs and resources. Objectives and strategies outlined in this plan will directly target this issue across all sectors of the Reserve. Increased awareness will lead to greater support for Reserve programs and utilization of its resources. It will also translate into greater stakeholder appreciation of the Bay and its resources.

Ticks and Tick-borne Disease

Tick densities on Prudence Island have traditionally been much higher than on the mainland, leading to concerns about increased risk of contracting tick-borne diseases. In the past this concern has been a deterrent for researchers and the public visiting the Reserve. However, in recent years estimates of tick densities on the mainland indicate they may be similar to those found on Prudence Island. This has led to a number of university and statewide education programs designed to increase the public's awareness of these risks and to provide strategies for prevention and risk management. These programs have reduced the perception that Prudence Island should be avoided. As a result, the 2010-2015 Management Plan encourages the use of Reserve resources while providing strategies and guidance for minimizing the risks of contracting a tick-borne disease.

1.7 Management Plan Development

The 2010-2015 Management Plan was developed through a collaborative effort involving Reserve staff, state agency professonals, ERD and stakeholders over a seventeen month period between December 2005 and July 2008. Resource professionals involved in research, education, training and stewardship at the Reserve and elsewhere in Rhode Island were engaged through a series of facilitated Focus Group meetings with Reserve staff. These meetings were designed to identify management issues and solicit input for the Plan. Specific Focus Group meetings were held to discuss research and monitoring, education and outreach, stewardship, and coastal training. A list of Focus Group meetings and participants is provided in Appendix C.

In addition to engaging resource professionals, the Reserve commissioned a telephone survey designed and conducted by the University of Rhode Island to solicit input from local individuals who live or own property on Prudence Island. The Survey was conducted in November 2006 and was completed by 169 individuals. The survey asked participants about their use of the island and Reserve properties, their familiarity with the Reserve and its programs, and their opinions regarding potential management actions. The survey also asked participants about specific land and water use issues on Prudence Island in an effort to provide information useful for the Prudence Island Planning Commission. A copy of the survey instrument and a summary of survey results are provided in Appendix D. Two Reserve Senior Advisory Committee meetings were held to discuss the initial development of the Plan and to provide comments on the Draft Plan. Results of the Focus Group discussions and property owner survey were also used to shape the goals, objectives and strategies that form the foundation of the 2010-2015 Plan.

In addition, the draft management plan was posted to the Reserve's website and made available during a 30 day public comment period. Notices were published in the Federal Register and the Providence Journal. All comments were addressed appropriately.

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2.0 Programmatic Accomplishments 1998 – 2009

Since the previous Management Plan was approved in 1998, the Reserve has experienced tremendous change and growth. Not only have the number of employees increased, but facilities have also seen significant enhancement. These changes have allowed the Reserve to increase the scope and diversity of its programs and to broaden its reach to better serve the local stakeholders of Rhode Island.

Sampling for nekton in the salt marsh with a throw trap.

2.1 Facilities

Changes to the Reserve headquarters building and overall campus have been markedly improved. Reserve headquarters has been expanded to include over 4000 square feet of usable space that includes: a visitor center, office and laboratory space, a small conference room, and a garage workshop. Two existing cottages were renovated in 2002 to accommodate additional visitation to the island. One cottage now serves as a small dormitory with capacity for twelve individuals, while the other now serves as a short-term residence for seasonal employees or visiting scientists. Derelict Navy-era buildings have been removed, improving the look and safety of the campus. Two of the Reserve's floating docks were renovated as well, one at the T-wharf and one at Potters Cove. In addition, a year-round weather station building was installed near Potters Cover and a composting toilet was installed near the T-wharf.

In 2006 the Reserve added a twelve-passenger van to its small fleet of vehicles. While a seemingly small change, this added capacity has dramatically improved access around the island for small groups and visitors. This resulted in the development of new onsite programming that wasn't possible before. Electronic and information infrastructure has also been significantly improved. The Reserve was upgraded from a dial up modem to a fractional T-1 line. This was upgraded again in 2008, further increasing bandwidth and connectivity to RI DEM headquarters in Providence. In 2009 the Reserve became fully networked with its own internal server. This added capacity has greatly improved the efficiency of staff communication and administration.

2.2 Research

Since 1998, the size and capacity of the research staff has grown to include a full-time Research Coordinator, a full-time Marine Research Specialist II and a Seasonal SWMP Technician. This increased capacity has allowed the research sector to fully meet its requirements to NOAA and to become established as a source for technical and scientific advice, as well as a nexus for collaborative research and monitoring within the Bay. During this time, the number of long-term SWMP stations being monitored and maintained has also increased to four. In 2006, real-time telemetry was added to the weather station and the water quality station located at the T-Wharf Bottom.

In 2005-2006, the Reserve was instrumental in developing the habitat mapping and change standards and protocols subsequently adopted by the entire NERR system. In addition, the Reserve expanded its water quality monitoring capability by building and deploying a high resolution water quality mapping system called Dataflow. This system can be used in shallow creeks and embayments not previously accessible. This capability was widely recognized and has been the source for a number of potential research and management collaborations.

Beginning in 2008, the Reserve was one of five partner reserves (along with Wells ME, South Slough OR, Chesapeake Bay VA, and North Carolina) collaborating on a three-year project to establish reference salt marshes for long-term ecological monitoring. The goals of the project were to establish these marshes to assess the impacts of global climate change and to com-

Investigating plankton during Bay Mania summer camp.

pare with nearby restoration marshes. The intent was to have monitoring infrastructure and protocols established in these reference sites after three years to allow for continued monitoring into the future.

During this time, a number of very important projects, reports and documents were produced. Among the list of significant documents was the Reserve's Site Profile completed in 2010. No other comprehensive document of its kind exists for Narragansett Bay. With a grant from NOAA's Restoration Center, along with participation from a number of partners, a full and rigorous survey of the distribution and extent of the Bay's eelgrass population was completed in 2006. The only other Bay-wide survey was completed in 1996. This work was followed by a widely cited report that helped stimulate the development of a Bay-wide eelgrass task force established to seek ways in which to continue monitoring this valuable but endangered natural resource. A number of other long-running monitoring studies were continued and enhanced with Reserve staff and Bay-wide partners. The Reserve began the first in a series of annual SWMP interpretive reports; the goal of this annual report is to provide data and analysis directly to scientists and local decision-makers in a concise and understandable manner. The Reserve established a technical series format to track and present reports based upon Reserve science. This growing series of documents is available from the NBNERR website.

During this time, Reserve staff provided a number of important advisory services to local and national stakeholders. Reserve staff members were instrumental in helping to train and establish the broader Bay-wide monitoring network called Bay Window.

2.3 Education

Since 1998, the education program has also seen significant growth and diversification in outreach, community and K-12 education programming. A number of infrastructure changes including the creation of a visitor/learning center have allowed these programs to develop. Exhibits in the learning center have been changed and updated over the years and continue to evolve, providing new educational opportunities. The Reserve also developed a number of new communication tools to help raise the profile and understanding of the Reserve and its programs. During this period the Reserve launched its first website and newsletter. Since that time, the website has been reorganized and content has expanded dramatically providing information and data to a wide audience. Most Reserve communications, science products and reports are now available for download from this site. In 2006, the Reserve launched its own unique NBNERR logo to help identify its programs and products and to provide greater program visibility. This branding has allowed us to develop promotional items such as t-shirts, hats, stickers, vehicle decals, etc. Another signature product that has grown in popularity over the years is the Reserve's annual tide calendar. Each month of the calendar highlights Reserve activities, partnerships, and Bay-wide issues relevant to the Reserve. In addition to print and electronic newsletters, the education coordinator sends short, concise e-alerts to our distribution list highlighting upcoming events, programs and reports.

Because of greater community presence, the Reserve is now expected to participate in a wide range of community outreach events that range from annual beach cleanups to earth day programs and other educational fairs. Upgrades to the dormitory have allowed the Reserve to initiate and develop summer camp programs in partnership with the Prudence Conservancy and URI's W. Alton Jones Camp. The education program now offers professional development workshops for Rhode Island teachers in partnership with the URI Office of Marine Programs. The Reserve was also one of three New England Reserves to win a NOAA Bay Watershed Education Training (B-WET) grant to pilot teacher training workshops using the NERRS System-Wide Teachers on the Estuary (TOTE) curriculum.

2.4 Coastal Training Program

The development and maturation of the Coastal Training Program (CTP) has been a significant achievement for the Reserve and an asset to local stakeholders. Since its inception, the CTP has continued to diversify its portfolio of trainings and training material. In particular, the CTP, in collaboration with RIDEM's Sustainable Watersheds Program, has focused on the variety of issues related to coastal development; including conservation development, conservation easements, community planning, etc. The CTP has also partnered with a number of other organizations to help coordinate other trainings and programs within the watershed. This includes working with Growsmart RI to develop and maintain an online training calendar (www.communityconnectionRI.org) that provides timely and comprehensive announcements of training events throughout the Narragansett Bay watershed. The CTP has also sponsored a number of large-scale meetings and workshops such as the biennial Power of Place Summit, the annual RI Land and Water Conservation Summit and the RI League of Cities and Towns Annual Convention.

The woodcutters stewardship program uses volunteers for forest stewardship.

2.5 Stewardship

As with the other program sectors, stewardship activities have also greatly expanded and diversified. The Reserve expanded stewardship activities in upland areas from primarily passive management to active restoration of early successional habitats (e.g. grassland, shrubland). The Reserve revised its longstanding home fuelwood program to a volunteer-based woodcutting stewards program with enhanced forest management and community education components. Stewardship also initiated a Cooperative Weed Management Area for Prudence Island which serves to share limited resources (e.g. volunteer labor, tools) to address terrestrial invasive species concerns irrespective of property ownership boundaries. An additional strategy to create an alternative spring break focusing on invasive species removal has become extremely popular. The stewardship sector supports conservation and stewardship efforts of partner agencies by expanding the Reserve's role as a local resource for technical and GIS assistance. Stewardship has also fostered stronger partnerships with organizations such as the Prudence Conservancy to share resources and develop projects.

2.6 Management Structure and Reserve Administration

Since the completion of the previous management plan, the management structure of the Reserve has evolved considerably, not only in each employee's functional role, but also in the total number of employees working for the Reserve. In 1998, Reserve staff was composed of three full-time, one part-time, and two seasonal employees. At that time, the manager (a full-time RIDEM employee) also served as the Research Coordinator, while a part-time RIDEM employee served as an Administrative Coordinator. A full-time RIDEM employee also served as a Caretaker and Maintenance Supervisor, while the full-time Education Coordinator was employed through a cooperative agreement with the Audubon Society of Rhode Island (ASRI). Currently, Reserve staff is composed of seven full-time and seven part-time or seasonal employees. This includes full-time staff for each of the Reserve core positions of Manager, Research Coordinator, Education Coordinator, Stewardship Coordinator, and CTP Coordinator in addition to a number of part-time and seasonal staff. In 2005 RIDEM hired a full-time Manager to oversee all Reserve functions in accordance with recommendations of the 2004, Section 312 program review. While the Manager and Caretaker are full-time RIDEM employees, the remaining core staff positions are contracted through a cooperative agreement with the Audubon Society of Rhode Island. This arrangement is necessary because of significant fiscal restraints within the State and strict limits on the total number of full time employees (FTEs). However, these employees report directly to the Manager and are entitled to health and retirement benefits through ASRI. In addition, the Reserve now follows an open and competitive hiring process for all permanent positions. These changes have resulted in greater staff retention and greater productivity across all program sectors.

2.7 Acquisition

During this period, two significant parcels were acquired by the State and will be formally included in the Reserve with the approval of this Management Plan. These include the 28 acre Dyer Island and the 128 acre Ballard property on Prudence Island. Both represent the preservation of unique habitats within the Narragansett Bay watershed and will provide enhanced opportunities for research and education.

3.0 Reserve Mission, Vision, Goals and Objectives

3.1 Narragansett Bay Reserve Mission and Vision

The unique mission and vision statements of the Narragansett Bay Reserve were developed to be consistent with the strategic vision and goals of the NERR System (Chapter 1), but also to be uniquely applicable to the needs of local stakeholders within the Narragansett Bay watershed.

Vision: To be a valued leader, partner and resource helping to sustain a healthy Narragansett Bay and its watershed through the collection, synthesis, interpretation and application of research and monitoring data.

Mission: To preserve, protect and restore coastal and estuarine ecosystems of Narragansett Bay through long-term research, education and training.

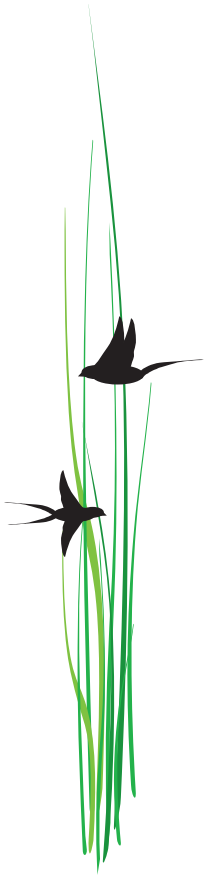
3.2 Reserve Goals

The unique goals and objectives developed for the Narragansett Bay Reserve are consistent with the three strategic goals established in the 2005-2010 National Estuarine Research Reserve System Strategic Plan (Appendix B), but are applicable and responsive to the needs of our local stakeholders. Further, the objectives were developed to address the unique needs and challenges faced by the Reserve while simultaneously considering the capacity and ability of the Reserve to reach our objectives and meet our goals. The goals for the Narragansett Bay Reserve are to:

1. Strengthen the protection and management of representative estuarine ecosystems within Narragansett Bay to advance estuarine conservation, research and education.

2. Increase the use of Reserve science and sites to address priority coastal management issues within Narragansett Bay and its watershed.

3. Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.



Vegetation monitoring as part of the NERRS Sentinel Site monitoring effort.

3.3 Reserve Program Goals and Objectives

Program objectives are organized according to the three Reserve goals. Each objective has an alphanumeric suffix identifying the specific Reserve sector that most contributes toward that objective.

R = Research and Monitoring
S = Stewardship
I = Infrastructure
P = Public Access
E = Education
T = Coastal Training Program
A = Administration
B = Boundary expansion and land acquisition

1. Strengthen the protection and management of representative estuarine ecosystems within Narragansett Bay to advance estuarine conservation, research and education.

- Encourage and assist in a multi-agency approach to research, monitoring, and science-based ecosystem management - R3

- Protect the ecological integrity of the land and water resources of the Reserve using an ecosystem-based management approach - S1

- Promote conservation by integrating the products, programs and expertise of other reserve sectors into stewardship activities to increase stakeholder engagement and understanding - S2

- Support and enhance watershed-wide stewardship programs by developing partnerships that share resources and leverage funds - S3

- Acquire property or property rights on select Narragansett Bay islands to expand Reserve boundaries for the long-term preservation of estuarine and coastal habitats – B 1

2. Increase the use of Reserve science and sites to address priority coastal management issues within Narragansett Bay and its watershed.

- Contribute to status and trends assessments and forecasting of environmental quality by tracking short-term variability and long-term changes in abiotic and biological parameters at the Reserve and within Narragansett Bay – R2

- Improve opportunities to support and conduct basic and applied research within the Reserve – R1

- Continue to provide coastal resource managers, the scientific community, and general education practitioners with appropriate scientific and technical information to foster informed decision making – R4

- Optimize educational use of the Narragansett Bay Research Reserve and its facilities with a focus on the Reserve's ecological and cultural significance - E2

- Provide and maintain the infrastructure needed to fully meet the Reserve's mission – I1

- Maintain and improve the administrative framework to efficiently support Reserve programs, goals and objectives – A1

3. Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

• Increase public awareness, understanding and appreciation of the Narragansett Bay estuary by designing, implementing and supporting high-quality, science-based education programs for K-16 and community education audiences – E1

• Increase the knowledge and skill levels of coastal decision-makers so their decisions may better preserve and protect the natural resources of Narragansett Bay and its watershed - T1

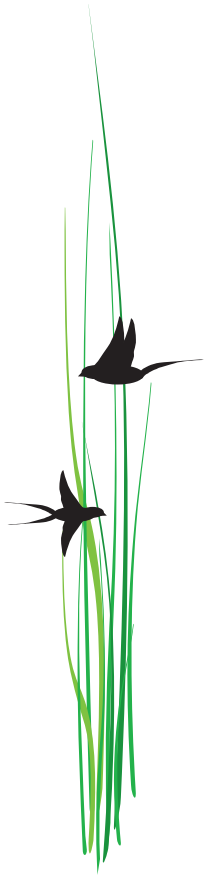
• Enhance collaboration, coordination and communication among trainers who provide coastal decision-makers with training and technical support on issues related to the Bay and its watershed - T2

• Facilitate networking and information exchange between coastal decision-makers both within and between communities - T3

• Ensure that knowledge and skills acquired by coastal-decision are applied effectively - T4

• Provide and enhance opportunities for public access while protecting the ecological health of Reserve habitats - P1

• Increase the use of high quality NBNERR and NERRS estuary, water quality data, and climate change education products by formal and informal educators in the Narragansett Bay watershed - E3



The annual Narragansett Bay waterfowl survey takes place each winter.

4.0 RESEARCH AND MONITORING PLAN

Research and monitoring activities at the Narragansett Bay Research Reserve are guided by national priorities and goals established for the National Reserve System by the Estuarine Reserves Division (ERD) of the National Oceanic and Atmospheric Administration (NOAA). These national research and monitoring guidelines are summarized in Section 4.1 below. Section 4.2 provides an overview of the Narragansett Bay Research Reserve's Research and Monitoring Program along with specific objectives, strategies, and tasks for guiding program management over the next five years.

4.1 Reserve System Research and Monitoring Guidelines

The Reserve System provides a mechanism for addressing scientific and technical aspects of coastal management problems through a comprehensive, interdisciplinary, and coordinated approach. Research and monitoring programs, including the development of baseline information, form the basis of this approach. Reserve research and monitoring activities are guided by the Reserve System Research and Monitoring Plan 2006-2011 which identifies goals, priorities, and implementation strategies (Appendix E). This approach, when used in combination with the education and outreach programs, will help ensure the availability of scientific information that has long-term, system-wide consistency and utility for managers and members of the public to use in protecting or improving natural processes in their estuaries. Research within the Reserves is designed to fulfill the Reserve System goals as defined in program regulations.

These include:

- Address coastal management issues identified as significant through coordinated estuarine research within the System;
- Promote Federal, State, public and private use of one or more Reserves within the System when such entities conduct estuarine research; and
- Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

4.1.1 Reserve System Research Funding Priorities

Federal regulations, 15 C.F.R. Part 921.50 (a), specify the purposes for which research funds are to be used:

- Support management-related research that will enhance scientific understanding of the Reserve ecosystem;
- Provide information needed by reserve managers and coastal ecosystem policy-makers, and;
- Improve public awareness and understanding of estuarine ecosystems and estuarine management issues.

The Reserve System has identified the following five priority research areas to complement the funding priorities outlined above:

1. Habitat and ecosystem processes
2. Anthropogenic influences on estuaries
3. Habitat conservation and restoration
4. Species management
5. Social science and economics

4.1.2 Reserve System Research Goals

The Reserve System research goals support Goal 2 of the 2005-2010 Reserve System Strategic to "Increase the use of reserve science and sites to address priority coastal management issues".

The 2006-2011 Reserve System Research and Monitoring goals are:

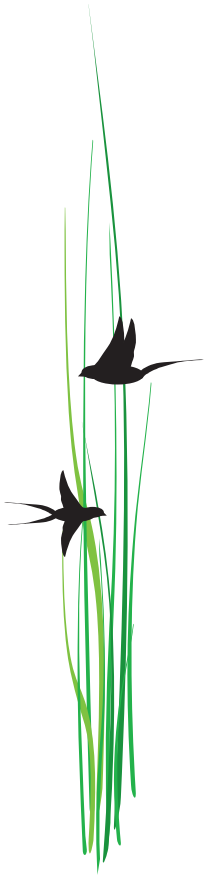
- Biological, chemical, physical, and ecological conditions of Reserves are characterized and monitored to describe reference conditions and to quantify change.
- Scientists conduct research at Reserves that is relevant to coastal management needs and increases basic understanding of estuarine processes.
- Scientists have access to NERRS datasets, science products and results.
- The scientific, coastal management and education communities, as well as the general public, use data, products tools, and techniques generated at the NERRS.

Currently, there are two Reserve System-wide efforts to fund estuarine research. The Graduate Research Fellowship Program (GRF) supports students to produce high quality research in the Reserves. The fellowship provides graduate students with funding for one to three years to conduct their research, as well as an opportunity to assist with the research and monitoring program at a Reserve. Projects must address coastal management issues identified as having regional or national significance, relate them to the Reserve System research focus areas, and be conducted at least partially within one or more designated Reserve sites. Proposals must focus on the following areas: 1) Eutrophication, effects of non-point source pollution and/or nutrient dynamics; 2) Habitat conservation and/or restoration; 3) Biodiversity and/or the effects of invasive species; 4) Mechanisms for sustaining resources within estuarine ecosystems; or 5) Economic, sociological, and/or anthropological research applicable to estuarine ecosystem management.

Students work with the Research Coordinator or Manager at the host Reserve to develop a plan to participate in the Reserve's research and/or monitoring program. Students are asked to provide up to 15 hours per week of research and/or monitoring assistance to the Reserve. This work may take place throughout the school year or may be concentrated during a specific season.

Secondly, research is funded through the NERRS Science Collaborative, which is a new NERRS program focused on integrating science into the management of coastal natural resources. Currently administered through the University of New Hampshire, the program integrates and applies the principles of collaborative research, information and technology transfer, graduate education, and adaptive management with the goal of developing and applying science-based tools to detect, prevent, and reverse the impacts of coastal pollution and habitat degradation in a time of climate change. The program is designed to enhance the NERRS ability to support decisions related to coastal resources through collaborative approaches that engage the people who produce science and technology with those who need it. In so doing, the Collaborative seeks to make the process of linking science to coastal management decisions, practices, and policies more efficient, timely and effective.

Setting up the DATAFLOW water quality mapping unit.



Installing a new United States Geodetic Survey benchmark on Prudence Island.

4.1.3 Reserve System Monitoring Goals

In 1989 the Estuarine Reserves Division (ERD) of NOAA initiated a System-Wide Monitoring Program broken into three phases as outlined in the Reserve System regulations and 2005-2010 strategic plan:

- **Phase I:** Environmental Characterization, including studies necessary for inventory and comprehensive site descriptions;
- **Phase II:** Site Profile, to include a synthesis of data and information; and
- **Phase III:** Implementation of the System-wide Monitoring Program.

The System-wide Monitoring Program provides standardized data on national estuarine environmental trends while allowing the flexibility to assess coastal management issues of regional or local concern. The principal mission of the monitoring program is to develop quantitative measurements of short-term variability and long-term changes in the integrity and biodiversity of representative estuarine ecosystems and coastal watersheds for the purposes of contributing to effective coastal zone management. The program is designed to enhance the value and vision of the Reserves as a system of national references sites. The program also takes a phased approach and focuses on three different ecosystem characteristics.

1. **Abiotic Variables:** The monitoring program currently measures pH, conductivity, salinity, temperature, dissolved oxygen, turbidity, water level and atmospheric conditions. In addition, the program collects monthly nutrient and chlorophyll a samples and monthly diel samples at one SWMP data logger station. Each reserve uses a set of automated instruments and weather stations to collect these data for submission to a centralized data management office.

2. **Biotic Variables:** The Reserve System is focusing on monitoring biodiversity, habitat, and population characteristics by monitoring organisms and habitats as funds are available.

3. **Habitat Mapping and Change:** This component attempts to identify changes in coastal ecological conditions with the goal of tracking and evaluating changes in coastal habitats and watershed land use/cover. The main objective of this element is to examine the links between watershed land use activities, local sea level change and habitat quality.

These data are compiled electronically at a central data management “hub”, the Centralized Data Management Office (CDMO), at the Belle W. Baruch Institute for Marine Biology and Coastal Research of the University of South Carolina. The CDMO provides additional quality control for data and metadata and compiles and disseminates the data and summary statistics via the Web (http://cdmo.baruch.sc.edu), where researchers, coastal managers and educators readily access the information. The metadata meets the standards of the Federal Geographical Data Committee.

4.2 Narragansett Bay Reserve Research and Monitoring Plan

One of the core functions of the Narragansett Bay Reserve is to support and conduct high quality research and monitoring, which is facilitated by a coordinated Research and Monitoring Program. The Reserve is staffed by a Research Coordinator, a Marine Research Specialist II, and a Seasonal Research Technician. Various other short-term interns are employed when funding is available. The program seeks to develop and enhance cooperative partnerships and to integrate with other Reserve programs to conduct and disseminate original research in the Reserve and throughout Narragansett Bay.

The 2010-2015 research priorities for the Narragansett Bay Reserve are outlined below. These priorities are derived from NOAA's ecosystem mission goal to protect, restore, and manage use of coastal and ocean resources through an ecosystem approach to management. They also complement the Reserve System Research and Monitoring Plan (Appendix E). They are intended to provide guidance to prospective students who are applying to the GRF program as well as to other visiting researchers who are interested in working at the Reserve. They will also in part guide research and monitoring activities conducted by Reserve staff. The 2010-2015 research priorities are:

1. Species interactions and relationships to physical, chemical, economic and social processes.

- Changes in species and guild composition, including invasives and interactions among species and the physical and chemical environment.
- Habitat conservation, restoration, and biota use.
- Data synthesis, hindcasting and forecasting.

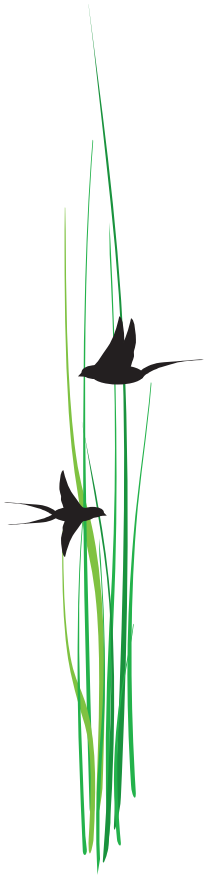
2. Monitoring, modeling and prediction of coastal habitat and ecosystem processes.

- Quantitatively examine and model the primary factors that affect fisheries, productivity and water quality.
- Coupling of Reserve ecosystem dynamics to estuarine and regional dynamics including responses to the effects of climate change.

4.2.1 Narragansett Bay Reserve Research and Monitoring Objectives

Four specific objectives were developed for the Narragansett Bay Reserve research and monitoring program to help achieve our goals while taking into consideration local needs and existing constraints. These objectives, along with a rational for their adoption, are shown on the next page in Table 4.1.

The DATAFLOW system collecting water quality information at speeds up to 20 knots.



Mirrors are used to monitor osprey chicks in platform nests erected in NBNERR salt marshes.

Table 4.1 – Objectives and their rational for the Reserve's research and monitoring program.

R1: Improve opportunities to support and conduct basic and applied research within the Reserve. Consistent with the NERRS national goals and national Strategic Plan, Objective R1 acknowledges the importance of the Reserve as a platform for research of coastal and estuarine systems. The objective is specifically worded to recognize that such research will be conducted by Reserve staff as well as visiting researchers. Such research provides the information needed to evaluate and predict how species, habitats and ecosystems may respond to changes in the many stressors facing the Bay such as water quality impacts of wastewater and stormwater management, habitat loss and degradation, and climate change.

R2: Contribute to status and trends assessments and forecasting of environmental quality by tracking short-term variability and long-term changes in abiotic and biological parameters at the Reserve and within Narragansett Bay. Objective R2 acknowledges the role the Reserve plays in collecting and evaluating status and trends data for the region, including the SWMP. Objective R2 also helps to address the needs of local stakeholders by the Reserve playing a bigger role in collecting biotic data and facilitating the assessment of that data, as well as other data collected at the Reserve. Evaluation and synthesis of the various data collected by Reserve staff and other scientists is necessary so that stakeholders can make informed decisions grounded in sound science.

R3: Encourage and assist in a multi-agency approach to research, monitoring, and science-based ecosystem management. The Reserve was established to protect resentative species and habitats of the New Englandsub-region of the Virginian bio-geographical region. Objective R3 acknowledges that the Reserve can best accomplish this objective by working with other agencies and organizations in a multi-agency approach with an emphasis on ecosystem management. This may include assisting in monitoring and assessment of water quality, habitat loss and fragmentation, invasive species, etc, directly or in cooperation with other agencies and organizations. Some of the agencies and organizations that regularly partner with the Reserve include the University of Rhode Island Graduate School of Oceanography and Environmental Data Center, the US Environmental Protection Agency's Atlantic Ecology Division, Save the Bay, and various RIDEM divisions.

R4: Continue to provide coastal resource managers, the scientific community, and general education practitioners with appropriate scientific and technical information to foster informed decision-making. One of the central themes identified by Focus Groups was the role that the Reserve can play in providing data and analyses for the purpose of research, education, and decision-making. Reserve staff provide knowledge and expertise to agencies and organizations by serving on local and national boards, committees and workgroups.

Survey of Prudence Island Property owners show 65% of those surveyed would be interested in volunteering for the Reserve.

4.2.2 Objectives, Strategies and Tasks for Research and Monitoring

Strategies and tasks for each of the four Reserve research and monitoring objectives are presented below. Objectives and strategies are shown in bold type while tasks are bulleted. Strategies are numbered to correspond with their respective objectives. The tasks listed represent actions that might be employed to accomplish a given objective. The application of specific tasks will be determined on a case-by-case basis as specific projects are planned and implemented. In some cases, detailed Action Plans may be prepared to further describe specific projects.

Objective RI: Improve opportunities to support and conduct basic and appllied research within the Reserve.

Strategies and Tasks

R1.1: Ensure scientists are aware that logistical support is available to facilitate research at the Reserve.

- Identify and develop overnight parking alternatives for vehicles at the ferry terminal in Bristol RI.
- Provide laboratory facilities, field supplies, vehicles, vessels and other essential equipment as required by visiting and resident researchers.
- Provide island transportation, including dedicated vehicles (perhaps golf carts) and ensure off-hour lab access for researchers.
- Improve and develop field research facilities at the Reserve and improve storage for visiting scientists' gear.
- Assist visiting researchers with field implementation of on-site and off-site research projects.
- Develop summary information regarding logistics and research opportunities at the Reserve and post on the Reserve's website.
- Maintain an updated annual list of cooperative research projects, research papers, GRF, CICEET and NERRS Science Collaborative and other research products generated by or at the Reserve. Distribute on appropriate websites and by other means.
- Advertise and promote the Graduate Research Fellowship to ensure that multiple high quality, competitive proposals are submitted that address Reserve and Reserve System research priorities and goals.

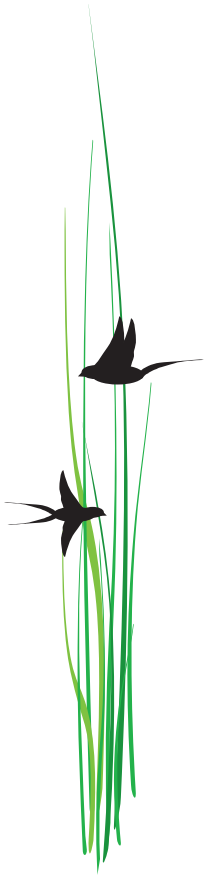
R1.2: Engage with regional and national science communities.

- Collaborate with the scientific research community to encourage development of research proposals and actively recruit researchers from outside institutions to work with or at the Reserve (e.g., NSF fellows, EPA Star fellows, etc.).
- Lead and participate in regional and national scientific meetings to review progress in priority focus areas and promote research in the Reserve.

R1.3 Provide the necessary resources to support and increase in-house research.

- Explore ways to expand the capacity of in-house research by adding seasonal research interns and volunteers.
- Prepare and submit proposals to secure funds to support in-house research and monitoring efforts.

A NBNERR graduate research fellow exhibits her research -- gut contents from local wading birds.



Preparing to deploy eelgrass bed markers in the Bay.

Objective R2: Contribute to status and trends assessments and forecasting of environmental quality by tracking short-term variability and long-term changes in abiotic and biological parameters at the Reserve and within Narragansett Bay.

Strategies and Tasks

R2.1: Conduct abiotic and biological monitoring consistent with national Reserve System programs to facilitate comparisons of the Narragansett Bay Reserve to other Reserve System sites.

- Continue long-term abiotic monitoring (water, nutrient and weather parameters) in accordance with the national System-Wide Monitoring Program (SWMP).
- Participate actively in national and regional synthesis and interpretation of SWMP data.
- Synthesize Reserve SWMP data in annual technical reports.
- Help develop and participate in national biological monitoring programs (SWMP phase 2).
- Help develop and participate in the national Habitat Mapping and Change initiative (SWMP phase 3).

R2.2: Characterize and establish baseline conditions and determine trends for key environmental quality parameters and natural resource populations and communities.

- Maintain and update a site profile and provide an electronic database of information on Reserve natural resources.
- Use GIS to map habitat and land cover in the Reserve over time to assess changes in accordance with the national Reserve System habitat mapping and change initiative.
- Encourage investigators of the Narragansett Bay estuary to use the Reserve as a reference site or a control for experimental research and monitoring projects in the Narragansett Bay watershed.
- Conduct additional monitoring of key parameters outside of SWMP to specifically and fully characterize conditions of the Reserve.

R2.3: Improve electronic accessibility of Reserve research, monitoring and site characterization data and information.

- Maintain current capabilities and improve electronic infrastructure (e.g. network and database capabilities, geographic information systems, etc.) for staff and researchers to promote access to Reserve data.
- Develop interfaces and tools to support access, analysis and synthesis of information from the Reserve, the Narragansett Bay estuary, and the Virginian biogeographic region.
- Provide a mechanism for near-real-time access to provisional data for researchers from SWMP water quality sites in addition to T-wharf Bottom.

R2.4: Assess ecological conditions and design and evaluate restoration efforts in support of the Reserve stewardship program.

- Collaborate in ongoing coastal wetland restoration efforts (eelgrass and saltmarshes) and assess the ecological effects of restoration (e.g., vegetation composition, extent and faunal use).

- Conduct research on natural ecological processes to help devise protection and restoration techniques for coastal wetlands.

- Conduct research and monitoring to better understand the effects of boater use on coves and shallow waters of the Reserve.

- Collaborate to examine patterns of freshwater usage and stream flow on Prudence Island.

- Encourage and support research and monitoring directed toward understanding the factors that affect tick-borne diseases.

- Disseminate research results that analyze restoration of coastal and estuarine habitats, including restoration techniques, ecological responses and impacts of past practices.

Objective R3: Encourage and assist in a multi-agency approach to research, monitoring, and science-based ecosystem management to protect the ecological integrity of Narragansett Bay.

Strategies and Tasks

R3.1: Participate in, enhance and facilitate opportunities for joint research and monitoring efforts among local, State and Federal resource agencies.

- Actively participate in the Rhode Island Environmental Monitoring Collaborative (RIEMC) and explore ways to enhance and expand the Reserve's role in the RIEMC and other Narragansett Bay ecological monitoring initiatives.

- Collaborate with others to establish a long-term program for assessing habitat and biological community trends in Narragansett Bay, including marine invasive species.

- Work to improve indicators, monitoring protocols and technology to improve the effectiveness of monitoring and assess the usefulness of using the Reserve as a reference for estuary-wide assessments and forecasts.

- Develop Memoranda of Understanding and interagency agreements with resource agencies to facilitate cooperative research and monitoring.

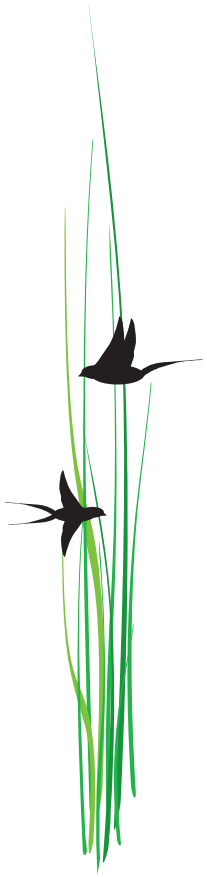
- Coordinate Reserve research with local and regional resource management efforts.

- Collaborate with and participate in the estuary-wide Bay Windows water quality monitoring program.

- Participate in collaborative studies to develop the scientific basis for Bay management.

R3.2: Encourage development and implementation of comprehensive management plans for the Bay and its watershed.

A visiting scientist from the Netherlands studying tardigrades.



• Work closely with local, State and Federal agencies including the Narragansett Bay Estuary Program (NBEP) and the RI Bays, Rivers and Watershed Coordination Team to develop, revise, and implement comprehensive management plans for the Bay and its watershed.

• Assist in the development of an effective Bay and watershed research and monitoring strategy.

Objective R4: Continue to provide coastal resource managers, the scientific community and general education practitioners with appropriate scientific and technical information to foster informed decision-making.

Strategies and Tasks

R4.1: Provide scientific data and tools to appropriate coastal decision-makers through the Reserve's Coastal Training Program (CTP).

• Collaborate with the CTP coordinator to ensure that proper scientific data and tools are disseminated in the proper venues to coastal decision-makers, as appropriate.

R4.2: Collaborate with the Reserve's Education Program to improve public understanding of estuarine research projects in Narragansett Bay.

• Develop demonstration areas around the Reserve based on current and ongoing research and monitoring projects.

• Provide information to support the development of publications, interpretive signs, workshops, and seminars to better inform both the local and Rhode Island community about ongoing coastal and estuarine research and monitoring.

R4.3: Work with the Reserve's Education Program to make estuarine research and monitoring data available to Rhode Island schools.

• Request information and periodic updates from researchers working at the Reserve as a routine course of business.

• Provide current and up-to-date information and data from the Reserve's research and monitoring program suitable for the Reserve's website or other media.

• Encourage staff and visiting researchers to participate in appropriate lecture and seminar series to discuss current research projects.

R4.4: Publicize results from Reserve research and monitoring programs.

• Attend local, regional and national scientific conferences and present Reserve research and monitoring projects as poster or oral presentations.

• Prepare, submit and publish high-quality Reserve research projects in appropriate peer-reviewed scientific journals.

• Prepare and submit technical reports for other Reserve research and monitoring projects that are not appropriate for the peer-reviewed scientific literature in the NERR Technical Series.

5.0 EDUCATION, INTERPRETATION, AND OUTREACH PLAN

Education, interpretation and outreach activities at the Narragansett Bay Reserve are guided by the national goals and objectives established for the entire Reserve System by the Estuarine Reserves Division (ERD) of the National Oceanic and Atmospheric Administration (NOAA). These national guidelines are summarized in Section 5.1 below. Section 5.2 describes specific objectives, strategies, and tasks for guiding the Reserve's Education program over the next five years.

Educational outreach in local schools. These students are learning about oyster restoration in the Bay.

5.1 Reserve System Education Guidelines

The Reserve System provides a vehicle to increase understanding and awareness of estuarine systems and improve decision-making among key audiences to promote stewardship of the nation's coastal resources. Education and interpretation at each Reserve in the Reserve System incorporates a range of programs and methodologies that are systematically tailored to key audiences around priority coastal resource issues by incorporating science-based content. Reserve staff members work with local communities and regional groups to address coastal resource management issues such as non-point source pollution, habitat restoration, and invasive species. Through integrated research and education programs the Reserves help communities develop strategies to deal successfully with these coastal resource issues.

