

Great Bay National Estuarine Research Reserve 2020-2025 Management Plan

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Executive Summary

The Great Bay National Estuarine Research Reserve (GBNERR) was designated by the National Oceanic and Atmospheric Administration (NOAA) in 1989, in large part due to a group of passionate local environmentalists advocating against the construction of an oil refinery along Great Bay's shores. The passion of the people who staff, support, and participate in Reserve activities continues to fuel the organization today. Over the past thirty years, GBNERR has expanded in size, relevance, and influence on estuarine issues both locally and nationally. Through time, GBNERR has stayed true to the mission of the NERRS as stated in the Coastal Zone Management Act of 1972 and the implementing regulations for the NERRS (see 15 C.F.R. § 921: hereinafter NERRS regulations), while continually assessing how to serve local communities and the host agency, the New Hampshire Fish and Game Department (NHFG).

As of 2020, the NOAA-approved Reserve boundary encompasses 10,235 acres of land and water that includes Little Bay, Great Bay, the mouths of five rivers, and over 30 NHFG managed properties within the watershed and along the shores of the bay. New Hampshire has a very small coastline. Great Bay is located 16 miles inland from the Atlantic coast and has seven rivers that flow into the estuary. Most policy and land use decisions that impact habitat and water quality are made at the local level by volunteer boards or elected officials. This creates a powerful motivation to approach GBNERR's effort from a watershed perspective by working closely with the communities that surround the bay and its tributaries. The integrated science, coastal training, education, and stewardship programs at GBNERR aim to understand the biophysical and social trends in the region, how these trends influence the health of the estuary and well-being of the people that live around the bay, and what appropriate action can be taken from a personal, professional, and political perspective to protect Great Bay.

This management plan articulates a five-year vision for GBNERR to continue to mature as a program, deliver science to inform coastal management, and raise awareness of estuaries and their connection to people using a place-based approach. Within the timeframe of this plan, the Reserve aspires to engage more people and different types of people with GBNERR programs and properties; improve program effectiveness and reach through the use of a renewed Advisory Structure; grow the research program; officially expand the Reserve boundary; and create a stable staffing and facilities plan. The efforts of GBNERR are coordinated with partners in the region to understand and mitigate the largest threats to coastal management in New Hampshire. At this time, the key threats and stressors facing Great Bay Reserve and the surrounding communities fall into two interconnected categories:

- **Land use changes** in the New Hampshire Seacoast that impact water quality and habitat.
- **Climate change**, which magnifies the issues related to land use change because of increased precipitation, changes to physical and chemical conditions, and species and habitat shifts.

To address these threats, the Reserve sets out the following mission, vision, goals, and objectives:

Mission:

Practice and promote the stewardship of estuaries through integrated and innovative research, education, resource management, and training in the Great Bay Watershed.

Vision:

A resilient Great Bay Watershed, where human and natural communities thrive.

GOAL 1

Coastal scientists and managers understand how Great Bay is functioning now, how it may function in the future, and how that is influenced by and will impact people in the watershed.

OBJECTIVES

- 1.1:** To understand, protect, and restore the structure and function of Great Bay estuarine ecosystems
- 1.2:** To understand the vulnerability and resiliency of Great Bay ecosystems and communities in relation to key stressors.
- 1.3:** To protect representative habitats within the NERR that support native wildlife.

STRATEGIES

- Work with partners to monitor environmental changes within Great Bay over time.
- Facilitate and conduct applied and basic research to advance understanding of the structure and function of estuaries.
- Facilitate and conduct science to advance understanding of how stressors are impacting the estuary and how habitat, water quality, and built communities may be impacted in the future.
- Develop, share, and use the best science available to prioritize and direct restoration and resource protection strategies.
- Work with partners to actively protect estuarine land and restore key habitats.
- Convene partners to identify and advance science, protection, and restoration priorities in the region.
- Translate and communicate GBNERR and other local science results to decision makers and citizens to inspire and enable action.
- Identify key coastal management science and technical needs and use that to guide GBNERR and partner efforts.
- Engage in the scientific and technical community of New Hampshire and within the NERRS to enhance understanding of Great Bay and advance national understanding of estuarine resources.

GOAL 2

People make personal and professional decisions that help restore and protect ecosystem function while advancing social priorities.

OBJECTIVES

- 2.1:** Reserve staff understand how people make professional and personal decisions that could impact Great Bay.
- 2.2:** People have clear information that translates local science.
- 2.3:** People understand the potential consequences and trade-offs of their actions and decisions.
- 2.4:** People recognize that they are an integral part of the Great Bay ecosystem and are inspired to and supported in making choices that protect and restore Great Bay.

STRATEGIES:

- Advance the understanding of personal and professional motivations and behavior change theory, and apply that to education, outreach, stewardship, and volunteer programming.
- Create or enhance outdoor experiences that inspire an engaged citizenry to act on behalf of the health of Great Bay.
- Translate science and coastal management questions in a tailored way is appropriate and relevant to specific audiences.
- Enhance opportunities for multi-directional dialogue and collaborative idea generation about what the key coastal issues are in the region and how to solve them.
- Deliver high quality training and education programs that demonstrate how people and the estuary are interdependent and give participants practical information and tools to change how they work and act.
- Encourage investigation and communication about trade-offs between different policy, restoration, and behavioral decisions.
- Work with the Great Bay Stewards to engage a larger and more diverse group of people to participate, volunteer, and experience GBNERR and GBNERR programs.

Awards and Achievements

The last management plan for the Great Bay National Estuarine Research Reserve was approved by NOAA in 2006. Between that time and the publication of this management plan, several important accomplishments have advanced the administration, facilities, and programming at the Reserve.



Facilities

The Hugh Gregg Conservation Center was completed in 2006. This building now hosts training workshops, research meetings, volunteer training, and recognition events; and provides space for GBNERR to meet with partners. The Special Collections Room was added in 2009 to interpret the history of fishing and hunting in New Hampshire. A picnic pavilion was erected on the Greenland campus in 2013 to provide covered space for programs and for visitors to the Discovery Center. Finally, the boardwalk was replaced in 2015 through the dedicated efforts of NOAA, NHFG, and the Great Bay Stewards.

Climate Change

GBNERR has been a statewide leader in understanding and communicating the impacts of climate change to coastal communities and coastal habitats. This encompasses work from across Reserve sectors including: Coastal Training Program work with the Coastal Adaptation Workgroup and the Climate Summit; staff engagement and support for the Coastal Hazards and Risks Commission and Coastal Zone Management Program efforts; incorporating climate science into school field trip and teacher training programming; research and stewardship efforts to model marsh migration pathways and marsh resiliency; work with partners on external research opportunities; and implementing sentinel site monitoring of elevation, water level, and vegetation in saltmarshes within the Reserve.

Nitrogen

The Reserve has been able to bring regional perspectives and experience to a hot topic in New Hampshire, has leveraged several NERRS Science Collaborative (NSC) grants to work on nitrogen pollution, and continues to work with municipalities through CTP to advance municipal strategies to deal with fertilizer use, stormwater, and wastewater. This topic has been incorporated into interpretive panels at the Discovery Center and into teacher training workshops to ensure the Reserve is bringing relevant coastal management information to community partners.

Spatial Tool Development

Through Picking Your Battles, Trails for People and Wildlife, and the Sea Level Affecting Marsh Migration (SLAMM) analysis, the Reserve has led several projects to help prioritize how to manage invasive species, prioritize salt marsh restoration or protection investments, and locate trail development using the best available science from the literature coupled with geospatial tools that are specific to New Hampshire. These tools have been extremely well received by partners and are being used by federal, state, and local authorities.

Great Bay Stewards

The increased capacity of the Great Bay Stewards has expanded opportunities for GBNERR. Having a partner that can help the Reserve accept external funding, has an Executive Director, and is working side by side to achieve joint priorities has truly increased the reach and effectiveness of the two organizations.

Connecting with the Community

The Reserve has made a concerted effort to enhance visitor experiences at the Reserve through exhibit upgrades, adding the osprey camera, replacing the boardwalk, and increasing volunteer opportunities and communication with the public through social media and in partnership with the Great Bay Stewards and NHFG.

K-12 Education

The school age programs have always been a strength of GBNERR and within this timeframe the demand has increased, the offerings have incorporated new scientific and historical topics, and the Reserve has implemented successful Teachers on the Estuary programs each summer to train teachers in estuarine literacy.

Collaborative Research

The Reserve has participated in or led 11 NERRS Science Collaborative Science (NSC), Integrated Assessment, and/or Transfer projects. The NERRS Science Collaborative has given the Reserve an opportunity to bring partners together to address priority coastal management issues like understanding and addressing climate impacts and stormwater management; has led to new academic, community and management partners; and has added direct capacity and expertise at the Reserve. The NSC has made the Reserve a more active partner in finding and applying resources to key issues.

Developing Strategic Partnerships

Each sector of GBNERR has worked hard to find and cultivate a network of partners to help achieve their goals. This is necessary with a small staff, and leads to better coordination and a greater awareness of how to implement impactful programs. The individual sectors have specific networks that are aligned with their expertise and program goals, and the manager has developed strong relationships with other coastal management professionals at the Coastal Program, Sea Grant, Piscataqua Region Estuaries Partnership, The NH Chapter of the Nature Conservancy, Conservation Law Foundation, and the Northeast Regional Association of Coastal and Ocean Observing Systems. This network actively communicates to understand each other's priorities for research and outreach, to coordinate around funding opportunities and work plans, and to jointly find funding for the most pressing needs in New Hampshire. The New England NERRS also have a close network that support each other, problem solve and advise, and work together on projects of regional significance.

Introduction to the National Estuarine Research Reserve System

The National Estuarine Research Reserve System was established in the Coastal Zone Management Act of 1972, as amended, to augment the National Coastal Zone Management Program, which is dedicated to comprehensive, sustainable management of the nation's coasts.

The Reserve system is a network of protected areas representative of the various biogeographic regions and estuarine types in the United States. Reserves are established for long-term research, education and interpretation to promote informed management of the Nation's estuaries and coastal habitats. (15 C.F.R. § 921.1(a)) The system currently consists of 29 Reserves in 24 states and territories, protecting over one million acres of estuarine lands and waters.

The National Estuarine Research Reserve System is a partnership program between the National Oceanic and Atmospheric Administration (NOAA) and the coastal states. NOAA provides funding, national guidance and technical assistance. The state partner manages Reserve resources on a daily basis working collaboratively with local and regional partners.

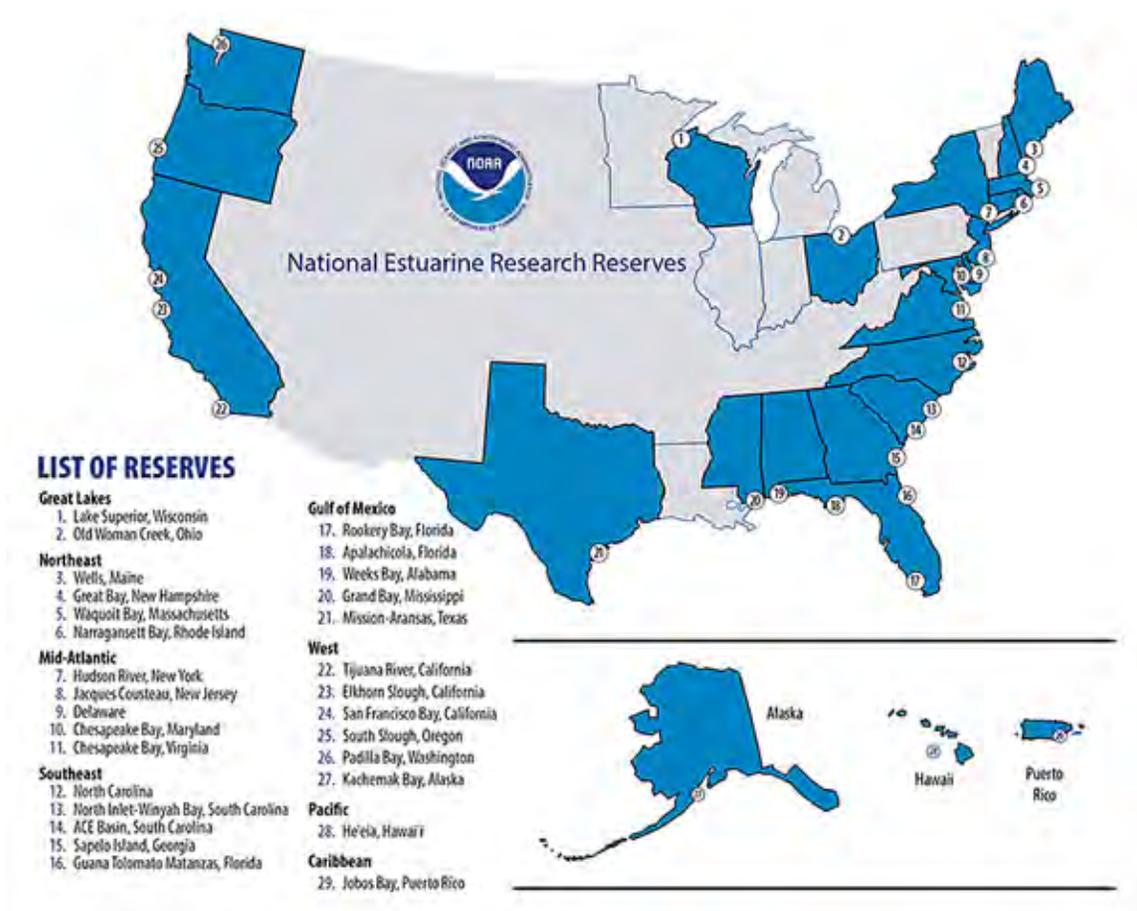


Figure 1: National Estuarine Research Reserve System map.

Estuaries are biologically rich, economically valuable, and highly vulnerable ecosystems. The vision and mission of the Reserve System reflect the importance of these systems within the Great Bay communities.

VISION:

Resilient estuaries and coastal watersheds where human and natural communities thrive.

MISSION:

To practice and promote stewardship of coasts and estuaries through innovative research, education, and training using a place-based system of protected areas.

GOALS

Pursuant to the NERRS regulations (15 C.F.R. § 921.1 (b), the goals of the National Estuarine Research Reserve System include the following:

- Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources
- Address coastal management issues identified as significant through coordinated estuarine research within the system;
- Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation
- Promote Federal, state, and public and private use of one or more Reserves within the System when such entities conduct estuarine research
- Conduct and coordinate estuarine research within the system; gathering and making available information necessary for improved understanding and management of estuarine areas

NOAA and the states work together to create a dynamic five-year Reserve system strategic plan to meet these program goals and NOAA's mission of science, service, and stewardship. The *2017-2022 Reserve System Strategic Plan* (<https://coast.noaa.gov/data/docs/nerrs/StrategicPlan.pdf>) focuses the Reserve core strengths of research, education, and training on three core issues:

1. Environmental change
2. Water quality and quantity
3. Habitat protection and restoration

GOALS

The Reserve system strategic plan goals are as follows:

Protecting Places

Enhance and inspire stewardship, protection, and management of estuaries and their watersheds in coastal communities through place-based approaches.

Applying Science

Improve the scientific understanding of estuaries and their watersheds through the development and application of Reserve research, data, and tools.

Educating Communities

Advance environmental appreciation and scientific literacy, allowing for science-based decisions that positively affect estuaries, watersheds, and coastal communities.

Biogeographic Regions and Boundaries of the National Estuarine Research Reserve System

NOAA has identified eleven distinct biogeographic regions and 29 subregions in the United States, each of which contains several types of estuarine ecosystems (15 C.F.R. § 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 2020, the Reserve System includes 29 Reserves and one state is in the process of designating a Reserve.

Each Reserve boundary will vary depending on the nature of the ecosystem. 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. Reserve boundaries encompass areas for which adequate state control has or will be established by the managing entity over human activities occurring within the Reserve. Reserve boundaries include a “core” area which is comprised of key land and water encompassing resources representative of the total ecosystem, which if compromised could endanger the research objectives of the Reserve, as well as a “buffer” area designed to protect the core area and provide additional protection for estuarine-dependent species, including those that are rare or endangered. Buffer areas may also include areas necessary for facilities required for research and interpretation. Additionally, buffer areas are identified to accommodate a shift of the core area as a result of biological, ecological or geo-morphological change that could be reasonably expected to occur. (15 C.F.R. § 921.11 (c)(3)).

National Estuarine Research Reserve Administrative Framework

The process for federal designation of a National Estuarine Research Reserve has many steps and involves many individuals and organizations. While each Reserve is a partnership program between NOAA and a coastal state, many entities collaborate to support the designation of a Reserve. Other partners include federal and state agencies, non-profit groups, universities, and members of the local community. For more information on the designation process see coast.noaa.gov/nerrs.

Upon designation, the Reserve implements the approved management plan and is eligible for NOAA financial assistance on a cost-share basis with the state. Management plans provide a vision and framework to guide Reserve activities during a five-year period and enable the Reserves and NOAA to track progress and realize opportunities for growth. Each management plan contains the Reserve goals, objectives, and strategies supported by programs focused on research and monitoring, education and outreach, training, and stewardship. They also outline administration, public access, land acquisition and facility plans and needs, as well as restoration and resource manipulation plans, if applicable. Reserves are increasingly confronted with complex questions regarding new uses in or near Reserves that may or may not be compatible with the Reserve System’s mission. A thoughtful and comprehensive management plan provides a foundation for addressing these challenges to protect and manage Reserve resources wisely and ensure that public and coastal decision makers value and protect coastal resources.

NOAA administers the Reserve System and establishes standards for designating and operating Reserves, provides support for Reserve operations and system-wide programming, undertakes projects that benefit the Reserve System, and integrates information from individual Reserves and programs to support decision-making at the national level. Additionally, NOAA periodically evaluates Reserves for compliance with federal requirements and with the individual Reserve’s federally approved management plan, as mandated under Section 312 of the Coastal Zone Management Act and the NERRS regulations (15 C.F.R. § 921.40).

NOAA currently provides leadership and support for three system-wide programs including the System-Wide Monitoring Program, the K-12 Estuarine Education Program, and the Coastal Training Program; the Margaret A. Davidson Graduate Research Fellowship Program, and the NERRS Science Collaborative. NOAA also provides support for initiatives focused on the Reserve system’s priorities.

Introduction to the Great Bay National Estuarine Research Reserve

History of the Reserve

In 1941, the New Hampshire Legislature adopted a “Joint Resolution to Make a Long Range Plan for the Development of Great Bay.” It charged the Office of State Planning (then called the State Planning and Development Commission) with the task of developing what became the Great Bay Plan (NH State Planning and Development Commission, 1945). It referred to the estuary as “the greatest undeveloped recreational resource in all of New England.” This ambitious plan included eight major components including creating better access, pollution control, improved fisheries, and preventing erosion of the land. Its most notable recommendation was to create a series of dams to increase recreational opportunities. While the dams were never funded, many of these ideas have since been implemented.

In the 1960’s, there was renewed interest in a development plan for the Great Bay. Once again, Legislature proposed increasing access and explored the feasibility of inland waterway from Lake Winnepesaukee to Great Bay (NH Office of State Planning 1989). As in the 1940’s, the focus of these efforts was on the recreational potential of the estuary.

The 1970’s brought about another chapter in the State’s planning efforts, this time with an emphasis on resource management. A proposal by Aristotle Onassis to build a large oil refinery in the Great Bay region led local residents to explore ways to protect the estuary. With the advent of the New Hampshire Coastal Zone Management Program, the State began the process of developing a plan to manage the entire estuarine system.

The State began exploring the possibility of including Great Bay as a part of the Reserve System in 1982. The New Hampshire Office of State Planning (OSP) acted as the lead agency in the effort to create the Great Bay National Estuarine Research Reserve and established a committee that prepared the original management plan and nomination documents. In 1989, the Reserve was designated, making it the 18th estuary in the United States to join the System.

OSP also played an integral role in the designation process, administration, land acquisition, design, and construction of the Reserve’s educational headquarters, the Great Bay Discovery Center. As the Reserve program became more fully operational, the management of the Reserve was shifted to the New Hampshire Fish and Game Department (NHFG) under the Marine Fisheries Division (transfer completed in 1995). As the guardian of the State’s fish, wildlife and marine resources, NHFG works in partnership with the public to:

1. Conserve, manage, and protect these resources and their habitats.
2. Inform and educate the public about these resources.
3. Provide the public with opportunities to use and appreciate those resources.

As guardian of the State’s living resources, *the executive director shall enter into cooperation with the departments of the federal government and of this and all other states, for the protection, propagation, and preservation of all wildlife in this State, and shall execute all matters pertaining thereto, including a biological survey of the State* (State Statute 206:23).

New Hampshire Fish and Game is authorized to accept federal and other sources of funds, with the approval of the Governor and Council, to conduct activities and hold property that support its mission (State Statute 206:39). Great Bay National Estuarine Research Reserve lands are directly managed by NHFG in accordance with the NH Wildlife Management Area Rules. The Reserve does work with several partners in the region to cooperatively plan and implement access, restoration, and stewardship projects on Reserve land, and to monitor conservation easements.

Ecological Resources

The Great Bay Reserve is part of the Great Bay Estuary, a complex embayment and New Hampshire's largest estuarine system. Fed by the tidal waters of the Piscataqua River that forms the boundary between Maine and New Hampshire, the estuary offers a variety of diverse habitats including eelgrass beds, mudflats, salt marsh, rocky intertidal, and upland forest and fields.

The Reserve begins at the General Sullivan Bridge at Dover Point, seven miles from the mouth of the Piscataqua River and the Gulf of Maine. The Reserve encompasses 10,235 acres, including approximately 7,300 acres of open water and wetlands. All of Great Bay and Little Bay are contained within the Reserve boundary as well as the tidal portions of five major river systems: Bellamy, Oyster, Lamprey, Squamscott, and Winnicut.

Great Bay lies at the confluence of tidally-driven salt water from the Gulf of Maine and fresh water from the river systems. Before reaching Great Bay, seawater travels 16 miles inland through the Piscataqua River and Little Bay. This geographic configuration makes Great Bay one of the nation's most recessed estuaries and it is often referred to as New Hampshire's "hidden coast."

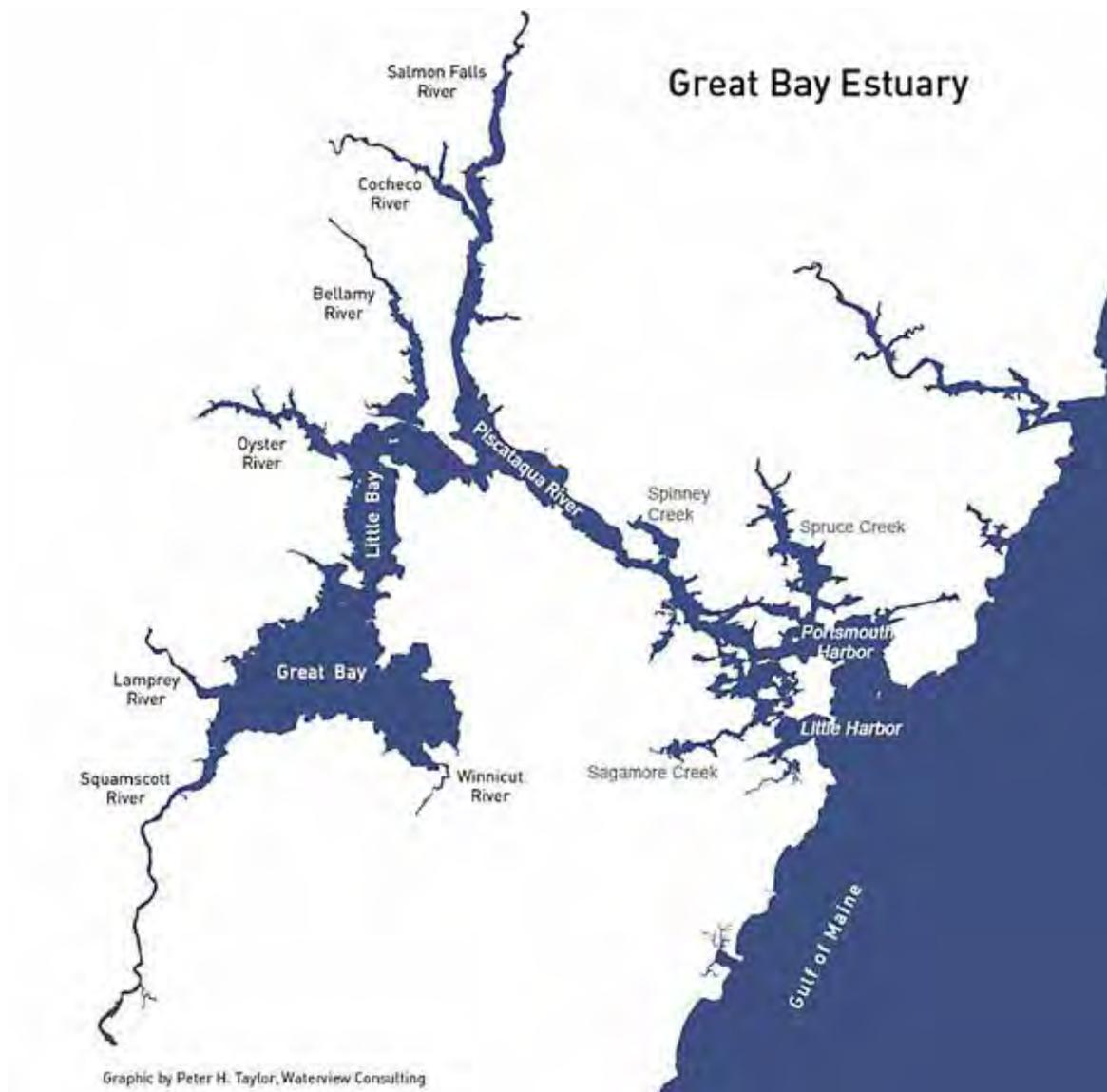


Figure 2: Map of Great Bay in relation to Gulf of Maine.

Great Bay's Watershed

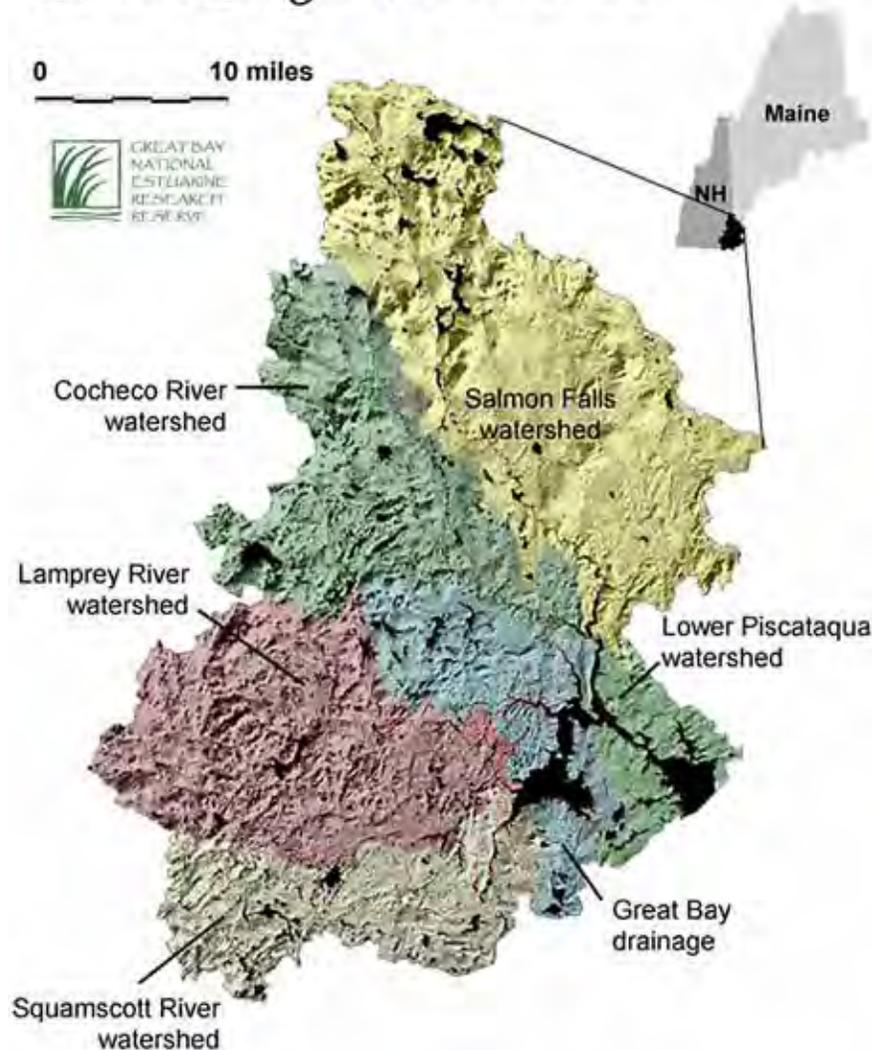


Figure 3: Watershed drainage map of the Great Bay region.

The large quantities of water that move in and out of the estuary create some of the strongest tidal currents in North America. This tidal exchange affects water quality, habitat extent, and species distributions. The rivers that flow into the Great Bay Estuary drain a watershed that extends more than 1,000 square miles. This convergence of land and water has influenced how flora, fauna, and people interact with the estuary.

Estuarine Habitats

There are five primary water habitats found in the estuary: eelgrass meadows, mudflats, salt marshes, channel bottom, and rocky intertidal shores. Natural and restored oyster beds are also present in the estuary. These habitats are home to hundreds of bird, fish, and plant species, including 23 that are considered threatened or endangered. The structure and function of these habitats are primarily controlled by the extent, frequency, and duration of tidal flooding.

Subtidal Channel and Bay Bottoms

Subtidal channel and bay bottoms are a major estuarine habitat type that occupies the lowest elevation areas of the Great Bay Estuary. They feature substrates that vary between soft mud, hard sand, and gravelly cobble or rock. Natural

communities found in these habitats are heavily influenced by tides and are predominantly found below mean low tide. Several fish and invertebrate species utilize subtidal channel and bay bottom habitats as refuge during low tidal periods when mudflats and other intertidal areas are exposed.

Oysters beds are important features found in shallow areas of subtidal channel and bay bottom habitats. Eastern oysters (*Crassostrea virginica*) perform critical ecosystem functions in the Great Bay Estuary and provide many ecological benefits to humans and wildlife. They are filter feeders that improve water quality and control nutrients by removing suspended solids from the water. Removal of excess nutrients is very important for preventing harmful algal blooms and hypoxic (low oxygen) zones that have caused harm to people and wildlife in estuaries similar to the Great Bay Estuary. Oysters also function as “ecosystem engineers” that create habitat for other species in the estuary. Estuarine fish and invertebrate species use well-established oyster reefs as rich habitat and feeding grounds (Konisky et al. 2014). The importance of the eastern oyster to the health of the estuary makes it a keystone species in subtidal and bay bottom habitats.

Eelgrass Beds

Seagrass beds are an important habitat type found in shallow subtidal areas of the Great Bay Estuary. Common eelgrass (*Zostera marina*) is the dominant seagrass species in the estuary, but widgeon grass (*Ruppia maritima*) is also found to a limited extent. Common eelgrass is a flowering vascular plant that roots into sand or mud substrates. It grows in dense submerged meadows that are limited to a specific elevation range in the Great Bay Estuary. The upper limit is established by ice scour in the winter and aerial exposure in the summer. The lower limit, or maximum depth, of eelgrass habitat is determined by the amount of light penetration into the water column. Eelgrass cannot grow below a minimum light availability threshold, and therefore does not live in areas with deep or turbid water where underwater irradiance is decreased below a tolerable level.

Eelgrass beds have an important ecological role in the Great Bay Estuary. They supply food and shelter for numerous juvenile fish and invertebrate species that use eelgrass meadows as spawning and nursery habitat. They also attract wading birds and predatory fish that come to feed on the abundance of smaller prey. Other bird species, such as ducks and geese, come to feed directly on the eelgrass vegetation. In addition to supporting the food web, eelgrass beds also alter sediment transport and biogeochemical cycles. Eelgrass anchors to the bottom using a network of roots and rhizomes that binds and stabilizes sediments, thereby protecting shorelines from erosion and tidal scour. The beds also improve water quality and clarity by trapping suspended solids and removing nutrients from the water column (Short 2013). The tremendously important influence of eelgrass on the estuarine food web and physical processes make it a keystone species of the Great Bay Estuary.

Eelgrass is sensitive to the synergistic effects of environmental conditions, so its status is a good indicator of ecosystem health and can be used to identify changes to the estuary. In 1989, the eelgrass distribution in Great Bay declined by 85% due to an outbreak of a marine slime mold (*Labryrinthula zosterae*) commonly known as “wasting disease” (Meulhstein et al. 1991). Following this devastating event there was only a partial recovery of eelgrass in Great Bay, with distributions of eelgrass peaking in 1996 (Short, 2013). Since the mid-1990’s, eelgrass populations have resumed their decline as a result of water quality trends.

Mudflats

Mudflats are extensive intertidal habitats that form in depositional environments of the Great Bay Estuary. They occur landward of subtidal habitats and seaward of saltmarsh. Sediments are fairly stable and comprised of sand, silt, clay, and organic materials. Mudflats are exposed during low tide and are typically devoid of vascular plants. They may seem barren to a casual observer, but are actually teeming with life. Mudflats cover a significant portion of the Great Bay Estuary and support a tremendous diversity of organisms that are integral to the estuarine food web. High levels of primary productivity and detritus deposition are what support the robust natural communities in these fecund habitats. Coastal and estuarine fishes come to mudflats during diurnal tidal flooding to feed on organisms living on the bottom or in the sediments. Wading birds, shorebirds, and other animals appear on the tidal flats when they are exposed to feed on the benthos.

Rocky Intertidal Shores

Rocky intertidal shore habitat type occurs intermittently along the coasts, islands, and outcrops of the estuary. Rocky intertidal shores range in elevation from the splash zone (just above high tide) to lowest exposed shore during low tide. They are subjected to a number of environmental conditions that affect species composition and zonation in this habitat. During high tide, organisms living in rocky shore habitats are exposed to high-energy wave action and strong tidal flow. During low tide, they are often exposed to sun and wind. In addition to macroalgae, the rocky substrates in this habitat type also sustain populations of crustaceans, barnacles, periwinkles, and mussels. Predatory fish and wading birds are also attracted to rocky intertidal shores to feed.

Salt Marshes

Salt marshes are a common wetland habitat found along the coasts of the Great Bay Estuary in locations that are sheltered from high-energy wave action. They are intertidal brackish wetlands that act as a transitional zone between upland habitats and non-vegetated intertidal habitats, typically mudflats. Salt marshes are frequently inundated by tides causing the soils to be constantly saturated with water. Bacteria thrive in these conditions and their growth causes the soil to have very low oxygen levels (hypoxia). The hypoxic soils in a salt marsh cause decomposition to occur at a very slow rate, and are therefore typically composed of deep mud or peat. Although the presence of hypoxic soils and salt water may seem like a forbidding place for plants and animals to survive, a number of organisms have evolved into salt marsh specialists that thrive in these conditions. Salt marshes are extremely productive habitats and are dominated by a detritus-based food web. Many of the species living in salt marshes are specialist organisms that occupy a distinct area of the marsh along the elevation gradient. The most dominant plant species in the marshes surrounding Great Bay are: *Spartina alterniflora*, *Spartina patens*, *Distichlis spicata*, and *Juncus gerardii*. Salt marshes as a whole provide excellent habitat for numerous species of birds, mammals, and arthropods.

The frequency and duration of tidal inundation are the primary factors that influence species composition and zonation in salt marshes (Mitch and Gosselink 2007). As a result, the threat of sea level rise from global warming is a major concern for salt marsh habitats. In order to survive, they will either need to accrete at a higher rate or migrate landward (or both) to compensate for increases in the elevation of tidal flooding. Fringe salt marshes or marshes with no avenue of retreat are at the greatest risk from sea level rise. Conservation and restoration strategies will be crucial for protecting these critical habitats from the effects of sea level rise and global warming.

These key habitats are part of the complex structure of ecological resources in the estuarine areas of the Reserve. The Reserve's position at the confluence of land, rivers, and sea creates an ever-changing ecosystem. Some of these changes result from natural dynamics and others are driven by people. Managing these resources against the backdrop of this change is part of the Reserve's role. As these resources are managed, the services that they provide back to the people in the region are critical to understand. An ecosystem service valuation study for Great Bay was complete in 2016 (NHDES, 2016). Estimated values included:

- Existence values: Salt marshes \$1.6 million, Eelgrass \$40.2 million, Oyster beds \$0.7 million
- Recreational oyster harvesting Oyster beds \$23,700
- Commercial aquaculture Oyster beds \$131,200–\$142,100
- Commercial fishing values: Salt marshes \$4,473, Eelgrass \$1.7 million
- Carbon sequestration value: Salt marshes \$3,400–\$16,300, Eelgrass \$49,100–\$81,600
- Oyster beds \$2,700
- Nitrogen removal value: Salt marshes \$608,300–\$688,800, Eelgrass \$13.1 million–\$14.8 million, Oyster beds \$5.3 million–\$6.0 million

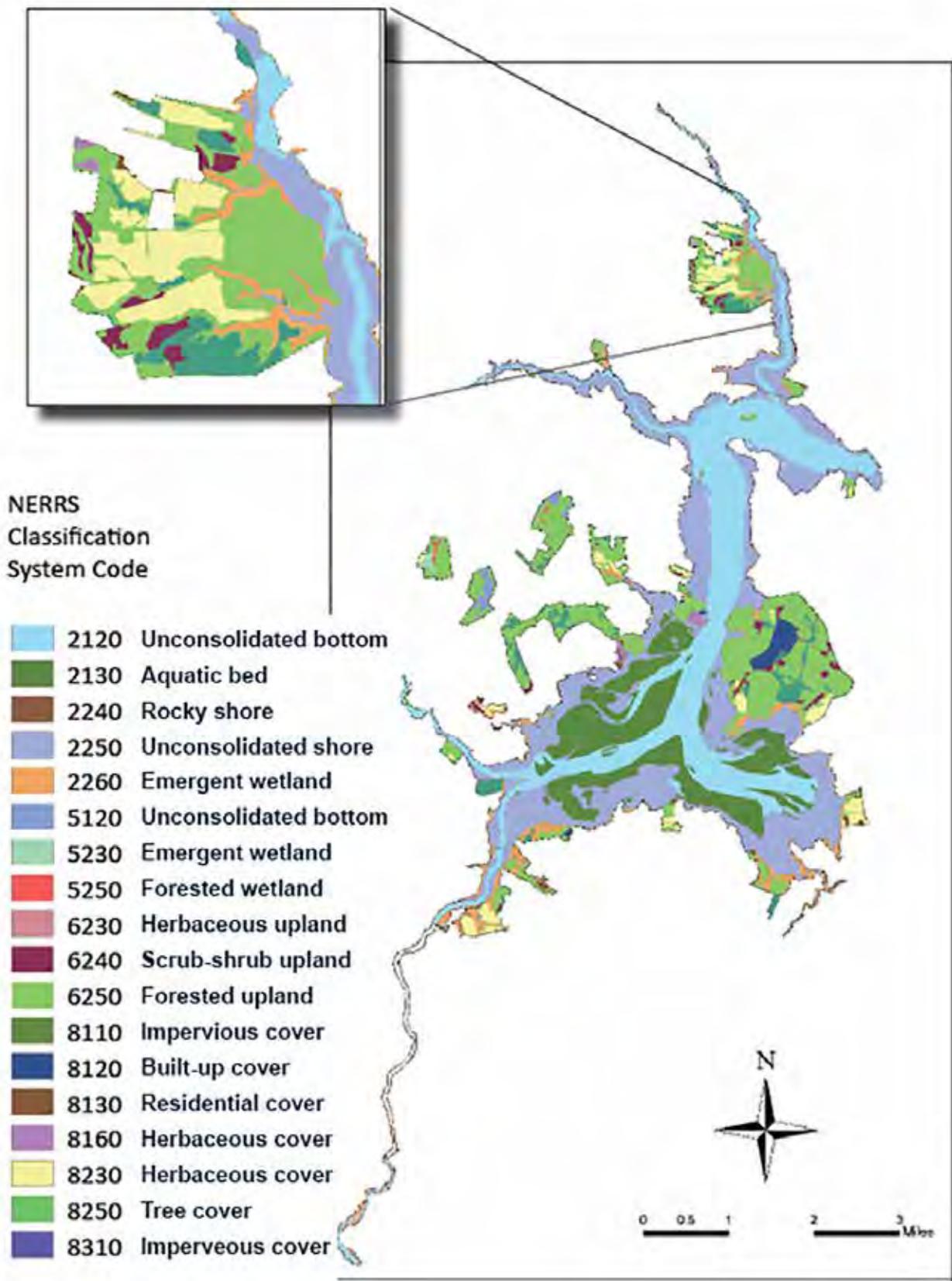


Figure 4: Map of key estuarine habitats in Great Bay.

