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Greenland Conservation and Land Stewardship Plan

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Prepared for the
Town of Greenland

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Acknowledgements

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- Ellen Snyder

Introduction

Purpose of the Plan

The New Hampshire Estuaries Project (NHEP) Technical Assistance Program provides financial assistance to communities for land conservation planning and protection, wetlands protection, and stormwater management in coastal New Hampshire. The Greenland Planning Board applied for and received support to develop stewardship plans for town-owned lands (see proposal in Appendix A). The Town is working on a Master Plan update, as well as considering the expenditure of a $2 million bond for land acquisition. This project enables the Town to assess existing town lands for natural resource values and stewardship needs and identify other areas within Town as conservation priorities. The information in this Plan can be inserted into the Master Plan as appropriate.

The NHEP awarded the contract to prepare the Stewardship Plans and Greenland Conservation Plan to Ellen Snyder, Ibis Wildlife Consulting, Newmarket, New Hampshire. This Plan has two parts:

- **Greenland Conservation Plan**
  This section reviews existing information about the Town of Greenland, including community conservation goals as described in the community profile report, master plan, open space plan, water resources plan and other documents. It highlights the unique and important natural resources and infrastructures in town. The Plan includes an assessment of existing town owned lands to determine their potential conservation values and evaluates opportunities to protect other important natural resources in town through new land conservation projects and other mechanisms.

- **Site-Specific Stewardship Plans**
  This section includes specific land management and stewardship recommendations for four town-owned parcels: Coastal Way (Morgan Ryan), Coakley Estate, Post Road (2 parcels), and Packer Bog (many parcels). Recommendations are also provided for several smaller town-owned properties.

Changing Land Use

New Hampshire is transforming from a largely rural state to a mostly urban and suburban one. This trend will continue at a rapid pace as the State is expected to grow by 358,000 people (or more than 28%) from 2000 to 2025. Most of this growth will occur in the four southeastern counties, with the Town of Greenland in the heart of this growth area. The major land use trends include loss of unfragmented forestland, lack of protection of lands around public water supplies and aquifers, loss of intact wetland ecosytems, and loss of high quality farmland. Rockingham County lost one-third of its productive farmland from 1997 to 2002 (SPNHF 2005).

According to the Greenland Open Space Plan, between 1953 and 1982, about 90 acres per year of farmland and forestland was converted to development. Commercial development has largely occurred along the town's major roads, including Route 33, Portsmouth Avenue, and Ocean Road. All of the Town's industrial development is located at the east end of Town along these major roads (RPC 1989). Several major developments have occurred recently or are in the planning process in Greenland. These include two large proposed projects: a new mall slated for Rt. 33 and the 79-lot Falls Way subdivision

proposed off Breakfast Hill Road. The 450-acre private Golf Course of New England was recently completed in the southwest corner of Greenland along the Winnicut River.

Impervious Surfaces

Impervious surfaces are areas covered by material that block water from filtering into the soil. Such surfaces include rooftops, paved sidewalks, roads, parking lots and driveways, and severely compacted soils. These hard surfaces alter natural water flow by increasing the volume and rate of stormwater runoff causing more flooding, higher flood peaks, lower water tables (less infiltration), more erosion and loss of streambank vegetation, more pollutants, nutrients, and sediments carried to waterways, and decline in water quality (NHEP 2004).

Studies show that stream ecosystems and water quality are degraded as impervious surfaces increase beyond 10% of the land within a watershed. Some sensitive species can be affected even if imperviousness is less than 10%, especially if this is near wetlands or other water bodies (NHEP 2004). Deacon et al. (2005) found that sites in southeastern New Hampshire with greater than 14% impervious surface in a watershed generally showed changes in stream water quality and habitat condition. In particularly, the researchers found that the % of urban land use in stream buffer areas was an effective indicator of stream quality. Sprawl-type development, such as commercial strip development with large parking lots and dispersed low-density residential development with long roadways and driveways, typically creates more impervious surface than compact development and redevelopment (Trowbridge 2003). Although the NH Estuaries Project is striving for all coastal communities to remain below 10% impervious surface, all communities are increasing in impervious surfaces. Greenland had 7% impervious surface in 1990 and 10% in 2000 (Justice and Rubin 2003).

The Economics of Open Space

Open space – forests, fields, wetlands, salt marshes, floodplains, river and lakeshores – are important to New Hampshire's economy. The land produces food and wood products that are further processed into other value-added products. Open space is also the basis for the State's recreation and tourism industry; it is one of the primary reasons that tourists visit New Hampshire. Second homebuyers often base their decision on the amount of or proximity to open space. Open space contributes economic benefits in other ways too. Businesses are attracted to places where quality of life (including open spaces) is high for the owners, employees, and potential customers. More open space often corresponds to less traffic congestion that results in fewer delays and lower transportation costs. An analysis by Resource Systems Group Inc showed that open space based economic activity contributed $8.2 billion per year to the New Hampshire economy in 1996-97 (Resource Systems Group, Inc. 1999).

Periodically the U.S. Fish and Wildlife Service (U.S. Department of the Interior) conducts a national survey of fishing, hunting, and other wildlife-associated recreation. The last survey in 2001, reported that 892,000 people (residents and non-residents) participated in at least one of these activities in New Hampshire. About 30% of these people hunted or fished in the State, and nearly 75% enjoyed other wildlife-dependent recreation such as bird watching. The people who participated in these activities spent over $600 million in the State on equipment, supplies, lodging, food, and related expenses (USFWS and US Census Bureau 2002).

In addition to the direct economic benefits seen in the agriculture, forestry, tourism, and recreation sectors, open space provides economic value in areas that are harder to measure, but likely no less significant. Open spaces provide many "ecosystem systems" such as purifying air and water, cycling nutrients, controlling floods. Without these natural services, we would need to engineer solutions that are typically much more costly (e.g., water treatment plants; flood control structures). Property values are

often higher for homes next to open space (Resource Systems Group, Inc. 1999). The Society for the Protection of New Hampshire set a goal of having every community conserve, with partners, at least 25% of its lands for a network of trails, parks, wetlands farms, and forests where people can connect with the natural world. They proposed this given the rapid pace of development and the importance of open space to our quality of life (SPNHF 2001)

Challenges and Opportunities

These land use trends and development pressures offer challenges and opportunities to guide future land conservation and development so as to protect drinking water supplies, restore and retain "ecosystem services" such as flood control, and provide and manage open space amenities in the Town of Greenland. Regulatory, non-regulatory, and volunteer measures are available to decision-makers and residents to protect and maintain water quality and other natural resource values. This plan focuses on the non-regulatory and voluntary measures.

New Information

Several new sources of information will be available in the next few months that Greenland decision-makers should consult. The New Hampshire Fish and Game Department recently completed a statewide Wildlife Action Plan. As part of this wildlife conservation plan, the Department is developing maps of critical habitats throughout the state that will be available in the next few months.

The Rockingham and Strafford Regional Planning Commissions and several conservation partners are completing a Land Conservation Plan for New Hampshire's Coastal Watersheds. This document with maps of important resources and strategies for protecting these resources will be a key resource for Greenland when it becomes available this summer.

Part I. Greenland Conservation Plan

Background – Town of Greenland

This section describes the Town of Greenland – population growth, roads and other infrastructure, drinking water sources, wastewater treatment, and prominent natural features including watersheds, wetlands, and other water bodies, and unfragmented lands. This provides a framework for understanding the conservation issues and options throughout the community as well as on specific town-owned parcels.

Demographics

The Town of Greenland is located in Rockingham County and encompasses 8,524 acres, of which approximately 1,666 acres is within Great Bay (RPC 2006, personal communication). Excluding the waters of Great Bay, Greenland covers about 6,858 acres and is bordered by the Towns of Stratham, North Hampton, Rye and the City of Portsmouth (Map 1) (RPC 1989). The December 2005 Town of Greenland Annual Report (Town of Greenland 2005) included the following summary of lands in Greenland:

Current Use	=	2,503 acres
Discretionary Easement	=	247 acres
Residential	=	2,088 acres
Commercial/Industrial	=	723 acres
Non-taxable	=	728 acres
Utility Lands	=	569 acres (estimated from balance of above)
TOTAL	=	6,858 acres

The population of Greenland as of the 2000 U.S. Census was 3,208. Greenland was incorporated as a Town in 1721 and by 1767 it was home to 805 residents, but by 1800 the population had dropped to 548 and fluctuated between that and 800 people for the next 150 years. Since 1960 the population has been steadily increasing each year (UNH Cooperative Extension 2006).

Roads and Other Infrastructure

The Town of Greenland is served by two major highways: Route 33 running east-west, and Route 151 (Post Road), that runs north-south from Route 33. Interstate 95 runs north-south through the eastern section of the Town, although there is no direct access within Greenland's borders. The New Hampshire Turnpike (I-95) opened in 1950 with four lands and expanded to eight lanes in 1973-74. Breakfast Hill Road is a major east-west connection from Rt. 151 to Rye. The volume of traffic has increased significantly in the last decade on these roads, particularly on Rt. 33. Greenland has one Class VI Road – Tide Mill Road, a ¼ mile dirt road from Rt. 33 to Great Bay (Town of Greenland 1999).

A Boston and Maine Railroad spur ("Portsmouth Branch") runs from Portsmouth through Greenland, carrying freight from Portsmouth to Newfields Junction. Another rail line that runs from Portsmouth to Foss Manufacturing in Hampton ("Main Line-East") passes through the southeast corner of Greenland.

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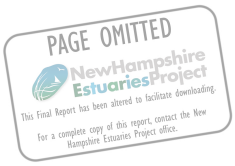

These freight lines don't have a regular schedule and run on average 1-2 times per week (NHDOT 2001, Kit Morgan, NH DOT, personal communication).

Peace Air Force Base (AFB) opened in 1954 and was decommissioned in 1991. Since then the Pease Development Authority has managed this area as the Pease International Tradeport and the U.S. Fish and Wildlife Service owns and manages over 1,000 acres of the former AFB as the Great Bay National Wildlife Refuge. Regional bus services operate out of a very busy and popular Portsmouth Transportation Center, also on part of the former AFB. Although these sites are not within the borders of Greenland, they are nearby and provide benefits to Greenland residents as well as contribute to traffic and development patterns.

Greenland has portions of five golf courses or driving ranges within its borders. The Portsmouth Country Club, Bramber Valley Golf Club, Breakfast Hill Golf Club and the Golf and Ski Warehouse Driving Range are all entirely within the town boundaries. Portions of the Pease Golf Course and The Golf Club of New England (a private course) are within Greenland. These lands are not permanently protected. However, the Town of Greenland holds a 99-year discretionary easement on the Portsmouth Country Club that is intended to keep it as open space for the life of the easement (Appendix B). The Golf Course of New England is required to have a conservation easement on a portion of its lands as mitigation for wetland impacts. It is anticipated that the easement will protect part of the Winnicut River corridor.

Water and Sewer

Greenland residents get their drinking water almost entirely from groundwater sources; about half have individual drilled or dug wells and the rest are on a public or private company well system. An 1899 Act passed by the New Hampshire General Court gave the City of Portsmouth the right to extend its water system into several neighboring towns including Greenland and to take or acquire lands as needed for this purpose. The City of Portsmouth dug a well in Greenland off Post Road near Haines Brook in 1942 and laid pipelines in 1943 to supply some of Portsmouth drinking water needs. The Town of Greenland and the City of Portsmouth signed an agreement on November 14, 1944 whereby Portsmouth extended the main about 2,000 feet along Portsmouth Avenue toward Stratham, providing water to the Greenland fire hydrants at no charge as well as supplying drinking water to Greenland residents and businesses along the line of the pipe that wish to connect to this water system as a fee service (Town of Greenland documents).

The Portsmouth Water Department estimated that 60% of the water from the Greenland Well goes to Greenland residents and facilities. The Well serves 485 Greenland customers in addition to other Portsmouth customers. Since the water in the Greenland Well goes into the Portsmouth water system, there are times (e.g., when the well needs to be serviced) when Greenland residents connected to this Well, receive water from other sources within the Portsmouth water system (e.g., Bellamy Reservoir, Madbury Wells) (Tom Cravens, City of Portsmouth Water Division, personal communication).

The Greenland Well has a 400-foot sanitary well radius, which prohibits buildings, parking, and other structures within this zone. The Well is accessed off Post Road via a dirt road owned by the City of Portsmouth; this road is open to use by Greenland residents to access the ball fields on town-owned lands behind the Well.

The Town has thus far required all development to provide adequate on-site water supply and sewer disposal, thus avoiding the need for a municipal water supply or wastewater treatment system. The Truck Stop at the corner of Rt. 33 and Ocean Road is hooked into the City of Portsmouth sewage system because of its size and the failure of the on-site system; everyone else is entirely served by on-site septic

systems. An evaluation of soil suitability for septic systems showed that many areas in Greenland have very low or low suitability for septic systems due to high water tables (RPC 1989, Map 3).

Groundwater Resources

Aquifers are concentrations of groundwater and those having medium to high potential to yield groundwater occur in the seacoast areas as alluvial deposits of sand and gravel ("unconsolidated") or in bedrock fractures ("consolidated"). The major source of recharge to these aquifers is through precipitation filtering directly down into the aquifer. The unconsolidated sand and gravel deposits are called "stratified drift aquifers" and typically yield more groundwater than bedrock fractures (RPC 1991).

Several studies, most recently a 1992 U.S. Geological Survey (Stekl and Flanagan 1992), identified four stratified drift aquifers within Greenland (Map 2). Three of these underlie a relatively small portion of Greenland and extend farther into Stratham, North Hampton, and Rye. Greenland's largest and most significant aquifer is located in the Town Center south of Rt. 33. Interstate 95, Rt 151 (Post Road), and Breakfast Hill Road all traverse portions of this aquifer. The Portsmouth well is located within this region of town. Wells located outside the aquifer areas are drilled into bedrock at depths ranging up to and over 400 feet.

Watersheds, Water Bodies, and Wetlands

A watershed is the geographic area of land that drains surface water to the lowest point, to a shared destination where a river or brook flows out. The network of rivers, streams, and other tributaries is collectively known as the drainage system of a watershed. Being familiar with the watersheds and their drainage systems within the Town of Greenland is critical to protecting drinking water quality because of the hydrological connection between these surfaces waters and groundwater. Also, these water bodies have their own important ecological, scenic, and recreational values.

Greenland has 18 rivers, streams, or brooks and 3 lakes or ponds (Table 1; from RPC 1991). Wetland soils are found on about 1,900 acres of Greenland or 25% of the Town's total land area. Many of these wetland areas are located adjacent to rivers and streams and include 150 acres of tidal wetlands.

Greenland is part of two regional watersheds: Great Bay and Coastal Watersheds. A small section of southeastern Greenland is in the Coastal Watershed. In this watershed, Berry's Brook flows north from Greenland into Rye and Portsmouth before draining into Little Harbor. Most of Greenland is within the Great Bay Watershed. Its drainage area covers portions of 12 towns and encompasses 7 major rivers including the Winnicut River in Greenland. Greenland's portion of the 117 square-mile Great Bay Watershed is 10.8 square miles. The Great Bay Estuary covers 5,696 acres at mean high tide and 2,688 acres at mean low tide. The high water surface area of the Bay within Greenland is about 1,800 acres. The Town has 5.8 miles of shoreline along Great Bay (RPC 1991).

Within Greenland, the Great Bay Watershed is divided into four sub-watersheds:

- Great Bay Sub-Watershed: Brackett Brook, Foss Brook, Shaw Brook, and two unnamed brooks drain directly into Great Bay.

- Winnicut River Sub-Watershed: Greenland's portion of this sub-watershed encompasses 2,388 acres. The Winnicut River flows northerly through Town to Great Bay and is fed by seven perennial tributaries: Barton Brook, Norton Brook, Marsh Brook, Winniconic Brook, Thompson Brook, and two unnamed streams. The 3-acre, naturally occurring Sandersons

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- Pond is located just west of Post Road. NH Fish and Game maintains a dam on the River just below Rt. 33.

  The Winnicut River is the only tributary river to the Great Bay estuary with only one dam. Given the lack of permitted point-source pollutant discharges within the watershed and the limited extent of development adjacent to most of the river, the Winnicut River is considered the most pristine of the tributary rivers to the Great Bay estuary (Woodlot Alternatives, Inc. 2004).