Formal and non-formal education programs target a variety of audiences including the general public, K-12 students, teachers, college students and faculty. K-12 and professional development programs for teachers include the use of established coastal and estuarine science curricula aligned with state and national science education standards and frequently involve both on-site and in-school follow-up activities. Reserve education activities are guided by national plans that identify goals, priorities, and implementation strategies for these programs. Education and training programs, interpretive exhibits and community outreach programs integrate elements of National Estuarine Research Reserve System science, research and monitoring activities and ensure a systematic, multi-faceted and locally-focused approach to fostering stewardship.

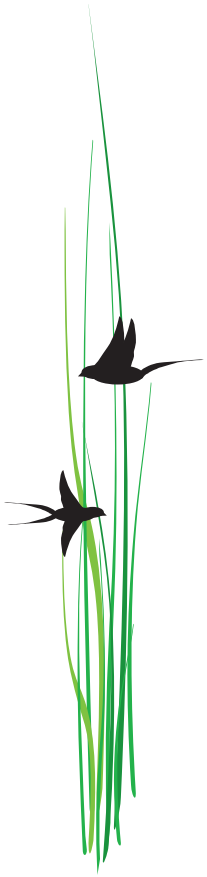
5.1.1 Reserve System Education Goals

The National Estuarine Research Reserve System's mission includes an emphasis on education, interpretation, and outreach. Education policy at the Narragansett Bay Reserve is designed to fulfill the Reserve System goals as defined in the regulations (15 C.F.R. Part 921(b).

Education goals include:

- Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation;

- Conduct and coordinate estuarine research within the system, gathering and making available information necessary for improved understanding and management of estuarine areas.



Education programs run the gammet “from K to gray:.

5.1.2 Reserve System Education Objectives

Education-related objectives in the Reserve System Strategic Plan 2005-2010 include:

1. People are aware of the ecological, economic, historical and cultural importance of estuarine resources.

2. People understand how human choices and natural disturbances impact social, economic and estuarine ecological systems.

3. People apply science-based information when making decisions that could impact coastal and estuarine resources.

5.2 Narragansett Bay Reserve Education Plan

Background

The Education Sector at the Narragansett Bay Reserve strives to cultivate an aware, knowledgeable citizenry who will act as responsible stewards of Narragansett Bay. This is accomplished using a broad suite of tools, strategies and approaches that include: inquiry-based education practices, meaningful outdoor experiences with hands-on learning activities, professional development opportunities for education practitioners both on and off-island, natural resources interpretation and multi-media communication. Each of these various programs and products utilize and capitalize on the Reserve’s unique set of resources which include its actual estuarine habitats as well as the skills, abilities and products produced by the Reserve’s other sectors.

The research, stewardship and coastal training programs support and contribute to education efforts through integration of actual research data and on-the-ground demonstration projects. Priority areas (themes) being addressed by the research and stewardship programs such as the effects of climate change and management of invasive species are incorporated into education programming to make it more meaningful. However, the Reserve’s island location and limited public access present significant challenges to on-site program growth. The sole means of access to Prudence Island for the majority of people is the Prudence Island Ferry. The ferry’s infrequent schedule, ticket fees and a lack of island transportation limit visitation by school programs and the public. This translates into few walk-in visitors to the Reserve’s lab and learning center and even fewer public school field trips. Budget cuts at public schools have compounded this situation by further reducing field-based learning experiences. In addition, other organizations such as Save the Bay, the Audubon Society of Rhode Island and the Roger Williams Park Zoo offer well-known and long-standing K-12 environmental education programs that compete for limited school field trips.

Rather than compete with these programs the NBNERR Education Advisory Committee agreed that the Reserve should partner with these programs to develop existing estuary education content and to provide resources and expertise when needed. They further suggested the Reserve’s education sector could fill a need for rigorously tested and sound science-based estuary education materials and resources. With this in mind, a main focus of the education sector over the next five years will be to follow the K-12 Estuarine Education Program (KEEP) sequence model and initiate a Needs Assessment/Market Analysis, followed by the development and support of appropriate education offerings in the Narragansett Bay watershed with a specific focus on the use of SWMP data in classrooms throughout the Narragansett Bay watershed. The resources being developed in the NERRS KEEP initiative are perfectly suited to accomplish this end.

Despite the challenges described above, a number programs and partnerships have been developed to bring more students and the public to the Reserve. For example, Save the Bay’s

boat-based education programs bring hundreds of students and teachers to the Reserve nearly year round. In addition, home school groups, because of their typically small size and flexibility, are taking greater advantage of Reserve resources and programs. By partnering with other organizations such as the University of Rhode Island's (URI) W. Alton Jones Camp, the Carnegie Abbey Club and the Prudence Conservancy, the Reserve is able to host a variety of day and overnight summer camps and provide students with hands-on learning opportunities.

Because of the Reserve's out of the way location, outreach materials and multi-media communications tools are particularly important. Tools such as eAlerts, biannual newsletters, the NBNERR website, promotional items and the annual Narragansett Bay tide calendar help us reach a broader audience and bring about a greater awareness of the Reserve, its mission and the importance of estuarine habitats.

A local teacher measures dissolved oxygen levels during a professional development workshop.

Examples of existing educational programs and resources include:

Teachers on the Estuary (TOTE) Professional Development Workshops

With assistance from a NOAA Bay-Watershed Education Training (B-WET) grant, the Reserve has been able to develop and implement intensive 4-day workshops for local educators. The teachers improve their knowledge of estuary ecology and are involved with hands-on research projects that they can then adopt for classroom and stewardship project applications. With our current B-WET funding we expect to reach 45 educators over the three-year grant cycle.

Prudence Island Tours

The Audubon Society of RI publishes a quarterly program guide loaded with recreational and educational offerings throughout the state. The Reserve has successfully offered year-round programs by way of this guide that almost consistently reach capacity. Families and individuals spend a minimum of six hours on Prudence Island with the Education Coordinator learning about the ecological and cultural significance of the Reserve and our on-going research and monitoring projects. The theme of these tours changes seasonally. Each year these island tours translate into over 400 audience contact hours for visitors who become local ambassadors for the Reserve.

Marine Science Summer Camps

The Reserve works in partnership with several different organizations to provide marine science focused summer camps for students aged 3 to 17. An overnight "Bay Mania" camp is held each summer on Prudence Island in partnership with URI's W. Alton Jones Campus. The campers are engaged in hands-on sampling and monitoring activities and have a chance to explore marine ecology as a career field. With the Audubon Society of RI, the Prudence Conservancy and the Portsmouth Abbey Club, the Reserve offers estuary science programming for day camps and visitors to Prudence Island. Approximately 200 campers experience the Reserve each summer through sleepover and day camps on Prudence Island.

Annual Community Education Events

The Reserve hosts five community education events each year. The first takes place in mid-July and is known as the "Narragansett Bay Block Party." This popular community gathering at the Reserve combines educational and entertainment elements such as scavenger hunts, arts and crafts, nature walks and live folk music. The second is the "Sustainable Fishing Contest" held each August. Anglers must know and follow legal size limits and catch regulations to compete for prizes and trophies. In addition, twice each year, once in the spring and once in the fall, the Reserve implements beach cleanups of our coastlines to raise awareness and improve stewardship of natural resources. The final Reserve-based event happens in December when the island community is invited to the Reserve for a holiday celebration and tour of the

lab facilities. Each year these events attract roughly 500 participants.

Lab & Learning Center

Exhibit rooms located in the Reserve headquarters serve as the Reserve's main interpretive space for visitors to Prudence Island. The Reserve will be staffing the large exhibit room with a full-time seasonal naturalist to improve our capacity to interpret in this space. In addition to interpretive signs and exhibits in the Center, hands-on educational activities such as plankton labs, fish printing and squid dissections are conducted here with visiting family and formal education groups. A rotating art exhibit is also on display in the Center. The summer months are busiest for visitation at the Center.

Estuary Ed Shed

Located on the T-Wharf; this small outbuilding houses two large flow-through aquaria, a touch tank, and several smaller coastal ecology exhibits. The T-wharf area is a popular island destination for both residents and visitors. During the summer when visitation is at its highest, the Ed Shed is staffed by a seasonal naturalist who works to educate visitors about Narragansett Bay and its wildlife. This facility is slated to be expanded, upgraded and made ADA accesible. The Estuary Ed Shed is open from early July through Labor Day weekend. It is also the starting point for a self-guided interpretive trail around the Reserve's South End unit.

Partner Education Programs

Save the Bay frequently brings K-12 students, educators, and campers to the Reserve on their boat, the M/V Aletta Morris. Several hundred students and teachers have had a chance to visit salt marshes and learn about the Reserve this way. The education sector also works with local home school families to bring their students out to the island on a monthly basis for estuary science programs. Each year Save The Bay brings hundreds of students and teachers to the Reserve, while the home school groups earn up to 500 contact hours on Prudence Island.

Media and Outreach Resources

Other on-going education efforts include: the creation of informational posters displayed in Reserve kiosks on-island, a biannual newsletter with a distribution of over 2000 recipients, lecture presentations, an annual digital photo contest, e-Alerts for distribution through a growing e-mail address list, public event outreach, and updates to the Reserve website and on-line calendar. The Reserve's annual Narragansett Bay Tide Calendar is distributed through many of the State's public libraries.

5.2.1 Objectives for Education

Education Program objectives are shown in Table 5.1 below with a brief description of the rationale for each objective. These objectives were developed to help meet the Reserve's mission but to also take into consideration local stakeholder needs and program constraints.

Table 5.1 – Objectives and Rational for the Narragansett Bay Reserve Education program.
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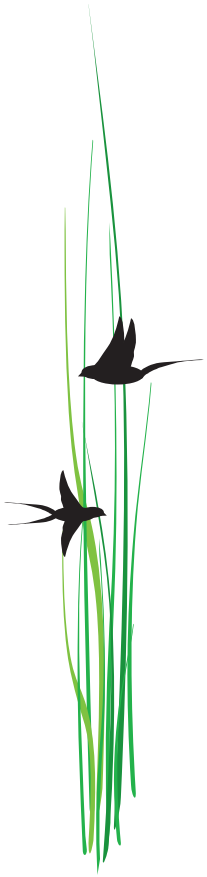
E1: Increase public awareness, understanding and appreciation of the Narragansett Bay estuary by designing, implementing and supporting high-quality, science-based education programs for K-16 and community education audiences. Narragansett Bay is a valuable environmental and economic asset for the State of Rhode Island. The health and resilience of the Bay and its watershed is vital to both the natural and human communities that depend on the estuary. Issues such as the improper management of wastewater and non-point source pollution often result in unsafe water for swimming, shellfish harvesting closures, algal blooms, loss of eelgrass habitat and fish kills. By increasing public awareness of these issues and the importance of healthy estuarine, the Reserve hopes to foster behavior changes that positively affect water quality, estuary health and lessen the severity of climate change impacts.

E2: Optimize educational use of the Narragansett Bay Research Reserve and its facilities with a focus on the Reserve's ecological and cultural significance. Prudence, Patience, Hope and Dyer Islands have a rich cultural and natural history and the Reserve attracts audiences wanting to learn about the significance of both the Island and the Reserve. To optimize public interest in these resources the Reserve works to highlight ongoing estuarine monitoring and research projects, best practices in land management, invasive species control, climate change impacts and the use of low impact designs in development. These demonstration projects offer the public concrete examples of ways to steward a healthier bay. Improving the visibility of these projects, interpreting on going research and stewardship initiatives, and maximizing the use of the Reserve for educational programming is critical to promoting the cultural and ecological significance of the Reserve.

E3: Increase the use of high quality NBNERR and NERRS estuary, water quality data, and climate change education products by formal and informal educators in the Narragansett Bay watershed. The Reserve strives to train educators in order to facilitate the use of local and national education tools such as those being developed through the Narragansett Bay Research Reserve and those from the national KEEP program. Professional development elements might include training educators to access and graph SWMP data, familiarizing them with the Estuaries 101 curriculum and using local experts in estuary climate change impacts to improve educators' abilities to teach about climate change and encourage behavior change in their students. By helping educators to bring estuaries, data and climate change information into their classrooms, the Reserve ensures that young people will have the opportunity to develop a relationship with Narragansett Bay early in their lives. With an understanding of the Bay and its functions they may be more likely to make sustainable lifestyle choices.



Summer campers dip net for minnows in Jenny Marsh.

5.2.2 Objectives, Strategies and Tasks for Education

Strategies and tasks for each of the three education objectives are presented below. Objectives and strategies are shown in bold type whiles tasks are bulleted. Strategies are numbered to correspond with their respective objectives. The tasks listed represent actions that might be employed to accomplish a given objective. The application of specific tasks will be determined on a case-by-case basis as specific projects are planned and implemented. In some cases, detailed Action Plans may be prepared to further describe specific projects.

Objective E1: Increase public awareness, understanding and appreciation of the Narragansett Bay estuary by designing, implementing and supporting high-quality, science-based education programs for K-12, undergraduate and community education audiences.

Strategies and Tasks

E1.1: Enhance, expand and evaluate existing K-12, undergraduate,and community education programming.

- Complete a market analysis and needs assessment (MA/NA) to determine our niche in the K-12 environmental education community.
- Use MA/NA results to develop high-quality science based K-12 education programs.
- Create and implement evaluation plans for existing K-12, undergraduate and community education programs.
- Use results of existing program evaluations to improve both K-12, undergraduate and community education programs.
- Design and implement programs that integrate the Reserve's Research, Stewardship, Coastal Training Program and Education Sectors such as undergraduate climate change internships and on-site undergraduate short courses.
- Contribute to the development of NERRS national K-12 Estuary Education Program (KEEP) education products and tools.

E1.2: Provide estuary education programs in the watershed suitable for all age levels.

- Continue to promote and conduct day-long community and family education programs such as seal watches and bike tours on Prudence Island.
- Participate in statewide and regional events such as Earth Day, National Estuaries Day and the International Coastal Cleanup that promote coastal stewardship.
- Give presentations to civic and recreational organizations such as Rotary and local fishing and kayaking clubs.
- Work with partners to run both day and overnight camps on Prudence Island.
- When appropriate, create opportunities for the Reserve's Graduate Research Fellows to present their research.

E1.3: Enhance and promote the Reserve's community education events to attract additional attendees and to promote Reserve conservation activities.

• Explore additional media outlets in order to advertise the Reserve's community education events such as the Narragansett Bay Block Party and the Sustainable Fishing Contest to attract more attendees and to promote Reserve conservation activities to a wider audience.

• Encourage partner organizations to contribute staff and education materials to NBNERR community education events.

E1.4: Utilize electronic media and multi-media tools in education.

• Enhance the overall education content of the Reserve's website.

• Distribute newsletters and e-alerts with engaging educational content.

• Maintain relevant documents and reference materials on-line such as the NBNERR technical report series.

• Create and distribute printed copies of the annual educational Narragansett Bay Tide Calendar. Post and promote a digital version on the NBNERR website.

• Utilize social media interfaces such as Facebook and Twitter to inform and communicate with stakeholders.

• Develop short videos and/or podcasts to post on websites such as YouTube and social media sites to support and promote Reserve goals and objectives across the sectors.

• Develop and distribute promotional items, brochures and other printed media to increase the Reserve's public visibility.

• Work with RIDEM and ERD's communications offices to disseminate information and press releases.

Objective E2: Optimize educational use of the Narragansett Bay Research Reserve and its facilities with a focus on the Reserve's ecological and cultural significance.

Strategies and Tasks

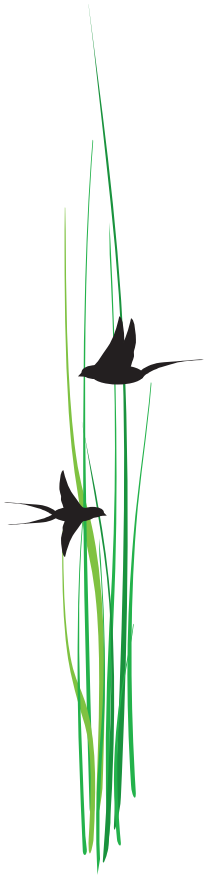
E2.1: Improve visitor orientation and information dissemination at island gateways such as the Homestead Ferry Landing, T-Wharf, and Potter's Cove.

• Utilize these key locations to welcome and orient visitors to the Reserve.

• Regularly install and update interpretive signs at these sites.

• Post and advertise Reserve programs using kiosks at the locations listed above.

Homeschoolers explore a NBNERR tidal creek during a six hour program on Prudence Island.



Learning about the local wildlife.

E2.2: Improve interpretive trail signs and exterior exhibits highlighting important ecological, geographic and cultural features on and around Prudence Island.

- Improve and/or replace educational signage in existing kiosks within the Reserve.
- Develop, improve and/or update self-guided trails with accompanying guide books.
- Develop signage to interpret ecological restoration projects throughout the Reserve.

E2.3: Plan, upgrade and improve indoor and outdoor interpretive exhibits at the Reserve's Lab & Learning Center and the Estuary Ed Shed.

- Develop an interpretive plan for the Reserve's Lab & Learning Center and surrounding 'campus' as well as the Estuary Ed Shed located on the T-Wharf.
- Develop, design and install new exhibits according to the interpretive plan. These will likely highlight current and long-term research and monitoring projects including SWMP, and will interpret demonstration areas in and around the Lab & Learning Center and the Estuary Ed Shed to illustrate important conservation elements such as native gardening and energy/water conservation.
- Redesign and update existing interpretive exhibits and signage when appropriate to align with the interpretive plan.
- Develop, design and install new outdoor exhibits at the Reserve's Lab & Learning Center building in conjunction with new construction.
- Train and utilize seasonal naturalists to act as hosts and educators at both the exhibit room in the Lab & Learning Center and the Estuary Ed Shed.

Objective E3: Increase the use of high quality NBNERR and NERRS estuary, water quality data, and climate change education products by formal and informal educators in the Narragansett Bay watershed.

Strategies and Tasks

E3.1: Coordinate with regional environmental and science education providers to partner on professional development offerings.

- Coordinate with, and support education partners in the watershed such as Save the Bay, the Audubon Society of RI, and the Rhode Island Geography Education Alliance to provide educators in the watershed with high quality, science-based professional development opportunities.
- Forge and build partnerships with local universities and colleges that offer pre-service training programs to bring estuary education, water quality data teaching skills and an understanding of coastal climate change impacts to new teachers.
- Provide educational materials, content and resources to partners involved in coastal and estuarine-focused professional development workshops.
- Utilize relevant list-serves to stay informed of regional programs and initiatives.

E3.2: Seek and secure funding to host professional development workshops.

• Build on the success of recent funding through NOAA's Bay–Watershed Education Training (B-WET) grant to seek continued support for multi-day Teachers on the Estuary professional development opportunities.

• Research and locate appropriate funding sources for the development and implementation of additional professional development opportunities.

• Implement and manage professional development grants as needed.

E3.3: Promote NBNERR professional development opportunities and other events targeted for educators.

• Submit press releases through the state media office.

• Utilize electronic media such as the Reserve's web page and e-mail list to disseminate relevant information.

• Work with Reserve partners like Save the Bay, the Audubon Society of RI and the Rhode Island Department of Education to help communicate with schools and educators in the watershed about upcoming estuary education professional development opportunities.

• Employ the Reserve's newsletter and/or other print media to spread the word about upcoming professional development opportunities.

E3.4 Make NBNERR education resources, KEEP products and the new educational SWMP data interface available to formal and informal educators in the watershed.

• Provide free estuary education resources for educators to download from the Reserve's website.

• Promote the use of these resources through electronic communication venues such as Facebook and the Reserve's email list, and news releases.

• Provide education content and resources to these organizations when appropriate.

• Utilize the expertise of Reserve sector staff to support and enhance local professional development initiatives

E3.5: Provide educators with both technical training and follow-up support after participating in workshop experiences.

• Provide background and training in technology-driven educational tools that enhance NBNERR and NERRS education programs such as Google Earth and the new SWMP interface.

• Stay in contact with educators who participate in estuary education professional development workshops in order to answer questions and act as a resource to the teachers and their students.

• Be responsive to the needs of individual educators and act promptly to assist them when needed.

Summer campers emulate NBNERR research programs and monitor invasive crabs.

The Coastal Training Program Coordinator assists a local non-profit group with educational training.

6.0 COASTAL TRAINING PROGRAM PLAN

The Narragansett Bay Research Reserve Coastal Training Program (CTP) is guided by national directives established for the National Estuarine Research Reserve System (NERRS) by the Estuarine Reserves Division (ERD) of the National Oceanic and Atmospheric Administration (NOAA). These national guidelines are summarized in Section 6.1 below. Section 6.2 provides an overview of the Narragansett Bay Research Reserve's CTP along with specific objectives, strategies and tasks for guiding the program over the next five years.

6.1 Reserve System Coastal Training Program Guidelines

The CTP provides up-to-date scientific information and skill-building opportunities to coastal decision-makers (decision-makers) who are responsible for making decisions that affect coastal resources. Through this program, National Estuarine Research Reserves can ensure that decision-makers have the knowledge and tools they need to address critical resource management issues of concern to local communities.

Coastal Training Programs offered by Reserves relate to coastal habitat conservation and restoration, biodiversity, water quality, and sustainable resources management and integrate reserve-based research, monitoring and stewardship activities. Programs target a range of audiences such as land-use planners, elected officials, regulators, land developers, community groups, environmental non-profits, businesses and applied scientific groups. These training programs provide opportunities for professionals to network across disciplines and develop new collaborative relationships to solve complex environmental problems. Programs are developed in a variety of formats rang-ing from seminars, hands-on skills training, participatory workshops, lectures and technology demonstrations. Participants benefit from opportunities to share experiences and network in a multidisciplinary setting, often with a Reserve-based field activity.

Partnerships are important to the success of the program. Reserves work closely with State Coastal Programs, Sea Grant College extension and education staff, and a host of local part ners in determining key coastal resources issues to address, as well as the identification of tar get audiences. Partnerships with local agencies and organizations are critical in the exchange and sharing of expertise and resources to deliver relevant and accessible training programs that meet the needs of specific groups.

The CTP requires a systematic program development process, including the execution of audience needs assessments and market analyses and the development of a marketing plan and a five-year strategic plan. The CTP also requires the establishment of an advisory group for guidance, program review and perspective in program development. The CTP implements a perrformance monitoring system, wherein staff report data in operations progress reports according to a suite of performance indicators related to increases in participant understanding, the application of knowledge gained and enhanced networking with peers and experts to help inform programs.

6.1.1 Reserve System Coastal Training Program Goal

The goal of the NERRS CTP in particular is to improve decision-making related to coastal resources management at local and regional levels.

The objectives of the NERRS CTP are to:

- Provide the best available science-based information, tools and techniques to those individuals and groups that are making important decisions regarding resources within coastal watersheds, estuaries and nearshore waters;

- Increase networking and collaboration across sectors and disciplines related to coastal management issues in local and bio-geographic areas; and

- Increase understanding of the environmental, social and economic consequences of human activity within the coastal landscape.

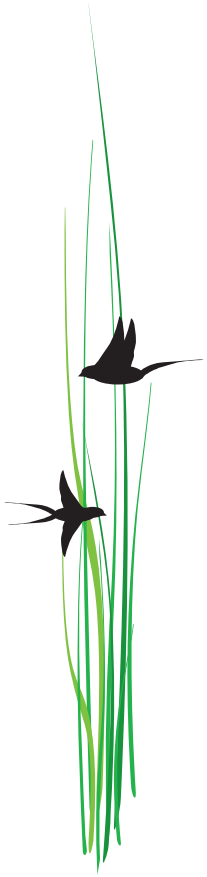
6.2 Narragansett Bay Reserve Coastal Training Program

The Reserve Coastal Training Program (CTP) strives to build the capacity of decision-makers within the Narragansett Bay watershed in making informed decisions as how to best preserve and protect the natural resources of the Bay and its watershed. The CTP accomplishes this by partnering with various organizations (including RI DEM, Grow Smart RI, the RI Coastal Resources Management Council, RI Sea Grant, and the RI Land and Water Partnership) and working closely with the other Reserve programs to offer training programs and products to various audiences. The CTP reaches over 500 people and averages 3,000 contact hours per year.

Through its training activities, the CTP addresses Reserve System and Narragansett Bay Research Reserve priority issues such as coastal and watershed development and estuarine eutrophication, habitat degradation and loss, and the loss of native species and ecosystem services. The primary audience most likely to make decisions affecting these issues, as identified through market analyses and needs assessments, includes municipal staff and officials. However it is important to note that the CTP will maintain enough flexibility to include other audiences highlighted by ongoing market analyses and needs assessments in its outreach efforts, and it will be open to partnership opportunities that address the needs of these groups.

Examples of past CTP training topics include conservation development and smart growth, wetland avoidance and minimization, riparian buffer restoration, and groundwater supply. Future trainings will include, but not be limited to, conservation easements, community low impact site planning and design, estuarine invasive species, planning for climate change, and wetlands restoration.

CTP products that have been developed include a brochure and a website, along with an online community calendar developed in partnership with Grow Smart RI, a local smart growth non-profit organization. The calendar serves as a resource for other training organizations, target audience members, and the public to post and learn about land-use and water resources-related trainings and other events in Rhode Island and nearby Connecticut and Massachusetts. In addition to informing decision-makers and the general public about relevant opportunities, the calendar also provides a forum for training organizations to enhance collaboration, reduce scheduling conflicts and avoid duplication of training efforts. Trainings and product development planned for 2010-2015 are outlined in section 6.6.2.



Prudence Island Groundwater Workshop by the Coastal Training Program.

6.2.1 Objectives for the Coastal Training Program

Reserve CTP objectives are listed in Table 6.1 below with a brief description of the rationale for each objective.

Table 6.1 – Objectives and Rationale for the Narragansett Bay Reserve Coastal Training Program.

T1: Increase the knowledge and skill levels of coastal decision-makers so they can make informed decisions that will best preserve and protect the natural resources of Narragansett Bay and its watershed. Decisions made by coastal decision-makers within the Narragansett Bay watershed can have significant and enduring consequences to the health and integrity of the Bay and the environment in general. Many of the key decision-makers (audiences identified in Sec. 6.1) often do not have adequate access to relevant science-based information, training and tools to aid them in making important decisions that affect Narragansett Bay and its watershed. As development pressure increases, there will only be more demands imposed upon coastal natural resources, rendering it imperative that decision-makers have the capacity to make sound decisions about issues that affect the Bay and its watershed.

T2: Enhance collaboration, coordination and communication among trainers who provide coastal decision-makers with training and technical support on issues related to the Bay and its watershed. Partnerships are a key element of implementing the objectives and strategies of the CTP, both at the local and national level. As the demands imposed on the natural resources of Narragansett Bay increase, so too does the importance of protecting and restoring these resources for their many natural, economic and social functions and values. By enhancing the collaboration, coordination and communication between training organizations, training gaps may be identified and redundancy reduced while partnership opportunities will increase and resources leveraged.

T3: Facilitate networking and information exchange between coastal decision-makers both within and between communities. The issues facing coastal resources are complex and cross not only ecological boundaries, but economic, political and social boundaries as well. CTP trainings and other activities allow coastal decision-makers to interact with and learn from their peers and experts in the field, increasing the diversity of their contacts and their awareness of opportunities for collaboration on key issues. Adequate networking time built into CTP trainings allows coastal decision-makers to glean new perspectives about a variety of issues across a range of disciplines.

T4: Ensure that the knowledge and skills acquired by coastal decision-makers are applied effectively. CTP trainings and products offered to coastal decision-makers are not singular or isolated events. Ongoing assistance in the form of updated scientific information and applications implemented through follow-up trainings and technical assistance is essential to the success of the program and of decision-makers' capacities to make informed and timely decisions. Also essential in meeting this goal is the ongoing monitoring of the success of the program through appropriate evaluations and assessments.

6.2.2 Objectives, Strategies and Tasks for the Coastal Training Program

Objectives and strategies are shown in bold type with tasks listed as bullets below each objective. Strategies are numbered to correspond with their respective objectives. These strategies and tasks will serve to guide future CTP activities. The tasks listed represent actions that might be employed to accomplish a given strategy. The application of specific tasks will be determined on a case-by-case basis as specific projects are planned and implemented. In some cases, detailed Action Plans may be prepared to further describe specific projects.

Objective T1: Increase the knowledge and skill levels of coastal decision-makers so they can make informed decisions that will best preserve and protect the natural resources of Narragansett Bay and its watershed.

Strategies and Tasks

T1.1: Identify specific training needs within the Narragansett Bay watershed that the CTP can address, either directly or through partnerships with other organizations.

- Conduct ongoing informal needs assessments of target audiences to collect information on the issues and topics that are important at the local level.

- Inventory existing training programs and solicit input from the CTP Advisory Committee regarding target audiences and priority issues, training methods, and potential training partners.

T1.2: Provide science-based information to coastal decision-makers within the Narragansett Bay Watershed.

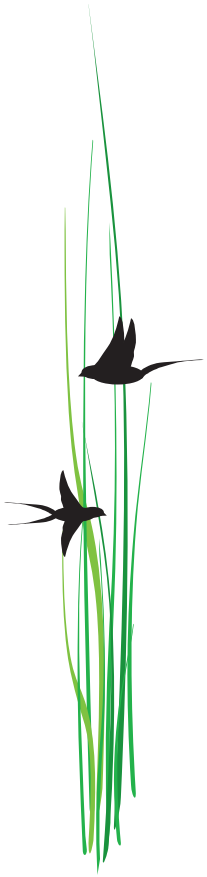
- Develop and deliver trainings which include, but are not limited to:
    - Conservation Development
    - Conservation Design Mapping
    - Conservation Easements and Open Space Management
    - Low Impact Development Community Site Planning and Design
    - Wetland Restoration
    - RI Estuarine Invasive Species
    - Community Adaptation to Climate Change
    - NOAA Coastal Services Center trainings

Objective T2: Enhance collaboration, coordination and communication among trainers who provide coastal decision-makers with training and technical support on issues related to the Bay and its watershed.

Strategies and Tasks

T2.1: Facilitate coordination and collaboration among groups already dedicated to the protection and restoration of the Narragansett Bay watershed and its resources.

- Continue to work with Grow Smart RI in publicizing and populating the online community calendar (www.communityconnectionri.org) for use by training organizations and the public to post and learn about trainings and other events in Rhode Island and nearby Massachusetts and Connecticut.



- Provide a meeting venue twice annually to exchange information.
- Operate a trainers' listserv.

Objective T3: Facilitate networking and information exchange between coastal decision-makers both within and between communities.

Strategy and Tasks

T3.1: Plan forums to promote inter-community and inter-regional networking.

- Target specific communities and regions to host networking functions.
- Provide workshop attendees with the contact information of all participants and speakers at the workshop.
- Provide time for networking and professional sharing at all training events.

Objective T4: Ensure the knowledge and skills acquired by coastal decision-makers are applied effectively.

Strategies and Tasks

T4.1: Develop and disseminate technical information and products to past and potential future workshop participants.

- Maintain and enhance an interactive website.
- Prepare fact sheets and other science news updates when necessary.

T4.2: Increase the visibility and awareness of the Reserve CTP among coastal decision-makers and local trainers.

- Write and distribute press releases for upcoming training events.
- Create advertisements to include in various training event program guides and other materials.
- Submit CTP-related articles to various organizations' publications.

T4.3: Continually evaluate program outcomes and adapt as necessary.

- Utilize post-training evaluation forms to be completed at the end of all training sessions to determine the effectiveness of training and where improvements are needed.
- Conduct long-term assessments (six- to nine-months post-training) to evaluate the application by coastal decision-makers of the information provided.

7.0 STEWARDSHIP PLAN

The NERRS 2005-2010 strategic plan defines stewardship as the responsible management of coastal resources using the best available information for the purpose of maintaining and restoring healthy, productive and resilient ecosystems. While the ecosystems, habitats, species and management issues differ greatly among reserves, and each applies different strategies for addressing local management issues, stewardship activities across the system are guided by the five guiding principles of the NERRS 2005-2010 strategic plan. These principles are:

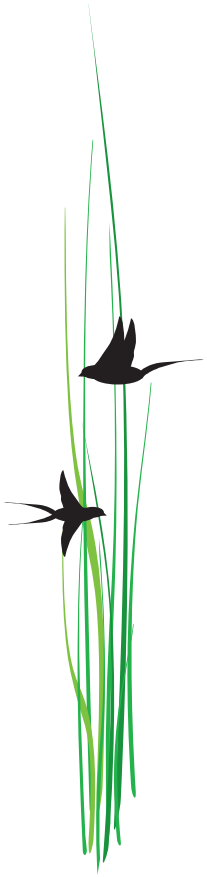
- Strong partnerships between NOAA, state agencies and universities and other local partners are critical to the success of the Reserve System.
- The Reserve System integrates science, education and stewardship on relevant topics to maximize the benefits to coastal management.
- Reserves serve as a catalyst and a focal point for demonstrating and facilitating objective problem solving and best management practices.
- Reserves engage local communities and citizens to improve stewardship of coastal areas.
- Reserves implement an ecosystem-based management approach.

College students participate in the Reserve's annual Alternative Spring Break Program.

7.1 Narragansett Bay Reserve Stewardship Plan

While the Narragansett Bay Reserve's stewardship program works to address a variety of ongoing local management issues important to the Bay and the Reserve's land and water resources, these programs are implemented to be consistent with the guiding principles described above. In addition, most Reserve programs and activities also align with the three national priorityissues of land use and population growth, habitat loss and alteration, and water quality degradation as identified in the current NERRS strategic plan. Further, many of the Reserve's programs and activities fall into one of three focus areas that include: protection of rare and threatened spe-cies, invasive species management and habitat improvement and maintenance.

However, some stewardship projects may address one or more of the national priorities, and span more than one focus area. Individual projects may also be of sufficient scope as to require a specific action plan to implement. This action plan may simultaneously address a number of priority issues, and utilize a number of strategies designed to preserve and protect coastal habitat. These plans may be revised on an as-needed basis as environmental or ecological conditions change. In scope they may be considered analogous to the design and implementation of a long-term research project. For example, a controlled burn action plan for a specific parcel may define the timing and extent of the burn, the partners involved, and the subsequent monitoring required. Such plans may simultaneously remove invasive species and improve or restore habitats that support rare or threatened species.



State prescribed fire crews boarding the Prudence Island ferry.

- **Protection of rare and threatened species**

Within the Reserve and throughout the watershed, many terrestrial, aquatic and marine species are under threat. These threats arise from a number of sources including habitat loss and fragmentation, increased competition from invasive species, and the various effects of global climate change. The Reserve contains a high diversity of estuarine and terrestrial habitats that support a number of rare or threatened species. The stewardship program takes an ecosystem-based approach towards preserving the necessary habitat for these species using the best management practices available. However, each species may require a different suite of strategies including: habitat manipulation, creation of natural or artificial migration corridors and restriction of public access. Regular monitoring provides data necessary to evaluate the success of these actions.

- **Invasive species management**

Both terrestrial and marine invasive species are of particular concern both within the Reserve and throughout the watershed. Their ability to alter and degrade native habitats and out-compete native species, including rare or threatened species, makes them particularly dangerous. Because of the historic agricultural and military use of the Reserve, much of the Reserve's terrestrial habitats have been altered and/or degraded from their natural state. Invasive species, particularly invasive plant species (autumn olive (*Elaeagnus oleaster)* for example), are a persistent presence on Reserve properties and on adjacent lands and adversely affect native species and natural communities. While some species maybe eradicated from the island, others must simply be managed to prevent further expansion. Individual action plans will be developed to address these threats.

- **Habitat improvement and maintenance**

Habitat improvement and maintenance activities target specific habitats under threat not only within the Reserve but throughout the watershed. These activities are consistent with, and are guided by, the State's Comprehensive Wildlife Conservation Strategy. The development of individual action plans for the Reserve take into account recent and ongoing research and monitoring, baseline and historic data, peer-reviewed publications and advice from local experts and practitioners. Reserve projects such as meadow restoration, pine barren management, invasive species monitoring and removal programs are beneficial both locally and nationally.

7.1.1 Objectives for Stewardship

Stewardship objectives are listed in Table 7.1 below with a brief description of the rationale for each objective. Individual action plans have been developed to address specific stewardship activities. These action plans will be periodically reviewed and revised as new property is acquired, site conditions change or new habitat management opportunities arise.

Table 7.1 – Objectives and Rationale for Narragansett Bay Reserve Stewardship

S1: Protect the ecological integrity of the Reserve's land and water resources using an ecosystem-based management approach. Resource protection through an ecosystem-based management approach promotes biodiversity and conserves sensitive species and their habitats. This approach improves habitat stability and ecosystem resilience. This is particularly important due to increasing threats from coastal development, invasive species and climate change. This approach is consistent with the primary purpose of the Reserve System, to preserve representative coastal habitats and promote the stable ecosystems necessary for the Reserve to serve as a platform for research and education.

S2: Promote conservation by integrating the products, programs and expertise of other reserve sectors into stewardship activities to increase stakeholder engagement and understanding. Cooperative projects involving research, monitoring and habitat management coordinated with education and outreach activities provide opportunities to inform stakeholders of the multidisciplinary approach necessary to maintain a healthy Bay. Cooperative projects provide additional avenues for stakeholders to engage the Reserve while simultaneously meeting a number of Reserve objectives in an efficient and effective way. Ongoing habitat management activities such as removal of invasive species and controlled burns can be strategically coordinated to include demonstration projects which are very effective in promoting stakeholder involvement. Research and monitoring activities embedded in these projects provide data and information that can be translated to the watershed as a whole to help address a number of priority issues facing the entire watershed.

S3: Support and enhance watershed-wide stewardship programs by developing partnerships that share resources and leverage funds. Many of the key management issues facing the Reserve such as invasive species management and habitat degradation are also important throughout the Narragansett Bay watershed. Stewardship programs often require a diverse set of skills and resources that may not be available in any one organization. By communicating and cooperating with various organizations, the unique skills and resources of each organization can be made available to successfully implement broad scale projects that ultimately support the NERRS mission. Conversely, Reserve programs may benefit from the unique capabilities of other Federal, State and non-profit organizations.

Dedicated college students spend their spring break tackling invasive plants in the Reserve.

Unloading from a Prudence Island beach cleanup.

7.1.2 Objectives, Strategies and Tasks for Stewardship

Strategies and tasks for each of the three Reserve stewardship objectives are presented below. Strategies are numbered to correspond with their respective objectives, while tasks are bulleted. These strategies and tasks will serve to guide future stewardship projects. The tasks listed represent actions that might be employed to accomplish a given strategy. The application of specific tasks will be determined on a case-by-case basis as specific projects are planned and implemented. In some cases, detailed Action Plans may be prepared to further describe specific projects.

Objective S1: Protect the ecological integrity of the Reserve's land and water resources using an ecosystem-based management approach.

Strategies and tasks

S1.1: Identify resources being adversely impacted by human activities at the Reserve and prioritize management efforts to enhance protection of these resources.