Upland Habitats

Upland habitats protected by the Reserve are located in the Great Bay Estuary watershed landward of the salt marshes. The dominant upland habitat types include forests, freshwater wetlands, and grasslands. These upland habitats are home to numerous plant and animal species, including some that are listed as endangered or threatened.

Forests

Forests are the dominant habitat type in upland areas of the Reserve and throughout the coastal watersheds of New Hampshire. They provide communities in the region with valuable ecological services and benefits such as recreational opportunities, groundwater recharge, water supply, forest products, and many others. There are multiple forest habitats surrounding the Great Bay Estuary, but the two dominant communities are Appalachian oak-pine and hemlock-hardwood-pine. There are several smaller forest communities found in upland areas near the Great Bay Estuary including Appalachian oak-sugar maple forest, pitch pine-Appalachian oak-heath forest, dry oak-hickory forest, hemlock forest, and several others (Zankel et al. 2006). Together the matrix forest and patch forest communities form a complex habitat mosaic that promotes species richness and wildlife abundance.

Freshwater Wetlands

Freshwater wetlands occur throughout many upland areas surrounding the Great Bay Estuary. Collectively, they provide a number of important functions and ecological services that are valuable to wildlife and humans, including: flood protection, water filtration, water storage, groundwater recharge, wildlife and aquatic nursery habitat, and shoreline stabilization. Wetland functions are often called “services” because they provide benefits (e.g. water treatment) and economic value to humans free of cost. Freshwater wetlands vary greatly because of differences in vegetation, soils, topography, hydrology, water chemistry, and other factors. However, one commonality is that they are all covered or saturated by water for at least part, and often all of the year. A wetland’s hydroperiod, or seasonal pattern of water levels, is often the most important factor determining what types of soils and biota are present.

Freshwater wetlands are often interspersed throughout forested landscapes and provide essential habitat for a variety of common and endangered wildlife. They are especially important for amphibian and reptile species in the Reserve, such as the endangered Blanding’s Turtle (*Emydoidea blandingii*). This species uses, and travels extensively between, a variety of wetland and terrestrial habitats (NHFG, 2015). Conservation of large undeveloped wetland complexes, such as those found within the Reserve, is a key strategy for protecting and restoring Blanding’s Turtle populations in New Hampshire. The North American beaver (*Castor canadensis*) is another important species found in the Reserve’s palustrine wetlands. Beavers are renowned “ecosystem engineers” that create and manage palustrine wetlands by damming streams and other water sources. Wetland complexes managed by beaver will form a complex mosaic of different habitats over time. For this reason, beavers are critically important for enhancing species and habitat diversity in freshwater wetlands and surrounding forests. In the Reserve, beaver-induced flooding has created wetlands with standing dead trees that act as important nesting habitat for Great Blue Heron and Osprey.

Grasslands

Grasslands are a common upland habitat type in the Reserve, although few occur naturally. Most grasslands today are created by human activities, such as land clearing and agriculture. Grassland habitats are defined in the New Hampshire Wildlife Action Plan as open areas, with few shrubs or trees, that are greater than 10ha and dominated by grasses, forbs, and sedges (NHFG, 2015). Grasslands around the Great Bay Estuary include airports, military installations, hayfields, pastures, fallow fields, croplands, forb communities, and coastal heathlands. Vegetation can vary in height from just a few inches to over four feet tall. The type, area, and height of vegetation are very important factors in determining which wildlife, particularly bird species, will utilize a grassland habitat. For example, the endangered upland sandpiper (*Bartramia longicauda*) is an area-sensitive species that only lives in large, contiguous grasslands (at least 50ha) that support their foraging and breeding requirements (Shriver et al. 2005). With large grasslands becoming increasingly rare in New Hampshire, the only upland sandpiper population remaining in the state is located at Pease International Airport. In addition to supporting wildlife, grassland habitats also sustain many native grasses and wildflowers such as big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), goldenrod (*Solidago spp.*), and milkweed (*Asclepias syriaca*).

C. Social and Cultural Context

Native Americans of the Abenaki and other nations have inhabited the region around Great Bay for thousands of years, sustained by its rich natural resources. The Native Americans that lived on the shores of Great Bay survived on the fish, shellfish, waterfowl, and mammals that were found in abundance in and around the estuary (Johnson, 1995).

The first European to explore and write about the area was English explorer Martin Pring in 1603. Pring is believed to have sailed his ship up the Piscataqua River all the way into Great Bay looking for sassafras, a plant considered to have great medicinal value.

The early 1600s brought the arrival of permanent European settlers. The first of these were fishermen who landed on the Isle of Shoals in 1623. The islands became an important fishing area for the early British and French colonies. Small settlements were also established the same year at Odiorne Point (called Pannaway) in Rye and Dover Point where Edward Hilton set up his trading post (Hanson, 1996). Today, Dover Point serves as the eastern boundary of the Great Bay National Estuarine Research Reserve.

Control of the region was contested throughout the French and Indian Wars. The conflict peaked with a raid on Oyster River Plantation (now Durham) by a mixed force of French and Native American combatants, retaliating on the settlement for broken treaties, destroyed and stolen lands, and failed peace negotiations. Nearly one hundred colonists were killed or captured in the raid, and the settlement was burnt. However, the area was eventually re-colonized.

The tidal portion of the Oyster River is included within the Reserve boundary. In 2014, archaeological research was undertaken along the river in an attempt to locate the original Oyster River Plantation settlement. The results of that research have been published in several New England archeology journals and local publications. The Reserve stewards sites that may contribute to further discoveries and an improved understanding of the pre-colonial and colonial history of the area.

As European settlement expanded, sawmills were installed along the tidal rivers. Much of the lumber produced there was exported, but it also fueled the shipbuilding business along the Piscataqua River and in 1800 the country's oldest naval shipyard was established in Portsmouth (now part of Maine).

In addition to sawmills, over 40 brickyards eventually dotted the shores of Great Bay and its tributaries. The rich blue marine clay was harvested from along the estuary shores and made into bricks that were used to build locally and all around New England, including some of the finest homes on Boston's Beacon Hill.

During the late 1700s and early 1800s, tidal towns such as Exeter turned from the sea to manufacturing. Exeter was home to the state's first paper mill in 1777 and the first sailcloth factory in 1790. The first cotton factory opened in Dover in 1815 and the city became an important manufacturing hub.

The exploitation of Great Bay's natural resources over three centuries was not without its cost. By 1750, salmon were already in decline because of the sawdust from the mills and the construction of dams that closed off their spawning grounds. In 1790, the State passed a law prohibiting the throwing of "ballast, rubbish, gravel, earth, stone, dirt, ashes, and filth" into the Piscataqua River. By 1835, most of the trees around the estuary had been cleared and the blue clay deposits largely exhausted. By the 1900s, the estuary became the dirty backyard as towns began looking inward and away from the water. It became a dumping ground for sewage and industrial waste. During World War II, the Portsmouth Naval Shipyard specialized in the construction of submarines and waste from this production was dumped into the river, a practice that did not end until 1976.

The Pease Air Force Base, which was located on Great Bay and operated from 1951 to 1991, also dumped hazardous materials on site. Many of these contaminants eventually found their way into Great Bay and remain in the sediments.

The largest threat to Great Bay came in the fall of 1973 when Aristotle Onassis proposed to build the world's largest oil refinery on Durham Point. The citizens of Durham rallied against the project and it was eventually defeated in 1974 (Moore, 2018). This close call set in motion efforts to protect Great Bay from future development and led to Great Bay being designated a National Estuarine Research Reserve in 1989.

In the 1990s the seacoast boomed with a tremendous increase in population and development. The development of the Pease Business Complex, the lack of an income tax, and the easy commute south and west to larger cities made the area very attractive to commuters from all over New England. Between 1990 -2010 the population of the area grew by almost 20%. New Hampshire's 17 coastal zone municipalities are home to approximately 11 percent of the state population, support more than 100,000 jobs, and account for a 2014 Gross Regional Product of approximately \$11 billion.

Today, a positive social attitude towards Great Bay and an enjoyment of the recreational, educational, and research opportunities it provides is balanced with development and a rising population in the New Hampshire Seacoast.

D. Threats and Stressors

The threats and stressors facing GBNERR and surrounding communities can be broken down into two categories:

1. **Land use changes** in the New Hampshire Seacoast that impact water quality and habitat.
2. **Climate change** and the effects of increased precipitation, changes to physical and chemical conditions, and species and habitat shifts, which magnify the issues related to land use change

Land use change reflects the growing human population in the New Hampshire Seacoast. Between 1990 and 2015, the combined population of the 52 towns in the Piscataqua Region watershed (10 in Maine and 42 in New Hampshire) grew by 38%, from 280,205 to 386,658. A growing population adds stress to the environment through increased wastewater, fertilizers, toxic contaminants, habitat fragmentation, and impervious surfaces. Between 1990 and 2010, impervious surfaces in the watershed increased by 120% and have continued to increase in recent years (PREP, 2017). Combined with changes in precipitation, these impervious surfaces are sending more contaminants into New Hampshire's estuaries. During extreme storm events, they are delivered in large, disruptive pulses. Such rapid inflows of runoff not only add more nitrogen and toxins to the system, but also stir up estuarine sediments.

At 43.6 tons per square mile (of tidal estuary surface area), nitrogen levels between 2012 and 2016 were much higher than the 14 tons per square mile threshold for eelgrass health indicated in a 2010 study of 62 New England estuaries. While the Great Bay Estuary has traits that make it more tolerant of high nutrient levels (such as high flushing rates), the system has three times the threshold level from that study, which is a concern.

Nutrients fuel the growth of phytoplankton and seaweed and make it more difficult for light to reach eelgrass beds. In the Great Bay system, results of monthly sampling of phytoplankton levels are almost always in ranges considered "good" or "fair." Seaweed percent cover at intertidal monitoring sites increased from 8% in 1980 to 19% in 2016 (PREP, 2017). Excessive seaweed growth, often resulting from eutrophication, can lead to low dissolved oxygen levels through unsustainable proliferation followed by increased decomposition. Low dissolved oxygen events in Great Bay tributaries limit the growth of eelgrass as well as benthic animals and shellfish. For example, in the summer months between 2012-2015, low oxygen events (< 5mg/L) were recorded between 15-75% of samples taken at the Squamscott River.

All of these impacts are exacerbated by human-caused climate change, most notably sea level rise and changing precipitation patterns.

Using mean sea level in 1992 as a starting point, New Hampshire sea levels are expected to rise between 1.3 and 2.3 feet by 2050 and between 2.9 and 6.2 feet by 2100 (Wake et. al, 2019). As reported in the 2015 Wildlife Action Plan, sea level rise will alter the function of coastal habitats such as salt marshes and estuaries, habitat availability, and the timing of nesting and migration for seabirds. Total habitat and species losses will likely be greater in developed areas—which are expanding and increasing with land use change—where there is no space for natural habitats to retreat or migrate inland. Modeling results suggest that salt marshes will likely reach a tipping-point under the highest sea level rise scenario, with 95 percent of salt marshes potentially disappearing by 2100. In addition to long-term sea level rise, extreme storm events can pose significant risks to coastal systems by altering hydrology, sedimentation, and land forming processes. Coastal dune sediments will be driven inland by storm surges, and dune degradation will further exacerbate the impacts of storms. As dune systems migrate landward, they will compete with developed landscapes and, as a result, the remaining dunes could eventually be lost completely.

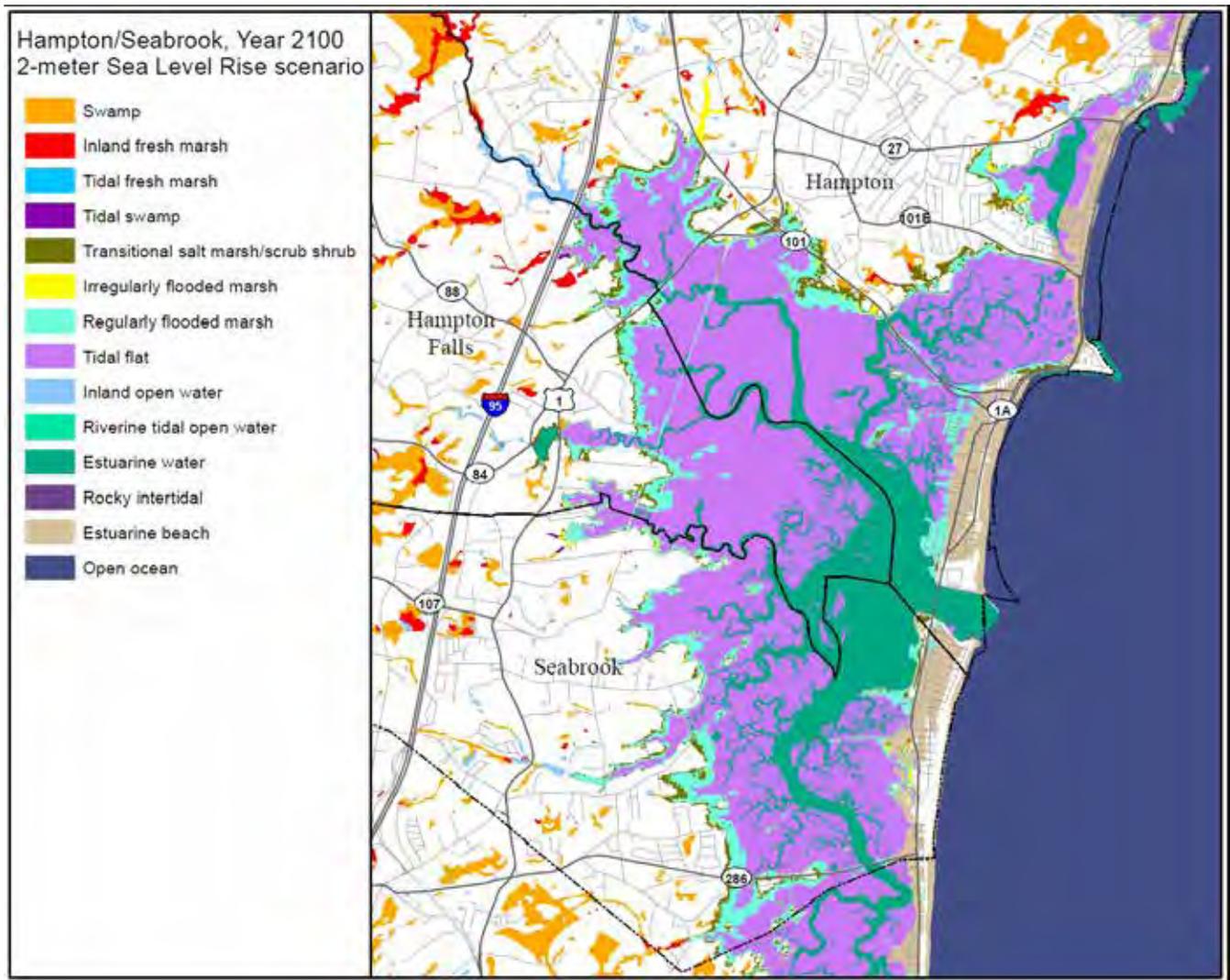


Figure 5: SLAMM model results demonstrating marsh loss.

Higher water levels will drown salt marshes, deepen estuarine waters, and convert salt marsh to mudflats and mudflats to subtidal zones. Salt marshes are among the most productive ecosystems in the world, and in addition to wildlife habitat, they provide multiple benefits to humans including flood storage, healthy fisheries, storm protection, and long-term carbon storage. Salt marshes may be able to migrate where the shore has a gentle, undeveloped slope, but otherwise will not be able to keep up with sea level rise and will disappear.

Deeper estuarine waters will deplete eelgrass beds because the light necessary for eelgrass growth and survival will no longer penetrate to the estuarine floor. Rocky intertidal zones will migrate landward where conditions are favorable and disappear where conditions are unfavorable. Changing water levels may impact where fish and waterfowl feed and breed, and saltwater intrusion may change freshwater wetlands to brackish wetlands—altering the types of flora and fauna those systems can support. Rising groundwater levels and saltwater intrusion due to changes in sea level may also impact water resources including local aquifers and drinking water sources (municipal, private, and commercial supplies), agricultural lands, and, later, the hydrology of forest and riparian ecosystems.

Annual precipitation is expected to increase by as much as 20% by the end of the 21st century compared to the late 20th century, and extreme precipitation events are projected to increase in frequency and in the amount of precipitation produced

(Wake et. al, 2019). Storm surges caused by extreme precipitation events disrupt dunes, salt marshes, and estuaries. These habitat types are critical to rare species like the Salt-marsh Sparrow and the Piping Plover.

Extreme precipitation will change the temporal distribution of fresh water to river and estuarine systems. In the marine environment, freshwater pulses may impact the timing and abundance of algal blooms and influence which species can enter the estuary to breed or feed.

Increased precipitation, coupled with rising groundwater levels, could compromise the function of individual septic systems and both private and municipal stormwater management facilities. These system failures may result in increased transfer of pollutants to groundwater, surface waters, wetlands, and estuarine systems. Pollutants adversely affect all natural systems and can lead to fish kills, oyster die-offs, smothered eelgrass beds, and noxious algal blooms. Freshwater pulses and decaying algal blooms also contribute to ocean acidification. As coastal and estuarine waters become more acidic, shellfish and other marine organisms face mortality and reduced fertility.

Overall, efforts at addressing ongoing and future threats to the estuary will focus on the interplay of human development, and climate impacts. Modeling can indicate where ecosystems like salt marshes and eelgrass are most likely to be successful under future sea level rise scenarios. To invest resources wisely, restoration and protection efforts should focus on habitats that will survive future conditions.

E. Boundary History

The Great Bay National Estuarine Research Reserve is a collection of parcels that are either owned or under an easement or management agreement with NHFG. The exception is the inclusion of the Great Bay National Wildlife Refuge in the boundary.

At the time of original designation, the Reserve included the Refuge land and two NH Fish and Game Wildlife Management Areas as well as wetlands that surrounded Great Bay proper. Some private land was also identified as a priority in the Crommet Creek, Lubberland Creek, Squamscott, and Lamprey river-mouth areas (NHFG, 1989).

In 2006, the land boundary was expanded to include additional Wildlife Management Areas that were conserved in the area and the water boundary was expanded to reach the head of tide for the Squamscott-Exeter River, the Lamprey River, the Oyster River, the Bellemy River, and the Winnicut River. Little Bay was also included in the boundary at that time (NHFG, 2006).

The Reserve's delineated boundary includes the critical habitat lands surrounding Great Bay. The purpose of delineating a boundary is to provide a targeted area in which to focus resources for the long-term protection of significant land and water areas. Therefore, the area within the boundary represents the diversity of flora, fauna, and habitats found within the Great Bay Estuary.

The Reserve's 1989 original boundary comprised 6,353 acres, including approximately 4,500 acres of tidal waters and wetlands (see Figure 6). The Reserve's 2006 boundary encompasses 10,236 acres, including approximately 7,300 acres of open water and wetlands, and 2,935 acres of upland as well as an area of acquisition interest of 20,172 acres.

The boundary includes all of the Great Bay (including Little Bay), as well as portions of five of the seven major freshwater rivers—the Winnicut, Squamscott, Lamprey, Bellamy, and Oyster—up to the first dams (see Figure 7).

Within the current GBNERR boundary, NHFG owns in fee or holds permanent conservation easements on 30 properties in the Great Bay region, totaling 1,646 acres:

- 23 owned in fee, totaling 1,092 acres.
- 7 conservation easements, totaling 554 acres.

The remaining upland acreage of the Reserve is associated with the Great Bay National Wildlife Refuge. NHFG has acquired fee simple or conservation easements on additional land since the approval of the last management plan. These properties are not yet within the boundary, but will be included in a proposed boundary expansion within the timeframe of this plan.

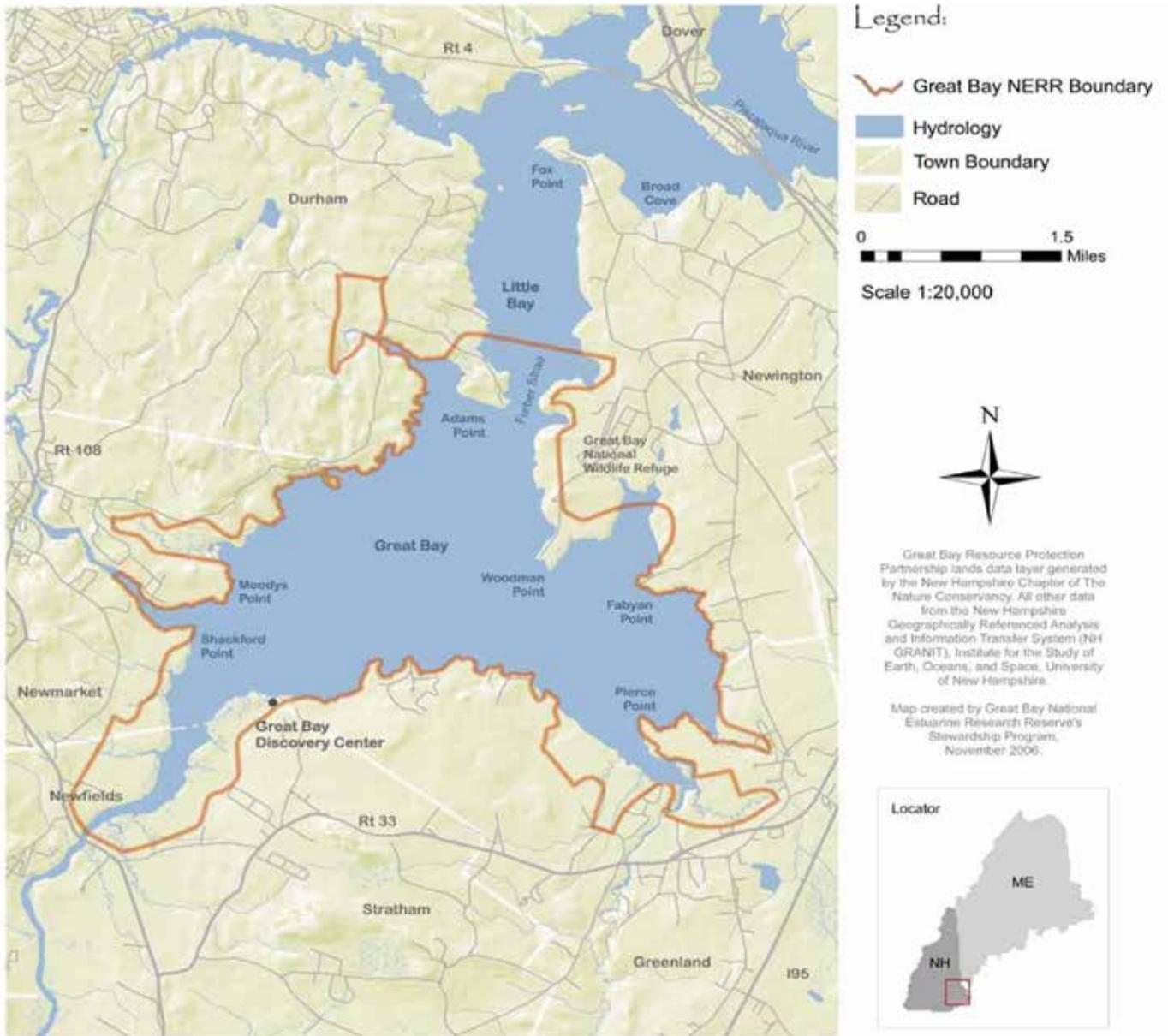


Figure 6: GBNERR Boundary: 1989.

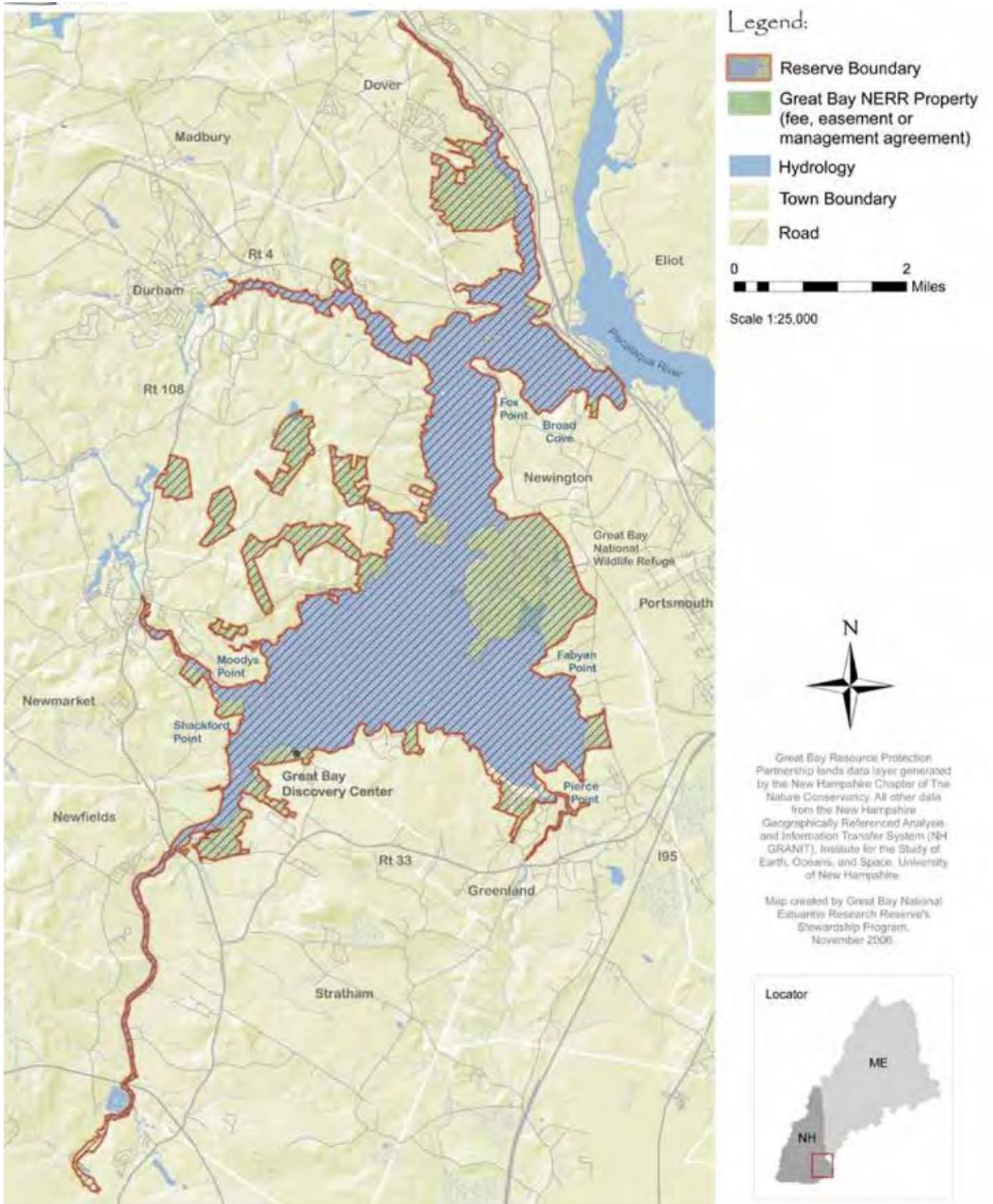


Figure 7: GBNERR Boundary, 2005.

GBNERR Strategic Plan

Mission

Practice and promote the stewardship of estuaries through integrated and innovative research, education, resource management, and training in the Great Bay Watershed.

Vision: A resilient Great Bay Watershed where human and natural communities thrive.

Tag Line: Promoting research, education, and stewardship throughout the Great Bay Estuary.

Approach

Ecosystem Based Management

For human and natural communities to thrive, the ecological, economic, and social benefits of a resilient Great Bay must be achieved. The primary stresses on the Great Bay Estuary (i.e. excess nitrogen, habitat fragmentation, and degradation stemming from changes in land use and climate change) and the surrounding communities (flooding, infrastructure costs, need for open space, need for economic growth, desire for high quality of life, etc.) are inter-related. Human behavior contributes to and can mitigate multiple stressors at one time. As the Reserve implements this plan, staff will strive to:

1. Approach research, education, outreach, and land management in a manner that integrates ecological and social considerations.
2. Prioritize actions that address multiple stressors and promote multiple benefits to the watershed.
3. Practice an adaptive management approach to programming that evaluates what is working and make adjustments accordingly.
4. Use a place-based approach to implementing and demonstrating ecosystem-based management.

Key Themes

- Human Uses of Natural Resources
- Land Use Change
- Climate Change
- Ecological Communities
- Water Quality

Estuaries are always in flux. Pressures on the estuary caused by humans and by climate change can affect the way estuaries normally function, altering their typical fluctuations and the way people interact with estuarine ecosystems. The Great Bay National Estuarine Research Reserve aims to protect ecosystem functions and services and address the coastal pressures of climate change and land use/human use changes. The Reserve focuses on protecting water quality and biological communities and promoting sustainable human use of and interaction with the estuary.



Long-term Integrated Goals and Objectives

GOAL 1

Coastal scientists and managers understand how Great Bay is functioning now, how it may function in the future, and how that is influenced by and will impact people in the watershed.

OBJECTIVES

- 1.1:** The structure and function of Great Bay estuarine ecosystems are understood, protected, and restored.
- 1.2:** The vulnerability and resiliency of Great Bay ecosystems and communities in relation to key stressors is understood.
- 1.3:** Representative habitats are protected within the NERR that support native wildlife.

STRATEGIES

- Work with partners to monitor environmental changes within Great Bay over time.
- Facilitate and conduct applied and basic research to advance understanding of the structure and function of estuaries.
- Facilitate and conduct science to advance understanding of how stressors are impacting the estuary and how habitat, water quality and built communities may be impacted in the future.
- Develop, share, and use the best science available to prioritize and direct restoration and resource protection strategies.
- Work with partners to actively protect estuarine land and restore key habitats.
- Convene partners to identify and advance science, protection and restoration priorities in the region.
- Translate and communicate GBNERR and other local science results to decision makers and citizens to inspire and enable action.
- Identify key coastal management science and technical needs and use that to guide GBNERR and partner efforts.
- Engage in the scientific and technical community of New Hampshire and within the NERRS to enhance understanding of Great Bay and advance national understanding of estuarine resources.

GOAL 2

People make personal and professional decisions that help restore and protect ecosystem function and advance social priorities.

OBJECTIVES

- 2.1:** Reserve staff understand how people make professional and personal decisions that could impact Great Bay.
- 2.2:** People have clear information that translates local science.
- 2.3:** People understand the potential consequences and trade-offs of their actions and decisions.
- 2.4:** People recognize that they are an integral part of the Great Bay ecosystem and are inspired to and supported in making choices that protect and restore Great Bay.

STRATEGIES

- Advance understanding of personal and professional motivations and behavior change theory, and apply that to education, outreach, and volunteer programming.
- Create or enhance outdoor experiences that inspire an engaged citizenry to act on behalf of the health of Great Bay.
- Translate science and coastal management questions in a tailored way is appropriate and relevant to specific audiences.
- Enhance opportunities for multi-directional dialogue and collaborative idea generation about what the key coastal issues are in the region and how to solve them.
- Deliver high quality training and education programs that demonstrate how people and the estuary are interdependent, and give participants practical information and tools to change how they work and act.
- Encourage investigation and communication about trade-offs between different policy, restoration, and behavioral decisions.
- Work with the Great Bay Stewards to engage a larger and more diverse group of people to participate, volunteer, and experience GBNERR and GBNERR programs.

Research Plan



A. National Research Context

The National Estuarine Research Reserve System’s mission includes providing opportunities for long-term research (15 C.F.R. § 921.1(a)). Research at each Reserve should support the Reserve System’s goals as defined in the NERRS regulations (15 C.F.R. § 921(b)).

To sustain these system goals, the *2017-2022 Reserve System Strategic Plan* (NOAA, 2017) outlines research objectives to maintain and expand biophysical and socio-economic monitoring to track environmental change, increase the use of collaborative research to address decision-maker needs, and ensure that scientific, education, and management audiences can use the data, research results, and tools developed by the system. Reserves use local, regional, and national partnerships to support research and monitoring priorities that meet their specific objectives.

In addition, research is supported by the Margaret A. Davidson Graduate Fellowship Program and by the NERRS Science Collaborative. The NERRS Science Collaborative delivers highly credible and relevant science to the coastal management

community by incorporating user input into the design and implementation of research projects, ensuring that the outcomes support stakeholder needs. Through competitive research awards, the program supports the Reserves and their prospective research partners to address system-wide NERRS research and management needs, while being responsive to local and regional Reserve priorities, and those of NOAA. The goal of the Davidson Fellowship is to build the next generation of leaders in estuarine science and coastal management by affording graduate students the opportunity to conduct collaborative science addressing key Reserve management issues, partake in professional development opportunities, and receive quality mentoring to support their professional growth. The fellowship will offer graduate students enrolled in a M.S. or Ph.D. program the opportunity to conduct estuarine research within a National Estuarine Research Reserve. Fellows will also receive professional guidance and mentoring from Reserve staff, as well as quarterly career-readiness training.

The NERRS System-Wide Monitoring Program (SWMP) supports environmental monitoring to develop quantitative measurements of short-term variability and long-term changes in water quality, biological systems, and land-use/land-cover characteristics of NERRS estuaries and estuarine ecosystems for the purposes of informing effective coastal zone management issues of regional or local concern. The *Reserve System-Wide Monitoring Program Plan* (NOAA, 2011) describes SWMP and its role in supporting the National Estuarine Research Reserve System's mission and strategic goals, details the existing monitoring capacity in the NERRS, and outlines an implementation and development plan for the program. The program is designed to enhance the value and support the vision of the Reserves as a system of national reference sites and focuses on three ecosystem characteristics:

- 1. Abiotic Characteristics:** Abiotic measurements use standard protocols, parameters, and approaches to collect data about the physical environment including weather, water quality, hydrological, and sediment related parameters. SWMP currently provides data on water temperature, specific conductivity, percent saturation of dissolved oxygen, pressure, pH, turbidity, salinity, concentration of dissolved oxygen, and pressure-corrected water depth. Meteorological data include air temperature, relative humidity, barometric pressure, wind speed, wind direction, rainfall, and photosynthetically active radiation (PAR). In addition, the program collects monthly nutrient and chlorophyll samples at all SWMP water quality stations and monthly diel samples at one SWMP water quality station. Data are Federal Geographical Data Committee-compliant and available via the Reserve System Centralized Data Management Office (<https://cdmo.baruch.sc.edu>).
- 2. Biotic Characteristics:** Biotic data collection uses standard protocols, parameters, and approaches to describe biological communities, including estuarine vegetated habitats, benthos, plankton, nekton, and birds, Reserve biota, and biodiversity.
- 3. Watershed and Land Use Classifications:** These classifications use standard protocols, parameters, and approaches to establish a spatial reference frame that can be linked to national geodetic networks for Reserve and watershed-scale spatial data products that track and evaluate changes in coastal habitats and watershed land use and land cover. This element is guided by the *Reserve System Habitat Mapping and Change Plan*.

B. Local Research Context

Geographic Scope and Key Audiences

The Great Bay National Estuarine Research Reserve research and monitoring program is primarily focused within the boundary of the Reserve. This encompasses all of Great Bay and Little Bay and to the head of tide of the Bellamy, Oyster, Lamprey, Squamscott, and Winnicut Rivers. It includes the terrestrial extent and habitats depicted in Figure 4. The Reserve also conducts research outside the Great Bay area when those studies relate to processes in Great Bay or contribute to regional or national science related to estuaries.

The research developed at the Reserve is designed both to serve the local stakeholders in the region to address coastal management questions, and to ensure that basic estuarine conditions and trends are understood over time.

The Great Bay National Estuarine Research Reserve works collaboratively with a variety of groups and organizations to make sure the work of GBNERR is relevant and applicable to coastal management. These include:

- **Municipalities that Surround Great Bay**

The role of local communities in environmental decision making is very important in New Hampshire. Local boards and elected officials often implement and enforce the key policies that can protect ecosystem services.

- **State and Federal Agencies**

State and federal regulators and technical assistance programs are important partners. Reserve science aims to provide information and support to state and federal agencies that implement land management and coastal management in New Hampshire and throughout New England.

- **Reserve Staff and Visitors**

At GBNERR, it is the intention that Reserve science informs and is integrated into training programs, education programs, and decisions related to managing NHFG lands.

- **Other Research Partners**

The Reserve partners closely with the UNH research community, surrounding Reserves, and other local partners such as the NH Coastal Program, the New Hampshire Chapter of the Nature Conservancy (TNC), the Northeast Regional Association of Coastal and Ocean Observing Systems (NERACOOOS), and Piscataqua Region Estuaries Partnership (PREP). Reserve monitoring and research gains relevancy when leveraged by other efforts in the region.

- **NERR System and NOAA**

GBNERR is engaged in understanding regional and national trends in estuary health, testing new monitoring technology, and developing transferable monitoring protocols with other Reserves and NOAA.

Local Research Context

The Great Bay National Estuarine Research Reserve research program has evolved in response to environmental, regulatory, agency, and staffing changes. GBNERR has had Research Coordinators with expertise in anadromous fish, watershed management, and estuarine ecology during this time. The topics of water quality and climate change have received considerable attention in New Hampshire, and the Reserve has adjusted to answer questions and to be a resource for local managers. In 2008, the Great Bay was placed on the New Hampshire Department of Environmental Services (NHDES) Section 303(d) list for Threatened or Impaired Waters. The designation immediately shifted the focus of many partners to the source, fate, and impacts of nitrogen in the system. The 2015 NH Wildlife Plan Coastal Habitats section developed research and management recommendations related to protecting and restoring coastal habitat and species that have helped shape the Reserve's work since the plan's release. Finally, the work of the Coastal Adaptation Workgroup and the NH Coastal Hazards and Risks Commission compiled and identified key research questions related to flooding and storm surge vulnerability that impact the built and natural communities in the region. A large increase in local aquaculture and oyster restoration efforts, interest in local food production, concern over emerging contaminants, the needs for salt marsh protection and restoration, and interest in ecosystem service and natural resource economics are likely to ensure that Reserve efforts evolve to meet coastal decision maker needs over time.