- Packer Brook Sub-watershed: Encompasses 1,524 acres in Greenland before it empties into the Winnicut River at the confluence with Great Bay. The Brook has one dam just below Portsmouth Avenue. Two perennial streams feed Packer Brook: Haines Brook and an unnamed stream. The subwatershed encompasses two ponds: the 2-acre naturally occurring Coombs Pond and a 15-acre pond created by gravel excavation by the State during the construction of I-95. The ecologically significant packer Bog also occurs within this sub-watershed.

- Pickering Brook Sub-Watershed: Greenland's portion of this sub-watershed is 325 acres.

Dams

Packer and Norton Brooks were dammed in 1930 and 1931, respectively to provide water for firefighting (UNH Cooperative Extension 2006).

Winnicut Dam

The New Hampshire of Fish and Game Department (NHFG) owns the Winnicut Dam, which is situated at the head-of-tide on the Winnicut River in Greenland. The current Winnicut Dam was constructed in 1957 at a location that had historically housed a dam since the mid-17th century. It is the only anthropogenic barrier to upstream fish movement along the main stem of the River and currently restricts fish movement within the Winnicut River, which in turn affects other ecological systems that are dependent upon the fish populations for dispersal within the ecosystem. Although a fish ladder was incorporated into the dam at the time of its construction in 1957, its design has proven to be inefficient in providing upstream passage for many fish species including alewife, blueback herring, rainbow smelt, and American eel. The Rt. 33 Bridge was rebuilt in 1959 filling in part of the Winnicut River and further constricting the stream channel (Woodlot Alternatives, Inc. 2004).

State and federal partners are completing the Winnicut Dam Removal Feasibility Study to evaluate options for the restoration of native fisheries and enhancing the overall function of the Winnicut River ecosystem. The management alternative preferred by the Study partners involves the removal of the Winnicut Dam and the construction of a fish passage under the Route 33 Bridge. This option would improve upstream and downstream fish passage and restore approximately 250 feet of the Winnicut River below the Rte 33 Bridge to riverine conditions. The restoration of the riverine habitat is particularly important to rainbow smelt populations in the Winnicut River, as this species is dependent upon riverine habitat for spawning and is not capable of ascending most types of fish passage systems (http://www.des.state.nh.us/coastal/restoration/winnicut.htm).

Table 1. Waterbodies within the Town of Greenland

Waterbody	Length/Size within Greenland	Watershed	Sub-Watershed
Brackett Brook	1.2 miles	Great Bay	Great Bay
Foss Brook	1.8 miles	Great Bay	Great Bay
Shaw Brook	1.2 miles	Great Bay	Great Bay
Unnamed	0.8 miles	Great Bay	Great Bay
Unnamed	0.5 miles	Great Bay	Great Bay
Winnicut River	4.0 miles	Great Bay	Winnicut
Barton Brook	0.3 miles	Great Bay	Winnicut
Norton Brook	1.0 miles	Great Bay	Winnicut
Marsh Brook	1.0 miles	Great Bay	Winnicut
Winniconic Brook	0.8 miles	Great Bay	Winnicut
Thompson Brook	2.0 miles	Great Bay	Winnicut
Unnamed	0.3 miles	Great Bay	Winnicut
Unnamed	0.7 miles	Great Bay	Winnicut
Sanderson's Pond	3 acres	Great Bay	Winnicut
Packer Brook	2.8 miles	Great Bay	Packer Brook
Unnamed	0.7 miles	Great Bay	Packer Brook
Haines Brook	0.8 miles	Great Bay	Packer Brook
Coombs Pond	2 acres	Great Bay	Packer Brook
Gravel Pit Pond	15 acres	Great Bay	Packer Brook
Pickering Brook	1.2 miles	Great Bay	Pickering Brook
Berry's Brook	0.8 miles	Coastal	Berry's Brook

The Great Bay Estuary

The Great Bay Estuary covers 17 square miles with nearly 150 miles of tidal shoreline. Great Bay is unusual because of its inland location, more than five miles up the Piscataqua River from the ocean. Many people harvest oysters, clams, and lobsters from these waters or fish for striped bass, bluefish, herring and smelt. Ducks, geese, and bald eagles spend the winter on the Bay's open waters. It is an estuary of national significance and home to several research sites including the Great Bay National Estuarine Research Reserve and the University of New Hampshire's Jackson Estuarine Laboratory (NHEP 2000).

Rivers flowing into Great Bay once supported substantial runs of anadromous fish (species that live in saltwater but spawn in freshwater), such as Atlantic salmon, American shad, and alewives and other river herring. Over-harvest, poor water quality, dams that restrict flow, and ditching and draining of salt marsh contributed to declines of many fish species. However, the tide has turned and conditions are improving, yet continued growth and development bring additional threats to water quality, wildlife habitat, and quality of life in Great Bay communities. Impervious surfaces (e.g., pavement, roofs, structures), shoreland development, and sprawl development send more sediment and pollutants into wetlands and waterways and eventually to the Bay (NHEP 2000).

Greenland encompasses 1,666 acres of Great Bay waters and nearly 6 miles of estuary shoreline. Not only is Great Bay an important natural resource for Greenland, future land use decisions by the town can help restore and maintain the many benefits derived from the Great Bay Estuary.

Access to Great Bay

Great Bay is popular for fishing, hunting, boating (kayaks, canoes, and motorboats), and wildlife watching. Public access to Great Bay is available at several locations, although not all sites allow for all types of access.

Within the Town of Greenland the following sites are open to public access:

- **Great Bay Discovery Center (end of Depot Road)**

The Discovery Center offers an extensive boardwalk into the salt marsh of Great Bay, an interpretive center, and a boat launch. The boat launch is a NH Fish and Game carry-in/car-top only launch for kayaks and canoes with access to water about 2 hours either side of high tide. At low tide there is a couple hundred yards of mud flats. There is parking at the boat launch for about 8-10 cars, although no boat trailers.

- **Great Bay Wildlife Management Area (off Bayside Road)**

This NHFG WMA has parking and a trail (foot travel) that takes you to a scenic vista of the Bay.

- **Leonard Weeks Conservation Area (off Tide Mill Road)**

The Leonard Weeks Descendents in American, Inc. own the 30-acre Weeks Conservation Area. The New Hampshire Land Conservation Investment Program (LCIP) acquired a conservation easement on the property in 1991 that protects the property from development in perpetuity. The Greenland Conservation Commission monitors the easement annually. Several nature trails open to the public traverse the property. Parking is located off Tide Mill Road.

- **Tide Mill Road access to the Winnicut River**

The Class VI Tide Mill Road runs from Rt. 33 to the tidal portion of the Winnicut River. This site is used to launch boats although there is limited turnaround and parking and the ground is quite soft. The road meets the River in an extensive area of salt marsh and is difficult to access other than at high tide. The Society for the Protection of New Hampshire Forests (SPNHF) holds a conservation easement on the private lands on either side of this Class VI Road.

Public boat access, including parking and ramps for boats on trailers, to Great Bay is also available at several locations in nearby towns:

- **Chapman's Landing, Stratham**
- **Newmarket Town Landing**
- **Adam's Point, Durham**
- **Hilton Park, Dover**

Unfragmented Habitat, Forests, and Farmland

Unfragmented blocks of habitat are large pieces of land with few or no roads, houses, or other development. In southeastern New Hampshire where development is more intensive, large unbroken areas in the hundreds of acres is significant. Unfragmented lands provide some of the most valuable wildlife habitat in the long-term. Larger areas typically encompass many habitat types, provide large contiguous areas for wide ranging animals, and maintain connectivity between wetlands and uplands (Kanter et al. 2001). These features offer many benefits to us as well. Intact, interconnected wetland systems (including associated uplands) absorb and filter water during floods, something that is becoming ever more critical as water shortages and extreme rain events (e.g., October 1996, May 2006) become more frequent.

Blocks of unfragmented lands also provide greater opportunities to preserve farming and forestry within the community. These undeveloped, but "working lands," provide economic benefits from harvesting of wood or farm products as well as "ecosystem services" through cleaner air and cooler temperatures. Greenland still has several large areas of unfragmented habitat. These include a portion of the Winnicut River watershed, Packer Bog, and the "Coastal Headwaters" in southeastern Greenland. Natural features define unfragmented lands so landowner or other political boundaries are not considered when determining unfragmented block size.

Town Interest in Open Space -- Natural Resource Conservation

Greenland residents have consistently supported the conservation of important natural resources within the community. This is reflected in the recent Community Profile event, the passage of the $2 million bond, visions and recommendations in the Master Plan, Open Space Plan and Water Resources Plan, expenditure of town funds for saltmarsh restoration, and the decisions by several landowners to protect their lands through conservation easements. These decisions and desires of community members are described in more detail below.

Community Profile

In February 2006, 140 Greenland residents participated in a Community Profile—a self-assessment of the Town facilitated by UNH Cooperative Extension. Participants identified many key themes with associated project ideas that they felt were the highest priority for success and impact to maintain and enhance the qualities of the Town. One of the six key areas was "Open Space Preservation." Identifying, protecting, and raising awareness about wetlands, forests, and other open spaces received the 4th highest votes in support of this action among all the ideas voted on at the conclusion of the Community Profile. Among the other conservation related ideas that emerged from the 2-day discussion included biking and walking trails, places to walk in the woods, better public access to Great Bay, and cluster housing (UNH Cooperative Extension 2006).

Open Space Bond

At the March 2004 Greenland Town meeting residents voted overwhelmingly in favor of a $2 million open space bond

ARTICLE 3 read as follows:

"To see if the Town will vote to raise and appropriate the sum of Two Million Dollars for the acquisition of conservation easements, open space land, and recreational land by the Town, all for the permanent protection of appropriate undeveloped land and recreational land in the Town of Greenland, and to authorize the issuance of bonds or notes in accordance with the Municipal Budget Act and to authorize the Selectmen to act on behalf of the town in connection with such acquisitions of conservation easements, open space land, and recreational land and to authorize the Selectmen to issue and regulate such bonds and notes and determine the rates of interest thereon. No more than ten percent of the proceeds of this Article shall be expended on land developed for non-passive recreational uses. All authority under this Article shall expire at the conclusion of five years from the date of passage hereof. Requires a 2/3 vote."

Passed by ballot vote Yes -177 No - 16

Town of Greenland Master Plan

Since Greenland's first Master Plan in 1971 and in subsequent updates (1986, 1988-89, 1999), town residents have expressed interest in preserving the rural character of the community and planning for open space and recreational areas. The 1988-89 Master Plan update included a goal to protect areas of environmental importance, including wetlands; this goal was re-affirmed in the 1999 update.

Several recommendations in the 1999 Master Plan that support open space planning and conservation included:

- Town road projects should be designed and constructed in a manner that minimizes impacts on water quality and sensitive environmental areas and considers aesthetics
- The Town, in conjunction with the City of Portsmouth, should consider the purchase of land or development rights for key parcels to protect future water supply and wellhead locations. This effort should be coordinated with general open space protection efforts
- Pursue the establishment of a publicly accessible hiking trail in Greenland by connecting, through easements and other agreements with landowners, a network of trails linking public conservation land and recreation land
- Develop an inventory of significant landscapes, vistas, and open spaces within Greenland updating the inventory on an annual basis
- Develop a land acquisition policy for the acquisition and/or protection of significant open space parcels in Greenland and actively seek local, state, and other funds to acquire open space parcels deemed important to town residents
- Work cooperatively with the Conservation Commission and the Board of Selectman to properly manage the Town's existing properties, including open space, conservation, and farmlands
- Consider zoning and other land use mechanisms that would aid in the preservation of existing farms and open space. Examples include cluster/open space zoning, purchase of development rights, conservation easements

The Town recently conducted a survey of Greenland residents as part of a Master Plan update that is currently underway (490 residents and business owners responded to the survey). Respondents chose the semi-rural atmosphere and location as the two most desirable features of the town. Although conservation of natural resources received fewer votes, the desirable features are, in part, a reflection of open spaces and other natural features of the town. In addition, answers to other survey questions point to strong

support for open space conservation. Nearly half the people answering the survey said that Greenland is growing too fast, many want walking and biking trails, and protecting the town's natural resources (e.g., wetlands, ground and surface water, and wildlife) ranked the highest in activities that the town should continue or improve. Residents want to see residential development controlled and industrial/commercial growth encouraged, particularly along Rt. 33 to ease the tax burden, although some expressed concern about the proposed Mall (Survey results compiled by Thane Harrison, January 2006).

Town Zoning Ordinance (March 9, 2004)

The Greenland Zoning Ordinance has several overlay districts that relate to protecting natural resource values. These include a Floodplain Management Overlay that is intended to maintain the flood carrying capacity of the surface waters of Greenland. The Aquifer Protection Overlay that seeks to protect, preserve, and maintain existing and future potential groundwater supplies and related groundwater recharge areas with the Town. The Wetland Conservation Area is intended to preserve natural wetlands. It prohibits structures or impermeable surfaces within 75' of tidal wetlands and 50' of inland wetlands.

Greenland Open Space and Recreation Plan (RPC 1989)

The Rockingham Planning Commission (RPC) wrote an Open Space and Recreation Plan for the Town of Greenland in 1989. The Plan included a general natural resource inventory, identified resource problems and opportunities, and offered resource protection strategies. The 1989 Plan specifically recommended shoreland protection for portions of Great Bay, Pickering Brook, Packer Brook, and the Winnicut River; further protection of Packer Bog; protection of the scenic views ("gateways to Greenland) along Rt. 33 (pasture/hayfields) and Newington Road (Great Bay); a conservation easement on the Portsmouth Country Club (completed); and acquisition of specific lands to provide recreational trails and linkages (See Appendix C for an excerpt from the 1989 OSP).

Greenland Water Resource Management and Protection Plan (RPC 1991)

One of the recommendations in the Water Resources Management Plan encouraged the Greenland Conservation Commission to work with owners of properties that contain critical water resources (i.e., wetlands, shorelands, aquifers) to protect these sensitive lands. Gifts, bequests, grants, and other sources of funds were mentioned as potential options for conserving these critical lands.

Saltmarsh Restoration

In the early to mid 1900s many of the salt marshes in New England were ditched in an attempt to control mosquitoes. Since mosquitoes breed in shallow standing waters that remain on the marsh surface between tide cycles it was thought that draining these permanent pools would prevent mosquito breeding. In the Pickering Brook salt marsh of Greenland a series of parallel ditches and a perimeter ditch were excavated sometime during the 1930s and 1940s (from Reilly 2005).

This practice actually had unintended and opposite results. The ditches held shallow water just long enough for mosquitoes to successfully breed, while prohibiting access to predatory fish. So, mosquito populations thrived. Before all the ditching, the soft-bottomed permanent marsh pools supported native fishes that preyed on mosquito larvae keeping mosquito populations in balance. Pools also provided many species of birds, fishes and invertebrates with foraging habitat. Ditching lowered the water table and reduced soil salinities, thus increasing the potential for the invasion of non-native plant species, such as *Phragmites* (common reed). Overall, ditching decreased habitat for native species, disrupted the normal

hydrologic functions of the salt marsh ecosystem, and likely increased mosquito populations (from Reilly 2005).

Salt marsh mosquitoes are still considered pests. And concern is high over mosquitoes as vectors of disease, such as West Nile Virus and Eastern Equine Encephalitis. Since 1979, the Town of Greenland has contracted with SWAMP, Inc. to use chemical control to reduce mosquito populations in surrounding salt marshes. During the last 20 years, over 5,000 pounds of larvicide was applied to the Pickering Brook salt marsh at a cost to Greenland taxpayers of well over $19,000. In 2000, SWAMP, Inc. urged the Town to consider restoring the salt marsh as an alternative to continued pesticide spraying. The Town contributed over $40,000 to restore 42 acres of salt marsh in Pickering Brook in collaboration with many other conservation partners. Restored marshes also provide recreational, wildlife, and water quality benefits to Greenland (from Reilly 2005).

Landowner Interest in Land Conservation

Several landowners in Greenland have worked with conservation organizations to protect their land. Examples include the Parker Tree Farm (conservation easement held by Rockingham County Conservation District), Rosamond Hughes properties (conservation easements held by SPNHF), and the Leonard Weeks parcel (Land Conservation Investment Program easement). The Packer Bog is mostly protected through The Nature Conservancy (TNC) and Town ownerships. The Great Bay Resource Protection Partnership (GBRRP) has worked with interested landowners to protect many parcels along Great Bay in Greenland and other communities.