- Protect all existing eelgrass beds by prohibiting damaging activities within the beds and deploying and maintaining buoys that clearly articulate prohibitions within eelgrass beds in the Reserve.
- Establish and communicate policies regarding public access and recreational use of the Reserve (see Public Access Plan pg.74).
- Document historic land use practices for individual habitat patches or stands in an effort to better understand the mechanisms of specific habitat generation/persistence and to help direct future management activities.
- Utilize the Stewardship Advisory Committee to guide implementation of the Stewardship Plan, when appropriate.

S1.2: Protect rare, threatened, endangered and protected species within Reserve properties and in the Narragansett Bay estuary.

- Identify, quantify and document rare species and their distributions on Reserve properties by compiling existing data, building upon previous monitoring efforts, and initiating guided monitoring through partnerships, facilitation of visiting research, in-house staff efforts, and volunteer programs.
- Protect, enhance and restore submerged aquatic vegetation (SAV) habitats in the Reserve (see SAV action plan).
- Maintain, restore, or expand pine barrens habitats that are critical for specific rare or unique native flora and fauna to a full range of expected age classes, structure, and habitat types.
- Apply active habitat, landscape and ecological management as necessary to ensure continued species and habitat success consistent with the Rhode Island Comprehensive Wildlife Conservation Plan.
- Consult individual rare species plans when planning any manipulative habitat or landscape management, research, educational or visitor-use program.

Over 90 percent of Prudence Island property owners surveyed indicated that they are supportive of Reserve programs to protect rare habitats and species.

S1.3: Improve management of the Prudence Island deer population by facilitating better communication and cooperation among interested stakeholders.

- Establish an annual informational meeting between Reserve staff, ASRI, the Prudence Conservancy, DFW and other interested stakeholders in early spring to discuss results of the previous year's hunting season and plans for the next year.
- Post a link on the Reserve website to the RIDEM website for results of annual deer hunts and surveys.
- Educate the public about the risks of tick-borne disease and necessary precautions to take in areas with high tick densities.

S1.4: Eliminate or reduce the spread and introduction of invasive species and their impacts on ecosystem function.

- Inventory, monitor and map invasive plant populations.
- Prioritize management activities for invasive species known to occur on Reserve properties using available prioritization protocols.
- Develop and implement management programs for high-priority invasive plant species.
- Test the effectiveness of various management techniques to control invasive plants.

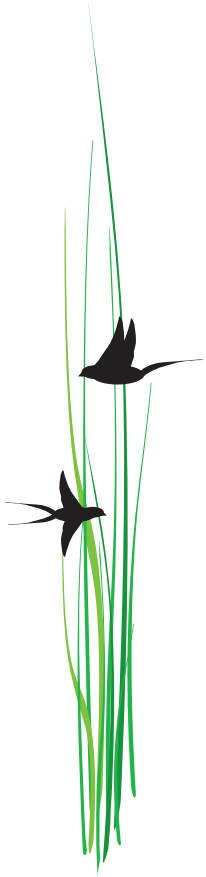
S1.5: Work to develop an appropriate mix of habitats to maintain ecological health within Reserve properties.

- Restore natural marsh conditions when appropriate.
- Prevent loss or degradation of existing early successional habitat as the result of plant succession or the spread of invasive species.
- Create early successional habitat types that may be currently underrepresented in the landscape.
- Promote the development of late-seral stage forest through passive management of forest interiors.
- Actively manage selected forest stands to enhance forest habitat structure and function.
- Improve field and woodland border habitat by creating cutback zones.

S1.6: Design and implement stewardship demonstration projects to enhance understanding of the effectiveness of management strategies and to promote adaptive management.

- Develop monitoring programs to determine if specific stewardship objectives are being achieved.
- Assess the effectiveness of conventional and traditional management mechanisms in restoring and maintaining early successional habitat.

College students cut and spray the invasive Autumn olive tree on their Alternative Spring Break Program.



Prescribed fire in the pine barrens, 2007.

- Assess the effectiveness of a variety of silvicultural practices to improve forest habitat structure and function.

Objective S2: Promote conservation by integrating the products, programs, and expertise of other Reserve sectors into stewardship activities to increase stakeholder engagement and understanding.

Strategies and Tasks

S2.1: Promote conservation through integration with research, outreach and education.

- When appropriate, use management activities as demonstration projects to promote public understanding and stewardship.

- Inform stakeholders and the general public about the importance of maintaining biodiversity of native taxa for ecological, health, economic and aesthetic purposes.

S2.2: Develop volunteer programs to help protect, monitor and manage sensitive natural resources within the Reserve and instill a sense of public ownership.

- Work with the Reserve Education Coordinator who will take the lead on developing education and volunteer programs related to SAV.

- Recruit volunteers to help monitor light levels using secchi discs and light meters in and around eelgrass beds in the Reserve.

- Continue to support the efforts of the Prudence Island Groundwater Task Force in their investigation of the groundwater resource through volunteer monitoring of stream flow and groundwater levels.

- Continue to utilize the volunteer-based Woodcutting Stewards Program to implement forest management activities.

- Work collaboratively with partner agencies to build our volunteer base to support a variety of natural resources and stewardship projects.

- Continue to work with and assist the Rhode Island Wild Plant Society's Plant Conservation Volunteer (PCV) program in identifying and inventorying rare species within the Reserve.

S2.3: Increase awareness of invasive plants and their detrimental impact on local ecosystems.

- Coordinate a local, ongoing public education campaign in partnership with the Prudence Conservancy to raise awareness of the invasive species threat.

- Educate landowners regarding effective control methods.

- Increase awareness of potential funding sources available to non-profit organizations and large land owners for invasive plant control for the purpose of improving wildlife habitat.

- Collaborate with island stakeholder groups to coordinate training, outreach, and

volunteer efforts to assist in island-wide invasive plant monitoring and control programs.

S2.4: Work closely with the Research Program in the characterization and assessment of ecological conditions to inform and evaluate management planning and actions (see also R2.4).

- When appropriate, apply the BACI (before, after, control, and impact) monitoring protocol to restoration actions.

- Continue to collect and analyze baseline ecological data (e.g. breeding bird point counts, geospatial habitat inventories, vegetation monitoring) to inform management planning.

- Continue to collaborate on incorporating management-driven research and monitoring to address specific needs within the Reserve and the Narragansett Bay estuary.

- Continue to participate and contribute to activities related to Habitat Mapping and Change.

Objective S3: Support and enhance watershed-wide stewardship programs by developing partnerships that share resources and leverage funds.

Strategies and Tasks

S3.1: Continue to work with existing partners, organizations and agencies involved in stewardship and natural resources management.

- Work with the Natural Resource Conservation Service (NRCS) on restoration planning and implementation.

- Participate on the Coastal Resource Management Council (CRMC) Habitat Restoration Fund technical advisory committee.

- Support Roger Williams University in bay-wide oyster restoration programs.

- Coordinate with RIDEM partners including the Divisions of Sustainable Watersheds, Fish and Wildlife, Forest Environment, and Parks and Recreation on planning and implementation of ecological and protected areas management.

- Solicit technical advice, as necessary, from partners who participate on the Reserve Stewardship Advisory Committee to plan restoration and other management actions.

S3.2: Identify new partner organizations and agencies and initiate new collaborative efforts.

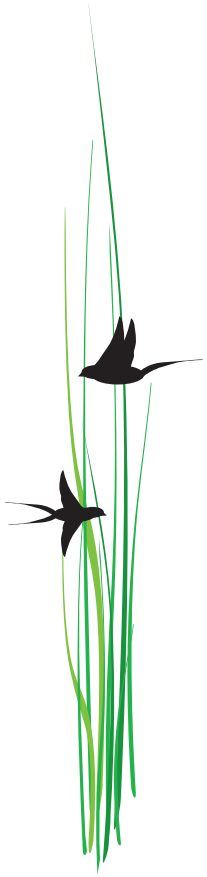
- Seek partnerships for restoration through the Rhode Island Restoration Collaborative and State partners.

- Identify potential funding agencies and/or partnerships to support equipment acquisitions, restoration, restoration science and other stewardship projects.

- Seek sources of volunteers through other organizations.

- Establish a Cooperative Weed Management Area for all of Prudence Island to promote more effective invasive species control programs.

Teachers learn how to identify and quantify salt marsh vegetation using quadrats.



Teachers learn research-based activities during a "Teachers on the Estuary" training.

8.0 ADMINISTRATION PLAN

The following sections provide an overview of the existing administrative framework that governs management of the Reserve. This includes the roles and responsibilities of State, Federal, and non-governmental partners. It outlines the existing Reserve staffing structure and presents a plan for guiding administrative decisions over the next five years.

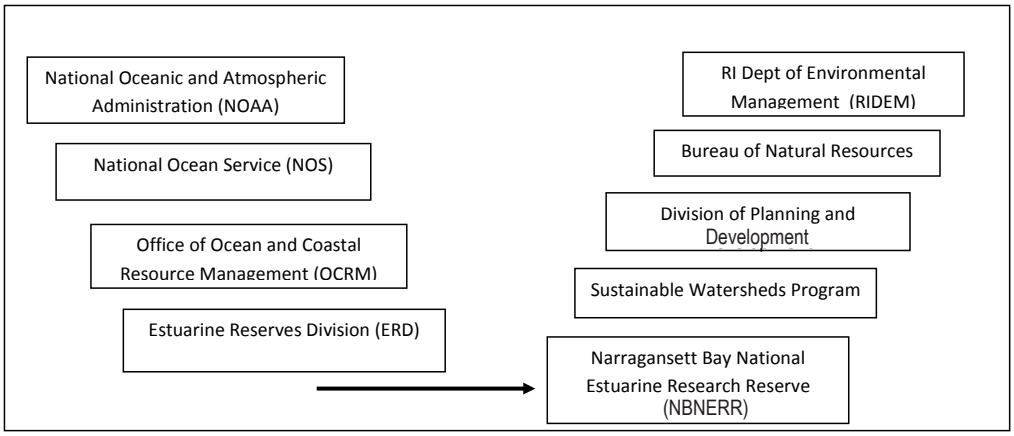
8.1 Reserve Governance

The Narragansett Bay Reserve is a federal-state partnership program established between the National Oceanic and Atmospheric Administration (NOAA) and the State of Rhode Island (State). In this partnership, NOAA provides 70% of the Reserve's annual operational funding as well as program guidance and support. The Estuarine Reserves Division (ERD) within NOAA administers this funding and is responsible for ensuring the Reserve complies with federal regulations and the requirements established under section 315 of the Coastal Zone Management Act of 1972. The State contributes the remaining 30% through staff and personnel support, as well as in-kind services. It also is directly responsible for managing Reserve properties and implementing Reserve programs. The Rhode Island Department of Environmental Management (RIDEM) is the lead agency designated to manage the Reserve. The administrative relationship between those departments within NOAA and the State responsible for Reserve management is shown in Figure 8.1. In addition to these state and federal partners, the Reserve also relies on a number of other governmental agencies and private organizations to meet its multi-disciplinary mission.

8.1.1 Federal Authority

The primary Federal statute governing the reserve system is the Coastal Zone Management Act of 1972 (CZMA 16 U.S.C. section 1451 et seq.). Section 315 of the CZMA established the NERR System and created the basic framework for its operation. The requirements set forth in the CZMA are implemented by NOAA through ERD which is administratively located within the Office of Ocean and Coastal Resource Management (OCRM) under the National Ocean Service (NOS), Figure 8.1. The requirements of the CZMA, along with other applicable regulations, guide management of the Reserve System. These regulations are periodically updated and are published in the Federal Register. ERD also prepares a five year Strategic Plan consistent with the CZMA to further guide the Reserve System.

Figure 8.1 - Administrative Location of the NBNERR within Federal and State Governments.



8.1.2 State of Rhode Island

Within the State, RIDEM is the lead agency responsible for managing Reserve operations. Within RIDEM, the Reserve is further located within the Division of Planning and Development in the Sustainable Watersheds Program (Figure 8.2). In addition, various other offices and divisions within RIDEM provide services to help support Reserve operations. The roles and responsibilities of relevant offices and divisions are briefly described below.

- **Division of Planning and Development (Bureau of Natural Resources)**

While RIDEM is responsible for overall administration of the Reserve, the Division of Planning and Development is responsible for direct oversight of the Reserve program. The Reserve Manager is administratively located in this Division and reports to the Chief of the Sustainable Watersheds Program. RIDEM staff members responsible for property acquisition and construction are also located within this Division. This close proximity is beneficial to the Reserve. In addition, this Division provides permanent office space at RIDEM headquarters for the manager and core staff when off-island activities are required.

Rain clouds roll in over Jenny Marsh and a tidal creek.

- **Division of Fish and Wildlife (Bureau of Natural Resources)**

The Division of Fish and Wildlife is responsible for a variety of wildlife management issues on the island. The Division is responsible for setting seasons, size limits, methods of taking and daily limits for the harvest of all wildlife as well as all recreational and commercial fisheries. Within the Reserve these activities include fisheries and wildlife management as well as public angling and hunting programs. The Reserve works closely with Fish and Wildlife staff to implement all of these programs. Responsibilities for habitat restoration and public access are also shared with the Reserve. The Division provides technical guidance, planning and logistical support to the Reserve for wildlife habitat management, development and habitat restoration. They help insure the Reserve is meeting the goals of the State's Wildlife Action Plan for species of Greatest Conservation Need.

- **Administration and Finance**

This office provides financial support services for Reserve programs. They are responsible for financial grant management and for submission of federal financial reports. They administer external contracts and help secure supplies and services for the Reserve.

- **Division of Parks and Recreation (Bureau of Natural Resources)**

The Division of Parks and Recreation helps to support infrastructure management within the Reserve. The Reserve's Parks Caretaker-Supervisor is employed through the Division of Parks and Recreation but is directly supervised by the Reserve Manager. The Parks Caretaker is responsible for maintaining the buildings, roadways and roadsides, firebreaks, docks and equipment, as well as other structures necessary for the efficient operation of the Reserve. Certain supplies and services may also be acquired through this Division to support Reserve operations.

- **Division of Law Enforcement**

This Division is on call to help enforce environmental regulation violations at the Reserve. Because of the challenging logistics of traveling to the Reserve, Law Enforcement does not regularly patrol Reserve properties. However, they will respond to a complaint or other violation of State regulations. They provide on-site presence and patrol regularly during the annual deer hunting season between October and January.

- **Other Divisions within RIDEM**

A number of other divisions provide services or support to the Reserve on an occasional or as needed basis. For example, the Division of Forest Environment provides technical support regarding forest management and controlled burns on Reserve lands. The Office of Environmental Response will provide support in the event of an oil spill or other environmental emergency. The Office of Human Resources supports the employment of the Reserve's RIDEM staff, some summer and seasonal employees including the park naturalists, technical support interns, and seasonal laborers. The Office of Water Resources is responsible for carrying out the various regulatory functions for maintaining water quality within Reserve waters and throughout Narragansett Bay.

Figure 8.2. - Organizational Location of the Reserve within the Rhode Island Department of Environmental Management.

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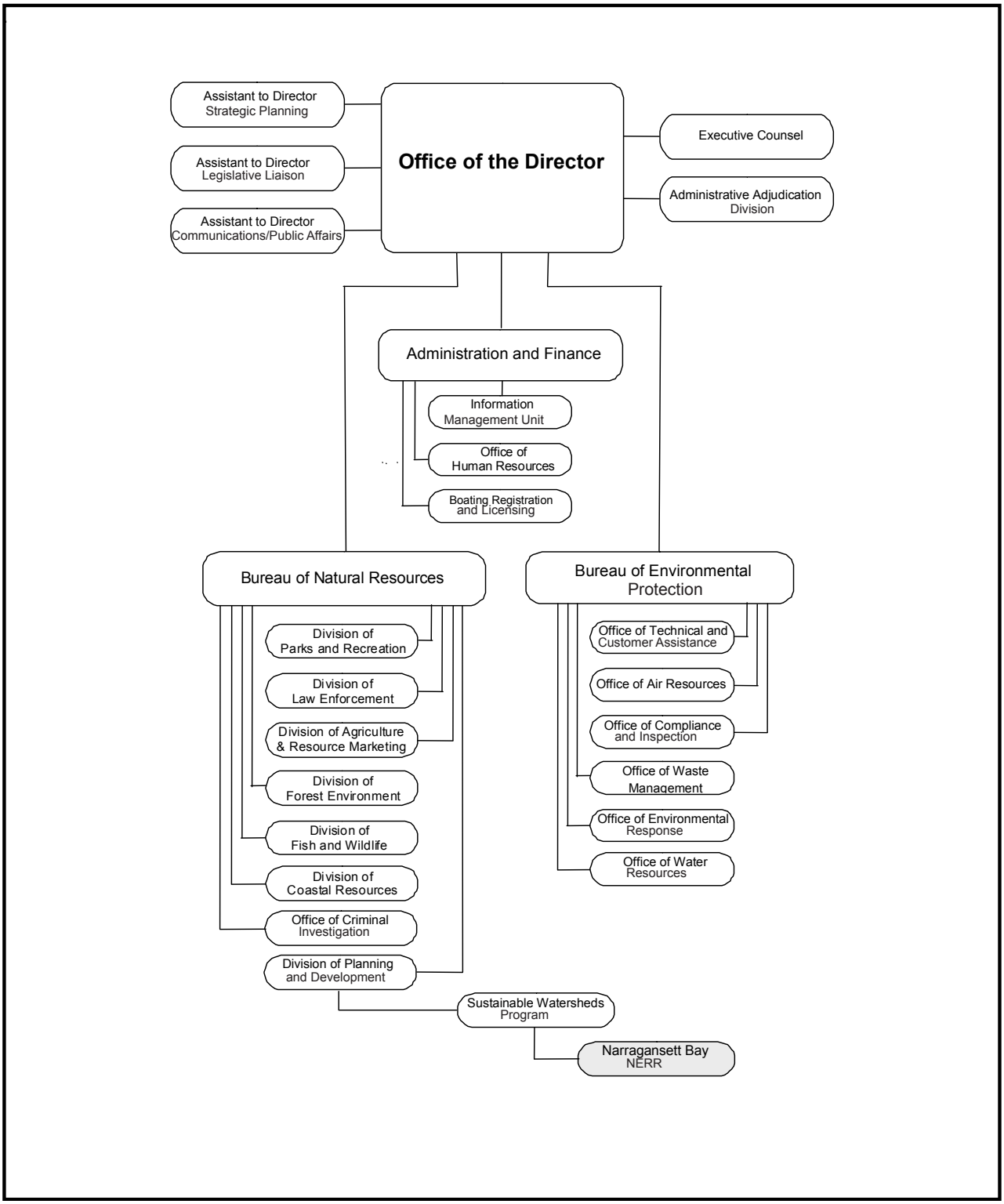


NBNERR in the clutches of an icy January.

8.1.3 Other Federal, State and Local Agencies

- **Rhode Island Coastal Resources Management Council**

The Rhode Island Coastal Resources Management Council (CRMC) is the state's CZMA agency and regulatory authority. The CRMC is authorized to approve, modify, set conditions, or reject the design, location, construction, alteration and operation of specified activities under the Council's jurisdiction. This jurisdiction is generally defined by the area extending from the territorial sea limit (three miles offshore) to two hundred (200) feet inland from any coastal feature, to Special Area Management Plans and to certain activities that occur anywhere within the state. CRMC permits are necessary for any activity within this zone that potentially threatens or alters this habitat.

- **Town of Portsmouth**

The Reserve lies within the boundaries of the Town of Portsmouth, RI. The town provides periodic police surveillance and rescue services and requires permits for building and construction consistent with town regulations. The town also provides a mechanism for acquiring vehicle fuel on the island.

- **U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)**

As directed by the conservation goals and priorities of the U.S. Department of Agriculture (USDA), the NRCS provides technical and, in some cases, financial assistance to the Reserve. Several habitat management projects at the Reserve have been funded by the Rhode Island NRCS.

8.1.4 Additional Reserve Partners

While the list of Reserve partners is long, several organizations work regularly with the Reserve to share resources, implement programs and facilitate contracts. These strong partnerships are essential in allowing the Reserve to fully achieve its goals and objectives.

- **Audubon Society of Rhode Island (ASRI)**

The complimentary missions of both the Reserve and ASRI allow this partnership to benefit both organizations on many different levels. An ongoing cooperative agreement between RIDEM and ASRI allows them to provide a number of services that are essential for the effective and efficient operation of the Reserve. Most importantly, this agreement provides a mechanism for ASRI to employ Reserve staff directly. This allows the Reserve far more flexibility than would be possible working within the State system. Because staff members are regular ASRI employees they receive a number of benefits including vacation, health and retirement. While these staff members are ASRI employees, they report directly to the Reserve manager. ASRI also allows the Reserve to structure a number of policies and standards for its employees that strike a balance between those of the State and ASRI. This helps minimize any differences in employment standards between the two organizations, creating a more unified working environment. For example, job descriptions and pay grades for all Reserve employees follow RIDEM standards. ASRI also provides a number of other services including the capacity to enter into contracts and procure supplies with greater flexibility than would be possible through the State. ASRI advertises Reserve programs and events through newsletters and program guides, allowing access to a wide distribution network. In exchange, ASRI receives recognition as a partner in all Reserve public media communication. Because of the Reserve's focus on marine and estuarine issues this recognition expands ASRI's visibility throughout the region. This partnership also serves both organizations because it provides close contact and opportunities to partner on issues and projects that both organizations share. This is particularly true

for outreach and education programs. Finally, ASRI provides a mechanism for the Reserve to receive donations or other grant support not possible through the State.

- **University of Rhode Island**

The University of Rhode Island (URI) has traditionally been an active partner with the Reserve. A continuing cooperative agreement with URI helps to maintain a strong connection to the research community and it serves as a mechanism that facilitates the exchange of products and services. URI continues to provide laboratory services for the analysis of water quality samples collected as part of the System Wide Monitoring Program. This agreement has also helped to serve as a conduit for collaborations with RI Sea Grant.

- **Prudence Conservancy**

Being the local land trust on Prudence Island, the Prudence Conservancy (Conservancy) works with the Reserve in a number of ways. Both organizations strive to preserve open space and provide opportunities for education and recreation. The Conservancy has worked with RIDEM and contributed funds towards the procurement of several important parcels on Prudence Island. Volunteers within the Conservancy maintain a number of trails, while the Reserve provides GIS and other technical support. The Education Coordinator partners regularly with the Conservancy on day camps and other education programs. The Conservancy also serves as a mechanism for sharing contracted services for stewardship activities on the island.

- **Grow Smart Rhode Island**

Grow Smart Rhode Island (GSRI) and the Reserve's CTP work extensively together and share a variety of resources. Examples of collaboration with GSRI include the development and maintenance of an online training calendar called CommunityConnectionRI which is a resource for other trainers in RI, and recently the development and execution of a formal training audience needs assessment. The Reserve's CTP is also a major sponsor of a biennial smart growth conference led by GSRI that attracts over 500 community stakeholders.

Partner Save The Bay regularly brings students to NBNERR.

8.2 Narragansett Bay Reserve Organization and Staffing

Reserve staffing is currently composed of seven full-time and seven part-time or seasonal employees. The exact number of seasonal employees varies depending on the availability of external funding. The State directly employs the Manager, Parks Caretaker-Supervisor and three seasonal staff members as well as the Administrator of the Sustainable Watersheds Program. The remaining staff members are employed through a cooperative agreement with ASRI. This includes the remaining core staff positions and other seasonal or part-time employees. The Reserve Manager supervises all Reserve employees. A schematic of the Reserve organizational structure is shown in Figure 8.3. The State provides funds to support the Parks Caretaker-Supervisor, eighty percent of the Research Coordinator's position, three seasonal employees. The Administrator, who is fully state funded, constributes thirty percent of his time supporting the Reserve. The remaining positions, including the Manager, are supported by Federal funds. Brief descriptions of the responsibilities for each permanent position are shown in Table 8.1. Detailed job descriptions are on file at the Reserve.

Most Reserve staff are stationed at the Reserve headquarters on Prudence Island. Only the CTP Coordinator is stationed primarily at RIDEM headquarters in Providence in order to have the scheduling flexibility needed for this position. The Reserve Manager divides his time between Prudence Island and RIDEM headquarters. This allows him to maintain regular contact with other RIDEM personnel and other partners and stakeholders. Because of logistical constraints getting to and from the island, the State also provides permanent office space for the Manager and the other core Reserve employees at RIDEM headquarters in Providence.

Figure 8.3 - Schematic layout of the Reserve's internal administrative structure. Positions shaded in gray are planned positions. Dashed lines represent supervision on specific projects.

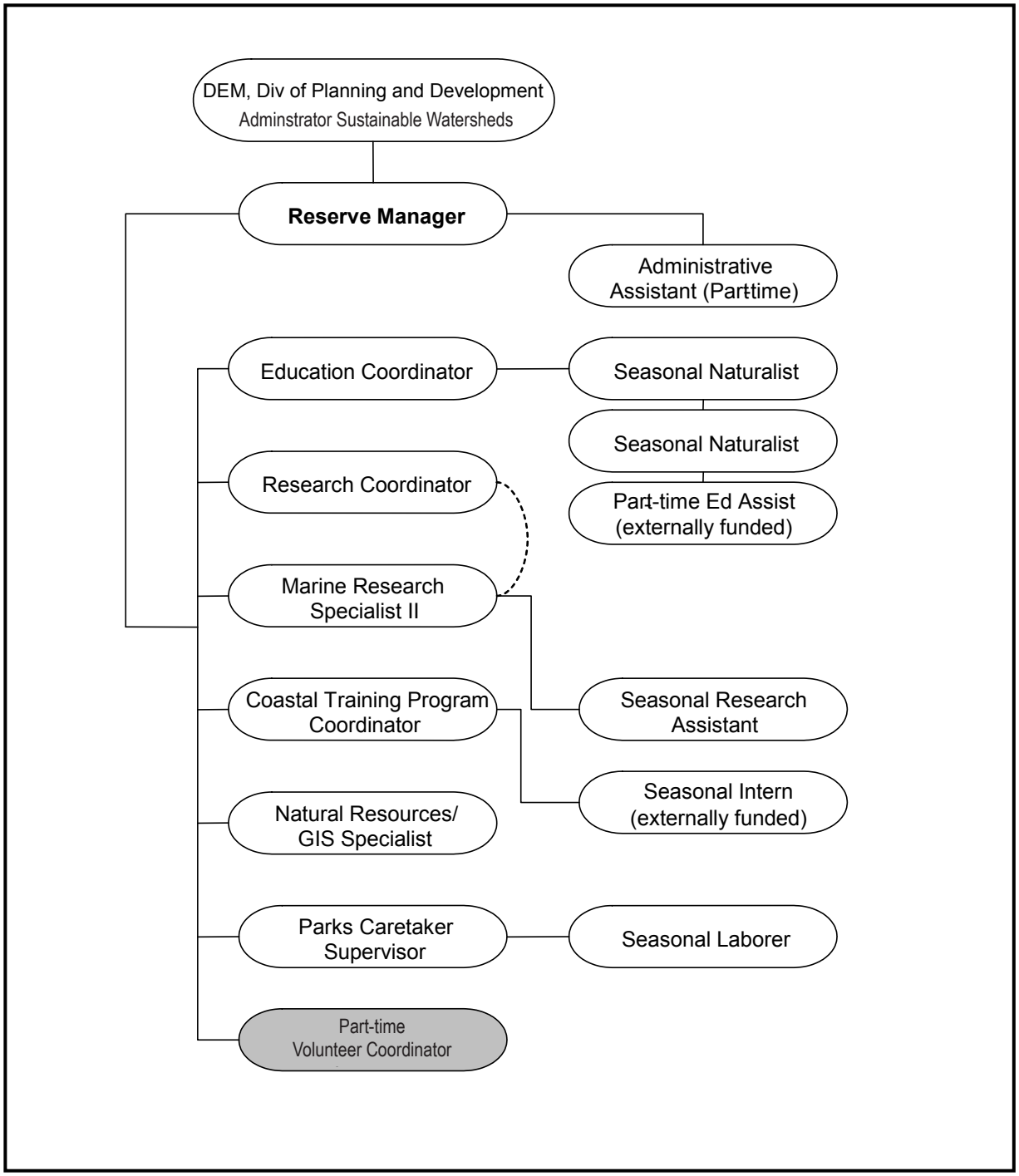


Table 8.1 – Existing Reserve staff and RIDEM support positions and responsibilities**

Position	Responsibilities
Reserve Manager 100% federally funded	Responsible for all on-the-ground operations of the Reserve including the supervision of all staff, management of budgets, procurement of supplies and contracts and compliance with NOAA NERR system requirements and deliverables. Responsible for providing guidance and leadership to Reserve staff in order to meet the Reserves mission and to develop the Reserve program. Also participates in a number of boards and advisory committees throughout the state.
Education Coordinator 100% federally funded	Responsible for public outreach, community and K-12 education programming, and interpretation for the Reserve. Works closely with other programs to create opportunities to disseminate information regarding ongoing Reserve projects and programs to the general public and K-12 audiences throughout the Narragansett Bay watershed. Also works to forge and develop partnerships with local organizations to extend resources and enhance the capabilities of the Reserve.
Research Coordinator 80% state funded 20% federally funded	Responsible for providing leadership, supervision and oversight of research and monitoring activities at the Reserve. Responsibilities include supervision of junior staff as well as coordination of NERRS system-wide programs, such as the GRF, NERRS Science Collaborative and CICEET program activities in Rhode Island. Collaborates with other agencies, stakeholders and other NERRS RCs to gather data on the ecological status of the Reserve and Narragansett Bay.
Natural Resources/ GIS Specialist 100% federally funded	Responsible for implementing and coordinating resource management and restoration and monitoring programs within the Reserve, providing GIS support for Reserve Staff and statewide partners, working closely with other Reserve sectors to integrate education, training and research programs with natural resource management. May supervise seasonal interns or employees.
Marine Research Specialist II 100% federally funded	Responsible for implementing the abiotic SWMP program at the Reserve in consultation with the Research Coordinator. Supervises seasonal interns along with deployment of instruments and management of data. Also works to implement and develop a variety of other research and monitoring projects in conjunction with the Research Coordinator. Develops and writes annual SWMP and other technical reports.
Coastal Training Program Coordinator 100% federally funded	Responsible for implementing the Coastal Training Program (CTP) in consultation with the Reserve Manager and RIDEM staff. The CTP provides coastal decision-makers with up-to-date scientific information so that they may make better informed decisions regarding coastal resources. Organizes and conducts training workshops and develops products while collaborating with other agencies and organizations.
Administrative Assistant (part time) 100% federally funded	Responsible for maintaining documents and files, supporting the procurement of services and supplies, maintaining inventory records, developing office procedures and protocols, and assisting staff with other routine administrative functions including some IT support.
Parks Caretaker Supervisor 100% state funded	Responsible for maintaining all outdoor and some indoor infrastructure of the Reserve including roads and roadsides, docks and grounds. Coordinates vehicle repairs, inspections and other maintenance-related tasks. This also includes supervision of seasonal laborers.
Administrator Sustainable Watersheds 100% state funded	Directly supervises Reserve manager and provides overall program oversight. Contributes to the development and implementation of CTP programs and products and helps supervise the CTP Coordinator. Spends approximately 30% of time on Reserve functions.
Seasonal Employees	2 Seasonal Naturalists (100% state funded) 1 Seasonal Laborer (100% state funded) 1 Research Assistant (6 month SWMP tech) (100% federally funded)

** Additional externally funded staff are currently working for the Reserve as temporary employees.

8.3 Reserve Staffing Plan

In recent years the total number of Reserve employees has grown moderately to include permanent full-time staff for all core positions as well as seasonal and part-time support positions (Fig 8.3). This has allowed Reserve programs to further develop and mature. However, at the current level of annual federal funding it's not possible for the number of Reserve staff to increase further. Currently, external funding supports one seasonal employee supporting both the Eduction and CTP Coordinators, as well as an intern reporting to the CTP Coordinator. With additional stable support several seasonal and temporary positions would be converted to full-time support positions. Ideally a full-time support employee would report to each sector coordinator. In addition, because of greater program visibility, the number of individuals looking for volunteer opportunities has grown. In order to utilize this resource, a part-time volunteer coordinator is needed. Brief descriptions for each full-time position are shown below.

Nekton sampling with a throw trap.

Full-time Administrative Assistant
Conversion of this part-time position to full-time will further improve overall function within the Reserve and increase program efficiency allowing programs to further mature. Further support for general administrative functions will relieve the manager and core staff of routine functions.

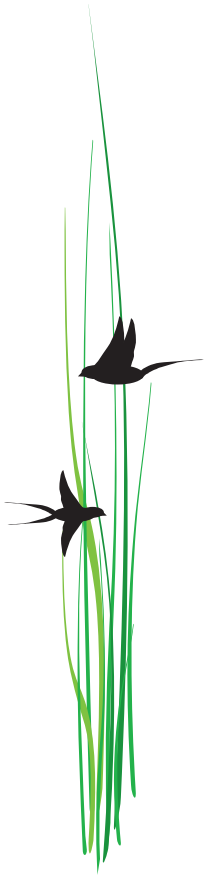
Assistant Educator and Program Assistant
Conversion of the current seasonal assistant to a full-time position would significantly relieve the EC from more routine education programming to focus on planning and other more complex functions. Duties for this position would include: preparation for camps, distribution of fliers and signs, attendance at media events such as Earth Day, routine tours and programs, etc.

CTP Support Assistant
Duties would include: assist the CTP Coordinator with the development and implementation of decision-maker trainings, help to create fact sheets and other educational and informational materials, make updates to the CTP website, and maintain the CTP mailing list and training participant database.

Stewardship Support Assistant
Duties of this position would include on-the-ground coordination of various stewardship activities, organization and preparation for meetings or activities, distribution of media, routine monitoring, acquisition of supplies, etc.

Full-time Research SWMP Technician
Conversion of the seasonal (six-month) SWMP technician to a permanent full-time position will provide greater program stability and reduce the need for direct oversight. This would allow the Research Coordinator and Marine Research Specialist more time to coordinate and plan other research and monitoring programs, analyze data, publish reports and perform higher-level planning and advisory functions.

Volunteer Coordinator
This new position will allow the Reserve's volunteer program to develop and mature. Duties of this position would include: liaise between volunteers and each of the sector leads, develop mailing lists and databases to match volunteers with Reserve needs, track volunteer contributions, recruit additional volunteers and support various volunteer activities.



Seal Watchers on the south end of Prudence Island.

8.4 Objective, Strategies and Tasks for Administration

8.4.1 Reserve Administrative Objective

Administration of the Reserve will be guided by the single broad objective shown below. A rational for this objective is also provided.

Objective A1: Maintain and improve the Reserve administrative framework to efficiently support Reserve programs, goals and objectives.

This objective is stated broadly to encompass a number of strategies that help advance Reserve programs. This includes strategies to help work effectively within state government and with federal partners to provide the services and products necessary for Reserve Operations. It also includes the development of mechanisms (financial and otherwise) to support staff and their needs. Further, it recognizes that changes in administrative structure may be needed as programs evolve.

8.4.2 Strategies and Tasks for Administration

Specific strategies and tasks developed to meet this objective are listed below. Strategies are shown in bold type while tasks are highlighted with bullets. The tasks listed represent actions that may be employed to accomplish a given strategy.

A1.1: Maintain and strengthen the Federal-State partnership between NOAA and RI DEM.

- Implement actions required or suggested in NOAA 312 evaluation reports.
- Assist and cooperate in the development of Reserve System strategic planning, budgets, priorities and program operations.
- Provide program and financial reports to NOAA in a timely manner.

A1.2: Develop and maintain cooperative relationships with other agencies and organizations to maximize Reserve efficiency and productivity.

- Continue to work with the Audubon Society of RI to maintain an effective and efficient partnership.
- Utilize the expertise and resources of Reserve advisory committees and other groups in conducting Reserve operations and programs.
- Increase cooperation and interaction with the Coastal Resources Management Council (the R.I. CZM agency) and provide technical assistance to CRMC wherever possible.
- Support improved coastal zone management by continuing to collaborate with and contribute to the efforts of local, State and Federal agencies.

A1.3: Provide the staffing and personnel needed for effective program development.

- Regularly evaluate and revise the Reserve's staffing plan.
- Establish and fund new positions as the Federal emphasis and budget permits.
- Obtain outside resources and expertise through cooperative agreements and volunteer efforts.
- Continue the use of seasonal laborers, naturalists and job-sharing to achieve an optimal cost-effective staffing mix.
- Seek outside sustainable funding for seasonal and part-time positions.
- Develop a plan to recruit and utilize volunteers across all programs for a variety of projects and programs including establishment of a volunteer coordinator.

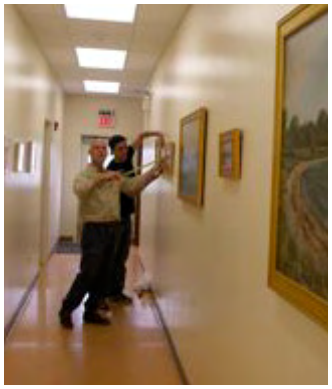
A1.4: Provide the administrative and financial mechanisms allowing the Reserve to share and receive resources and funds with a variety of Federal, State and non-profit agencies and organizations.

- Continue to work with ASRI as a conduit for funds and resources.
- Strengthen ties with other non-profit organizations, agencies and universities to explore ways in which to share resources such as staff or intern time.

A1.5: Evaluate employee performance and provide mechanisms for professional development and improvement.

- Conduct annual or semi-annual employee performance reviews.

Salt marsh monitoring.



Hanging a new art exhibit in the Lab & Learning Center. Local artists exhibit year-round at the Reserve.

9.0 INFRASTRUCTURE PLAN

This plan outlines the Reserve's current status for all infrastructure including roads, docks and buildings and describes plans for infrastructure enhancements and construction that may take place within the next five years. The Plan also addresses the importance of maintaining existing infrastructure essential for overall Reserve operations.

Management decisions and actions regarding infrastructure enhancements will be guided by the following principles:

1. Provide universally designed facilities that fulfill the Reserve's mission while complying with the requirements of the Americans with Disabilities Act (ADA).

2. Infrastructure will be designed and located to meet as many needs as possible with minimal cost and environmental impact to the surrounding area.

3. New infrastructure shall strive to be a model of sustainable development and shall incorporate sustainable or recycled products to the greatest extent possible.

4. Where appropriate, all new infrastructure and upgrades shall strive to be energy efficient and include native plants for landscaping purposes.

9.1 Existing Infrastructure

Since the Reserve's designation, phased renovation of existing Navy buildings has significantly improved the Reserve's capacity to meet its mission and goals. The following summarizes existing infrastructure at the Reserve:

- 5,000 square foot Reserve headquarters building serving a number of functions. This building houses a visitor center, general purpose room, water quality lab, small conference room and office space for seven full-time staff. This facility also has a single-bay garage currently being used as a workshop.

- Dormitory residence provides year-round overnight (short-term) accommodations for up to 12 Reserve guests.

- Three bedroom residence provides year-round housing for either a full-time caretaker or longer-term accommodations for visiting scientists.

- 150 square foot educational annex located at the T-wharf provides temporary seasonal exhibits and aquaria for visitors.