GBNERR has a close working relationship with the three other New England Reserves, UNH and the Jackson Estuarine Lab, with the NH Department of Environmental Services (NHDES), The New Hampshire Chapter of the Nature Conservancy (TNC), and with the local National Estuary Program, the Piscataqua Regional Estuaries Partnership (PREP). GBNERR and SWMP are integral to a collaborative monitoring effort in the Great Bay region. The Reserve, PREP, NHDES, and a coalition of towns located within the watershed all contribute funds or expertise to collect water quality data from the Great Bay. All partners dedicate funding to the Jackson Lab, so the data is collected, managed, and QA/QCd in a consistent manner. The partners share data, equipment, protocols, staff, and knowledge to ensure a common understanding of trends in the Great Bay watershed. The data is used by partners for regulatory purposes, to identify spatial gaps in understanding, to draw connections between water quality and habitat conditions, and ultimately to inform management options.

In addition to these very local partners that are focused on Great Bay, there is a robust coastal and ocean research community within the Gulf of Maine.

The Reserve has worked with the research partners in Great Bay and Gulf of Maine to determine the critical science and monitoring gaps for this region. Regional efforts such as the “Integrated Sentinel Monitoring Network for Change in Northeast U.S. Coastal and Ocean Ecosystems” lay out an approach and suggest parameters to consider in order to understand trends. Legislative Commissions related to Coastal Hazards and Risks and Marine and Coastal Resources have also identified emerging research and monitoring needs for the region. In addition to these state and regional efforts to identify priorities, the Reserve is also responsive to NHFG coastal science needs and to the interests of wildlife management partners in the region (USFWS, NRCS, etc.). Many of these priorities are articulated in the 2015 New Hampshire Wildlife Action Plan.

Although there are a relatively large number of research and monitoring partners and programs in a small geographic space, many of the partners and programs have limited staff. Therefore, the network often functions as a team. The Reserve is an important part of this group offering expertise in salt marsh monitoring, modeling and assessment; water level and elevation data; climate impacts on species and habitat; water quality data; collaborative research opportunities; a link to NOAA resources and expertise; and GIS tools to inform restoration, land management, and protection decisions. National programs such as the NERRS Science Collaborative and the Margaret Davidson Fellowship provide key opportunities to apply Reserve resources to address the coastal management needs that have been written into the plans that exist in the region.

C. Current Research Program

Staffing

The Great Bay National Estuarine Research Reserve currently has a very small research program with one full-time Research Coordinator and a Stewardship Coordinator. Part-time contractors are hired through the Great Bay Stewards to support the Reserve on externally-funded grants. The System Wide Monitoring Program is administered through UNH, and there are two part-time technicians that contribute to the abiotic, weather, and nutrient elements of the SWMP program. Funding for the System-Wide Monitoring program goes directly to UNH. The water quality lab at UNH conducts monitoring using the same technicians and the same protocols for GBNERR, NHDES, and PREP. This allows the three partners to use funds more efficiently, work together to fill monitoring gaps, and seamlessly use the water quality data collected in Great Bay for multiple regulatory and non-regulatory purposes. The Stewardship Coordinator at the Reserve is also engaged in research activities and works closely with the Research Coordinator. The Reserve has been fortunate to have a combination of grant funding and private funding to sponsor summer technicians and has leveraged undergraduate and graduate student interest in studying Great Bay to add capacity. The launch of the Margaret Davidson Fellowship program will also enhance research capacity at GBNERR during this planning period. The Reserve also takes part in UNH and other partner grants when projects align with GBNERR expertise and research interests.

Facilities

There is no lab facility at the Great Bay Discovery Center campus, however there is some basic lab space available to the Reserve at the Region 3 office of NH Fish and Game in Durham and the SWMP program has access to lab space at the UNH Jackson Lab. The Research Coordinator, research contractors, and students working at the Reserve as interns or fellows have office space at the Depot House.

Key Partners

New Hampshire Department of Environmental Services

The NH Department of Environmental Services has several divisions that partner with GBNERR. GBNERR monitoring data is ingested into the DES database for use in regulatory permitting, and GBNERR is integrated into the monitoring and data analysis for the agency. The DES shellfish program is a key partner in understanding aquaculture needs and trends and

related water quality issues. The Coastal Program is a key partner in advancing stormwater and coastal resiliency science and technical assistance.

University of New Hampshire

The University of New Hampshire is located in Durham, NH and operates an Estuarine Lab that sits directly on Great Bay. The University is a key partner to the Reserve through several programs housed by the University and through individual researchers and academics that partner with the Reserve. Specific partnerships that are affiliated with UNH include:

- **Piscataqua Region Estuaries Partnership:** <https://prepestuaries.org/about-prep/>
The Piscataqua Region Estuaries Partnership is housed at UNH and works very closely with GBNERR on outreach, monitoring, and collaborative efforts within the watershed. GBNERR data is used in their State of Our Estuaries Report. PREP and GBNERR participate together on research and monitoring efforts in Great Bay and prioritize science gaps and needs through their Technical Advisory Committee.
- **Jackson Lab:** <https://marine.unh.edu/facility/jackson-estuarine-laboratory>
The GBNERR SWMP program is administered by the Jackson Estuarine Lab. The Reserve also relies on and works with scientists at Jackson Lab to understand and help monitor salt marsh, eelgrass, macro algae, oysters, crabs, lobsters, horseshoe crabs, and bacteria in Great Bay. These scientists are GBNERR's closest collaborators and often help with TOTE programs, CTP content and training, monitoring efforts, and externally funded research.
- **UNH Stormwater Center**
The Stormwater Center is a longtime partner of GBNERR in advancing Low Impact Development science and outreach and understanding the impact of non-point pollution on the estuary. GBNERR has partnered on several NERRS Science Collaborative Projects and CTP events with the Stormwater Center.
- **Sea Grant and UNH Cooperative Extension:** <https://seagrant.unh.edu/>
New Hampshire Sea Grant is another key partner that works with the Reserve in multiple programmatic areas. The research program collaborates to engage citizen scientists in Reserve work, apply to external funding opportunities, advertise fellowships and internships, and share information about research that is happening within the organizations.

Other Academic Partners

The Reserve also maintains important academic partners outside of UNH Jackson Lab. GIS experts, biologists, sociologists, climatologists, hydrologists, and engineers all have worked closely with GBNERR through externally-funded projects and through research and CTP work in the region.

The New Hampshire Chapter of the Nature Conservancy

The Reserve has been a research partner with TNC on efforts to assess salt marsh health, conduct geospatial analysis, compare modeling of migration pathways, determine effective invasive species removal techniques, restore oyster reefs, and prioritize land protection efforts.

New England NERRS

The research and monitoring efforts of the New England Reserves are well-coordinated, and Reserves continue to share information and protocols for monitoring change, tracking new species, understanding regional trends, and sharing a voice in regional research and monitoring efforts.

Federal Agencies

The Reserve engages several federal programs in GBNERR research and monitoring work. Examples include partnerships with NOAA, Environmental Protection Agency (EPA), Natural Resource Conservation Service (NRCS), and US Fish and Wildlife Service (USFWS).

Northeast Regional Association of Coastal and Ocean Observing Systems (NERACOOS)

The regional NERACOOS office is located in Portsmouth, NH, and the regional director is interested in and motivated to

understand coastal management needs and link offshore and near-coastal data in the region. NERACOOS maintains a buoy in Great Bay, offering a complement to SWMP data and an opportunity to look at additional parameters within the bay.

Current Research Program Description:

Implementation of the System Wide Monitoring Program

- **Abiotic Monitoring:** GBNERR maintains SWMP data in partnership with the University of New Hampshire. The NOAA award is split between NHFG and UNH, with a portion of the federal funds going directly to UNH to oversee the SWMP program. UNH is responsible for collecting data, purchasing and maintaining equipment, and submitting all required data to the Central Data Management Office in South Carolina. Technicians from UNH attend the Technician Training Workshop each year and have been active in the SWMP Technician network.

The Principal Investigator on the SWMP grant at UNH is also the lead for water quality monitoring work for the Department of Environmental Services and PREP. This allows GBNERR, DES, PREP, and UNH to work together to identify water quality monitoring gaps and trends, enabling joint discussion about new parameters that would be valuable in the region and making the NERRS SWMP results and protocols useful to a broader suite of coastal managers and regulators in New Hampshire. The SWMP lead in New Hampshire has extensive experience as he is also a long-time technician for a larger buoy in Great Bay that is part of the North East Regional Association of Coastal and Ocean Observing System (NERACOOS).

- **Biomonitoring:** GBNERR continually monitors salt marshes around Great Bay. The Reserve partnered with volunteers and salt marsh ecologists at UNH to monitor plant communities and the rooting zone pore water in 2010, 2011, 2013, 2014, 2016 and 2017. In 2018 and 2019, with the hiring of a new Research Coordinator, GBNERR was able to conduct salt marsh biomonitoring independently with volunteer support for the first time and plans to continue this new model moving forward.
- **Sentinel Site Elevation and Water Level Monitoring:** GBNERR completed a vertical control plan in 2013, installed a local tide station in the southern part of Great Bay in 2017, and completed an elevation survey of monitoring points in 2019. This will allow the Reserve to track how marsh communities are responding to changes in water level in the estuary.
- **Habitat Mapping:** NOAA approved the Great Bay Habitat Map and Habitat Mapping and Change Plan in 2015, and in 2017 the Reserve began to develop a high-resolution habitat map in partnership with the Office for Coastal Management. This high-resolution map has been a key input to models and will serve as a baseline for monitoring changes in marshes in New Hampshire as an indicator in the State of Our Estuaries Report.
- **Non-SWMP Monitoring:** GBNERR has participated in, coordinated, or facilitated other monitoring efforts around Great Bay and at other NERRs to respond to short-term questions and to contribute to research efforts in the region. Working with USFWS, the Reserve has been monitoring the ecotone from marsh to forest and has conducted elective pore water monitoring at long-term salt marsh sites. Staff collaborated, shared, and synced up salt marsh monitoring efforts with TNC, and participated in horseshoe crab spawning monitoring and macroalgae monitoring with UNH; eDNA monitoring, oyster restoration and monitoring with UNH and TNC; tidal crossing surveys with the state regulatory agency (DES); biomonitoring of marshes at Waquoit Bay and Narragansett Bay; and a national study examining crab abundance and distribution across many of the NERRs. The Reserve also piloted using periphyton as an indicator of water quality in the rivers that feed into Great Bay through pieces of two small grants in 2014 and 2015.
- **Use of Monitoring Data:** GBNERR is committed to making sure the data collected is useful and available to academic, management, and education partners. Locally, UNH researchers use water quality and weather data to understand estuarine conditions relating to their research. Examples include bacterial and toxicology studies and research to inform oyster restoration siting. Detailed habitat maps, SET, and water level data are used by academic and agency modelers and by Reserve staff to refine the NH Sea Level Affecting Marsh Migration Model and the Landscape Scale Assessment of Marsh Resiliency project. Reserve monitoring data is used in the Teachers on the Estuary program every summer. GBNERR's interactive field experiences and hands-on classroom activities for teachers highlight water quality data, habitat mapping information, and SET data.

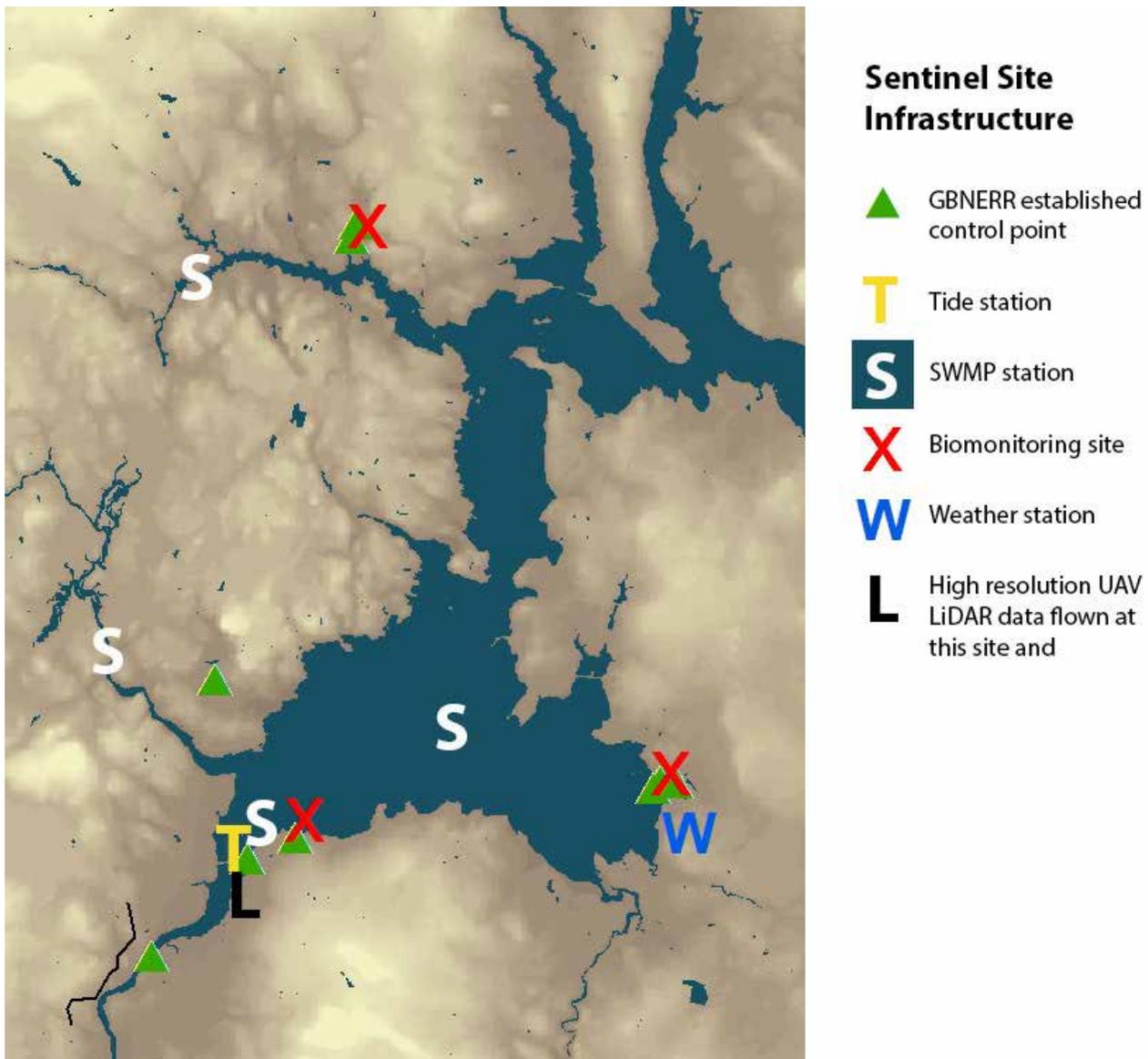


Figure 8: Map of monitoring sites.

Prioritization of Research and Monitoring Needs

Reserve staff work with established partner networks to assess research and monitoring needs in the region. Depending on the research topic or focus, different groups provide input on priorities. For example, climate-related research priorities are often discussed at Coastal Adaptation Workgroup (CAW) meetings and brought back to the research community. Similarly, many water quality research questions are identified through GBNERR’s partnership with PREP, UNH Jackson Lab, the NH Coastal Program and Watershed Bureau of the Department of Environmental Services. This group works together to develop an annual monitoring plan that uses SWMP protocols but expands the geographic scope and in some cases the parameters collected to meet regulatory needs or to investigate emerging trends. NHFG and others also work closely with PREP to produce a State of Our Estuaries report every five years. The State of Our Estuaries Report engages stakeholders from a broad spectrum of interests to participate in their Technical Advisory Committee (TAC) meetings. This process is one of the main avenues for identifying monitoring and research needs for the bay that are related to water quality and the connection between water quality and habitat. Habitat science priorities are solicited from natural resource management partnerships like the Wildlife Action Plan Implementation Team, the Great Bay Resource Protection Partnership, and engagement with

groups like the Nature Conservancy. The New Hampshire Charitable Foundation partnership, Great Bay 2020, also prioritized research and monitoring needs for Great Bay. Continuing collaboration with SeaGrant, PREP, and the Coastal Program adds to this list each year. Reserve staff may also learn about research questions and needs at regional or national professional conferences or meetings.

The NERRS Science Collaborative call for NERR priorities, and the recent call for the Davidson Fellowship research priorities gave GBNERR staff an opportunity to articulate science questions and solicit feedback on those from close partners. When scientists approach the Reserve for help or partnership on a project, staff consult each other, the management plan, the NERRS Strategic Plan, and close partners to evaluate if the proposed project is a good fit.

Research Focus Areas and Approach

The Great Bay National Estuarine Research Reserve is a resource for research partners and a place to integrate science with decision maker outreach, citizen engagement, and K-12 audiences. The Reserve has been an active participant in over a dozen NERRS Science Collaborative projects ranging in topics from vegetated buffers to climate modeling, with different sectors and partners engaged depending on the topic. Collaborative science is a natural fit for GBNERR because of the distributed governance model of municipal decision making, the heavily partnered nature of coastal management work in New Hampshire, and the limited staff and facilities of the Reserve research program. The research efforts at GBNERR are focused on finding the gap or problem, bringing people together to try to find a solution, and bringing that information back out to partners or applying that science directly to Reserve decisions and management actions.

The following focus areas have been identified through Reserve staff and partners that will direct the research and monitoring program in the next five years.

Monitoring Program Areas

System Wide Monitoring Program and Sentinel Sites: Expand geographic coverage of water quality monitoring; add new parameters to SWMP to capture important trends such as acidification; contribute to other monitoring efforts in Great Bay (e.g., macroalgae, seagrass, horseshoe crab, and oyster monitoring); test better ways to measure existing parameters from sondes (e.g., chlorophyll); explore the placement of the Great Bay sonde and how to integrate it with the NERACOOS buoy; continuing to tie elevation data to the GBNERR monitoring network and research needs; ensure SET and biomonitoring data is comparable across NERRS sites; continue to map habitats and how they are changing over time; ensure that all DataSonde, water-level, and SET infrastructure is secure and up to date; and explore expanding to a second sentinel site location at Chapmans Landing.

Pre- and Post-Restoration Monitoring: Promote the use of Reserve lands as reference sites for restoration efforts; support experimental approaches to restoration (e.g. thin-layer placement, marsh migration, ditch remediation, runneling); and participate in the development and implementation of pre- and post-monitoring activities for restoration and living shoreline projects.

Watershed Health: Explore, test, and implement innovative ways to monitor estuarine health in Great Bay. This could be building on past/current efforts such as eDNA or periphyton, or working with partners to implement other ways of creating indices of estuarine health (benthic indices, microbial indices, etc.).

Understanding Emerging Threats: Advance understanding of contaminants or harmful viruses that may be having a negative impact on human and ecological health (PFAS, microplastics, vibrio, personal care and pharmaceutical products, etc.) and how ocean acidification may impact organisms in the Gulf of Maine and in New Hampshire waters.

Invasive Species and Species Migration: Track invading species of concern and species shifts within the estuary.

Socio-Economic and Human Dimensions: Collect baseline knowledge/attitude/behavior data, and/or develop or track data about important socio-economic trends in the region.

Research Program Areas

Restoration Science: Advance restoration science and enhance adaptive capacity for key habitats such as eelgrass, oyster beds, and salt marsh. Advance restoration science related to threatened, rare, or endangered species.

Great Bay Ecosystem Processes: Study interactions between abiotic and biotic conditions. Continue to support investigating the hydrology, biological processes, sediment and light dynamics, changes in pH, etc., that influence ecosystem processes in Great Bay.

Climate Science: Conduct research, modeling, and monitoring to advance understanding of how estuarine processes, habitats, and species will respond to climate related impacts (water level and flow, water and air temperatures, shifting habitat conditions, changing ocean and freshwater chemistry and acidification, etc.). Collaborate to study and relay information about how climate related changes will impact local community health, economy, infrastructure, and planning processes.

Land Use Change and Anthropogenic Influences: Conduct research, modeling, and monitoring to advance understanding of how land use related stressors (pollutant load, temperature changes, hardened shorelines, etc.) impact estuarine physical and biological processes, habitats, and species, and to provide insight to appropriate management solutions.

Social Science: Advance behavior-change science, understand influences on municipal and landowner decisions, use of economic data in coastal decision making, etc.

Science to Support Multiple Uses: Study and create tools that help balance multiple uses of public land, multiple goals of living shoreline projects, and tradeoffs of different management scenarios for the estuary.

Invasive Species and Species Shifts: Understand factors contributing to shifting biological communities and effective management techniques.

Challenges

Lack of Staff, Equipment, and Space: The Reserve lacks a research facility or laboratory. As such, GBNERR equipment is limited to basic salt marsh and macroalgae monitoring supplies. The Reserve has research capacity in two full-time staff (the Research and Stewardship Coordinators) and when successful with external funding, there is support for a part-time temporary person to help. It is difficult to keep part-time temporary people, as they are hired as contractors through the Great Bay Stewards to conduct very specific grant supported tasks. The Reserve also does not have adequate housing for visiting scientists, interns, fellowship students, or classroom space.

Lack of all tide access to Great Bay: Research staff lack immediate low tide access to Great Bay from the main campus in Greenland. The partnership with Jackson Estuarine Lab provides all tide access approximately 20 minutes away from the Greenland campus.

Limited Ability to Manage Soft Funding: The way positions are created, funded, and filled in the state system makes it difficult for the Reserve to build a research program using soft funding. Additional staff capacity can be added when the Reserve is successful with a grant by hiring them as part-time contractors with the Great Bay Stewards, but the Stewards and NHFG do not provide regular funds that could sustain these externally-funded positions between grants or add general capacity to the program. The Great Bay Stewards have built significant capacity over the past few years to serve as a fiscal agent for GBNERR grants, but there is no equivalent to a Sponsored Projects Office at a university to manage and track external grants.

Inherent Complexity of Coastal Science: GBNERR has limited capacity, and the Great Bay ecological and social system is complex. Monitoring change over time is important, and must be linked to research to understand why trends are occurring and how municipal, state, and personal decisions can influence the estuary. Ideally a NERR would have expertise in natural science, wildlife management, climate science, water quality, human dimensions research, and biophysical modeling to continually add value to the research community. The Reserve works with partners to identify and address gaps, but it is difficult to maintain responsibilities and expectations to NHFG, NOAA, and watershed partners and coordinate efforts that are so diverse in scope, discipline, and target audience.

Research Objectives and Strategies

GOAL

Advance the scientific understanding of the condition, structure, and function of Great Bay estuarine ecosystems.

OBJECTIVES

- R1:** Publications, data sets, regional assessments, national products, GIS tools, maps, guidance documents, and white papers produced at the Reserve are used by the scientific and management communities.
- R2:** High quality datasets contribute to regulatory decisions related to water quality and habitat protection and restoration.
- R3:** GBNERR creates, improves, or contributes to standards, protocols, and templates for collecting and analyzing data across geographies.
- R4:** Restoration and land protection prioritization tools and maps created by or in partnership with GBNERR are used by NHFG and land management partners.
- R5:** New protocols and tools are tested and implemented to enhance monitoring efforts in Great Bay.
- R6:** Existing partners are well-coordinated and new partnerships are developed to fill physical and social science gaps.
- R7:** GBNERR is a valued contributor to national and regional NERRS projects and products.
- R8:** New Hampshire Fish and Game and GBNERR education, stewardship, and CTP sectors are supported by the science that is generated within Great Bay and have access to expertise to plan and implement their programs.
- R9:** Students, citizens, and volunteers are engaged in GBNERR science and understand how their efforts are connected to the GBNERR mission and the overall health of the estuary.

STRATEGIES

- Maintain and enhance the System-Wide Monitoring and SSAM-1 Program to collect long-term data on water quality, weather, elevation, sedimentation, water level, biological communities, habitat, land use, and land cover characteristics.
- Increase Reserve capacity to collect, synthesize, and deliver environmental indicators data; monitor changes and trends with partners in the region.
- Conduct collaborative research projects that engage natural resource managers across multiple sectors to address decision-makers' and stakeholders' needs.
- Engage volunteers, interns, undergraduates, and graduate students in research opportunities.
- Maintain and strengthen partnerships with research institutions and local management partners to understand and address science and monitoring needs, including social science needs.
- Communicate research results and monitoring trends through technical reports and peer-reviewed publications; presentations; syntheses of physical, biological, and geochemical data; and training and technical assistance for decision-makers.
- Use Reserve-based science and monitoring to inform land management, restoration and stewardship activities.
- Produce guidance and summary documents that translate science for end-users.
- Incorporate GBNERR and partner research results, data, and tools into education and training programs.
- Work with Education, Stewardship, and CTP staff to assess the needs of partners and stakeholders to develop science priorities and to target science communication and knowledge-transfer.

Education Plan



A. National Education Context

The National Estuarine Research Reserve System’s mission includes an emphasis on education, interpretation, and outreach (C.F.R. § 921.1(a)). Education at each Reserve is designed to help fulfill the Reserve System’s goals as defined in the NERRS regulations (15 C.F.R. § 921.1(b)).

To sustain these system goals, the 2017-2022 Reserve System Strategic Plan outlines education objectives to increase coastal residents’ and visitors’ awareness and ability to improve stewardship of estuaries, coastal watersheds, and their communities; improve educators’ and students’ understanding and use of the Reserve system and NOAA resources for place-based and inquiry-based learning; and grow and motivate the next generation of coastal professionals through access to programs and facilities that facilitate research, resource management, and educational opportunities.

Reserves conduct formal and informal education activities, as well as outreach activities that target culturally diverse audiences of educators and students, environmental professionals, resource users, and the general public. Education and public programs, interpretive exhibits and community outreach programs integrate elements of Reserve System science, research, and monitoring activities and ensure a systematic, multi-faceted, and locally focused approach to fostering stewardship.

The Reserve system is committed to providing tomorrow's future leaders with the knowledge and understanding of the nation's oceans and coasts to be responsible stewards. To fulfill this commitment, the Reserve System has created the K-12 Estuarine Education Program (KEEP) to increase the estuary literacy of students, teachers, and the general public. The KEEP Program helps students and teachers learn about essential coastal and estuarine concepts, develop data literacy skills, and strengthen their critical thinking, team building, and problem-solving skills. 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 involves both on-site and in-school follow-up activities.

Community action education and outreach are another priority for the Reserve System. Community education programs foster behavioral change to promote resource conservation. These programs work with audiences whose choices directly impact the integrity of estuaries and their associated watersheds.

B. Local Education Program Context

The Great Bay National Estuarine Research Reserve education program is focused on the natural and cultural history of the Great Bay watershed. Programming largely takes place on-site, and the current target audiences include children, teachers, and visitors to the Discovery Center. Most participants in GBNERR education programs are from New Hampshire, as well as northern Massachusetts and southern Maine.

Since the approval of the last Management Plan, Reserve staff have completed a market analysis and needs assessment for student and teacher education efforts in the region. The results of these efforts inform the direction of programming outlined in this management plan. In addition to those two larger efforts, each field trip teacher is asked to evaluate the programs, and the School Programs Director leads an evaluation session after each season with the education docents to reflect on the evaluations and to listen to their ideas about how to make adjustments each year. All Reserve staff continually discuss emerging science and community needs, and these less formal evaluations and conversations have also contributed to the needs, objectives, and proposed activities in this plan.

Market Analysis Summary

Great Bay National Estuarine Research Reserve (GBNERR) conducted a market analysis survey in the spring of 2014. The survey collected information about educational organizations in the New Hampshire Seacoast area and select organizations in Maine and Massachusetts. Information was collected on types of programs offered, grade levels taught, topics addressed, use of climate change in programming, use of Next Generation Science Standards in programming, collaboration with higher level institutions, types of resources used, and counties served within New Hampshire.

Data gathered showed that a wide variety of programs were offered to different grade levels. The most common programming focused on middle to elementary school offerings, with some being offered to the high school age group. Of the programming offered, outdoor activities were prevalent in K-12 education programming. Climate change was being addressed by some organizations. However, the need for more focus on climate change was revealed. Marketing was most commonly targeted directly to the school, with some being conducted through electronic sources. Teacher trainings were offered through a variety of organizations with many providing college credits for participation; however, no organizations surveyed offered housing for teachers. Many organizations also offered teacher resources to help prepare for or review material addressed in a program. Lack of familiarity with the Next Generation Science Standards may indicate the varying stages of adoption by schools and administrations.

Topics needing more attention include experimentation and the scientific method, lab and field techniques, and data analysis, as well as human dimensions such as impact to the environment and stewardship activities. All of these are aligned with Reserve goals and objectives.

Needs Assessment Summary

An educational needs assessment administered in the spring of 2014 revealed that many teachers in the surrounding counties are not aware of the GBNERR educational offerings. The study found that most teachers are not required to teach estuarine science, and many are not currently using real time data to teach science or environmental education. Many teachers want downloadable curriculum materials to support their work, particularly related to the topic of climate change. The most commonly selected topics that teachers would like to see more offerings around included human impacts on the environment, nutrient cycling, and food webs. When teachers were asked what kind of assistance they need to incorporate more outdoor education in their classroom, most indicated that facilitating field work and data collection and facilitating inquiry-based learning would be most valuable. The needs assessment asked specific questions to help inform the development of future teacher workshops; the strong preference was for workshops at the GBNERR that last no longer than three days. Offering Continuing Education Credits did not show strong signs of influencing willingness to attend. The most common barrier to attending workshops was high registration costs, underscoring the importance of offering workshops at little-to-no-cost for New Hampshire teachers.

Priority Issues for Education Programs

GBNERR education programs focus on the natural and cultural history of Great Bay. All of the GBNERR programs aim to connect people to natural resources and emphasize the interrelationship between society and nature. This theme continues from toddler programs through school field trips, exhibits around the campus, and public education programming. Great Bay is an inland estuary, and GBNERR programs focus on watershed and estuarine processes, species, and cultural links rather than ocean issues. These themes directly support both the NH Fish and Game and the NERRS Strategic Plans.

C. Education Program Capacity

Staffing

The current education staff includes two full-time and two part-time staff: the Education Coordinator, the Assistant Education Coordinator/School Programs Director, and two part-time park guides. The Education Coordinator also serves as the Site Director of the Greenland campus supervising facilities, scheduling, and volunteer activities. The Assistant Education Coordinator/School Programs Director is the lead contact for all field trips and school-age camps and special activities. The two naturalist positions teach the field trip programs, lead kayak programs, lead the “Once Upon an Estuary” program for young children, and assist with all informal education programming.

Facilities

Facilities that support the education program include: the Great Bay Discovery Center; the Hugh Gregg Coastal Conservation Center and Special Collections room; and campus features such as the boardwalk, two education pavilions, interpretive trails, and a hightide-only boat launch.

Great Bay Discovery Center

The Discovery Center serves as the visitors’ center for the Reserve, and also hosts the school field trip program. It features over 1000 square feet of exhibit space, aquariums, and a touch tank.

Hugh Gregg Coastal Conservation Center and Special Collections Room

The Hugh Gregg Coastal Conservation Center was constructed in 2006 as a meeting space for a variety of Reserve activities. This space is used to support school field trips in inclement weather, and to serve as a “base” for summer camps and seasonal activities. The Special Collections Room is an exhibit space in the basement of the Gregg Center that highlights hunting and fishing artifacts and practices from the Seacoast region. This collection has become a standard “module” in the fall field trips and is visited by more than 5,000 students a year.



Campus Features

The GBNERR campus in Greenland features a 1,400 linear foot boardwalk, a covered lunch pavilion, an educational pavilion, an amphitheater, a boat launch and waterfront area, two model boats that function as teaching space and play structures, an outdoor exhibit that highlights the green features of the campus, and several themed gardens.

Key Partners

The Education Coordinator is part of a coastal education community in New Hampshire known as the Coastal Education Initiative (CEI). The group meets at a minimum two times annually to collaborate and discuss program opportunities and projects for potential partnership. The group also serves as an advisory board to one another, whereby partners can ask for support and direction on a variety of issues, opportunities, and challenges.

Coastal Education Initiative Members include:

- **University of New Hampshire Sea Grant:** Since its inception, the Discovery Center has worked hand-in-hand with UNH Sea Grant docents and program leads. Docents attend GBNERR volunteer training sessions and lead many of the education programs at the Reserve. Additionally, staff attend events that UNH holds such as Ocean Discovery Days and monthly meetings. Education staff partner with Sea Grant to develop curricula and education programs throughout the year.
- **The Piscataqua Gundalow Company:** In 2017 GBNERR partnered with the Gundalow Company to offer a TOTE workshop focused on climate impacts to fisheries and wildlife. Teachers spent a full day aboard the one-of-a-kind gundalow vessel for a bay-to-sea trip. Gundalow Company staff and GBNERR staff often partner to offer programs or support for other coastal initiatives.

- **Blue Ocean Society:** The Blue Ocean Society is a non-profit organization dedicated to the conservation of the marine environment. GBNERR education partners with Blue Ocean on projects relative to marine debris and curriculum development.
- **Seacoast Science Center:** Like the Great Bay Discovery Center, the Seacoast Science Center is a site-based educational visitor center situated directly on the Gulf of Maine. Programs at the Center are more focused on open ocean topics but often programs overlap, and staff work together on joint projects and curricula.

Other key partners:

- **Squam Lakes Science Center:** An education center in the geographic center of New Hampshire, GBNERR partners with Squam Lake to share volunteer management ideas, training, and environmental education programs. Although the niche of Squam Lake is freshwater, many of the same basic ecological concepts are transferable.
- **Association of Nature Center Administrators:** The Education Coordinator attends ANCA meetings and utilizes current research and findings for administration of the Great Bay Discovery Center. Annually, site directors meet to collaborate and share projects and challenges of running environmental education centers.
- **NH Environmental Education Association:** NHEEA is an organization which supports and advances environmental education throughout New Hampshire. GBNERR attends workshops and utilizes its active listserv to reach teachers and other educators throughout the state.

D. Current Education Program Delivery

K–12 Education

Estuary Exploration Programs

Great Bay Discovery Center’s Estuary Exploration Programs are offered in the spring and fall to elementary school children and are tailored to the appropriate grade level. Fall programming emphasizes the cultural history of Great Bay and its relationship to the area’s natural resources. The program includes a visit to an American Indian fishing encampment, complete with birch bark covered wigwam and replica artifacts for students to touch, and an interactive lesson about colonial-era trading aboard a gundalow. The program also features educational stories accompanied by artifacts related to oystering, lobstering, and salt marsh haying. Spring programs focus on the natural resources of Great Bay. The experience broadens students’ understanding of coastal New Hampshire’s estuarine ecosystems through a focus on hands-on activities. The programs address concepts such as non-point and point source pollution, habitats, climate change, and estuarine species with facilitated visits to the waterfront and Discovery Tank, as well as an interpretive walk along the boardwalk. Staff and trained volunteers lead these interactive experiences. Over 5,000 students grades 1-5 attend these field trips annually.

Teacher Training

Teachers on the Estuary

Teachers on the Estuary (TOTE) is a highly visible National Estuarine Research Reserve System education program that offers hands-on, field-based, professional teacher development opportunities by National Estuarine Research Reserve sites across the nation. The program goals are for teachers and students to increase their knowledge and appreciation of estuarine environments, as well as, acquire the necessary skills to act as stewards of estuarine resources.

The education program provides a multi-day hands-on, field-based professional development program at the Reserve in support of estuarine education. The target audience is K-12 teachers, informal educators, and pre-service teachers. This program satisfies the following criteria based on sound educational practices:

- Hands-on, field-based, professional teacher development sessions in support of high-quality estuary education
- Promotion and coordination at the national level

- Theme based on local research, habitats, and resources plus national initiatives
- Training in NERRS education resources such as Estuaries 101
- Alignment to state or national curriculum frameworks
- Adherence to sound pedagogical practices
- Responsive to NOAA review and suggestions, and includes an evaluation component

Traveling Trunks

The Great Bay Traveling Trunk Program allows teachers, students, and other interested groups and individuals access to Bay-related artifacts, books, posters, videos, recordings, slides, curricula, puppets, and more. Each individual trunk program is designed to bring the natural and cultural history of the Great Bay estuary into school classrooms statewide. Trunk materials are most appropriate for elementary age children. Spring program trunks include: *Horseshoe Crabs*, *Great Bay's Ancient Mariner!*, *Ospreys!*, and *It's All Connected*. Teachers can borrow a Great Bay Cultural History Trivia game in the fall.

Education Programming for General Audiences

Community Outreach

The Reserve has implemented programs and activities to target adult members of the community. Often these programs and events bring quality estuarine information to non-academic audiences through lectures, lunch talks, interpretive walks, or demonstration activities. As a part of this general community outreach, the Great Bay Discovery Center is open to visitors from May through October every year. Exhibit space highlights the unique aspects of the Great Bay estuary, from hydrology to ecology. Historic uses of the salt marsh and bay are featured as well. A Discovery tank and several fish tanks allow visitors to get up close to estuarine fish, mollusks, and invertebrates. New exhibits feature estuarine habitats and wildlife, and their relationship to marine debris and other stressors within the estuary.

Public Events

The Reserve is involved in many events to educate the public on the significance of Great Bay. All of these are community-wide events where the Reserve and other coastal education partners promote the benefits of the estuary and focus on the critical issues facing coastal natural resources.

Discover Wild New Hampshire Day

This popular celebration began in 1989 as a way to recognize Earth Day and the State's diversity of natural resources and outdoor activities. Each year, the Reserve participates in this event run by New Hampshire Fish and Game. Annually, five to ten thousand visitors attend.

Interpretive Kayak Trips

The Reserve offers summer naturalist-guided kayak trips throughout the estuary. All trips are taken with a Reserve-owned fleet of kayaks and include a kayak lessons for beginners. Kayak trips connect visitors to Great Bay and allow access to habitats like oyster reefs, seagrass beds, and salt marshes that are difficult to see from shore. Kayak programs are designed to bring in different audiences by appealing to many different types of visitors to the estuary. Examples of programs offered in the past include angling trips by kayak, birdwatching by kayak, yoga paddle boarding, photography themed trips, science on the bay, and moonlight kayaking trips.

Baywalks

Throughout the open season, the Great Bay Discovery Center offers a series of naturalist-guided programs along the boardwalk and throughout the grounds and Discovery Center. A variety of program themes have been developed focusing on subjects such as gundalows, the water cycle, and the ecological zones found on-site. Education staff will occasionally accommodate specific theme requests to assist local groups such as the Scouts.

Bayventures

Bayventures is a camp program for children ages 6-12 with a focus on providing activities using the estuary to expose participants to local ecological concepts. Using current literature supporting unstructured exploration of the outdoors, staff

offer a variety of programs and use outdoor exploration, art, literature, and science to connect school age children to the estuary. Bayventure programs are typically offered in the summer and the winter and are split into “Jr. Bayventures” for younger ages and “Bayventures” for the older children.

Once Upon an Estuary

The target audience for this program is preschool, with a focus on offering general educational programs through reading and outdoor experiences. The objective of this program is for participants to become aware of a variety of ecological concepts through staff-lead stories, crafts, and activities. This program is offered in the winter and in the summer.

Great Bay Matters

The Reserve publishes a seasonal newsletter (three times a year) for an audience that is both within the Great Bay watershed and beyond (current circulation is 3,000). The Reserve and Great Bay Stewards publish Great Bay Matters cooperatively. The articles in the newsletter encompass both organizations’ activities as well as a section focused on the Great Bay Discovery Center education programs. The scope of the publication includes results from research projects, general articles about the estuary, conservation information, and a calendar highlighting upcoming events.