Inventory of Natural Resources

Natural Resource Mapping

In 2002, the Greenland Conservation Commission (GCC) requested assistance from the Seacoast Land Trust (SLT) to complete a series of baseline natural resource maps and co-occurrence models for the Town. In 2003, the SLT contracted with the Society for the Protection of New Hampshire Forests to complete the maps, using a grant from the New Hampshire Estuaries Project. The major goals of the mapping project were to understand the natural resources in Town, to identify high priority areas for conservation, and to raise awareness among landowners and other residents of the value and importance in protecting these areas. Ultimately the goal was to work cooperatively with interested landowners and funders to protect the areas of high resource value (Truslow 2003)

The maps generated by SPNHF included:

- Aerial Photography Base Map
- Water Resources: wellhead protection zones, favorable gravel well areas, sand and gravel aquifers, known and potential groundwater contaminant sources
- Important Soils: prime farmland soils, soil development potential
- Resource Co-Occurrence: riparian and wetland 200’ buffer zones, National Wetland Inventory (NWI) wetlands, high value wildlife habitat, important soils, natural landcover, unfragmented block >500 acres or 250-500 acres, water resources features

Full-size color versions of these maps hang on the wall of the meeting room at the Greenland Town Hall. The maps are also available online at http://www.spnhf.org/research/recent-mapping-projects.asp.

Based on this mapping project, the areas in Greenland with the highest co-occurrence values were (Map 3):

- The Winnicut River Watershed south of Tuttle Lane to the North Hampton Town Line and between Rt 151 and the Stratham Town Line
- Great Bay north of the Boston & Maine Railroad

Other areas in Town with high co-occurrence values were (Map 3):

- The southeast corner of Greenland east of I-95 to the Rye border and extending from the North Hampton Town Line north across Breakfast Hill Road through Packer Bog to Haines and Packer Brooks.
- Northwest Greenland between the Stratham Town Line and the Boston & Maine Railroad encompassing Brackett Brook and other unnamed Great Bay tributaries

Co-occurrence is one measure, although a composite measure, of how a community can prioritize areas for conservation. This can be used in combination with other specific community conservation goals such as protecting drinking water sources or creating a corridor of conservation lands through town that support a recreational trail for walking.

Freshwater Wetland Mitigation Inventory

The Greenland Conservation Commission identified nine potential mitigation sites within Town for wetland consultants to evaluate for restoration and/or protection as part of a NH Estuaries Project funded program (Appendix D). Seven of the sites were evaluated in the field with five of those sites recommended for protection, ranging in size from 30 acres to the 340-acre central Winnicut River system. The wetland scientists identified a potential wetland creation site in an old borrow pit and a potential wetland restoration site adjacent to the Winnicut River (West Environmental and Carex Ecosystems 2003).

The key recommendations of the wetland mitigation inventory were to protect several important wetland systems in Greenland. These included:

- Winnicut River and associated wetlands and upland buffers from Rt. 33 south to the North Hampton Town Line encompassing the Winnicut River Headwaters including the Norton Brook tributary. Conservation of these areas would protect water quality, high value wetlands, and diverse upland buffer habitats
- Great Bay Tributary that would conserve over 100 acres of high value upland buffer including headwaters of an unnamed stream, rare or uncommon plants, and protect the water quality of Great Bay
- Thompson Brook, a tributary to the Winnicut River that flows through the Coastal Way conservation area that would protect wildlife habitat and water quality in a tributary stream

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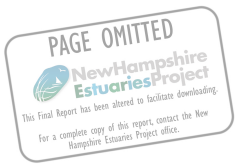

Additionally the wetland scientists recommended a restoration project off Winnicut Road to stabilize a small drainage between the road and the river to prevent water quality degradation from road runoff and sedimentation.

A 0.25-acre site of an old borrow pit next to the ball fields off Post Road was recommended for wetland creation that could provide a wetland for education and aesthetics.

Berry's Brook Headwaters
Although not included in the wetland mitigation inventory described above, the headwaters of Berry's Brook is located on the town-owned Coakley Estate parcel in the southeast corner of Greenland. Lands in and around the headwaters were heavily disturbed during the life of the Coakley landfill and associated sand and gravel operations. Disposal activities contaminated the landfill site as well as 40 acres of adjacent wetlands, reducing their value to migratory birds. In a bankruptcy settlement with the Responsible Parties, the U.S. Fish and Wildlife Service recovered $250,000 to compensate for injuries to natural resources. These funds were used to restore over 300 acres of degraded salt marshes in North Hampton (USFWS 2005).

Despite the disturbance (or in part, because of the disturbance) the town-owned Coakley Estate has unique and valuable wildlife habitat and other ecological features. Funding from mitigation or other sources may be available for restoration efforts in the Berry's Brook headwaters. For further discussion on this, see Part II, Coakley Estate Stewardship Plan.

Conservation Lands in Greenland

This section briefly explains the existing publicly and privately owned conservation lands that are protected from future development either through conservation easements or fee-simple ownership. The lands included here are ones that are conserved for the natural resource values such as wetlands, floodplains, salt marsh, unique ecosystem, riparian areas, wildlife habitats, forests, and hayfields. Recreation lands that support more active pursuits such as athletic fields and tennis courts are described in the next section.

Greenland has approximately 11.33% of its lands (~771 acres) conserved through a mix of town, private, and state conservation ownerships or easements (Map 4). Most of the town-owned parcels came to the Town through gifts or tax liens and are not presently permanently protected as open space. Table 2 is a listing of town-owned lands with conservation values based on an assessment by the consultant as part of the development of this Plan (see Part II for more detailed discussion of each parcel). According to the 2005 Town of Greenland Annual Report, 2,503 acres in Town are in current use (Town of Greenland 2005). This is down from 2,999 acres in current use in 2000 and 3,440 acres in current use in 1990 (RPC 2006, personal communication). Despite the penalty (current use change tax) to landowners for taking lands out of current use, this does not appear to be a deterrent or an effective tool for conserving open spaces long-term in Greenland. None of the current use change tax in Greenland goes into a Conservation Fund.

Table 2. Town-Owned Lands with Conservation Values

Name	Location	Acres	Date and Method of Acquisition	Access	Notes/Restrictions
Coastal Way	R10 Lot 29	49.8	2003: Donation as part of Coastal Way or Meaghan Way subdivisions?	End of Coastal Way subdivision Liberty Hill Campground Rd	Deed restriction--To be maintained in perpetuity as open space; Hiking, horseback riding, x-country skiing, fishing, bird watching allowed. No ATVs
Packer Bog	R8 Lot 1	6.9	1979: Tax Forfeit	No developed access	
	R8 Lot 4	2.3	1979: Tax Forfeit		
	R8 Lot 7	20	1979: Tax Forfeit		
	R8 Lot 8	4.1	1990: Gift by William S. Cohen		No restrictions
	R8 Lot 9	19	1979: Tax Forfeit		
	R8 Lot 10	17.2	1979: Tax Forfeit		
	R8 Lot 11	0.65	1979: Tax Forfeit		
	R8 Lot 12	24	1979: Tax Forfeit		
	R8 Lot 13	12.5	Tax Forfeit		
	R20 Lot 2	36.6	1979: Tax Forfeit		
Great Bay Salt Marsh	R15 Lot 5	4.9	1990: Gowen Family Gift	Bayside Rd; no developed access	Deed-- to remain a wildlife habitat, in memory of the father of the donor and former Greenland selectman Clarence E. Gowen; 2/3 vote needed to change
	R15 Lot 20	1.25	1979: Tax Forfeit	Bayside Rd; no developed access	Imbedded within Fish and Game ownership and a Nature Conservancy easement
	R15 Lot 21	4.5	1981: Brackett Family Gift	Bayside Rd; no developed access	Deed--to remain a wildlife habitat, in memory of John H. Brackett, grandfather of donor; 2/3 vote needed to change. Imbedded within Fish and Game ownership and a Nature Conservancy easement
	R15 Lot 22	3.7	1979: Tax Forfeit	Bayside Rd; no developed access	Imbedded within Fish and Game ownership
	R15 Lot 23	0.75	1979: Tax Forfeit		
	R18 Lot 3	1.14	1979: Tax Forfeit		
	R21 Lot 3	2.1	2003: Town purchase		No restrictions
Coakley Estate	R1 Lot 9B	58.3	1989: Tax forfeit	560 Breakfast Hill Rd: Town ROW off Breakfast Hill through Bethany Church parking lot	Abuts the Coakley Landfill superfund site; Potential restrictions on groundwater withdrawals; old gravel operations/heavily disturbed; Headwaters of Berry's Brook

Post Road/Park Avenue (Haines Brook)	U02 Lot 3	21.85	1988: purchased for potential future cemetery	145 Post Road	Portsmouth owns ROW to the well; Ballfields in front part; Gas pipeline, PSNH line, and I-95 traverse back/east portion of the property; Subject to 400-fo0t sanitary protective radius
	U02 Lot 3A	1.1	Received in 1988 as part of Lot 3 acquisition	145 Post Road	Borders Haines Brook and Greenland Well
	U03 Lot 8B	15	August 6, 2003 Purchased from John A. Chick, Jr. for $325,000	69 Park Ave; 50 foot right of way off Park Avenue	Haines Brook flows across parcel. Gas pipeline, PSNH line, and I-95 traverse back/east portion of the property. Subject to 400-foot sanitary protective radius
Fall/Valhalla Drive	R3 Lot 1	11	2001: Gift by Charles Fall	End of Valhalla Drive	Deed--to remain as a wildlife habitat for the enjoyment of the residents of the Town in memory of the late John and Florence Ireland of Greenland, parents of Jennie M. Fall. Includes a drainage easement (Plan D-13162); Abuts I-95; wetland
Moulton Avenue	U1 Lot 26	4.9	Lot line adjustment in 1990; Received in 1977 from Moulton et al.	30-foot right of way off Moulton Avenue near Lane Avenue	No restrictions
Holly Lane	U7 Lot 14	1.63	1990: Tax Forfeit	At the intersection of Grove Street and Holly Lane	Abuts SPNHF held easement on Hughes property; old borrow pit, wet
	U7 Lot 15	1.65	1990: Tax Forfeit		
Easements Held or Monitored by the Town of Greenland					
Leonard Weeks & Descendents in America, Inc.	R17 Lot 64	30.55	February 26, 1991 Land Conservation Investment Program Easement	Along Tide Mill Road	Open to public for hiking on nature trails. Parking area off Tide Mill Road

Portsmouth Country Club	R21 Lot 15 and R19	247	May 16, 1991; Amended July 30, 1992	80 Country Club Lane	PCC granted a 99-year discretionary easement to the Town of Greenland to maintain the property in its undeveloped, scenic, and open space condition. The public can walk, hike, sled, and x-country ski on the property only during periods of sufficient snow cover. In return for this easement, the Town agreed to classify the lands for purposed of current use tax assessment as open space.

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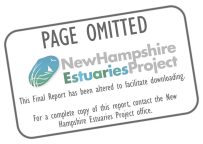

Table 3. State, Municipal, and Private Conservation Lands or Easements in Greenland.

Name	Easement Holder	Location	Acres	Notes
Fee Ownerships				
NH Fish and Game		R13 Lot 4A	<1	Great Bay Discovery Center
		R13 Lot 5	7.8	Great Bay Discovery Center
		R14 Lot 13	34	(Weeks) Great Bay WMA
		R15 Lot 19A	25.6	(Underwood)
		R17 Lot 23	<1	Great Bay
		R17 Lot 25	9.5	Great Bay WMA
		R17 Lot 58	<1	Winnicut Dam access
		R18 Lot 1	5.9	Winnicut Dam access
		R18 Lot 2	32.3	Great Bay WMA
		R22 Lot 1	38.76	(Smith)
		R22 Lot 3	11.56	(Emery)
		R22 Lot 3A	14.74	(Emery)
		R22 Lot 4	26.6	(White) Great Bay WMA
The Nature Conservancy		R8 Lot 18	51.75	(Coombs)
City of Portsmouth		R8 Lot 5	5.7	Part of Packer Bog
		R20 Lot 1	3.49	Part of Great Bog
		U2 Lot 2	24,787’	
Conservation Easements				
Parker Tree Farm	Rockingham County Conservation District	R6 Lot 8E	152	
Rosamond Hughes #1	Society for the Protection of NH Forests	R18 Lot 33 & 34	23	
Rosamond Hughes #2	Society for the Protection of NH Forests	R9 Lot 1	118.3	
Coombs	The Nature Conservancy	R7 Lot 11	28.3	Part of Packer Bog
Underwood Point	The Nature Conservancy	R15 Lot 19	32.76	Great Bay

Recreational Facilities

Although athletic fields, community parks, boat launches, and golf courses are not typically considered conservation lands (they are not permanently conserved these areas often serve multiple purposes and provide outdoor enjoyment. The list of public and private recreation facilities in Greenland is in Table 4.

Table 4. Public and Private Recreation Facilities in Greenland.

Name	Location	Size (Acres)	Features
Town-Owned Facilities			
Sunset Field	Behind the Town Offices off Portsmouth Ave.		Regulation-size baseball field Bleachers & lights
Caswell Park	Intersection of Caswell Drive and Bayside Rd.	2.5	2 tennis courts Regulation size baseball field with dug-outs Basketball court
Central Elementary School	Center of Town along Post Road	3.5	Playground
Ralston Park	Intersection of Rt. 33 and Riverside Drive	0.25	No facilities; abuts Winnicut River
Breakfast Hill Park	Southeastern tip of Greenland on the north side of Breakfast Hill Rd.	0.75	No facilities; picnicking; historical site
Town Landing	End of Tide Mill Rd.	50' ROW	No facilities; suitable only for launching untrailered boats
State-Owned Facilities			
Winnicut River Access	At the Winnicut River Dam, off Rt. 33	0.5	Unpaved boat access launch above the dam; parking for several vehicles
Great Bay Discovery Center	End of Deport Road	50	Interpretive educational center with trail/boardwalk; car-top boat launch
Privately-Owned Facilities			
Portsmouth Country Club	80 Country Club Lane	253	18-hole public course; 99-year discretionary lease held by the Town of Greenland
Bramber Valley Golf Club	75 Bramber Valley Drive	47	9-hole public course
Breakfast Hill Golf Club	339 Breakfast Hill Road	170	18-hole public course
Pease Golf Course	200 Grafton Drive, Portsmouth	11	3 nine-hole public golf course
The Golf Club of New England	167 Winnicut Road	450	18-hole course; Private Club
Golf and Ski Warehouse Driving Range	Rt 33 near the intersection of Tide Mill Road	16	Driving range
Camp Gundalow/ Portsmouth YMCA	End of Tuttle Lane	13	Children's summer camp; basketball court, swimming pool, play area, cabins
Piscataqua Fish & Game	End of Tuttle Lane	18	Clubhouse

Club			Target-shooting range
Emery's Landing	End of Emery Lane		Access for ice-fishing shanties
Nearby Facilities			
Stratham Hill Park	Large parking lot off Rt 33	108	Trails with fire tower on top for scenic views of Great Bay; picnic shelter

Conservation Focal Areas

The sources of information described above were used to identify six "focal areas" for conservation in the Town of Greenland (Map 5). These focal areas were selected based on their cumulative resource values and the magnitude of the benefits to the community that would be achieved by conserving lands within these focal areas. Implementing specific land protection projects within these focal areas requires collaboration with interested landowners as well as other conservation partners.

I. Great Bay Estuary

Great Bay is one of the most important natural resources within the Town of Greenland as described throughout the Plan. The Great Bay Estuary is a nationally and locally significant salt marsh ecosystem. A majority of the lands and tidal areas along Great Bay north of the railroad tracks in Greenland have the highest natural resource co-occurrence values as identified in the Natural Resource Inventory. Conservation of lands and wetlands within this focal area protects important economic, recreational, ecological, and aesthetic values for the Greenland community. The Winnicut River and Packer and Pickering Brooks flow into Great Bay near the Portsmouth Country Club and are worthy of additional protection to maintain water quality and a healthy ecosystem in Great Bay.

