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Crommet Creek Conservation Area Management Plan

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Executive Summary

Name:	Crommet Creek Conservation Area
Total Acreage:	4,902
Total Conservation Acres:	2,425
Location:	Towns of Durham & Newmarket, Rockingham & Strafford Counties, New Hampshire
Main Access Points:	Generally located east of Route 108 between Durham & Newmarket. Major access points exist at Adams Point off Durham Point Road, the NH Fish and Game / Great Bay NERR Wildlife Management Area trailhead on Dame Road, and The Nature Conservancy's Lubberland Creek trailhead on Bay Road.
Ecological Importance:	The Crommet Creek Conservation Area comprises the largest block of natural lands in the immediate Great Bay watershed, and in New Hampshire's North Atlantic Coast Ecoregion. It includes the entire watershed of two tidal creeks that flow directly into the Great Bay Estuary. The area has been identified by the Great Bay Resource Protection Partnership as a protection priority due to the size of the natural area; the diversity of habitats and wildlife it supports; and it's integral role in protecting the regional water quality and resources within the Great Bay Estuary. The Conservation Area includes headwater wetlands, and the entire spectrum of freshwater and estuarine wetland and aquatic communities along both Lubberland and Crommet creeks. The Great Bay is a shallow inland tidal estuary of national importance for migratory birds. The Great Bay supports 29 species of waterfowl, 27 species of shorebirds, 13 species of wading birds, osprey and bald eagle. The Estuary is unique in that it is recessed 9 miles from the ocean along the Piscataqua River. Although development is increasing in the watershed, it remains one of the more healthy and viable estuarine ecosystems on the North Atlantic coast.
Conservation Status:	Approximately half of the land area is permanently protected (49%) through fee ownership and conservation easements.
Goal	To develop and implement a landscape approach that seeks to guide management of conservation lands in the Crommet Creek Watershed and is consistent with the goals of the Great Bay Resource Protection Partnership.

I. Introduction

a. Management Plan Scope and Goals

The Crommet Creek Management Plan is intended to provide individual conservation property owners guidance in stewardship and management decision making from a landscape, ecological perspective.

This document describes representative land features within the Crommet Creek Conservation Area boundary, but focuses on conservation lands. Additionally, management recommendations within this plan are based on field work performed as of January 2012 protected lands within the watershed, but should be applicable to all lands within the watershed, assuming similar habitats and hydrologic connections occur on privately held lands in the Conservation Area.

The lands and waters within the Crommet Creek Conservation Area are owned and managed by a number of different conservation organizations and private land owners (Figure 3). For purposes of this document, "conservation lands" refers to all properties that are owned in-fee by a public entity (municipal and state) or a nonprofit conservation organization and managed for conservation purposes, and those privately owned properties with a conservation easement protecting conservation resources in perpetuity. The principal landowners of conservation land within the Crommet Creek Conservation Area are the New Hampshire Department of Fish and Game and Great Bay National Estuarine Research Reserve (NHFG / GBNERR), The Nature Conservancy (TNC), the Society for the Protection of New Hampshire Forests (SPNHF), the Town of Durham, University of New Hampshire, and eight (8) private landowners. The largest conservation landowners include NHFG/GBNERR, TNC, SPNHF and the Town of Durham. It is recognized that each of these conservation entities have their own mission, management goals, and capacity for management of their conservation lands.

An array of funding sources have been used to acquire the conservation lands within the Conservation Area. The variety of federal, state and local funding sources coupled with the diversity of parcel ownership has resulted in multiple conservation interests on individual parcels and within the Conservation Area. As a result, the Great Bay Resource Protection Partnership (GBRPP) identified the Crommet Creek Conservation Area as a significant and distinct geographic area that would realize long term benefits from an ecologically based, cohesive management plan.

The primary goal of the Crommet Creek Management Plan is to provide management guidelines that will help protect the integrity of the constituent habitats and ecosystems in and around the Conservation Area. The plan focuses on, prioritizes, and presents information on the natural resource features, while recognizing political and ownership boundaries. This plan is also intended to help coordination, cooperation, and communication between the individual landowners with respect to management actions and planning processes.

As a voluntary guide to cooperative management in the Crommet Creek Conservation Area, this plan is not intended for use by local governments or state agencies to regulate or restrict land management practices. Recommendations in one chapter may be different from recommendations in another chapter. This reflects the diversity of different goals and objectives a landowner may have for a particular situation on a particular property. Attempts to adopt the *Crommet Creek Conservation Area Management Plan* for land-use regulation, in part or in entirety do not align with the intent or spirit of the authors. The State takes a primary role in the regulation of timber harvesting (RSA 277-J), shoreland protection (RSA 483-B), pesticide application (RSA 430), wetland and wetland buffer impacts (RSA 482-A), and hunting and fishing (RSA 214). Landowners are responsible for obtaining permits and understanding the relevant statutes as appropriate to their site-specific management objectives.

In addition to this Plan, several other resources exist to assist landowners with land management decisions including:

- UNH Cooperative Extension. Rockingham County office: 603-679-5616; Strafford County office: 877-398-4769. http://extension.unh.edu
- Best Management Practices (BMPs) determined by the state as the most effective and practical means of controlling point and non-point pollution at acceptable levels.
    - *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire*. http://des.nh.gov/organization/divisions/water/wetlands/documents/timber_harvesting.pdf
    - *Best Management Practices for Erosion Control during trail construction and maintenance*. http://www.nhstateparks.org/uploads/BMPmanual2010.pdf
    - *Best Management Practices for Agriculture in New Hampshire*. http://www.nh.gov/agric/divisions/markets/documents/bmp.pdf
- *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. http://extension.unh.edu/goodforestry/index.htm

Overall Goal

To develop and implement a landscape approach that seeks to guide management of conservation lands in the Crommet Creek Watershed that is consistent with the conservation goals of the Great Bay Resource Protection Partnership.