- Single 30 foot long floating dock located at the T-wharf for Reserve vessels or other permitted visiting vessels for day-use only. A second smaller floating dock located at Potters Cove serves a similar function.

- Large WWII era T-wharf constructed by the Navy more that 40 years ago provides fishing access only. Because of the age of this structure and damage resulting from a barge collision and fire, no other functions are possible at this time.

- Maintenance facility and three-bay garage is used for basic equipment repair and tool storage. This facility also houses an office for the Reserve's Parks Caretaker-Supervisor.

• The Reserve currently operates a single 23 foot research vessel which is also used for basic transportation to and from the island for visitors and contractors.

• Several Navy storage bunkers are currently being used to store moisture-tolerant field gear. The remaining bunkers are sealed shut for safety reasons.

• A heated and insulated 80 square foot weather station shed at Potters Cove.

• 13.4 miles of drivable roadways.

• 4.2 miles of walking trails.

• A 4,000 square foot Navy Quonset hut currently not being utilized.

• Boat ramps located at the South End and Potters Cove.

Professional development for teachers who are becoming familiar with the on-line Estuaries 101 curriculum.

9.2 New Infrastructure Needs

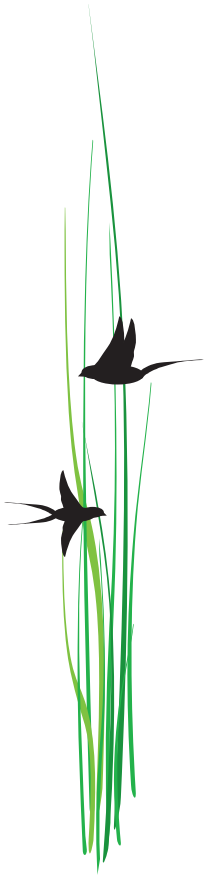
Within the next five years, the Reserve's expected need for new facilities or infrastructure is modest. While some new construction is needed, additional value-added capacity can be gained by coupling this with the enhancement of existing facilities. The immediate and future needs of the Reserve fall into the categories shown below.

9.2.1 Classroom and Meeting Space Needs

The Reserve currently does not have a venue or classroom where moderate-sized (> 20) groups can meet. Presently the Reserve only has a single small room designed to function as a library and conference room. However, this room is often used as temporary office and work space by interns and visiting scientists. These conflicting uses are most common during the warm season months when most Reserve-based programs take place. A covered outdoor meeting space such as a pavilion will help alleviate these conflicts and provide a multi-purpose space suitable for a variety of programs. This outdoor meeting space will also minimize the risk of tick exposure which is very high on Prudence Island. In addition, it is anticipated this pavilion will also include a small integrated and enclosed classroom and storage space which will provide additional program flexibility. This enhanced structure will result in an education and outreach facility more than adequate for Reserve programs.

9.2.2 Workshop and Storage Facility Needs

At the present time, workshop and storage facilities are not adequate for Reserve programs to run efficiently. The Reserve currently has limited workshop space for Reserve staff, visiting scientists, interns and volunteers. Additional space is needed to store, maintain, or construct field gear and scientific instruments. At the present time, the single-bay garage located within the Reserve headquarters building serves as an informal workshop space for scientists and staff. It is also used for storing field gear and various types of sample processing. This space does not function well for either purpose because it must also occasionally serve as garage space. Field gear is also stored in several Navy-era bunkers located across the south end of the Reserve. However, many of these are damp, poorly ventilated or lighted, and not suitable for storage of many types of items.



Local artist, Johan Bjurman, painting the Reserve's Narragansett Bay mural.

Additional storage space is needed not only for field gear but also for Reserve boats. Currently, two small (approximately 20 foot) Reserve vessels are stored out-of-doors in the winter, increasing wear and tear. Renovation of existing structures or construction of a new indoor storage and workshop facility will greatly reduce vessel maintenance and repair and allow existing space within the headquarters building to be reorganized.

9.2.3 Office and Support Facility Needs

During previous renovations, the Reserve headquarters building was only designed to accommodate office or workstation space for permanent core staff positions. No space was allocated for administrative support, interns or visiting scientists. Since that time, the national program has grown to include both the Stewardship and CTP sectors increasing permanent staff. Currently, workstation space for administrative support, seasonal employees and interns is located in each of the laboratories and meeting rooms creating conflicting uses for these spaces.

9.2.4 Interpretation and Exhibit Area Needs

Currently the Reserve has very little in the way of outdoor educational exhibits or demonstration projects. Because most staff must travel to and from Prudence Island via an infrequent ferry, the Reserve's learning center is often closed when the public visits the Reserve. This is especially true during the warm season months. The addition of outdoor exhibits will greatly improve learning opportunities.

In addition to the Reserve's Learning Center, the T-wharf area (0.75 miles from headquarters) receives a great deal of visitation during the summer months. However, visitors are only served by a small education shed. While a flow-through aquaria system stocked with live animals is maintained during the summer by the seasonal naturalist, other permanent indoor and outdoor exhibits and signs are lacking. By expanding these exhibits the Reserve can greatly enhance the educational experience of all visitors.

9.2.5 Site Access Infrastructure Needs

Because few options are available for transportation to Prudence Island, access to the Reserve is also limited. While most visitors and residents travel to the island via the ferry, the Reserve can also be reached by private vessel. However, opportunities to access the Reserve via small or medium-sized vessels are limited because no public dock space is available. Two existing docks suitable for small vessels are located at Potters Cove and the T-wharf. However, public use of this dock is restricted to loading and unloading passengers. Current plans to increase docking capacity at the T-wharf for an additional two vessels will help, but not resolve, this problem. During peak usage, these docks are barely sufficient for Reserve vessels and an occasional education or research vessel. In order to increase access to the Reserve and its programs, additional day-use dock space is needed for small and medium-sized boats. Furthermore, because of the large size and deteriorated condition of the existing Navy T-wharf, moderate-sized vessels cannot safely dock at this facility. Construction and renovation of the existing Navy T-Wharf is the logical choice because it is a popular summer destination for visitors and is within reasonable proximity to the Reserve headquarters building. Improvements to this location would provide a welcoming gateway to the Reserve, thereby increasing educational and research opportunities.

The Reserve currently operates a single, small (23 foot), and aging research vessel that is also used for basic transportation to the island. Acquisition of a new and slightly larger vessel would also greatly improve research and educational opportunities and improve the efficiency of transporting staff, outside researchers, educators and contractors to and from the island.

9.3 Construction Plan

A phased construction plan including renovations to existing structures is outlined below. With completion of this plan the Reserve will have sufficient capacity for all of its programs to fully mature. In 2007 the Reserve updated its master plan for the Reserve headquarters campus. This updated plan is composed of several discrete components that can be phased in as funds become available. Completion of each phase satisfies many of the needs described above.

I Construction and installation of an outdoor pavilion and education center

NOAA funds were awarded in 2009 for the construction of an outdoor education center. This phase will include an outdoor pavilion with a small integrated building suitable for a number of uses. This structure will be placed on an existing cement pad adjacent to the Reserve headquarters building and will be equipped with solar panels or a wind turbine. This phase also includes a number of demonstration exhibits and kiosks featuring green design concepts. This phase increases meeting and storage space while simultaneously reducing conflicting uses within the headquarters building. This phase also provides outdoor educational opportunities.

II Enhanced outdoor demonstration projects and public access

This small phase builds on the improvements provided in phase I by adding additional outdoor demonstration projects and creating an inviting and functional entrance to the headquarters. In this component, permanent parking will be located on another existing cement pad (currently not used) close to the headquarters building. This will be linked to the pavilion and headquarters with walkways featuring pervious materials and native plants for landscaping to highlight a number of other green design features. An outdoor composting toilet may be added.

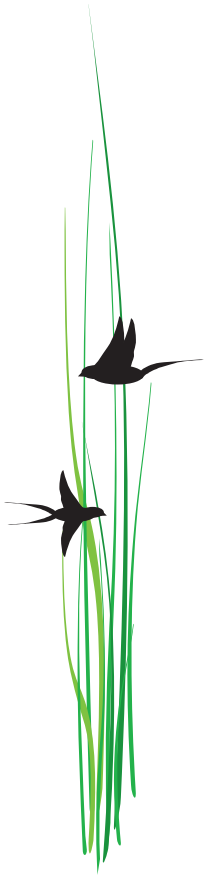
III Construction of a storage and workshop building

This prefabricated building will be located on another existing cement pad adjacent to the headquarters building. This building will include storage space for field gear and scientific equipment for Reserve staff and visiting scientists. The building will also include workshop space for staff, visiting scientists and volunteers. Ideally, space can also be allocated to winter storage of several small research vessels. If this is not feasible, or cost effective, renovation of an existing Navy-era Quonset hut may serve this purpose. Installation of this building will complete the headquarters campus and will free up the existing headquarters garage for other purposes.

IV Conversion of headquarters workshop/garage to a conference room

With completion of phase III the existing garage can be converted to a large conference room with minimal cost and effort. The existing garage space is physically a part of the headquarters building and is equipped with heat and electricity. A reconfiguration of the entrance doors are the only structural changes needed. The high ceiling and large size (32' X 24') make it perfectly suited for a year-round conference or meeting room. With this conversion, the existing small conference room/library can be converted to permanent office and workstation space, further reducing any conflicting use issues.

Participants in NBNERR's first "Teachers on the Estuary" professional development workshop.



9.4 Objective, Strategies and Tasks for Infrastructure

9.4.1 Infrastructure Objective

The maintenance and construction of Reserve infrastructure will be guided by the single objective shown below. A rational for this objective is also provided.

Objective I1: Provide and maintain the infrastructure needed to fully meet the Reserve's mission.

This objective is stated broadly to recognize that a variety of infrastructure types are required to meet the needs of a place-based research, education and habitat preservation program. It also acknowledges that maintenance of existing infrastructure is as important as new construction for meeting program goals. As written, this objective also allows for flexibility to take advantage of opportunities as they arise.

9.4.2 Infrastructure Strategies and Tasks

Strategies and tasks to achieve the infrastructure objective over the next five years are listed below. Strategies are shown in bold type while tasks are bulleted. The tasks listed represent actions that might be employed to accomplish a given strategy. The application of specific tasks will be determined on a case-by-case basis as specific projects are planned and implemented. In some cases, detailed Action Plans may be prepared to further describe specific projects.

I1.1 Effectively maintain all necessary infrastructure within the Reserve.

- Develop an annual maintenance plan that outlines specific activities needed to ensure safe and well-maintained buildings, roads and structures that will greatly improve the effectiveness of the Reserve.
- Provide the means to identify and protect historically and culturally significant sites and structures where possible.
- Develop an asset protection plan that includes capital expenditure needs.

I1.2 Provide enhanced facilities at the Reserve headquarters and the T-wharf area for indoor and outdoor education, exhibit and meeting space.

- Design and construct an outdoor pavilion with an integrated activity building including electrical service to be located on the existing cement pad adjacent to the Reserve headquarters building.
- Install new landscaping and outdoor educational exhibits that highlight native plantings and sustainable development.
- Create a formal parking area on the existing cement pad and create walkways and demonstration projects leading to an expanded butterfly garden and the visitor center.
- Rebuild and enhance the education annex facility at the T-wharf with capacity for new educational exhibits.

I1.3 Provide additional boating access opportunities for visitors via a new docking facility at the T-wharf.

- Renovate the T-wharf to provide access for small and medium-sized vessels. Design and construct additional floating dock space for day-use at the T-wharf.

I1.4 Provide adequate workshop and storage space to effectively and efficiently facilitate Reserve research, education and stewardship activities.

- Evaluate the structural integrity of the existing Quonset hut located along the T-wharf Road for both vessel and field gear storage.

- Evaluate changes needed to make effective use of existing Navy bunkers for storage.

- Design and construct a new workshop and storage facility adjacent to the Reserve headquarters building.

I1.5 Provide work space and support facilities including Internet connectivity for all full-time staff, seasonal interns, volunteers and visiting scientists.

- Increase Internet access to all rooms within the Reserve headquarters.

- Explore options for increasing Internet access to the visiting scientist cottage and the facilities garage.

- Increase workstation and office space.

- Develop a plan to increase the efficiency of existing lab space for visiting scientists, interns and volunteers.

- Convert existing headquarters garage to a conference room.

Enjoying music at the Narragansett Bay Block Party.

Narragansett Bay is known nationally for its excellent sailing. Boats on the Bay take advantage of perfect conditions.

10.0 PUBLIC ACCESS PLAN

The Reserve encourages a diverse range of activities within its boundaries consistent with the goals, objectives and strategies outlined in this management plan. However, these activities must be responsibly managed and regulated in order to provide adequate long-term protection of the Reserve's natural resources. This plan describes the issues relating to habitat protection and the objective, strategies and tasks developed to balance the protection of natural resources with the demands of scientific research, education, and public recreation. Several broad priorities including natural resources protection, passive recreation, and communication were used to guide the development of the public access plan. Many strategies were developed to simultaneously meet several or all of these priorities.

10.1 Resource Protection

While the public is encouraged to experience a variety of Reserve habitats, protecting these habitats from damage and degradation remains the highest priority. This balance is achieved by managing public access and activities differently across the Reserve and throughout the year in order to provide this balance.

10.1.1 Prohibited Activities

While some habitats are more sensitive to human impacts than others, some activities are never allowed within the Reserve because of the significant risk of damage these activities pose, not only to the health of the ecosystem, but also for the use of these habitats as a research platform. Activities never allowed are:

- Camping
- Fires
- Motorized, off-road vehicles
- Alcohol consumption
- Litter or trash disposal, organic or otherwise
- Leaving marked trails
- Collection of any plants, animals, or artifacts

10.1.2 Seasonal and Temporary Access Restrictions

Under certain circumstances public access to the Reserve may be temporarily or seasonally restricted for health and safety reasons or when human presence could impact particular natural resources. For example, vehicular access on Prudence Island is significantly restricted during the fall-winter deer hunting season for safety reasons. During this time vehicular access to the Reserve is restricted to a single road. Pedestrian access is allowed as long as safety regulations are followed. Access to certain bird habitats is also discouraged during the breeding season. Many of the Reserve's bird rookeries are located on Patience, Hope and Dyer Islands which are only accessible by private vessel. Violations of these regulations can be reported to the RIDEM Division of Law Enforcement.

The Reserve Manager may limit or close specific public-use areas, lands, waters, and facilities, and/or temporarily prohibit certain activities when such action is deemed necessary for resource management, research, education, and/or when it is in the best interest of health, safety, and the general welfare of the public. In particular, vehicular access may be limited in certain areas when road conditions are poor.

10.1.3 Sensitive Habitats

The Reserve is home to a number of ecological habitats, some of which are extremely sensitive to human disturbance, are rare and unique, or are home to threatened species. Within this range of habitats, the Reserve has developed strategies to balance the competing needs of enhanced public access and resource protection. For example, installation of viewing platforms and boardwalks can provide public access to wetlands in the least invasive way possible. While the Reserve cannot prevent boaters from anchoring in sea grass beds, installation of marker buoys can inform the public about their location, allowing boaters to avoid these areas.

A fishing boat heads out in the early morning on Narragansett Bay.

10.2 Passive Recreation

Providing opportunities for education and interpretation is a key part of the Reserve's mission. Therefore it's critical to provide a variety of ways in which people can safely access Reserve habitats in a way that protects the environment. The public visits the Reserve for a number of non-structured recreational opportunities including clamming, fishing, hiking, boating, and birding. Others come for structured activities offered by the Reserve's research and education programs. The Reserve offers a number of ways in which this can be accomplished.

10.2.1 Vehicle and Pedestrian Access

The Reserve maintains a number of drivable roads that provide some access to a variety of habitats including coastal shrubland, open meadow, pine barren mosaic, fresh and salt water marshes, beaches, and marine soft and hard bottom habitats. In addition there are a number of hiking and biking trails throughout the Reserve that provide further access to these habitats. The Reserve has a large fishing pier and a sandy beach for public recreation. This access provides most people with opportunities to pursue activities such as walking, hiking, biking, bird-watching, clamming, fishing and just relaxing in many places around the Reserve. While public access to sensitive habits may be restricted, development of boardwalks or viewing platforms will provide additional access to sensitive habitats.

10.2.2 Vessel Access

Access to Prudence Island and Reserve facilities depends upon the public ferry or private vessel. No public transportation is available to Patience, Hope and Dyer islands. On Prudence Island there are three primary gateways to the Reserve: (1) the ferry landing at Homestead; (2) the T-wharf at the southern end of the island; and (3) a small floating dock located Potter's Cove along the northeastern shore of the island. At the present time, there are two existing docks for small vessels located at Potter's Cove and the T-wharf. However, these docks are used for research vessels and programmed education and are not available for public day-use. Increasing docking space for small vessels is a strategy for increasing access to the Reserve (See chapter 9, Infrastructure Plan).

10.3 Communication

In order for stakeholders to better utilize and appreciate the Reserve, it is important that policies and regulations be communicated via several different mechanisms. When the public is better informed, they are more likely to responsibly use the Reserve and as a result reduce potential conflict. Some of these mechanisms include newsletters (paper and electronic), email alerts, signs and posters and the internet. In certain locations, signs, posters or buoys are present to warn the public of the sensitive nature of these habitats. In other cases, not disclosing the presence or location of rare or threatened species is the best strategy for protection.

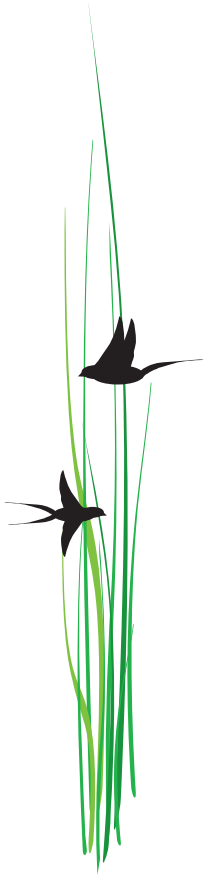
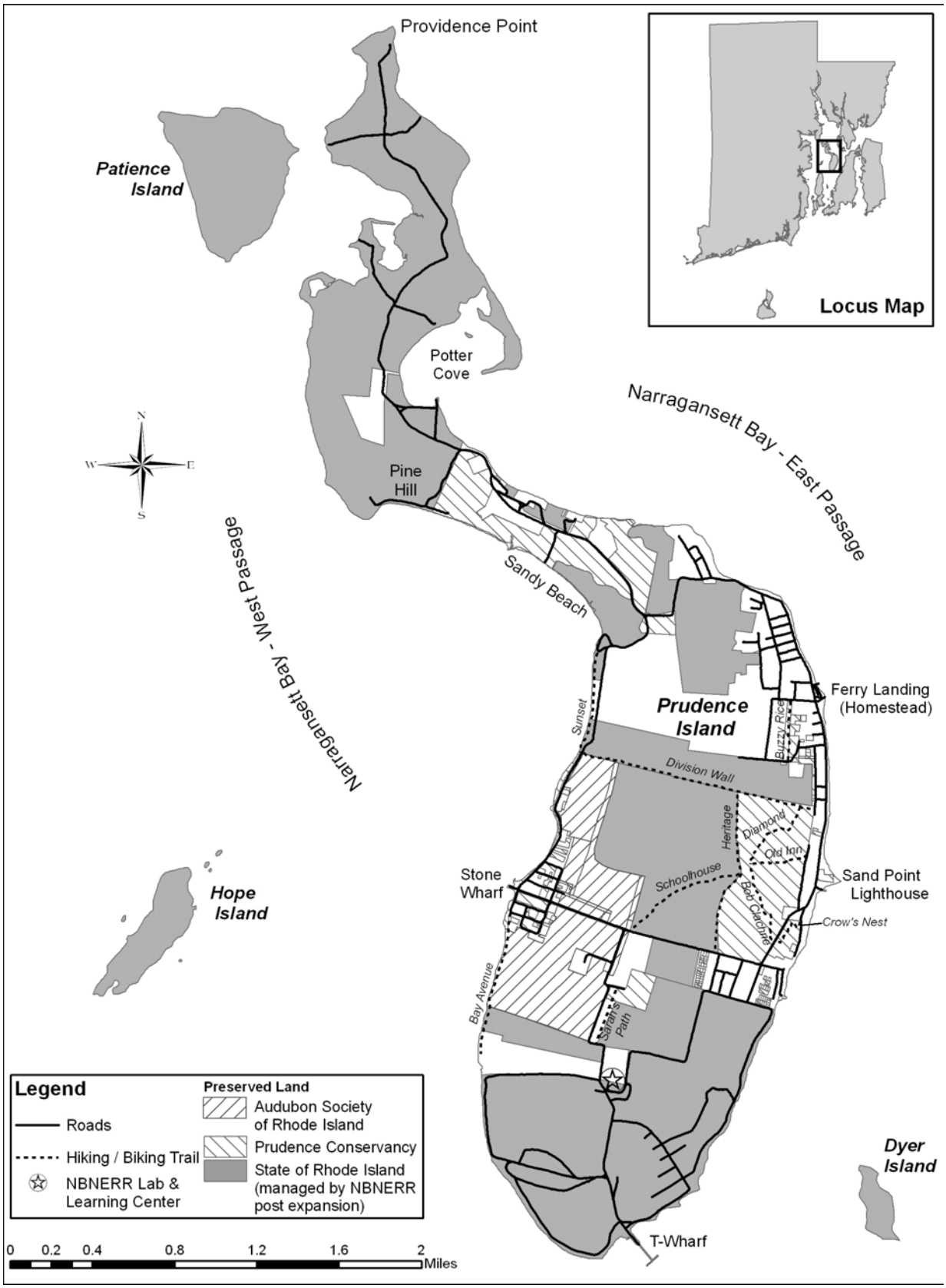


Figure 10.1 – Trail and Road Access to Reserve Properties on Prudence Island. No trails or roads are present on Patience, Hope, and Dyer Islands



10.4 Objective, Strategies and Tasks for Public Access

10.4.1 Public Access Objective

Public Access to the Reserve will be guided by the single objective shown below. A brief rationale for this objective is also provided.

Objective P1: Provide and enhance opportunities for public access while protecting the ecological health of Reserve habitats.

This objective acknowledges that all strategies and tasks developed for public access must consider the competing needs of resource protection along with the goal of increasing the public's appreciation of estuarine ecosystems and their willingness to make informed decisions.

Participants in the 2008 Sustainable Fishing Contest.

10.4.2 Strategies and Tasks for Public Access

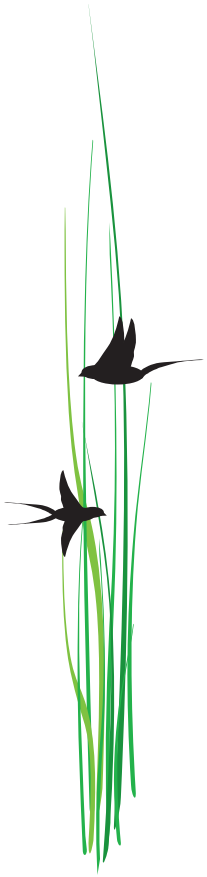
Specific strategies and tasks developed to meet this objective are listed below. Strategies are shown in bold type, while tasks are identified with bullets. The tasks listed represent actions that may be employed to accomplish a given strategy.

P1.1: Protect the ecological resources of the Reserve from prohibited activities and human-induced damage.

- Post signs where appropriate, listing prohibited activities.
- Enforce the use of permits for organized activities.
- Maintain fencing and gates to prohibit unauthorized use of vehicles or other access to certain areas of the Reserve where appropriate.
- Work with local law enforcement to enforce State, local, and Reserve regulations.

P1.2 Provide enhanced opportunities for passive recreation within a variety of Reserve habitats.

- Work with partners to maintain and expand the existing trail system throughout the Reserve.
- Provide amenities such as benches, platforms or boardwalks at selected locations along trails and throughout the Reserve.
- Continue to make available self-guided tour booklets, trail guides and maps.
- Continue to provide fishing opportunities by allowing access to the T-wharf.
- Continue to periodically open the North End of Prudence Island to vehicular traffic for special events.



Using “Bay Bucks” to educate participants in the Narragansett Bay Block Party who wish to get an ice cream.

P1.3: Inform the public and Reserve partners of the Reserve’s Public Access guidelines.

- Create a Public Access Guidelines document that may include changes to hours of operation, gate closures, permits, restricted or permitted activities, etc.
- Distribute the Public Access Guidelines through a variety of media including the Reserve website, printed copies at Reserve Headquarters, etc.
- Provide information regarding temporary or permanent changes to public access via a variety of media including e-mail alerts, the Reserve website, island kiosks, etc.
- Provide stakeholders with information concerning public transportation to Prudence Island.

P1.4: Enhance and maintain existing access to the Reserve for small and medium-sized vessels.

- Construct and maintain additional floating docks at the T-wharf for small-sized (less than 25 feet in length) day-use boats.
- Renovate the T-wharf to provide day-use dockage for medium-sized research, education or other permitted vessels.
- Provide multiple mooring opportunities for small to medium-sized vessels at the T-wharf and Potter's Cove.

11.0 BOUNDARY EXPANSION AND LAND ACQUISITION PLAN

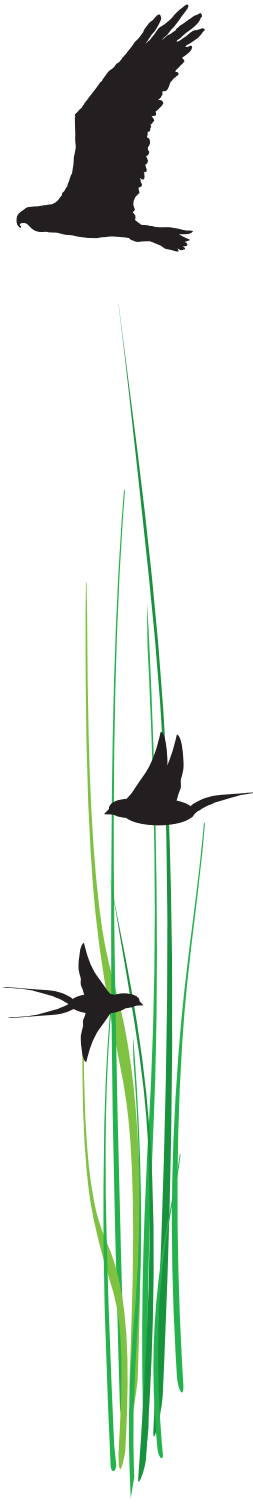
The Reserve boundary and land acquisition plan provides guidelines for the acquisition of lands or property rights for the long-term protection of ecologically valuable estuarine habitats suitable for research and education.

11.1 Reserve System Guidelines

National Estuarine Research Reserves may include existing Federal or State lands already in protected status where mutual benefit can be enhanced. Criteria used in assessing any proposed acquisition will include: (1) all Federal regulations and NERR guidelines then in effect and (2) Narragansett Bay NERR land acquisition criteria, including community support. Agreement for the Narragansett Bay Reserve to act as a steward of any given parcel of land may vary according to the particular ecological values of the land (i.e., “key” or “buffer”) and the interests of the particular landowner.

Individual sites should be either relatively undisturbed from the natural state or suitable for restoration and provide protection for sensitive or critical habitats. They should also be able to support long-term research, education, and interpretation. NERR System Federal regulations (15 CFR Part 921.11(c)(3)) state that: “Reserve boundaries must encompass the area within which adequate control has or will be established by the managing entity over human activities occurring within the Reserve. Generally, Reserve boundaries will encompass two areas: key land and water areas (or ‘core area’) and a buffer zone. Key land and water areas and buffer zone will likely require significantly different levels of control (see Sec. 921.13(a)(7))”.

The term ‘key land and water areas’ refers to that core area within the Reserve that is so vital to the functioning of the estuarine ecosystem that it must be under a level of control sufficient to ensure the long-term viability of the Reserve for research on natural processes. Key land and water areas, which comprise the core area, are those ecological units of a natural estuarine system which preserve, for research purposes, a full range of significant physical, chemical, and biological factors contributing to the diversity of fauna, flora and natural processes occurring within the estuary. The determination of which land and water areas are ‘key’ to a particular Reserve must be based on specific scientific knowledge of the area. A basic principle to follow when deciding upon key land and water areas is that they should encompass resources representative of the total ecosystem, and which if compromised could endanger the research objectives of the Reserve. The term ‘buffer zone’ refers to an area adjacent to or surrounding key land and water areas and essential to their integrity. Buffer zones protect the core area and provide additional protection for estuarine-dependent species, including those that are rare or endangered.



Monitoring invasive Asian shore crabs.

11.2 Reserve Boundary and Acquisition Plan

All Narragansett Bay Reserve initiatives pertaining to land acquisition or extended scope of stewardship will be undertaken in cooperation with the local community, and will follow all notice-related procedural requirements of Federal and State law.

11.2.1 Stewardship Focus Areas

While the Reserve acquisition plan follows Federal guidelines, the geographic scope of this plan represents a departure from the previous management plan in that it takes a more focused approach toward the protection of lands located on islands within Narragansett Bay. The Narragansett Bay Reserve is only one of two Reserves within the national system located solely on islands embedded within a larger estuarine system. These islands, while influenced by environmental conditions in the larger Narragansett Bay estuary, represent unique and discrete ecological units buffered by their distance from the mainland. The State also fully owns most parcels within the Reserve, ensuring adequate control and protection (Fig 11.1). The single unit not owned by the state is the 291 acre Heritage unit on Prudence Island which is owned by the Prudence Conservancy (Fig 11.2). The State however does hold a conservation easement on this property. As a result, all Reserve properties with the exception of the very small acreage of the headquarters campus and existing roadways are considered core areas.

11.2.2 Local Partners

The Reserve works with the State of RIDEM Division of Planning and Development and the Coastal Resources Management Council (CRMC) to identify, secure funding and procure properties for inclusion into the Reserve. The Reserve also works with these organizations to acquire other coastal properties suitable for the Federal Coastal and Estuarine Land Conservation Program (CELCP).

Other very important partners include the island's local land trust, the Prudence Conservancy, and The Nature Conservancy (TNC). The Prudence Conservancy continues to be an active partner and was instrumental in securing funding for the recent acquisition of the Ballard property on Prudence Island. The Prudence Conservancy also holds a conservation easement on this property. TNC was also instrumental in acquiring Patience Island.

11.2.3 Current Boundaries

At the time of the previously approved management plan, Reserve properties were located on Prudence, Patience and Hope islands, all of which are approximately located within the middle of Narragansett Bay. While most properties are wholly owned by the State, each island varies in the extent of ownership (Fig 11.1). For example, Hope Island is wholly owned by the State and represents the highest possible level of protection. More than 99% of Patience Island is also owned by the State. The remaining land is divided among three small separately owned parcels. None have full-time residences.

Finally, the Reserve manages approximately 57% of Prudence Island through direct ownership or conservation easements on seven separate parcels. Brief descriptions of the ecological habitats included in each property unit are described in Section 1.5.3 of this Plan. An additional 18% of the land is protected by other groups such as the Audubon Society of Rhode Island and the Prudence Conservancy through direct ownership or conservation easements.

11.2.4 Proposed Boundary Expansion Properties

With the acceptance of this Management Plan the Reserve's core boundary will expand to include two new property units; all of Dyer Island, and the Ballard Unit on Prudence Island. Both properties are fully owned by the State and will ensure the highest level of protection. Both include exceptional and unique habitats suitable for long-term research or education.

- Dyer Island is a 28 acre uninhabited island located to the east southeast of Prudence Island along the east passage of the Bay (Fig 11.2). It was purchased in 2002 with the support of NOAA funding. Reserve jurisdiction also includes an additional 185 acres of submerged lands surrounding the island. Terrestrial habitats include coastal brush land, a salt marsh complex and cobble beaches. Submerged habitats include both hard and soft bottom substrates. This island serves as a major rookery for numerous shorebird species which have been monitored by State wildlife biologists since 1985. A 1992 study identified Dyer Island as a critical habitat for nesting birds and recommended the island for protection. The report also ranked Dyer Island as second only to Rose Island for diversity of macroalgae. A rare unditched salt marsh complex also provides unique research opportunities. Because of its logistical isolation, research and passive recreation are the most likely uses of the island.

- The 128 acre Ballard property is located at the northern boundary of three preserved parcels owned or managed by the State, the Conservancy and the Audubon Society of Rhode Island (Fig 11.2). This acquisition will permanently preserve a number of unique coastal habitats and move toward the creation of a permanent north-south greenway for the island. This property is predominantly forested with limited (< 20%) mixed early successional shrubland and grassland communities. A pine barrens mosaic, which is a dominant ridgeline feature of the island's landscape with a rich cultural history (locally referred to as the "desert"), extends into this parcel. A portion of the Mill Creek watershed, including the creek and its associated wetlands, is also located on this property. The Conservancy holds a conservation easement on this property and will extend and maintain a network of trails in this portion of the island. This acquisition, because of its unique habitats and easily accessible location, will provide exceptional opportunities for research, education and recreation.

Measuring an invasive Asian shore crab.

Figure 11.1 - **Map of Existing and Expanded Reserve Land and WaterHoldings.**

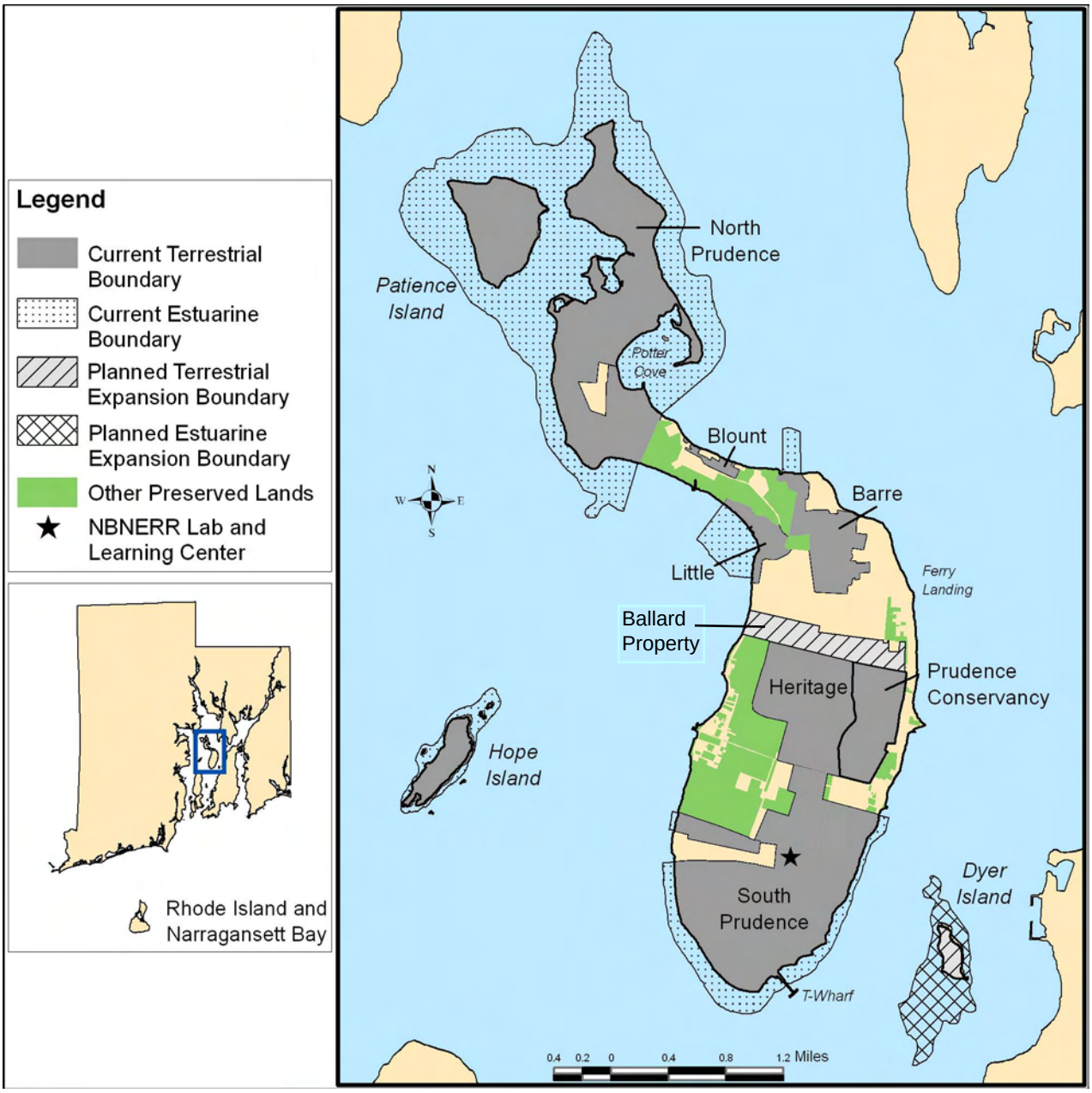
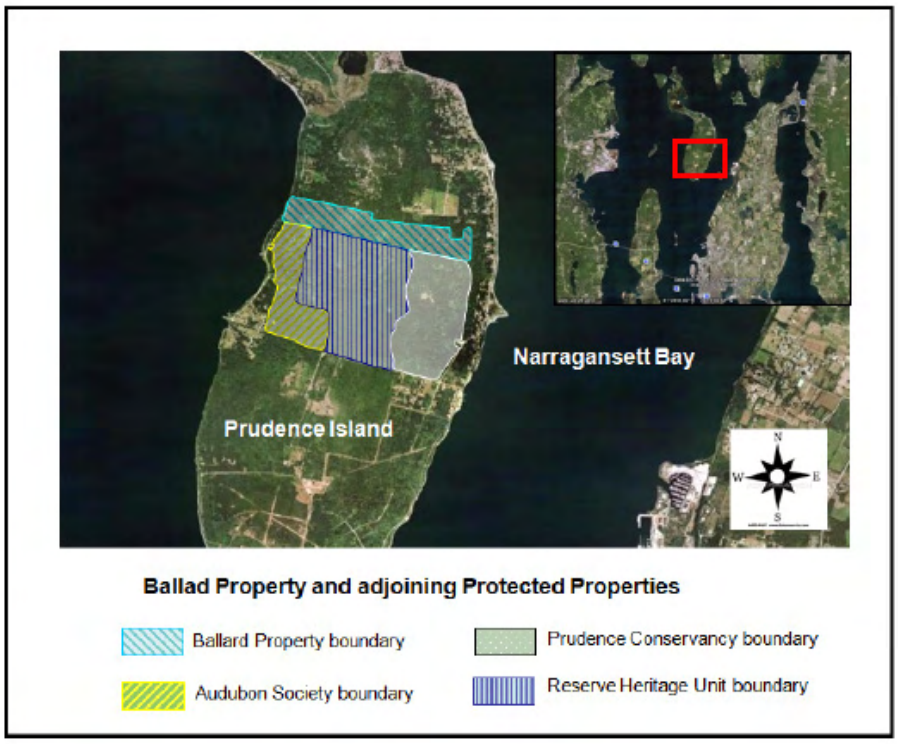
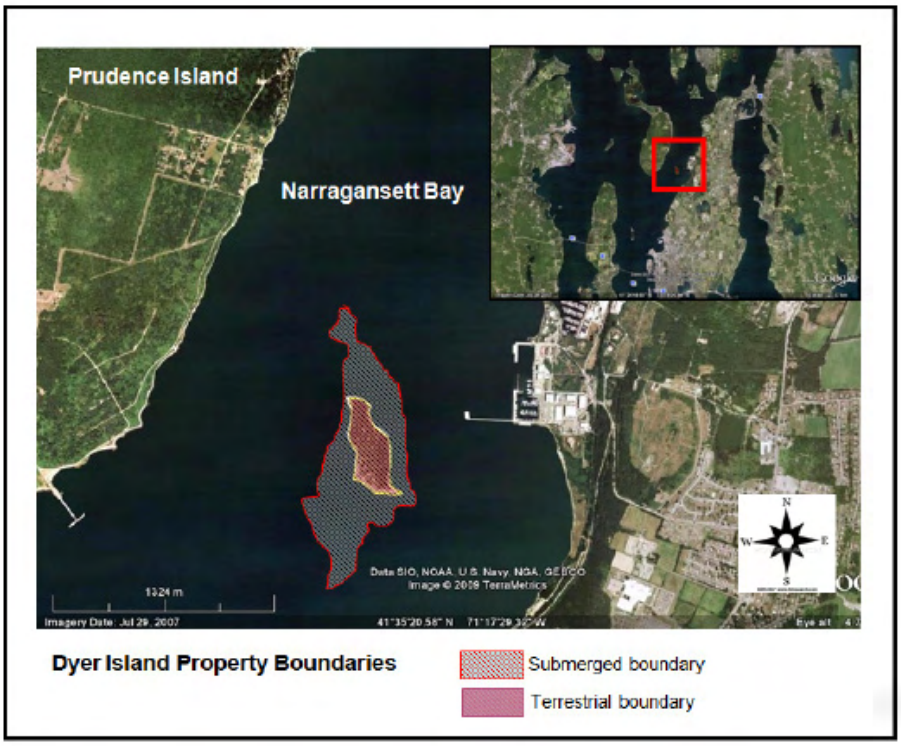


Figure 11.2 - **Maps of Boundary Expansion Properties for the Reserve.** a) Ballard Property on Prudence Island, and b) Dyer Island

a)



b)



Professional development workshop for teachers on National Estuaries Day, 2007.