E. Looking Ahead: Education Future Needs, Opportunities, and Challenges

Considering the national and local context, the results of the recent Market Analysis and Needs Assessment, and the current and projected capacity at the Reserve, the next five years will focus on three areas that the Reserve would like to strengthen: public involvement, integration, and collaboration.

The education staff at GBNERR are excited about the opportunity to integrate Conservation Action Education into a variety of their programs. Specifically, staff intends to develop summer Bayventure programs and joint programs with the Stewardship Coordinator to address one of the key findings in the needs assessment: human impacts on the environment. Staff will work to develop programs that foster behavior change and address the protection and restoration of the estuary and any associated habitats.

A minimum of 10 Conservation Action Education Programs will be developed in conjunction with the Coastal Training, Research, Stewardship and School Program Coordinators. For example, in the spring of 2020, the Stewardship and Education Coordinators worked together to expand and enhance a community supported pollinator garden initiative at the Wildlife Garden within the Reserve boundary. Additionally, the Educator Coordinator will seek to develop CAE Programs that assist other sectors in interpreting and transferring scientific research and findings. When possible, the Education Coordinator will develop CAE programs that address NERRS Science Collaborative Grants that GBNERR staff are involved with.

Both the school programs and the interpretive exhibits within the Great Bay Discovery Center are being enhanced and modified to include key initiatives of both the Research and Stewardship Programs. Education staff worked in conjunction with the RC to define and develop an exhibit on “being a saltmarsh scientists”. Actual data sheets and research tools used by the RC were modified and included in the exhibit for a young audience to explore and study an adjacent saltmarsh model. Interpretive panels are being developed and reviewed by the RC. In addition, the concept of saltmarsh migration and the functions and values of saltmarshes are being incorporated into school programming and the interpretive kayak trips in the estuary.

Another opportunity involves the power of volunteerism. Working together with several of the partners mentioned above, the Reserve hosted a New Hampshire Seacoast Volunteer Summit in 2019. The summit brought together volunteers from around the Seacoast involved in coastal education, protection, or restoration, in order to enhance and increase scientific literacy, interpretive skills, and a better understanding of the challenges facing all of the coastal organizations in New Hampshire’s small but robust Seacoast.

The popularity of TOTE at GBNERR has resulted in a challenge: it is difficult to meet the demand for follow-up programming from teachers. Former TOTE graduates are seeking additional opportunities at the Reserve for middle and high school

students. While being a desirable outcome, accommodating these requests due to seasonal change and limited staff has been a challenge. Currently school programs occupy the boardwalk and grounds on the GBNERR campus daily for approximately six months out of the year. The remaining 4–5 months of the year may experience snow-covered marshes and a challenging outdoor learning environment. However, late in the fall of 2019, the EC successfully hosted a group of high-school students and their teacher who had recently attended the TOTE in the summer. The program was run out of facility space not normally occupied during school programs and in an area of the saltmarsh not in conflict with existing programs. The EC believes she can host such groups concurrently with school groups during environmentally judicious periods on the salt marsh. The EC has begun conversations with the RC and SC to determine an area on the marsh that will not conflict with existing SET and vegetative monitoring goals. The EC will continue to work with existing TOTE teachers to develop and host additional groups.

The ongoing effort to update aging exhibits has become increasingly challenging as exhibit design and fabrication costs rise. Education staff try to produce products in-house whenever possible but will continue to seek both in-kind and financial support to update exhibits throughout the campus.

Lastly, the Needs Assessment conducted in 2015 provided valuable information for which TOTE trainings topics were developed. In the next grant period, topics yet to be addressed will be incorporated into programming and an updated Needs Assessment will be conducted. An annual reflection of education output measures will be considered and incorporated where possible in future programming.

Education Objectives and Strategies

GOAL

Advance environmental awareness, appreciation, scientific literacy, and stewardship of estuaries, coastal habitats and watersheds through integrated and innovative interpretation of solid scientific principles.

OBJECTIVES

- E1:** Students who participate in K-12 programming have the opportunity to apply age appropriate STEM concepts through hands on activities.
- E2:** Everyone who participates in an education program at GBNERR has increased understanding of the natural and/or cultural history of Great Bay.
- E3:** Everyone who participates in an education program at GBNERR is aware of how people are connected to estuaries and has the opportunity to create a personal connection with Great Bay.
- E4:** Everyone who participates in a GBNERR education program is inspired and supported to make personal decisions that can help maintain or improve the condition of Great Bay.
- E5:** Students and volunteers that assist with GBNERR education programs are well prepared, well supported, and have opportunities for personal and professional growth at GBNERR.
- E6:** Teachers who attend trainings at GBNERR are inspired, prepared and supported in teaching estuarine concepts to meet educational requirements.
- E7:** GBNERR education programs incorporate GBNERR site features, local science, NOAA science, and NERRS science in programs, messaging and exhibits.
- E8:** The diversity of stakeholders involved in GBNERR estuarine education programs is expanded.
- E9:** The effectiveness of GBNERR education programming is better known through continual evaluation.

STRATEGIES

- Provide hands-on, natural and cultural field enrichment programs for a K-16 audience.
- Increase understanding and appreciation of the Great Bay Estuarine System through dynamic and interactive interpretive exhibits.
- Provide year-round estuarine education and outreach programs utilizing current scientific principles, findings and data focused on coastal habitats, wildlife and human interactions.
- Develop education programs that promote stewardship of estuaries based on awareness and understanding of personal impacts and actions individuals can take to improve the health of the nation's estuaries.
- Maintain and build strong programs for the volunteer community designed to enhance understanding, protection and restoration of the Great Bay Estuary.
- Evaluate effectiveness of education programs through surveys, focus groups, and reflection sessions with educators, volunteers and program participants.
- The Education Needs Assessment will be updated and the Education Market Analysis will be refreshed to incorporate new and relevant programming and potential education partnerships and opportunities.
- Strive to provide estuarine environmental education opportunities to diverse audiences in our watershed.

Coastal Training Program Plan



A. National Context

The NERRS regulations outline a set of goals for the Reserve system (15 C.F.R. § 921.1(b)). The *2017-2022 Reserve System Strategic Plan* outlines coastal training objectives to ensure that coastal decision-makers and environmental professionals understand and effectively apply science-based tools, information, and planning approaches that support resilient estuaries and coastal communities, pursuant to these goals.

The Coastal Training Program provides up-to-date scientific information and skill-building opportunities to coastal decision makers responsible for making decisions affecting coastal resources. Through this program, Reserves ensure that coastal decision makers have the knowledge and tools they need to address important local resource management issues.

The target decision-maker groups vary according to Reserve priorities, but generally include groups such as local elected or appointed officials, managers of both public and private lands, natural resource managers, coastal and community planners, and coastal business owners and operators. They may also include groups such as farmers, watershed councils, professional associations, recreation enthusiasts, researchers, and more.

Reserves are uniquely positioned to deliver pertinent information to local and regional decision makers given their place-based nature. Coastal Training Program coordinators know the local people, places, and science and are able to skillfully convene training participants and experts to address coastal management issues. Training programs are built upon solid and strategic program documents, including an analysis of the training market and assessment of audience needs. Coordinators then work with the results to identify how their program can best address local and Reserve System priority issues.

Partnerships are integral to the success of the program. Reserves work closely with several NOAA programs, as well as a host of local partners in determining key coastal resource issues, target audiences, and expertise to deliver relevant and accessible programs.

B. Local Coastal Training Program Context

New Hampshire's 18-mile oceanic coastline is the shortest in the nation. Due to the large tidal expression in the Gulf of Maine, extending 8 to 12 feet in coastal New Hampshire, the center of the Great Bay estuary is 15 miles inland from the ocean, resulting in 326 miles of tidal shoreland. The resulting 1,087 square-mile coastal watershed is under the jurisdiction of 43 New Hampshire and 10 Maine municipalities. This region is the geographic focus of the Coastal Training Program (CTP) at the Great Bay National Estuarine Research Reserve (GBNERR), which works closely with the Wells Reserve CTP and the Piscataqua Region Estuaries Partnership (PREP) to cover the Maine municipalities. The geographic extent of the seacoast region in New Hampshire is small enough that the Coastal Training Program can serve the entire coastal watershed, the Great Bay Estuary, the Hampton Seabrook Estuary, as well as the communities directly adjacent to the Atlantic Ocean.

New Hampshire is currently the second fastest growing state in New England, following Massachusetts (U.S. Census Bureau, 2018). Between 1990 and 2015, the population in the Great Bay Watershed grew 38%, increasing from 280,205 to 386,658 (NH OEP, 2016). Development and land use change, increased stormwater loads, and increased nutrient pollution are all fueled by this population growth, making the impacts of land use change a key focus of the GBNERR CTP.

On a state level, the 2016 census estimated 634,666 housing units in New Hampshire, with a median per capita income of \$34,264.00. The census recorded a population that is 93.6% white, 3.7% Hispanic, 2.8% Asian, 1.6% black and 0.3% American Indian (totals more than 100% are due to double counting in Hispanic category). Fewer than 8% of households speak a language other than English at home. New Hampshire remains the second leading state in the nation in total area of forest cover (84%) (NH DNCR, 2012), and one of the state's leading industries is year-round nature-based tourism (NH DBEA, 2014). Thirty-five percent of New Hampshire's tidal shoreline is publicly owned or in conservation (NHDES, 2016).

New Hampshire prides itself on not having an income tax and a low sales tax rate; it is currently rated sixth for business tax climate nationally (Tax Foundation, 2019). In 2013, New Hampshire ranked eighth nationally in percent of the population over 25 years of age with a bachelor's degree or higher; eighth in per capita income in 2014, and had the lowest poverty rate in the nation in 2013. New Hampshire has low unemployment, ranking second nationally in 2019 (BLS, 2019), and a low crime rate, ranking the third lowest in the country in 2018 (FBI, 2018). These positive statistics are a striking contrast to New Hampshire's fourth-highest national ranking in incidence of cancer for all ages and both sexes per 100,000 population for a five-year average (2011–2015) and New Hampshire's fifth-highest national ranking for incidence of cancer for both sexes under the age of 50 per 100,000 population (US Cancer Statistics Working Group, 2019). Although the cancer rates are not fully explained in the literature, it is an interesting contrast to New Hampshire's reputation for a high quality of life.

The 2018 PREP State of Our Estuaries Report (PREP, 2018) documented that of the sixteen ecological indicators tracked in the NH Coastal Watershed, four are **Improving** or are generally good: Nutrient Loading Point Sources, Beach Advisories, Toxic Contaminants and Bacteria. Eight indicators are **Cautionary** or possibly deteriorating: Nutrient Loading Non-point Sources, Total Suspended Solids, Dissolved Oxygen, Seaweeds, Shellfish Harvest Opportunities, Migratory Fish, Nutrient Concentrations, and Phytoplankton. There are four indicators that are **Negative** with deteriorating conditions: Eelgrass, Impervious Surfaces, Clams, and Oysters.

GBNERR Priority Topic Areas

Based on the ecological and socio-demographic setting described above, the primary issues challenging a sustainable Great Bay ecosystem are land use patterns and climate change. The GBNERR CTP programming focuses on addressing the secondary consequences of growth and development and how that relates to climate vulnerability, flood protection, water quality, and habitat concerns.

Maintaining Water Quality

The Coastal Training Program advances the protection of water quality by providing science and support related to stormwater and non-point source pollution, wastewater, nutrient pollution, wetland buffers, and land use. Emerging issues of concern in the Seacoast region are legacy toxins, the widespread use of synthetic pesticides, and the contamination of drinking water supplies from multiple sources. To maintain water quality, the Coastal Training Program offers education and outreach to improve stormwater management and stormwater municipal ordinances; works to bring the best science to bear on the wastewater management questions; offers education and assistance to enhance the use of vegetated buffers; develops target audience knowledge and skills of ecosystemic approaches and disseminates research related to non-point pollution sources.

Land Use Planning

Planning is critical to addressing water quality and climate concerns at GBNERR. The CTP supports land conservation efforts, floodplain management, careful siting of development and infrastructure, enhancement of wildlife habitat, creation of living shorelines, and comprehensive shoreline management. It promotes natural resource-based planning, watershed scale planning and management, and the use of Low Impact Development principles.

Shoreline Management

A topical bridge between managing land use and preparing for climate change is addressing how the immediate shoreline is managed and developed. The GBNERR CTP recognized an important window of opportunity to address this bridge early on in the New Hampshire Coastal Risks and Hazards Commission (NHCRHC) process. In 2014, the CTP organized and implemented the Hard and Soft Shoreline Management Conference to start a local conversation about shoreline management options and ensure that all relevant partners had a common understanding of the state of the science and implementation in the Northeast. The NHCRHC completed its work in 2017 and recognized a need to have better science and better policy associated with shoreline armoring and permitting. The need to address ecological approaches to shoreline management has become a priority for CTP, and the program works closely with the New Hampshire Coastal Program (NHCP) to identify and address information gaps related to this topic.

Preparing for Climate Change

The GBNERR CTP has a strong programmatic focus on how changes in precipitation, sea level rise, and temperature are impacting municipal infrastructure, natural resources, cultural resources, groundwater and drinking water, and economic vitality. The CTP Coordinator actively engages in technical assistance, facilitates information exchange between scientists and local and state decision makers, works on vulnerability assessments and adaptation planning efforts, and leads a Coastal Adaptation Workgroup that convenes scientists, non-profit, and business and outreach professionals to deliver climate adaptation information in a coordinated way to local communities. New issues continue to emerge from this work and have resulted in questions about sea level rise effects on groundwater in the seacoast area; efforts to find new methods to build municipal capacity to address climate adaptation and build social as well as infrastructure resilience; and the reinforcement of the need to advance buffers as a water resource management tool that can provide multiple benefits to these priority areas. In addition, an emerging area of work in the next five years will be to help communities think through immediate post-disaster planning.

Building Baseline Conservation and Process Skills

The GBNERR CTP target audience is municipal boards and elected officials. These community decision-makers have a high turnover rate in their positions and most who serve are volunteers. In general, this group has a wide range of skills and knowledge related to environmental issues. They often require basic information about ecological functions,

long- and short-term planning, and decision-making processes. These needs have been recognized over the history of the program, and the GBNERR CTP is working to address them systematically through the Board Empowerment Series, a new workshop series developed with partners at PREP and the New Hampshire Association of Conservation Commissions.

Target Audiences

Local decision makers, such as municipal boards and elected officials are the primary target audience for the CTP because they have the principal authority on local planning and land use decisions that impact water quality, habitat, and climate preparedness. New Hampshire has a weak state government and strong local control. Municipalities address natural resource issues mainly through local ordinances implemented by municipal land use boards (predominantly volunteer); elected city councilors or selectmen; and appointed positions such as planning, zoning, and historic resource board members, conservation commissioners, and greenery committees. Municipal staff members also play a crucial role as gatekeepers of information to the boards and in their role as liaisons in the municipal process. These staff members have an in-depth understanding of the municipal data and process needs, and their role as decision support providers make them a key target audience.

Because municipal boards are primarily comprised of local volunteers with high turnover and highly variable skills and background, the CTP has established relationships in each community that help introduce the program to new people. This helps the CTP Coordinator understand the skills and knowledge of new board or commission members, and provides a bridge between the Reserve and the people that make decisions at a municipal scale. A key lesson learned throughout the first decade of the program was the importance of relationships with people in each community. The relationships are necessary to make people aware of CTP and related partner workshops, trainings, and technical assistance; to ensure that they trust the information; and to provide an introduction to new staff or volunteers in the towns.

Assessing Audience Needs

Needs for the target audience are assessed on a continual basis through workshop evaluations and engagement in projects. More focused needs assessment interviews, surveys, and focus groups have also been conducted on a topic-by-topic basis. Since the original Needs Assessment was produced, there have been community needs assessments and community policy assessments conducted around the topics of climate resiliency, buffers, living shorelines, and stormwater. Needs assessments have been conducted by GBNERR and through partners in technical assistance work in New Hampshire or as a part of NERRS Science Collaborative Projects. All of the results are shared amongst partners and used to shape future events.

Program Evolution

The GBNERR CTP was accepted and recognized by the National Estuarine Research Reserve System in 2004 after completing the required planning documents. The strategic period of 2004-2007 focused on partnership building and establishing the CTP as a valued contributor to the training market by bringing new resources to bear on the issues faced by New Hampshire's Coastal Decision Makers (CDMs). During the period of 2008-2011, the program focused on refining and cementing the CTP niche by strengthening its role in this training market and finding new ways to address the needs of coastal decision makers in a time sensitive manner not attainable by partners. The 2012-2017 program demonstrated a leadership role in this training market with a stronger program focus on climate preparedness, municipal capacity building, and living shorelines. The 2018-2023 strategy will continue with past foci and concentrate on more strategic follow-up efforts after training events. The CTP will also focus on utilizing recent studies that look into how innovation and leadership happen. The program acknowledges that information gaps are only one piece of what is needed to create change, and its goal is to help promote other practices that are proven in the environmental field (peer to peer learning, engaging the public in support of municipal efforts, etc.).

C. CTP Program Capacity

Program Implementation

Staffing

The Great Bay Coastal Training Program is implemented through one full time employee, the Coastal Training Program Coordinator (CTPC), and when funding is available, through contractors hired through the Great Bay Stewards. Within the GBNERR Management Plan (staffing), the need for additional assistance for the CTP program is articulated. It would be preferable to have a NHFG GBNERR assistant that is not grant funded; the stability of funding is critical to being able to carry through on topics beyond the life of a grant and the success of the Coastal Training Program has created a demand for the technical assistance and outreach offered by GBNERR. The CTPC works closely with the GBNERR Volunteer Coordinator to find innovative ways to engage volunteers in the CTP to build capacity.

Facilities

The Hugh Gregg Coastal Conservation Center (HGCCC) was constructed in 2006 as a meeting space for a variety of Reserve activities. The HGCCC is an highly valuable asset to the CTP and its partners, as it can accommodate trainings and workshops for up to 120 participants, has a small kitchen, and is equipped with audio visual equipment.

The Depot House

The CTP Coordinator is based in the Depot House, which provides desk space for contractors or partners and a small conference table. The current facility works well to support the collaborative nature of the program and offers a tangible benefit to partners because workshops, symposiums, and small groups can be hosted comfortably there.

Campus Features

The GBNERR campus in Greenland features a 1400 linear foot boardwalk, a covered lunch pavilion, an educational pavilion, an amphitheater, a boat launch and waterfront area, an outdoor exhibit that highlights the green features of the campus, and several themed gardens. The green features of the Reserve have been used as demonstration sites for the CTP, and the boardwalk and wetlands have been on-site demonstration areas.

Key Partners

New partners are brought into the CTP as topics and opportunities arise; some are research partners that help bring relevant information to target audiences, and some are outreach and technical assistance professionals that partner to implement the program and coordinate on needs assessment and evaluation. As the program has matured, the format for information delivery has become customized to specific audiences and tailored to particular topics, solidifying coordination amongst technical outreach partners in the region. This has resulted in a group of trained facilitators and workshop planners, shared needs assessments and evaluation results, shared communication and presentation materials, and a community of practice in the seacoast region that has elevated the effectiveness of all of the programs. Key partners in the extension work include the NH Department of Environmental Services, University of New Hampshire Sea Grant and Cooperative Extension Programs, NH Association of Conservation Commissions, the NH Coastal Program, the Piscataqua Region Estuaries Partnership, and the Regional Planning Commissions, as well as several municipalities and NGOs.

Advisory Committee

The GBNERR and the CTP are currently shifting from separate Advisory Committees (ACs) for each sector (as well as the Reserve as a whole) to a Reserve Advisory Committee that will serve the CTP, Research, Education, and Stewardship. The CTP Coordinator currently consults with numerous partners, outreach leaders, and target audience members to guide the CTP. The RAC will provide a more comprehensive advisory role for the Reserve and each sector needs. The CTP Coordinator will consult the RAC on decision-maker needs, the training market, and partnerships. The CTP Coordinator will also consult individuals within each target audience as needed throughout the year to review and act as a litmus test for training offerings. Training histories and an overview of upcoming trainings will be presented at RAC meetings with solicitation of input. RAC

membership will include representatives from key partner organizations, local municipalities, land managers, environmental management professionals, academic research communities (such as UNH), and individuals who are leaders in their field in business and education.

Current CTP Program Delivery

Major Activities and Methodologies

The CTP delivers information through workshops, trainings, summits, coordinating Advisory Committees for research projects, and through direct technical assistance and education. From 2004 (when the GBNERR CTP gained NOAA approval) through June 2018, the GBNERR CTP has implemented 191 trainings for 6,892 participants with an average of 36 attendees per event; in addition, there were a total of 51 technical assistance efforts. Many events took place at the Reserve, which has been an efficient way to deliver information and has raised visibility for GBNERR and CTP. However, there are advantages to taking information directly to communities and to the meetings and locations that are relevant to the topic. The community then can apply the knowledge directly to the issues they are most concerned with, they develop a more personal relationship with Reserve staff, and the Reserve develops a deeper appreciation for the unique challenges and opportunities of working with that community and particular issues. The main challenge with this approach is the limited capacity of the CTP. Strong partnerships and grant funded contractors help implement this approach.

Working Across Sectors at GBNERR

There is direct alignment between the CTP and the science and tools generated by the monitoring, research, and stewardship activities at the Reserve. The Stewardship Program has been working on climate impacts to habitats and wildlife; the Research Program has been deeply engaged in the water quality issues within Great Bay; and the Education Program continually works to integrate current science and community concerns into GBNERR publications, public outreach, visitor center and exhibit displays, and into K-12 education program and teacher trainings. The CTP supports and participates in these activities where appropriate and needed.



Disseminating Results and Program Information

Currently, the results of the CTP are disseminated in Reserve and NHFG publications including *Great Bay Matters*, social media efforts, and listservs. The Coastal Adaptation Workgroup (CAW) has a website, blog, Facebook and Twitter presence that does an excellent job promoting climate resiliency work on behalf of all of the partners involved.

Marketing Strategy

The goal of the CTP Marketing Strategy is to make sure that the people who want or need CTP services know about the program and how to access assistance. There are two key recent events that have influenced GBNERR's CTP Marketing Strategy that essentially balanced each other out. The first was a failed attempt to build a CTP website in 2010. The website was based on the model utilized by the Padilla Bay Reserve, but for a variety of reasons the site never became functional and was abandoned. The second factor that has influenced the Marketing Strategy is that the Great Bay NERRR website has become far more functional than in the past and now can house and provide timely updates to subscribers about workshop offerings and information. The key marketing techniques employed are word-of-mouth from participants, the strong integrated communication network of training partners and collaborators and their marketing support, the GBNERR website and social media platforms, and the state partner marketing resources, which include social media, press, and website support.

Evaluation

Each workshop has an individual evaluation, and joint summits and conferences are evaluated and debriefed with partners to determine how to improve similar events in the future. Evaluations are used both to solicit feedback on the content and delivery of the event, but also to assess needs for next steps or additional topics of need. The CTP and the other technical assistance partners in the region share each other's evaluation results, leveraging resources and creating a community that is jointly addressing needs and improving methods.

Looking Ahead: Future Needs, Opportunities, and Challenges

Stakeholders in the Great Bay region have identified needs related to specific topics for specific audiences and have also identified more general skills for community decision makers.

Topical Needs

- Clear buffer and stormwater ordinances, and guidance and science to support them
- Information about the purpose, permitting, construction, and maintenance of living shorelines
- Assessments and planning assistance related to flood, groundwater, temperature, and sea level rise impacts on private and public infrastructure, recreational and cultural resources, human health, and natural communities
- Development of municipal strategies to reduce water quality impacts to Great Bay
- Dissemination of information on legacy toxins and the current widespread use of synthetic pesticides
- Outreach and education on natural systems (ecosystem function), and how much natural land is needed to sustain communities and allow for continued growth without a loss of quality of life

Delivery Needs

- Expansion beyond conservation commissions to work more intensely with zoning boards, selectmen/women, and planning boards
- Delivery of content directly to community board meetings in their towns, rather than expecting attendance at regional workshops
- Build and enhance relationships in communities with local policy makers
- Develop communication products and outreach materials, summarizing research on topics of concern to municipal governments (i.e. nitrogen, toxins/pesticides, stormwater, climate change)

Audience Capacity Needs

- Develop ongoing training on basic skills required of community board members (map reading, navigating state regulations, etc.)
- Develop modules on common topics that can be repeated or delivered quickly and efficiently on an ongoing basis to new local decision makers
- Commit to working with communities to get an issue “over the finish line” and beyond, offering ongoing assistance on a project, workshop, or training series
- Build social media geared to younger citizens to foster engagement and build capacity
- Host engagement events through the Stewardship Network to build capacity

Challenges and Opportunities for GBNERR CTP

As the CTP Program at GBNERR has matured, the Coordinator has been identified in the region as a person who can facilitate well, provide scientific content and training, convene partners around an important issue, organize collaborative science projects and advisory committees, and efficiently organize and host large events. These skills have attracted more requests for assistance from scientific and outreach partners and the communities in the area. As with many successful programs, there is now a gap between the opportunities to provide additional assistance to advance CTP goals, and the reality of having one full-time employee. With additional capacity, the program could expand audiences, do more direct assistance in the towns, work more intensively on emerging topics, and develop solid baseline information and delivery modules to account for the high turnover and variable skills and knowledge in the target audience group.

Key strengths of the CTP that can be built upon include the ability to be nimble and work on issues that are the highest priority to the communities. Many partner organizations are directed by grant funds, so their ability to truly target the highest priority of a local community may be impeded by national or state focal areas of interest. This also hampers some organizations ability to follow through in technical assistance beyond a grant or project period. This makes the CTP a very valuable long-term partner and leads to enhanced trust and collaboration with communities in the area. The close network of partners that have developed a true community of practice in southeastern New Hampshire is another key strength to a program that can continue to be leveraged in the future.

Anticipated Outcomes

- Buffer ordinances incorporate the best available scientific and social information; communities enhance capacity to monitor and enforce buffers; community support for buffers grows; and municipal leaders understand the value and function of buffers.
- Municipal planning documents incorporate the best available science related to climate vulnerabilities and assessments and utilize planning guidance that addresses those vulnerabilities. Towns evaluate projects with climate impacts in mind, and understand the link between climate mitigation and adaptation.
- Town leaders have access to information that can help them prioritize actions to minimize pollution. This includes information related to Wastewater Treatment Plants, storm water, homeowner actions like fertilizing lawns or fields, and septic information.
- A diverse set of community decision makers are engaged in CTP activities.
- New local decision makers have access to training and resources that enforce basic knowledge and skills necessary to work on CTP topical areas of interest.

Performance Targets

- By 2025, 75% of CTP participants will recognize the Great Bay National Estuarine Research Reserve as a leading source of scientific information pertaining to coastal resource management.
- By 2025, 90% of CTP participants report the intent to apply the products and services provided through the Coastal Training Program to make decisions that will sustain estuarine ecosystems.

- By 2025, 75% of CTP participants report increased knowledge about how their management decisions have an impact on coastal resources.
- By 2025, 60% of CTP participants report enhanced relationships and/networks with stakeholder groups and service providers to address coastal issues.
- By 2025, GBNERR CTP incorporates five new science, stewardship, and education efforts to integrate CTP with the Reserve and NHFG science and expertise.

CTP Objectives and Strategies

GOAL

Promote and support science-based decisions that positively affect estuaries, watersheds, and coastal communities.

OBJECTIVES

- CTP1:** Coastal Decision Makers will recognize the Great Bay National Estuarine Research Reserve as a leading source of scientific information pertaining to coastal resource management.
- CTP2:** Coastal Decision Makers utilize the products and services provided through the Coastal Training Program to make decisions that will sustain estuarine ecosystems.
- CTP3:** Coastal Decision Makers acknowledge and understand that their management decisions have an impact on coastal resources.
- CTP4:** Coastal Decision Makers form partnerships with stakeholder groups and service providers to address coastal issues.
- CTP5:** GBNERR CTP programming supports and incorporates science, stewardship, and education efforts at the Reserve and within NHFG.

STRATEGIES

- Provide high quality workshops that are relevant, timely, and engage the appropriate experts.
- Deliver follow up materials and coordinate sharing resources among workshop participants.
- Raise awareness and knowledge level of target audience and community members through large “summit” events that highlight important coastal management issues.
- Deliver basic ecological and process knowledge that is critical to municipal boards and elected officials.
- Facilitate partners in discussing and evaluating emerging target audience needs.
- Provide small group and one-on-one technical assistance to communities within the Great Bay watershed as follow up to workshops and projects.
- Lead and/or participate in end-user engagement activities related to NERRS Science Collaborative Projects and other collaborative and end-user-driven science in Great Bay.
- Maintain excellent working relationships with content experts, community members, and key partners.
- Work with GBNERR staff to share information about coastal decision maker needs, emerging science, and reinforce messaging about how personal and professional decisions impact Great Bay.
- Evaluate all CTP events and share results to improve future efforts and to assess needs.

Administrative Plan



A. Organizational Framework

The Great Bay National Estuarine Research Reserve sits within the Marine Division of New Hampshire Fish and Game. The Marine Division Chief is the direct supervisor to the Reserve Manager. See *Appendix IV* to view the NHFG organizational chart.

New Hampshire Fish and Game provides cash match to the operational award each year through the state budgeting process, using NHFG revenue that comes from the sale of fishing and hunting licenses. The agency is self-funded, which is challenging for many hunting and fishing agencies around the country as sales of licenses decline. The state budgeting process is on a biennial cycle, and the state provides strict guidelines for following the budget once it is passed; new expenses and new revenues must be accepted by the Governor and Council.

B. Staffing

Current Staff

Great Bay National Estuarine Research Reserve has six full time employees and four approved part time employees that work for NH Fish and Game. Contractors are hired through the Great Bay Stewards to help support externally funded grants, and the Reserve offers summer internships to local university students. Full time staff include the Manager, Research Coordinator, Stewardship Coordinator, Education Coordinator, Coastal Training Program Coordinator, and the Assistant Education Coordinator positions. Current part time staff include a facilities caretaker, two part time educators, and the Volunteer Coordinator.

Reserve funding also supports staff at the Jackson Estuarine Lab that work on the System Wide Monitoring Program. NOAA provides one award to NHFG to administer most of the Reserve functions, and one award to the University of New Hampshire to implement SWMP. Currently a portion of three part-time people are supported through the SWMP cooperative agreement.

Administrative functions at the Reserve are primarily directed by the Reserve Manager. However, with a small staff there are facilities maintenance, communications, and administrative duties that are distributed throughout the organizational chart. For example, the Education Coordinator is also the lead facilities manager for the Discovery Center and the liaison to the NHFG Public Affairs office, and the Volunteer Coordinator currently orders supplies and manages social media accounts.

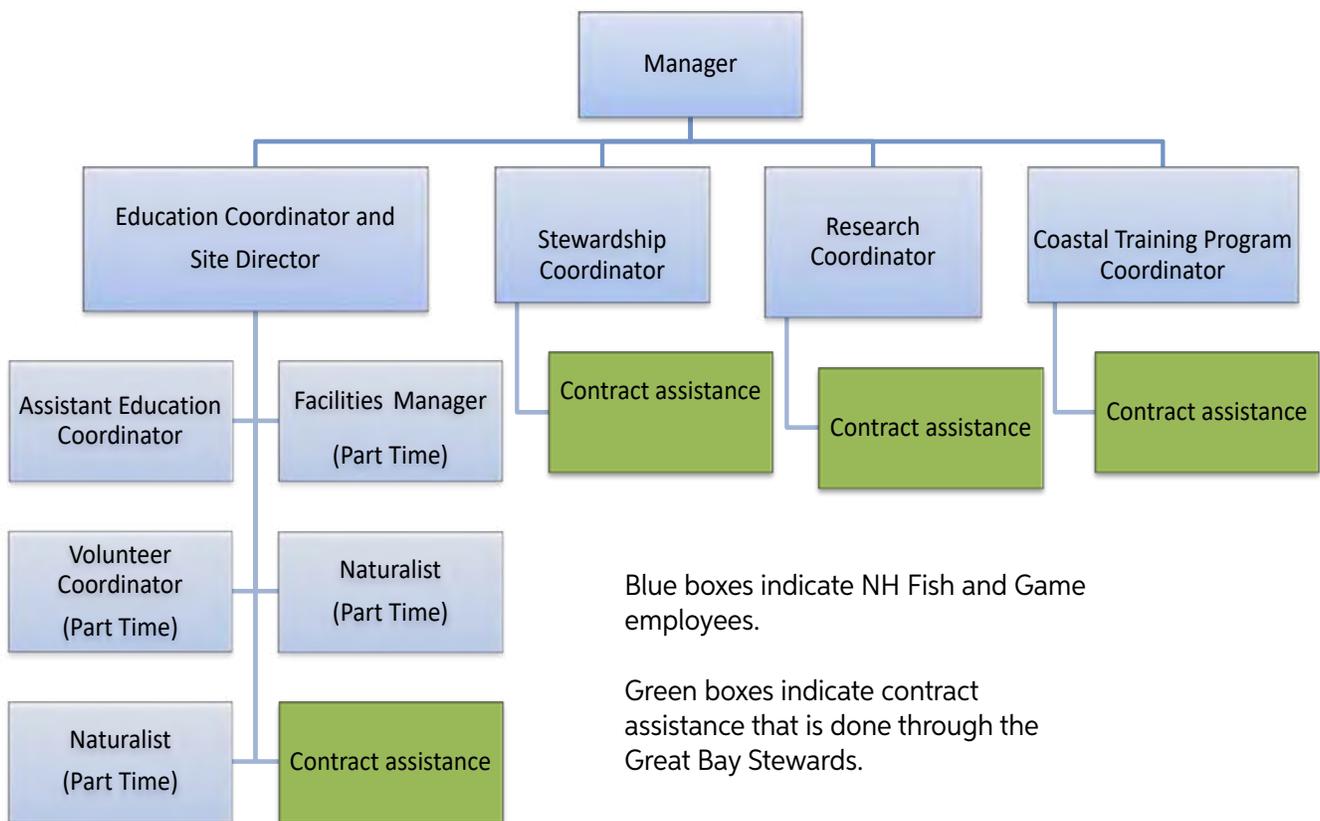


Figure 9: GBNERR organizational chart.

Staffing Challenges

Rising Costs: As salaries and benefits cost rose when the NOAA budget was flat, the NHFG match increased to keep pace with union-negotiated benefit and salary increases. This has led to 1-2 employees who have more than 30% of their time covered by NHFG. When the NOAA grant has gone up or down, the majority of the impacts have been to a) temporary staffing hours and positions; and b) the portion of the Stewardship Coordinator and Research Coordinator that are funded through the NOAA grant.

State Labor Grade system and historic positions: The state hiring system has specific job classifications that each Reserve employee must fit into, and each classification is associated with a specific hourly wage. It is important that people have a job classification that accurately reflects the work they do. GBNERR leadership has been successful in re-classifying some positions and has attempted to create new positions, but this is a slow process that requires multiple steps of approval. The organizational chart for the NERR has grown opportunistically and as confined by budget realities. The GBNERR manager continually assesses what the needs of the organization are, how staff are aligned with those needs, and how that relates to the state job classification and labor grade requirements. This is an ongoing and challenging process.

Staff Retention: The Reserve has a small staff: six full time people, four part time people and two contractors. The part time hourly employees and part time contractors hired through the Stewards do not have any benefits, do not make high wages, are part time without a path to becoming full time, and are sometimes of limited duration (seasonal or associated with a grant). This makes it difficult to recruit and retain talent. Having to fund grant-sponsored assistance through the Stewards has worked, but it does have some limitations as those funds cannot be mixed with state funds, and they are not employees of the Reserve. Contract employees do not have benefits or any guarantee of stability, and therefore the turnover rate is high. Many long-time employees of the Reserve have no benefits, make a low salary, and yet are critical to program success and the day-to-day operations of the Reserve.

Specific Programmatic Needs

The Great Bay National Estuarine Research Reserve is able to accomplish all of the NOAA requirements and uphold several commitments to NHFG with a very small staff. There are programmatic gaps for the Reserve to achieve its mission that cannot be filled without additional people to help manage facilities and land and who are qualified to deliver high quality programs. The highest priority staffing needs for the Reserve would add capacity in the following areas:

- Facilities support
- Stewardship and land management assistance, geospatial analysis assistance
- Field technician and additional data collection and analysis support
- A full time Volunteer Coordinator
- CTP program assistance to focus on ecosystem side of climate resilience
- Naturalist for public programs
- Educators targeting middle and high school students
- Administrative support
- Communications support

Opportunities For Staffing in the Future

Maintaining and recruiting high quality staff is critical. It is important to make sure that positions are classified correctly, that NHFG and GBNERR work to create full time positions for critical roles, and that the organization continues to think creatively about creating more stable funding for assistance for the Research, Stewardship, and CTP programs through working with the Great Bay Stewards, UNH, NHFG, and other key partners.

In addition to specific programmatic support, the Reserve must continue to expand skill sets that are applicable to their work. This includes the use of new technologies to collect, manage and analyze data; enhancing GIS capacity throughout

the GBNERR staff; staying up to date with communications, graphic design, and mapping software; finding innovative ways to reach new audiences with the training programs; and continually advancing staff expertise related to environmental education, research, land management, environmental stewardship and training.

C. Advisory Committees Plan

The Reserve does not have any formal Advisory Structures at this time. The Research program used to have a Research Advisory Board and the Coastal Training Program had an Advisory Committee in the early years of programming. By 2012, these committees were no longer active. The Research Coordinator of GBNERR proposed to merge the Research Advisory Board with the Technical Advisory Committee for the local National Estuary Program (the Piscataqua Region Estuaries Partnership) to avoid duplication of effort and membership; and the Coastal Training Program no longer needed the Advisory Board to help with program definition or niche as the program grew. The CTP Coordinator felt that many of the key functions of an Advisory Committee were being met due to the small geography of New Hampshire, and the practice of working very closely with partners.

Reserve staff participate and, in some cases, help to lead other committees in the region (the NEP Management Committee, the Sea Grant Policy Advisory Committee, etc.). As a part of discussions related to the Management Plan revision, staff thought carefully about what an appropriate role for an Advisory Structure at GBNERR and would like to try to reinstate an annual Advisory Meeting starting in 2020. Key criteria for a renewed Advisory Structure are:

- The Advisory Structure will serve a real purpose. Their input will be tied to actual decisions made at the NERR.
- The people invited will be capable of giving specific advice to one or more programmatic areas (Education, Research, Land Stewardship or Coastal Training), and will also be “big thinkers” who can help advise on cross-sector priorities and initiatives.
- The staff must be committed to preparing for these interactions very well; having specific questions for the group to weigh in on and an idea of what types of people will be able to help them with those questions.
- The Reserve is open to having an Advisory Meeting rather than a standing body. This will give the Reserve the flexibility to invite partners that are most helpful in addressing specific concerns in a given year. It is likely that some organizations will be invited continually due to the extensive partnering that is done (PREP, Sea Grant, Coastal Program, and NHFG representatives).

D. Key partners

Partnering effectively is “the New Hampshire way.” State-federal partnerships in the Seacoast region of New Hampshire work very closely together on a regular basis. This tight relationship is based on geographic proximity, a relatively small amount of state funding to work with, and an understanding that having so many programs focused on an 18-mile coastline would be inefficient and ineffective without working together. The National Estuary Program Director, Coastal Program Director, Sea Grant Director, IOOS regional Executive Director, and GBNERR Director meet regularly to review priorities and opportunities, conduct joint Congressional outreach, and develop consistent messaging across the programs. Outside of coordination amongst the leadership of these organizations, the staff also work together to leverage expertise and interest and work very closely together to implement municipal outreach, education and volunteer events, coordinated monitoring, and land protection and stewardship activities.