The Great Bay Resource Protection Partnership continues to actively protect lands in this focal area. Specific partners include The Nature Conservancy, NH Fish and Game, and the Great Bay Discovery Center/Great Bay Estuarine Research Reserve. The Portsmouth Country Club has significant frontage on Great Bay and as such it has high natural resource co-occurrence values. Building on existing conserved land, maintaining connectivity between lands, and protecting extensive upland buffers around wetlands, salt marsh, rivers and other water bodies are important conservation goals and are achievable in this focal area. Given the amount of land conservation that has occurred in this area to date, it appears that many landowners are interested in leaving a legacy of conservation. Further protection of the Great Bay Estuary is consistent with the 1989 Greenland Open Space Plan (RPC 1989).

Recommendation: The Great Bay Resource Protection Partnership will likely continue to take the lead in land conservation along Great Bay (north of the railroad tracks) as this group has funds dedicated to this goal. The Town of Greenland can assist by supporting these projects and providing landowner contacts as appropriate. In addition, the Town may take the lead on smaller parcels that the Partnership is not able to negotiate.

II. Winnicut River Watershed

The Winnicut River is the largest riverine system in Greenland and long with Great Bay has the highest natural resource co-occurrence values as identified in the Natural Resource Inventory. The river and associated watershed lands harbor significant floodplain, riparian, and wetland habitats. Portions of the Winnicut River watershed lie within one of the largest unfragmented areas (> 500 acres) remaining in Greenland, encompassing diverse wetlands and uplands. There are several large parcels already conserved in the watershed, so future land conservation could build on these conserved lands to maintain connectivity and preserve intact ecosystems. Conservation efforts along the Winnicut River will protect water quality, minimize erosion, and provide flood control as well as protect high value wildlife habitat and scenic values.

Potential partners in land conservation within the Winnicut River watershed include the Rockingham County Conservation District, Society for the Protection of NH Forests, and New Hampshire Fish and Game as they each own land or hold conservation easements in the watershed. The Golf Course of New England also owns a large parcel along the Winnicut River. Further protection of the Winnnicut River shoreline is consistent with the 1989 Greenland Open Space Plan (RPC 1989).

Recommendation: This is an important focal area for the Town of Greenland to consider, as the Winnicut River is a prominent and important natural resource for the community. Work with interested landowners and conservation partners (as funding sources) to build on existing conservation lands and protect critical water resources (floodplains, wetlands, shorelines).

III. Packer Bog

Packer Bog, identified by the New Hampshire Natural Heritage Bureau as part of the larger Portsmouth Cedar Swamp, supports an exemplary (excellent) example of an uncommon plant community—Atlantic white cedar-yellow birch/sweet pepperbush swamp. This unique bog ecosystem supports several rare plants and is the headwaters to Packer Brook that flows through Greenland and into Great Bay. This area has a high co-occurrence natural resource value and is in a large unfragmented block of habitat (250-500 acres).

The Town of Greenland received many parcels totaling over 140 acres through tax liens. In addition, the City of Portsmouth, Seacoast Land Trust, and The Nature Conservancy, working with interested landowners, have protected several other portions of Packer Bog. Further protection of the Packer Bog is consistent with the 1989 Greenland Open Space Plan (RPC 1989).

Recommendation: Packer Bog is worthy of further land conservation efforts to protect the integrity of the natural systems and the plants and animals that live there. Given the rare and uncommon biological diversity within the bog, the Town of Greenland should work with The Nature Conservancy to identify specific conservation strategies and opportunities to protect the bog.

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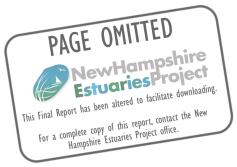

IV. Haines Brook-Packer Brook

Haines Brook starts in the heart of Greenland within the large stratified drift aquifer underlying the center of town and flows northeast before it joins up with Packer Brook. Both Brooks are important for protection of water quality in Great Bay as well as for drinking water for Greenland residents. Both Brooks have important and extensive emergent wetlands and associated riparian (shoreline) habitats that serve to protect water quality by minimizing erosion and reducing flood volumes and velocities. Haines Brook flows through the 400-foot sanitary well radius of the Greenland Well, a critical drinking water resource for Greenland residents.

The Town owns several parcels within the Haines Brook watershed as well as the in the headwaters of Packer Brook as described above under Packer Bog. There remains an opportunity for the Town to work with interested landowners to ensure further protection of these water resources. In addition, this area offers excellent educational opportunities as an outdoor laboratory given the proximity to the elementary school. Further protection of Packer Brook is consistent with the 1989 Greenland Open Space Plan (RPC 1989).

Recommendation: The Haines-Packer Brook watershed area offers excellent opportunities for the Town to pursue additional land conservation with interested landowners to protect drinking water resources as well as provide educational and recreational opportunities close to the center of town. Consider working with the City of Portsmouth on assistance with protecting the Greenland wellhead protection area.

V. Coastal Headwaters

The Coastal Headwaters encompasses the southeastern corner of Greenland, east of I-95 and mostly south of Breakfast Hill Road, and portions of Rye and North Hampton. It is so named because it supports the headwaters of several important tributaries including Little River, Berry's Brook, and Norton Brook. This is a large unfragmented block of habitat (>500 acres). The rivers and brooks harbor significant and extensive emergent wetlands and riparian habitat. Several uncommon turtle species (Blanding's and spotted) have been recorded in the coastal headwaters. A stratified drift aquifer underlies the area around the intersection of the Greenland, Rye and North Hampton town boundaries and a portion of the large aquifer underneath Greenland center extends into the Coastal Headwaters.

The Coakley Landfill and Coakley Estate (owned by the Town of Greenland) are within the Coastal Headwaters. This provides an opportunity to build on this "protected" land, restore degraded wetlands, and protect the extensive wetland system within a large unfragmented forested region. The area offers potential for developing educational and passive recreational trails.

Recommendation: The Coastal Headwaters is a critical area for additional land conservation because of the importance of protecting the stratified drift aquifers as drinking water sources, restoring and maintaining the extensive wetlands within the headwaters of three tributaries, and the opportunity for education and recreation. The Town could work with interested landowners and several potential partners including the Towns of North Hampton and Rye, and the City of Portsmouth (representing the landfill Coakley Group), in additional to potential funding sources listed in Appendix D.

VI. Brackett Brook – NH Technical College Corridor

Most of the high natural resource values and conservation potential in Greenland lies in the eastern and southeastern portions of the community and along Great Bay. However, other rivers, wetlands, farmlands, and other natural resources in other portions of Greenland are also valuable. One are that offers an opportunity for maintaining a relatively large block of habitat and protecting wetlands and riparian habitat is the Brackett Brook watershed in the western corner of Greenland. The headwaters of Brackett Brook are behind the New Hampshire Technical College in Stratham before flowing into Greenland and eventually to Great Bay. This could provide some connectivity from Statham Hill Park to lands conserved along Great Bay.

Recommendation: Consider meeting with the Town of Stratham, New Hampshire Technical College, and the Great Bay Resource Protection about the feasibility of conserving the Brackett Brook watershed.

Open Space Recommendations

A. Land Conservation Criteria

Greenland residents have expressed support for conserving undeveloped lands that have significant value to the community (e.g., $2 million bond, Community Profile, Master Plan). This Conservation Plan summarized these values and identifies 6 focal areas in town worthy of conservation consideration. Funding and landowner interest will greatly influence the location and extent of specific land conservation projects. Since there are typically more lands to be conserved than financial resources available it is important for the community to establish criteria for prioritizing land conservation efforts. This can help guide the expenditure of the $2 million bond and other funds.

These criteria could include:

- Land that protects water quality – groundwater and surface water (aquifers, rivers, floodplains, salt marsh, freshwater wetlands, associated uplands)
- Land that add to contiguous areas of already conserved land or other undeveloped land (maintaining large unfragmented blocks)
- Land that provides connectivity between conserved land or maintains wildlife corridors
- Land that provides opportunity for recreational walking trails, including connectivity through town where feasible
- Land that protects scenic landscapes

The community may refine or add to these criteria. Other criteria may include protection of working farms or forest, rare plant communities, or important wildlife habitat.

B. Funding Land Conservation

Greenland is fortunate to have several land conservation partners (e.g., NH Fish and Game, The Nature Conservancy) as well as landowners who've been willing to conserve their land. Land conservation is becoming more expensive as land values increase, so these partnerships are becoming even more important. Greenland has several opportunities to leverage the $2 million bond for land conservation. This is important since there are many areas worthy of protection and by leveraging the bond Greenland residents are more likely to support future bonds or appropriations for land conservation. For more on the benefits of open space to communities, local funding tools, and how to accomplish projects see *Saving Special Places: Community Funding for Land Conservation* (Hart and Taylor 2002).

Current Use Change Tax

One funding tool that is used by many New Hampshire communities including Greenland's neighbor is allocating a portion of the Current Use Change Tax to a Conservation Fund. Below is a summary of the amount that surrounding towns allocated to their conservation fund through warrant article (from New Hampshire Association of Conservation Commissions website: www.nhacc.org):

Town	**% Current Use Change Tax Placed in Conservation Fund**
Durham	100% since 2001
Newington	100% since 2001
Newmarket	50% since 1989
North Hampton	100% since 1990
Portsmouth	100% since 1995
Rye	50% since 1996 ($10,000 cap per property)
Stratham	100% since 2000

Donations, Bargain Sales, and Other Landowner Options

Some landowners are able and interested in the outright donation of open space lands. Greenland has received such gifts in the past. Often these donations or partial donations benefit the landowner through some reduction in federal taxes. Landowners can donate lands in several ways:

- Fee simple donation of an entire parcel
- Fee simple donation with a life estate
- Fee simple donation by bequest
- Donation of a conservation easement
- Bargain sale: fee simple or easement at less than appraised value

There are variations on these options, all are unique to each landowner, and require landowner's to consult with their attorney. For more information on these conservation options refer to Conserving Your Land by Brenda Lind (2004) or contact UNH Cooperative Extension, Land and Water Conservation Program (603-679-5616).

Grants and Other Partnerships

Grants are available from a variety of federal and state sources, although the funds available in any given year fluctuate depending on legislative priorities. Some of the key grants programs are listed below. Contact information for each of these programs and partners is in Appendix E.

Federal Grants:

- Farmland Protection Program: land acquisition
- North American Waterfowl Conservation Act (NAWCA) Small Grants Program: land acquisition
- Land and Water Conservation Fund: land acquisition
- Coastal and Estuarine Land Conservation Program (CELCP): land acquisition
- USDA Natural Resource Conservation Service Wildlife Habitat Incentive Program (WHIP): habitat management projects, wetland restorations
- U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program: wetland restoration

State Grants

- Land and Community Heritage Investment Program (LCHIP): land acquisition
- NH Department of Environmental Services Drinking Water Source Protection Program: land acquisition
- Center for Land Conservation Assistance: land transaction costs
- New Hampshire Fish and Game Landowner Incentive Program: easement acquisition
- New Hampshire Fish and Game Small Grants Program: habitat management projects
- New Hampshire State Conservation Committee: moose plate grants for site specific projects

Mitigation

The New Hampshire Department of Environmental Services (NH DES) rules require that development projects be designed to *avoid* and *minimize* impacts to wetlands. The impacts that are proposed must be only those that are unavoidable. It is the responsibility of the applicant to document these considerations in the application for a permit and to work with NH DES to develop a mitigation proposal to compensate for the loss of wetland functions and values (see Appendix F).

The definition of *"compensatory mitigation"* from NH DES means *"creation of a new wetland, restoration of a wetland, or preservation of land to offset the impact of a project by replacing or partially replacing wetlands functions and values lost due to the project, or by substituting the value added to a wetland or wetland system for the functions or values lost."*

The compensatory mitigation site location is to be located in the same watershed as the impacted wetlands when available and practicable. Although it is the responsibility of the applicant/developer to find the appropriate mitigation sites, the Town would benefit from having potential restoration or land conservation sites prioritized before projects are proposed.

The Packard Development, LLC proposed mall has a mitigation proposal to restore and protect wetlands and associated uplands in the Great Bog in Portsmouth. Eleven sites in Greenland were evaluated as potential mitigation sites for this project but were not selected based on various reasons. The Town of Greenland should develop a list of priority land conservation projects that could be used in the future as mitigation sites.

C. Open Space Subdivisions and Other Regulatory Tools

The Rockingham Planning Commission provides guidance to the Town of Greenland on land use planning issues and ideas. Greenland has incorporated language in its zoning ordinances that provides some protection for important natural resources. The community may want to consider additional measures such as incentives for open space/cluster subdivisions that retain a large portion as open space particularly in sensitive areas, greater wetland setbacks and buffers, steps that reduce or minimize the amount of impervious surfaces. For example, the New Hampshire Estuaries Project has information on reducing impervious surfaces to protect water quality (see Appendix G) and the Rockingham Planning Commission prepared a report for the Town of Greenland on limiting impervious surface cover (RPC 2004).

D. Education

The community has opportunities to promote conservation through education. One approach is to promote the existing conservation lands in Greenland through brochures, signs, and the town website. This will raise awareness about the town's conservation efforts, and as people use these open spaces, they'll value and appreciate these areas more. This should lead to greater support for future land conservation initiatives and a greater awareness of the need to care for these lands. Local schools in particular can take advantage of the diversity of habitats on conservation lands in Greenland where students can learn about nature in their backyard and develop a greater sense of place.

Part II. Greenland Conservation and Land Stewardship Plan

Site Specific Stewardship Plans for Town of Greenland Properties

A. Coastal Way Conservation Area

B. Coakley Estate

C. Post Road-Haines Brook

D. Packer Bog

Recommendations on Other Town-Owned Lands

- **Great Bay Estuary**
- **Grove Street-Holly Lane Lots**
- **Valhalla Drive – Fall Family Gift**
- **Moulton Avenue**

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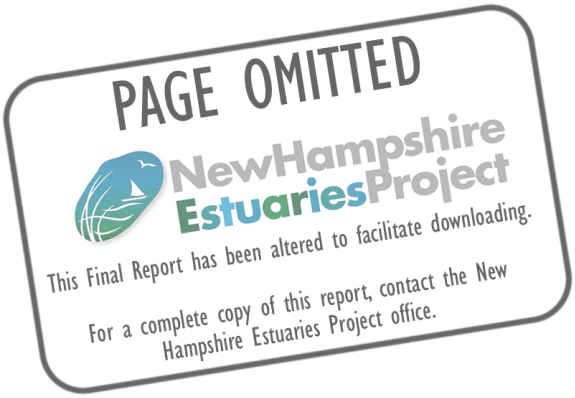

A. Coastal Way Conservation Area Stewardship Plan

Location (Map A-1)

927 Portsmouth Avenue
Tax Map R-10, Lot 29
53.18 acres

Public Access (Map A-1)

- Near the end of Coastal Way: hammerhead parking provides space for 4 cars; walking access to property is along a 30-foot easement at the end of the subdivision
- Liberty Hill Campground Road

Purpose

This parcel was given to the Town of Greenland in 2001 as conservation land as part of the abutting Meaghan Way subdivision and the end of Coastal Way development. The deed (Book 3544 Page 1393) stipulates:

> "This property is conveyed subject to the condition that it shall be maintained in perpetuity as open space. No industrial, commercial, or residential use may be made of the property nor shall any mining, excavation, or disturbance of the property be permitted not shall any commercial advertising signs be permitted on the property. This land shall not be used at any time by motorized two or three-wheeled vehicles of any kind or any all-terrain vehicles or any other similar vehicles designed for off-road use."

Rockingham County Registry of Deeds

Deeds	Book/Page	Date Recorded	Purpose
Town of Greenland	4145/2876	09/10/2003	Lot line adjustment
Town of Greenland	3991/2978	04/03/2003	Conveyance of open space, corrected deed
Town of Greenland	3544/1393	02/20/2001	Conveyance of open space
Morgan Ryan Realty Trust	3450/2684	01/21/2000	
Remick George & Knowlton J	2487/529	04/20/1984	
Coakley Patrick J Estate of	1525/113		

Recorded Plans

Number	Date	Purpose
D31002	09/30/03	Lot line adjustment between Tapley (R10 Lot 30) & the Town of Greenland
D-28747	02/23/01	Scamman Coastal Way Condominium Site Plan.
D-28395	10/03/00	Morgan Ryan Subdivision Plan for Meaghan Way and end of Coastal Way. Shows 30-foot wide access right of way from end of Coastal Way to conservation area. Plan Note #9 says "the gravel road to Tapley Campground will be blocked with boulders to prevent vehicular access." Plan also

indicates a 50-foot right of way to Tapley per Book 1796 Page 293. Includes conveyance of the 53.18 acres of open space to the Town of Greenland

Surrounding Lands

This conservation land is located on the south side of Portsmouth Avenue (Rt. 33). The property is bordered to the northeast by the Coastal Way subdivision; to the east by the Meaghan Way subdivision; to the south by the Statham Town Line; and to the west by privately owned lands and the Liberty Hill Campground Road.