11.2.5 Selection Criteria (priority areas)

A number of factors enter into the decision for Reserve land acquisition. However the relative weight of each factor may vary depending on the unique character or situation of each land parcel. These factors are shown below.

Habitat quality

- Contains key land and water areas
- Excellent example of estuarine habitat typical of Virginian bioregion
- Degree of reversion or restoration needed/possible
- Shape: edge effect
- Community composition, structure, dynamics, interactions

Consistency with Reserve Objectives

- Estuarine habitat of a type inadequately represented within the Reserve, provides buffer against existing or probable future impacts for portions of ecosystem which are already under Reserve stewardship, or which are reasonably anticipated acquisitions

- Fulfills research and monitoring, education and interpretation, stewardship, facilities purposes or other management needs identified in the Reserve Management Plan

Cost

- Cost of acquisition including long-term savings on overall Reserve costs (e.g., increased efficiency, improved security)

Degree of Threat

- Imminence of development

- Presence of State or Federally listed threatened and endangered species protected or protectable by other programs

Defensibility

- Area adequate for continued functioning of ecological unit (as is, or will be, with reasonably anticipated adjacent acquisitions)

- Adequately buffered from adjacent existing and/or anticipated future land uses (as is, or will be, with reasonably anticipated additional acquisitions)

- Reasonably accessible for monitoring

- Reasonable opportunity for management of public access

- Low probability of succumbing to ecological pressures: encompasses full range of significant physical, chemical, and biological factors necessary for long-term viability (e.g., acceptable population levels, exotic species minimal or absent)

- Expense of long-term monitoring and stewardship

11.2.6 Acquisition and Boundary Expansion Objective

The Reserve's acquisition and boundary expansion plan is guided by the single objective shown below.

Objective B1: Acquire property or property rights on select Narragansett Bay islands to expand Reserve boundaries for the long-term preservation of estuarine and coastal habitats.

This objective focuses Reserve efforts to protect to the greatest possible extent the fragile and unique estuarine and coastal habitats found on islands within Narragansett Bay.

11.2.7 Strategies and Tasks for Acquisition and Boundary Expansion

The Reserve may expand its boundaries through a number of different strategies, each of which may be appropriate given the unique situation of each parcel. A number of Federal, State, and private nonprofit organizations have or may acquire land ownership or stewardship rights over key habitats or buffers appropriate to the Narragansett Bay NERR mission. In these instances, the Reserve may seek cooperative agreements or Memoranda of Understandings that allow the Reserve to assume stewardship of property owned or acquired by another organization, or the ability to co-manage lands.

B1.1: Outright purchase of selected properties.

- Work with Federal, State, and local partners to identify funding to purchase selected properties

B1.2: Outright purchase or donation, with life estate to seller.

B1.3: Outright purchase, partial donation for income, or inheritance tax benefits.

B1.4: Donation or bequest of full title.

B1.5: Grant of limited rights (e.g., development, timber).

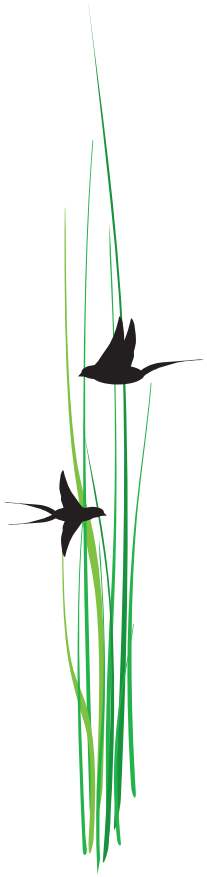
B1.6: Grant of first right of refusal.

B1.7: Grant of conservation easement, retained right of residence.

B1.8: Lease with option to purchase.

B1.9: Land trade with or purchase from third party.

B1.10: Memorandum of Understanding, authorizing use by researchers without transfer of title.



11.2.8 Potential Future Acquisitions

Future acquisitions are not prioritized but all rank highly based on the criteria listed above. The opportunity to acquire these parcels is driven by owner willingness and circumstances and the availability and mechanism of funding.

- **Little Unit, Phase II - 50 acres**

The acquisition involves 50 acres of the eastern portion of property owned by the family of Barbara Little and adjoins the western 39 acres of the property which was purchased and incorporated into the Reserve in 1991. This proposed acquisition would help to protect the fragile salt marsh system on the west side of Prudence Island. It also abuts the watershed for the Prudence Island water supply, which is drawn primarily from the Indian Spring well on the Barre unit of the Reserve. The Reserve will work with the Prudence Conservancy to help the Reserve purchase this property or obtain a conservation easement if purchased by the Conservancy.

- **Bacon Shorefront - 30 acres**

This land, comprising 30 acres owned by the Bacon Family Trust, links the Ballard property to the Little unit and is a key acquisition in the Reserve greenway running the length of Prudence Island. This property has an undisturbed metamorphic rocky shoreline distinct from the sedimentary rock outcrops along the western shore of south Prudence. Several endangered species of insects inhabit the sand barrens area, locally called the “desert.”

- **Dutch Island - 81 acres**

This island is located in the southern West Passage of Narragansett Bay, in Jamestown, Newport County, Rhode Island, and provides access to a wider range of marine-related species due to its position closer to the mouth of the Bay compared to other Reserve land holdings. The majority of the property is currently owned and operated by the State as the Dutch Island Management Area. The U.S. Coast Guard (USCG) owns 0.25 acres of the property. Abandoned U.S. Department of Defense (DOD) structures remain on the property including a transformer house, former barracks, and a hospital. These structures currently provide too great a risk for open public access to the island at this time. However, given funding for site remediation, inclusion of this site into the Reserve could provide additional opportunities for public access to coastal and estuarine habitats due to its close proximity to Jamestown. In addition, because Dutch island is located closer to the mouth of the Bay, a broader range of marine-related habitats occur there.

APPENDIX A

Memorandum of Agreement
Between the
National Oceanic and Atmospheric Administration
And the
Rhode Island Department of Environmental Management
Detailing the state-federal roles in the
Management of the Narragansett Bay NERR

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Memorandum of Agreement
Between the
National Oceanic and Atmospheric Administration
And the
Rhode Island Department of Environmental Management
Detailing the state-federal roles in the
Management of the Narragansett Bay NERR

This Memorandum of Agreement states the provisions for the cooperative management of the Narragansett Bay National Estuarine Research Reserve ("NERR") in the state of Rhode Island, between the the Rhode Island Department of Environmental Management and the National Oceanic and Atmospheric Administration's ("NOAA") Office of Ocean and Coastal Resource Management.

WHEREAS, this Memorandum of Agreement supercedes the previous "Memorandum of Understanding" Between NOAA and the Rhode Island Department of Environmental Management regarding the Narragansett Bay NERR made on August 16, 1996.

WHEREAS, the state of Rhode Island has determined that the waters and related coastal habitats of the Narragansett Bay NERR provide unique opportunities for study of natural and human processes occurring within the estuarine ecosystems of the state to contribute to the science of estuarine ecosystem processes, enhance environmental education opportunities, and provide scientific information for effective coastal zone management in state of Rhode Island; and

WHEREAS, the state of Rhode Island has determined that the resources of the Narragansett Bay NERR and the values they represent to the citizens of Rhode Island and the United States will benefit from the management of these resources as part of the NERR-System; and

WHEREAS, NOAA has concurred with that finding and pursuant to its authority under section 315 of the Coastal Zone Management Act of 1972, as amended (CZMA, 16 U.S.C. 1461) and in accordance with implementing regulations at 15 CFR 921.30 has designated the Narragansett Bay NERR; and

WHEREAS, the Rhode Island Department of Environmental Management, as the agency designated by the Governor of Rhode Island is responsible for managing the Narragansett Bay and acknowledges the value of state-federal cooperation for the long-term management of the reserve in a manner consistent with the purpose of their designation; and

WHEREAS, the management plan describes the goals, objectives, strategies/actions, administrative structure, and institutional arrangements for the reserve, including this MOA and others;

NOW THEREFORE, in consideration of the mutual agreements herein, NOAA and the Rhode Island Department of Environmental Management agree to the following:

ARTICLE I: TERRITORIAL-FEDERAL ROLES IN RESERVE MANAGEMENT

A. Rhode Island Department of Environmental Management Role in Reserve Management

The Rhode Island Department of Environmental Management shall:

1. be responsible for compliance with all federal laws and regulations, and ensure that the Narragansett Bay NERR management plan is consistent with the provisions of the CZMA and implementing regulations;

2. ensure protection of the natural and cultural resources of the reserve, and ensure enforcement of the provisions of state law, including rules and regulations of the Rhode Island Coastal Resources Management Council;

3. ensure adequate, long-term protection and management of lands included within the reserve boundary;

4. annually apply for, budget, and allocate funds received for reserve operations, research and monitoring, education and stewardship; and as necessary, land acquisition and reserve facility construction;

5. conduct and coordinate research and monitoring programs that encourage scientists from a variety of institutions to work together to understand the ecology of the reserve ecosystem to improve coastal management;

6. conduct and maintain programs that disseminate research results via materials, activities, workshops, and conferences to resource users, state and local agencies, school systems, general public, and other interested parties;

7. provide staff, and endeavor to secure state funding for the manager, education coordinator and research coordinator;

8. secure facilities and equipment required to implement the provisions within the reserve management plan;

9. ensure adequate funding for facilities operation and maintenance;

10. maintain effective liaison with local, regional, state, and federal policy makers, regulators and the general public;

11. serve as principal contact for issues involving proposed boundary changes and/or amendments to the reserve management plan;

12. respond to NOAA's requests for information, particularly cooperative agreement and grant progress reports and evaluation findings, including necessary actions and recommendations, made pursuant to Section 312 of the CZMA; and

13. expend funds in accordance with federal and state laws, the reserve management plan, and annual funding guidance from NOAA.

B. Federal Role in Reserve Management

NOAA's Office of Ocean and Coastal Resource Management shall:

1. administer the provisions of the Sections 315 and 312 of the CZMA to ensure that the reserve operates in accordance with goals of the reserve system and the Narragansett Bay NERR reserve management plan;

2. review and process applications for financial assistance from the Rhode Island Department of Environmental Management consistent with 15 CFR 921, for management and operation, and as appropriate, land acquisition and facility construction;

3. advise Rhode Island Department of Environmental Management of existing and emerging national and regional issues that have bearing on the reserve and reserve system;

4. maintain an information exchange network among reserves, including available research and monitoring data and educational materials developed within the reserve system;

5. to the extent possible, facilitate NOAA resources and capabilities in support of reserve goals and programs.

C. General Provisions

1. Nothing in this agreement or subsequent financial assistance awards shall obligate either party in the expenditure of funds, or for future payments of money, in excess of appropriations authorized by law.

2. Upon termination of this agreement or any subsequent financial assistance awards to Rhode Island Department of Environmental Management any equipment purchased for studies to further this agreement will be disposed of in accordance with 15 CFR 24.32.

3. A free exchange of research and assessment data between the parties is encouraged and is necessary to ensure success of cooperative studies.

D. Other Provisions

1. Nothing in this agreement diminishes the independent authority or coordination responsibility of either party in administering its respective statutory obligations. Nothing in this agreement is intended to conflict with current written directives or policies of either party. If the terms of this agreement are inconsistent with existing written directives or policies of either party entering this agreement, then those portions

of the agreement which are determined to be inconsistent with such written directives and policies shall be invalid; but the remaining terms not affected by the inconsistency shall remain in full force and effect. At the first opportunity for revision of this agreement, all necessary changes shall be made by either an amendment to this agreement or by entering in a new superseding agreement, whichever is deemed expedient to the interested parties. Should disagreement arise on the interpretation of the provisions and/or amendments of this agreement that cannot be resolved by negotiations at the operating level of each party, the area(s) of disagreement shall be stated in writing by each party and promptly presented to a mutually approved mediator for non-binding mediation. If the parties cannot agree on the choice of a mediator or if the mediation does not resolve the dispute to the mutual approval of the parties, the parties are free to pursue any other legal remedies that are available.

ARTICLE II: REAL PROPERTY ACQUIRED FOR PURPOSE OF THE RESERVE

As well as acknowledging the rest of the requirements set forth at 15 CFR 921, the Rhode Island Department of Environmental Management specifically acknowledges and will fully comply with conditions set forth at 15 CFR 921.21 (e), which specify the legal documentation requirements concerning the use and disposition of real property acquired for reserve purposes with federal funds under Section 315 of the CZMA.

ARTICLE III: PROGRAM EVALUATION

The Office of Ocean and Coastal Resource Management Division of NOAA will schedule periodic evaluations of Rhode Island Department of Environmental Management performance in meeting the terms of this agreement, financial assistance awards, and the reserve management plan. Where findings of deficiency occur, NOAA may initiate action in accordance with the designation withdrawal or interim sanctions procedures established by the CZMA and applicable regulations at 15 CFR 921.40-41.

ARTICLE IV: EFFECTIVE DATE, REVIEW, AMENDMENT AND TERMINATION

A. This agreement is effective on the date of the last signature on this agreement and shall be in effect until terminated by either party.

B. This agreement will be reviewed periodically by both parties and may only be amended by the mutual written consent of both parties.

C. This agreement may be terminated by mutual consent of both parties, or by NOAA if NOAA withdraws designation of the reserve within the reserve system, pursuant to applicable provisions of the CZMA and its implementing regulations as described under 15 CFR 923 Subpart L, or if NOAA finds that Rhode Island Department of Environmental Management fails to comply with this MOA. The agreement may be terminated by Rhode Island Department of Environmental Management with or without cause. Should this agreement be terminated, reimbursement of unexpended funds from financial assistance awards shall be determined on a pro rata basis according to the amount of work done by the parties at the

time of termination. Additionally, reimbursement for land purchased and facilities constructed with NOAA funds shall be consistent with terms and special award conditions of financial assistance awards.

D. If any clause, sentence or other portion of this MOA shall become illegal, null or void for any reason, the remaining portions of this MOA shall remain in full force and effect.

E. No waiver of right by either party of any provision of this MOA shall be binding unless expressly confirmed in writing by the party allowing the waiver thereof.

IN WITNESS THEREOF, the parties have caused this agreement to be executed.

Donna Wieting, Acting Director
Office of Ocean and Coastal
Resource Management
National Oceanic and
Atmospheric Administration
U.S. Department of Commerce

Dated: 9-7-10

W. Michael Sullivan PhD., Director
Rhode Island Department of Environmental
Management

Dated: 7.11.10

Witness: _____

JOELLE GORE
(Print Name)

Witness: _____

RAYNA SANTORO
(Print Name)

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APPENDIX B

2005-2010 National Estuarine Research Reserve System
Strategic Plan

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strategic PLAN | 2005 - 2010

National Estuarine Research Reserve System

research stewardship education

The National Estuarine Research Reserve System is administered by NOAA's National Ocean Service, Office of Ocean and Coastal Resource Management, Estuarine Reserves Division. For more information, visit us online at **www.nerrs.noaa.gov** or contact us at: 1305 East West Highway N/ORM5, Silver Spring, Maryland 20910. Phone number: 301-713-3155

Project Manager: George Cathcart

Writer: Cory Riley

Layout Design: Matt McIntosh

vision | Healthy estuaries and coastal watersheds where coastal communities and ecosystems thrive.

mission

To practice and promote coastal and estuarine stewardship through innovative research and education, using a system of protected areas.

goals

1. Strengthen the protection and management of representative estuarine ecosystems to advance estuarine conservation, research and education.

2. Increase the use of reserve science and sites to address priority coastal management issues.

3. Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Introduction

For thousands of years, coastal and estuarine environments have provided people with food, safe harbors, transportation access, flood control, and a place to play and relax. The pressures on the nation's coast are enormous and the impacts on economies and ecosystems are becoming increasingly evident. Severe storms, climate change, pollution, habitat alteration and rapid population growth threaten the ecological functions that have supported coastal communities throughout history. As a network of 27 protected areas established for long-term research, education and stewardship, the National Estuarine Research Reserve System (NERRS) has a unique role to play in keeping coastal ecosystems healthy and productive.

The reserve system is a partnership program between the National Oceanic and Atmospheric Administration and coastal states that has protected more than one million acres of coastal and estuarine habitat since the program was established by the Coastal Zone Management Act in 1972. NOAA provides funding, national guidance and technical assistance. Each reserve is managed on a daily basis by a lead state agency, non-profit organization or university with input from local partners. Through careful stewardship, innovative science and education, and relevant training programs, the reserves encourage careful management and protection of local estuarine and coastal resources.

The Coastal Zone Management Act created the reserve system to protect estuarine areas, provide educational opportunities, promote and conduct estuarine research and monitoring, and transfer relevant information to coastal managers. For the next five years, core reserve programs will focus on four priority topics: impacts of land use and population growth, habitat loss and alteration, water quality degradation, and changes in biological communities. The National Estuarine Research Reserve System's 2005-2010 Strategic Plan articulates how the strengths of the reserve system will be applied to address the major challenges of coastal management.

A Local Approach to National Priorities

Land use and population growth, water quality degradation, habitat loss and alteration, and changes in biological communities are not the only topics that reserves work on, but these four have risen to the top as deserving of adequate and strategic investment for the national system. These four topics are high priority science and training needs for coastal managers.[3] Reserve scientists, educators and land managers have identified these topics as locally and nationally important and appro-

priate to the mission of the National Estuarine Research Reserve System. Increased understanding about these topics will improve the reserve system's ability to protect and restore coastal watersheds and estuaries and empower individuals to make informed decisions. The nation's coasts and estuaries need to be managed, understood and appreciated at multiple scales. Through a network of locally oriented programs around the country, the reserve system provides insight into common information and management needs as well as data for use by local, regional and federal scientists and decision makers. Working at both the site level and as a national system, reserves have a greater impact than could be achieved through community efforts alone.

The goals, objectives and strategies outlined in this strategic plan will guide and support the National Estuarine Research Reserve System in its nation-wide efforts to improve coastal management, advance estuarine research, and educate current and future generations of coastal stewards.

Stewardship: *The responsible management of coastal resources using the best available information for the purpose of maintaining and restoring healthy, productive and resilient ecosystems.*

Priority Coastal Management Issues

1. Land Use and Population Growth

The United States' exploding coastal population results in competing demands for clean water, beaches, recreational and commercial space, infrastructure and housing. In 2003, an estimated 153 million people lived in coastal counties, which is approximately 53% of the total US population. Pressure to develop land in coastal areas is escalating at more than twice the rate of population growth. Land use changes can significantly impact coastal and estuarine species and habitat. The Pew Ocean Commission reports that when more than 10% of a watershed is covered in impervious surface such as roads, roofs and parking lots, aquatic resources begin to degrade.[1]

Coastal population and land use demands are not only increasing, they also are changing. Demographic and socio-economic trends show that the backgrounds and interests of people who are moving to the coast may be different from those of traditional fishing, commerce, or beach communities. The way people value and understand their relationship to the coast is reflected in the personal, political and professional choices they make. To make wise coastal resource management decisions, we need to understand the relationships among estuarine ecosystems and changing landscapes and attitudes. National Estuarine Research Reserves encourage the development and use of science based knowledge and tools in local land use planning, community development, and stewardship of public and private property.

2. Habitat Loss and Alteration

More than half of the nation's coastal wetlands have vanished since European settlement.[2] Estuarine and coastal environments continue to be altered and eliminated due to dredging, dams, recreational and commercial uses, flood and hazard mitigation, residential and infrastructure development, commercial port activities, and agriculture. Many of these activities disturb the physical, biological and chemical attributes of the estuary and therefore degrade

the plants and animals that depend on the habitat to survive. Seagrass beds, marshes, shellfish, bird and fish populations can be affected by sedimentation, erosion, and hydrological, chemical or physical alteration of the habitat. Estuarine ecosystems also are vulnerable to coastal storms and sensitive to changes in climate and sea level. Coastal managers want to know more about how their choices influence coastal habitat and the species that live there. Better information will ensure that alternatives are considered for permitting, as well as planning and implementing successful restoration and mitigation efforts.[3]

Reserve research and monitoring programs increase the fundamental understanding of estuarine dynamics and add new information about the causes and consequences of changes in habitat quantity and quality. Research and stewardship programs at the NERRs also develop, implement and evaluate new techniques to restore and protect estuarine resources. Training programs and advisory services make this information available to professionals. Through education programs conducted at the reserves, students and citizens learn why these habitats are important and what they can do to keep them healthy.

3. Water Quality Degradation

Improving the condition of coastal water quality is a goal of the Coastal Zone Management Act and an ongoing struggle for all coastal regulatory agencies. Despite continuing local, state and federal investments, more than 20,000 beach closures were enforced in 2004[4] and more than 60% of estuarine waters were classified by the EPA as having degraded water in 2005.[5] Excess nutrients and chemical and biological contamination can cause human health problems and threaten aquatic life.

The Reserve System has been collecting water quality data for ten years to quantify short term variability and long term changes in estuarine waters. Through monitoring and studying changes in water quality, the reserves investigate how human activity, weather patterns, and estuarine characteristics contribute to changes in water quality that affect ecological processes and, consequently, human health. Reserves apply the knowledge generated through research and monitoring to improve water quality through habitat protection, restoration, and training and outreach programs.

4. Changes in Biological Communities

Biological communities are changing as a result of invasive species, over-harvest, climate changes, pollution, and habitat destruction. Invasive species out-compete or consume native organisms; habitat alteration and destruction displace some species and create opportunities for others; and changes in parameters such as temperature and salinity can shift the distribution of plants and animals. Chemical contamination and nutrient enrichment damage habitat and can alter the structure of floral and faunal communities. Over-harvesting biological resources also can change community structure and threaten valuable species. These problems impact natural interactions and linkages and lead to cascading indirect effects throughout the ecosystems.

Reserve research, stewardship, education, and training programs focus on understanding how changes in biological communities affect the way estuaries function. To minimize the negative impact of these changes, reserves investigate and communicate how to balance public needs with the protection of increasingly susceptible natural resources.

Guiding Principles

- Strong partnerships between NOAA, state agencies and universities, and other local partners are critical to the success of the reserve system.
- The reserve system integrates science, education and stewardship on relevant topics to maximize the benefits to coastal management.
- Reserves serve as a catalyst and a focal point for demonstrating and facilitating objective problem solving and best management practices.
- Reserves engage local communities and citizens to improve stewardship of coastal areas.
- Reserves implement an ecosystem-based management approach.

Goal One:

Strengthen the protection and management of representative estuarine ecosystems to advance estuarine conservation, research and education.

Objectives:

1. Biogeographically and typologically representative estuarine ecosystems are protected through the designation of new reserves.

2. Biological, chemical, physical, and community conditions of reserves are characterized and monitored to describe reference conditions and to quantify change.

3. Reserve ecosystems are conserved through land acquisition, natural resource management and restoration.

Strategies:

- Identify and designate new reserves consistent with system-wide policy and available resources.

- Collect system-wide measurements of the short-term variability and long-term changes in the water quality, biotic communities and diversity, land-use and land cover characteristics of estuarine ecosystems to support effective coastal zone management.

- Collect baseline information about the biological, physical, chemical, and socio-economic parameters of reserve biological and human communities.

- Integrate NERRS monitoring, data management, education and training capabilities in regional ocean observing systems.

- Implement land acquisition plans to enhance the long term integrity and diversity of reserve habitats.

- Restore and actively manage reserves' natural resources to meet local habitat and human use goals.

- Work collaboratively with other programs to evaluate and apply advanced technologies and tools to support effective coastal management.

- Provide facilities and support to manage the natural resources within reserve boundaries.

Goal Two:

Increase the use of reserve science and sites to address priority coastal management issues.

Objectives:

1. Scientists conduct estuarine research at reserves that is relevant to coastal management needs.
2. Scientists have access to NERRS datasets, science products and results.
3. The scientific community uses data, tools and techniques generated at the NERRS.

Strategies:

- Understand coastal decision maker science and training needs through needs assessments, coastal management science needs surveys, etc.
- Work collaboratively with other programs to conduct research on priority management issues in the reserves.
- Offer Graduate Research Fellowships to master's and doctoral students to conduct science that is relevant to coastal management and to train students in estuarine science.
- Deliver monitoring and observation data to the scientific community.
- Disseminate reserve science through publications, outreach and technology transfer.
- Generate time-series data and empirical studies to describe the ecological condition of reserve habitats.
- Promote reserve science products through web sites, communication materials, and other avenues to meet the needs of diverse stakeholders.
- Increase visibility and reinforce the credibility of NERRS science through communication efforts about NERRS research and monitoring.
- Attract scientists and practitioners to use reserves as reference sites.
- Conduct and facilitate relevant research in reserve watersheds.
- Synthesize reserve data into information for use in decision making.
- Conduct and facilitate research into education effectiveness and behavior change.
- Ensure that reserves have facilities and research support to meet the needs of visiting scientists and staff.

Scientist: *A person who uses principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses.*

Goal Three:

Enhance people's ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objectives:

1. People are aware of the ecological, economic, historical, and cultural importance of estuarine resources.

2. People understand how human choices and natural disturbances impact social, economic, and estuarine ecological systems.

3. People apply science-based information when making decisions that could impact coastal and estuarine resources.

Strategies:

- Provide educational opportunities that increase students' understanding of estuarine science and technology.

- Implement and participate in public programs and events to raise awareness and understanding about estuaries and the NERRS.

- Produce and distribute educational materials and web-based products that raise public awareness about estuaries, the NERRS, and NERRS education products.

- Train teachers to educate students about coastal watersheds and estuaries.

- Deliver monitoring and observing data to diverse user groups in a useful format.

- Improve the willingness and ability of communities to restore and protect coastal ecosystems.

- Provide science-based information and training to individuals and organizations.

- Assist restoration practitioners in developing and applying effective restoration techniques.

- Implement volunteer programs to engage local citizens in advancing the goals of the reserves.

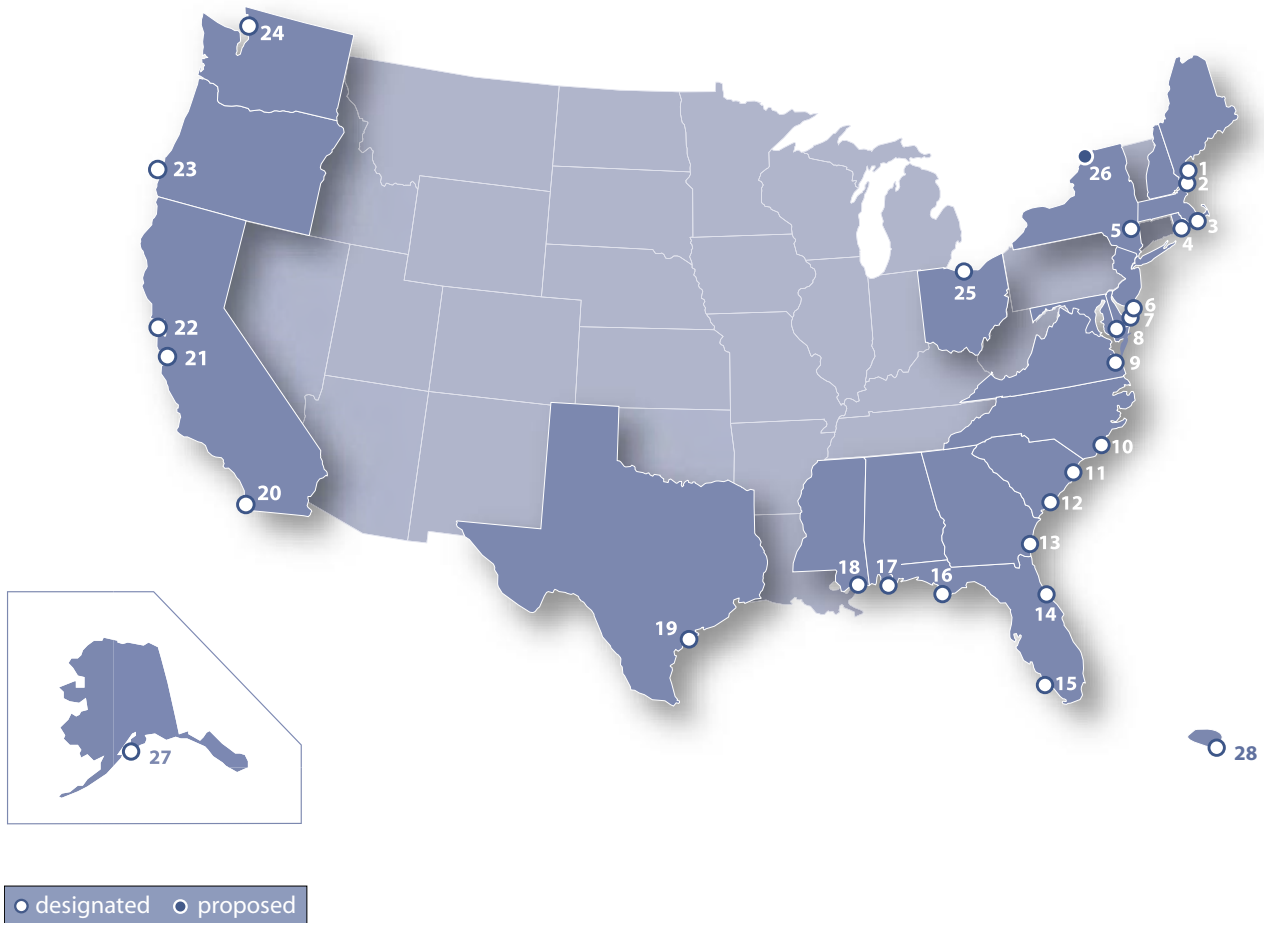
- Conduct programs to encourage people to make personal choices that reduce their impact on coastal resources.

- Evaluate programs to determine how people apply information and knowledge.

- Build and maintain educational facilities and interpretive displays.

Sources

1. Pew Ocean Commission Report
2. United States Commission on Ocean Policy Report
3. NERRS Coastal Training Program Trends Analysis Report, Improving Links Between Science and Coastal Management
4. National Resource Council website
5. EPA Coastal Conditions Report



1. Wells Reserve, Maine
2. Great Bay Reserve, New Hampshire
3. Waquoit Bay Reserve, Massachusetts
4. Narragansett Bay Reserve, Rhode Island
5. Hudson River Reserve, New York
6. Jacques Cousteau Reserve, New Jersey
7. Delaware Reserve
8. Chesapeake Bay Reserve, Maryland
9. Chesapeake Bay Reserve, Virginia
10. North Carolina Reserve
11. North Inlet-Winyah Bay Reserve, South Carolina
12. ACE Basin Reserve, South Carolina
13. Sapelo Island, Georgia
14. Guana Tolomato Matanzas Reserve, Florida
15. Rookery Bay Reserve, Florida
16. Apalachicola Reserve, Florida
17. Weeks Bay Reserve, Alabama
18. Grand Bay Reserve, Mississippi
19. Mission-Aransas, Texas
20. Tijuana River Reserve, California
21. Elkhorn Slough Reserve, California
22. San Francisco Bay, California
23. South Slough Reserve, Oregon
24. Padilla Bay Reserve, Washington
25. Old Woman Creek, Ohio
26. Proposed Reserve—St. Lawrence River
27. Kachemak Bay Reserve, Alaska
28. Jobos Bay Reserve, Puerto Rico

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APPENDIX C

Focus Group Meeting Participants
for Development of 2010-2015 NBNERR
Management Plan

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Table C1. Coastal Training Program Focus Group Participants

Participant	Organization	Role/Position
Bob Stankelis	Narragansett Bay NERR	Reserve Manager
Jen West	Narragansett Bay NERR	Coastal Training Program Coordinator
Kristin VanWagner	Narragansett Bay NERR	Education Coordinator
Jenny Astrella	RIDEM	Training Intern
Pam Rubinoff	RI Sea Grant	Coastal Management Extension Specialist
Rupert Friday	RI Land Trust Council	Director
Lisa Philo	URI NEMO	Communications Specialist
Gina DeMarco	Northern RI Conservation District	District Manager/Education Coordinator
Tim Scott	Roger Williams University	Director, Center for Economic and Environmental Development.
Derry Riding	RI Statewide Planning	Principle Planner
Rich Ribb	Narragansett Bay Estuary Program	Director
Sheila Brush	Grow Smart RI	Director of Programs
Margherita Pryor	US EPA Region 1	Regional Coordinator
Bruce DiGennaro	The Essex Partnership	Meeting Facilitator

Table C2. Education and Outreach Program Focus Group Participants

Participant	Organization	Role/Position
Russell Hirschler	Save the Bay	Director of Education
Kristen Swanberg	Audubon Society RI	Sr. Dir of Education Programs
Cheryl Tavares	Narragansett Bay NERR	Seasonal Naturalist, and teacher
Joe Baines	NA	Prudence IslandHistorian
Eric Pfirman	Save the Bay	Captain Aleta Morris
Joan Muller	Waquoit Bay NERR	EC Wacoit Bay Reserve
Jill Johnen	Office of Marine Programs at URI	
Gail Scowcroft	Office of Marine Programs at URI	Associate Director
Tom Ardito	Narragansett Bay Estuary Program	Outreach and Policy Coordinator
Susan Kennedy	Coastal Resources Center at URI	Communications Specialist
Jen McCann	Rhode Island Sea Grant	Coastal Management Extension Specialist
Bruce DiGennaro	The Essex Partnership	Meeting Facilitator

Table C3. Research and Monitoring Focus Group Participants

Participant	Organization	Role/Position
Kenny Raposa	Narragansett Bay NERR	Research Coordinator
Bob Stankelis	Narragansett Bay NERR	Manager
Christine Comeau	Narragansett Bay NERR	Marine Research Specialist
Tom Kutcher	Narragansett Bay NERR	Natural Resource Specialist
Jennifer West	Narragansett Bay NERR	Coastal Training Program Coordinator
Kristin Van Wagner	Narragansett Bay NERR	Education Coordinator
Mark Bertness	Brown University	Professor
Ames Colt	RI Sea Grant	Associate Director
Pete August	URI Coastal Institute	Director
Chris Deacutis	Narragansett Bay Estuary Program	Chief Scientist
Sue Kiernan	RIDEM/OWR	Chief
Richard McKinney	USEPA	Scientist
Scott Nixon	Graduate School of Oceanography, URI	Professor
Candace Oviatt	Graduate School of Oceanography, URI	Professor
Peter Paten	School Natural Resources URI	Professor
Kelly Presley	Eco Verus	
Don Pryor	Brown University	
Scott Rutherford	Roger Williams University	Professor
Chris Weidman	Waquoit Bay NERR	Research Coordinator
Bruce DiGennaro	The Essex Partnership	Meeting facilitator

Table C4. Stewardship and Land Management Focus Group Participants

Participant	Organization	Position/Role
Larry Mouradjian	RIDEM	Assistant Director Natural Resources
Scott Millar	Office Water Resources, RIDEM	Chief
Bob Stankelis	Narragansett Bay NERR	Reserve Manager
Mike Lipisky	Div Fish and Wildlife, RIDEM	Chief
Chris Raithel	Div Fish and Wildlife, RIDEM	Senior Biologist/wildlife management
Lori Gibson	Div Fish and Wildlife, RIDEM	Supervising Biologist/deer management
Brian Teft	Div Fish and Wildlife, RIDEM	Senior Biologist/wildlife management
Charlie Brown	Div Fish and Wildlife, RIDEM	Senior Biologist/wildlife management
Catherine Sparks	Div of Forestry, RIDEM	Chief
Beth Correira	Prudence Conservancy	Stewardship Specialist
David Gregg	RI Natural History Survey	Executive Director
Scott Ruhren	Audubon Society	Senior Director of Conservation
Janet Coit	Nature Concervancy	State director
William (Bill) Brumback	New England Wildflower Society	Conservation Director
Dr. Frank Golet	School Natural Resources URI	Professor
Dr. Art Gold	School Natural Resources URI	Professor
Dr. Laura Myerson	School Natural Resources URI	Professor
Dr. Mark Bertness	Brown University	Professor
Rick McKinney	USEPA	
Giancarlo Cicchetti	USEPA	
Joe Bachand	Natural Resources Conservation Service, RI	Ecological restoration
Andy Lipsky	Natural Resources Conservation Service, RI	conservation biologist

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APPENDIX D

2006 Management Plan Telephone Survey
Results for Prudence Island Property Owners

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NBNERR TELEPHONE SURVEY RESULTS[1]

METHODS

- Telephone survey of Prudence Island land owners conducted in November 2006

Sample

- All efforts were made to obtain home telephone numbers for everyone who owns property on Prudence Island (residing on and off Prudence Island)
- 19 property owners responded to the post card mailing
- 15+ hours to search for telephone numbers
- 298 phone numbers located (out of 441 property owners)
- 169 surveys completed
- 48 property owners declined to take the survey once contacted
- 43 unable to reach
- 17 wrong numbers
- 3 deceased
- 18 numbers were disconnected
- 56.7% response rate
- Enough property owners responded so that the data is representative of the property owners for whom we had valid phone numbers
- The data is NOT representative of all Prudence Island property owners. (To be representative, we needed 205 respondents; we were 36 surveys short of that.)