New Hampshire Department of Environmental Services and the NH Coastal Program

The Coastal Program and GBNERR work extensively together to identify emerging needs, attempt to find funding to address those needs, and share staff expertise through working together, advising on projects, and pursuing external funding and fellowships together. NH Coastal Program and Reserve offices are close together, and staff have almost weekly interaction.

The Reserve Manager and Coastal Program Director share copies of annual cooperative agreements with each other and consult with each other on workshop ideas, research proposals, fellowship ideas, evaluations, and planning documents.

University of New Hampshire

The University of New Hampshire is located in Durham, New Hampshire and operates an Estuarine Lab that sits directly on Great Bay. The University is a key partner to the Reserve through several programs housed by the University and through individual researchers and academics that partner with the Reserve. Specific partnerships that are affiliated with UNH include:

- **Piscataqua Region Estuaries Partnership:** <https://prepestuaries.org/about-prep/>
The Piscataqua Region Estuaries Partnership is housed at UNH and works very closely with GBNERR on outreach, monitoring, and collaborative efforts within the watershed. The Reserve manager is the chair of the Management Committee for PREP and GBNERR data is used in their State of Our Estuaries Report. GBNERR and PREP collaborate on research and monitoring efforts in Great Bay, and the CTP Coordinator works with PREP staff to administer the Board Empowerment Series to municipal audiences.
- **Jackson Lab:** <https://marine.unh.edu/facility/jackson-estuarine-laboratory>
The GBNERR SWMP program is administered by the Jackson Estuarine Lab. The Reserve also relies on and works with scientists at Jackson Lab to understand and help monitor salt marsh, eelgrass, macro algae, oysters, and bacteria in Great Bay. These scientists are GBNERR's closest collaborators and often help with TOTE programs, CTP content and training, monitoring efforts, and serve as leads or collaborators on externally funded research that Reserve staff work on.
- **Sea Grant and UNH Cooperative Extension:** <https://seagrant.unh.edu/>
New Hampshire Sea Grant is another key partner that works with the Reserve in multiple programmatic areas. The GBNERR Education program shares ideas and volunteers with the Marine Docent program and the Coastal Research Volunteers Program. The CTP program works extensively with Sea Grant extension agents on the issues like Climate Adaptation and Stormwater. Reserve staff sit on the Sea Grant Policy Advisory Committee. Co-operative Extension agents outside of Sea Grant also partner closely with GBNERR, particularly with the Stewardship Coordinator. The tool loan library created by GBNERR was successfully transitioned to Cooperative Extension; the GBNERR volunteer coordinator works closely with the Nature Groupies (Cooperative Extension) to advertise stewardship type of work days; and the Stewardship Coordinator has developed GIS based tools in partnership with Extension (Picking your Battles, Trails for People and Wildlife).

Academic Partners

The Reserve also maintains important academic partners outside of Jackson Lab. GIS experts, biologists, sociologists, climatologists, hydrologists, and engineers all have worked closely with GBNERR through both externally funded projects and through research and CTP work in the region.

Great Bay Resource Protection Partnership www.greatbaypartnership.org/

The Great Bay Resource Protection Partnership continues to coordinate organizations in the Great Bay region that are pursuing land conservation and/or are managing current conservation lands. The focus of the group has shifted in the past eight years to focus on administering a land transaction grant program, sharing conservation-related science, creating projects that help all organizations with stewardship challenges, and sharing field expertise to evaluate projects.

Wildlife Action Plan Implementation Team

New Hampshire Fish and Game updated the NH Wildlife Action Plan in 2015. This was a significant effort by the entire agency to assess the threats to and condition of NH fish and wildlife. The Reserve led the coastal habitats section of this plan and the SLAMM modeling led by the Reserve was used to assess threats to salt marshes and salt marsh dependent species. A standing committee within the agency is committed to implementing recommendations in the plan, and the Reserve stays active with this group to advance habitat science and monitoring and to assist with outreach to natural resource managers and communities. The current statewide "Trails for People and Wildlife" project addresses a wildlife risk identified within the Action Plan update and is reviewed by WAP implementation team members as trails are being developed.

Coastal Adaptation Workgroup www.nhcaw.org/

The New Hampshire Coastal Adaptation Workgroup (NHCAW) is a collaboration of 24 organizations working to ensure coastal watershed communities are resourceful, ready, and resilient to the impacts of extreme weather and long-term climate change. The group coordinates technical assistance to communities in the coastal watershed and connects communities with scientists, funding opportunities, and ongoing support on the topics that are most pressing to them. This group is co-chaired by the Coastal Training Program Coordinator at GBNERR and has been held up as a national model for how to collaborate to promote climate adaptation.

Great Bay 2020 <https://preestuaries.org/initiatives/great-bay-2020/>

The Great Bay 2020 effort was initiated when the New Hampshire Charitable Foundation, the major charitable organization in the state, asked leaders in Great Bay to come up with a coordinated vision for improving Great Bay. The funders were interested in a collective impact plan to help direct environmental charitable giving in the region, and the result was a strategic plan for maintaining and improving water quality in Great Bay. Members of the steering committee include the Director of PREP, the Manager of GBNERR, the Director of NH Coastal Program, the DES Watershed Management Bureau Administrator, the State Director of the Nature Conservancy, and the Director of the Conservation Law Foundation New Hampshire.

E. Administrative Needs and Opportunities

Challenges

Budget

Federal and state budgets were reduced in 2012, causing reductions in the part-time staffing available to the NERR. Once a state budget line is reduced, it is very difficult to regain the funds. The most direct impact to the NERR was a loss of a naturalist and a significant change to the pay grade and number of hours available for facilities support. This has led to challenges in keeping the buildings and grounds maintained and has detracted from programmatic work as staff shift to more mundane tasks like watering, cleaning, pruning, etc.

Small Program

Nationally, the NERRS have expanded programming (TOTE, Habitat Mapping and Change, Sentinel Sites) but the number of core staff and funding to support additional staff has not increased proportionally. GBNERR is proud of the national progress the NERRS has made in the last ten years and is excited to be a part of that growth. However, even new opportunities that assist Reserves in achieving their mission (NSC, NOAA science taking place at the NERR, etc.) do have staff time and investments necessary to be successful. This has led to prioritization challenges. This is difficult for smaller Reserves that do not have as much flexibility in the way staff are funded.

Staff Retention

The Reserve has a small staff: six full-time people, four part-time people and two contractors. The part-time hourly employees and part-time contractors hired through the Stewards do not have any benefits, are not on a path to becoming full time employees, and are hired for positions that are often of limited duration (seasonal or associated with a grant). This makes it difficult to recruit and retain talent. Having to fund grant-sponsored assistance through the Stewards has worked, but it does have some limitations as those funds cannot be mixed with state funds, and they are not employees of the Reserve.

Facilities/Space

The Reserve is facing space and facilities challenges that impact programs. As the Reserve programming has grown and evolved, some needs that were not anticipated when the Discovery Center was sited and built have arisen. A more detailed assessment of needs has been done for the draft Management Plan chapter, but most notable are the need for Research and Stewardship lab and field work prep space, visiting researcher dorms, more appropriate office space for staff, small

classroom space for education, additional storage for all programs, and more parking space at the Discovery Center. The options for how to deal with facility-related challenges are constrained by the railroad that cuts the Discovery Center campus off from the surrounding neighborhood. Currently, Reserve staff are located in three different buildings, leading to missed opportunities to work together and communicate effectively.

A Split Funding Model with UNH

Great Bay National Estuarine Research Reserve accomplishes the System Wide Monitoring Program in partnership with the University of New Hampshire. NOAA administers a separate grant to UNH to perform the SWMP requirements. There are pros and cons of having SWMP housed at UNH, so the challenges associated with this arrangement do not necessarily outweigh the benefits.

The most important benefit of this arrangement is that GBNERR data is collected and managed along with data funded through the Coastal Program/Department of Environmental Services, EPA, the NEP, and the municipalities that surround Great Bay through the same lab at UNH. This leads to a better system for integrating data from multiple funding sources to inform management in New Hampshire. The protocols for collection and data management are influenced heavily by the SWMP protocols, because the SWMP funding is a large and stable contributor to the collective monitoring efforts. The lab has extensive knowledge and experience that it brings to the collective monitoring effort in Great Bay and to the NERR system. The Reserve is able to be a part of interesting collaborations and test new ideas because of the collective support in the region for the water quality monitoring lab. Another benefit of this setup is that UNH is able to provide match for the SWMP grant, saving NHFG money. Drawbacks of having SWMP administered separately include the fact that the RC does not have any direct responsibility for the monitoring program (although there is extensive communication); it is more expensive to administer SWMP through the University; and the Reserve does not have the flexibility to use SWMP personnel for other NERR monitoring and research efforts.

Opportunities

Expanding Work to Support NHFG

The Great Bay National Estuarine Research Reserve has opportunities to expand its work with NHFG to address mutual habitat, land protection, education, and science goals. There is an opportunity to be more proactive about understanding agency needs and incorporating that into GBNERR programming. In addition, there are likely efficiencies that can be gained in increased collaboration with other divisions around natural resource management/stewardship, science, communications, and outreach work.

Optimizing and Expanding Partnership and Funding Opportunities

To enhance capacity and improve the Reserve's ability to achieve the mission, GBNERR needs to continually think about how to work with partners to raise money, visibility, impact, and efficiency. The Great Bay Stewards and other established partnerships will be nurtured, but opportunities to work with new organizations that have shared priorities should also be explored.

Creating a Safer and More Resilient Organization

A disaster response plan was developed for GBNERR in 2018. It will be important to practice this plan, make improvements, and continue training within the organization and with Reserve volunteers to implement the plan. This may require purchasing new equipment, creating new partnerships, and different considerations for facilities and programming in the future.

Supporting the Future Generation of Coastal Stewards

With a growing volunteer program, new fellowship opportunities, an established CTP and habitat science outreach reputation, K-12 programming, and an emerging Conservation Action Education program there is an opportunity to work on a more strategic vision for how GBNERR is developing the next generation of coastal leaders. The Reserve has the opportunity to use the diversity of programmatic opportunities to foster more continuous learning, professional growth, and networking opportunities across ages and disciplines. This opportunity includes the chance to diversify the types of people who typically engage in Reserve programs and in coastal science, education and management.

Administration Objectives and Strategies

GOAL:

Ensure that the Great Bay National Estuarine Research Reserve has the facilities, partners, staffing, financial resources, and appropriate policies to fulfill the GBNERR mission.

OBJECTIVES

- A1:** Ensure that GBNERR staff are well trained, motivated, function as a team and contribute to the goals of the organization.
- A2:** Continually improve administrative processes to improve budgeting, accounting, and planning practices.
- A3:** Promote awareness and understanding of local, regional, and national issues affecting the health and resilience of the nation's estuaries through a variety of print and virtual media, outreach activities, and partnerships.
- A4:** Create effective communication and administrative pathways to facilitate opportunities to work with other NHFG divisions, Great Bay Stewards, NOAA, and other key partners in the region.
- A4:** Ensure the relevance and increase the visibility and impact of GBNERR work through intentional engagement with the Great Bay community and Reserve partners.
- A5:** Ensure that GBNERR people and infrastructure are safe and resilient through emergency and disaster response planning and preparedness activities.
- A6:** Create integrated programs that support improved understanding about Great Bay and an engaged citizenry that is prepared to act.
- A7:** A more diverse community of people are engaged in GBNERR, and therefore connected to Great Bay and coastal management issues.

STRATEGIES

- Create and implement an Advisory Board structure for the Great Bay National Estuarine Research Reserve.
- Work closely with the Great Bay Stewards to align interests, accounting practices, and communication messages.
- Adhere to all New Hampshire Fish and Game and NOAA administrative, reporting, and training requirements.
- Maintain and improve communication pathways with the public including newsletters, websites, and social media.
- Regularly work with NHFG to understand the research, outreach and public access needs from the agency perspective and incorporate those into Reserve work.
- Hold regular staff meetings with collaboratively developed agendas, meaningful input opportunities, and a focus on problem solving.
- Work side by side with the Great Bay Stewards to improve the capacity of both organizations to advance the shared mission and encourage diverse audiences to engage at GBNERR.
- Encourage GBNERR staff to serve in an advisory role, join workgroups and engage with local, regional and national partners with aligned missions.
- Foster integration across GBNERR programs and support participants, volunteers, interns, fellows, and partners to grow through participation in multiple aspects of GBNERR programming.
- Recruit, maintain, and support GBNERR staff through ensuring that expectations are clear, positions are classified correctly, work conditions are excellent, and individual evaluations are meaningful.
- Improve understanding of the motivation and barriers related to including diverse audiences that are not currently engaged in Reserve work, and implement solutions.
- Practice, implement, adapt, and improve the GBNERR Disaster Response Plan with staff, partners, and volunteers.

Volunteer Plan



A. Local Context

Community involvement is a key method the Reserve uses to fulfill the mission of the Great Bay National Estuarine Research Reserve (GBNERR). Through education, CTP, and collaborative research, community members will gain an increased awareness of the importance of Great Bay, specific information and support for how their actions and decisions influence Great Bay, and inspiration through personal connections with reserve staff and partners. The volunteer program at GBNERR simultaneously supports the rest of the staff in achieving their programmatic goals through providing labor and advances the Reserve goal of connecting people to Great Bay and inspiring positive action.

Local Partners and Reserve Niche

The Reserve is part of a network of environmental organizations that work with volunteers in the Seacoast region. There are two types of volunteers that GBNERR works with:

- 1) returning volunteers with specialized skills that help implement programmatic priorities and
- 2) one-time or short-term volunteers that contribute to larger field work or facilities-related efforts.

About GBNERR Volunteers

Reserve volunteers typically live within 20 minutes of the Discovery Center. Different volunteer tasks attract different types of people and GBNERR adapts recruitment, training and communication methods to serve the diversity of participants. The majority of regular Reserve volunteers are retired professionals who are engaged in their community and eager for new information and experiences. The Reserve is continually fostering volunteerism with other audiences as well and creating opportunities for students, families, and companies to engage with Reserve work. Regular volunteers tend to form close social ties to each other, demonstrate commitment to Great Bay and environmental protection, and often become members or board members of the Great Bay Stewards. They are ambassadors for the GBNERR mission and are advocates for the Reserve and Great Bay within the community.

History of the Volunteer Program

A strong volunteer program has been a key part of the education program for well over 15 years. Some current volunteers at GBNERR have been with GBNERR for over 25 years and have witnessed the entire evolution of GBNERR. Over the last five years the core group of regular volunteers that participate in several opportunities each year has grown from about 50 to about 60 regular volunteers. In that same timeframe, the number of one-time workdays has tripled, making it possible to complete bigger projects on the grounds of the Discovery Center and other Reserve properties. Volunteer retention has remained consistent at between 80 and 90% from year to year, and annual volunteer hours have increased almost 1,000/year over the last few years. Volunteers dedicate approximately 4,000 hours to GBNERR programs each year; valued at over \$75,000 in donated service.

B. Current Program

Program Capacity

Staff

The Reserve currently has one part-time Volunteer Coordinator. All sector leads are required to be engaged with volunteer efforts that support their program.

Partner

Several nonprofits recruit, train, and maintain regular volunteers in a similar way to GBNERR and these groups work together to share information, best practices, and people. Key partners include the Gundalow Company, the UNH Sea Grant Marine Docents, Blue Ocean Society, and the Seacoast Science Center. Nature Groupies is a UNH-led effort to coordinate volunteer work day recruitment and sign up across the state. This allows the Reserve to let this group know when, where, and what type of help is needed for a volunteer opportunity, and volunteers can sign up, receive reminders and directions, and connect to a larger community of people committed to stewardship in the state. The Reserve also works closely with UNH to work with incoming freshman as a part of orientation, with AmeriCorps to host longer intensive volunteer efforts, and with United Way to advertise events to individuals and corporations.

Programmatic Areas of Support

Reserve volunteers are offered a variety of activities and programs to encourage their participation. These are structured to suit those who want to commit to a weekly schedule, one-day event, or somewhere in between. In addition to the categories described below, volunteers often donate their time to work on projects unique to their interests or skills.

- Exhibit room
- School programs
- Gardens and grounds maintenance
- CTP events
- Research and monitoring project
- Lands and facilities workdays



Recruitment

Volunteer opportunities at GBNERR are advertised through a variety of outlets including: Great Bay Stewards and NH Fish and Game social media posts, press releases, website announcements, flyers posted at strategic places, and presentations or presence at community or volunteer events. The Volunteer Coordinator also cultivates relationships with other volunteer organizations in the region to do joint advertising and recruitment. Current volunteers are asked to bring friends that might be interested to the annual picnic and to shadow current volunteers, exposing potential volunteers to the Reserves work and to the thriving volunteer community.

Training

The Reserve staff invests significant effort training volunteers and holds training sessions throughout the year for school program docents. During training, volunteers are given a comprehensive information packet including a history of the Reserve, articles and in-depth information on natural and cultural history of the area, and best practices for interpretation for children. New volunteers shadow more experienced volunteers before leading groups themselves, and teacher evaluations offer feedback to the docents. Similarly, volunteers for stewardship, phenology, or research projects are given background information, attend training sessions when needed, and are offered opportunities to explore the topic further throughout the year. Starting in 2019, volunteers have also been trained in the emergency management procedures for the GBNERR campus.

Volunteers are offered continuing education opportunities throughout the year. They are encouraged to attend CTP events such as the Climate Summit, Great Bay Steward public events, Lunch and Learn lectures at GBNERR, relevant public lectures or workshops being held by others in the watershed, and are offered special kayak trips and field trips organized by GBNERR staff. GBNERR staff work to create a cadre of volunteers who are comfortable interpreting the significant value of Great Bay to the public and who understand the context of GBNERR's work within NHFG and within the watershed.

Evaluation

Volunteers are engaged in evaluation in two ways: 1) they provide feedback to education staff on how programs are implemented, and 2) they are asked for feedback on how to make the volunteer experience more positive for them in the future.

The largest group of volunteers and the highest number of volunteer hours are associated with the school program. The school program evaluation surveys administered by the education staff are shared with volunteers, and volunteers are invited to a reflection session twice a year to look at the cumulative evaluation results and discuss how to adapt and improve the

program. GBNERR staff value the insights of the volunteers and have asked them to be engaged in GBNERR decisions such as the disaster response plan, hiring process for a new Volunteer Coordinator, and exhibit room design.

Retention

The current retention rate for GBNERR volunteers is 85%. Key aspects of GBNERR's volunteer retention strategy include: excellent training, constant communication, and publicly recognizing and celebrating the value that volunteers bring to the organization. Reserve staff cultivate the common interests among volunteers by sharing articles, offering new educational opportunities to them, and sincerely including their input and interest in Reserve programming. A small volunteer room provides a meeting place with snacks, nature guides, recent articles of interest, and a whiteboard where volunteers can record interesting things they saw or heard that day. Several times a year, volunteer events are held to celebrate their work and thank them; these include a holiday party, a summer picnic, and a fall volunteer recognition dinner. An annual award is given to an outstanding volunteer at the recognition dinner. Staff at GBNERR take a personal interest in every volunteer and take time to get to know them. For many volunteers, GBNERR has become an important part of their social world. Year after year, volunteers report that these events and the cultivation of a community are what bring them back.

C. Looking Ahead

Volunteer Program Needs

Historically, the school education programs have had the largest and most active volunteer community, and that program has relied most heavily on volunteers to get programmatic work done. Over the past five years, the volunteer program has collaborated more with the Stewardship, Research, and CTP programs at GBNERR. As the staff have explored how to engage more volunteers in all aspects of GBNERR work, they recognized a need to expand recruitment efforts to find volunteers that are interested in and able to perform different types of duties (field work, database, carpentry) and create connections between all of the volunteers to expand the community.

There are opportunities to improve and expand the way the Reserve works with large groups of volunteers for corporate work days or AmeriCorps teams, and the Reserve will continue to explore if a longer-term AmeriCorps volunteer opportunity could exist at GBNERR. Volunteer training and activities connect the volunteers to Great Bay, and raise awareness of the GBNERR mission. This enables them to become community ambassadors that advocate for and act on behalf of Great Bay.

It will be important to build off of the current efforts to increase knowledge through training and information sharing across the Seacoast organizations that work with volunteers. This creates opportunities for GBNERR staff to get better at managing volunteers and for volunteers to expand their capacity to interpret natural systems, manage groups, and expand other science or education skills.

Challenges

Because most GBNERR activities happen during the workday, it is difficult to recruit and retain working age volunteers to be regular participants in Reserve programs. Younger volunteers often need transportation and there is no public transportation to the Discovery Center. The Reserve also will need to think about generational differences in motivation and retention strategies to engage all ages in the Reserve's volunteer network.

With one part-time Volunteer Coordinator, it is difficult to balance all of the needs of the GBNERR staff and to be attentive to all of the volunteers on campus each day. The Reserve discusses the use of volunteers and interns as annual work plans are developed by each program to become more strategic about recruitment timing and effort, and this should continue to improve in the future.

The current volunteer space is very small and gets overcrowded frequently. It cannot accommodate more than three people at a time, and there are typically 4-6 volunteers per school program. A larger space would be welcome by both volunteers and by staff as a proper staging area for volunteer efforts and a place for them to gather and eat lunch.

Volunteer Program Objectives and Strategies

GOAL

Strong partnerships with the volunteer community enhance protection and stewardship of the Great Bay Estuary.

OBJECTIVES

- V1:** Programmatic needs of GBNERR staff are understood and incorporated into volunteer and internship opportunities.
- V2:** Volunteers and interns know what is expected and are trained and supported by both the Volunteer Coordinator and the respective program coordinator in completing their work.
- V3:** Volunteers and interns feel connected to Great Bay and to GBNERR's mission as a result of their time with the organization. They understand the GBNERR presence/properties around GB and the connection to NHFG and NOAA.
- V4:** Volunteers and interns feel valued by GBNERR and understand how their efforts are connected to important work in the estuary.

STRATEGIES

- Offer rigorous training and continuing education opportunities to GBNERR volunteers.
- Encourage and participate in a network of organizations who are engaging citizens in environmental education, research, and stewardship work.
- Continually evaluate the volunteer and intern experience at GBNERR and made adjustments based on that feedback.
- Regularly assess programmatic needs of GBNERR staff and how volunteers or interns can help address those needs.
- Intentionally assess the needs and opportunities for volunteers to engage in CTP, Stewardship, and Research efforts at GBNERR.
- Communicate how volunteer and intern efforts link to GBNERR products and programs.
- Celebrate volunteers through recognition events, soliciting and using their feedback, and offering information and resources that are of interest to them.
- Create and support volunteer opportunities that connect volunteers to multiple GBNERR properties.
- Work to recruit and retain a more diverse portfolio of volunteers.
- Support volunteers in becoming better stewards of the estuary and messengers for the GBNERR mission.

Resource Protection and Stewardship Plan



A. Local Context

The Great Bay watershed has a combined total area of 1,084 square miles. The watershed is a diverse mosaic of important habitats including tidal and freshwater wetlands, salt marsh, mudflats, eelgrass beds, tidal channels and fields and forests (Short 1992a). The Great Bay watershed supports several species of concern, both federally and state endangered or threatened, and rare plant communities.

The rising awareness of climate related impacts to the environment and intense development pressures experienced by the New Hampshire Seacoast in the 1990s and early 2000s created significant and imminent threats to maintaining clean water, species diversity, and unfragmented natural habitats. In response, many private and public conservation organizations have been active in efforts to protect significant habitat areas.

As a stakeholder in this region, the Reserve has been involved in developing and participating in activities, programs, and partnerships that are designed to adequately deal with development pressure and climate change impacts by using

Table 1: Natural Resources at the Great Bay National Estuarine Research Reserve

Category	Description
Extent of GBNERR	Over 2,500 acres of land and 7,300 acres of sub-tidal lands and water, including Great Bay, Little Bay, tidal portions of the Squamscott, Lamprey, Oyster, Winnicut, and Bellamy Rivers. <i>See Figure 7 for the boundary.</i>
Habitat Types	Eelgrass, oyster beds, salt marsh, rocky intertidal, mudflat, channel, forest, grassland, freshwater wetlands.
Threatened and Endangered (T&E) Species	Federally endangered species include the shortnose sturgeon and rusty-patched bumblebee. State endangered species include the brook floater mussel, American brook lamprey, Blanding’s turtle, Eastern hognose snake, upland sandpiper, Eastern small-footed bat, little brown bat, Northern long-eared bat, tri-colored bat, and New England cottontail. Threatened species include the ringed boghaunter, Hessel’s hairstreak, bridle shiner, Atlantic sturgeon, spotted turtle, pied-billed grebe, common loon, common tern, cliff swallow, purple martin, Eastern meadowlark, and grasshopper sparrow.
Critical or Essential Habitat	Salt marsh, eelgrass, oyster beds, and freshwater wetlands.
Cultural Resources	Shell middens, colonial and industrial revolution era artifacts, historic use of a regionally specific shipping vessel (the gundalow).
Value	An ecosystem service valuation study for Great Bay was complete in 2016 (NHDES, 2016 How People Benefit from New Hampshire’s Great Bay Estuary). Estimated values included: <ul style="list-style-type: none"> • Existence values: Salt marshes \$1.6 million, eelgrass \$40.2 million, oyster beds \$0.7 million • Recreational oyster harvesting: Oyster beds \$23,700 • Commercial aquaculture: Oyster beds \$131,200–\$142,100 • Commercial fishing values: Salt marshes \$4,473, eelgrass \$1.7 million • Carbon sequestration value: Salt marshes \$3,400–\$16,300, eelgrass \$49,100–\$81,600, oyster beds \$2,700 • Nitrogen removal value: Salt marshes \$608,300–\$688,800, eelgrass \$13.1 million–\$14.8 million, oyster beds \$5.3 million–\$6.0 million

emerging science, sound stewardship practices, and technical assistance services. GBNERR activities are guided by the 2015 Wildlife Action Plan update and responsive to the challenges experienced on NHFG land and those experienced by other natural resource managers in the region. As an organization that is charged with advancing science, demonstrating best practices, and delivering technical assistance, Reserve natural resource management efforts take a holistic approach to implement the mission of the NERRS.

B. Current Program

Program Capacity

Staff

GBNERR has one full-time person dedicated to Stewardship-related responsibilities. The Stewardship Coordinator is also the point person for GIS mapping, habitat mapping, and many aspects of the sentinel site program. The Volunteer Coordinator assists with volunteer work days on GBNERR lands. Throughout the program’s history, the Stewardship Coordinator has had seasonal or part time help and/or contract assistance, depending on state budget and external grant funding.

Facilities

Stewardship activities happen on the lands and waters within the GBNERR boundary. Office space for the Stewardship Coordinator is at the Discovery Center, and storage space for Stewardship-related supplies and equipment is currently available at the Discovery Center and Hugh Gregg Conservation Center basement and at the Bunker Creek barn facility in Durham.

Partners

NHFG

The Division of Information Technology provides GIS support and spatial modeling support from NHFG. The NHFG Lands Team reviews projects and assists with problem solving and enforcement for landowner and easement issues; the Wildlife Division provides assistance and advice on appropriate uses, habitat management, and restoration projects; and the Law Division provides direct assistance on landowner relations and enforcement.

NOAA

The Reserve has received excellent service and much needed expertise from the Office of Coastal Management. OCM has provided on-the-ground assistance for the high-resolution habitat mapping project and helped the Reserve install the water level gauge. NOAA assisted the Reserve in establishing and maintaining their vertical network to tie the water level station into benchmarks in 2019.

The Nature Groupies <https://naturegroupie.org/>

The Nature Groupies is a partnership led by UNH Cooperative Extension that connects over 200 organizations in New England to citizens who want to do nature-based volunteer work and citizen science. The Nature Groupies help GBNERR recruit for events, and GBNERR has helped to provide science-based resources to guide the volunteers that work with the Nature Groupies across the state (Trails for People and Wildlife, Picking Your Battles, etc.). The Reserve has also partnered with the Nature Groupies to offer a tool loan program for volunteers and volunteer boards.

Great Bay Resource Protection Partnership www.greatbaypartnership.org/

The Great Bay Resource Protection Partnership continues to coordinate organizations in the Great Bay region that are interested in and actively pursuing land conservation and/or are managing current conservation lands. The focus of the group has shifted in the past eight years to focus on administering a land transaction grant program, sharing conservation-related science, creating projects that help all organizations with stewardship challenges, and sharing field expertise to evaluate projects.

The Great Bay Resource Protection Partnership also established regional Conservation Area Management Plans for geographic regions of interest to align and create efficiencies for management and stewardship activities across land holders. The intent is to develop shared management goals for a group of properties within a region and then share resources and information to implement those goals. Currently, GBNERR is an active participant in the Crommet Creek Coastal Area Management Plan.

Local Land Management Entities

County conservation districts and municipal conservation commissions are important partners in conducting on-the-ground land management in New Hampshire. The GBNERR Stewardship program targets these audiences when developing tools to inform watershed or parcel level land management decisions.

Other Federal Agencies

The Natural Resource Conservation Service (NRCS) Wetlands Reserve Program (WRP) is engaged with the Great Bay National Estuarine Research Reserve on habitat improvement projects on Reserve lands, and the Stewardship Coordinator represents GBNERR to the National Oceanic and Atmospheric Administration on matters related to invasive species removal, habitat assessment, and restoration. The Environmental Protection Agency (EPA) has partnered with GBNERR to understand different ways to model salt marsh migration and climate-related impacts to species. The US Fish and Wildlife Service is also a close partner to GBNERR to protect and restore threatened or endangered species and sensitive coastal habitats, and US Forest Service is a key partner in managing invasive species.

Current Natural Resource Management and Stewardship Program Description

Protecting estuaries and promoting their stewardship is central to the mission of every National Estuarine Research Reserve. For GBNERR, natural resource management includes overseeing land use, how restoration projects are conducted, where to prioritize conservation, and how to engage the public or partners in Reserve activities.

These types of decisions have a direct impact on the habitat and wildlife that the Department is mandated to manage, and it also has a direct impact on people in the community. For example, the way a parcel of land is managed dictates what kind of species can live there and therefore the type of ecosystem services that parcel can support. This has implications for fish, wildlife, plants, and the physical conditions of that site (hydrology, sediments, etc.) as well as for the surrounding area or range of those species. This in turn has implications for the people that rely on Fish and Game land to hunt, fish, bird-watch, or take a walk. GBNERR land management also has implications for the neighbors of that piece of land who care about what they see and what activities happen next door.

Therefore, the Stewardship and Land Management Program at GBNERR takes a holistic approach focused on direct land management, advancing habitat science to support other natural resource managers, and engaging the community in promoting the stewardship of Great Bay.

Managing GBNERR Lands

The Stewardship Program at GBNERR oversees the management of over 90 deeded parcels that have been consolidated into 30 NHFG properties that are within the GBNERR boundary or are owned by NHFG within the previously approved land acquisition target area. Since the approval of the last management plan, several parcels have come into NHFG ownership and are managed by NHFG with the intention of incorporating them into the GBNERR boundary in the near future. Although a boundary revision is not a part of this management plan, a separate boundary amendment proposal will be sent to NOAA within the timeframe of this plan. As funding and resources permit, GBNERR will strategically manage invasive species, enhance habitat for important species, expand native plantings, vegetate riparian and wetland buffer areas, and implement restoration projects to facilitate marsh resilience; especially near mouth of the Squamscott River and other areas where salt-marsh sparrow habitat can be maintained or improved.

Land management responsibilities include the review and coordination of mitigation activities with the Department of Transportation (DOT); effective monitoring of conservation easements and deed restrictions, coordination with the Department of Environmental Services on invasive species and habitat restoration projects, and working with municipal and regional conservation groups to encourage best land management practices in the Seacoast region.

The 2015 Wildlife Action Plan (WAP) and associated species and habitat plans released by NHFG also guide Reserve land management priorities. Enhancing NHFG land for game species, New England cottontail, and Blanding's turtles are examples of land management activities that are prioritized and implemented in partnership with other NHFG divisions. NHFG also implements wildlife habitat improvement agreements for agricultural easements or timber harvesting within the GBNERR boundary.

The close partnerships fostered through the Great Bay Resource Protection Partnership allow for collective prioritization of land management issues, habitat and land stewardship science needs, and land protection. This partnership has worked together on GBNERR led projects to help with early detection of invasive species, create and maintain the Sweet Trail, create stewardship plans for blocks of conservation land with multiple landowners, and deal with landowner issues that impact multiple tracks of land.

Advancing Habitat Science to Support Land Management Decisions

The Reserve develops spatial tools that help prioritize natural resource management activities. These tools are then applied to GBNERR lands and promoted as tools for natural resource managers around the state and around the country. GBNERR partners with the University of New Hampshire academics, NHFG and non-profit experts, GBNERR staff, and other NERR experts on spatial planning, survey, restoration, and wildlife ecology projects that help direct and prioritize land protection, land management, and restoration efforts to balance multiple uses and interests on conservation lands. Habitat monitoring and

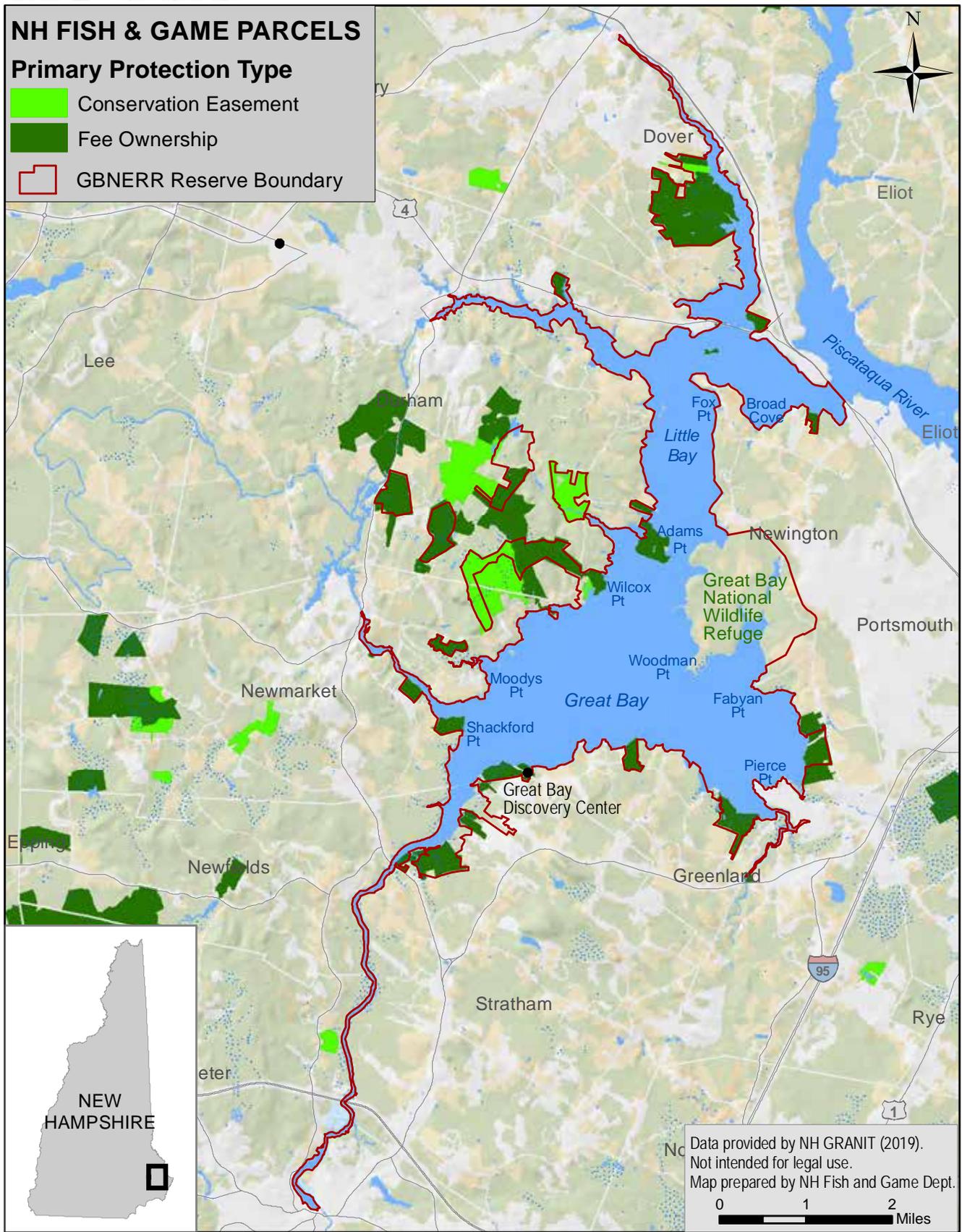


Figure 10: NHFG Parcels by Primary Protection Type.

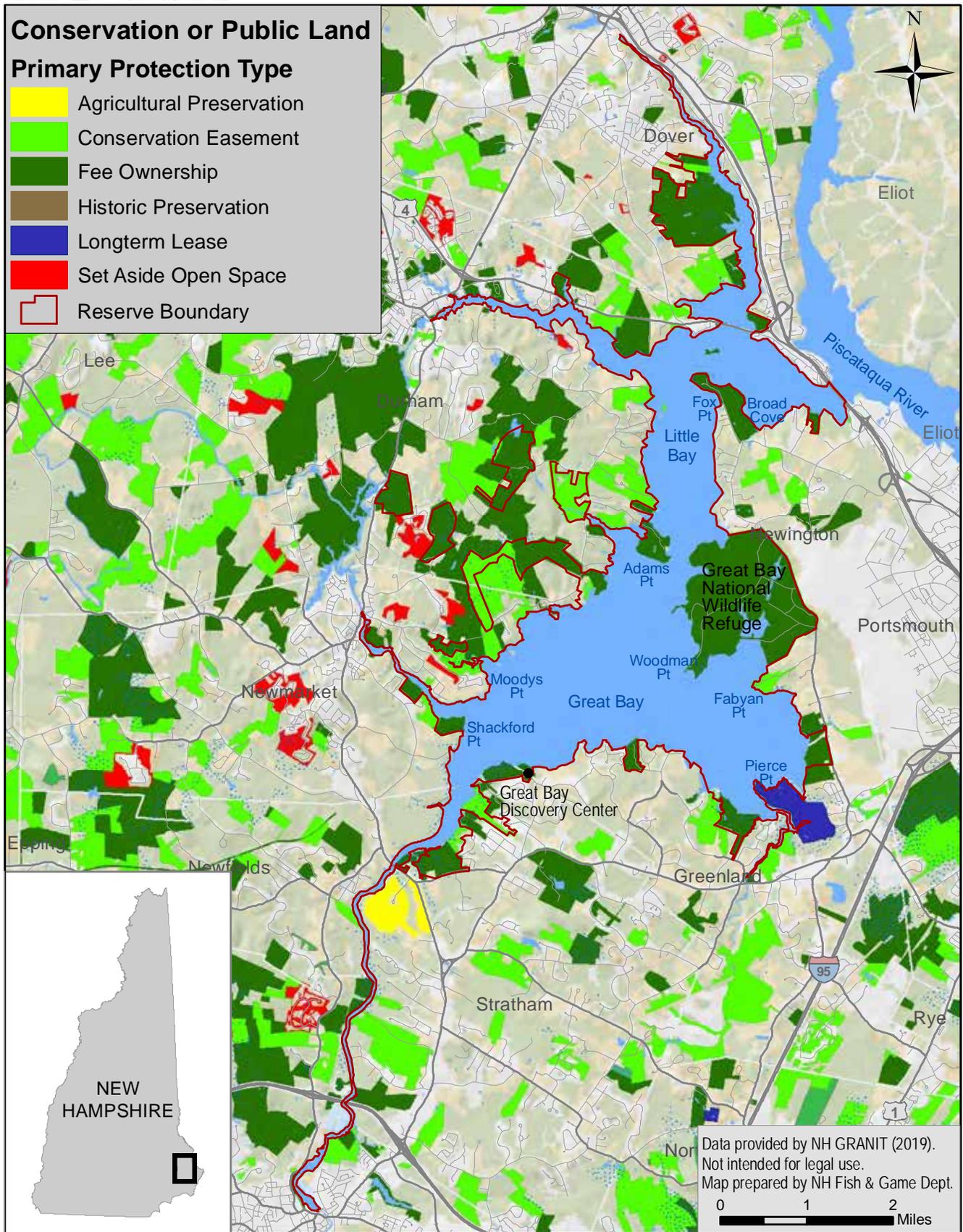


Figure 11: GBNERR Conservation of Public Lands by Ownership Type.



mapping is a critical input to these spatial products, and the Stewardship Coordinator and Research Coordinator work closely on GBNERR monitoring projects. A key aspect of Reserve science is looking ahead and thinking about how natural resource management decisions can factor in climate change impacts, future build-out scenarios, and human uses.