Watersheds and River Drainages

The Coastal Way property lies within two watersheds: Great Bay and Winnicut River. The northern section abutting Rt. 33 drains toward Great Bay. The rest of the property is within the Winnicut River watershed. Thompson Brook, a tributary to the Winnicut River, flows from west to east through the southeast section of the property.

Historical Land Uses

A series of aerial photos from 1952 to the present provides a bird's eye view of the land use on this property over the past 50 years. The 1952 aerial photo shows this parcel as mostly cleared for agricultural (pasture and/or cropland) and heavily cut for timber. By 1964, some of the forest had grown back but much was still cleared. The 1974 photo shows much more extensive disturbance apparently from a sand and gravel operation. By 1992 vegetation is just starting to grow back, with all but the eastern section of the property is re-vegetated. The 2003 photo shows a mostly forested sites with an area of old field in the northeast corner.

Habitat and Associated Wildlife

The current vegetation and habitat types on the Coastal Way conservation land is in part a reflection of the natural tendency of the site (i.e., soils and drainage) as well as the past land uses. The most visible aspect of the property is the dense stand of invasive autumn olive that dominates the old gravel pit in the central region of the property. The autumn olive is the most obvious invasive plant, but other troublesome species are present as well in varying amounts including buckthorn, honeysuckle, multiflora rose, and purple loosestrife. Despite this invasion and the heavy disturbance of the past decades, the conservation area supports a diversity of habitat types and offers opportunities for wildlife habitat management, passive recreation, and nature observation.

A report from the New Hampshire Natural Heritage Bureau (NHNHB) indicates that there are no known rare species or exemplary natural plant communities on the property (NHNHB 2006), however a detailed on-site survey has not been completed. During the preparation of this management plan several site walks were conducted and no rare plant species were detected, but the surveys were not done during the active growing season. The Natural Heritage Bureau reports several important natural communities within one mile of the property, however many of these are associated with saltmarsh and would not occur on Coastal Way.

The Coastal Way conservation area can be viewed as several different habitat types:

- Red maple-sensitive fern swamp
- Thompson Brook and associated wetlands
- White pine moist forest
- Old gravel pit
- Old field (wetland soils)

Some of these habitat types still clearly reflect the past land uses and are described as such, particularly the old gravel pit and the old field. Each of these is described below and outlined on a topographic map.

Red Maple-Sensitive Fern Swamp

This plant community is in the northwest corner of the property that borders the Liberty Hill Campground Road and drains toward Great Bay. The aerial photos dating back to at least 1954 indicate that this area was ditched and drained for agricultural uses. In the 1990s vegetation started to reclaim this area and given the low-lying topography, enough seepage and rainfall enabled some natural restoration of the vegetation. The soils are classified as Scitico silt loam, a poorly drained soil that occurs in drainageways and is suited to woodland (USDA 1994).

The dominant vegetation indicates that this could be considered a red maple-sensitive fern swamp as defined by the NHNHB (Sperduto and Nichols 2004). This is a common type of red maple swamp with a diversity of trees and shrubs and other understory plants. The dominant tree species include red maple, American elm, gray birch, quaking aspen, and black cherry with some white pine, hemlock, and eastern red cedar. Understory shrubs include winterberry, highbush blueberry, speckled alder, staghorn sumac, silky dogwood, and northern arrowwood. The area is saturated or seasonally saturated and is fed by seepages and upland runoff. Sensitive fern is a common plant in the wet areas. The wettest areas support open water and emergent marsh (e.g., cattails).

Many common wildlife species use this area for nesting, feeding, cover, and travel including white-tailed deer, common grackle, red-winged blackbird, American goldfinch, black-capped chickadee, and downy woodpecker.

The red maple and other vegetation adapted to wet or moist soils gives way to upland plants with a slight rise in elevation along the south edge of the wetland. Here the past disturbance is reflected in a dense tangle of invasive plants including glossy buckthorn, autumn olive, honeysuckle, and multiflora rose. Maturing staghorn sumac and quaking aspen are intermingled with the invasive trees and shrubs.

Old Gravel Pit

The sand and gravel operation covered a large area of this property of which a portion was still heavily disturbed through the 1990s. The Soil Survey of Rockingham County (USDA 1994) simply classifies the soils in this area as “pits, sand and gravel.”

Because the topsoil was scraped off the plants that have re-colonized here are predominantly the invasive autumn olive. This plant has invaded many areas in the seacoast and readily occupies disturbed sites. Invasive plants, such as the olive, cause problems by crowding out native plants. Although some bird species readily adapt to these shrubs as they provide thick cover, the sites usually lack the plant and animal diversity that would normally grow here.

A trail used by deer and humans runs is already somewhat established through the autumn olive and can be enhanced to provide improved public access through the property. Cardinal, ruffed grouse, white-tailed deer use this area regularly.

Old Field

The eastern corner of the property that was affected by the sand and gravel operation is in an old-field condition with scattered shrubs and small trees. This area was likely a part of the Scitico silt loam soils as the native shrubs that grow here are associated with wetlands, including silky dogwood, speckled alder, willow, highbush blueberry, as well as quaking aspen, eastern red cedar, and spiraea. Invasive plants species are encroaching on the field and shading out native plants. These include autumn olive, multiflora rose, common buckthorn, and some black swallowwort. The latter is as present along the 30-foot easement from Coastal Way. Common bird species using shrubby fields include catbird, common yellowthroat, and American goldfinch.

Thompson Brook and Associated Wetlands

Thompson Brook, a tributary the Winnicut River, flows through the southeastern corner and just touches the southwest corner of the property from west to east. The Brook and associated wetlands is the most pristine portion of the Coastal Way conservation area. The aerial photos indicate that this was the least disturbed area during the years of sand and gravel operation. The soils are classified as poorly drained Squamscot fine sandy loam with scattered hummocks. The dominant trees are white pine and red maple. Hemlock occurs in pockets along the Brook.

Beavers are active along portions of the Brook. Their activities have created areas of emergent wetland and shrubland along the Brook that support cattails, silky dogwood, nannyberry Viburnum, red maple, winterberry, and alder. A few stems of invasive plants are found along the Brook, including purple loosestrife and glossy buckthorn. Common species observed here included song sparrow, red-winged blackbird, mallard, American goldfinch, swamp sparrow, winter wren, red squirrel, and beaver. A nearby vernal pool supports breeding wood frogs, spring peepers, and American toads.

White Pine

A mature white pine stand extends from Thompson Brook to the old gavel pit. The soils are poorly drained (Squamscot fine sandy loam). The trees are growing close enough together to reduce the crown size of individual trees. Red maple and hemlock are scattered in the overstory among the white pine. The understory is sparse with little sapling, shrub, or ground cover. A few red oak, American beech,, and white pine seedlings are evident along with cinnamon fern, goldthread, highbush blueberry, and bayberry in the sparse understory.

Common wildlife species that occur here include tufted titmouse, black-capped chickadee, American crow, red-breasted and white-breasted nuthatches, blue jay, rub-crowned kinglet, hermit thrush, and red squirrel.

A stonewall appears to separate this white pine stand from the autumn-olive dominated gravel pit. Along the transition common buckthorn is creeping in to the forest understory. An old tree stand with some garbage strewn about is located near the stonewall; otherwise the property is relatively free of garbage (except along Rt. 33).

Management Recommendations for Coastal Way

The Coastal Way conservation area offers opportunities for passive recreation. Given the heavy disturbance of the past there are also many opportunities for habitat restoration and land stewardship. To provide optimal public access for passive recreation (e.g., walking, x-country skiing) and nature viewing and to implement habitat management prescriptions, the Town will likely want to work with partners and apply for grants as some of the management prescriptions are time-consuming.

The management recommendations provided below are based on the following site objectives:

- To provide a public trail for passive recreation (e.g., walking, x-country skiing)
- To control invasive plant species leading to the restoration of native plant species for the benefit of wildlife and a healthy ecosystem
- To maintain and enhance wildlife habitat and protect water quality

Invasive Species Management
One of the greatest challenges for the Town of Greenland is the control and management of invasive plant species on town owned lands. Several parcels – Coastal Way, Post Road/Haines Brook, and Coakley Estate – are inundated with invasive plants, a result of past land uses particularly from sand and gravel operations. This activity scraps off the topsoil, leaving behind bare, disturbed ground that is especially suitable for colonization by invasive plants. The dominant invasive plant species on town lands are autumn olive, multiflora rose, glossy and common buckthorn, Morrow's honeysuckle, Oriental bittersweet, and black swallowwort. Japanese knotweed, purple loosestrife, and common reed (Phragmites) are lesser problems, and other problem species may emerge over time.

Invasive species are a challenge because they are so aggressive and require repeated treatments over many years to control. However, there are guidelines and grant sources to help the town begin to address this management issue. Invasive species control is compatible with and is necessary to meet other management goals such as recreation trails, wildlife habitat, and water quality. In addition to the management strategies described below, Appendix H has more detailed information on invasive species and control methods and additional sources of information. Invasive species are controlled through several different methods: hand removal, cutting/mowing, girdling, herbicides, and biological. Often more than one method is needed. Any use of herbicides requires a certified pesticide applicator license. Many conservation organizations are finding that herbicides are necessary to control invasive plants in certain situations and to restore ecological function to natural areas.

Any invasive species control requires that all parts of the invasive plants be removed from the site and properly disposed of either by burning or bagging and land filling. Many invasive species can easily take root from a small piece of root or dropped berries. Avoid invasive species control during the fruiting season.

General Stewardship Recommendations

- Designate this property as the Coastal Way Conservation Area
- Mark the boundaries of the property with signs and/or paint
- Evaluate the need to do a formal boundary survey to clearly identify the property boundaries. Existing boundary surveys of surrounding lands may be sufficient (see the baseline documentation packet for a copy of these surveys)
- Confirm public access points off Coastal Way and Liberty Hill Campground Road.
- Contact UNH Cooperative Extension for a list of potential natural resource consultants that could assist with specific management recommendations, particularly invasive species control
- Consider developing a town invasive species control plan that can track control efforts and species' distributions

Create a Public Trail for Passive Recreation (Map A-2)

- Develop a trail that extends from Liberty Hill Campground Road through the Old Gravel Pit to the Old Field with access to the Coastal Way subdivision via the right-of-way
- Avoid any spur trails through the white pine stand to Thompson Brook, as this would open the area to invasive plants from the gravel pit and old field. Invasive plants travel quickly along trails and woods roads
- Designate the hammerhead parking area near the end of Coastal Way with signs indicating parking for access to the conservation area
- Develop a parking are for 2-3 vehicles off Liberty Hill Campground Road, if this road is open to the public
- Identify potential volunteer groups to help with the trail such as boy or eagle scouts
- Contact the New Hampshire Trails Bureau for technical assistance and potential grant for developing the trail. A more detailed site evaluation will be needed to layout specific trail route to avoid wetland areas and determine need for boardwalks or other materials. The old field is wet in places.
- Apply for grants (such as the Trails Bureau and Moose Plate grants, in combination with habitat management below) to assist with trail development
- Consider contacting landowners with undeveloped abutting lands to determine feasibility of extending public recreational trail
- A trail system should be developed in combination with invasive species management described below

Implement Habitat Restoration and Management (Map A-2)

1. Invasive Species Control and Restoration of Native Plant Species

Pursue removal of the invasive autumn olive (dominant), buckthorns, multifora rose, and honeysuckle through repeated mowings if feasible. Replant with native shrubs and trees as needed. Native shrub species include silky dogwood, willow, elderberry, arrowwood, nannyberry, highbush blueberry, gray dogwood, staghorn sumac, spiraea, among others. Begin invasive species control in the old gravel pit and move into the old field. A wooded strip between the gravel pit and Liberty Hill Campground Road is a third area that will need treatment eventually.

- Consult with Matt Tarr, UNH Cooperative Extension, on the success of another similar project in Greenland off Tide Mill Road. They are using a combination of repeated mowings to control invasive plants with follow-up spot treatment with herbicide if necessary. Often, to

effectively control these invasive plant species you must cut and stem treat with a recommended herbicide. Spot-treatment of the cut stem is the most effective treatment with the least chance for injury to non-target species. Foliar spray is not recommended in this plan as it has a greater change of non-target impacts.

- Any use of a pesticide requires a certified pesticide applicator license. The UNH Cooperative Extension Rockingham County office can provide a list of potential consultants to assist the Town with this and other habitat management recommendations.
- The Natural Resource Conservation Service may be able to offer technical assistance on site conditions for planting native shrubs and trees following the removal of autumn olive and other invasives. Soil amendments may be needed to enable native species to take hold. See Appendix H for a potential list of native shrub and tree species and potential sources for these plants
- Based on specific proposal and recommendations from the town, agency technical assistance, and consultant apply for grants to assist with implementation. Several good possibilities include:
    - NH Fish and Game Department, Wildlife Division, Small Grants Program
    - USDA Wildlife Habitat Incentive Program (WHIP)
    - US Fish and Wildlife Service, Partners for Fish and Wildlife Program

2. Maintenance of the Old Field Habitat

To maintain the area of old field in native shrubs, small tress, and grasses and flowers will require periodic cutting of some of the large trees and any invasive shrubs. This can be done using a chain saw, handsaws, or large mechanized equipment such as a brontosaurus, depending on the amount that needs to be cut. The brontosaurus is a large rotary grinder mounted on a tracked excavator that grinds small trees into shredded wood. These machines are efficient and the operators can easily cut around trees or shrubs to be left. The current rental rate is about $1,200 a day but grants are available. The goal is to maintain a mix of native shrubs, small trees and open areas of grass and wildflowers. Some of the native species to be left uncut in the old field include spiraea, willow, silky dogwood, aspens, alder, eastern red cedar, and highbush blueberry. Repeated cutting or mowing of the invasive shrubs will be necessary. Given the wet conditions of some parts of the field any use of heavy equipment should be done on frozen ground.

The frequency of cutting depends on how fast natural succession occurs (i.e., how fast trees encroach). Once the area is treated by a brontosaurus, the area may need to be mowed with a brush hog) or similar equipment every 3-5 years. The grassy areas should be mowed more often, every one to two years in early fall (after all nesting and feeding of birds, mammals, and insects).

- A consultant can layout a proposed cutting schedule for this area
- Based on a specific proposal and recommendations from the consultant apply for grants to assist with implementation. This should be combined with the invasive species control in the old gravel pit as the potential grant sources are the same and some of the work could be done as part of the same project

3. Management of the White Pine Stand

The white pine stand that borders Thompson Brook is developing slowly with some overcrowding of the crowns. This stand could be thinned to allow some pines to develop larger crowns and become more vigorous. As part of this management, small openings (~1/4 acre) could

be cut to remove scrappy small red maple and white pine to regenerate some understory and leaving any large red oaks to produce more oaks acorns as a wildlife food source.

Currently there are no suitable markets for the small volume of white pine in this stand and this part of the property lacks an access for mechanized harvest equipment. In addition, any opening of the forest with an access trail or woods road from the rest of the property would create a quick pathway for invasive plants. Given the dominance of invasive species on the property it is recommended that no active management occur in this stand. This management advice should be reviewed in 5 years to assess the invasive species situation and wood markets.

A small stand of buckthorn is creeping into the white pine stand along the stonewall near the old gravel pit. These small buckthorns should be controlled during the first wave of invasive species management to prevent further spread into the forest.