Surveyors/Callers

- Callers solicited by URI professor via flier and recruitment
- 7 callers/surveyors (5 URI undergraduate students; 1 URI staff member) in addition to NBNERR staff
- Approx. 111.75 hours of calling
- 24 hours of data entry

Caller's initials and number of surveys

Caller Initials	n=Surveys	V%		N
no initials	5	3.0		169
AV	34	20.1		
EB	26	15.4		
ED	50	29.6		
JE	37	21.9		
KW	14	8.3		
TB	3	1.8		

DESCRIPTIVE DATA ANALYSES

KEY TO TABLES

[ ]	variable names are in brackets
italics	questions as they appear in the survey are italicized
n	represents the number of responses in each category
N	represents the number of respondents who answered the question
V%	represents the number of responses in each category of a given variable out of the number of respondents for whom we have information on the given variable
S%	represents the number of responses in each category of a given variable out of the entire sample
Mean	average score

[1] Judy A. Van Wyk, Ph.D., University of Rhode Island, Department of Sociology & Anthology, 507 Chafee Bldg., Kingston, RI 02881, Office: 401-874-4146, cell: 401-419-7932

Median	middle score
Std. Dev.	(Standard deviation): the larger the standard deviation, the more widely the responses are dispersed among the categories of the variable.
9	Variable names that end in "9" required open-ended responses
#s	Numbers in the narrative tables represent the number of times that very similar statements were made in response to the open-ended question. One person may have many different responses.

[sex]

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	Female	86	51.2	50.9	168	1.49	1	.501
2	Male	82	48.8	48.5				

[miss9] *Are you aware of what the **mission** is for the Narragansett Bay Reserve on Prudence Island?*

n	Mission	n	Mission
9	EDUCATION (IN GENERAL)	1	to educate children
1	-about bay	1	to get more people to come to PI
1	-about fish	1	to keep land parcel size down
1	-about island	1	to keep the land in public domain
1	-about wildlife	14	TO PRESERVE/CONSERVE (IN GENERAL)
1	to be involved w/coastal area & Island people	3	-bay
1	to bring awareness about water table	2	-ecosystems
2	to clean bay/water	1	-eel grass
2	to control invasive species	3	-environment
	TO COUNT/KEEP TRACK OF	2	-estuaries
2	-bay	1	-fish
1	-changes	1	-flowers
1	-health of estuaries	7	-land
1	-people	1	-living lab for scientists
1	-waste	3	-marshes
1	-wildlife	3	-natural habitats
2	to clean bay/water	2	-open spaces
10	TO DO RESEARCH (IN GENERAL)	1	-osprey
1	-ecosystems	1	-quality of life
1	-eel grass	1	-turtles
2	-estuaries	3	-water
2	-marshes	9	-wildlife
1	-sea beds	2	to prevent overdevelopment
3	-water quality	1	to promote the bay
1	-what needs to be done	1	to understand
1	-wildlife		

[enhan] *Please tell me the extent to which you agree or disagree with the following statement: The Narragansett Bay Reserve on Prudence Island enhances my quality of life.*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	Strongly Disagree	2	1.2	1.2	166	3.4	3	.866
2	Disagree	15	9.0	8.9				
3	Agree	85	51.2	50.3				
4	Strongly Agree	43	25.9	25.4				
5	No opinion/don't know	21	12.7	12.4				

[enhan9] *Could you explain to me why you feel that way?*

n	Disagreed or Strongly Disagreed to [enhan]	n	Disagreed or Strongly Disagreed to [enhan]
1	as long as the land is going built on, it will be fine	1	do not see how it makes any difference to her
1	blocks of fire trails, live in misery on the island. not allowed to cut fallen trees, lack of employees to service residents at night and on weekends. just recently got street signs	5	does not have any effect /don't personally feel it
1	cannot get food	1	pay a lot of taxes and do not get what I am suppose to get. Not good water, everyone pays through Portsmouth
1	cleaning the bay would be nice	1	self-centered in things they do- create restriction that is not necessary

[enhan9] *Could you explain to me why you feel that way?*

n	Agreed or Strongly Agreed to [enhan]	n	Agreed or Strongly Agreed to [enhan]
1	always say federal tax and nature center- bike, walk	1	-nice place
1	assumes that it is like the Narragansett bay commission	1	-the land is better than when he was a child
1	because family has long history on the island. it is a unique environment and want to keep it that way	1	I like to go out and get bait and go fishing
5	because I have quite an affinity towards the Island and any organization that is protecting it and keeping it in its natural state	2	it's a place completely apart from everyday life. relaxing
1	bikes and hikes	1	like to look at facilities and go to meeting about forest. good programs
1	daughter works there- she runs the summer camp	1	not many estuaries. keeping safe and agree with everything they do. cannot be destroyed
1	did work with them, weather station, built the platform	1	opening the south end for islanders, research with eel grass- uses of it in garden for a fertilizer.
5	do not know a whole lot about it.	1	out of state now. shell fishing when on the island
1	do things in marsh		PRESERVATION
1	down almost every day, T-wharf, clamming, its wonderful	2	-preservation of natural habitat is important when surrounded by places like Providence
	EDUCATIONAL PROGRAMS	1	-prevents abuses and losses and protects land
3	-because they provide educational programs	17	-focus on environmental preservation and I support that strongly
1	-been down there for a few educational things, not sure who sponsored.	1	-keeps land controlled and prettier, keeps the tick population down
1	-does a lot to educate younger population	1	-monitoring quality of water and island. can see the difference
2	-educational programs are overall- positive	1	-they monitor what is happening on land and in waterways
1	-it brings an awareness of the fragility of the bay and wildlife. the bay has come along way	1	-work towards keeping waters clean
1	-lands in conservation are good. kids have participated in programs, hike, use T-wharfs	4	research - they are studying insects, animals and wildlife on the island and it better helps us understand the cycle of life
1	-since its been there, there are more resources for questions and better info for children and adults on flora and fauna		RESERVE MAKES IT BETTER
1	-speak of what is around you	8	-anything that betters the bay will enhance life
1	good stuff with osprey, if we can work with the ticks and deer	1	-good to have reserve land
1	have not seen a lot of changes but do not expect that they happen overnight	1	-it is important to the bay, we all interact with the environment
1	haven't noticed too much of info given changing anything. Info doesn't relate to everyday life	3	-nice to have a state presence on the island looking out for things
1	I do not go as frequently anymore	1	-Prudence Island has a feeling of open space because of that
2	I do not know what they do	2	-the beaches and bay are much cleaner
	I LIKE PRUDENCE ISLAND	1	-surveys = better future for the bay and marshes

Table split by page break

1	-been down for years and everyone enjoys	1	shell fisherman- its his livelihood
1	-enjoy south end and T-wharf. I like that people know about the island and environment.	1	the deer are better, the animals are looked after
1	-like the people	1	we all need to work together
1	-my family enjoys it and we have access to it year round		

[resmng]*Do you agree or disagree that natural resources on the Island are being managed properly?*

Codes	Categories	n	V%	S%
1	Strongly Disagree	4	2.4	2.4
2	Disagree	36	21.8	21.3
3	Agree	95	57.6	56.2
4	Strongly Agree	6	3.6	3.6
5	No opinion/don't know	24	14.5	14.2

N	Mean	Median	Std. Dev.
165	3.06	3	.967

[resmng9] *Could you explain to me why you feel that way?*

n	Disagreed or Strongly Disagreed to [resmng]	n	Disagreed or Strongly Disagreed to [resmng]
1	a lot of stuff, get people involved, taking out bugs	1	-too much building allowed; resources of water and water quality is terrible
	ANIMALS/WILDLIFE	1	-water and reserves are becoming abused, waste management next to salt pond is wrong
4	-bittersweet- wildlife needs ideal habitat and they are not creating that. think animals are hurting	1	-water department is not run by town so no houses are metered
1	-certain things like the turkeys being wiped out and deer population is having the same issue. Coyote population is increasing	1	-what we get from Portsmouth is not comparable to mainland. for example, taxes we pay and water
1	-took out too many deer	9	could be better
5	cant see that anything is being managed at all	1	do not think that the department could manage anything correctly
6	CONCERNS ABOUT THE WATER (GENERAL STATEMENTS)	2	housing expansion worries me
1	-do not think water system makes sense, disorganized, what are they doing about waste	1	island being left in its natural state but still see a lot of trees and limbs being cleaned and maintained
1	-I use to be on water board and it wasn't being used for water but a zoning board. water usage is incorrect	1	marshes need to be cleaned up and the watch trees shouldn't be destroyed
2	-people are abusive with the water	1	paying a lot of money and not getting enough services
1	-single biggest fear: never a comprehensive study on the water- single most important thing	1	prudence conservancy clears too much land
1	-the water situation is being mishandled. a lot of houses coming up and the water cannot keep up	1	spending a lot on putting too many people on projects

[resmng9] *Could you explain to me why you feel that way?*

n	Agreed or Strongly Agreed to [resmng]	n	Agreed or Strongly Agreed to [resmng]
	ANIMALS/WILDLIFE	1	-people are careful
1	-deer and wildlife is managed correctly.	1	-the efforts there, the attention is there, and the educational programs are there
1	deer population isn't managed properly,	1	-the island stayed natural
	-evidence of preservation and wildlife around	1	I follow the news articles about deer hunting and visit the center
2	-except for wildlife	2	GOOD JOB (IN GENERAL)
1	-I actively see people doing research, building bird houses, and preventing birds from becoming extinct	1	-all factions working together for some same cause

Table split by page break

1	-I follow the news articles about deer hunting and visit the center	1	-as good as it could be
1	-they are trying to cut down wood that's fallen, keep sections for wildlife by controlling invasive plants	1	-because the public property as well as DEM reserve state act are committed to managing their property effectively
	-they watch everything from tick to deer. they are strict about a lot of things	2	-do not know enough about it
1	because I have been to conservancy meetings and I am a member	1	-do not see anything terrible on island
1	been decent number of reconstruction and conservation effort	1	-there's a conservancy and safeguards in place
1	broad statement. there are lots of issues but there is an effort going on	1	I think a lot of people on the island are environmentally conscious
1	BUILDING	1	I think conservancy is taking a bigger part than before with the navy reserve and learning, younger generation can learn more hands on
1	-a lot more building is bad	1	know they are aware they cannot remove stone walls or cut down trees
1	-because all land is being preserved from development	1	more to do now that the reserve is working on Prudence
1	-conservancy trying to keep nature from being taken over by more development. Island remains quite rustic	1	regulated well- close upper bay with pollution reports
1	-fighting off development	1	land is managed well. trash and garbage...
1	-minimum amount of building	1	commercial fisherman coming too close to shore
1	CLEARING ROADS NICELY, KEEPING THE PATHS CLEAN	1	Research is good
1	-doing what they can. not perfect but okay	1	T-wharf is getting cleaned up, bay is cleaner and healthier
1	-everyone seems knowledgeable	1	they are being over managed
1	-everything is changing but still a lot of land to be reserved and protected	1	the resources, lack of development, DEM's responsibility to help with deer and species population
1	-group like commission and conservancy help	1	the south and north ends are covered by the estuary conservancy, do not go overboard
1	-have not seen any abuse of resources	1	through the state are managed property
1	-grew up on prudence island but rent now. brush and junk cars off the island cleared	1	trying to be aware, mindful of the tick situation
1	I don't take exception to anything they are doing	1	water supply is adequate although clams, oysters, and steamers are scarce
1	-island is a big polluted heap, trying to clean up is good	1	we do not have the service that everyone else has
1	-looks around and seems like the environment is in good shape	1	not cutting back grass to prevent fires- sometimes overlooked
1	-needs to be balanced between conservation and use, and the island does a good job	1	have not seen results of hunting. reserve land is not being handled properly, invasive species
1	-not a lot of abuse, not much trash around	3	Water problems
1	-Onery Island is still the same since I was a child	1	-except water- overdevelopment is going to encroach on the aquifer

[ecolo] *In the past 5 years, have you heard about any environmental research projects being conducted on Prudence Island?*

Codes	Categories	n	V%	S%
1	No	43	25.7	25.4
2	Yes	110	65.9	65.1
3	Unsure	14	8.4	8.3

N	Mean	Median	Std. Dev.
130	1.79	2	.754

[recalla9] *What do you recall about that/those project(s)?*

n	Recalled about Project	n	Recalled about Project
1	agriculture, butterflies and stuff in estuaries and goats	1	-seaweed
2	ANIMAL STUDIES (EXCEPT FOR DEER)	1	oil recovery on south end
1	-animal studies on the south end	1	receding the beds
1	-snails	1	roads
2	-tubes to catch mice	1	SEA LIFE STUDIES/PRESERVATION
1	-wildlife in wetlands	1	-DEM shellfish
1	arts and crafts	2	-fish
4	BIRD STUDIES/PRESERVATION	1	-horseshoe, crab counting, evasive crabs
1	-migratory birds	1	-Luther Blount- getting soft-shell clam seedlings and distributing in the bay
9	-osprey	1	-monitor seal populations, help wildlife
1	Brown university is doing research on acid rain	1	-nests for the oysters
1	BUG STUDIES (EXCEPT FOR TICS)	8	-oysters
1	-college students investigated insects in marshes	1	-oyster fishing
1	-moth traps, beetles	1	-oysters on North end
1	-wouldn't now on south side because of bugs	2	-RWU oyster and shellfish
1	cannot remember	1	-salamander
4	cleaned beach	1	-sharks
1	efforts to produce historical preservation and information	2	-shellfish
1	elimination of invasive species	1	-URI did research and Rojo got a loan for oyster beds north and south under governship
1	email updates	1	see places where walking restrictions are
2	estuaries research/preservation (non-specific)	1	study, gear, remember someone's experiment being ruined, butterflies
1	experiments in creek and north end	1	swamps
1	GENERAL STATEMENTS ABOUT CLEANING/PRESERVATION	1	telephone poles so people would not trample on agriculture
1	-clean up bays	2	T-WHARF- FISHERIES AREA (NON-DESCRIPTIVE)
1	-coastal cleanup, lectures	1	-shack at T-wharf
1	-environmental stuff with closing off land	1	-T-wharf research through Rojo
1	-south and north end	20	TIC/DEER/LYME DISEASE STUDIES (GENERAL)
1	-students from universities do projects	7	-deer studies (general)
1	-URI projects	1	-deer study with pole and apparatus- deer sniff something.
1	little garden on south end	1	-fed deer to help put stuff on necks to kill ticks
10	MARSHES (GENERAL)	1	-fenced off area, how it would do without deer
3	-have seen people/kids in marshes	1	-head count of deer
3	-white flags in marshes	1	-not paying attention to deer tics
1	moths and butterflies	3	-URI did something with controlling ticks & Lyme disease
1	nag creek- not sure what	1	tides, invading species
1	outside north end- oyster farm	1	title pool
1	placed some goats in an area to see what kind of vegetation that would eat	13	WATER/WATER QUALITY STUDIES (GENERAL)
3	PLANTS (NON-SPECIFIED)	1	-south end-water testing Brown University- salt ponds
1	-different trees that grow on the island	1	-water quality, issues about endangered species
22	-eel grass	4	WEATHER STATION ON NORTH END
3	-goats on Pier rd to eat growth	1	-rainfall measuring
	-invasive plants	1	went to a meeting but do not know who ran it, evasive species, Robin Evans at the farm
1	-moss (goes to museum after)	1	worked there
1	-on the west side- eel grass	1	working with invasive species, European lodge

[anywhre] *In the past 5 years, have you heard about any environmental research projects being conducted anywhere in Narragansett Bay?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	53	40.8	31.4	167	1.83	2	.559
2	Yes	51	39.2	30.2				
3	Unsure	26	20.0	15.4				

[recallb9] *What do you recall about that/those project(s)?*

n	Activity	n	Activity
2	Animal/wildlife (non-specific)	1	research
1	aware through newsletters		SEA LIFE
1	boat goes out at southern edu, program held on boat	7	-oysters
	CLEAN/SAVE THE BAY	1	-oyster project, Mr. Blout's land, seating of oyster beds
4	-clean the bay	1	-shellfish
3	-save the bay	4	-fish
1	digging out and dredging waterways	1	-crabs
1	dredging LNG	1	-horseshoe crabs
1	from Sakonnet times- cannot recall specifics	2	-clams
1	going all the time	1	-fishery sampling
1	historical boat search	1	-seals
1	marsh studies, rainfall measuring,	1	-lobsters and their shells
4	MONITORING WATER QUALITY (NON-SPECIFIC)	2	-quahogs
1	-water quality, tested at T dock - ongoing O2 levels in depts.	3	-shellfish
1	-study on oxygen levels in the water	1	-scallops
1	-dissolve oxygen study	1	-seating quahog bed
1	-water warming	1	-point where fish died
1	-oxygen levels in different places, sick for marine	1	-scallop project in North
1	-cracking down on people with bad septic systems	1	-fish dying in Jamestown, dying clam beds
1	-watching salt content	1	see it in paper sometimes
1	-research buoys	1	seen research vessels, but cannot give detail
1	Noah boat	3	Tic/deer/Lyme disease studies (general)
1	PLANTS (NON-SPECIFIC)	1	transporting quahogs
16	-eel grass	2	UNIVERSITIES (NON-SPECIFIC)
1	- took mud samples to plant eel grass	1	-I think URI did something, not sure what
1	-they're trying to clean the bay, the new sewage plant	1	-two projects- study vs digging out the channel and URI study in Quonsette area
1	pollution, checking out beach areas	1	-URI does a lot
1	newsletter from NBNERR- gets in information from here	1	weather station
1	not up to date, not aware of them	1	website
2	not very much/nothing	1	went out on a barge
1	old ships		

#I'm going to read a list of outdoor activities and I want you to tell me if you or guests that you have invited to your property have done any of these things on Prudence Island in the last five years.

[act1] *Bird Watching?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	44	26.3	26	167	2.8	3	1.243
2	1 or 2x	16	9.6	9.5				
3	3-10x	36	21.6	21.3				
4	>10x	71	42.5	42.0				

[act2] *Hunting*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	127	76	75.1	167	1.62	1	1.144
2	1 or 2x	1	.6	.6				
3	3-10x	14	8.4	8.3				
4	>10x	25	15.0	14.8				

[act3] *Going for Walks*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	9	5.4	5.3	167	3.71	4	.747
2	1 or 2x	2	1.2	1.2				
3	3-10x	18	10.8	10.7				
4	>10x	138	82.6	81.7				

[act4] *Swimming*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	16	9.6	9.5	167	3.55	4	.916
2	1 or 2x	1	.6	.6				
3	3-10x	25	15.0	14.8				
4	>10x	125	74.9	74				

[act5] *Jogging/Running*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	99	59.3	58.6	167	1.94	1	1.245
2	1 or 2x	14	8.4	8.3				
3	3-10x	19	11.4	11.2				
4	>10x	35	21.0	20.7				

[act6] *Biking*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	55	32.9	32.5	167	2.63	3	1.272
2	1 or 2x	11	6.6	6.5				
3	3-10x	41	24.6	24.3				
4	>10x	60	35.9	35.5				

[act7] *Boating, Sailing, Kayaking, or Canoeing*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	29	17.5	17.2	166	3.16	4	1.135
2	1 or 2x	8	4.8	4.7				
3	3-10x	36	21.7	21.3				
4	>10x	93	56	55.0				

[act8] *Water Skiing*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	135	80.8	79.9	167	1.38	1	.855
2	1 or 2x	9	5.4	5.3				
3	3-10x	14	8.4	8.3				
4	>10x	9	5.4	5.3				

[act9] *Cross Country Skiing*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	161	96.4	95.3	167	1.08	1	.411
3	3-10x	5	3.0	3.0				
4	>10x	1	.6	.6				

[act10] *Quohoging or Fishing*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	12	7.2	7.1	167	3.59	4	.845
2	1 or 2x	3	1.8	1.8				
3	3-10x	27	16.2	16.0				
4	>10x	125	74.9	74.0				

[act11] *Have you ever visited the Narragansett Bay Reserve lands and/or facilities on the Island?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	12	7.2	7.1	167	3.36	4	.939
2	1 or 2x	12	7.2	7.1				
3	3-10x	53	31.7	31.4				
4	>10x	84	50.3	49.7				

[outdr9] *Are there any other outdoor activities that you can think of that you or your guests have done in the past 5 years on the Island?*

n	Other Activity	n	Other Activity
11	BBQ's/parties/picnics	1	-softball
4	beach cleaning	16	gardening/planting flowers
13	beach combing (collecting shells, driftwood, beach glass, seaweed)	6	look for/watch deer
7	beach walking	2	look for wildflowers
8	berry-picking	1	metal detecting
1	bird feeding	1	New Year's plunge
1	bird watching	1	painting
1	boat watching	3	photography
2	bonfires/camp fires	1	public meetings
2	clamming	1	raising honey bees
2	dog walking	1	scuba diving
1	donate land programs	1	seal watching
3	driving	1	sledding
6	exploring/site seeing	3	stargazing/astronomy
1	fishing contest	3	sun bathing
2	GAMES/SPORTS	1	trail work
1	-bacchi ball	1	walk perimeter/cliff climbing
3	-croquet	1	watch air show
1	-football	1	watch sunset
5	-hiking	2	wood/tree cutting
1	-horseshoes	1	wreath making
3	-kite flying	4	yard work
1	-outdoor pool table		

[proga9-l9] *Are there any of the activities that we just discussed that you would consider participating in through a Narragansett Bay Reserve program? Which ones would those be?*

n	Activity	n	Activity
2	all of them	1	historical tour
1	any outdoor event	2	hunting
1	anything to do with recreation	1	invasive plants
1	anything with wildlife	4	kayaking
1	art workshops	1	learning marine studies
1	beach clean-ups	1	lectures
1	beach combing	1	love to over weekends
3	biking	1	maintenance of island nature sites
8	bird watching	1	monitoring
	BOATING/SAILING	1	photography
1	-boat races	1	plant identification
4	-boating	3	quahoging
1	-boating around island	1	-quahogathon
3	-sailing	3	running/jogging
1	community works	1	seal watching

Table split by page break

2	cross country skiing	4	SWIMMING (NON-SPECIFIC)
1	ecology	1	-community swim
1	educational nature/history	1	tree identification
1	everything he does already	12	walking (non-specific)
2	FISHING (NON-SPECIFIC)	1	watching butterflies
4	-fishing tournaments	1	water activities
1	helping mammals	1	wildlife watching
7	HIKING (NON-SPECIFIC)	1	would do most of them
1	-formal hikes- to north end		

Now I'm going to read to you a few statements that the Reserve would like your responses to. Please tell me the extent to which you agree or disagree with each one.

[sup1] *The first one is new development should be concentrated in the Homestead area of the Island*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	Strongly Disagree	64	39.8	37.9	161	2.81	2	2.059
2	Moderately Disagree	33	20.5	19.5				
3	Slightly Disagree	13	8.1	7.7				
4	Slightly Agree	9	5.6	5.3				
5	Moderately Agree	18	11.2	10.7				
6	Strongly Agree	10	6.2	5.9				
7	don't care/no opinion	14	8.7	8.3				

[sup2] *New development should be spread throughout the Island*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	Strongly Disagree	52	32.3	30.8	161	3.47	4	2.154
2	Moderately Disagree	20	12.4	11.8				
3	Slightly Disagree	5	3.1	3.0				
4	Slightly Agree	18	11.2	10.7				
5	Moderately Agree	28	17.4	16.6				
6	Strongly Agree	27	16.8	16.0				
7	don't care/no opinion	11	6.8	6.5				

[sup3] *Increased visitation to the Reserve via a renovated T-wharf will not affect my quality of life on Prudence Island*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	Strongly Disagree	16	9.7	9.5	165	4.52	5	1.759
2	Moderately Disagree	20	12.1	11.8				
3	Slightly Disagree	6	3.6	3.6				
4	Slightly Agree	10	6.1	5.9				
5	Moderately Agree	52	31.5	30.8				
6	Strongly Agree	56	33.9	33.1				
7	don't care/no opinion	5	3.0	3.0				

[sup4] *Small boat dock space at the T-wharf for visitors should be increased*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	Strongly Disagree	16	9.6	9.5	166	4.45	5	1.831
2	Moderately Disagree	22	13.3	13.0				
3	Slightly Disagree	7	4.2	4.1				
4	Slightly Agree	20	12.0	11.8				
5	Moderately Agree	44	26.5	26.0				
6	Strongly Agree	42	25.3	24.9				
7	don't care/no opinion	15	9.0	8.9				

[susp5] *Programs should be conducted on the Island to protect rare habitats and species*

Codes	Categories	n	V%	S%
1	Strongly Disagree	2	1.2	1.2
2	Moderately Disagree	2	1.2	1.2
3	Slightly Disagree	4	2.4	2.4
4	Slightly Agree	4	2.4	2.4
5	Moderately Agree	38	23.2	22.5
6	Strongly Agree	107	65.2	63.3
7	don't care/no opinion	7	4.3	4.1

N	Mean	Median	Std. Dev.
164	5.58	6	.959

[sup6] *Public access to the northern portion of the Reserve is sufficient. If they disagree at all, ask the following open-ended question*

Codes	Categories	n	V%	S%
1	Strongly Disagree	35	21.1	20.7
2	Moderately Disagree	16	9.6	9.5
3	Slightly Disagree	7	4.2	4.1
4	Slightly Agree	11	6.6	6.5
5	Moderately Agree	49	29.5	29.0
6	Strongly Agree	32	19.3	18.9
7	don't care/no opinion	16	9.6	9.5

N	Mean	Median	Std. Dev.
166	4.1	5	2.067

[sup6w9] Could you tell me why you disagree?

n	Reason for Disagreeing	n	Reason for Disagreeing
6	as long as gate is open you can get in, but it's always locked up	1	lots of trash
28	because there isn't good access to that part – not welcoming	1	mosquito problem
13	cannot get past the gate- vehicle access should be allowed	1	no map
3	could do better job with the parking	1	no signs
1	have only been there once	1	more hiking and accessible land on south side but not in north
2	have never been there	2	need a bike path
1	haven't been up there in over 20 years.	1	only one road- cannot keep boat or go through north end with boat
1	if it is opened up to cars it needs to be monitored so land will not be destroyed	1	potters cove is already overwhelmed
3	it is a big area to walk – too far for elderly and handicapped	1	really disappointed that we would get around the stone houses
1	it is good for hiking, but the elderly cannot do that	1	residents should have more access but not tourists. maintain for animals
6	it is infested with ticks.	1	trail is well mowed but it is hard to get to.
5	It is not well taken care of	1	walking, biking, no vehicles should be allowed

[susp7] *Public access to the southern portion of the Reserve is sufficient.*

Codes	Categories	n	V%	S%
1	Strongly Disagree	5	3.0	3.0
2	Moderately Disagree	7	4.2	4.1
3	Slightly Disagree	1	.6	.6
4	Slightly Agree	10	6.1	5.9
5	Moderately Agree	67	40.6	39.6
6	Strongly Agree	69	41.8	40.8
7	don't care/no opinion	6	3.6	3.6

N	Mean	Median	Std. Dev.
165	5.17	5	1.223

[sup7w9] *Could you tell me why you disagree?*

n	Reason for Disagreeing	n	Reason for Disagreeing
1	by car it is, other ways no	1	the T-wharf is in tough shape
1	could use more public access on the south end	1	there is a lot more to the island than is offered
8	Gates should not be locked during hunting season	1	too many efforts to intentionally restrict access
1	maintain for animals and maintain for public	1	sometimes open and sometimes closed
1	not sufficient	1	under utilized
1	only available through ferry landing	1	within the island
1	taking part of island that is restricted for residence	1	wonderful now
1	the roadway is pretty bad though		

Now I'm going to read to you a short list of events and programs on the Island that are offered by the Narragansett Bay Reserve, and I want you to tell me if you have attended any of them in the past 5 years.

[ed] *Have you attended any educational programs or workshops*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	no/not attended	90	53.9	53.3	167	1.56	1	.690
2	yes/attended	62	37.1	36.7				
3	yes/but not sure who offered it	13	7.8	7.7				
4	don't know if attended	2	1.2	1.2				

[walk] *nature walks/hikes?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	no/not attended	130	78.3	76.9	166	1.25	1	.536
2	yes/attended	32	19.3	18.9				
3	yes/but not sure who offered it	2	1.2	1.2				
4	don't know if attended	2	1.2	1.2				

[beach] *beach cleanups?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	no/not attended	84	50.6	49.7	166	1.54	1	.599
2	yes/attended	77	46.4	45.6				
3	yes/but not sure who offered it	3	1.8	1.8				
4	don't know if attended	2	1.2	1.2				

[camp] *sent kids to a Reserve summer camp or volunteered at one?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	no/not attended	139	83.7	82.2	166	1.19	1	.491
2	yes/attended	24	14.5	14.2				
3	yes/but not sure who offered it	1	.6	.6				
4	don't know if attended	2	1.2	1.2				

[ohouse] *attended an Open House at the Reserve on a holiday or during the summer?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	no/not attended	79	47.3	46.7	167	1.56	2	.577
2	yes/attended	85	50.9	50.3				
3	yes/but not sure who offered it	1	.6	.6				
4	don't know if attended	2	1.2	1.2				

[train] *training program?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	no/not attended	156	93.4	92.3	167	1.1	1	.414
2	yes/attended	8	4.8	4.7				
3	yes/but not sure who offered it	1	.6	.6				
4	don't know if attended	2	1.2	1.2				

[pubmt] *attended a public meeting?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	no/not attended	89	53.3	52.7	167	1.54	1	.656
2	yes/attended	69	41.3	40.8				
3	yes/but not sure who offered it	6	3.6	3.6				
4	don't know if attended	3	1.8	1.8				

[vol] *participated in any volunteer stewardship activities, such as trail maintenance or woodcutting?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	no/not attended	133	80.1	78.7	166	1.23	1	.527
2	yes/attended	29	17.5	17.2				
3	yes/but not sure who offered it	2	1.2	1.2				
4	don't know if attended	2	1.2	1.2				

[partic] *Over the NEXT 5 years, do you think your level of participation in Narragansett Bay Reserve programs will likely;*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	remain the same	67	40.4	39.6	166	1.72	2	.721
2	increase	85	51.2	50.3				
3	decrease	8	4.8	4.7				
4	don’t know	6	3.6	3.6				

What do you think should be goals for the Narragansett Bay Reserve over the next 5 years?

[info1] *Should they provide information for the public about ongoing projects on the Reserve*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	3	2.1	1.8	140	2.04	2	.279
2	Yes	129	92.1	76.3				
3	don't know/don't care	8	5.7	4.7				

[land2] *Protect the land and natural resources of the Reserve*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	1	.7	.6	139	2.02	2	.189
2	Yes	134	96.4	79.3				
3	don't know/don't care	4	2.9	2.4				

[wild] *Protect wildlife in the Reserve*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	3	2.2	1.8	139	2.03	2	.268
2	Yes	129	92.8	76.3				
3	don't know/don't care	7	5.0	4.1				

[research] *Conduct environmental research*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	2	1.4	1.2	140	2.03	2	.238
2	Yes	132	94.3	78.1				
3	don't know/don't care	6	4.3	3.6				

[educate] *Provide educational programs for the residents and the general public*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	4	2.8	2.4	142	2.01	2	.266
2	Yes	132	93.0	78.1				
3	don't know/don't care	6	4.2	3.6				

[goal9] Any other goals you think they should have?

n	Other Goals	n	Other Goals
	ACCESS	1	-already great on south end
1	-boat access and parking, come up with ferry out of Bristol, maintain north end facilities and parking area	1	-bring free testing back. do something with the bittersweet- its negative
1	-make island more accessible for residents but not for visitors	6	-continue to do what you are already doing and more
1	-make more accessible to south end	1	-controlled burning at south end
4	-improve access on north end	1	-do not try to control nature
1	-resident yes, public no	1	-federally mandated quite clear
1	-should be more widespread than just the island. the state should help and the south end should be opened more, and the public needs to see island	4	-fix T-wharf/needs to be better maintained
1	-southern portion of the island should be a place for LNG and islanders. should earn a tax credit for doing that. help with energy needs too	1	-I would like to see a designated shelter
1	-they should try to increase the number of non resident visitors to the island and reserve.	1	-make sure the deer are well taken care of
	ADVERTISE	1	-more input from town of Portsmouth for better roads
5	-advertise programs better	1	-more island friendly
1	-need a place where information is available to the public	1	-provide more ferry service
1	-newspaper to property owners. cannot find out about things until day before, a newspaper would get information out	1	-Prudence connection from Portsmouth
	CLEAN	1	-rid of evasive species and re-introduce things from past
1	-clean up the dump	1	-research
3	-keep Island clean/clean up the Island	1	-involve the islanders
2	-trash removal	1	-like to see European watch. why can't we chop them down? other invasive species- try to get some of it
	DEVELOPMENT	1	-safety issues, quicker medical help provided to people, specifically elderly
1	-limit commercial use of waters	2	-something should be done about coyotes
1	-oxygen level of water, maintain integrity of the island, "Prudence is a rare gem." Do not let it become like Cape Cod, classes on kayaking, no sidewalks or street lights	1	-sounds like a lot of goals to me
	EDUCATE	9	-tics/don't protect deer/Lyme disease
1	-could expand exhibits; perhaps an aquarium interpretative center maybe	5	-trim sides of roadway
1	-educate about environmental issues	1	-what they do is fine, has a lot of positive activity. should just do their thing but not expect the rest to be involved
1	-educate about the historic value of the Island	1	-work with Portsmouth- good publicity
1	-educate about the water		PRESERVATION
6	-educate about what it is they actually do, and what their goals are	1	-habitat management
2	-educate about wildlife	10	-preservation in general
3	-educate children/child programs	2	-regulate hunting
2	-education for weekenders/summer visitors/tourists	1	-resource management

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1	-education is outstanding. continue education programs	6	-water cleanliness/improve water quality in bay
12	-education/outreach in general	1	-wildlife management
1	-have programs for high school aged teens, research education, stewardships	1	-work on how to improve quality of habitat on the island.
1	-like to see them do what they did during the 70s; a walking tour, signs for different trees and species so you could identify them		SHELLFISHING & FISHING
1	-to increase public awareness of habitats through workshops	4	-monitor fisheries, fishermen, and shell fishing
	GENERAL COMMENTS	3	-protect shell fishing

[long] *How many years have you owned property on Prudence Island?*

Years	n	V%	S%	N	Mean	Median	Std. Dev.
0-5	18	10.8	10.6	166	30.66	24.5	24.928
6-10	31	19.2	19.0				
10-15	11	6.6	6.6				
16-20	15	9.0	8.9				
21-25	13	7.8	7.8				
26-30	7	4.2	4.2				
31-35	7	4.2	4.2				
36-40	20	12.0	11.9				
41-45	3	1.8	1.8				
46-50	13	7.9	7.8				
51-55	2	1.2	1.2				
56-60	8	4.8	4.8				
61-65	2	1.2	1.2				
66-70	2	1.2	1.2				
76-80	3	1.8	1.8				
81-85	1	.6	.6				
86-90	4	2.4	2.4				
100	4	2.4	2.4				
110	1	.6	.6				

[house] *Do you own a house or cottage on the island?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	6	3.7	3.6	161	1.96	2	.190
2	Yes	155	96.3	91.7				

Could you please tell me the number of people who spend time at the residence in an average year, and their ages?

Number of people at each Age

Variable	Age group	N	count[2][3]
[age1]	under 5	31	84
[age2]	5 to 18	75	257
[age3]	19 to 25	47	138
[age4]	26 to 39	59	252
[age5]	40 to 64	130	497
[age6]	65 and older	74	163
	Total	158	1391

[2] "Count" represents the number of people reported to be occupants in an average year in each age category.
[3] One respondent reported that there are 300 current occupants under 5 years old, 700 ages 5-18, 19-25, 26-39; 400 ages 40-64, and 200 people over 65. That respondent's answers to these questions were eliminated from the table.

[age7]Mean age of people who spend time at residences on Island in an average year is approximately 25 years old (mean age group = 3.94).

Within the last 5 years, which of these changes have you made to your residence(s) on the Island?

[rmade1] *Have you increased the amount of space*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	129	80.1	76.3	161	1.2	1	.4
2	Yes	32	19.9	18.9				

[rmade2] *Winterized it*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	114	70.8	67.5	161	1.29	1	.456
2	Yes	47	29.2	27.8				

[rmade3] *Put it up for sale*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	158	98.8	93.5	160	1.01	1	.111
2	Yes	2	1.3	1.2				

[rmade4] *Transferred it to a family member*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	135	83.9	79.9	161	1.16	1	.369
2	Yes	26	16.1	15.4				

[rmade5] *Put in a new well*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	146	90.7	86.4	161	1.09	1	.292
2	Yes	15	9.3	8.9				

[rmade6] *Upgraded the septic system*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	132	82.0	78.1	161	1.18	1	.385
2	Yes	29	18	17.2				

[rmade9] *Have you made any other changes?*

n	Other Changes	n	Other Changes
1	add to the house	1	major addition
21	added a new roof	1	new filtration system
6	added/built a deck	1	new floor
1	added garage	1	new generator
4	brand new construction	4	new kitchen
2	built/repaired a screened in porch	12	new windows
2	built/repaired a shed	6	painted
1	careful what goes into your septic system	1	pumped every 2 years, transferred to daughter last month
1	changed heat from gas to kerosene, changed drainage system to PVC- both on one property	1	purchased more property
1	chemical toilet	1	put in a propane gas system
1	closed in a porch	2	put in new heating system
4	completely renovated inside	1	rebuilt property- stripped it to the studs. dug up porch and first floor and put in drainage pipes to drain the cellar. pipes go down to hill to bay maybe? is permitted
1	currently building it	1	removed a tree
1	doors	1	renovated bathroom
1	fixed external siding	1	routine maintenance and normal maintenance - deck

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1	general maintenance, chimney, and deck	1	sided the house
1	installed central air conditioning and propane heater	1	sold old house nine months ago
4	interior improvements	1	tore it down and rebuilt
1	landscaping	2	upgraded electric system
4	maintenance	2	upgrading and renovating
1	maintenance, property up and head issues with water	1	upkeep stuff, cleared land/brush between neighbors house, made path to bay

If you are able to within the next 5 years, which of these decisions will you make about your residence(s) on the island?

[rmake1] *Increase the amount of space*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	129	80.6	76.3	160	1.23	1	.488
2	Yes	26	16.3	15.4				

[rmake2] *Winterize it*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	135	84.4	79.9	160	1.18	1	.428
2	Yes	22	13.8	13.0				

[rmake3] *Put it up for sale*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	151	97.4	89.3	160	1.07	1	.299
2	Yes	7	4.4	4.1				
3	don't know	2	1.3	1.2				

[rmake4] *Transfer it to a family member*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	136	85.0	80.5	160	1.18	1	.461
2	Yes	19	11.9	11.2				
3	don't know	5	3.1	3.0				

[rmake5] *Put in a new well*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	154	96.3	91.1	160	1.05	1	.270
2	Yes	4	2.5	2.4				
3	don't know	2	1.3	1.2				

[rmake6] *Upgrade the septic system*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	124	78.0	73.4	159	1.26	1	.533
2	Yes	28	17.6	16.6				
3	don't know	7	4.4	4.1				

[rmake9] Will you be making any other changes?

n	Other Changes	n	Other Changes
1	giving to kids- break up lots	4	new roof
1	hot water	2	new windows
2	improvements/renovation	1	paint exterior
1	maintain septic system	2	painting
1	make house bigger	1	possibly putting up a second floor
1	may change heating system	1	putting in new bathroom

Table split by page break

1	may put in new furnace and switch from electric heat used presently	1	re-do deck
1	might add a smaller outer building for storage	1	replace porch and general maintenance
2	new deck	1	taking down walls inside house
1	new floors, siding	1	upgrade electrical and plumbing systems
3	new/renovating garage		

[mo1-12] In an average year, during which months is your residence usually occupied?