Engaging the Community to Promote Stewardship

The land that is within the Reserve boundary is a small fraction of the natural landscape that surrounds Great Bay. There are several other federal, state, local, nonprofit and private landowners within the watershed that are interested in promoting wildlife habitat and clean water. To effectively reach these common goals, information sharing and coordination amongst these landowners is critical. As habitat science is generated at GBNERR, concerted effort is made to develop products that are relevant and easy to use by conservation partners. This requires engagement throughout a project, carefully designed and distributed products, and technical assistance to promote new tools and science and support their implementation. GBNERR works with outreach specialists at UNH Cooperative Extension and the Wildlife Action Plan Implementation Team as well as with the CTP Coordinator to reach municipal and county land managers and ensure that new tools are shared with state and federal agencies that manage land in the region. Guidance documents, shared data sets, presentations, and on-the-ground implementation are done alongside other engaged land managers.

Private landowners and the general public are also key to the long-term stewardship of Great Bay. Demonstration projects such as the Community Wildlife Garden create places where people can see how personal choices can create positive change for Great Bay. Working with volunteers on invasive species removal, native plantings, trash clean up, and other stewardship-related projects fosters a connection to Great Bay and connect people directly to the resources. GBNERR coordinates these efforts and creates print and web-based information resources for private landowners, and promotes presentations and hands-on workshops with other GBNERR staff that give private landowners the information they need to implement good stewardship practices on privately held parcels.

C. Management Authorities within the Reserve

When any Reserve is designated, the management of the land and water defers to existing federal and state regulations at the time of designation. Because of this, the area within the Reserve boundary is governed by state entities. This model leads to unique protection levels for each Reserve. For Great Bay, NHFG and NHDES are responsible for most of the permitting and regulations. NOAA can intervene if a state approves a project with a large, long-lasting impact to the representative character of the estuary.

Reserve Waters

New Hampshire Fish and Game Authority: www.wildlife.state.nh.us/

New Hampshire Fish and Game has authority over fishing, scientific harvest of fish and shellfish, and shares authority with NH Department of Environmental Services and Department of Health and Human Services for shellfish aquaculture. Harvest licenses can be found on NHFG's website and restrictions limits vary by season, and citizens should contact NHFG for updated information. Scientific use permits for coastal waters are overseen by the NHFG Marine Division. Federal, state and NHFG rules can be found: <https://wildlife.state.nh.us/marine/rules.html>. Organisms collected through this permit are not allowed for consumption or for sale. The scientific permit application fee may be waived for some education and scientific research and monitoring projects, and applicants who receive a permit must submit a report each year to NHFG.

Reserve Lands

Wildlife management areas (WMAs) are managed by NHFG. State regulations, maps of all WMAs, and a description of selected WMAs for the state can be found at <https://wildlife.state.nh.us/maps/wma.html>.

- a. Special Use Permits (SUP) are required for any activity not explicitly allowed in the WMA rules. SUPs on Reserve lands are usually presented to NHFG Lands Team by the Reserve's Stewardship Coordinator, and are reviewed monthly by NHFG's land team in Concord.
- b. Scientific permits are issued for research on wildlife throughout the state including GBNERR, and are overseen by NHFG non-game biologists.
- c. DES permits apply to all state private and public lands/water. NHFG works with DES in the environmental review process.
- d. In addition to the NHFG Lands Team, there is a Statewide Lands Management Team (SLMT) that includes representatives from several other state agencies. Infrastructure and major habitat management projects on any state-owned land, including WMAs, are reviewed by this group.

Key State Regulations Applicable to Reserve Key Habitats

The Shoreland Water Quality Protection Act, originally named the Comprehensive Shoreland Protection Act (CSPA), was enacted into law in the 1991 session of the Legislature. The act establishes minimum standards for the subdivision, use, and development of shorelands adjacent to the state's public water bodies. Changes were enacted into law and became effective April 1, 2008 and July 1, 2008. The changes were broad in scope and included limits on impervious surfaces, a provision for a waterfront buffer to limit vegetation removal, shoreland protection along rivers designated under RSA 483 (Designated Rivers), and the establishment of a permit requirement for many new construction, excavation and filling activities within the Protected Shoreland. In 2011, the CSPA was renamed to the Shoreland Water Quality Protection Act and included changes to vegetation requirements within the natural woodland and waterfront buffers, the impervious surface limitations, and a new shoreland permit by notification process. NH Department of Environmental Services (NHDES) is responsible for implementing the Shoreland Water Quality Protection Act and town officials can implement further restrictions on shoreland development through local ordinances, overlay districts, or bylaws. NHDES is currently updating all wetland-related rules, and the Reserve will continue to comply with state regulations and assist in their implementation.

Wetland restoration projects, especially in tidal waters, must go through a state wetland review and permitting process, and require cooperation among all participating federal and state agencies. Those projects falling within the Reserve's boundary must comply with appropriate NERRS regulations (as stated under 15 C.F. R. sec. 921.1 (d) and (e)). Due to functions associated with eelgrass (supports detrital food web, filtering & stabilizing sediment, habitat diversity for wildlife, food for waterfowl), eelgrass beds are protected as "vegetated shallows" under the Clean Water Act, and some are included within "Essential Fish Habitat" as designated by the Magnuson-Stevens Fishery Conservation and Management Act.

Species of Concern

Federally threatened species include the Atlantic Sturgeon (Gulf of Maine Distinct Population Segment), piping plover and northern long-eared bat. Federally endangered species include the shortnose sturgeon and the rusty patched bumblebee.

State endangered species include the brook floater mussel, American brook lamprey, Blanding's turtle, Eastern hognose snake, upland sandpiper, Eastern small-footed bat, little brown bat, tri-colored bat, and New England cottontail. State threatened species include the ringed boghaunter, Hessel's hairstreak, bridle shiner, Atlantic sturgeon, spotted turtle, pied-billed grebe, common loon, common tern, cliff swallow, purple martin, Eastern meadowlark, and grasshopper sparrow.

D. Allowable Uses

Recreation

The Reserve is involved with several agencies and organizations on issues relating to recreation:

1. The Reserve staff coordinates with NHDES to receive pertinent information on the permitting process for docks and piers and to review applications for new installations.
2. The NH Port Authority issues mooring permits and NHFGD Marine Fisheries Division works with them to review applications for new mooring areas. A long-term goal is to formalize the rules for issuing permits in sensitive areas.
3. Commercial moorings require a commercial license and landings report, which are submitted to NHFG.
4. The effects of personal watercraft on the resuspension and erosion of salt marsh creeks was studied as a UNH sponsored project. The resulting data may affect future regulations.
5. In the Piscataqua Region Estuaries Partnership Comprehensive Coastal Management Plan (PREP 2010), goals have been set for shellfish management. NHFGD is working with the PREP to achieve sustainable shellfish resources by tripling the area of shellfish beds that are classified as open for harvest; and to triple the quantity of harvestable clams and oysters in New Hampshire's estuaries.

Great Bay Reserve is broken into core (Great Bay) and buffer (Little Bay) with higher conservation priority in the core. For instance, the area designated as core limits moorings and restricts aquaculture.

Dredging

A portion of the coastal waters of New Hampshire is subject to maintenance dredging. While Great Bay proper and its tributary rivers are not frequently dredged and are a low priority for future dredging, the rivers were dredged a century ago to facilitate commercial trade and local commerce. The NHCP is the chair of the Dredge Management Task force. NHFG does not have permit issuance authority with respect to dredging activities. However, RSA 206:10 charges NHFG with protecting, propagating and preserving the fish, game, and wildlife resources of the State. This law has led to a coordinated effort between NHFG and NHDES for all dredging projects. The Reserve supports dredging only when it is supported by science and accompanied by mitigation or restoration plans when necessary. Further, dredging within the Reserve may only occur in buffer areas and only in accordance with the NERRS Regulations, 15 C.F.R. § 921.1 (d).

Aquaculture

NHFG handles the aquaculture licensing process. This process is stringent and is designed to ensure that any aquaculture practices will be conducted responsibly with regard to protecting the natural resources and traditional uses for the common good. Further, aquaculture within the Reserve may only occur if it is a long-term pre-existing use, 15 C.F.R. § 921.1 (d) and only in buffer areas. Aquaculture within the Great Bay estuary has been limited to Little Bay and the Piscataqua River and other tributaries to Little Bay.

Shellfish

The Great Bay estuary has abundant shellfish resources that can be found in the tidal rivers as well as in both the Little Bay and Great Bay proper. In Great Bay Estuary, shellfish resources are harvested only for recreational use. Oysters (*Crassostrea virginica*) are of primary interest with mussels (*Mytilus edulis*), razor clams (*Ensis directus*) and soft-shell clams (*Mya arenaria*) also being harvested. State and federal laws set water quality standards that determine whether shellfish can be harvested

from given areas. To help prevent disease in consumers of raw shellfish, water quality standards use certain types of bacteria and their concentrations as indices of fecal contamination. New Hampshire's monitoring protocol is consistent with current National Shellfish Sanitation Program recommendations.

Boat Discharge

All state waters including the Great Bay estuarine system are considered "no discharge zones" for boating septic waste. Under the "no discharge rule" that took effect in 2004, boats with Type I and Type II marine sanitation systems must be secured or disabled when operating in a no discharge zone to prevent overboard discharge. Boats with Type III systems must discharge wastes through an approved on-shore pump-out station. The Reserve distributes the NH Coastal Program's coastal access map, which delineates the local pump-out stations for boaters. Enforcement is the responsibility of the US Coast Guard (USCG) and NHDES.

E. Enforcement

The land management responsibilities are done in close partnership with the NHFG Habitat and Law Divisions. All Great Bay National Estuarine Research Reserve lands are managed as state Wildlife Management Areas (WMA) and follow NHFG rules and policies related to appropriate uses on those lands. Special Use Permits are required for any activities not explicitly allowed in the regulations that are done on a WMA, and the approval of those requests takes place through a NHFG team that includes the Director of the New Hampshire Fish and Game Department and representatives from multiple agency divisions. The NHFG Law Division and Wildlife Division are responsible for enforcement when there are unallowable uses or illegal harvest on GBNERR properties. Problems on NHFG lands are often reported by abutters or conservation partners, and Reserve staff often work with both NHFG and external partners to attempt to resolve issues before elevating it to the Law Division. The Nature Conservancy also holds deed restrictions on the majority of the NHFG owned GBNERR land, and they monitor properties every three years and report issues to the agency and assist in tracking their resolution.

F. Looking Ahead

Natural Resource Management and Stewardship Challenges

Continued Stewardship of Distributed Properties

The distributed pattern of parcels that NHFG manages within the GBNERR boundary makes boundary marking, trash removal, deterring vandalism, and habitat management challenging.

Staff Capacity

GBNERR stewardship and natural resource management responsibilities are diverse and include GIS work, sentinel site and habitat mapping and monitoring, land acquisition and restoration work, and direct management of the Reserves dispersed parcels of land. There is one full-time Stewardship Coordinator, and part-time help is contracted when funds are available.

Natural Resource Management and Stewardship Emerging Issues

Science needs associated with the Natural Resource Management and Stewardship activities are noted in the Research and Monitoring Chapter. Factors that will influence the way GBNERR manages its lands and waters in the future include:

- Understanding emerging climate science and unanticipated impacts for fish, wildlife, and habitats of interest.
- Shifting species distribution due to climate impacts will change native population management and restoration targets.
- Proactively thinking about habitat migration in conservation and restoration decision making.
- Understanding habitat and human use trade-offs when multiple uses or restoration options are considered.
- Working within the Great Bay Resource Protection Partnership in a new context that is focused on sharing science and stewardship efforts (rather than focused on joint acquisition of property).
- Emerging technology may affect methods used to monitor land use and habitat change.

Natural Resource Management and Stewardship Goals and Strategies

GOAL

Practice and promote land protection and management strategies that sustain wildlife and water quality.

OBJECTIVES

- NR1.** Reserve lands are managed in accordance to applicable federal and state regulations and policies and enforced to conserve habitat and water quality.
- NR2.** Rare and endangered species and associated habitats are protected within GBNERR.
- NR3.** Land protection and management practices at GBNERR support maintaining or improving habitat conditions and water quality within the Great Bay watershed.
- NR4.** Human impacts on wildlife habitat and water quality are understood and minimized through conservation education, outreach, and communication.

STRATEGIES

- Work within NHFG and with partners to ensure that conservation goals are met through monitoring the lands and communicating with partners and NHFG when problems arise.
- Work with NOAA to submit a boundary revision proposal to incorporate NHFG lands acquired since the 2006-2011 management plan approval.
- Ensure that NHFG lands are well marked and mapped to help raise public awareness about the Reserve, enforce easement agreements, work with adjacent landowners, and geographically guide the work on NHFG-owned lands.
- Develop and test land management practices that enhance key habitats, species, or ecosystem functions.
- Advance understanding of how aquaculture efforts in Great Bay interact with native habitat and water quality.
- Advance understanding of how people impact wildlife and habitat quality through science and outreach.
- Work directly with other landowners and natural resource managers in the region to share information, best practices and resources to do land stewardship projects.
- Engage the public, volunteers, and citizen scientists in land stewardship projects and monitoring.
- Bring the best available stewardship and habitat science to GBNERR education, CTP, research, and facilities and lands management decisions and programming.

Public Access and Visitor Plan



A. Local Context

Great Bay is often referred to as the “Hidden Gem” of the seacoast. People from all over the state and all over the country visit the New Hampshire beaches and coastal city of Portsmouth, NH, and never know that the Great Bay Estuary is nearby. Being shallow and dominated by mudflats at low tide, Great Bay has thrived historically as a hunting area but not as a recreational boating or swimming destination. With increased suburban development in the late 1900s and early 2000s, kayaking, hiking, and wildlife watching have become popular recreational activities in the area. Several agencies, nonprofits, and towns have done excellent land protection work over the past 20 years to conserve a large amount of land around Great Bay; providing opportunities to hike, cross country ski, and birdwatch. Access to the bay itself remains relatively rare and NHFG properties on Great Bay are important opportunities to provide public boat access and to connect people to the water.

An assessment of climate vulnerability to all coastal Wildlife Management Areas and NHFG boat launch sites was conducted in 2017, with notes about how current uses of those areas may be impacted due to sea level rise or coastal flooding. For GBNERR managed properties and facilities, habitat shifts are likely, but damage to infrastructure is not likely.

The lands that GBNERR manages are distributed around the bay. Some are appropriate for encouraging public access and visitor use, but others support sensitive wildlife populations or have difficult access points. This plan outlines the parcels that GBNERR intends to encourage for public use, while acknowledging that all NH Fish and Game WMAs are open to the public, with some small exceptions.

B. Current Public Access to GBNERR

Boat Access

Reserve waters can be accessed through NHFG owned properties and/or from boat access sites that surround Great Bay (see Figure 12). Relative to other water bodies of a similar size, Great Bay does not have extensive boat access. The dramatic tides leave over 50% of the bay as exposed mudflat during low tide, making it less than ideal for many recreational boaters. The all tide water access sites within the NERR area are at the Great Bay Marina on the east side of Great Bay, Jackson Estuarine Lab docks on the west side of Great Bay, and there is all tide river access at the boat landing at Chapman's Landing.

Upland Access Points

The Reserve has a management interest in over 90 parcels that surround Great Bay. Not all of these properties are excellent candidates for multiple public uses. Some are active wildlife recovery or restoration sites, some are remote and were protected largely due to unique ecological conditions, and some are most appropriate for a specific type of public use and wildlife habitat (for example, agricultural fields that are maintained for ground nesting bird species). All Reserve lands are open to the public and are managed as Wildlife Management Areas by NH Fish and Game. Some parcels are more appropriate for helping to interpret the mission of the NERR, and the staff put together a "Passport" to direct visitors to those properties in the past. These were selected to represent different themes that are critical to the NERR, and are therefore considered "Ambassador Properties". These properties include:

Discovery Center

By far the most critical property for interpreting the GBNERR mission, the Great Bay Discovery Center campus houses the programs and also has a visitor center, interpretive trails and signs that interpret Reserve science and encourage visitors to encourage personal stewardship practices. Many of the monitoring programs use the marsh in front of the Discovery Center as a site and there is a SWMP water quality station less than a mile by boat from the Center. The Discovery Center marsh is the site of sentinel site infrastructure and is also a long term macroalgae monitoring site.

Adams Point

This parcel was historically a farm and is a peninsula that juts into the narrows that separate Little Bay from Great Bay. It is owned by NHFG and the Jackson Estuarine Lab is located here. NHFG maintains a parking area, established walking trails, and stairs to access the rocky shoreline. This is a popular place for picnicking, hiking, and recreational oyster harvesting.

Great Bay Community Wildlife Garden and Chapman's Landing

Chapman's Landing is a NHFG boat access site along the Squamscott River, close to the Discovery Center and dominated by salt marshes. Adjacent to the boat parking area is a small parcel that has been transformed into a Community Backyard Wildlife Garden. Through native plantings, a wildlife pond, and interpretive exhibits, this parcel provides a peaceful setting for visitors to enjoy the garden and be inspired to create a wildlife-friendly backyard at their own home.

Crommet Creek and the Sweet Trail

The Newsy Property is located along the Sweet Trail, a 3.9-mile trail that connects conservation land belonging to multiple conservation partners in the Crommet Creek area of Durham. The Great Bay Resource Protection Partnership was responsible for the creation and maintenance of the trail, and the Newsy property is a NHFG-owned parcel that includes interpretive panels and a deck that overlooks freshwater wetlands.

Great Bay Farms (Emery Farm)

The 11.56-acre shorefront (life estate) portion of the 131-acre Great Bay Farms site has not been open to visitors in the past. This property is a farm complex on the eastern shore of Great Bay that has been owned by NHFG through a life estate agreement for the past twenty years. The life estate expired and NHFG took the property over in the spring of 2018. The site is currently used as one of the long-term macroalgae study sites and is adjacent to a marsh that is monitored each year by the Reserve. The agency is still working on a plan for the property, but the spectacular views and historic ice fishing access make this a likely place to direct visitors in the future.

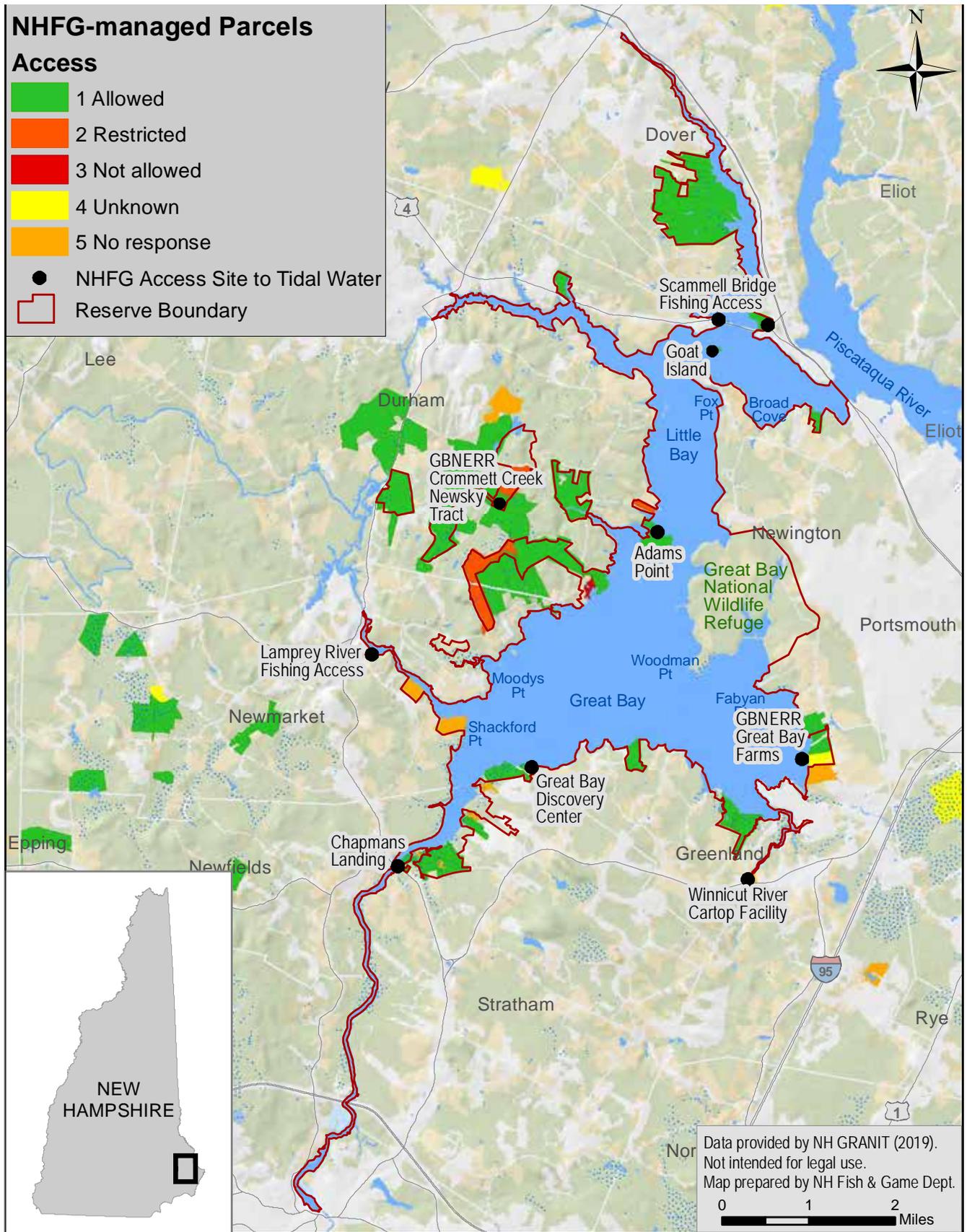


Figure 12: GBNERR Public Access map.

C. Looking Ahead

Challenges

Parking

The ability to have multiple events at once and/or host large events for the public at the Discovery Center is limited by a lack of adequate parking space.

Connection to Great Bay

There are not many places around Great Bay to view or access the water. This is a public access challenge for the state, compounded by the lack of deep water or all-tide access points in Great Bay. Because the bay is not used recreationally as much as other water bodies, there is less public awareness and appreciation for Great Bay. The Discovery Center does have kayak access to Great Bay, but there is no view of the water from the Visitor Center and many people come to the Discovery Center without understanding that there is an estuary directly behind the building. The staff have explored this issue and discussed the tradeoffs of creating a view vs. maintaining as much vegetation as possible along the buffer. Other properties that NHFG manages (Adams Point, Great Bay Farms) offer a more direct connection to Great Bay due to historic maintenance of agricultural fields, but fewer people visit those properties and there are no public programs offered.

Staffing the Visitor Center

The Discovery Center is open Wednesday through Sunday from May to October. There are often visitors who would like to have access to the indoor exhibits every day of the week and year round, and would also like additional programming to be offered on the weekends, but the small staff size makes this a challenge. Volunteers are used to staff the Center, but a NHFG employee must always be on site as well. This challenge is directly related to a lack of funding for temporary, part-time positions.

Railroad

The Discovery Center campus is bounded to the north by a railroad line. The use of this rail line may expand in the future, and the Reserve and the Great Bay Stewards have worked to stay informed about this issue over the past four years in order to be proactive on offsetting any impact this may have on Reserve programming and operations.

Balancing Multiple Uses

As Wildlife Management Areas, all Reserve properties are open to and encourage wildlife habitat and managed fishing and hunting. There is also a high demand for public trails in the seacoast region. These multiple demands on public property can be at odds with each other and lead to different approaches to encouraging access.

Complex Boundary

The Reserve properties are distributed around Great Bay. This makes it difficult to post boundaries, maintain landowner and abutter relations, and convey allowable uses in a consistent way. There is an extensive partnership network involved in land management, so coordination between fee owners, easement holders, etc. can be complicated when dealing with visitor use issues or encroachments.

Climate Impacts

As habitats shift within Great Bay, the way species are managed for fishing and hunting may change. This may influence how people use the bay and when it is accessed for different uses. The boardwalk is in a low-lying area of the Greenland campus of GBNERR, and was designed to accommodate changing water levels when it was rebuilt in 2015 through the use of adjustable helical piles. There may also be changes to the freshwater wetlands along the Sweet Trail, so partners involved in that effort will need to monitor and adapt trails as appropriate.

Opportunities

Sweet Trail

Working in a partnership between NHFG, NH Chapter of the Nature Conservancy, NH Audubon, and the Society for the Protection of NH Forests, this trail takes hikers from the shores of Great Bay into a large unfragmented forest block with extensive freshwater wetlands. This area (the Crommet Creek area) was a major focus for land protection for the GBRPP

and the trail is a way to responsibly direct people to appreciate this unique natural system. The trail is very popular, and the partnership continues to work together to maintain the trail and address abutter issues as they arise.

Great Bay Farms

The transition of this property into NHFG management will be a major effort for the next few years, but the opportunity to open this area up for public visitation and events is enormous. This property will likely be the primary focus for efforts to expand visitor access to Great Bay within the next five years. Careful planning and considerable site work will be required, but the location is close to Portsmouth, offers incredible views, contains an opportunity for a new boat launch, links to adjacent NHFG properties, has ample space for parking and new programming, and reinforces a connection to traditional agricultural land use that dominated the area until the past few decades. The Reserve will consider how to maximize the use of this property and integrate research, education, and training programming at Great Bay Farms.

Great Bay's Community Wildlife Garden

The Reserve has done extensive work to create a peaceful public access area. The small demonstration area shows how to landscape a backyard in a way that creates beautiful wildlife and bird habitat. The Reserve will need to transition to a sustainable maintenance plan for the property and schedule programming that interprets the site and encourages visitors to add wildlife friendly practices to their own yard.

Upgrades to the Visitor Experience at the Discovery Center

Within the evaluation period, GBNERR built a new boardwalk, created a handicap accessible path to the waterfront, installed kiosks to interpret the green features of the site, and placed interpretive stations along the boardwalk. The entryway to the Hugh Gregg Coastal Conservation Center was renovated and the Visitor Center at the Discovery Center had a new floor map, new entry desk, marine debris exhibits, and a salt marsh exhibit added.

Increased Kayak Programming at GBNERR

Consistent kayak programming can be challenging for GBNERR to maintain with a small staff. Luckily, a highly qualified naturalist who also has extensive kayak skills has been with the Reserve as a part-time employee for the past six years. This has led to more consistent and high-quality kayak programs throughout the summer season. The trips all have themes that link to the NERR mission.

Increased Visibility and Community Engagement

Having an active social media presence and increasing the partnership with NHFG to advertise GBNERR programming has expanded visibility for the Reserve, attracting more visitors to the Center. The Great Bay Stewards also have a regular newsletter that promotes programming and encourages members to get out and enjoy Great Bay.

Enhanced Public Awareness of GBNERR Properties and Programs

In addition to creating increased visibility for the Discovery Center, the Reserve would like more people to recognize and experience the other NHFG properties that are within the GBNERR boundary and engage the volunteer community with more of the NHFG properties within the boundary. The Reserve would also like visitors to understand the breadth of programming that occurs at GBNERR and connect casual visitors to the research, stewardship and community outreach work that is done by Reserve staff.

Increased Recognition of GBNERR as a Platform for Research

As the research opportunities at GBNERR have expanded with the NERRS Science Collaborative and Margaret Davidson Fellowships, there is now an opportunity to develop a more strategic approach to promoting the Reserve as a platform for research. This can be done across age groups (high schools, college students, academic researchers, etc.) and Reserve staff can help ensure that people are aware of the range of science occurring in Great Bay and the range of opportunities to conduct science at GBNERR.

Visitor Use and Public Access Goals, Objectives, Strategies

GOAL

Visitors and partners increase environmental awareness and appreciation, scientific understanding, and personal and professional stewardship of estuaries at GBNERR when they visit Reserve lands and waters.

OBJECTIVES

VUPA 1: Maintain and improve appropriate public access sites within the GBNERR boundary to ensure they are safe, well marked, and interpreted when appropriate.

VUPA2: Promote sustainable and compatible public visitation of GBNERR lands and water through communicating with the public and creating resources for them to learn about Reserve properties and how to enjoy them.

VUPA3: Visitors to GBNERR have experiences that deepen their appreciation for Great Bay and inspire actions that will protect and restore it.

VUPA 4: Visiting scientists and students use GBNERR as a platform for biophysical and social science research.

VUPA 5: Educators and training partners seek out GBNERR as a place to conduct programs and connect to Great Bay.

STRATEGIES

- Assess public access needs for both water access and land access in partnership with NHFG.
- Work with NHFG to develop boat access sites, parking, and other appropriate public access development projects in response to agency goals.
- Communicate with all partners and visitors to understand and manage use conflicts on NHFG lands.
- Ensure that education, research, and training programs have appropriate access to NHFG lands to advance estuarine science and demonstrate and interpret best management practices.
- Provide the public with information about public access opportunities at GBNERR through print, web and social media communications.
- Promote the use of the Reserve for estuarine social and natural science research, and promote the Reserve as a place to come to learn about research happening in Great Bay.
- Provide interpretive and educational opportunities on NHFG lands that advance visitor understanding and appreciation for Great Bay and how to protect and restore it.
- Consider safety, inclusion, and universal accessibility in all visitor use planning and projects.
- Seek to better understand how people are currently using Great Bay, what they value about their experiences in Great Bay, and how and if that influences personal and professional decision making.

Facilities Development and Improvement Plan



A. Approach to Facilities

Facilities and grounds must align with the organization's philosophy and goals. Key principles followed at GBNERR to maintain and develop facilities are:

Sustainability

Reserve actions should always aim to have the smallest footprint possible to achieve Reserve goals, follow environmentally-friendly building and maintenance techniques, be as efficient as possible, demonstrate innovative green technology, and consider climate change in facilities and grounds planning.

Stewardship

Visiting the Reserve should be a catalyst for environmental stewardship; encouraging action that restores and protects ecosystem functions and values.

Connection

Everyone who visits GBNERR facilities is encouraged to connect with the environment, to learn something new, and to deepen their appreciation for the estuary.

These organizational values will guide how the Reserve maintains and develops facilities that support programs.

These facilities need to fulfill the following basic functions:

- Support the administrative and office needs of Reserve staff
- Support the use of the Reserve as a living laboratory (monitoring and research)
- Support the Reserve as a place for decision makers and community members to learn about how natural and human systems affect each other (CTP, demonstration sites, etc.)
- Support the land management priorities of the Reserve
- Provide an inspiring and educational visitor experience
- Maintain and improve water access to Great Bay
- Provide space for volunteers, visiting research or education professionals, interns and students to work with the Reserve
- Support K-12, public and teacher education programs
- Ensure people have hands on learning opportunities at indoor and outdoor exhibit space
- Raise awareness of what GBNERR is and what the Reserve does through connecting the grounds, facilities and exhibits to the Reserve mission and programs.

B. Current Facilities

The Greenland Campus

The majority of the Reserve staff and programming is located on a 50-acre site of mixed-upland forest, freshwater wetlands, and extensive salt marshes in Greenland, New Hampshire. This campus currently includes three buildings, a boardwalk, a boat launch, outbuildings, and several trails.

Discovery Center

The Great Bay Discovery Center is located on the shores of Great Bay in Greenland, New Hampshire. The Discovery Center officially opened in 1996 and serves as the Reserve's education headquarters and interpretive center. The Discovery Center main building includes 1000 ft² of exhibit space on the main floor, and office space and meeting space on the second floor.

Hugh Gregg Conservation Center

The Gregg Center opened in 2006 and provides a large meeting space for the Coastal Training Program and other activities and public events. It also includes exhibits on the wildlife of Great Bay and a Special Collections room that interprets historic artifacts from the region.

Depot House

The Depot Station is an approximately 1650 square foot historic train station located at the entrance to the Discovery Center and Gregg Center. New Hampshire Fish and Game purchased the building and property in 1998 and until January 2012, the building provided living space for the Reserve's maintenance supervisor and occasional visiting scientists and conservation law officers. The building now houses office space, and Reserve staff and the Great Bay Stewards have worked together to renovate the building.

Other Greenland Campus Elements

The Greenland campus also includes a picnic pavilion, a quarter-mile boardwalk, a screened education pavilion, and outdoor exhibits.

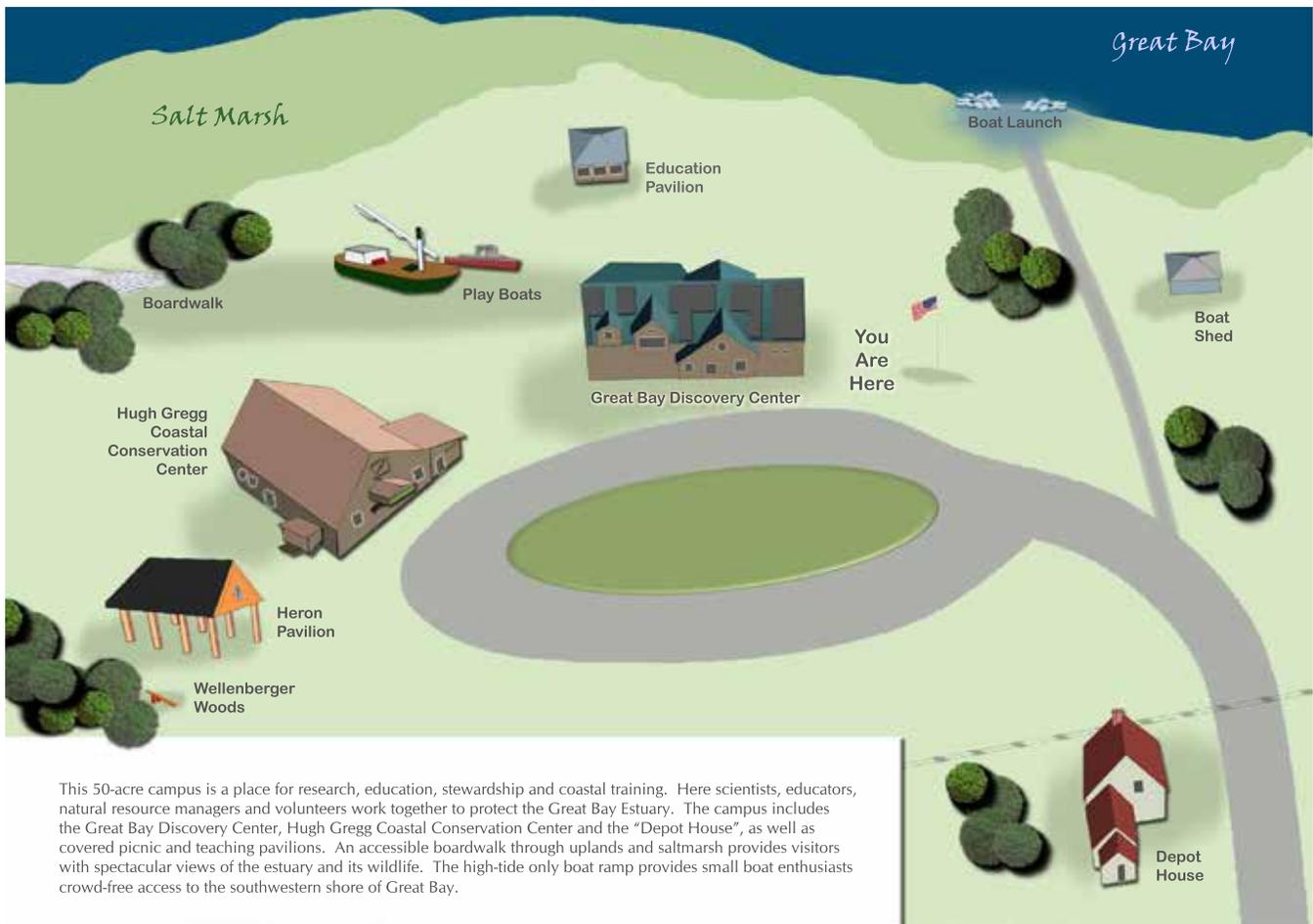


Figure 13: Great Bay Greenland Campus Map.

Facilities Away from the Greenland Campus

Region 3 NH Fish and Game Office

The Reserve Manager is based at the Marine Fisheries Division headquarters on the University of New Hampshire campus in Durham. Marine Fisheries Division staff members are located here, including the Division Chief, executive secretary, two wildlife biologists, and several fisheries biologists and technicians. In addition, seasonal staff and local Conservation Officers for the Seacoast region are based at the Region 3 office.

Great Bay Farm

The 11.56-acre shorefront (life estate) portion of the 131-acre Great Bay Farms site has not been open to visitors in the past. This property is a farm complex on the eastern shore of Great Bay that has been owned by NHFG, but in a life estate agreement for the past twenty years. The life estate has now expired and NHFG took the property over in the spring of 2018. The agency is still working on a plan for the property, but the spectacular views and historic ice fishing access make this a likely place to direct visitors in the future and expand programming.

Wiggin Community Wildlife Garden

Chapman's Landing is a NHFG boat access site along the Squamscott River, close to the Discovery Center and dominated by salt marshes. Adjacent to the boat parking area, there is a small parcel (Wiggin) that has been transformed into a Community Backyard Wildlife Garden. Through native plantings, a wildlife pond, a viewing platform, and interpretive exhibits, this parcel provides a peaceful setting for visitors to enjoy and be inspired to create a wildlife-friendly backyard at their own home.

Bunker Creek Barn

In Durham, off of Route 4 on the north side of Great Bay, is a storage barn located on a Reserve property. This old New England-style barn came with a property purchased by the Great Bay Resource Protection Partnership and was turned over to NHFG. The building is primarily used as winter boat storage for the Reserve and the Marine Fisheries Division as well as long-term storage for equipment. It is currently in poor condition.

C. Challenges and Opportunities

Lack of Space to Accommodate Basic Functions of the Reserve

The office space in the upstairs of the Discovery Center was originally designed to be a caretaker's apartment. This has left a legacy of an inadequate and unsafe office environment. The Depot House is the other area currently used for office space. This was also designed as a residential space, and is not set up for efficient use as an office.