- Review the white pine stand in 5 years to determine management options
- Any work in the white pine stand should occur on frozen ground to prevent rutting in the poorly drained soils and to minimize disturbance of the herbaceous ground cover
- A small area of trash is located near the stonewall – this should be cleaned up at some time, perhaps during a clean-up of the entire property with a scout or other volunteer group (more trash is present along the property boundary with Rt. 33)
- Control the invasive buckthorn on the edge of the forest along the stonewall

4. Protection of Thompson Brook

The protection of Thompson Brook is an important management goal. This includes protecting water quality through maintaining the riparian (shoreline) vegetation and preventing erosion and sedimentation. Beavers actively manage this stream corridor, although over time they consume all preferred foods and start eating less palatable species such as hemlock. Current beaver activity indicates that this time might be approaching. A management technique is to create small group cuts (<1 /4 acre) near the shoreline to regenerate favored hardwood shrubs and trees for beaver. This option could be considered in 5 years when the management of the white pine stand is re-assessed. In the meantime, natural succession and natural disturbances will continue to manage this area. This is the preferred management strategy at this time given the concern over introducing invasive plants to a generally pristine part of the property. An uncut vegetated buffer should be maintained around the vernal pool adjacent to the Brook.

- Allow natural succession to occur along Thompson Brook
- Avoid any trails or active management near the Brook at this time to avoid potential of invasive species introductions from other parts of the property

5. Red Maple-Sensitive Fern Swamp

The red maple-sensitive fern swamp seems to be continuing on its natural recovery from past clearing for agriculture. A couple management options could be considered in this habitat type.

- Work with the natural resource consultant to determine the feasibility of controlling the invasive trees and shrubs that form a dense tangle between the old gravel pit (dominated by autumn olive) and the wetter portions of the red maple swamp. This could be combined with the proposed work described on part 1 (invasive species control) above.

- Within 5 years evaluate the condition of the speckled alder within the red maple-sensitive fern swamp. As speckled alder grows older and taller it looses its most beneficial quality as wildlife cover. Cutting a portion of the alder stands on frozen ground can help regenerate this species and create better cover for woodcock and other wildlife.

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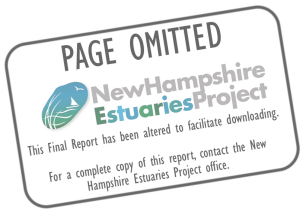

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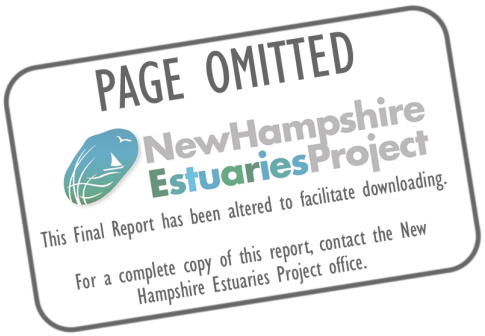

B. Coakley Estate Stewardship Plan

Location (Map B-1)

560 Breakfast Hill Road
Tax Map R1, Lot 9B
58 acres

Public Access (Map B-1)

Fifty foot right-of-way off Breakfast Hill Road through property owned by The Bethany Church

Rockingham Country Registry of Deeds

Deeds and Plans	Book/Page	Date Recorded
Town of Greenland	3454/1131	02/10/2000
Plan D-26791 as Lot #2		11/25/1998
Plan D-22088		02/19/1993
Coakley Patrick J. Estate of	1347/0172	03/07/1955

Property History

The Town of Greenland acquired this 58-acre parcel through a tax sale/tax lien executed by the Greenland Tax Collector on August 14, 1989. This property was part of a larger parcel of approximately 107 acres owned by the Patrick J. Coakley Estate. The Bethany Congregational Christian Church acquired the northern 20 acres of the Coakley property with frontage on Breakfast Hill Road in 1998. The remaining 29 acres of the original parcel is in the Town of North Hampton and is the site of the Coakley Landfill, a superfund site.

Prior to being permitted by the State as a sanitary landfill on April 21, 1971, the site was a sand and gravel operation beginning in 1965. Under an agreement made in 1972, the owner was to be responsible for compaction and cover material at the landfill, and the City of Portsmouth was to manage the disposal of incinerator ash from the Portsmouth Refuse-to-Energy Project at the landfill. In March 1983, the State issued a Consent Order requiring the owner to accept only incinerator ash from the Refuse-to-Energy Project (http://www.epa.gov/superfund/sites/npl/nar50.htm).

Landfill operations began in 1972 and ended in 1985. From 1973 to 1977, rock quarrying was conducted at the site. Much of the refuse disposed of at the landfill was placed in open trenches created by rock quarrying and sand gravel mining. Waste materials disposed at the landfill included municipal wastes, industrial wastes, sewage sludge, and incinerator residue from the Incinerator Recovery Plant at the Pease Air Force Base. In 1978 and 1979, oil-soaked debris was placed in the northern section of the landfill. The exact volume of the material is unknown. In 1979, leachate breakouts were detected in the surrounding areas of the landfill. In 1981, the State of New Hampshire granted a nearby town permission to dispose of pesticide waste containers at the landfill. In 1983, the testing of the water quality from a drinking water well revealed the presence of five different Volatile Organic Compounds (VOCs). The site is located on a groundwater/surface water divide, and residential wells to the south, southeast, and northeast of the landfill were contaminated with low levels of VOCs. The site was listed on the U.S.

Environmental Protection Agency's (EPA) National Priorities List (NPL) in 1986 (http://www.sandia.gov/eesector/gs/gc/na/01_nh_coakley_ldfl.html).

In 1989, North Hampton extended a municipal water supply line to residents who had been obtaining their water from 13 private wells contaminated with VOCs. The State set up a residential well monitoring program with an early warning system to detect any groundwater contamination in the area. The State completed a study of the landfill in 1990 that investigated the hydrogeologic conditions at the site, including an estimate of the total area of the landfill and soil deposits, details of the hydraulic properties of bedrock and selected surface streams, and the identity of pathways for contaminant migration from the site. The EPA began a study in 1990 of the migration of contaminants into off-site groundwater and the ecological effects of the site contamination on adjacent wetlands. In the fall of 1994, a groundwater remedy was documented that included imposing institutional controls to prevent the use of contaminated groundwater, allowing groundwater to clean itself through natural attenuation, and long-term monitoring. The landfill was capped in 1998. http://www.epa.gov/region1/superfund/index2.htm).

The Town of Greenland did not use the landfill and therefore assumed no liability associated with the Coakley Landfill Superfund Site (September 29, 1999 letter from the U.S. E.P.A. to Peter Loughlin, Greenland Town Attorney). The Town of Greenland executed an agreement with the Coakley heirs on January 28, 2000 finalizing the transfer of the property to the Town.

Based on aerial photos and current site conditions the access to the landfill seems to have been off Breakfast Hill Road in Greenland through the now town-owned property. The quarry operation also occurred on the property that Greenland later acquired.

The Coakley Group, an association that includes the City of Portsmouth, the Towns of North Hampton and Newington, and dozens of private companies alleged to have dumped at the landfill, is still working on closure and remediation issues. In January 2002, the Coakley Group sent a request to the Town of Greenland requesting that the town execute a "Declaration of Groundwater Use Restrictions" on the Coakley property. In a January 11, 2006 letter to the Coakley Group representative, the U.S. Environmental Protection Agency suggested that the Coakley Group, in consultation with Town, hire an appraiser to determine the value of a groundwater withdrawal restriction to ensure that the Town (and other landowners) are offered fair and reasonable compensation if the Declaration is signed (details on this issue are available at the Greenland Town Hall).

Surrounding Lands

This property is in the southeast corner of Greenland. The property is bordered by the Rye Town Line to the east; North Hampton Town Line to the south; a railroad track along the west; and PSNH transmission line along the north boundary. To the west of the railroad track are several large parcels owned by a few landowners, including a 210-acre parcel (known as the "Falls Way Subdivision") with 75 house lots pending before the Greenland Planning Board but that is also potentially being pursued for conservation instead. This parcel encompasses the headwaters of Norton Brook that flows toward the Winnicut River.

Watersheds and River Drainages

The Coakley Estate encompasses the headwaters of the Berry's Brook drainage. Berry's Brook is a 6-mile long stream that flows north-northeast through Greenland, Rye and Portsmouth before emptying into Little Harbor. The Seacoast Land Trust is working with interested landowners and other conservation partnerships to protect this high quality watershed.

Habitats and Associated Wildlife

The current vegetation and habitat types on the Coakley Estate are in part a reflection of the natural tendency of the site (i.e., soils and drainage) as well as the past land uses. The southern edge of the property is part of the Coakley Landfill including a section of mowed area within the chain-link fence surrounding the capped landfill. The western portion of the property encompasses the headwaters of Berry's Brook and associated wetlands, some of which may be a result of the previous quarry operation. Early successional habitats occur around the edges of the old quarry and near the entrance to the property. The remainder is a mix of upland forest and forested wetland.

The 1994 Soil Survey of Rockingham County classifies the soils of the wetland areas as Squamscot fine sandy loam (poorly drained) and Greenwood & Ossipee soils (very poorly drained). The area of the old sand and gravel and quarry operation are simply classified as pits, sands and gravel. The northeast corner of the property is well-drained Chatfield-Hollis Canton Complex.

A report from the New Hampshire Natural Heritage Bureau (NHNHB) indicates that there are no known rare species or exemplary natural plant communities on the property (NHNHB 2006), however a detailed on-site survey has not been completed. During the preparation of this management plan several site walks were conducted and no rare plant species were detected, but the surveys were not done during the active growing season. The Natural Heritage Bureau reports several uncommon animals and good examples of several natural communities within one mile of the property.

Berry's Brook and Associated Wetlands

The western portion of the Coakley Estate includes the headwaters of Berry's Brook and associated wetlands. It includes a variety of wetland types such as small stream, emergent marsh, scrub-shrub, and forested wetland. The dominant native wetland shrubs include speckled alder, nannyberry, winterberry, willows, and highbush blueberry. Emergent wetland plants include cattail, tussock sedge, and the invasive *Phragmites*, among other native plants

The forests around the headwaters of Berry's Brook are a patchwork of forested wetlands and upland knolls that are likely a result of the old quarrying operation. The wetter spot support red maple, American elm, speckled alder, and other native wetland shrubs. Black cherry, quaking aspen, white ash, red oak, white pine, and birches grow on the slightly higher and drier spots. Much of this low-lying patchwork of forest has a tangle of invasive species in the undergrowth, making it nearly impassable in places. The major invasive plants are multiflora rose, buckthorn, and bittersweet. The old rock quarry has succeeded into a wetland community dominated by willows, alder, and some invasive *Phragmites* and autumn olive.

The New Hampshire Natural Heritage Bureau (NHNHB) has two records of uncommon turtles from along Berry Brook south of Breakfast Hill Road. A Blanding's turtle was observed in the marsh adjacent to the railroad track along Berry Brook, northwest of Coakley in April 1997. A spotted turtle was observed farther south along the railroad tracks in North Hampton. Both of these turtles likely travel throughout the wetland mosaic that extend onto Coakley Estate. The Berry's Brook watershed from the headwaters near Breakfast Hill Road to the confluence with Witch Creek in Rye supports 18 rare plants and animals and more than a dozen exemplary natural communities (NHNHB, unpublished data).

Beaver are active in the large wetland area with dams, lodges, and travel ways clearly evident. Other species observed in the wetland areas included many common birds such as swamp sparrow, common grackle, and red-winged blackbird.

Early Successional Habitat

The southern portion of the property abuts the Coakley Landfill with a portion of the mowed capped landfill and protective chain link fence in Greenland. The entrance to the property behind the Bethany Church is still recovering from the earlier gravel and quarry operation as grasses and other herbaceous plants retain an "old field" successional habitat structure. The edges of the grassy areas are dominated by early successional tree species—gray birch, pin cherry, quaking aspen. Invasive autumn olive, honeysuckle, and Japanese knotweed are scattered about but fortunately are not yet too severe. The path/dirt road that leads to the landfill gate is edged with multiflora rose, another invasive plant.

Species observed in the early successional habitats included turkey vultures and bluebirds in the mowed landfill area. At the edge and feeding in other open grassy areas were an adult coyote and 4 young pups. Kestrel, white-tailed deer, red-tailed hawk, indigo bunting, Eastern kingbird, and American goldfinch were observed in the old field.

Scattered along the path/dirt road near the entrance to the property are scattered piles of demolition debris and other trash. The Town may have left this material, however, there is an ungated/unauthorized access from Rt. 1 where someone could drive in and dump debris.

Upland Oak-Pine Forest

Scattered among the wetlands near the northern boundary are upland knolls with mature red oak and white pine. The northeast corner of the property and the eastern boundary are underlain by well-drained soils that support mature red oak and white pine. This habitat type covers a small portion of the property but offers a nice diversity to the wetlands and disturbed and early successional areas on the rest of the parcel.

Other Natural Resource Values

Unfragmented Habitat Block

This parcel is part of a larger (>1,000 acres) unfragmented region of Greenland, Rye, and North Hampton east of I-95 known as the Coastal Headwaters. It is so named because it supports the headwaters of several important tributaries including Little River, Berry's Brook, and Norton Brook (which flows to the Winnicut River). The Coakley Estate is separated from the rest of the unfragmented block by a railroad track that is used only a few times per week. A railroad track could block movement of some species, but most wildlife will travel freely across. The railroad bed also provides potential nesting sites for turtles. The Blanding's turtle, which has been observed in this area in the past, benefit from large unfragmented areas to maintain a viable population, as they are highly susceptible to road mortality.

Stratified Drift Aquifer

The 2003 Natural Resource Inventory or Greenland prepared by the Seacoast Land Trust and the Society for the Protection of New Hampshire Forests (SLT 2003) mapped the water resources of the Town, including public water supply sources, stratified drift aquifers, and surface waters. The eastern half of the Coakley Estate property overlies a stratified drift aquifer that extends into Rye and North Hampton.

Management Recommendations for the Coakley Estate

The Coakley Estate offers unique opportunities for outdoor recreation and education, habitat restoration, and conservation of wildlife. To provide optimal public access for recreation (e.g., walking, x-country skiing) and nature viewing and to implement habitat management prescriptions, the Town will likely want to work with partners and apply for grants.

The management recommendations provided below are based on the following site objectives:

- To provide a public trail for passive recreation (e.g., walking, x-country skiing) and nature education and interpretation
- To protect the water quality of the Berry's Brook headwaters and associated wetlands
- To restore and protect surface and groundwater
- To maintain and enhance wildlife habitat by controlling invasive species and restoring plants

Invasive Species Management
One of the greatest challenges for the Town of Greenland is the control and management of invasive plant species on town owned lands. Several parcels – Coastal Way, Post Road/Haines Brook, and Coakley Estate – are inundated with invasive plants, a result of past land uses particularly from sand and gravel operations. This activity scraps off the topsoil, leaving behind bare, disturbed ground that is especially suitable for colonization by invasive plants. The dominant invasive plant species on town lands are autumn olive, multiflora rose, glossy and common buckthorn, Morrow's honeysuckle, Oriental bittersweet, and black swallowwort. Japanese knotweed, purple loosestrife, and common reed (Phragmites) are lesser problems, and other problem species may emerge over time.

Invasive species are a challenge because they are so aggressive and require repeated treatments over many years to control. However, there are guidelines and grant sources to help the town begin to address this management issue. Invasive species control is compatible with and is necessary to meet other management goals such as recreation trails, wildlife habitat, and water quality. In addition to the management strategies described below, Appendix H has more detailed information on invasive species and control methods and additional sources of information. Invasive species are controlled through several different methods: hand removal, cutting/mowing, girdling, herbicides, and biological. Often more than one method is needed. Any use of herbicides requires a certified pesticide applicator license. Many conservation organizations are finding that herbicides are necessary to control invasive plants in certain situations and to restore ecological function to natural areas.

Any invasive species control requires that all parts of the invasive plants be removed from the site and properly disposed of either by burning or bagging and land filling. Many invasive species can easily take root from a small piece of root or dropped berries. Avoid invasive species control during the fruiting season.