Months	n	Percent of Respondents on PI in each Month
January	68	42%
February	68	42%
March	76	46.9%
April	104	64.2%
May	133	82.1%
June	154	95.1%
July	161	99.4%
August	159	98.1%
September	149	92%
October	126	77.8%
November	87	53.7%
December	74	45.7%

N
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[land1] *Do you own any undeveloped/vacant lots?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	111	67.3	65.7	165	1.33	1	.471
2	Yes	54	32.7	32.0				

[build1] *Is your vacant lot buildable?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	13	24.5	7.7	53	2.17	2	.995
2	Yes / I think so	27	50.9[4]	16.0				
3	Some are / some aren't	4	7.5	2.4				
4	don't know	9	17.0	5.3				

Within the last 5 years, which of these changes have you made to your vacant lot(s) on the Island?

[lmade1] *Left it (them) all vacant*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	11	21.2	6.5	52	1.81	2	.445
2	Yes	40	76.9	23.7				
3	don't know	1	1.9	.6				

[lrmade2] *Sold one or more vacant lots*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	50	96.2	29.6	52	1.06	1	.308
2	Yes	1	1.9	.6				
3	don't know	1	1.9	.6				

[lrmade3] *Built a cottage on a lot and sold it*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	51	98.1	30.2	52	1.04	1	.227
3	don't know	1	1.9	.6				

[lrmade4] Su*bdivided a lot(s) into several other lots*

[4] Read as: About 59.9% of those who own vacant lots report that they are buildable.

Codes	Categories	n	V%	S%
1	No	51	96.2	20.2
2	Yes	1	1.9	.6
3	don't know	1	1.9	.6

N	Mean	Median	Std. Dev.
53	1.06	1	.305

[lmade9] *What other changes have you made?*

n	Other Changes Made to lot(s)	n	Other Changes Made to lot(s)
3	cleared it/them	1	just cut the grass
1	combined lots	1	made pasture land, made a barn
1	cut down trees	1	put a well in one of them

If you are able to within the next 5 years, which of these decisions will you make about your vacant lot(s) on the island?

[lmake1] *Continue to own all the lots and leave them vacant*

Codes	Categories	n	V%	S%
1	No	11	20.8	6.5
2	Yes	37	69.8	21.9
3	don't know	5	9.4	3.0

N	Mean	Median	Std. Dev.
53	1.89	2	.543

[lmake2] *Sell one or more vacant lot*

Codes	Categories	n	V%	S%
1	No	47	88.7	27.8
2	Yes	3	5.7	1.8
3	don't know	3	5.7	1.8

N	Mean	Median	Std. Dev.
53	1.17	1	.509

[lmake3] *Build a cottage on a lot and sell it*

Codes	Categories	n	V%	S%
1	No	46	86.8	27.2
2	Yes	2	3.8	1.2
3	don't know	5	9.4	3.0

N	Mean	Median	Std. Dev.
53	1.23	1	.609

[lmake4] *Subdivide lot(s) into several other lots?.....*

Codes	Categories	n	V%	S%
1	No	48	90.6	28.4
2	Yes	2	3.8	1.2
3	don't know	3	5.7	1.8

N	Mean	Median	Std. Dev.
53	1.15	1	.496

[lmake9] *What other changes will you make?*

n	Other Changes Will Make	n	Other Changes Will Make
2	build a garage/shed on it	1	buy lot next door to make it buildable. cannot get water on lot- not big enough for a well and septic
1	build another house, but keep property	1	combine lots

[liveon] *If you are able to within the next 5 years, will you increase the amount of time you live on the Island?*

Codes	Categories	n	V%	S%
1	No	37	22.4	21.9
2	Yes	75	45.5	44.4
3	Maybe	8	4.8	4.4
4	Already live there year round	41	24.8	24.3
5	don't know	4	2.4	2.4

N	Mean	Median	Std. Dev.
165	2.39	2	1.157

[water] *What is the water source for your property?*

Codes	Categories	n	V%	S%
1	The Prudence Utility Corporation	109	68.1	64.5
2	The Prudence Park Water Association	16	10.0	9.5
3	a private well	29	18.1	17.2
4	there is no water source on the property	1	.6	.6
5	don't know	5	3.1	3.0

N	Mean	Median	Std. Dev.
160	1.61	1	1.010

[water9] *other* (water source)

n	Other Water Source
1	a friend's private well
6	I have a private well too
1	community water system on west side with 15 families
2	one of the two public water options
1	the well along the heritage trail

[pool] *Does your property have a cesspool or a septic system?*

Codes	Categories	n	V%	S%
1	neither one	3	1.9	1.8
2	cesspool	61	38.4	36.1
3	septic system	94	59.1	55.6
4	don’t know	1	.6	.6

N	Mean	Median	Std. Dev.
159	2.58	3	.543

[pool9] *other* (disposal system)

n	Other Disposal System
1	30,000 dollar version septic system
1	barn has septic system
1	have two cesspools
1	leaching field

[quality] *Does the quality of your water influence how much you use?*

Codes	Categories	n	V%	S%
1	No	84	52.5	49.7
2	Yes	72	45.0	42.6
3	don't know	4	2.5	2.4

N	Mean	Median	Std. Dev.
160	1.5	1	.549

[drink] *Does anyone regularly drink tap water on your property?*

Codes	Categories	n	V%	S%
1	drink the water on property	73	46.2	43.2
2	bottled water only	58	36.7	34.3
3	neither one	3	1.9	1.8
4	both	23	14.6	13.6
5	don't know	1	.6	.6

N	Mean	Median	Std. Dev.
158	1.87	2	1.053

[drink9] *other* (water source) - One person said "friend's well."

[filter] *Do you use some form of water filtration system?*

Codes	Categories	n	V%	S%
1	No	64	59.8	37.9
2	Yes	43	40.2	25.4

N	Mean	Median	Std. Dev.
107	1.4	1	.493

[laund] *Is your family's laundry done on the property, or is it taken to the mainland?*

Codes	Categories	n	V%	S%
1	No, laundry is not done on the property	49	31.0	29.0
2	Yes, laundry is done on the property	92	58.2	54.4
3	Laundry is done in both places, on the property and mainland	17	10.8	10.1

N	Mean	Median	Std. Dev.
158	1.8	2	.616

[laundb] *Is your decision not to do laundry on the property influenced by your water quality?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	29	53.7	17.2	54	1.46	1	.503
2	Yes	25	46.3	14.8				

[lawn] *Is the lawn or garden on your property ever watered?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	95	59.7	56.2	159	1.4	1	.492
2	Yes/ I think so	64	40.3	37.9				

[lawn9] *About how often is it watered in an average year*?

n	How Often is Lawn or Garden Watered	n	How Often is Lawn or Garden Watered
1	just in the pots on the deck	2	-water lawn 2-3 times per year
1	tried to grow grass	1	-water lawn 3 times per week
	GARDEN	1	-water lawn 4-8 weeks
2	-water garden	1	-water lawn 6-8 times per year
1	-water garden 2-3 times per week in the summer	1	-water lawn 32 times per year
1	-water garden from the well and a couple of flowerbeds	1	-water lawn 48 times per year
1	-water garden May-September about 1-2 times per week	1	-water lawn 60 days per year
2	-water garden occasionally	1	-water lawn, but it depends on the rain
1	-water garden on weekends	1	-water lawn every day during growing season
1	-water garden once every two weeks	2	-water lawn every other week in the summer
3	-water garden once per week	1	-water lawn in cases of droughts
2	-water garden one hour each night in the summer	1	-water lawn infrequently
1	-water garden sporadically	4	-water lawn occasionally
6	-water gardens when they need it	3	-water lawn rarely
	LAWN	1	-water lawn sometimes in the summer
1	-water lawn 1-2 times a year	1	-water lawn when it does not rain in July and August
4	-water lawn 1-2 times per week	9	-water lawn when it needs it
3	-water lawn 2 times per week in the summer		

[auto] *Does anyone wash their car on your property?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	127	80.9	75.1	157	1.19	1	.394
2	Yes/I think so	30	19.1	17.8				

[auto9] *About how often is it washed in an average year?*

n	How Often is Car Washed	n	How Often is Car Washed
9	1 or 2 times per year	2	occasionally
1	3 times per year	7	rarely
2	6 times per year	1	very seldom
1	10 times per year	1	sporadic
1	12 times per year	2	only if I have to
1	end of every weekend	1	only in early spring
1	every other week	2	just hose/rinse it off
1	infrequently		

[educ] *What is the highest level of school that you completed?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
2	Some high school (1-3 years, 9th-11th)	2	1.2	102	166	5.56	6	1.857
3	High school graduate (4 years)	31	18.7	18.3				
4	Some college (1-3 years)	23	13.9	13.6				
5	Business, technical or trade degree	14	8.4	8.3				
6	Bachelor degree (4 years)	51	30.7	30.2				
7	Some graduate school	7	4.2	4.1				
8	Master's degree	33	19.9	19.5				
9	Ph.D./Doctorate	5	3.0	3.0				

[retire] Are you retired?

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	99	59.6	58.6	166	1.44	1	.566
2	Yes	61	36.7	36.1				
3	Retired from one (or more) job(s), but currently working at another	6	3.6	3.6				

Would you want the Reserve to send you information about;

[more1] *ongoing research projects?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	20	12.1	11.8	156	1.89	2	.350
2	Yes	143	86.7	84.6				
3	don't care/no opinion	2	1.2	1.2				

[more2] *stewardship projects?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	48	29.1	28.4	165	1.73	2	.496
2	Yes	113	68.5	66.9				
3	don't care/no opinion	4	2.4	2.4				

[more3] *volunteering opportunities?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	52	31.5	30.8	165	1.72	2	.516
2	Yes	108	65.5	63.9				
3	don't care/no opinion	5	3.0	3.0				

[more4] summer camp offerings?

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	101	61.6	59.8	164	1.41	1	.541
2	Yes	59	36.0	34.9				
3	don't care/no opinion	4	2.4	2.4				

[more5] wildlife issues?

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	38	23.0	22.5	165	1.79	2	.452
2	Yes	124	75.2	73.4				
3	don't care/no opinion	3	1.8	1.8				

[more6] general environmental issues?

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	20	12.1	11.8	165	1.89	2	.350
2	Yes	143	86.7	84.6				
3	don't care/no opinion	2	1.2	1.2				

[more9] *Other issues?*

n	Other Issues	n	Other Issues
1	believe in conservation of natural resources	1	island
1	berry schedule	1	LNG. plant
1	calendar of events	1	shell fishing
1	don't send information	5	tell me all about what they are doing
1	enough people	1	wants information regarding land management
1	fish	1	water is not chlorinated- should be illegal to sell such dirty water
1	I would like to see people stop developing on the island	3	water issues

[email] *Could I have your e-mail address to send that information to you?*[5]

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	e-mail	45	35.7	26.6	126	1.64	2	.481
2	Snail mail	81	64.3	47.9				

How else might you like to receive information from the Narragansett Bay Research Reserve? Read each response.

[sems] *Through workshops and seminars?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	46	30.7	27.2	150	1.75	2	.546
2	Yes	96	64.0	56.8				
3	don't care/no opinion	8	5.3	4.7				

[news] *Through our newsletters?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	20	13.6	11.8	147	1.88	2	.38
2	Yes	124	84.4	73.4				
3	don't care/no opinion	3	2.0	1.8				

[poster] *Through posters in our kiosks?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	42	28.4	24.9	148	1.77	2	.536
2	Yes	98	66.2	58.0				
3	don't care/no opinion	8	5.4	4.7				

[broch] *Through brochures distributed on Prudence Island?*

Codes	Categories	n	V%	S%	N	Mean	Median	Std. Dev.
1	No	32	21.8	18.9	147	1.82	2	.478
2	Yes	109	74.1	64.5				
3	don't care/no opinion	6	4.1	3.6				

[talka9] *Is there anything that we might have missed in this survey that you feel is an important issue that the Narragansett Bay Reserve on Prudence Island should address? What about public access on Prudence Island, do you want to share any thoughts about that issue?*

n	Important Issue	n	Important Issue
	BOAT ACCESS	1	-want training program on invasive species
1	-add more boat access		PUBLIC ACCESS
1	-Boat ramps handicap accessible in favor on west side prove helpful to residents.	1	-beach access is good as well as all other access.
1	-boaters on the bay should be able to utilize facilities better but in order to do that they need to be made more aware	1	-do not increase public access

[5] All respondent contact information and their preferences indicated for these five variables was recorded (hand written) onto the telephone number spreadsheets.

Table split by page break

3	-need more boat ramp access	1	-do not provide public services or access
	BRIDGE	1	-do not want to see public access increased for day trippers
2	-need a bridge	2	-East side could be more accessible
8	-no bridge or a road to the island	1	-good to have public access. people should not be kept away but it is a fragile place and there needs to be restrictions
	COYOTES	1	-increase public access in the North for cars, but it should be monitored.
1	-coyotes are killing wild cats	1	-increased reserve traffic could put a burden on existing FF volunteers on the island. We are greedy and proud.
1	-saw a coyote on island last summer.	1	-make sure access is good year round
1	-very concerned regarding issues about coyotes supposedly released by state. should be informed on the island- concerned for smaller wildlife, deer and foxes.	4	-more access to north end
	DEER	1	-North end access improved- open to cars.
1	-all good. it is just upsetting what the hunters do.	1	-public access is insufficient, but do not want it to be a haven for people to hang out. the more people, the more things get run down, rules get broken, vandalism
1	-deer hunting- there are areas (heritage area) that are open to hunting that should not be. the deer are disappearing too quickly. the hunters have enough space to hunt, they don't need reserve or heritage space. knows we can not but a fence up, but wishes we could.	14	-need more public access
1	-deer ruining vegetation	1	-no place to park in Bristol and costs 800 dollars per year. cannot park more than one hour on the street.
1	-hunting and poaching is out of control and. homeowners are fine. hunters should never hunt on conservancy land	1	-parking is an issue in Bristol because so much of public is going over.
2	-Save the deer	1	-Public access has to do with it if you know someone but Rhode Islanders should see the beauty of it
	DEVELOPMENT	1	-public access is becoming easier
2	-do not commercialize it	1	-public access needs to be controlled to some extent
1	-do not overdevelop island.	1	-public access should have some oversight made about facilities on the island and supervision needs to occur to ensure they are being used as intended.
1	-general store- what's next?	1	-should be less public access
1	-it is a little detached- good prefer cluster development	20	-There is enough public access, it's good the way that it is now
13	-no new development	1	-wants more meetings about access issues
1	-the public can come. the homestead area of the island is already developed.		PUBLIC BATHROOM
1	-there is no room for new development	1	-need a bathroom at homestead.
1	-West shore is okay to develop	8	-need public bathroom facilities -8
	FERRY	1	-need public bathroom facilities except in south end
1	-ferry arrangement- owned independently- too restrictive. hard to maintain property because of that. parking from ferry- if there is to be growth, that needs to change.	1	-need public bathroom facilities on South end
1	-ferry from other side to old steamship dock- rehabilitate the old dock because it is moving- needs to be renovated- ferry from providence would be welcome		RESEARCH

Table split by page break

1	-ferry service needs tweaking although she does not want to see anymore cars on the island.	1	-the island is changing because more people go each year. the island cannot support it. study should be done to see how many people can live there without hurting the island. the more people that live there, the more the island is likely to lose its balance. Nothing needs to be barred from the residents
5	-ferry should be easier	1	-want to know who is conducting the research.
1	-ferry should go later in the evening	1	-would be nice to know when new research is being done
1	-It would be nice if the ferry ran more frequently. 1:00 ferry.		ROADS
1	-it's difficult because of ferry but also adds to privacy.	1	-close roads in south and certain times of the year
1	-lucky to have a ferry but it is challenging	1	-do not improve the roads
1	-need a ferry to run every half-hour	1	-fix the roads, or keep grass cut down low so you can walk or ride a bike.
2	-need heated/bathrooms on ferry	1	-she wants to go all the way to the north end, there needs to be a road around the whole island.
3	-need more ferries or boats	1	-the roads and could also be improved
1	-need more incoming boats and can come/leave at visitors convenience rather than ferry's convenience		SHELLFISH
3	-no new ferry	3	-the shellfish are disappearing
1	-providing more ways to get there for people that live there.	1	-west side- use to be able to find mussels, no more of them, its all shells... why?
1	-second ferry on west side		TAXES
1	-the ferry service is a monopoly	1	-do not want to participate if they aren't serious. do something about state of providence. too many people and taxes are too high
1	-the guy who owns the ferry is a jerk.	1	-does not have facilities like public restrooms and non-islanders don't know and should know in case they come visit for the day. pay full tax rates and have unpaved roads and no street lights.
1	-very difficult, cannot park in Bristol. Boat is usually full and therefore cannot bring guests. cannot bring cars on boat	1	-I like to know what each individual staff member is doing in detail. why are my taxes so high?
	FIRE	1	-issues with town of Portsmouth and where tax money goes. unify islanders so we can be one voice.
1	-issue of fire danger needs to be addressed.	1	-more public funding available, residents of island carry the bulk of the burden funding it.
1	-not happy with the DEM. need someone down there to protect the land. too many times people leave fires unattended causing problems. if someone gets hurt there is no one to help them, closed camp ground in south end of prudence island.	1	-town of Portsmouth is making money from taxes. and having a hard time with school funding
1	-putting out fires for visitors. "its our home and people aren't always careful."		TICKS/LYME
	GENERAL COMMENTS	8	-get rid of ticks/deer because of ticks
1	-a lot of marsh lands in the middle of the island	1	-grass kept mowed for ticks. more information on lyme disease with physicians who know how to treat it provided to islanders
1	-be friendly to the residents.	1	-keep grass cut all year long, fix the tick problem
1	-don't want large numbers of people coming in and changing the way of life on the island.	1	-lyme disease and ticks, but should not just kill deer; something needs to be done
1	-first trip to the island was in 1938	1	-lyme disease testing
1	-frustrating, annoying in summer and dead in the winter	1	-more research on the ticks
1	-habitat management.	1	-need to spray for deer ticks, malathion? water-soluble, maybe a spraying time

Table split by page break

1	-I really think the turkey issue needs to be addressed. DEM lied to us about the turkeys being able to survive on the island- we need to accommodate the turkey. DEM needs to be held accountable. the Island holds meetings that only a few can attend and you need to not have just a handful of people speaking on behalf of the whole island		TOURISM
1	-LNG- liquefied natural gas- going to bring gas on big ships. this is a huge environmental mistake.	1	-need more tourism
3	-need conservation officer/park police who makes and enforces the laws	2	-no additional tourism
1	-need to deal with invasive plants		TRASH
7	-no more people moving in	2	-hate to see people running amuck by leaving trash being
1	-no woodcutting this year and many people rely on that.	1	-shorelines need to be kept clean
1	-not so much wildlife, issues like drunk driving, more activities for teens, swimming lessons.	1	-why isn't NBRR picking up trash on the beach?
1	-prefer not to have a restaurant on island		T-WHARF
1	-prudence island should become a town	1	-finishing T-wharf and launching pad in potters cove
1	-Quonset point- container port- not against it. RI is losing jobs and catering to old wealth. got permission to cut scrub pines down around Sand point once to preserve the character.	1	-make emergency dock space at T-wharf
1	-should not maintain grass more than they do	1	-Not most welcoming t-wharf- needs more access, more information, accommodation, and maps for trails.
1	-the cheaper the price of gas, the better	4	-T-wharf is not maintained
	NBNERR	1	-T-wharf- good.
3	-good job, very thorough		WATER QUALITY
1	-hours of reserve, want to visit but not sure when it is open.	2	-no sewer, so water looks like tea. sewage is dumped into bay
2	-need more publicity about what they reserve does	1	-no more water wells
1	-newsletters stopped?	1	-pissed off about dirty water at his home. water from springs getting wasted by dumping into the bay.
1	-no advertisements in travel magazine to Prudence or RI	1	-sewage treatment plant is needed for bay. keep water clean for shellfish.
1	-not in favor of increase	1	-very concerned about water supply and issues- went to meeting about water.
	-not sure what reserves actual job is and what they do, want to be informed on that. DEM site visited and saw things she was interested in such as meetings that she was not able to go to. Would like to see the info from the meetings posted on website or sent to her. what is the reserves interaction with the community. also wants more information bout the bay.	1	-want to be sure people do not bring jet ski's- they are too damaging and obnoxious, also afraid of them going into marshland
1	-post at Marcy's	1	-water on the island and ground water increased in use, is it being replenished? water supply!
1	-should not spend a lot of money to promote this.	8	-water quality is an important issue that needs to be addressed
1	-the postcards helped	1	-who is responsible for oversight of the wells on Prudence Island? The number of wells impacts the island. Prudence Utility Corps ability to service all the wells

[talkb9] *What about issues on other islands such as Patience, Hope, or Dyer? Is there anything that you feel is an important issue on these islands that should be addressed? What about public access on these islands, do you want to share any thoughts about that issue?*

n	Important Issue	n	Important Issue
	DUTCH ISLAND	1	-they should remain as undeveloped, we should be able to visit them
1	-clean old lighthouse on Dutch Island	1	-vacant islands- no harm being done.
	DYER ISLAND	2	-want information on preservation and maintenance of these islands
1	-Dyer- concerned if they are trying to keep it undeveloped	1	-worry about LNG and dreading that it will affect bay
1	-been to Dyer. nice to have them uninhabited	1	-would be good to hear that research is being down on them as well
	GENERAL COMMENTS ABOUT THE ISLANDS	1	-would like to have information concerning status, use and occupancy if their current ways change
1	-A ferry service should go there so people can get to know those islands	1	-would like to know more about them. not sure how reserve sponsored day to islands
26	-all fantastic and should be left alone		HOG ISLAND
1	-beautiful at sunset, leave these islands alone.	1	-good to get information on hog island, light house sold recently
1	-blunts marine should be a sanctuary	1	-keep them as sanctuaries, good for eda. ferry service to hog island. nice for occasional field trips once a month so people without personal boats could see
20	-do not know about them		HOPE ISLAND
1	-do not know if the public is all that interested	1	-can anyone even go on Hope Island?
1	-does not know if you can even go to them	1	-Hope good for recreation but should have utilities
1	-fire dept work with the island- fire lane blocked, -put up street signs	2	-Hope should have access- trails for walking
2	-increase access on the islands		MULTIPLE ISLANDS
1	-love to visit someday	1	-Dyer-gull infested- but Hope. needs boat access Patience.
1	-need some time to let people quahog and clean over there	1	-have never spent time on Patience, fished around Dyer
1	-no camping and patrol trash better	1	-never have been to Patience or Hope- only seagulls live there
1	-no desire to go there		PATIENCE ISLAND
1	-not important	1	-Patience could use a real good clean up
1	-nothing on those islands	1	-Patience is building up a little bit, could help pay taxes for government
1	-people should have access. possible campsites or picnic areas	1	-Patience open for deer hunting and not one warden so don't have to check in. need to police the hunting
1	-probably is not all that great. patience perhaps a park	1	-Patience should have some development- wont harm anyone
1	-provide tours or programs for these islands. run a shuttle that brings you to other islands where you can receive tours	1	-Patience with legal campers
1	-they are underdeveloped. cannot go there except by personal boat	1	-stop camping on Patience

The surveyors/callers were instructed to write notes on the surveys in the empty spaces when something arose that did not seem to fit anywhere else. These are those comments.

n	Comments	n	Comments
	CALLER COMMENTS	1	-would participate in NBRR workshops in the summer. Advertise
1	-did not complete the survey. he did not want to finish because he never visits. owns land through father		MULTIPLE PROPERTIES
1	-did not take survey, they just want information	1	-Increased visitation to the reserve via a renovated wharf would have a positive affect. they own three houses

Table split by page break

1	-selected both e-mail and snail mail	1	-just built house on lot- nobody lives there yet
1	-this woman was in a hurry and didn't really seem to care	1	-owns 2 homes. water quality is very good where she lives
	GENERAL COMMENTS	1	-owns 2 houses
3	-age is factor that limits activity	2	-owns 2 lots
1	-attended play by NBRR	2	-owns 3 lots -
1	-do not know enough about the consequences of developing. not sure about the downsides.	1	-owns 4 vacant lots
1	-does not like Robert Greene's project	1	-owns a farm
1	-does not live on Prudence Island full time		NUMBER OF PEOPLE WHO VISIT RESIDENCE PER YEAR
1	-home in family- "4 generations"	1	-5-10 at a time rent. 3-80 years old
1	-homestead part is developed, cannot do much more	1	-does beach clean-ups on own. Has two properties. In the summer only- they have up to 14 people of all ages
1	-I conduct my own clean-ups	1	-DEM suggestions: professional quahogers should be kept away
1	-no activities with NBRR- 73 years old	1	-in the summer the family uses property. other months they visit once a month or every other month
1	-no new development. family owned the whole north end		WATER USE
1	-not good relationship. cannot trust the NBRR	1	-friend has a well- they do their laundry there
1	-she says husband works for conservancy and says she believes most of the questions are non applicable and don't help anyone on the island. she also says that she is really ticked off that they put coyotes on the island to control deer population	1	-have water tested yearly
1	-susp5- depends on what they are. beetle thing?	1	-looking into getting water filtration system
1	-take yourself through the woods trips with markers, we want it back		

APPENDIX E

National Estuarine Research Reserve System
Research and Monitoring Plan 2006 - 2011

Appended to body of plan only

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National Estuarine Research Reserve System

Research and Monitoring Plan (2006-2011)

Appendix E

The National Estuarine Research Reserve System is administered by NOAA's National Ocean Service, Office of Ocean and Coastal Resource Management, Estuarine Reserves Division. For more information, please contact Susan White, Research Coordinator, NOAA Estuarine Reserves Division, at Susan.White@noaa.gov. Or, visit **http://www.nerrs.noaa.gov**.

Appendix E

Executive Summary

This document: 1) describes the current status of research and monitoring efforts within the National Estuarine Research Reserve System (NERRS), 2) describes five research priority areas that the system will focus on over the next five years, and 3) outlines a set of strategies that will enable the system to move forward in conducting and supporting research to address specific coastal management needs as well as improve our basic understanding of estuarine systems.

The five priority research areas were identified with input from a variety of sources including reserve research staff and managers, the NERRS Strategic Plan, and national documents outlining national coastal research needs and priorities. NERRS priority research areas focus on:

- Habitat and Ecosystem Coastal Processes
- Anthropogenic Influences on Estuaries
- Habitat Conservation and Restoration
- Species Management
- Social Science and Economics

Key reserve research goals, objectives, and strategies presented in this research plan will assist the reserve system in addressing the five research priority areas, as well as meeting strategic goals outlined by the system, in the following five years. Social science and economics are disciplines that could engender relevant research related to the priority areas listed. The research goals outlined for this plan include:

Goal 1: Biological, chemical, physical, and ecological conditions of reserves are characterized and monitored to describe reference conditions and to quantify change.

Goal 2: Scientists conduct research at reserves that is relevant to coastal management needs and increases basic understanding of estuarine processes.

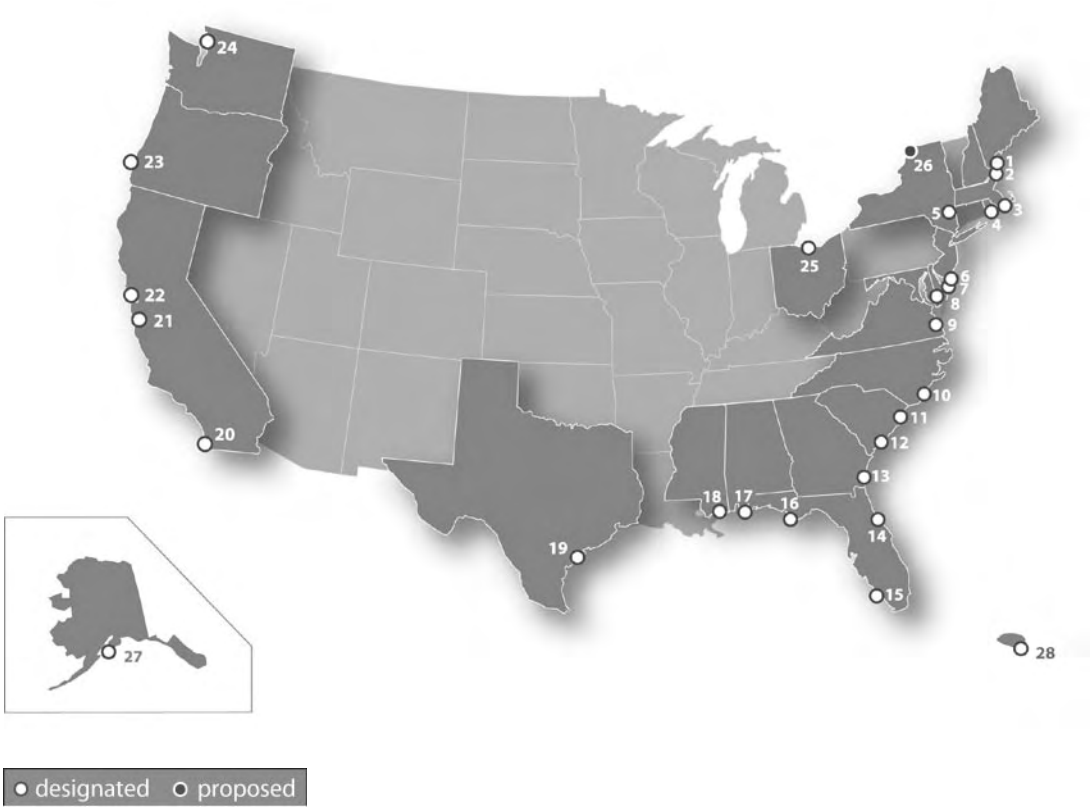
Goal 3: Scientists, educators, and coastal managers have access to NERRS datasets, science products and results.

Goal 4: The scientific, coastal management and education communities, as well as the general public, use data, products, tools, and techniques generated at the NERRS.

The NERRS has developed this research and monitoring plan to guide national, regional, and local research efforts that promote the protection and conservation of estuarine habitats through the provision of improved ecological information.

NATIONAL ESTUARINE RESEARCH RESERVES

A network of 27 protected areas



1. Wells Reserve, Maine
2. Great Bay Reserve, New Hampshire
3. Waquoit Bay Reserve, Massachusetts
4. Narragansett Bay Reserve, Rhode Island
5. Hudson River Reserve, New York
6. Jacques Cousteau Reserve, New Jersey
7. Delaware Reserve
8. Chesapeake Bay Reserve, Maryland
9. Chesapeake Bay Reserve, Virginia
10. North Carolina Reserve
11. North Inlet-Winyah Bay Reserve, South Carolina
12. ACE Basin Reserve, South Carolina
13. Sapelo Island, Georgia
14. Guana Tolomato Matanzas Reserve, Florida
15. Rookery Bay Reserve, Florida
16. Apalachicola Reserve, Florida
17. Weeks Bay Reserve, Alabama
18. Grand Bay Reserve, Mississippi
19. Mission-Aransas, Texas
20. Tijuana River Reserve, California
21. Elkhorn Slough Reserve, California
22. San Francisco Bay, California
23. South Slough Reserve, Oregon
24. Padilla Bay Reserve, Washington
25. Old Woman Creek, Ohio
26. Proposed Reserve—St. Lawrence River
27. Kachemak Bay Reserve, Alaska
28. Jobos Bay Reserve, Puerto Rico

Introduction

The National Estuarine Research Reserve System (NERRS) is a network of 27 reserves dedicated for long-term research, monitoring, education and resource stewardship. These 27 estuaries and coastal watersheds, representing different biogeographic regions of the United States, were established by the Coastal Zone Management Act of 1972. The reserve system operates as a partnership program between the National Oceanic and Atmospheric Administration (NOAA) and the coastal states and territories. NOAA provides funding, national guidance and technical assistance, while the states provide matching funds, personnel, and managerial oversight. Each reserve is managed on a daily basis by a lead state agency or university, with input from local partners. This partnership program between NOAA and the coastal states and territories protects more than 1.3 million acres of estuarine land and water, which provide essential habitat for wildlife; offer educational opportunities for students, teachers and the public; and serve as living laboratories for scientists.

One of the Guiding Principles of the Estuarine Reserves Division (ERD), as outlined by the NERRS Strategic Plan (2005-2010), is to "demonstrate and facilitate the development of sound science and best practices for improved local and regional coastal resource management." The reserve system is also mandated to provide protection of estuarine and coastal natural resources and to promote research and education activities that lead to greater protection of these systems. To facilitate the development of sound science for improved coastal decision making and the protection of natural resources, the reserve system has developed a research and monitoring plan that focuses on integrating the long term research goals of NOAA with those of the reserve system on local, regional, and national scales. As a system, the NERRS will approach research and monitoring from the perspective of an ecosystem approach to management which includes accounting for ecosystem knowledge and uncertainty, engaging in a collaborative and incremental approach to achieving research goals, employing adaptive techniques to improve research efforts, and balancing diverse environmental and societal objectives to inform coastal management decisions.

The purpose of this research plan is to help set priorities, provide a focus for partnership development, and help allocate financial resources and time to high priority issues. In addition, it will inform coastal resource managers and governmental, non-governmental, and academic scientists of the reserve system's research priorities and capabilities. This will serve to both enhance research collaborations and leverage resources to further the state of coastal research science to support improved coastal management. The research plan will also support reserve research, education, and stewardship staff in their efforts to seek

The National Estuarine Reserve System Research Plan

Audiences	Results
Scientists (governmental, non-governmental, and academic)	Communicates reserve research priorities
	Guides collaborative projects
Coastal resource managers	Leverages research resources within NOAA and external to the reserves

National Estuarine Research Reserve System

Vision: Healthy estuaries and coastal watersheds where human and ecological communities thrive.

Mission: To practice and promote coastal and estuarine stewardship through innovative research and education, using a system of protected areas.

external funding for reserve programs related to coastal resource management. As a living document, this five-year reserve research plan provides a basis for refining research priorities and strategies and also allows for the flexibility that is required to support a national research effort that is implemented primarily at local to regional scales. While this iteration of the plan focuses on natural science research, it is anticipated that this plan will be expanded to include research plans that address reserve needs in social science, restoration science, and education research within five years. Refining and aligning national, regional and local research priorities is challenging, yet efforts to do so will continually improve the relevance and impact of NERRS research efforts. While this research plan guides system-wide priorities, individual reserves will also pursue research and monitoring projects that address questions unique to their sites or regions. Reserve management plans will guide individual site-based research and monitoring priorities.

Background

The National Estuarine Research Reserves were established to provide opportunities for long-term research, education, and stewardship. According to 15 CFR Part 921 National Estuarine Research Reserve System Program Regulations, Subpart A, § 921.1 mission, goals and general provisions, three goals stand out as supporting the development of a coordinated research plan for the NERR system.

- Ensure a stable environment for research through long-term protection of NERR resources,

- Address coastal management issues identified as significant through coordinated estuarine research within the System, and

- Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

The authority to develop a system-wide research plan within the NERRS also resides in Title 16, Chapter 33, §1461 National Estuarine Research Reserve System, of the Coastal Zone Management Act (CZMA). Within the CZMA, specific research guidelines address the need for a plan for coordinated research and the development of related performance measures. Specifically, these guidelines suggest:

- Developing a mechanism for identifying, and establishing priorities among, the coastal management issues that should be addressed through coordinated research within the System,

- Establishing common research principles and objectives to guide the development of research programs within the System, and

- Establishing performance standards upon which the effectiveness of the research efforts and the value of reserves within the System in addressing the coastal management issues identified may be measured.

NOAA has recently redesigned its approach to research to follow a more interdisciplinary, cross-cutting strategy to address defined priority research areas (NOAA, 5-yr Research Plan, 2005). The new infrastructure for NOAA's research focuses on four mission goals: Ecosystem, Climate, Weather and Water, and Commerce and Transportation Goals. The reserve system is a strong contributing member of the Coastal and Marine Resources Program within the Ecosystems Goal Team. The reserve system also contributes indirectly to the Climate Goal as well as the Weather and Water Goal. The mission of the Ecosystems Goal is to protect, restore, and manage the use of coastal and ocean resources through an ecosystem approach to management. Through the integrative and collaborative efforts of reserve research, education, and training activities, coastal ecosystems will be better understood and coastal decision making will improve.

National Oceanic and Atmospheric Administration

Vision: Societally relevant research that forms the scientific basis for more productive and harmonious relationships between humans and their environment.

Mission: To conduct research, develop products, provide scientific understanding and leadershipand to conduct outreach towards fostering NOAA's evolving environmental and economic mission.

NOAA's Ecosystem Goal Team Selected Outcomes

- **Healthy and productive coastal and marine ecosystems that benefit society.**
- **A well informed public that acts as stewards of coastal and marine ecosystems.**

Existing NERRS Research and Monitoring Programs

NERRS System-Wide Monitoring Program

The NERRS System-Wide Monitoring Program (SWMP; pronounced "swamp") was developed in 1995 to provide researchers, resource managers, educators, and other coastal decision makers quantitative measures with which to assess short-term variability and long-term change in estuarine conditions. At present, the program is moving into its second decade of collecting critical estuarine water quality and meterological data. A key feature in establishing SWMP was the implementation of a set of consistent standard operating procedures that ensure the long-term collection of data that is comparable across time and locations. As such, SWMP is able to provide robust data for such things as, for example, trend analysis and change detection of anthropogenic impact assessments, as well as the effects of large-scale forcing (e.g., El Niño/Southern Oscillation and North Atlantic Oscillation, climatic conditions, sea level rise, and global climate change) and localized, stochastic events (e.g., hurricanes and contaminant spills) on estuarine conditions within a reserve. By implementing these standard operating procedures in a coordinated fashion across all 27 reserves, SWMP data can also be used for meaningful comparisons of estuarine conditions at the regional and national levels, thus enhancing the value of the reserves as a system of national reference sites. Thus, SWMP provides valuable short- and long-term data to researchers, natural resource program managers, coastal educators, and other coastal decision-makers.

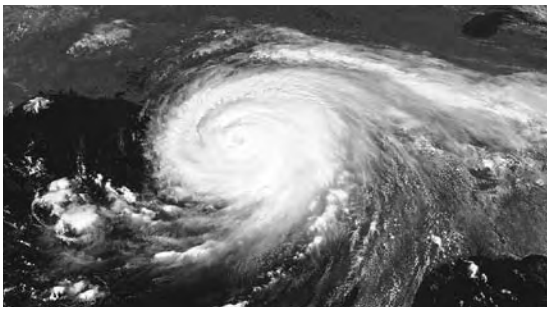


Photo Credit: NOAA's National Environmental Satellite, Data, and Information Service (NESDIS)

The NERRS System-wide Monitoring Program (SWMP) is able to provide both long-term data for trend analysis and change detection as well as data on the impact of localized, stochastic events such as Hurricane Katrina (2005) on estuarine conditions within reserves.