Programmatically, the Reserve needs dedicated office space for each sector lead, an education prep area, a dedicated space for a GIS station and printer/plotter, adequate space for each program to have interns or assistants, a space for volunteers to congregate and get organized, lab space or research/field prep areas, classrooms and workshop space, adequate office space for the Reserve Manager, and space for the Great Bay Stewards. There is no staff bathroom in the Discovery Center and there are few offices that have doors. There is no garage on the campus, leading to unsafe and impractical storage of gas-powered tools, the ATV, and small boats and trailers. Storage at the Bunker barn is far from the Discovery Center and other properties where the work is done, and the barn is not in good condition.

There are often too many programs happening in the limited space that the grounds and buildings at the Discovery Center can accommodate. The small visitors center and boardwalk do not have room for a large school group and a group of passive recreationalists at the same time. The parking lot is overwhelmed whenever there is a school group with buses and a workshop of over 15 people. The barn is the only indoor space available for any program (workshop, education program, research meeting, etc.) and results in use conflicts and reduced programming.

Reserve staff acknowledge that there are limitations due to the shape and size of the Greenland/Stratham parcel. The campus is surrounded by the marsh, a rail line, and residential development. Creative use of the current buildings and campus space; using other GBNERR, NH Fish and Game and UNH properties and assets; and creative partnering will be needed to ensure all of the Reserve programs have the facilities needed to function.

Challenging Visitor Environment

Basic Challenges

The Reserve also has basic challenges associated with being an interpretive center for Great Bay. These include:

- No bathrooms for the public to use when center is closed;
- Limited parking;
- A play area that is too small and dangerously close to the rail line;
- Aging exhibits that need updating;
- Disparate messaging throughout the campus that needs to be more cohesive
- No view or pathway to the water from the Discovery Center; Many visitors come to the campus and leave without knowing there is an estuary next to them; and
- Limited public awareness of the center. Many people that live very close to the Center do not know it is there due to the location at the end of a short dead-end road.

Site Specific Constraints

The parcel of land that the Discovery Center is located on is on a bulge of land that is bordered by the estuary on most sides and a rail line to the south. A rail crossing is at the entry to the site, and therefore the rail line cuts the Center off from other



transportation routes. The number and length of trains that travel this line has been small but is growing, and no expansion of the current parcel is possible due to the rail easements and land ownership that surround the Reserve.

Older Buildings and Exhibits

In addition to having been designed to be residential, the Discovery Center is now 25 years old and most of the building has never been renovated or updated. The Hugh Gregg Coastal Conservation Center is a newer facility, but there are still maintenance challenges that need to be addressed. The state of New Hampshire has a very limited budget for facility-related projects, and the Reserve has worked closely with NH Fish and Game and the Great Bay Stewards to keep buildings in good care.

Insufficient support for building and grounds maintenance

Maintaining multiple buildings and all of the associated grounds for both staff use and for over 12,000 visitors a year requires significant staff time and effort. Despite the amazing work done by volunteers and the help the Reserve receives from the Facilities and Lands Division of NHFG, the Reserve needs additional staff capacity to do an adequate job keeping up with facilities related work.

Opportunities for Improvement

Specific needs that are anticipated within this plan's timeframes:

- Lab, monitoring, and research storage and prep areas
- Updated exhibits

- Proper office space for all programs
- Volunteer room
- Staff bathroom(s)
- Bathrooms available to visitors when the center is closed
- Housing for visiting researchers, volunteers, or teachers
- Access to basement of HGCC from inside the building
- Larger meeting space with functional kitchen
- Garage or proper storage building for boats, ATV, lawnmowers, snowblowers, etc.
- Classroom space
- Indoor and outdoor event space
- Dedicated space for the Great Bay Stewards office and adequate shared space for meetings and events

Grounds improvements anticipated within this plan's timeframe:

- Improve parking and capacity to host large groups
- Restoring a view of Great Bay that is ecologically appropriate
- Enhance and improve trails
- Link outdoor and indoor exhibits to each other and to programming priorities
- Use Reserve sites as demonstrations for best practices in restoration, invasive species removal, etc.
- Create signage that connects visitors and to ongoing research and stewardship initiatives
- Create signage that raises awareness of other GBNERR properties and how to access Great Bay
- Upgrade kayak shed
- Assess campus for renewable energy generation
- Continually improve water access

Location Considerations for Facilities and Grounds Improvements

It is important to note that the functional needs listed above may or may not all be appropriate at the current campus. The Discovery Center campus, the Great Bay Farms property, the Bunker Creek property, and creative partnering with UNH and other Divisions of NHFG are all opportunities that need to be explored through careful planning. In 2018 and 2019, the GBNERR staff did extensive work to identify the programmatic functions needed, the limitations of the current buildings and grounds, and the potential to address these challenges at the Great Bay Farms site.

Short term needs that could be addressed at the Great Bay Farms site include: housing for visiting researchers, teachers and volunteers or maintenance staff; parking and space for outdoor events; improving access to Great Bay for kayaking, canoeing, ice fishing; developing self-led trails; creating a picnic area or pavilion to support passive recreation opportunities; and storage for equipment that is not needed on a daily basis. Some of the existing buildings on site would need to be removed and/or renovated and site improvements would be necessary to accommodate these uses. It is possible that longer term needs could be addressed at either location, but all parties will need to consider:

- Facilities guiding principle
- Cost
- Programmatic and mission alignment
- Site constraints

- Existing programmatic infrastructure
- Established relationships within Greenland
- A maintenance, use, and/or removal plan for buildings not in use by GBNERR

Facilities Objectives and Strategies

GOAL

Develop and maintain facilities that support the programmatic work of the Reserve, inspire visitors to care about and for Great Bay, and demonstrate sustainability and resilience best practices.

OBJECTIVES:

- F1.** Reserve staff have the space to adequately perform their education, training, stewardship, research, administrative, and community engagement work.
- F2.** Volunteers, interns, fellows, key programmatic partners, and the Great Bay Stewards have appropriate space to operate in partnership with Reserve staff.
- F3.** Participants in Reserve programming and visitors to GBNERR increase their willingness and ability to act in the interest of the Great Bay watershed because of their experience at the Reserve campus.

STRATEGIES:

- Regularly assess facilities maintenance and improvement priorities with staff, NHFG, and with close partners and program participants.
- Prioritize facility needs and work with NHFG and the Great Bay Stewards to implement improvements.
- Maintain all GBNERR facilities and grounds to the highest standard possible.
- Work with NHFG to improve energy and water use efficiency at all buildings.
- Create a plan for the Great Bay Farms property and the Discovery Center campus that addresses GBNERR and NHFG agency priorities.
- Create opportunities to demonstrate and interpret sustainable grounds, building and maintenance practices at GBNERR.
- Work with partners within the agency and within the seacoast area to understand ways GBNERR facilities can fill regional environmental science, education and training needs.
- Identify funding opportunities to address facilities needs.

Land Acquisition Plan



A. Acquisition Context

Protecting coastal land may be the most important activity that natural resource managers can employ to mitigate known and unknown stressors to coastal habitat and water quality. Proactively purchasing or restricting use on land ensures that ecosystem services are maintained, and that nature will be allowed to responsively adapt as conditions evolve. Intact landscapes protect fish and wildlife, water quality, mitigate flood impacts, filter pollutants, and sequester carbon. To maximize these benefits, assessments and planning tools can help direct land protection efforts and align both land protection and land use planning to advance mutual conservation goals.

GBNERR experienced a rapid and dispersed land protection expansion in between 1996-2012. Federal investment in land protection in the region was significant and partners worked to align landowner wishes with the organizational interests of multiple non-profits and partners in the region. GBNERR was not designated as one contiguous parcel and the new land acquired in the 1990s/2000s also did not require parcels to be adjacent to be added to the Reserve. The result is a patchwork of over 90 parcels in the Great Bay region that are managed by or in partnership with NHFG. As land protection science has advanced and the federal resources to purchase land have been reduced, GBNERR will be more targeted in its land protection strategy in the next five years.

The Reserve's land acquisition strategy is informed by New Hampshire Fish and Game land protection priorities and by a regional conservation partnership: the Great Bay Resource Protection Partnership.

The Great Bay Resource Protection Partnership

The Great Bay Resource Protection Partnership is a collaboration of conservation organizations in the coastal region that promotes landscape-scale land conservation and stewardship. Since 1994, the Great Bay Resource Protection Partnership (Partnership) has operated as a cooperative effort to promote collective conservation goals and implement conservation programs. The Partnership's comprehensive approach to conservation is guided by landscape scale conservation planning. This collaborative, science-based process furthers the understanding of ecosystem and water quality health, and informs the Partnership's land protection, management and stewardship activities. The Great Bay National Estuarine Research Reserve has been a principal partner in this organization since it was created in 1994.

Current principal partners include:

- Great Bay National Estuarine Research Reserve
- New Hampshire Audubon
- New Hampshire Fish and Game Department, Wildlife Division
- Society for the Protection of New Hampshire Forests
- The Nature Conservancy, New Hampshire Chapter
- US Environmental Protection Agency
- US Fish and Wildlife Service, Great Bay National Wildlife Refuge
- US Natural Resources Conservation Services
- Southeast Land Trust of NH

The Partnership works closely with local communities to align land protection priorities and leverage funding for parcels that advance the goals of the partnership. The Partnership's geographic service area has been the 24 New Hampshire municipalities included in the Great Bay Focus Area, as identified in Atlantic Coast Joint Venture of the North American Waterfowl Management Plan (USFWS). Over the past 18 years, the Partnership has protected 105 properties, totaling 5,870 acres. Conservation lands are located in 13 communities, and comprise concentrated blocks of conservation lands, known as Conservation Areas. The 12 Conservation Areas range in size from 264 acres to 2,594 acres, and protect a significant diversity of habitats and species. The Partnership's collaborative stewardship program provides ecologically compatible public access to thousands of acres of land and access to water in the seacoast of New Hampshire.

In 2012-2013, the Great Bay Resource Protection Partnership went through a strategic planning process to reconfirm its joint strategy for land protection in the region. The Partnership's activities are now guided by the following goals.

Land Conservation and Stewardship Goals

Water Quality

To protect human health and, through land conservation and stewardship, achieve and maintain the water quality and quantity necessary to support the aquatic living resources of the Great Bay and its tributaries within the coastal watershed.

Wetland Ecosystems and Significant Habitats

To protect, enhance, restore, and manage an appropriate distribution and diversity of wetland ecosystems and other habitats essential and significant for the protection of water quality of Great Bay and wildlife including migratory birds, fish, shellfish and other wildlife.

Migratory Bird Populations

To maintain or improve current distributions of waterfowl and other migratory bird populations, and to help maintain optimum population levels, distributions, and patterns of migration.

Exemplary Natural Communities and Habitats

To protect, enhance, restore, and manage exemplary natural and characteristic natural communities and habitats for rare, threatened, and endangered species of animals and plants.

Working Landscape

To protect farm and forest land that provides both important sustainable economic and ecological benefits and to help ensure that these lands continue to be managed on a sustainable basis that provides multiple conservation values and supports other conservation goals of the Partnership.

Landscape Stewardship and Management

To manage conservation properties within a landscape perspective that respects the integrity and diversity of the entire ecosystem, promotes shared management guidelines and fosters management collaboration among conservation landowners.

Recreational and Educational Opportunities

To protect natural areas that are important for aesthetic purposes and provide quality public recreational and educational opportunities that are compatible with the protection of the other Conservation Goals of the Partnership.

The Partnership seeks to support the permanent protection and ongoing stewardship of the region's significant habitat areas and conservation lands. There are three integrated program areas that will achieve the Partnership mission and conservation goals:

- 1) Partnership:** Networking and Collaboration
- 2) Land Conservation:** Planning and Projects
- 3) Stewardship:** Landscape Conservation and Funding

As a principal partner in GBRPP, the Reserve works to represent NHFG land protection interests to the group and also works with the partnership to advance land protection planning science. In 2006, the NH Coastal Conservation Plan was created and adopted by the GBRPP (Zankel, 2006). The focus areas within the plan have guided priorities within the watershed for all conservation partners. Since this plan was published, there have been several geospatial projects to advance understanding of how and where land protection can have the greatest impact on GBRPP goals. Specifically, modeling done by GBNERR to understand how sea level will impact habitat, studies to assess landscape scale climate resiliency, wildlife connectivity and water quality benefits done by the Nature Conservancy, and the updated Wildlife Action Plan maps assessing habitat quality are all new information sources that should be incorporated into prioritizing land protection.

Protected parcels and their ownership are publicly available through user friendly maps on NH GRANIT and GRANITviewer. GRANIT and the Coastal Viewer also host mapping products that display the results of recent geospatial assessments in an interactive way to assist in community and partner protection efforts.

New Hampshire Fish and Game Priorities

The Department owns WMAs for three primary purposes:

- 1) to conserve, improve, maintain, and/or restore habitats for wildlife;
- 2) to enhance local wildlife populations and assist in maintaining the state's native biodiversity; and
- 3) to provide public access to Department lands for hunting, fishing, trapping, and wildlife watching of the state's fish and wildlife resources.

In 2015, the Department took on an agency wide effort to focus land protection efforts; assessing current holdings and evaluating where there could be the greatest likelihood of advancing the three purposes stated above. Although the coastal area did not emerge as a high priority state-wide, the agency remains supportive of high-quality land protection projects.

Specifically, the agency is interested in projects that meet the following criteria:

Habitat Values

- High habitat diversity
- Wintering habitats
- Grass/Forb
- Shrubland/Young Forest
- Orchards
- Wetlands and vernal pools
- Rare Species
- Wildlife Action Plan Tier 1 or 2
- Forest Management Opportunities
- Habitat connectivity/riparian corridors; linkages to other conservation lands, particularly WMAs
- Other significant habitat

Access

- Public access: Opportunities for public parking, woods roads or trails
- Management Access: sufficient woods roads to support forest or field management

Agency land management challenges

- Condition of woods roads and stream crossings is often poor or in need of improvement.
- High demand to expand and maintain existing trails.
- Rogue trails are often created that are not well designed, or do not support department priorities (OHRVs, mountain bikes, hiking).
- Encroachments from abutters.
- Illicit use of properties (dumping, partying, camping, target shooting, etc.).
- Invasive exotic plants.

B. Core vs. Buffer Areas

Reserves must ensure that the site's boundary encompasses an adequate portion of the key land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation.

Boundary size will vary greatly depending on the nature of the ecosystem. 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 key land and water areas representing core and buffer zones.

Core designated areas must be vital to the functioning of the estuarine ecosystem and 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.

Buffer zones protect the core area and provide additional protection for estuarine-dependent species, including those that are rare or endangered. When determined appropriate by the state and approved by NOAA, the buffer zone may also include an area necessary for facilities required for research and interpretation. Additionally, buffer zones should be established to sufficiently accommodate a shift of the core area as a result of biological, ecological, or geomorphological change, which reasonably could be expected to occur.

The 1989 Management plan did not make any distinction between core and buffer areas, but the approved 2006 Management Plan did designate five parcels of land as core, and designated the entire Great Bay as core. The primary justification for including the land parcels listed below as core are that they represent different habitats and areas around Great Bay, and most of the parcels have very limited public access and therefore are likely to remain pristine.

Designated Core Areas

Great Bay

The Great Bay Estuary is often described as two joined areas; Great Bay and Little Bay. These two areas are separated by Furber Straight, a narrow area between Adams Point in Durham and the eastern shore of the Great Bay National Wildlife Refuge. The area south of Furber Straight (Great Bay) is designated as core within this management plan, delineated by a cable crossing just north of Furber Straight. The allowable uses within Great Bay are restricted, allowing for fewer competing uses and a more pristine area for natural systems to thrive.

Rollins

This 11-acre parcel on the northwestern shore of Little Bay has limited public access, and is an active eagle nesting site.

Solomon Property

This 92-acre property is the largest freshwater system in the Crommet Creek area on the western side of GBNERR. The 2015 Wildlife Action Plan identifies this area as representing the highest priority habitat in New Hampshire and in the biological region. It is located within the largest unfragmented block in the Seacoast and is likely to remain a pristine property representing a unique habitat.

Wilcox

Wilcox Point is the only winter eagle roost in Great Bay and is the only property in GBNERR that has specific Wildlife Management Area rules that prohibit foot traffic (to protect the roost). The 34.2-acre property is located on the western shore of Great Bay and is a forested shoreline.

Underwood/Marsh Island

Adjacent to other NHFG properties and isolated from any foot traffic, this 25.6-acre property near the mouth of the Winnicut River has salt marsh, scrub shrub, and forest habitat. It is ranked as highest priority habitat in the biological region in the 2015 Wildlife Action Plan and is also identified as a potential migration pathway for salt marsh.

Shackford Point

This 58.4-acre property is located on the southeastern shore of Great Bay, at the mouth of the Lamprey River. There is no foot access to the property and therefore is pristine. As with the Marsh Island property, the slope and location offer the potential for marsh migration in the future and this area is ranked as highest priority habitat for the biological region in the 2015 WAP.

C. Acquisition Target Area

Criteria

As with previous management plans, the key criteria that drive the GBNERR acquisition strategy include:

- protect water quality, critical habitat, and key species of concern;
- use a watershed perspective that is designed to maintain and enhance the integrity of the entire ecological system and connect pathways of water and wildlife;
- create opportunities for fishing, hunting, and public access appropriate to NHFG WMA rules;
- protect land that the Reserve and NHFG have the capacity to manage effectively; and
- enhance GBNERR education, public access, stewardship and research opportunities.

These criteria are evaluated in the context of the key coastal management stressors to Great Bay: land use changes and climate change. As the understanding of how these threats will impact water quality, habitat, and key species evolves over time, the way that knowledge is applied to land protection prioritization will similarly evolve. Emerging science about ecosystem services and how people in the Great Bay watershed value the bay may also influence aspects of the Reserve's land acquisition strategy; both in developing goals and in promoting those goals in a way that resonates across audiences.

Spatial areas of interest

The area of land acquisition interest for the Great Bay National Estuarine Research Reserve has evolved over time. The original GBNERR land acquisition target area was very small, and was expanded with the approved plan in 2006. This expansion was a reflection of the maturity of the program and the success of the Great Bay Resource Protection Partnership in securing funds to purchase land at a time when land was converting from family farms and forestry lots to residential development. The land acquisition target area in the 2006 plan reflected NHFG and partnership priorities at that time. Recent work to update the Wildlife Action Plan in 2015, conduct salt marsh migration modeling in 2015, and evaluate water resource values (TNC, 2018) have shifted the focus for this planning period. The expansion of interest at the river mouth areas reflects where marsh migration potential, flood storage, and wildlife habitat value is high. This plan also reflects NHFG focus areas in the region related to New England Cottontail habitat.

D. Acquisition strategy

Evaluating potential properties

When land protection opportunities arise in the seacoast area, the partners from the GBRPP share known information about the land owner and their interest. A desktop analysis of the property is done to determine if it is in an area that has been identified in the Coastal Land Protection Plan or in any of the more recent analysis that have been done in the region (Sea Level Affecting Marsh Migration, Wildlife Connectivity Study, Water Quality and Quantity Study, Wildlife Action Plan). Then, a field assessment site visit is scheduled with a team of people from the partnership with expertise in wildlife ecology, botany, and natural resource management to collect additional information about the parcel and to confirm the results of the desktop analysis and create a property assessment. A property assessment documents the ecological factors such as:

- Natural communities
- Wildlife habitat
- Rare and endangered species
- Recreational activities
- Invasive species
- Restoration goals

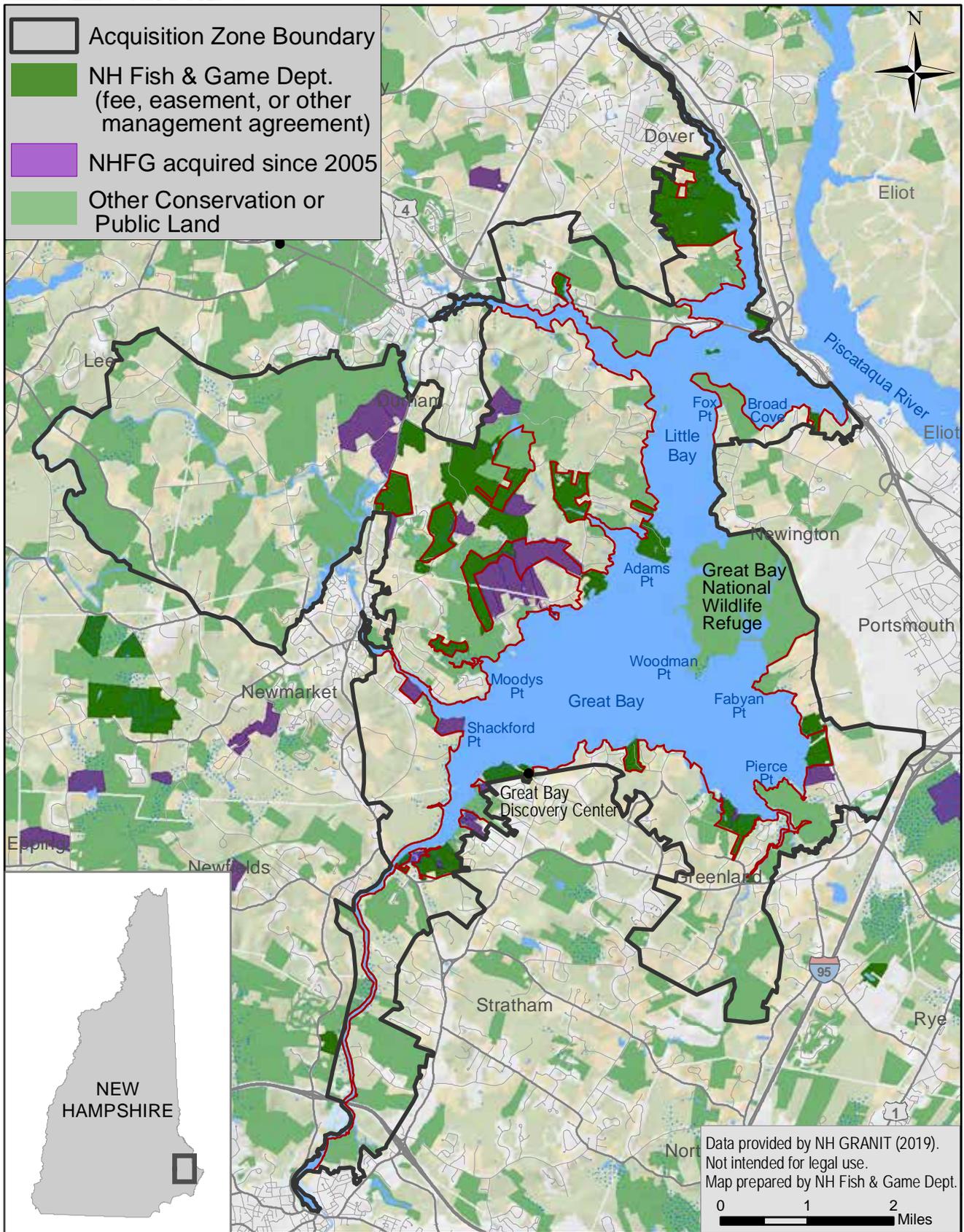


Figure 15: GBNERR 2020 Acquisition Zone.

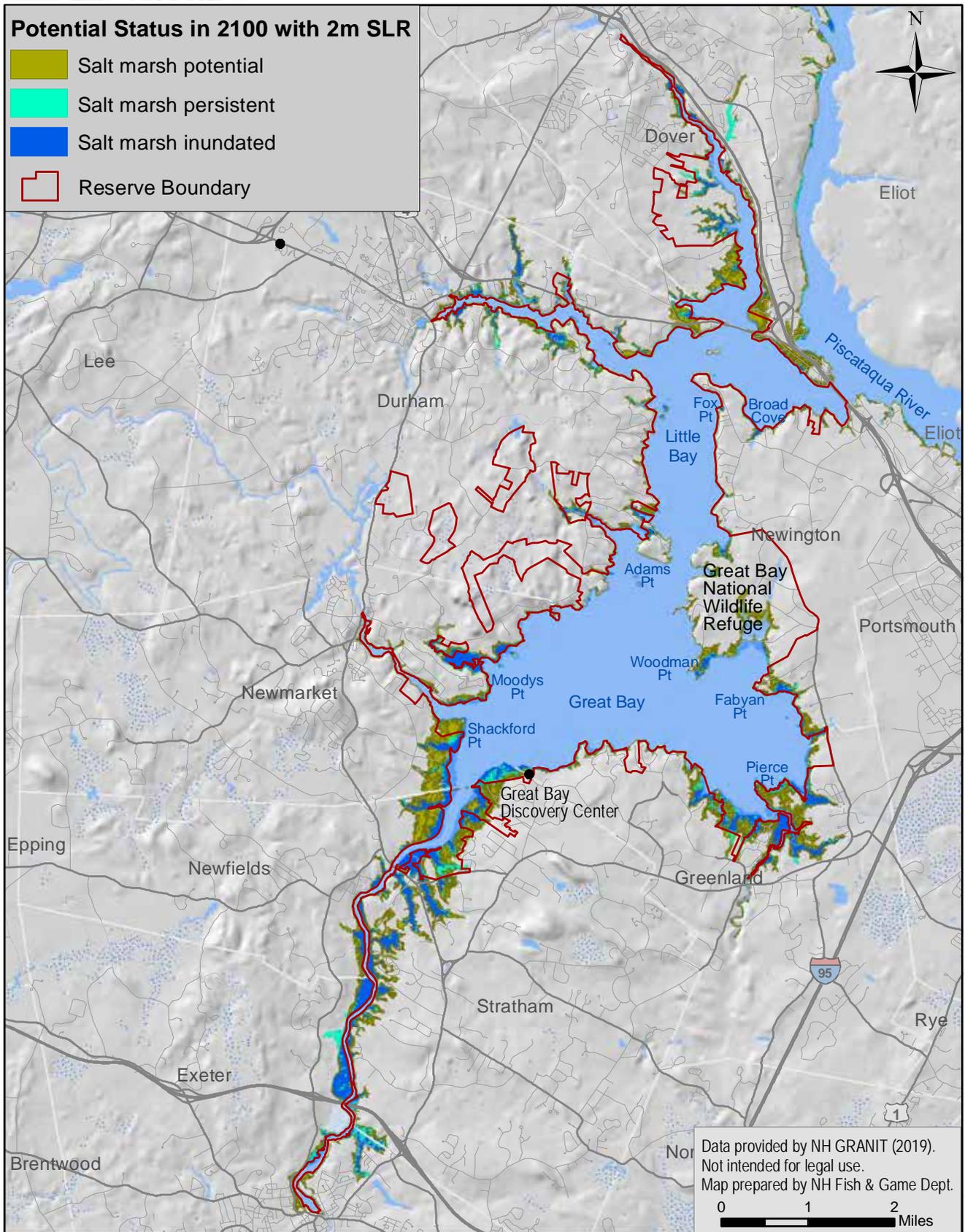


Figure 16: GBNERR 2019 Habitat Priority–Sea Level Affecting Marshes Model (SLAMM).

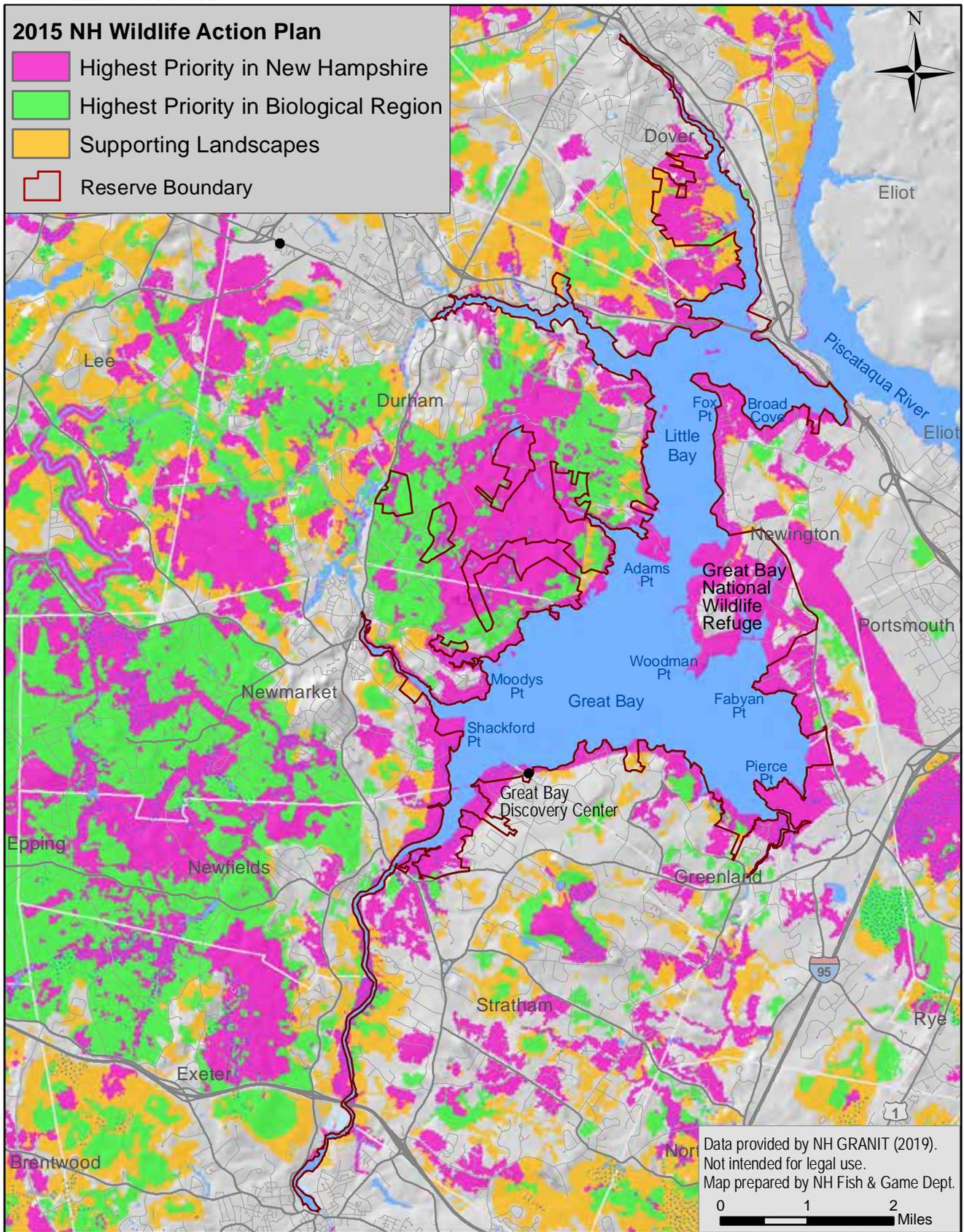


Figure 17: GBNERR 2017 Habitat Priority–Wildlife Action Plan (WAP).

Based on the preferences of the land owner, proximity to other protected land, and the characteristics and likely future uses, the partnership works together to brainstorm potential funding sources and determine which agencies or organizations are interested in ownership.

Land Protection Strategies

Fee Simple

NHFG prefers to hold property through fee ownership. Most of the conservation properties within the boundary are owned by NHFG. The Nature Conservancy holds or maintains deed restrictions on properties that were originally acquired through the Great Bay Resource Protection Partnership because they purchased the property and then transferred the properties to NHFG. Therefore, TNC monitors deed restrictions on the property and works with GBNERR and NHFG staff to remedy any problems that arise.

Conservation Easements

Land protection projects are expensive in coastal New Hampshire, and often deals are put together using multiple sources of funding. NHFG sometimes chooses to hold a conservation easement or deed restriction on properties where the habitat value is high and NFG involvement in the property can advance agency habitat goals. In these cases, NHFG can achieve its management interests for a reduced investment in a project. Ideally, the conservation easement or deed restriction will be done when a conservation partner is the owner. However, there are two properties within the GBNERR boundary that are privately held properties with NHFG conservation easements:

- 1. Wilcox Point**

A private parcel adjacent to the Wilcox Point WMA has a NHFG conservation easement to encourage a buffer area for the eagle nesting site on Wilcox Point.

- 2. Browne Center**

NHFG holds an easement with the University of New Hampshire and one other private land owner on parcels that abut a large block of publicly-owned land in the Crommet Creek area to encourage joint management of the forest and freshwater system.

Current Land Protection Efforts

Advancing science

The Great Bay National Estuarine Research Reserve has been working with partners to advance the use of emerging science and geospatial tools in land protection efforts in New Hampshire. In particular, GBNERR has led efforts to model marsh migration throughout the state and incorporate the findings into local and regional land protection efforts and climate resiliency plans.

Technical assistance

Field and desktop GIS assessments of potential projects are evaluated with other partners by the Stewardship Coordinator/wildlife ecologist. The Reserve also works with partners and other NHFG agency staff to prepare and review resource inventories and regional management plans for newly acquired properties.

Partnership and Lands Team

The Reserve works closely with the Great Bay Resource Protection Partnership and with the NHFG Lands Team to evaluate potential projects, discuss potential management strategies or challenges, and communicate about land protection priorities and implementation strategies.

Land transaction assistance

As a part of the Great Bay Resource Protection Partnership, the Reserve is also involved in reviewing and selecting projects for a regional land transaction grant program. This program is funded through a private foundation and manages a small competitive grant program for transaction costs for land protection projects in the Great Bay and Hampton-Seabrook watershed area.

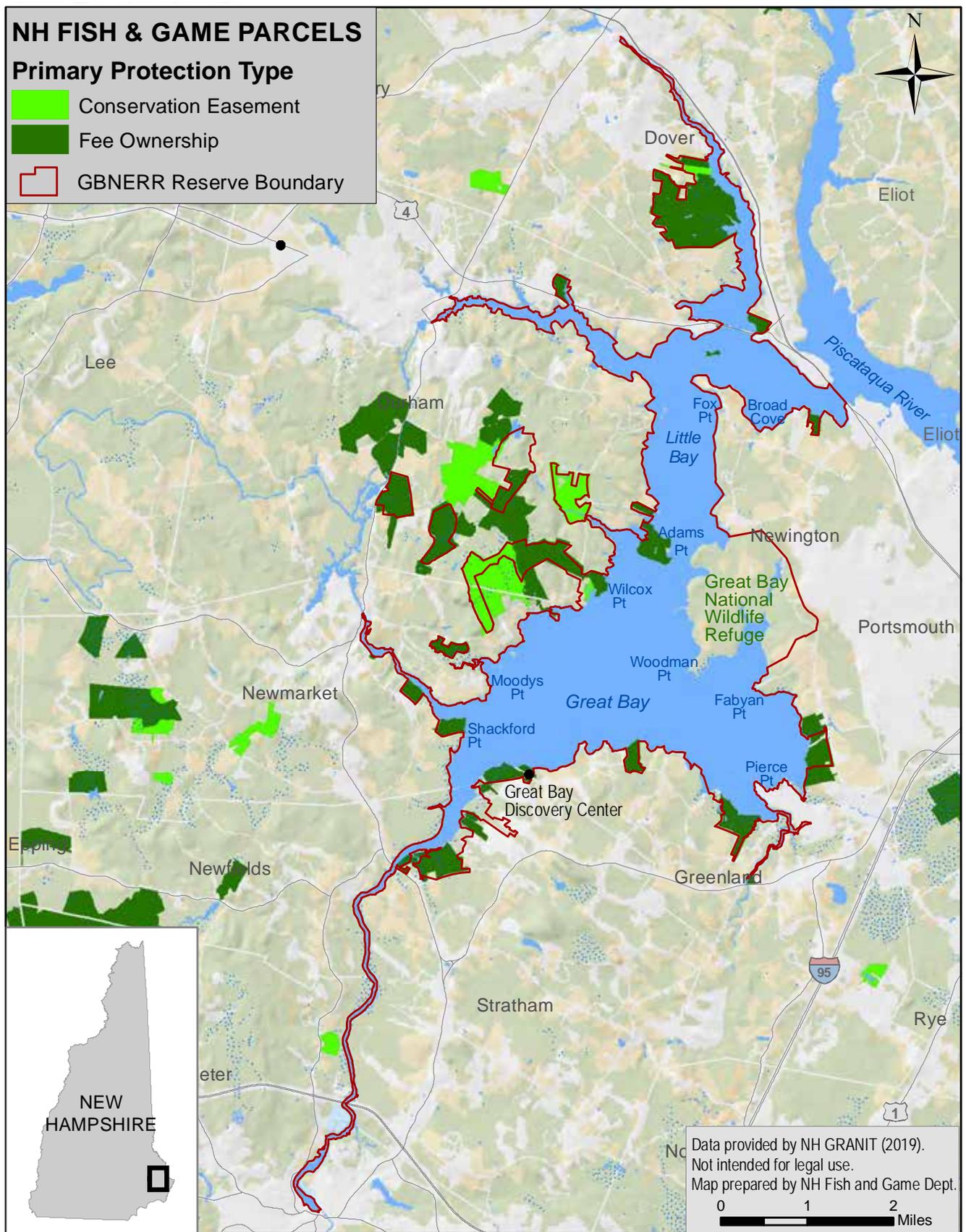


Figure 18: NHFG Parcels by Primary Protection Type.

Land Acquisition Plan

GOAL

Advance the protection of critical estuarine resources and associated uplands of the Great Bay Estuary.

OBJECTIVES:

- LA1:** Land protection partners have the science and tools needed to prioritize land protection efforts.
- LA2:** NHFG and Great Bay Resource Protection Partnership land protection priorities are implemented through GBNERR land protection efforts.
- LA3:** Land protection partners have the technical assistance needed to complete projects that advance the Great Bay Resource Protection Partnership goals.
- LA4:** Land protection partners in the Great Bay region explore creative funding sources and partners to implement priority projects.
- LA5:** Land conservation goals and land use planning efforts use shared science, messaging, and goals to advance ecosystem health.

STRATEGIES:

- Submit a boundary expansion request to NOAA that incorporates new parcels and carefully considers core and buffer areas.
- Work with land protection partners to create and share science that can inform land protection prioritization.
- Incorporate potential climate related species and habitat shifts into land protection prioritization and efforts.
- Share information about potential land protection projects with NHFG and Great Bay Resource Protection Partnership partners to evaluate the best strategy and ownership type for each project.
- Create and support messaging about the value of land protection in mitigating the threats to estuarine habitat and water quality.
- Evaluate potential projects within the GBNERR targeted acquisition area for habitat quality, resilience potential, programmatic value, and stewardship needs.
- Secure funding and implement projects that fall within the targeted acquisition area and are determined a good fit for the agency and for GBNERR.

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APPENDIX I
MOA between NHFG and NOAA

Memorandum of Understanding
Between the
National Oceanic and Atmospheric Administration and
The New Hampshire Fish and Game Department
Detailing the State-Federal Roles in the Management of the Great Bay Reserve

This Memorandum of Understanding (MOU) establishes the framework for the cooperative management of Great Bay Reserve in the State of New Hampshire, between the NH Fish and Game Department and the National Oceanic and Atmospheric Administration, Office for Coastal Management (NOAA). This agreement supersedes the previous agreement between NOAA and NH Fish and Game Department regarding Great Bay Reserve made in 2006.

I. AUTHORITY

The authority for this agreement is the Coastal Zone Management Act of 1972, as amended (CZMA, 16 U.S.C. §§ 1451-65, 1461), and its implementing regulations at 15 C.F.R. Parts 921, 923.

II. BACKGROUND

The State of New Hampshire has determined the waters and related coastal habitats of Great Bay Reserve provide unique opportunities for the study of natural and human processes to contribute to the science of estuarine ecosystem processes, enhance environmental education opportunities and public understanding of estuarine areas, and provide a stable environment for research through the long-term protection of reserve resources.