General Stewardship Recommendations

- Designate this property as the Berry Brook Conservation Area (or some other name)
- Mark the boundaries of the property with signs and/or paint
- Evaluate the need to do a formal boundary survey to clearly identify the property boundaries. Existing surveys of the property may be sufficient (see the baseline documentation packet for a copy of these surveys)
- Confirm public access off Breakfast Hill Road through the parking area of The Bethany Church

- Consult with The Bethany Church to assess potential sharing of their back parking lot as a parking area for access to the town land
- Continue to work with the appropriate partners to resolve any issues surrounding the Coakley Landfill (such as the groundwater management zone and water quality)
- Continue to work with other conservation partners and interested landowners to protect more lands within this large unfragmented block of habitat
- Place large boulders or other material to block unauthorized access on eastern boundary (see Map B-2)
- Piles of quarried rock that remain on site could be removed and used by the town for other purposes such as riprap or sold with funds reinvested in the property
- Remove the demolition and other construction debris piled along the access road to the landfill

Create a Public Trail for Walking and Nature Interpretation (Map B-2)

- Build on the existing access and pathways that lead to the landfill to create a trail system for walking and nature observation
- Map B-2 has a proposed trail route; some parts of the route may need adjustment depending on soils and wetland conditions or may require boardwalks to cross wet areas
- The portion of the proposed trail through the forest will need to be done in combination with some invasive species control. Multiflora rose is particularly dense in this area. A more detailed site assessment will also be needed to locate a route that avoids wet areas
- Erect an informational kiosk at the entrance with a map of the property showing the trails and key features including Berry's Brook, the quarry, and the landfill
- Identify volunteer groups such as boy or eagle scouts to assist with trail development and inquire with local businesses on donating materials

Implement Habitat Restoration and Management (Map B-2)

- Host a site walk with resource professionals to discuss feasibility and need for wetland restoration (and to identify funding sources) within the Berry's Brook headwaters. Invite representatives from NH Fish and Game, NH Department of Environmental Services, US Environmental Protection Agency, US Fish and Wildlife Service, Natural Resource Conservation Service, and UNH Cooperative Extension -- see Appendix D for contact information.
- Maintain the old-field early successional habitat through mowing and brush hogging. Use repeated mowings with hand tools or brush hog to control invasive shrubs (autumn olive, multiflora rose, honeysuckle) and invading trees. Leave any native shrubs (e.g., alder, willow, bayberry, dogwood). See Appendix H for more information on invasive species control
- Some areas of the old field are quite uneven as a result of the prior quarry and gravel operation. These areas likely need to be re-graded, while maintaining some contours for diversity, to allow ongoing mowing and brush hogging. Once the site is re-graded seed with a cover group and plant with some native shrubs. Consult with UNH Cooperative Extension or Natural Resource Conservation Service on seed sources and look in Appendix H for sources of native plants
- Leave the mature oak-pine forest to natural succession; no need for active management

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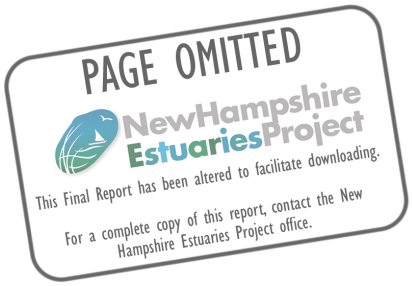

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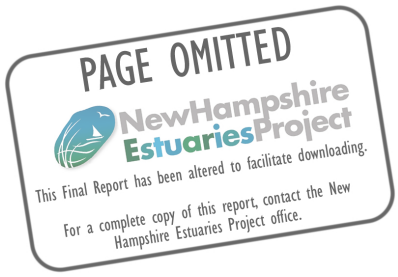

C. Post Road-Haines Brook Stewardship Plan

Location (Map C-1)

Park Avenue/Post Road
Tax Map U2, Lot 3, 21.85 acres
Tax Map U2, Lot 3A, 1.1 acres
Tax Map U3, Lot 8B, 15.03 acres

Public Access (Map C-1)

- Dirt road off 145 Post Road that leads to Greenland Recreation Fields; road owned by the City of Portsmouth
- Fifty-foot right of way at 69 Park Avenue (former Chick land)

Purpose

Lot 3 and 3A (Tax Map U2) purchased from Stephen Vickery in 1988 for potential as a future cemetery. Since then ball fields have been built on Lot 3

Lot 8B (Tax Map U3) purchased from John A. Chick, Jr. in 2004; no specific purchase specified, except that it adds to adjacent town-owned land

Rockingham County Registry of Deeds

Deeds and Plans	**Book/Page**	**Date Recorded**
Town of Greenland (U2 Lot 3 and 3A)	2771/2841	12/06/1988
Vickery, Stephen I (U2 Lot 3 and 3A)	2376/1382	11/03/1980
City of Portsmouth	1008/112	02/15/1943
Town of Greenland (U3 Lot 8B)	4225/0789	01/26/2004
Chick, John A., Jr.	2816/2102	11/17/1989

Surrounding Lands

These properties are close to the center of Greenland with most of the surrounding developed as residential houses and town facilities (e.g., elementary school, library). There is little other conserved land in the vicinity. The parcels are between Post Road (Rt. 151) to the west and the natural gas pipeline, PSNH powerline, and I-95 to the east. Undeveloped land remains to the north along the Haines Brook-Packer Brook drainage. Packer Bog lies not far to the east but is separated by the Interstate and utility lines.

Watersheds and River Drainages

These parcels lie within the Great Bay Watershed. The lands here drain into Haines Brook, which flows northeast into a 15-acre pond that was created to the construction of I-95. Haines Brook flows out of this pond and then joins up with Packer Brook. From that juncture, Packer Brook flows under Rt. 33 and Portsmouth Avenue and then takes a meandering path before emptying into the Winnicut River near the shores of Great Bay.

Historical Land Uses

Most of this town-owned land was cleared and used for agriculture for many years. The parcel U03 Lot 8B was known as the Hodgdon's Turkey Farm prior to the town's acquisition. I-95, PSNH powerline and the natural gas line traverse the back portions of both of the large parcels. A City of Portsmouth well (known as the "Greenland Well") sits between lots 3 and 3A (Tax Map U02). The City of Portsmouth owns the access road and a small parcel where the well is located. An old borrow pit is in the southeast corner of the Lot 3, behind the ball fields.

Land Uses and Habitat Types

The current vegetation and habitat types on the Post Road-Haines Brook town lands is in part a reflection of the natural tendency of the site (i.e., soils and drainage) as well as the past land uses. Given the location and existing uses, these lands offer excellent opportunities for continues public recreation, including ball fields and nature trails. The old borrow pit provides an opportunity for a wetland creation (and control of invasive autumn olive) that could be used as an educational site by the nearby elementary school. The Chick property provides early successional habitat for wildlife and scenic trail options.

A report from the New Hampshire Natural Heritage Bureau (NHNHB) indicates that there are no known rare species or exemplary natural plant communities on the property (NHNHB 2006), however a detailed on-site survey has not been completed. During the preparation of this management plan several site walks were conducted and no rare plant species were detected, but the surveys were not done during the active growing season.

The 1994 Soil Survey of Rockingham County shows the following soils underlying the Post Road-Haines Brook town properties:

- 38A Eldridge fine sandy loam, moderately well drained
- 460C Pennichuck Channery very fine sandy loam, well drained
- 510B Hoosic gravelly fine sandy loam, somewhat excessively well drained
- 538A Squamscott fine sandy loam, poorly drained

In the 1980s the New Hampshire Department of Environmental Services (NH DES) implemented new rules for protecting groundwater resources around large production wells (see Appendix H). The rules establish a "sanitary protective radius" of varying dimensions depending on the volume of groundwater extracted. The Post Road-Haines Brook town properties lie over the large stratified drift aquifer in the center of Greenland. Although the Greenland Well was installed in the 1940s, it is in the interest of the City of Portsmouth and the Town of Greenland to follow the protective measures for this size well, which corresponds to a 400-foot sanitary protective radius. The provisions of the sanitary protective area include:

- maintain in a natural state except for structures and activities needed to maintain the well
- land uses should be only those necessary to maintain and operate the well and shall not pose a contamination risk to groundwater
- no drainage from areas that use pesticides or fertilizer
- no underground utilities except for potable water and electrical or communication conduits
- the water supplier should own the land or control the land through an easement

The Post Road-Haines Brook town lands have several different land uses and habitat types:

- Active playing fields and associated access roads and parking areas
- Reverting borrow pit (potential wetland restoration site)
- Grassland/old field early successional habitat
- Haines Brook
- Mature oak-pine forest (in scattered patches)

Active Playing Fields and Associated Roads

Active ball fields are located on much of the Post Road Lot 3 parcel. The soil survey indicates that this area has well drained soils, making it ideal for playing fields. A chain link fence surrounds the entire playing area. A gravel parking lot lined with large granite stones is just inside the fence. This was done to prevent parking in the grassy area along the access road and adjacent to the Greenland Well. A plaque near the entrance to the ball field parking lot states: "this athletic field was made possible through the generosity of Seacoast United Soccer Club, Portsmouth Regional Hospital with the support of Hartmann Enterprises and Kathy and Tom Maher."

The access road continues around the west and south edge of the ball fields, providing access to the Natural Gas Pipeline facility, PSNH line, and the old sand and gravel pit. This gravel access road is bordered by a narrow strip of sapling and mature white pine, red oak, black cherry, and sugar maple along with patches of sumac, red cedar, and invasive autumn olive. Black swallowwort, a non-native invasive plant (vine) is growing vigorously along the dirt road that parallels the fence and the large pile of granite rocks. This plant is also growing throughout the unmowed portion of the ball field and seems to be spreading into the adjacent Chick field near the Greenland Well.

Old Borrow Pit

An old borrow pit in the southeast corner of Lot 3 is growing in with invasive autumn olive as well as native sumac, willow, alder, gray birch, and quaking aspen. The herbaceous plants include invasive purple loosestrife and Phragmites. The gas pipeline bisects a portion of this low-lying area. The site was excavated down to the water table, which has led to a degraded wetland condition. West Environmental and Carex Ecosystems (2003) identified this as a potential wetland creation site that could, if completed, provide high wetland value for education, aesthetics, and recreation as well as enhance the wetland for wildlife habitat.

Grassland/Old Field Early Successional Habitat

The former Chick property supports reverting pasture or hayfield that is now growing in with patches of shrubs and small trees among the grassy understory. The dominant native plants are goldenrod, raspberry and blackberry, milkweed, willow, silky dogwood, sumac, spiraea, gray birch, cherry, quaking aspen. Several invasive shrub species are overtaking areas of native shrubs. The invasive species include

common buckthorn, autumn olive, honeysuckle, bittersweet, and some black swallowwort. A row of mature trees (sugar maple, red oak, black cherry) separates this land from the ball fields. In the woods row near the Greenland Well a tangle of invasives is growing that includes bittersweet, honeysuckle, buckthorn, and black swallowwort. The northeast corner transitions to mature oak pine forest. This corner of the old field also has a large pile of old tree stumps and wood and in the nearby woods is a pile of old barrels and rusted oil tanks

The natural gas pipeline and PSNH powerline that traverse the back portions of Lots 3 and 8B also provide early successional habitat since they are periodically mowed or brush cut. This mix of grasses, flowers, shrubs, and small trees provides habitat not found in the mature forest. Coyote, fox, deer, small mammals, song sparrow, rufous-sided towhee, common yellowthroat, eastern bluebird, goldfinch, and cardinal are a few of the wildlife species that use these areas. A diversity of bees other insects such as beetles, butterflies, and dragonflies are abundant in early successional habitats.

Haines Brook

Haines Brook flows through the old field (Chick property) to the northeast. The Brook runs in a straight line through the property, indicating that it was likely ditched at one time. The upstream portion of the Brook runs through residential properties and is also degraded.

Mature Oak-Pine Forest

Oak-pine forest is the dominant forest type in this part of New Hampshire. These town lands support patches of mature oak-pine forest along the dirt access road, between the Post Road and Park Avenue/Haines Brook parcels, and long the back portions of both properties. A small stand of forest between the Greenland Well and Haines Brook supports a mature forest of sugar maple, black cherry, red maple, and American elm (and some invasive barberry in the understory. The tree species here are different because of the proximity to Haines Brook. Someone has recently used a machete to hack many of the trees in this small triangle of woods.

The back-forested section of the Haines Brook parcel has a large collection of old barrels, including some large underground oil storage tanks (near the wood pile in the back of the field).

Management Recommendations for the Post Road – Haines Brook

The Post Road-Haines Brook town properties offer unique opportunities for protection of drinking water, outdoor recreation and education, and habitat restoration. The management recommendations provided below are based on the following site objectives:

- To protect groundwater drinking water resources related to the Greenland Well and the stratified drift aquifer and surface waters related to Haines Brook
- To maintain and enhance access to the ball fields
- To provide a public trail for passive recreation (e.g., walking, x-country skiing) and nature education and interpretation
- To restore and maintain wildlife habitats

Invasive Species Management

One of the greatest challenges for the Town of Greenland is the control and management of invasive plant species on town owned lands. Several parcels – Coastal Way, Post Road/Haines Brook, and Coakley Estate – are inundated with invasive plants, a result of past land uses particularly from sand and gravel operations. This activity scraps off the topsoil, leaving behind bare, disturbed ground that is especially suitable for colonization by invasive plants. The dominant invasive plant species on town lands are autumn olive, multiflora rose, glossy and common buckthorn, Morrow's honeysuckle, Oriental bittersweet, and black swallowwort. Japanese knotweed, purple loosestrife, and common reed (Phragmites) are lesser problems, and other problem species may emerge over time.

Invasive species are a challenge because they are so aggressive and require repeated treatments over many years to control. However, there are guidelines and grant sources to help the town begin to address this management issue. Invasive species control is compatible with and is necessary to meet other management goals such as recreation trails, wildlife habitat, and water quality. In addition to the management strategies described below, Appendix H has more detailed information on invasive species and control methods and additional sources of information. Invasive species are controlled through several different methods: hand removal, cutting/mowing, girdling, herbicides, and biological. Often more than one method is needed. Any use of herbicides requires a certified pesticide applicator license. Many conservation organizations are finding that herbicides are necessary to control invasive plants in certain situations and to restore ecological function to natural areas. However, since the Post Road-Haines Brook site is near the Greenland Well and over the aquifer, herbicides should not be used to control invasive plants here. The Town will need to rely on mechanical methods (hand pulling, mowing, etc)

Any invasive species control requires that all parts of the invasive plants be removed from the site and properly disposed of either by burning or bagging and land filling. Many invasive species can easily take root from a small piece of root or dropped berries. Avoid invasive species control during the fruiting season; best to control the plant during the growing season before it sets fruit.