The NERRS and NOAA established SWMP as a phased monitoring approach that focuses on three different ecosystem characteristics:

Abiotic Factors, including: atmospheric conditions, water quality (nutrients, contaminants, etc.) and physical parameters (salinity, tidal range, groundwater, freshwater inflow, bathymetry, etc.);

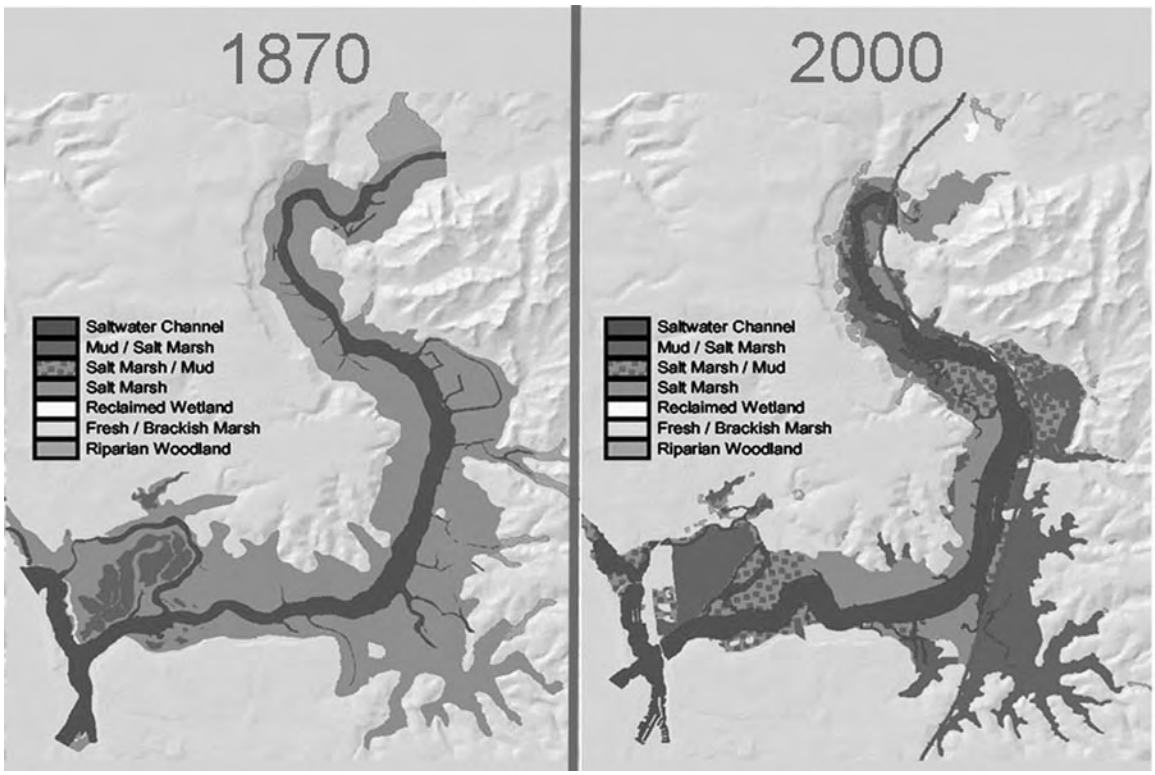
Biological Monitoring, including: biodiversity, habitat and population characteristics;

Watershed and Land Use Classifications, including: changes in consumptive and non-consumptive uses.

Phase 1 of SWMP focuses on monitoring a suite of water quality and meterological parameters over a range of spatial (local, regional, national) and temporal (minutes, hours, days, months, years) scales. Data loggers are continuously deployed at a minimum of at least four water quality stations at each reserve to record measurements of conductivity, salinity, temperature, pH, dissolved oxygen, turbidity, and water level at thirty minute intervals. Each reserve also collects monthly measurements of water column nutrients (e.g. nitrate, nitrite, ammonia, and ortho-phosphate) and chlorophyll-a concentrations at the four stations. In addition, diel sampling (2.5 hour sampling intervals over 25 hours) for nutrients and chlorophyll-a occurs at a minimum of one site each month. At least one weather station at each reserve records meteorological measurements of local temperature, wind speed and direction, relative humidity, barometric pressure, rainfall, and Photosynthetic Active Radiation at 15- to 30-minute intervals. Reserve staff have laid the technical groundwork necessary for the phase-one SWMP data collection network to be integrated into the backbone of the United States' Integrated Ocean Observing System (IOOS), with a near-real-time telemetry system for timely dissemination (NOAA 2004).

Photo Credit: Rookery Bay National Estuarine Research Reserve

Conservative estimates for the volume of data collected by the NERRS abiotic sampling program are: 13.5 million data points for water quality, 34.4 million data points for meteorological monitoring, and 31,104 data points for nutrient monitoring.



Wetland change analysis within the Elkhorn Slough, CA NERR utilizing habitat mapping techniques to quantify a 50% loss in marsh vegetation in the past 150 years (Van Dyke and Wasson 2005).

Phase 2 of SWMP focuses on characterizing biotic diversity in reserve estuarine ecosystems by assessing community composition and species abundance and distributions. Reserve projects will explore patterns of inter-annual variability and spatial distribution of estuarine communities, including emergent and submerged vegetation, invasive species, benthic, plankton and nekton communities, as well as targeted monitoring for the occurrence and distribution of invasive species. Since 2004, biomonitoring demonstration projects at 16 reserves have focused on developing baseline information on submerged and emergent vegetation distribution for use in future land use change research, determining changes in the health and distribution of these communities with long-term changes in water quality and quantity, and quantifying changes in estuarine habitat types. Rigorous protocols were established to ensure a national strategy for implementing this biomonitoring initiative, while retaining local flexibility as appropriate for individual reserves (Moore and Bulthius 2003). There are currently plans for a special journal edition focusing on local, regional, and national application of this biological monitoring information.

Phase 3 of SWMP is well-aligned with phase 2, as both of these efforts utilize remote sensing imagery and ground truthing. The central objective focuses on tracking and evaluating changes over time in coastal and estuarine

habitat and land use in the watershed. Reserve staff have developed a common classification system to provide the system with consistent, and thus nationally comparable, habitat and watershed mapping efforts (Kutcher et. al. 2005). The use of a common classification system will enable the NERRS to assess habitat change at local, regional, and national scales and identify the status of coastal habitats (i.e., degrading, improving, or maintaining). In addition, system-wide use of this classification system will provide a baseline of information that can be applied to management and restoration activities and guide conservation and protection of these important habitats. Currently, five reserves have piloted this classification system and the protocol was refined in the fall of 2005. It is anticipated that this classification system will be adopted by the reserves in 2006. Phases 2 and 3 will be implemented as resources become available.

Further details regarding parameters measured, data acquisition, data dissemination, deployment protocols, developing phases of SWMP, and applications of NERRS SWMP data within research, coastal decision making and education communities are available in the NERRS SWMP Plan (NOAA, 2002; Appendix A) and the NERRS SWMP 10th Anniversary Report (Owen and White, 2005). To ensure the collection of accurate, high quality SWMP data, the reserve system established a Centralized Data Management Office (CDMO; http://cdmo.baruch.sc.edu) in 1995. Quality assurance/quality control protocols have been established for the collection of all monitoring parameters and for the metadata (FGDC content compliant) associated with the time-series datasets.

A number of publications use and synthesize SWMP data. A recent special issue of the Journal of Coastal Research highlights a number of reserve research efforts (Kennish and Finkle 2004), and past syntheses have produced additional information regarding patterns within the reserve system (Wenner et. al., 1998 and 2000).

NERRS Graduate Research Fellowships

The NERRS Graduate Research Fellowship (GRF) program provides master's degree students and Ph.D. candidates with an opportunity to conduct research of local and national significance focusing on enhancing coastal zone management. Since its inception in 1997, the program has funded more than 160 fellows from 56 universities across the country. The five research focus areas for the GRF program are: eutrophication, effects of non-point source pollution and/or nutrient dynamics; habitat conservation and/or restoration; biodiversity and/or the effects of invasive species; mechanisms for sustaining resources within estuarine ecosystems; and economic, sociological, and/or anthropological research applicable to estuarine ecosystem management (Figure 1).

Reserve Site-Specific Research

The National Estuarine Research Reserves serve as living laboratories for on-site staff, visiting scientists and graduate students. Since its inception, a primary goal of the program has been to ensure a stable environment for research through long-term protection of reserve resources and ecosystems. Reserve management plans include site-based research

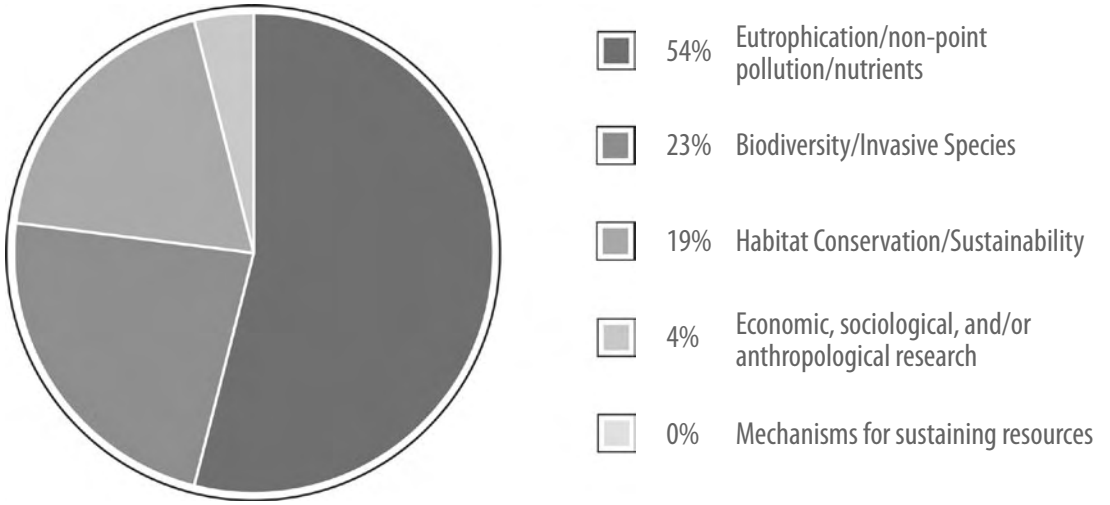


Figure 1. *Snapshot of NERR Graduate Research Fellowship research project focus areas for 2005.*

and monitoring priorities. Research activities within the reserve system occur in a number of ways. Each reserve has a research coordinator who is primarily responsible for coordinating research and monitoring efforts that occur within the reserve. As a group, the research coordinators' scientific expertise encompasses a wide range of subjects including nutrient biogeochemistry, population, community and ecosystem ecology, and physical oceanography. The breadth of knowledge and expertise that is shared among research coordinators constantly improves and pushes the reserve system toward new and successful research opportunities focused on improving coastal management decisions at individual reserves and nationally. In addition, scientists from a variety of backgrounds (e.g. academic, non-governmental, state and federal governments) conduct research within each reserve in coordination with reserve research staff. This also broadens the scientific knowledge base for the NERRS.

Research and Monitoring Partnerships

Additional research and monitoring efforts within the reserves are supported by a series of partnerships within NOAA and other programs. Examples of these partnerships include:

- The Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET) is supported through a partnership between NOAA and the University of New Hampshire (http://www.ciceet.unh.edu). Research projects funded by CICEET occur within reserve boundaries or the adjacent watershed and focus on a variety of environmental issues from habitat restoration research to developing and piloting new technologies to monitor water quality and contaminants.

- NOAA's Chesapeake Bay Office (NCBO) and the NERRS support specific research and monitoring programs that focus on understanding and restoring Chesapeake Bay communities.

- NOAA's Coastal Services Center (CSC) has supported remote sensing and geographical information system (GIS) tools, training, and development programs within the reserve system.

- NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) has partnered with reserve sites to demonstrate the effectiveness of collaboration to produce an improved, more effective product that will be used by coastal managers and others for improved decision making. CO-OPS National Water Level Observation Network (NWLON) is expanding to include reserve sites in an effort to link SWMP data with more detailed tide, water level, and weather information within the Reserve.

- NOAA's National Weather Service (NWS) and National Environmental Satellite, Information, and Data Service (NESDIS) have partnered with the NERRS to deliver newly telemetered, real-time, SWMP weather and water data through NOAA's Geostationary Operational Environmental Satellites (GOES) and the NWS's Hydrometerological Automated Data System (HADS) to the NERRS Centralized Data Management Office.

- NOAA's Sea Grant Programs, Coastal Zone Management Programs, and National Marine Sanctuary Programs support research projects that address priority research needs within or adjacent to reserve sites.

- The National Atmospheric Deposition Program (NADP)/National Trends Network (NTN) and United States Geological Survey (USGS) have established atmospheric deposition monitoring programs within and close to reserve boundaries.

- The Environmental Protection Agency's National Estuary Program (NEP) and the NERRS collaborate at local scales to accomplish research that is relevant for both programs and at national scales to improve science information exchange bewteen programs.

- The Smithsonian's Environmental Research Center (SERC) and the NERRS have ongoing collaborations that focus on monitoring and forecasting expansion and distribution of invasive species within the reserve system.

- NOAA's National Centers for Coastal Ocean Science (NCCOS) collaborates with the reserve system to investigate long-term trends in eutrophication and contaminants in estuarine systems across the nation. The reserves continue to be involved in NCCOS's national estuarine eutrophication assessments and the Mussel Watch Program.

- NOAA's Educational Partnership Program (EPP) established the Environmental Cooperative Science Center (ECSC) in October 2000 with Florida A&M University in collaboration with Delaware State University, Jackson State University, Morgan State University, South Caro-

lina State University, and the University of Miami Rosenstiel School. The ECSC addresses ecological and management issues through studies and collaboration with several NERR sites and the Florida Keys National Marine Sanctuary. The ECSC NERR partners include: Apalachicola, FL NERR; Grand Bay, MS NERR; ACE Basin, SC NERR; Delaware NERR; and Chesapeake Bay, MD NERR.

- The National Science Foundation's coastal Long-term Ecological Research (LTER) sites offer the NERRS additional research and collaborative opportunities. Sapelo Island NERR is located within the Georgia Coastal Ecosystems LTER site.

Research Plan Framework and Development

The research plan for the NERRS has been developed to address topic areas and technological needs identified at national, regional, and local levels. Considerable challenges must be overcome to develop a coherent national research plan for the reserve system that can simultaneously incorporate and accommodate the flexibility in approaches and design that are necessary to meet local and regional coastal research and management needs, while also addressing nationally significant coastal issues. Scaling research priorities up from a local and regional perspective to address nationally relevant coastal issues requires the reserves to constantly evaluate how individual reserve research can support broader national estuarine information and application needs.

Development of this plan has been coordinated by NOAA's Estuarine Reserves Division with primary input from the individual reserves and NOAA's Office of Coastal Resource Management. Reserve research coordinators and managers contributed directly to the formulation of this plan by identifying the primary research needs and coastal management issues within reserve sites (Appendix B). The plan incorporates information contained in several documents produced by the reserve system including the NERRS Strategic Plan for 2005-2010 (Appendix C), the NERR System-Wide Monitoring Plan, NERR management plans, site profile documents (Appendix D), and local needs assessments conducted by the NERR Coastal Training Programs. Additional research needs and coastal management issues were identified through the findings of several recent compilations including: (a) the CICEET survey of coastal management needs for new and improved technology (2004); (b) the Coastal States Organization (CSO) census of national and regional priorities to improve links between science and coastal management needs (2004); (c) the CSO survey of state coastal observational and monitoring needs (2004); (d) research needs for coastal resource management identified by the Estuarine Research Federation (ERF, 2005); (e) the National Research Council priorities for coastal ecosystem science (1994); (f) the PEW Ocean Commission Report; and (g) findings from the U.S. Commission on Ocean Policy (2004). As an example of the range of coastal management priorities identified, Table 1 presents CSO's results for both national research needs and needs identified by NERRS Manager's as well as key estuarine threats identified by the PEW Ocean Commission. Information provided by these sources has been used to identify a series of reserve research priorities that are both nationally relevant and tailored to meet the regional and site specific needs of individual reserve sites.

Table 1. *Coastal management research needs and threats identified from surveys conducted by the Coastal States Organization and PEW Ocean Commission.*

The Coastal States Organization top ranked research needs:

Top National Level Research Needs	Top NERR Research Priorities
Cumulative Effects	Cumulative impact assessment
Source identification and tracking	Ecosystem indicators
Trends/change analysis	Source identification and tracking
Remote Sensing	Improved models
Improved Models	Rapid detection and monitoring of invasive species
	Risk and vulnerability assessments
	Restoration prioritization
	Ecological characterizations

The PEW Ocean Commission identified the following key estuarine threats and pressures:

Coastal development
Nutrient runoff into coastal rivers and bays
Unsustainable fishing activities impacting nearshore/estuarine systems
Invasive species introductions
Global climate change impacts

The framework for the NERR Research Plan provides a pathway for integration and support of site-based research projects to meet local, regional, and national coastal and estuarine management needs (Figure 2). Science investigations and research projects undertaken at individual NERR sites are supported by state, NOAA, and other sources, and are typically conducted by NERR scientists, graduate students, visiting investigators, contractors, and volunteers to meet the needs identified by local and regional coastal resource managers. Taken collectively, the research effort undertaken within the network of NERR sites contributes in a "bottom-up" manner to the goals and objectives of the NERR Research Plan. Conversely, the NERR Research Plan serves a "top-down" role to provide guidance, coordination, and the national context to support site-based research within the NERRS network. Financial support for the site-based research activities is typically derived from the states, federal agencies, regional programs, non-governmental organizations, and/or other sources depending on the topic and focus of the research problem. As the focal point for coordination of NERRS science activities, the NERR Research Plan serves as an integral element of the NERR Strategic Plan for 2005-2010. The NERR Strategic Plan functions to coordinate the research and monitoring

activities with other elements of the NERRS (e.g., education/outreach, coastal training, resource stewardship, and management). This in turn serves to facilitate investigations undertaken by multiple reserves, and to leverage support for NERRS research internally in cooperation with other NOAA science programs and externally in partnership with outside groups. Science activities completed under the guidance of the NERR Strategic Plan and NERR Research Plan contribute to the objectives of the NOAA-wide Research Plan (2005), and they address the cross-cutting issues identified by the Ecosystem Goal for Coastal and Marine Resources. Collective integration of NERRS science at many levels (e.g., NERRS sites, NERR Research Plan, NERR Strategic Plan, NOAA Research Plan) will help meet a sub-set of the national priorities for coastal and estuarine ecosystem science.

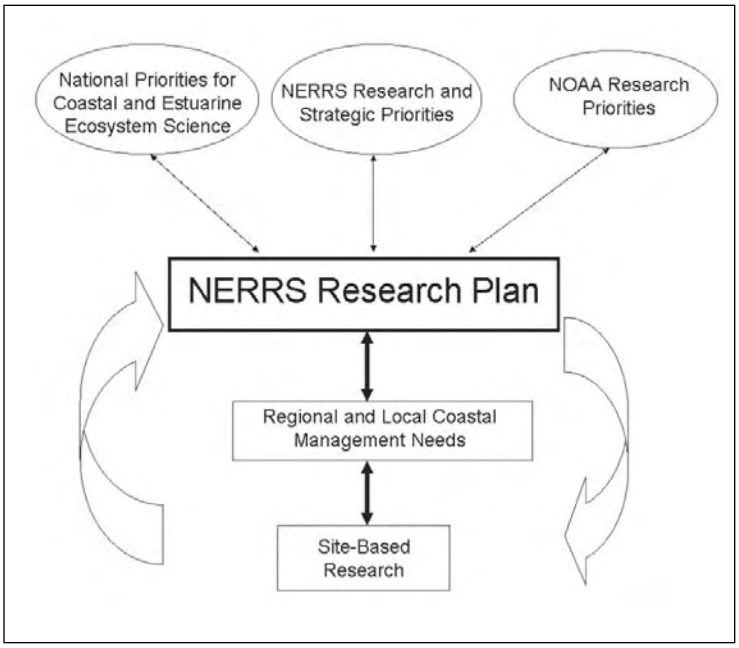


Figure 2. *The development components and anticipated science contributions associated with the NERRS Research and Monitoring Plan at local, regional, and national scales.*

Priority Coastal Management and Research Issues

The U.S. Commission on Ocean Policy recommended that NOAA adopt an ecosystem-based approach to the development of coastal and ocean policy that is based on the best available science for marine and estuarine ecosystems. NOAA's focus on protecting, restoring, and managing the use of coastal and ocean resources through an ecosystem approach is closely aligned with the specific research activities undertaken within the reserve system. The NERR Research Plan nests within the broader, NOAA 5-Year Research Plan, while simultaneously addressing the regional and local needs of the reserves.

The highest priority U.S. coastal management issues identified at both the national and regional levels focus on assessments of impacts due to changing shoreline and watershed land use and coastal habitat change (Table 1). It is clear that nationally and regionally, coastal managers are concerned about increased development pressures in coastal and estuarine areas, and are supportive of research and monitoring efforts that will address the growing need for information to document impacts on the coastal environment. Environmental contamination, habitat

degradation, eutrophication, invasive species, declines in fish species, freshwater diversions, sea level changes, and sediment problems are significant stressors to coastal and estuarine ecosystems. Consequently, it is not surprising that the top-ranked research needs for coastal managers are: (a) new approaches to address the cumulative effects of multiple environmental stressors, and (b) source identification and tracking for coastal environmental pollutants. Priority information needs identified by the U.S. coastal management community include quantitative data to describe temporal trends and changes in land use, coastal habitats, and habitat quality, and the priority needs for new technology focus on development of useful products from remote sensing imagery and improved conceptual and numerical models to predict the consequences of stressors on environmental change.

The priority research needs identified by the estuarine research community (e.g., academia, agencies, NGOs, and private-sector scientists; ERF, 2005) are highly complementary to those identified by the U.S. coastal management community. The highest priority research needs are: (a) investigations of anthropogenic impacts on estuarine ecosystem functions; (b) documentation of linkages among coastal land use activities and estuarine habitats; (c) increased understanding of environmental variability, sensitivity, and resilience; and (d) new infrastructure to link estuarine science, management, and policy (ERF, 2005). These priority estuarine research issues are consistent with the priorities for coastal ecosystem science identified by the National Research Council (i.e., integrated monitoring of coastal habitats; watershed hydrology and ecosystem processes; water quality and aquatic ecosystem functions; ecological restoration and rehabilitation; development of observational and predictive systems). In combination, the priority research needs identified by the U.S. coastal management and research communities clearly articulate a suite of pressing science-management issues that can be addressed by the network of representative reserve sites and the NERRS Research Plan. For example, within individual reserves, program priorities are broadly focused on research regarding habitat change/land use, cumulative impact assessments, tracking of pollutants, development of indicators that link land use with ecosystem impacts, estuarine ecosystem functions, invasive species, land use change analysis, the success of restoration efforts, habitat use by fish and shellfish, integrated monitoring, and improved models that predict and/or simulate changing environmental conditions.

National Estuarine Research Reserve System Research Plan

The NERRS Strategic Plan outlines four priority coastal management issues; land use and population growth, habitat loss and alteration, water quality degradation, and changes in biological communities. The five main NERRS research priority areas clearly address these identified estuarine threats and the supporting research questions, goals and strategies described below will enable the NERRS to better understand estuarine processes, provide scientific data that can be applied and thus improve coastal management decisions and the protection of estuarine habitats (Figure 3).

The five main NERR research priority areas were identified as a result of information complied from within the NERRS, NOAA and external sources as outlined previously. NERR research priority areas include:

- Habitat and Ecosystem Coastal Processes
- Anthropogenic Influences on Estuaries
- Habitat Conservation and Restoration
- Species Management
- Social Science and Economics

Research projects that are designed to tackle NERRS research priority areas will clearly address the four priority coastal management issues identified within the NERRS Strategic Plan and thus support improved coastal decision making and a greater understanding of estuarine systems. The research categories are interrelated on one or more levels. In addition, research can include natural or social science research. For example, social science and economic research can be used as a tool to address natural science issues. In the true ecological sense, this is a web of research topics with threads leading from topic to topic. NERRS- specific research questions are focused on coastal management issues related to these five priority areas.

Key Questions for each priority area might include:

Habitat and Ecosystem Coastal Processes

- What are the natural scales of variability in coastal and estuarine ecosystem processes?
- How do short-term climatic events (e.g., tropical storms and hurricanes), and large-scale events (e.g., El Nino, North Atlantic Oscillation, global climate change) impact estuarine water quality parameters and estuarine habitats?
- How do variable watershed inputs and oceanic physical forcing drive changes in estuarine ecosystems (including nutrient cycling, sediment transport, larval transport, etc.)?

Anthropogenic Influences on Estuaries

- How do human activities impact estuarine water quality, living resources (e.g.,

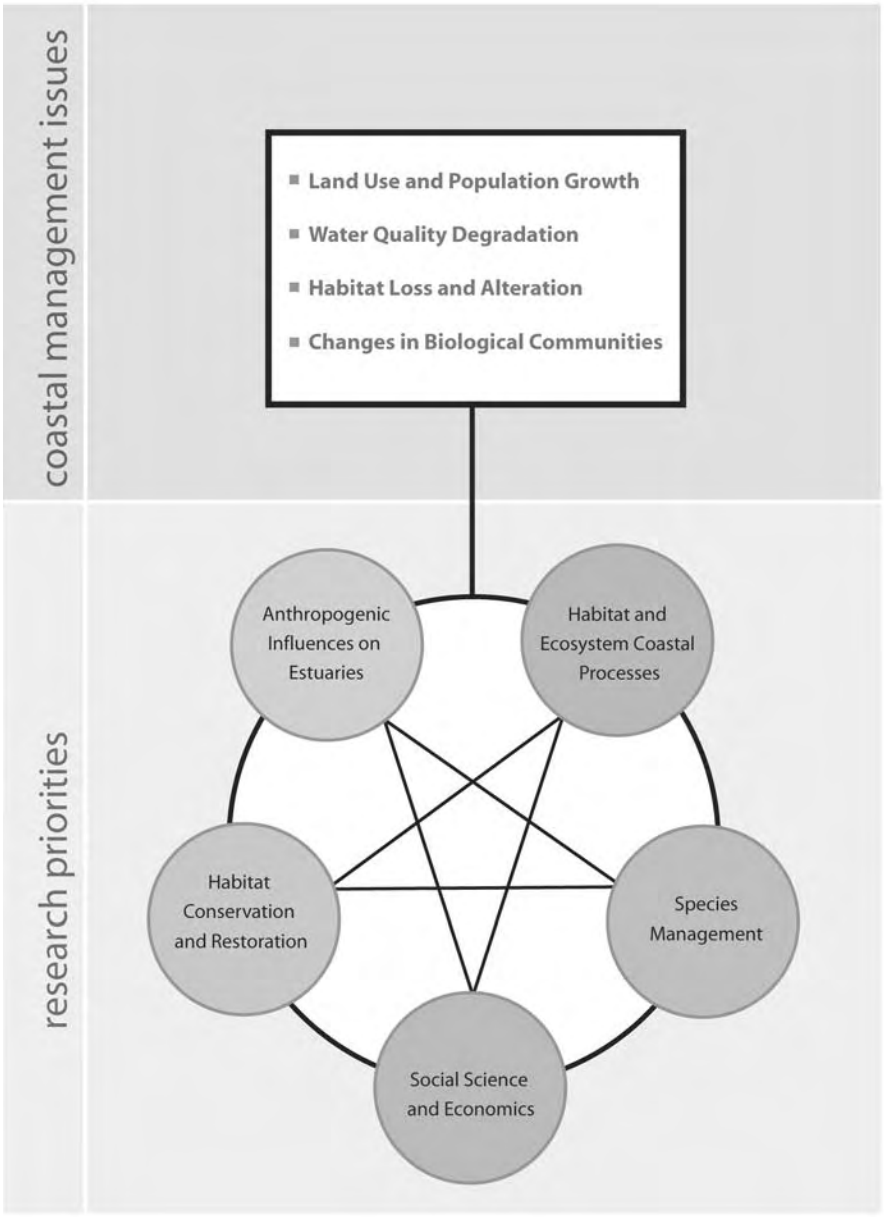


Figure 3. *The 5 NERRS Research Priorities, anthropogenic influences on estuaries, habitat and ecosystem coastal processes, habitat conservation and restoration, species management and social science and economics address key coastal management issues.*

submerged aquatic vegetation, benthic communities, habitat fragmentation), and ecosystem function (or "services")?

- Are current watershed and coastal nutrient management measures effective in minimizing impact to estuarine ecosystems and resources?
- What is the magnitude and impact of atmospheric deposition on estuaries?

Habitat Conservation and Restoration

- What impacts does climate change have on habitat integrity and restoration success?
- How does the restoration of tidal hydrology impact estuarine communities (e.g. colonization of invasive species, resiliency of native species, etc.).
- What are the linkages between adjacent upland habitats and tidal wetlands and how critical are those links to the recovery of wetland function?
- What invasive species control methods are effective?
- How can reserves serve as reference sites for restoration efforts?

Species Management

- How do invasive species affect native species and communities?
- What tools can be developed and used to detect invasive species, respond rapidly and appropriately to these events, and monitor for additional impacts?
- Can natural variations in the distribution and density of organisms be distinguished from human impacts on these populations?
- How do estuarine and coastal communities and individual species populations change under varying environmental conditions?
- How are estuarine species and communities affected by landscape or watershed scale changes (e.g., habitat proximity, subtidal-intertidal linkages, connectivity)?

Social Science and Economics

- How are coastal populations demographics changing and how does this/will this impact natural resource protection and management?
- What are the economic tradeoffs/effects of increasing development and urbanization in the coastal zone on traditional commercial enterprises such as seafood harvesting, etc.?
- How do human perceptions of health risks influence coastal decision making and natural resource protection?
- What are the cumulative impacts of multiple human recreational and economic activities on the coastal environment?

Implementation Strategy

Research Goals

The reserve research and monitoring plan includes a number of priority goals for the system (a few of which are outlined below) to support national and regional efforts toward improving the protection of coastal and estuarine natural resources by conducting research that supports sound coastal decision making. These goals are not meant to be an exhaustive list as by definition this research plan is designed to be supportive of regional and local research initiatives that address reserve system and NOAA research needs. The goals listed below provide a basic foundation on which reserve science efforts can build. It is fully anticipated that these strategies will be modified appropriately over time as the Reserve system continually assesses the quality and impact of research results and products in order to continue to improve and sustain coastal environments (Appendix E). The desired ecosystem approach to management is an iterative process, where results from previous actions and research are used to refine and improve future efforts in research and management decisions. Implementation of some strategies depends on the availability of sufficient resources.

Research Goal 1: Biological, chemical, physical, and ecological conditions of reserves are characterized and monitored to describe reference conditions and to quantify change.

Objectives:

1. Water and weather parameters, biodiversity, and habitats located within the reserve and nearby watershed areas are sufficiently characterized, both spatially and temporally, to support trend analysis efforts.

2. Biological monitoring data collected by the reserve system are incorporated into an accessible database for use.

3. Biological monitoring efforts within the NERRS are synthesized regularly as appropriate at national, regional and local scales.

Strategies:

- Complete site profiles.

- Continue system-wide measurements of the short-term variability and long-term changes in estuarine water quality and meteorological parameters, consider expanding suite of standard water quality parameters tracked (e.g. addition of chlorophyll a to fixed station sampling) as possible.

- Collect system-wide measurements of the short-term variability and long-term changes in submerged aquatic vegetation and emergent vegetation.

- Collect additional appropriate biological monitoring information on important

habitats, species, and ecological functioning within reserves.

- Link system-wide measurements of chemical and physical parameters with biological monitoring information.
- Implement a system-wide habitat classification system that allows for site specific and system-wide analysis.
- Synthesize biological monitoring pilot project data and revise protocol to reflect lessons learned and move toward system-wide operational status.
- Develop a system-wide remote-sensing strategy that supports and enhances ongoing biological monitoring and habitat classification efforts.
- Partner with appropriate university, state agency, federal agency, local government and private entities to bring monitoring of sediment quality, benthic communities, nekton populations and shoreline change into reserves.
- Integrate NERRS monitoring data into the national IOOS program.

Research Goal 2: Scientists conduct estuarine research at reserves that is relevant to coastal management needs and increases basic understanding of estuarine processes.

Objectives:

1. Research efforts focus on understanding the response of estuarine and coastal processes to specific natural and anthropogenic impacts.
2. Research efforts focus on estuarine habitat and species management and the restoration of critical ecosystem function.
3. Research efforts incorporate an ecosystem-based approach to management that involves multiple stakeholders.
4. Scientists from multiple agencies (ie. academic, governmental, NGO's, etc.) utilize reserves as a platform for research.

Strategies:

- Attract CICEET, GRF, and external researchers to reserves to work on priority research topics: habitat and ecosystem coastal processes, anthropogenic influences on estuaries, habitat conservation and restoration, species management, and social science and economics.
- Revisit GRF priority research areas to update them as appropriate to reflect NERRS coastal management needs.
- Utilize SWMP data to drive hypothesis driven research within reserves and adjoining watersheds.

- Support ecosystem-based approaches to coastal research and management projects that incorporate adaptive management strategies to improve research efforts and applications.

- Design and regularly update a database that archives and tracks research projects within the NERRS that are supported by non-Section 315 NERRS funding (i.e. other NOAA monies, academic, NGO, external funding sources, etc.) and address priority coastal management and estuarine research needs.

- Improve current partnerships and explore new opportunities to leverage resources that support reserve priority research efforts.

- Facilitate research efforts between and across NERRS, both regionally and nationally, to address important coastal issues.

- Design a regional or national assessment of the NERRS that integrate research results from the reserves to determine if NERRS environmental conditions are improving or declining and why (i.e. a "report card" for the NERRS).

Research Goal 3: Scientists, educators, and coastal managers have access to NERRS datasets, science products and results.

Objectives:

1. Scientists are aware of available NERRS datasets and research products.

2. Biological monitoring data is available for academic scientists, coastal managers, and educators to use.

3. Data visualization products are available.

Strategies:

- Develop a useful and informative database for accessing past and current research projects, data, and resulting publications and products.

- Establish a data management strategy and database to support biological monitoring and land use/habitat information.

- Disseminate science through publications, outreach and technology transfer.

- Develop and implement appropriate communication tools to increase awareness of science conducted, data application, and data availability within the NERRS.

- Assess CDMO capabilities and needs in relation to expanding NERRS research and monitoring, data accessibility, and data visualization efforts.

Research Goal 4: The scientific, coastal management and education communities, as well as the general public, use data, products, tools, and techniques generated at the NERRS.

Objectives:

1. Researchers and coastal managers identify priority resource needs that will improve research activities at the local, regional, and national scales.

2. Enhance the use of NERRS scientific data in coastal training, stewardship, and education programs within the NERRS.

3. The NERRS are increasingly recognized as a primary source of information about estuaries and coastal areas.

Strategies:

- Re-evaluate priority research needs biennially.
- Revise and update SWMP Plan based on NERRS research and monitoring needs.
- Conduct a SWMP External Review.
- Coordinate with education and outreach professionals early in the formation of research activities, where feasible, to target educational product development and dissemination from research activities.
- Provide science based information and training to individuals and organizations that make decisions about coastal resources on a regular basis in a professional or volunteer capacity.
- Improve the ability of restoration practitioners to restore and protect coastal ecosystems.
- Provide science based information to assist in the production and dissemination of educational materials and web based products that use science generated at the reserve.
- Provide science based information and training to citizens so that they can make informed decisions about protecting coastal resources through their own actions.

Appendices:

A. NERRS SWMP Plan Executive Summary

B. Regional NERRS research priority issues

C. NERRS Strategic Plan (2005-2010)

D. NERRS Site Profile Status

E. Key milestones anticipated for achieving NERRS research goals

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APPENDIX F

NBNERR Senior Advisory Committee
as of 2006-2007

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Table F1. Reserve Senior Advisory Committee Participants

Participant	Organization	Role/Position
W. Michael Sullivan	RIDEM	Director
Larry Mouradjian	RIDEM	Associate Director Natural Resources
Scott Millar	Sustainable Watersheds Office, RIDEM	Chief
Bob Stankelis	Narragansett Bay NERR, RIDEM	Reserve Manager
Larry Taft	Audubon Society RI	Executive Director
Curt Spaulding	Save the Bay	Executive Director
Richard Ribb	Narragansett Bay Estuary Program	Director
Pete August	Coastal Institute, URI	Director
Jonathan Garber	Atlantic Ecology Div,, USEPA	Director
Bob Gilstein	Town of Portsmouth	Town Manager
Kevin Flynn	Div. of Planning, State of RI	Associate Director
Grover fugate	Coastal Resources Management Council, RI	Executive Director
Bob Marshall	Prudence Conservancy	Chair
David Gregg	Rhode Island Natural History Survey	Executive Director
Mike Lapisky	Div. Fish and Wildlife, RIDEM	Chief
Bob Sutton	Div Planning and Development, RIDEM	Chief
Bruce DiGennaro	The Essex Partnership	Meeting Facilitator

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Appendix G

Rhode Island Coastal Zone Program
(Coastal Resources Management Council)
Memo of Program Consistency with
The NBNERR

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Rhode Island Coastal Resources Management Council

Inter-Office Memorandum

Date: September 20, 2010

To: Robert Stankelis, Manager
Narragansett Bay National Estuarine Research Reserve

From: Jeff Willis
Deputy Director

cc: Grover J. Fugate, Executive Director

Subject: Narragansett Bay National Estuarine Research Reserve Management Plan 2010-2015

Thank you for the opportunity to review the Reserve's Management Plan for 2010-2015. I have read the document and believe it to be consistent with the goals and objectives of the Rhode Island Coastal Resources Management Program.

As stated, the purpose of the document *"…is to provide an overall framework to guide planning and decision-making for the Reserve… [while providing] enough flexibility to take advantage of opportunities as they arise."* That said, the CRMC's involvement of late in the Coastal Training Program has led to a better alliance of the two programs, most notably in the area of furthering the issue of climate change within the region: A workshop on the subject is being planned and coordinated by the programs for this fall. Also, continued interaction between staffs on issues such as sea level rise, habitat loss and fragmentation will only lead to better utilization of each program's strengths.

However, as you may know, the RICRMC has been instrumental in coordinating the development of the state's approved Aquatic Invasive Species Management Plan and administers the state's federal funding among the Plan's partners for its implementation. And as stated, the Reserve contributed to the Plan's development (pg 10). To better demonstrate the relationship between the Reserve and the RICRMC, a more specific statement regarding this relationship could be made within this section.

Thank you again for the opportunity to review the Management Plan. Should you have any questions do not hesitate to contact me.