- A. The State of New Hampshire has determined that the resources of the Great Bay Reserve and the values they represent to the citizens of New Hampshire and the United States will benefit from the management of these resources as part of the National Estuarine Research Reserve System.
- B. The NH Fish and Game Department, as the agency designated by the Governor of New Hampshire, is responsible for maintaining, operating and managing the Great Bay Reserve in accordance with Section 315 of the CZMA, 16 U.S.C. § 1461, and acknowledges the value of state-federal cooperation for the long-term management and protection of the reserve in a manner consistent with the purpose of its designation.
- C. NOAA finds that the State of New Hampshire has satisfied the legal and procedural requirements for designation and, pursuant to its authority under Section 315 of the CZMA, 16 U.S.C. § 1461, and in accordance with implementing regulations at 15 C.F.R. Part 921, has designated the Great Bay Reserve.
- D. The Great Bay Reserve management plan approved by NOAA describes the goals, objectives, strategies/actions, administrative structure, and institutional arrangements for the reserve, including this agreement and others. In consideration of the mutual agreements herein, NOAA and NH Fish and Game Department agree to the following roles indicated in Section III of this agreement.

III. STATE-FEDERAL ROLES IN RESERVE MANAGEMENT

A. NH Fish and Game Department Role in Reserve Management

The NH Fish and Game Department shall:

1. be responsible for compliance with all federal laws and regulations, and ensure that the Great Bay Reserve 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 and regulations aimed at protecting the reserve;
3. ensure adequate, long-term protection and management of lands and waters included within the reserve boundary;
4. cooperate with NOAA to apply for and manage funds to support the reserve in accordance with federal and state laws, the reserve management plan, annual funding guidance from NOAA, and any other NOAA directives pertaining to 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, the 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 support 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; and
12. cooperate with NOAA regarding review of performance pursuant to Section 312 of the CZMA, 16 U.S.C. § 1458, 15 C.F.R. § 921.40, and ongoing management plan approvals.

B. Federal Role in Reserve Management

NOAA's Office for Coastal Management shall:

1. administer the provisions of the Sections 312 and 315 of the CZMA, 16 U.S.C. § 1458 and 16 U.S.C. § 1461, respectively, to ensure that the reserve operates in accordance with goals of the reserve system and the Great Bay Reserve management plan;

2. review and process applications for financial assistance from the NH Fish and Game Department, consistent with 15 C.F.R. Part 921, for management and operation of the reserve, and, as appropriate, land acquisition and facility construction;
3. advise NH Fish and Game Department 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; and
5. to the extent possible, facilitate the allocation of NOAA resources and capabilities in support of reserve goals and programs.

C. General Provisions

1. Nothing in this agreement shall obligate either party in the expenditure of funds, or for future payments of money. Each party bears its own costs to implement this agreement. NOAA may provide Federal funding in accordance with the CZMA and any requirements of the U.S. Department of Commerce through financial assistance awards that are separate from this agreement.
2. 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 this agreement that are determined to be inconsistent with such written directives or policies shall be invalid; but the remaining terms not affected by the inconsistency shall remain in full force and effect. In the event of the discovery of such inconsistency, and at the first opportunity for revision of this agreement, the parties shall seek to amend or terminate this agreement in accordance with the provisions of subsection V of this agreement.
2. Any disagreement on the interpretation of a provision, amendment, or other matter related to this agreement shall be resolved informally at the lowest operating level of each party's respective organization. If such disagreement cannot be resolved, then the area(s) of disagreement shall be stated in writing and presented to the other party for further consideration. If agreement is not reached within thirty (30) days of presentation, then the parties shall forward the written presentation of the disagreement to their respective higher official for appropriate resolution.

IV. PROGRAM EVALUATION

In accordance with section 312 of the CZMA, 16 U.S.C. § 1458, and 15 C.F.R. § 921.40, NOAA's Office for Coastal Management will schedule periodic evaluations of NH Fish and Game Department performance in meeting the terms of this agreement and the reserve management plan. Where findings of deficiency occur, NOAA may

initiate action in accordance with the interim sanctions or withdrawal of designation procedures established by the CZMA and applicable regulations at 15 C.F.R. Part 921, Subpart E.

V. 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 unilateral termination by either party. Termination of this agreement may provide grounds for NOAA (at its discretion) to withdraw designation of the reserve from the reserve system, pursuant to applicable provisions of the CZMA and its implementing regulations as described under 15 C.F.R. Parts 921 (Subpart E) and 923 (Subpart L). Section 315 of the CZMA, 16 U.S.C. § 1461, provides that NOAA may withdraw designation of a National Estuarine Research Reserve if: 1) NOAA finds that any of the criteria for establishing the reserve no longer exist; or 2) a substantial portion of the research conducted within the reserve fails to meet reserve system guidelines. In making any decision to withdraw designation, NOAA will take into consideration factors set forth in 15 C.F.R. § 921.40.
- D. If any clause, sentence, or other portion of this agreement shall become illegal, null, or void for any reason, the remaining portions of this MOU shall remain in full force and effect.
- E. No waiver of right by either party of any provision of this agreement shall be binding unless expressly confirmed in writing by the party giving the waiver.

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

Jeffrey L. Payne
Director
Office for Coastal Management
National Ocean Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Glenn Normandeau
Executive Director
NH Fish and Game Dept

Date

Date

APPENDIX II
Federal Consistency Determination



The State of New Hampshire
Department of Environmental Services



Robert R. Scott, Commissioner

May 26, 2020

Adrienne Harrison
Senior Coastal Management Specialist
National Oceanic & Atmospheric Administration
NOS, Office for Coastal Management
35 Colovos Road, Suite 148
Durham, NH 03824

RE: File No. 2020-05; 2020-2025 Great Bay National Estuarine Research Reserve Management Plan

Dear Ms. Harrison:

The New Hampshire Coastal Program has received the National Oceanic and Atmospheric Administration's federal consistency determination for the 2020-2025 Great Bay National Estuarine Research Reserve Management Plan, pursuant to Section 307(c)(1) of the Coastal Zone Management Act, 16 U.S.C. §1456(c)(1). After reviewing the Draft Management Plan, we find it to be consistent, to the maximum extent practicable, with the enforceable policies of New Hampshire's federally approved coastal management program.

Should you have any questions, please feel free to contact me at (603) 559-0025.

Sincerely,

Christian Williams
Program Coordinator
New Hampshire Coastal Program

cc: Cory Riley, GBNERR

www.des.nh.gov

222 International Drive, Suite 175 • Portsmouth, NH 03801
(603) 559-1500 • Fax: 559-1510 • TDD Access: Relay NH 1-800-735-2964

APPENDIX III
Public Involvement and Comments

Public Comment Process and Response

Development of the Great Bay National Estuarine Research Reserve (GBNERR) management plan occurred over 4 years and included direct input from all Reserve staff members, New Hampshire Fish and Game (NHFG), the New Hampshire Coastal Program, the Piscataqua Regional Estuaries Partnership, the Great Bay Stewards, as well as the National Oceanic and Atmospheric Administration's Office for Coastal Management. Reserve staff started conducting interviews with other NHFG divisions, the Great Bay Stewards and with other key external partners in 2015 to prepare for this plan. Staff conducted an initial SWOT analysis in 2015 and held 7 meetings between 2015-2019 to discuss opportunities, develop objectives, and create the integrated strategic plan. External partners were invited to review drafts of the plan in early 2018 and then again in 2019 during the public comment period.

NOAA's Office for Coastal Management reviews and approves the plan after ensuring sufficient opportunity for comment by the public, per 15 Code of Federal Regulations 921.33. NOAA published a notice announcing the availability of the draft plan for a 30-day public comment period in the Federal Register on March, 24 2020. The comment period ended on April 18, 2020.

Additionally, public notices were published local newspapers, on the GBNERR website and on social media. A press release was issued through the NHFG Department and the Foster Daily News newspaper announced the public comment period on January 31, 2020. A public meeting was held on February 24th at 6:00 PM at the Hugh Gregg Conservation Center at 91 Depot Road in Greenland, NH.

After the required 30-day public comment period, revisions to the document were made, where appropriate. Specific comments received on the plan are noted below in bold and are followed by a description of how the Great Bay NERR addressed the comment.

Comment 1: Can the Reserve post the 2007 plan alongside the new plan on your website to make it easier to review them side by side?

Reserve response: The 2007 plan was posted on the website on February 25, 2020 to address this comment. Once the 2020 Management Plan is approved, the 2007 and 2020 plan will be posted in the "About" section of www.greatbay.org.

Comment 2: Can you post the presentation from the public meeting on your website?

Reserve response: The presentation was posted at www.greatbay.org on February 25, 2020.

Comment 3: How have the goals and structure changed since the last plan?

Reserve response: The new plan follows revised guidelines provided by the National Oceanic and Atmospheric Administration. The chapters are organized to review the current context of the programs, describe the needs and opportunities that can be addressed over the next five years, and state the goals, objectives and strategies that the reserve will work toward during the timeframe of this plan.

Comment 4: The CTP objectives are different from the others. Why are they different and would it be better to have them structured consistently?

Reserve response: The Coastal Training Program objectives were written differently at the request of our federal partner, the National Oceanic and Atmospheric Administration. The national CTP program has worked for years to have very targeted and measurable program objectives. When NOAA reviewed an earlier draft of the plan, they suggested that the objectives in the CTP Chapter follow "SMART" objective guidelines (specific, measurable, realistic and time-bound).

After considering this comment, the Great Bay NERR staff decided that we prefer a more consistent approach to how objectives are written throughout the plan to make it more reader friendly and to use language that is easier for all readers to understand. GBNERR staff worked with the National Oceanic and Atmospheric Administration to include the detailed "SMART" objectives as "performance targets" and include the previous iteration of CTP objectives in the chapter.

APPENDIX IV
Federal Register Notice

DATES: The meeting will be held via webinar April 8, 2020, from 1:30 p.m. until 5 p.m. and April 9, 2020, from 8:30 a.m. until 12 p.m.

ADDRESSES:

Council address: South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, N Charleston, SC 29405.

FOR FURTHER INFORMATION CONTACT: Kim Iverson, Public Information Officer, SAFMC; phone: (843) 571-4366 or toll free (866) SAFMC-10; fax: (843) 769-4520; email: kim.iverson@safmc.net.

SUPPLEMENTARY INFORMATION: The following agenda items will be addressed by the SEP during the meeting:

1. Update on recent and developing Council actions;
2. Updates on the Council's Citizen Science Program and Fishstory pilot project;
3. Coastal Migratory Pelagics historical documents project update,
4. Southeast Fisheries Science Center technical memorandum on the economics of the commercial king and Spanish mackerel fishery;
5. Allocations for multi-use fisheries;
6. Best fishing practices outreach and persuasion;
7. MyFishCount recreational reporting project survey results and final report.

The SEP will provide guidance to staff and recommendations for SSC and Council consideration as necessary. The meeting is open to the public and webinar registration is required. Information regarding webinar registration will be posted to the Council's website at: <https://safmc.net/safmc-meetings/scientific-and-statistical-committee-meetings/> as it becomes available. The meeting agenda, briefing book materials, and online comment form will be posted to the Council's website two weeks prior to the meeting. Written comment on SEP agenda topics is to be distributed to the Panel through the Council office, similar to all other briefing materials. Written comment to be considered by the SEP shall be provided to the Council office no later than one week prior to an SEP meeting. For this meeting, the deadline for submission of written comment is 12 p.m., Monday, April 1, 2020.

Multiple opportunities for comment on agenda items will be provided during the SEP meeting. Open comment periods will be provided at the start of the meeting and near the conclusion. Those interested in providing comment should indicate such in the manner requested by the Chair, who will then recognize individuals to provide comment. Additional opportunities for

comment on specific agenda items will be provided, as each item is discussed, between initial presentations and SEP discussion. Those interested in providing comment should indicate such in the manner requested by the Chair, who will then recognize individuals to provide comment. All comments are part of the record of the meeting.

Special Accommodations

These meetings are physically accessible to people with disabilities. Requests for auxiliary aids should be directed to the Council office (see **ADDRESSES**) 3 days prior to the public hearings.

Note: The times and sequence specified in this agenda are subject to change.

Authority: 16 U.S.C. 1801 *et seq.*

Dated: March 19, 2020.

Tracey L. Thompson,

Acting Deputy Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. 2020-06157 Filed 3-23-20; 8:45 am]

BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Notice of Availability of a Draft Management Plan for the Great Bay National Estuarine Research Reserve

AGENCY: Office for Coastal Management, National Ocean Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

ACTION: Notice of availability; request for comments.

SUMMARY: The National Oceanic and Atmospheric Administration (NOAA) is soliciting comments from the public on a draft revised management plan for the Great Bay National Estuarine Research Reserve. The revision of the existing plan is necessitated by the applicable requirements of the National Estuarine Research Reserve System. The Great Bay National Estuarine Research Reserve revised plan is intended to replace the plan approved in 2007.

DATES: Comments must be received at the appropriate address (see **ADDRESSES**) on or before April 23, 2020.

ADDRESSES: Copies of the draft Management Plan can be downloaded or viewed on the internet at <https://www.greatbay.org/great-bay-draft-management-plan-public-comment-period>. The document is also available by sending a written request to the point

of contact identified below (see **FOR FURTHER INFORMATION**).

You may submit comments on this draft Management Plan by any of the following methods:

Electronic Submission: Submit all electronic public comments by email to Adrienne.Harrison@noaa.gov.

Mail: Submit written comments to Adrienne Harrison, Office for Coastal Management, 35 Colovos Rd., Suite 148, Durham, NH 03824.

Comments submitted by any other method or after the comment period may not be considered. All comments are a part of the public record and may be publicly accessible. Any personally identifiable information (e.g., name, address) submitted voluntarily by the sender may also be accessible. NOAA will accept anonymous comments.

FOR FURTHER INFORMATION CONTACT: Adrienne Harrison of NOAA's Office for Coastal Management, by email at Adrienne.Harrison@noaa.gov, phone at (603) 862-4272, or mail at: 35 Colovos Rd., Suite 148, Durham, NH 03824

SUPPLEMENTARY INFORMATION: Pursuant to 15 CFR 921.33(c), a state must revise its National Estuarine Research Reserve management plan at least every five years. The Great Bay National Estuarine Research Reserve revised plan will replace the previously-approved plan.

The revised management plan outlines a strategic plan; administrative structure; research and monitoring, education, stewardship, wetland science and training programs of the Great Bay National Estuarine Research Reserve; resource protection plan; restoration management plan; public access and visitor use plan; consideration for future land acquisition; and facility development to support operations and programming. This management plan articulates a five-year vision for GBNERR to continue to mature as a program, deliver science to inform coastal management, and raise awareness of estuaries and their connection to people using a place-based approach.

Since 2007, the Great Bay National Estuarine Research Reserve has implemented its core and system-wide programs; secured science, education, and conservation grants to serve Great Bay communities; made significant repairs and improvements to the Discovery Center campus including installing a pervious pavement parking lot, replacing the original boardwalk, and refurbishing staff offices in the Depot House and Discovery Center; updated exhibits in Discovery Center including designed and installed marine debris exhibits; and enhanced

waterfront access for kayak launching. There will be no boundary change with the approval of the revised management plan. The revised management plan will serve as the guiding document for the 10,235-acre Great Bay National Estuarine Research Reserve for the next five years.

NOAA's Office for Coastal Management will conduct an environmental analysis in accordance with the National Environmental Policy Act on the proposed approval of the Great Bay National Estuarine Research Reserve's revised management plan. The public is invited to provide comment or information about any potential environmental impacts of the proposed action, and these comments will be used to inform NOAA's decision on whether to approve the revised management plan.

(Authority: 16 U.S.C. 1461 *et seq.*)

Dated: March 19, 2020.

Keelin S. Kuipers,

Deputy Director, Office for Coastal Management, National Oceanic and Atmospheric Administration.

[FR Doc. 2020-06163 Filed 3-23-20; 8:45 am]

BILLING CODE 3510-08-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XW008]

Endangered and Threatened Species; Extension of Public Comment Period

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; extension of public comment period.

SUMMARY: NMFS hereby extends the comment period on the notice of initiation of 5-year reviews of 28 species of Pacific salmon and steelhead (*Oncorhynchus spp.*) listed under the Endangered Species Act of 1973, as amended (ESA).

DATES: Comments and new relevant information related to these 5-year reviews must be received by midnight on May 26, 2020.

ADDRESSES: You may submit information on this document, identified by NOAA-NMFS-2019-0097, by any of the following methods:

- **Electronic Submissions:** Submit all electronic public comments via the Federal e-Rulemaking Portal www.regulations.gov. To submit

comments via the e-Rulemaking Portal, first click the "submit a comment" icon, then enter NOAA-NMFS-2019-0097 in the keyword search. Locate the document you wish to comment on from the resulting list and click on the "Submit a Comment" icon to the right of that line.

- **Mail or Hand-Delivery:** Address comments to Robert Markle, NMFS, West Coast Region, 1201 NE Lloyd Blvd., Suite 1100, Portland, OR 97232.
- **Instructions:** Comments must be submitted by one of the above methods to ensure that we can receive, document, and consider them. Comments sent by any other method, sent to any other address or individual, or received after the end of the comment period may not be considered. All comments received are a part of the public record and will generally be posted for public viewing on www.regulations.gov without change. All personal identifying information (e.g., name, address, etc.) submitted voluntarily by the sender will be publicly accessible. Do not submit confidential business information, or otherwise sensitive or protected information. We request that all information be accompanied by: (1) Supporting documentation such as maps, bibliographic references, or reprints of pertinent publications; and (2) the submitter's name, address, and any association, institution, or business that the person represents. NMFS will accept anonymous comments (enter "N/A" in the required fields if you wish to remain anonymous).

Please note that submissions without supporting information—those merely stating support for or opposition to the action under consideration—will be noted but not used in making any listing determinations, as such comments do not represent actual scientific or commercial data.

FOR FURTHER INFORMATION CONTACT: Robert Markle at the above address, by phone at (503) 230-5419, or by email at robert.markle@noaa.gov.

SUPPLEMENTARY INFORMATION: On October 4, 2019, we announced the initiation of 5-year reviews for 28 listed species of Pacific salmon and steelhead; see 84 FR 53117 for a complete list of the species under review as well as the relevant statutory provisions, policies and information under consideration. The original comment period was set to close on March 27, 2020.

However, we are now extending the comment period by 60 days to provide additional opportunity for public input.

Authority: 16 U.S.C. 1531 *et seq.*

Dated: March 19, 2020.

Angela Somma,

Chief, Endangered Species Conservation Division, National Marine Fisheries Service.

[FR Doc. 2020-06149 Filed 3-23-20; 8:45 am]

BILLING CODE 3510-22-P

DEPARTMENT OF DEFENSE

Office of the Department of the Air Force

Notice of Intent To Prepare an Environmental Impact Statement for the B-21 Main Operating Base 1 (MOB 1) Beddown at Dyess Air Force Base, Texas or Ellsworth Air Force Base, South Dakota—Cancellation of Public Scoping Meetings

AGENCY: Department of the Air Force, DoD.

ACTION: Amended notice of intent.

SUMMARY: The United States Air Force (Air Force) is issuing this amended and updated notice from the original notice published on March 6, 2020 (**Federal Register**, Vol. 85, No. 45, 13148) to advise the public of its continuing intent to prepare an Environmental Impact Statement (EIS) for the B-21 Main Operating Base 1 (MOB 1) Beddown at Dyess Air Force Base (AFB), Texas or Ellsworth AFB, South Dakota. As a direct result of the National Emergency declared by the President on Friday, March 13, 2020, in response to the coronavirus (COVID-19) pandemic in the United States and the Center for Disease Control's recommendations for social distancing and avoiding large public gatherings, the Air Force is now canceling six public scoping meetings between March 31, 2020 and April 9. In lieu of the public scoping meetings, the Air Force will use the alternative means set forth below to inform the public and stakeholders and to obtain input for scoping the proposed action.

ADDRESSES: Additional scoping-related information on the B-21 MOB 1 Beddown EIS environmental impact analysis process can be found on the project website at www.B21EIS.com. The project website can also be used to submit comments. In the alternative, interested persons may submit written comments by mail or email. For those who do not have ready access to a computer or the internet, the scoping-related materials posted to the website will be made available upon request by mail or phone. Inquiries, requests for scoping-related materials, and comments by mail regarding the Air Force proposal should be directed to either the Dyess AFB Public Affairs,

APPENDIX V
Wildlife Management Area Rules

CHAPTER Fis 900 RULES FOR LANDS AND WATERS UNDER DEPARTMENT CONTROL
PART Fis 901 AREAS AFFECTED

Fis 901.01 Department Controlled Lands.

(a) The following wildlife management areas and other department controlled lands listed in Table 900.01 shall be subject to Fis 900:

Table 900.01 Department Controlled Lands

MANAGEMENT AREA	TOWN(S)
Adams Point WMA	Durham
Ammonoosuc Shorebank Access Land	Bethlehem
Androscoggin River WMA	Shelburne
Barden WMA	Richmond
Beaver Brook WMA	New Durham, Alton
Bellamy River WMA East	Dover
Bellamy River WMA West	Dover
Black Brook Station WMA	Sanbornton
Bofinger Conservation Area Land	Dummer
Brentwood State Game Farm WMA	Brentwood
Brown WMA	Pittsburg
Carpenters Marsh WMA	Hancock
Cascade Marsh WMA	Sutton
Cemetery Hill WMA	Sunapee
Chadwick Meadows Marsh WMA	Sutton
Chase Island WMA	Cornish
Church Hill WMA	Ashland
Clarada WMA	Ellsworth
Cocheco River WMA	Dover
Coldrain Pond WMA	New Durham
Connecticut Lakes Natural Area	Pittsburg, Clarksville
Connecticut River Shorebank Access Land	Chesterfield, Colebrook, Lebanon, Walpole
Conner Farm WMA	Exeter
Contoocook River No. Branch Shorebank Access Land	Antrim
Contoocook River Shorebank Access Land	Henniker, Hillsboro
Corey WMA	Deerfield
Cornish WMA	Cornish

Currier WMA	Kingston, East Kingston
Danbury Bog WMA	Danbury
Deer Hill WMA	Brentwood
Doles Marsh WMA	Deerfield
Dumpling Brook WMA	Merrimack
Ellis Hatch, Jr. WMA	Middleton, Brookfield, New Durham
Evas Marsh WMA	Hancock
Farrar Marsh WMA	Hillsboro
Forest Peters WMA	Northwood
Fort Hill WMA	Stratford
Gallop Marsh WMA	Unity, Lempster
Garland Pond WMA	Ossipee
Glen Lake & Greggs Falls Pisc. River WMA	Goffstown
Goodrich Marsh WMA	Epping
Goonan Road Shorebank Access Land	Manchester
Gordon WMA	Sunapee
Gray WMA	Pittsburg
Great Bay Discovery Center land	Greenland, Stratham
GBNERR WMA	Dover, Durham, Exeter, Greenland, Madbury, Newfields, Newmarket, Newington, Stratham
Great Bay WMA	Greenland
Great Bog WMA	Portsmouth
Great Island WMA	Walpole
Greenough Pond WMA	Wentworths Location and Errol
Hackett Hill WMA	Tamworth
Hampton Harbor WMA	Hampton
Hedgehog Brook WMA	Columbia
Henry Laramie WMA	Enfield, Grantham
Herbert L Webster WMA	Canaan
Hirst, Brockway Marsh WMA	Boscawen
Hoit Road Marsh WMA	Concord, Loudon
Horne Brook WMA	Berlin, Success
Hosmer WMA	Antrim
Hubbard WMA	Walpole
Kearsarge WMA	Andover

Kimball WMA	Webster
Kinson WMA	Marlow
Knights Meadow Marsh WMA	Webster
Kona WMA	Moultonboro
Lamontagne WMA	Deerfield
Lamprey River Shorebank Access Land	Newmarket
Lebanon WMA	Lebanon
Leonard WMA	Webster
Little Cohas Marsh WMA	Londonderry
Long Mountain WMA	Odell
Lower Shaker WMA	Enfield
Marks WMA	Alton
Mascoma River WMA	Canaan
McDaniels Marsh WMA	Springfield, Grafton
Merrimack River Shorebank Access Land	Concord, Litchfield
Merrymeeting Marsh WMA	Alton, New Durham
Milford Fish Hatchery Lands	Milford
Morrill Pond WMA	Canterbury
Mount Kelsey WMA	Millsfield, Ervings Location
Muchyedo Banks WMA	Canterbury
Muise Mountain WMA	Odell
New Hampton Fish Hatchery Lands	New Hampton
Owl Brook Hunter Education Center Lands	Holderness
Palazzi Island WMA	Campton
Pemigewasset River WMA	Campton, Thornton
Perkins Pond WMA	Weare
Peterson WMA	Dublin
Piscassic River WMA	Epping, Exeter, Newfields
Piscataquog WMA	Lyndeborough, Mont Vernon
Pleasant Lake Land	Deerfield
Powder Mill Fish Hatchery Lands	New Durham
Powder Mill Pond WMA	Greenfield
Powwow Pond Land	Kingston
Powwow River WMA	Kingston
Reeds WMA	Orford

Robert Durant Natural Area	Jefferson
Ryan WMA	Dublin
Saco River Shorebank Access Land	Bartlett
Saltmarsh WMA	Hampton, Seabrook, Hampton Falls
Sargent WMA	Newton
Sewall's Falls Multi-Use Recreation Area Land	Concord
Soucook River Shorebank Access	Concord
Souhegan River WMA	Greenville
Spaulding WMA	Charlestown
Stonehouse Pond WMA	Barrington
Thornton WMA	Thornton
Turtleton Pond WMA	Concord
Twin Mountain Fish Hatchery Lands	Carroll
Union Meadows WMA	Whitefield
Upper Ammonoosuc Rover WMA	Stark
Warren Fish Hatchery Lands	Warren
Webster Lake WMA	Franklin
Wendall Marsh WMA	Sunapee
White Pond Shorebank Access Land	Wilmot
Wilcox Point WMA	Durham
Wilder WMA	Lyme
Winnicut River Shorebank Access Land	Greenland
Woodman Marsh WMA	Northwood

PART Fis 902 USE OF DEPARTMENT CONTROLLED LANDS

Fis 902.01 Definitions.

- (a) "Off highway recreational vehicle" means "off highway recreational vehicle" as defined in RSA 215-A:1 VI.
- (b) "Snowmobile" means "snowmobile" as defined in RSA 215-C:1, XV.
- (c) "Vehicle" means any automobile, truck or motorcycle.

Fis 902.02 Standards Applicable to All Areas.

- (a) Subject to the specific restrictions set forth in Fis 903.01 to Fis 903.07, public use of all lands listed in Table 900.01 shall be subject to the following general standards and restrictions:
 - (1) The lands and waters shall be open to the public year round for the purpose of hunting, trapping, fishing, birding, and wildlife observation;
 - (2) The taking of wildlife shall be permitted on all such lands during the open seasons in accordance with the statutes and rules under Title 18 except as provided in Fis 903;
 - (3) Watercraft may be left overnight on lands listed in Table 900.1, provided that:
 - a. The watercraft shall be present only between April 1 and November 15; and
 - b. The watercraft shall be permanently identified by a current NH boat registration number or the owner's name and address affixed to the craft;
 - (4) All watercraft present on such lands after November 15 shall be subject to removal and disposal pursuant to RSA 471-C:14. In the event the value of the craft exceeds \$250.00, the matter shall be referred to the office of the attorney general seeking assistance to obtain appropriate legal relief against the apparent owner of the craft;
 - (5) No watercraft may be left overnight in any area that is a public boat access area as defined in RSA 233-A:1, IV, and controlled under Fis 1600;
 - (6) Decoys for the purpose of waterfowl hunting shall not be left unattended and shall be deployed so that the user maintains contact with unaided eyesight;
 - (7) No person shall consume or possess any open container of liquor or alcoholic beverage as defined by RSA 175:1 while hunting on WMAs;
 - (8) No person shall construct a permanent structure on such lands, including but not limited to a permanent tree stand, observation or hunting blind, rope swings, or diving platforms;
 - (9) Portable or temporary tree stands or observation or hunting blinds shall be erected only between August 1 and January 31 on such lands;
 - (10) All tree stands or observation or hunting blinds left after January 31 on such lands shall be subject to removal and disposal without further notice by the fish and game department;
 - (11) Except in accordance with Fis 904, no person shall discharge a firearm on such lands except while lawfully engaged in hunting or trapping activities;
 - (12) Paint ball and airsoft activities shall not be allowed on such lands;
 - (13) The use of OHRVs and snowmobiles shall be prohibited on such lands, except:
 - a. On frozen state-owned public waters as defined in RSA 271:20; and

- b. On trails approved by the executive director and the department of resources and economic development pursuant to RSA 215-A: 42;
- (14) Unless otherwise posted, the maximum speed limit on land shall be 45 miles per hour for a snowmobile and 35 miles per hour for an OHRV;
 - (15) Except when specifically permitted by the executive director or his designee, no person shall attach, affix or mount any commercial or private numerals, notice or advertisement of any description to a department kiosk, gate, tree, or any other part of such lands; and
 - (16) No person shall block or obstruct the pedestrian or vehicular ingress or egress access to any such land, other than:
 - a. A law enforcement officer; or
 - b. Department personnel, or their agents or contractors, while acting in performance of their duties of management, construction, or repair of such lands or public waters, or any improvements to such properties.
- (b) In the absence of a special use permit obtained in accordance with Fis 902.03, no person shall:
- (1) Stay on a department property overnight;
 - (2) Conduct an organized activity on the property involving 15 or more persons;
 - (3) Remove any naturally occurring material or vegetation from the site;
 - (4) Alter the existing condition of the site by adding or altering any structure or changing the flow of stormwater drainage; or
 - (5) Conduct or cause to be conducted any investigation, including the use of metal detection equipment, that could discover, yield, or alter a known or previously unrecorded historic resource, even if in receipt of a permit for such investigation issued in accordance with RSA 227-C:7.

Fis 902.03 Special Use Permits.

- (a) Unless expressly allowed under Fis 902.02, no use of department-controlled land shall begin prior to issuance of a special use permit by the executive director or his designee.
- (b) A special use permit shall be required for the following on all lands under department control, including public boat access areas under RSA 233-A:1, IV:
 - (1) Recreational activities including but not limited to:
 - a. Construction or maintenance of trails for any purpose, including OHRV and snowmobile trails;
 - b. Field trials as specified in Fis 814;
 - c. Camping;
 - d. Campfires;
 - e. Organized horseback riding events; and
 - f. Organized OHRV and snowmobile events on or over frozen waterbodies that require ingress and egress over department-controlled land;
 - (2) Non- recreational activities including but not limited to:
 - a. Removal or disturbance of natural resources including archeological digs, mineral digs, or prospecting;

- b. Agricultural activities;
 - c. Activities that involve or have potential for erosion or impacts on water quality;
 - d. Altering or removing vegetation, including the removal of dead and down material;
 - e. Wildlife scientific study if such study involves collection of individuals pursuant to a state or federal permit, regardless of the number of persons involved; and
 - f. Installation, use, maintenance, or storage of equipment on the site for any period longer than one day;
- (3) Any activity involving 15 or more people acting as a group;
- (4) Commercial activities consistent with the purpose or management of the property except for guiding associated with hunting, trapping and fishing; and
- (5) Operation of an OHRV to enable individuals with documented permanent mobility disabilities to access hunting, fishing, or trapping opportunities, subject to the following conditions:
- a. Permits shall be strictly limited as to dates and locations of use;
 - b. The locations where the OHRV may be used shall be limited pursuant to Fis 902.03 (f) to protect animals or plants at the site from damage, or to prevent harm to water quality from erosion or other impacts; and
 - c. Proof of vehicular insurance shall be required.
- (c) Persons seeking a special use permit shall submit a request in writing to the executive director including the following information:
- (1) The name of the affected WMA, public boat access area, or other department-controlled land and its location;
 - (2) A description of the proposed activity, with dates, time of day and duration of use;
 - (3) A detailed map(s) of the property, and local area showing the location of the proposed activity, which may be obtained from:
 - a. A WMA map located at the department website, www.wildlife.nh.us ;
 - b. A map created from the New Hampshire GRANIT Data Mapper located at the University of New Hampshire website, www.granit.unh.edu;
 - c. A map from the United States Geological Survey showing the area in question; or
 - d. A map prepared by a professional engineer, or licensed land surveyor;
 - (4) A description of the equipment needed for the proposed activity and the extent of its intended use;
 - (5) A plan or description for any road or trail work necessary for the proposed activity, including:
 - a. Proposed changes to water courses or drainage, such as culverts and stream crossings;
 - b. Whether any soils or stone will be either cut from the site or added to the site;
 - c. Whether any structures or signage are proposed to be erected and left at the site, to include trail signs, bridging, seating, or storage areas; and
 - d. Whether there will be removal of trees or vegetation, other than minor trimming that will not result in the destruction of the tree or other plant;
 - (6) An estimate of the number of people participating if the request is for an event, or seasonal use levels for a trail; and

- (7) The person's name, address, phone, fax, e-mail and the name and address of any organization that the person represents regarding the request.
- (d) The executive director, or his or her designee, shall review the request for completeness. If further information is needed to permit an evaluation of the request it shall be requested in writing within 14 days of receipt of the request.
- (e) A special use permit request shall not be further evaluated until sufficient information has been received to enable a finding that the request is complete.
- (f) The executive director shall, within 30 days of determining that the request is complete, grant a special use permit request, unless he or she finds that the proposed activity poses a risk of adverse impacts to:
 - (1) Federal or state listed endangered or threatened species as listed in Fis 1000 or species listed in the natural heritage bureau inventory database as determined by using the procedure found in Res 1105;
 - (2) Species of conservation concern or their habitats as identified by the department;
 - (3) Any fish, wildlife or their habitat at the location based upon input from department staff or reviews from state or federal agencies with jurisdiction over the location or use;
 - (4) Floodplains, wetlands, shorelands, or public waters of the United States;
 - (5) Known historic resources, as determined under RSA 227-C:1;
 - (6) Areas with unique geologic characteristics;
 - (7) Any of the above characteristics based upon cumulative environmental risks or degradation;
 - (8) Roads, trails, infrastructure or facilities; and
 - (9) Public health or safety, based upon concerns over traffic, vehicular parking, or the ability of the property to safely accommodate the estimated number of users at the specific location.
- (g) Specific limitations and conditions shall be placed upon a special use permit if required to:
 - (1) Protect identified fish, wildlife and habitat resources or environmental features;
 - (2) Protect infrastructure or facilities present at the site from damage or overuse;
 - (3) Protect the public health and safety of users and neighboring property owners prior to, during, and after the proposed activity; and
 - (4) Insure that the permitted activity will not interfere with, or be contrary to the purpose for which the land was acquired, developed or managed.
- (h) Upon request, the executive director shall approve a request to alter the date of a permitted event if:
 - (1) Intervening weather events including, but not limited to, a lack of snow, cause the condition of the property to be inappropriate for the approved use; and
 - (2) The property has not been permitted for a conflicting use on the requested date.

Fis 902.04 Dogs.

- (a) Dog training, in accordance with RSA 207:12-a, shall be prohibited from March 15 through July 15.
- (b) Dogs shall be under the control of their owners or custodians by leash, electronic collar or voice control at all times, except from March 15 through July 15 when all dogs shall be on a leash.

- (c) Dogs shall not be allowed in actively managed agricultural fields during the growing season.
- (d) Call back pens shall be used only during daylight hours. All pens shall be labeled with the owner's name and address

PART Fis 903 RULES APPLICABLE TO PARTICULAR WILDLIFE MANAGEMENT AREAS

Fis 903.01 Adams Point WMA.

- (a) Adams Point in Durham shall be subject to the following provisions:
 - (1) No parking shall be permitted on the entrance road; and
 - (2) The speed limit within the area shall be 20 mph.

Fis 903.05 Wilcox Point WMA. Wilcox Point WMA shall be closed to the public from December 1 through April 1.

PART Fis 905 MEMORIAL POLICY ON LANDS AND WATERS UNDER DEPARTMENT CONTROL

Fis 905.01 Memorial Policy Definitions.

- (a) "Memorial" means any statue, monument, sculpture, bench, tablet, memorial, plaque, or other structure or landscape feature, including a tree, garden or memorial grove, designed to perpetuate in a permanent manner the memory of a person, whether deceased or not, group, or event. The term "memorial" also includes the naming of structures or other features, including features within the interior of buildings.
- (b) "Commemorate" means the process of remembrance, or showing respect for someone or something by means of a ceremony, or by doing or building something in remembrance of a person or an event.

Fis 905.02 Memorials.

- (a) The installation of memorials or other commemorative items on land owned or controlled by the department, including public boat access areas shall be prohibited unless:
 - (1) The form, location, and materials used are approved in advance by the executive director; and
 - (2) The receipt of the commemorative items are approved by the governor and executive council when required by RSA 4, or the fish and game commission when required by RSA 206:33-a.
- (b) The donation of memorials or other commemorative items shall be submitted for approval to the fish and game commission per RSA 206:33-a, I if the value of the item(s) is no more than \$2,500.00.
- (c) The donation of memorials or other commemorative items shall be submitted for approval to the governor and executive council per RSA 4:8, I if the value of the item(s) exceeds \$2,500.00.
- (d) A special use permit shall be required for the scattering of human or animal ashes from cremation on land owned or controlled by the department, provided that no bones, teeth, or any other identifiable human remains may be so deposited.
- (e) A special use permit shall be required for any ceremony connected to the installation of a memorial that involves 15 or more persons, or that involves alteration of a department facility or alteration of the landscape of department property.
- (f) Memorials installed on department lands without the required authorizations shall be removed by the executive director or his designee, and disposed of pursuant to RSA 471-C:14. In the event the value of the memorial exceeds \$250.00, the matter shall be referred to the office of the attorney general seeking assistance to obtain appropriate legal relief against the apparent owner of the memorial.

Fis 905.03 Authorization for Memorials.

- (a) No memorial shall be authorized in honor of a person unless at least 2 years have elapsed since the death of the person to be commemorated.
- (b) The executive director shall authorize a memorial when:
 - (1) There is a compelling justification for the recognition; and
 - (2) The proposed memorial is consistent with the department's mission of conserving, managing and protecting fish, wildlife, and marine resources and habitats, informing and educating the public about these resources, and providing the public with opportunities to use and appreciate these resources.
- (c) A person seeking to install a memorial on property owned or controlled by the department shall submit a request in writing to the executive director, providing the following information:
 - (1) The name of the person making the request, together with address and contact information;
 - (2) A description of the proposed memorial, including size, material, and inscription;
 - (3) A plan showing the memorial's proposed location; and
 - (4) Justification for the memorial, including:
 - a. How the memorial is consistent with the department's mission;
 - b. The association between the land area or facility and the person, group, or event to be commemorated; and
 - c. How the memorial enhances the public's appreciation of the land, facility or natural resources.
- (f) The executive director shall apply the following factors in making the determination whether to authorize the installation of a memorial:
 - (1) The association of state-wide importance between the land area or facility and the person, group or event to be commemorated;
 - (2) Whether the location and design of the memorial avoids significant disturbance of natural features of the site;
 - (3) Whether the memorial will be constructed of materials suitable for, and consistent with the local environment;
 - (4) Whether the memorial will interfere with open space and existing public use; and
 - (5) Whether the memorial design is aesthetically appropriate to the site.
- (g) The person requesting the memorial shall be responsible for the cost of procuring and installing the memorial.

APPENDIX VI
NHFG Organizational Chart

NHFG Organizational Chart