General Stewardship Recommendations

- Mark the boundaries of these properties with signs and/or paint
- Evaluate the need to do a formal boundary survey to clearly identify the town-owned property boundaries (see the baseline documentation packet for a copy of existing surveys)
- Confirm the Town of Greenland's right of way public access via the City of Portsmouth dirt road off Post Road
- Establish ownership of the 50-foot right of way off Park Avenue by placing signs at entrance and along boundary. This could serve as another trail access in future years
- Work with the City of Portsmouth on protecting the Greenland Well and stratified drift aquifer from any potential groundwater contamination. This includes working with Portsmouth to apply for a NH DES drinking water protection grant that would be used to place an easement on the Haines Brook (Chick) property and the portion of Lots 3 and 3A that are within the 400-foot sanitary radius. See section on Land Use and Habitat Types on page 59 for more discussion on protection of sanitary well radius.
- Work with interested landowners on protecting additional lands along Haines and Packer Brook to the northeast
- Consider developing a town invasive species management plan that can track control efforts and species' distributions

Recreation Fields and Trails (Map C-2)

- Immediately start mowing the entire area inside the chain link fence and along the dirt road at least twice a year (or more often if in conjunction with other mowing of the ball fields) to control the invasive black swallowwort. This plant may have come in on the granite rocks or perhaps in the gravel for the road since it is spreading out from that point. The Town should check the source to be sure it is not transporting this plant to other locations.
- The current parking area inside the chain link fence is still within the 400-foot sanitary protective radius. Consider moving the parking site to other areas along the dirt road toward the back of the property. There is space along the right side of the dirt road and also room for a gravel parking area beyond the locked gate as shown on Map C-2.
- The current parking area could then potentially become an area for small children to play, as long as any materials or play equipment placed in this area meet the standards of the 400-foot sanitary radius
- Create a walking trail that begins from the recreation ball fields and extends along the gas pipeline and into the Haines Brook parcel (see Map C-2)
- Consult with the owners of the natural gas pipeline and PSNH on use of these rights of way for trails and parking access and the wetland creation proposed below
- Avoid using any pesticides or fertilizers that could contaminant the well or aquifer

Wetland Restoration and Habitat Management (Map C-2)

- As recommended by West Environmental and Carex Systems, consider creating/restoring a wetland in the old borrow pit. The conditions are tending toward a wetland community, but many invasives are dominating the site including autumn olive. Given the proximity to the Greenland Well and location over the stratified drift aquifer, rely on mechanical methods to control the autumn olive.
- Consult with wetland scientists (such as West Environmental, Inc) on steps to creating a wetland on this site. Pursue funding sources to fund such a project. Good possibilities include:
    - Wetland mitigation projects
    - USFWS Partners for Fish and Wildlife
    - NH Fish and Game Small Grants Program
- Maintain the old field/early successional habitat on the Haines Brook parcel with periodic mowing and brush hogging as necessary to control invasives (this will require 3-4 cuttings over 1-2 years and beyond), to maintain grassy areas (mow every fall), and to prevent the field from reverting to forest. Retain the native shrubs (e.g., alder, sumac, willow, dogwood, spiraea).
- Allow a buffer of natural vegetation to grow along Haines Brook (50 feet on either side) to restore a protective zone of riparian (shoreline vegetation). Control any invasives that come in through mechanical means (hand saws or hand pulling)
- The area of invasives in the treeline/field edge near the Greenland Well should be controlled through hand pulling and repeated cutting.
- Remove and properly dispose of the large dump of old barrels from the woods at the back of the Haines Brook parcel
- At the same time remove or burn (if all untreated wood) the large tree stump dump in the field at the back of the field
- Apply for grants to assist with the invasive species control and old-field management. Best potential sources include
    - NH Fish and Game Small Grants Program
    - Conservation (Moose) License Plate Grant Program

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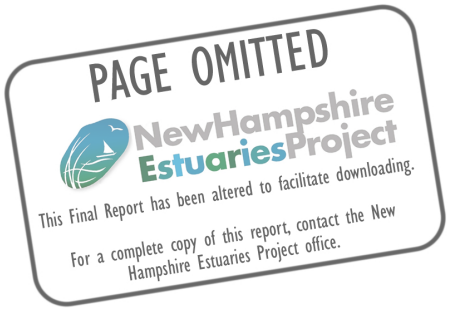

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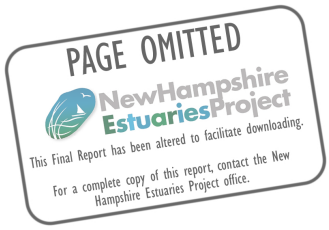

D. Packer Bog Stewardship Plan

Location, Size, and Purpose (Map D-1)

Between I-95 and Ocean Road

Tax Map and Lot	Acres	Purpose
R8 Lot 1	6.9	1979: tax forfeit
R8 Lot 4	2.3	1979: tax forfeit
R8 Lot 7	20.0	1979: tax forfeit
R8 Lot 8	4.1	1990: Gift by William S. Cohen; no restrictions
R8 Lot 9	19.0	1979: tax forfeit
R8 Lot 10	17.2	1979: tax forfeit
R8 Lot 11	0.65	1979: tax forfeit
R8 Lot 12	24.0	1979: tax forfeit
R8 Lot 13	12.5	1979: tax forfeit
R20 Lot 2	36.6	1979: tax forfeit
TOTAL	143.25	

Public Access

Packer Bog is open to the public; however there are no developed parking areas, access points, or trails

Rockingham County Registry of Deeds

Deeds and Plans	**Book/Page**	**Date Recorded**
Town of Greenland	2833/0904	04/12/1990

Surrounding Lands

The 143+ acres of town-owned land in Packer Bog abut other conserved lands owned by City of Portsmouth or easements held by The Nature Conservancy. The Bog is an extensive area of wetlands that drains to Packer. It is bordered to the south and east by residential development and a golf course, to the west by private land and I-95 and to the north by commercial development. Several undeveloped properties remain between the western boundary of the town-owned lands and I-95. Two cell towers are located in this area on private land.

Watersheds and River Drainages

These parcels lie within the Great Bay Watershed. The lands here drain into Packer Brook, which flows northwest under I-95, then joins with Haines Brook. From that juncture, Packer Brook flows under Rt. 33 and Portsmouth Avenue and then takes a meandering path before emptying into the Winnicut River near the shores of Great Bay.

Habitats and Other Ecological Features (Map D-2)

The 300-acre Packer Bog is one of the largest forested wetlands within the Great Bay watershed, and as such provides many wetland functions including sediment removal, nutrient uptake, and flood control that maintain downstream water quality. It is largely an Atlantic white cedar -- yellow birch -- pepperbush swamp, a rare coastal natural community. The Nature Conservancy has recorded several rare plant species from the greater bog ecosystem, which includes the Atlantic white cedar. Some of the bird species found in Packer Bog include Canada warbler, veery, eastern wood pewee, ovenbird, common yellowthroat, winter wren, scarlet tanager, cedar waxwing, and swamp sparrow.

Packer Bog along with Great Bog to the northeast in Portsmouth and the Portsmouth Cedar Swamp to the southeast were once a large interconnected wetland system located in the divide between three distinct subwatersheds: Packer Brook (Packer Bog), Pickering Brook (Great Bog), and Berry's Brook (portions of Packer Bog). The hydrology and habitats of these watersheds have been significantly degraded by residential and commercial development, as well as by railroad, interstate, pipeline, and powerline construction (The Nature Conservancy, unpublished data). The Bog currently appears relatively free of invasive plant species.

The 1994 Soil Survey of Rockingham County classifies the soils of Packer Bog as:

- 134 Maybid silt loam, very poorly drained
- 295 Greenwood mucky peat, very poorly drained
- 538A Squamscott fine sandy loam, poorly drained

The major plant community or habitat types found within the bog, as documented by The Nature Conservancy, include:

- Atlantic white cedar -- yellow birch -- pepperbush swamp
- Red maple – sensitive fern forest
- Hemlock – beech – oak – white pine forest
- Cattail emergent marsh

Atlantic White Cedar -- Yellow Birch -- Pepperbush Swamp

This is the dominant wetland type in Packer Bog. The dominant canopy tree is red maple with yellow birch, American elm, and hemlock interspersed. Atlantic white cedar is scattered sparsely throughout the forested wetland. The shrub community is diverse and abundant and includes sweet pepperbush, northern spicebush, highbush blueberry, winterberry, mountain holly, and northern arrowwood. The major herbaceous plants in the understory are skunk cabbage, cinnamon fern, spotted touch-me-not, lady fern, royal fern, and sensitive fern.

Red maple – Sensitive Fern Forest

The Atlantic white cedar – yellow birch – pepperbush swamp grades into a red maple – sensitive fern forest in places. The dominant plants here are red maple, black ash, black birch, and American elm. Skunk cabbage and cinnamon fern dominant the herbaceous layer.

Hemlock – Beech – Oak – White Pine Forest

The upland areas surrounding the bog support a hemlock – beech – oak – white pine forest

Cattail Emergent Marsh

The western edge of Packer Bog, which includes some of the town lands, supports emergent marsh dominated by cattail marsh.

Management Recommendations for Packer Bog

True to its name, Packer Bog is a boggy "basin swamp." Its value and importance lies in its ecological features including presence of rare plants and a large wetland complex, and as the headwaters of Packer Brook, which flows to Great Bay. The Nature Conservancy has long identified Packer Bog (part of the much larger Portsmouth Cedar Swamp Complex) as an ecologically significant area worthy of permanent protection. Given its wetland conditions and ecologically sensitive features, the area is not conducive to extensive public use and developed access and trails. Therefore, these management recommendations are based on the following goals:

- To protect the ecological integrity of the bog, including protection of rare species and natural plant communities
- To maintain the ecological functions of the wetland complex including flood control and water quality protection (particularly of Packer Brook and its tributaries that flow to Great Bay

General Stewardship Recommendations

- Continue to work with The Nature Conservancy and interested landowners on the protection of additional lands around Packer Bog
- Since the focus of The Nature Conservancy is to protect biological diversity, considering transferring ownership of Packer Bog parcels to them for long term stewardship
- Avoid creating developed public access or conducting management activities that would provide conduit for invasive species since many other Greenland town properties have this as a major management issue. Currently Packer Bog appears relatively free of invasive species and once established they are very difficult to control
- Monitor for invasive plant species and remove through hand pulling as soon as plants are observed. Dispose of any invasive plants through bagging and land filling or burning
- Packer Bog does not currently need any active management; allow natural succession and processes to occur

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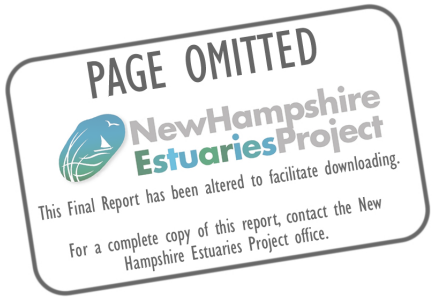

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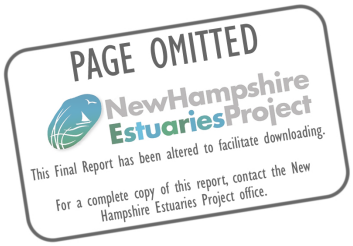

Recommendations on Other Town-Owned Lands

Great Bay Estuary

The Town of Greenland owns several parcels of mostly salt marsh along Great Bay. Some of these parcels were gifts to the town, some were received through tax forfeit, and the Town purchased one:

Tax Map	Size	Date/Purpose

R15 Lot 5 4.9 ac 1990: Gowen Family Gift
Deed-- to remain a wildlife habitat, in memory of the father of the donor and former Greenland selectman Clarence E. Gowen; 2/3 vote needed to change

R15 Lot 20 1.25 ac 1979: Tax Forfeit
Imbedded within Fish and Game ownership and/or an easement held The Nature Conservancy

R15 Lot 21 4.5 ac 1981: Brackett Family Gift
Deed--to remain a wildlife habitat, in memory of John H. Brackett, grandfather of donor; 2/3 vote needed to change. Imbedded within Fish and Game ownership and/or an easement held The Nature Conservancy

R15 Lot 22 3.7 ac 1979: Tax Forfeit
Imbedded within Fish and Game ownership and/or an easement held The Nature Conservancy

R15 Lot 23 0.75 ac 1979: Tax Forfeit
Imbedded within Fish and Game ownership and/or an easement held The Nature Conservancy

R18 Lot 3 1.14 ac 1979: Tax Forfeit
Imbedded within Fish and Game ownership and/or an easement held The Nature Conservancy

R21 Lot 3 2.1 ac 2003: Purchase by the Town

Natural Resource Values

The town-owned parcels in conjunction with the other lands along Great Bay protect rare plant and animal species and exemplary natural communities. The attached report from the New Hampshire Natural Heritage Bureau provides specifics on these rarities. The Great Bay Resource Protection Partnership is uniquely organized to acquire, protect, and manage these estuarine habitats. Five of the town-owned parcels (R15 Lots 20, 21, 22, and 23 and R18 Lot 3) are imbedded within either Fish and Game ownerships or easements held by The Nature Conservancy. Their small size and dominance by salt marsh makes these five town-owned parcels ill-suited for any sort of Great Bay public access trail unless combined with the Fish and Game lands.

Recommendations:

- Transfer ownership of the imbedded lots (R15 Lots 20, 21, 22, and 23 and R18 Lot 3) to the Great Bay Resource Protection Partnership (i.e., The Nature Conservancy or Fish and Game) with stipulations that they be forever protected as conservation land and for their biological diversity. The

Partnership is best able to manage the habitats and species on these parcels as part of their larger ownerships.

- Transfer of R15, Lot 21 would require 2/3 vote at a Town Meeting as stipulated in the deed gifted to the Town from the Brackett Family. A transfer of ownership of this property to the Partnership still maintains the intent and spirit of this gift.
- Continue to support the work of the Great Bay Resource Protection Partnership in their efforts to protect additional critical lands along Great Bay.
- Some parcels may be too small for the Partnership to entertain, for these the Town may serve as the lead in land conservation with interested landowners. This is most beneficial if additional lands are provide connectivity to the other town-owned salt-marsh parcels (R15 Lot 5 and R21 Lot 3).

Grove Street-Holly Lane Lots

The Town of Greenland obtained by tax collector's deed (tax forfeit) two lots at the intersection of Holly Lane and Grove Street. These two abutting lots are on Tax Map U7, Lot 14 (1.63 acres) and Lot 15 (1.65 acres). These parcels are accessible by parking at the short paved spur at the end of Grove Street just as it meets Holly Lane. The lots are bordered on either side by residential houses and behind are bordered by the Hughes Tree Farm that is protected by a conservation easement held by the Society for the Protection of New Hampshire Forests.

Lot 14 has frontage on Grove Street and appears to have been used as a borrow pit during the construction of the surrounding development. A high berm along the back boundary and a ditch filled with water bordering the road indicates that the site was excavated. The vegetation is primarily sapling trees and tall shrubs dominated by red maple, quaking aspen, speckled alder, staghorn sumac, and white pine. Sensitive fern, an indicator of wetland conditions, is common in the understory. Autumn olive and honeysuckle, two non-native invasive plants, are growing vigorously along the edges of the property and the road. Lot 15 has similar vegetation and site conditions.

Recommendations:

- Since these lots are too wet to be developed as house lots, the Town should retain ownership as there is parking for 1-3 cars
- Consult with the landowner of the abutting land (Hughes, R9, Lot 1) and the Society for the Protection of NH Forests (the easement holder) to consider the feasibility of a public walking trail that could be accessed from the Grove Street-Holly Lane town land. An important feature of the Hughes easement is to protect wildlife habitat so a trail would need to prevent any degradation of habitat and any motorized or wheeled vehicles should be prohibited
- Consider controlling the invasive species, including autumn olive and honeysuckle, through repeated mowings as part of a larger invasive species control plan on other town conservation lands

Valhalla Drive – Fall Family Gift

The Town received an 11.32-acre parcel (R 3 Lot 1) from Charles and Jeanne Fall in 2001 as part of the Valhalla Drive subdivision. This lot is the remaining back land at the end of Valhalla Drive and abuts I-95. A 20-foot drainage easements runs through the west-southwest portion of the property. Parking access to this property is available at the end of Valhalla drive for 3-4 vehicles. The deed to this land was given to the Town on the condition that it remains as wildlife habitat for the enjoyment of Town residents. The gift was made and accepted in memory of the late John Ireland and Florence Ireland of Greenland, parents of Jennie M. Fall. Any change in these uses requires a 2/3 vote on a Warrant Article at Town Meeting. See the attached Warranty Deed (Book 3681 Page 0435 and Plan D-13162.

Nearly the entire parcel is wetland that is interconnected with a much larger wetland system that extends southwest paralleling I-95 and Post Road. The dominant plants are red maple, white pine, ironwood, American elm, speckled alder, nannyberry Viburnum, and highbush blueberry. There is some open water-emergent marsh and scrub shrub wetland with beaver activity; otherwise the property is primarily forested wetland.

Recommendations:

- Retain this parcel as a conservation area to protect the wetland and associated surface and ground water, and as wildlife habitat
- Consider controlling the invasive species, including autumn olive and honeysuckle, through repeated mowings as part of a larger invasive species control plan on other town conservation lands

Moulton Avenue

The Town of Greenland received this parcel (U1 Lot 26; ~5.2-acres) in 1977 from Edwin and Norman Moulton and Judith Banker (Book 2288 Page 1839 Plan D-3000). The lot lines were revised in 1990 with abutting lands owned by the Hartmann Construction Corporation (see boundary line agreement: Book 2830 Page 1026 and Plan D-16510). The Town has a 35-foot access off Moulton Avenue that runs along the east boundary of Lots 8 and 8A on Tax Map R9, as part of the 1990 lot line adjustments. A 16-foot access off Moulton Avenue along the east side of Lot 25 Tax Map U1 was part of the original deed from the Moulton family in 1977.

Recommendations:

- Confirm the access rights of way off Moulton Avenue through discussions with abutting landowners
- Erect a few small signs to indicate the location of the access points and boundary of town parcel
- Leave as an undeveloped (no trails) conservation area given its small size and surrounding residential development

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