Objectives

1. Develop a comprehensive landscape scale Management Plan, in collaboration with conservation landowners, to guide immediate and long term stewardship decisions.

2. Coordinate management decisions and actions of conservation landowners including state agencies, municipalities, private nonprofit conservation organizations, and private landowners.

b. Implementation of the Management Plan

The Management Plan is intended to be used as a reference guide for conservation landowners while making resource based decisions. In addition, the Partnership will convene annual, or bi-annual (as determined), voluntary meetings of the conservation landowners in the Crommet Creek Conservation Area. The Conservation Area Management Planning group (CAMP) forums will provide an opportunity for conservation landowners to discuss completed and proposed stewardship issues on their properties including: management activities; research activities; research information; technical assistance; funding sources; and opportunities for collaboration.

c. The Great Bay Resource Protection Partnership

The Great Bay Resource Protection Partnership ("GBRPP" or "Partnership") is a group of organizations committed to protecting the important habitats of the Great Bay Region. Since 1994, the Partnership has operated as a unique cooperative effort intended to further collective conservation goals and promote conservation actions (Table 1).

Principal Partners are those organizations with a state-wide conservation presence that oversee the ongoing activities of the Partnership and serve as the primary policy making entity. The Principal Partners include:

- Ducks Unlimited, Inc.
- Great Bay National Estuarine Research Reserve
- New Hampshire Audubon
- New Hampshire Fish and Game Department
- Society for the Protection of New Hampshire Forests
- The Nature Conservancy, New Hampshire Chapter
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service, Great Bay National Wildlife Refuge
- U.S.D.A. Natural Resources Conservation Service

Associate Partners include the professionally staffed, non-profit conservation organizations with a service area that includes at least part of the Great Bay Focus Area, in which the organization purchases and owns land and/or interests in land.
The Associate Partners in the Great Bay Focus Area include:

- Southeast Land Trust of New Hampshire
- Bear Paw Regional Greenways
- Rockingham County Conservation District
- Strafford Rivers Conservancy
- Strafford County Conservation District

Community Partners include the twenty-four (24) municipalities and regional conservation and planning organizations in the Great Bay Focus Area (Figure 1).

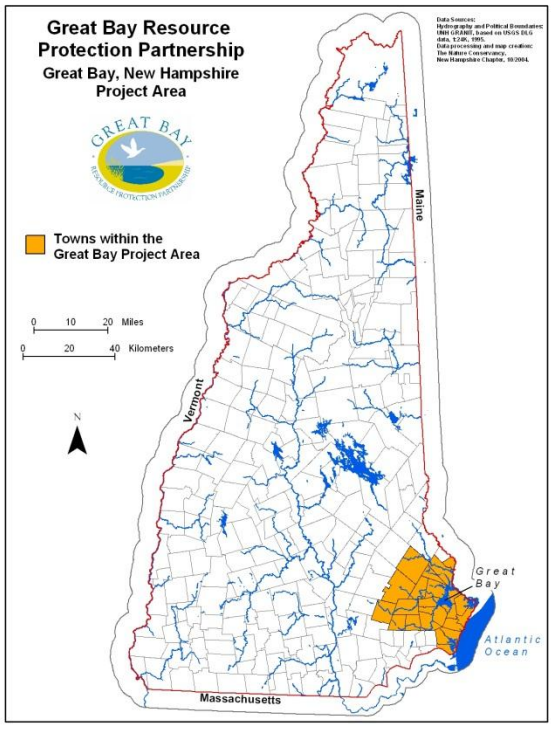


Figure 1. Map showing the 24-town Great Bay Focus Area for the Great Bay Resource Protection Partnership

The three program areas of the Partnership include Stewardship and Conservation Planning, Land Protection, and Recreation and Education.

Stewardship, Science and Conservation Planning: Foundations for Decision Making and Collaborative Resource Management

Partner organizations collaborate on research and applied science projects that help decision-makers address important resource management issues. Research on a broad range of issues inform the Partnership's land protection, management and stewardship activities.

Identifying Significant Habitat Areas

The Partnership's *Habitat Protection Plan* (1997, updated 2000) provides information about the important habitats and priority conservation lands in the region. Based on a habitat analysis of over 50 species of birds, fish and reptiles utilizing Geographic Information System mapping and field knowledge, over 14,000 acres were identified and organized into 25 Significant Habitat Areas that range from 400 to 10,000 acres.

Conservation Area Planning

Conservation Areas are geographic areas identified within Significant Habitat Areas. Ecological Studies conducted for Conservation Areas provide an inventory of species and important habitats. This valuable field data helps to direct the conservation activities of the Partnership from establishing land protection priorities to long term stewardship and management of protected conservation lands. Field data for the Crommet Creek Conservation Project Area has been incorporated into this management plan.

Stewardship Collaboration

Management decisions for protected properties are guided by both a landscape-scale plan and individual property management plans. Using resource characteristics and other factors, lands are managed for multiple conservation benefits including wildlife habitat, wetland protection and restoration, forests, fields, and recreation and education opportunities. The Partnership's continued conservation responsibilities include the collaborative management of protected properties from a landscape scale perspective that respects the integrity of the entire ecosystem. Stewardship among conservation

landowners includes designing common goals and sharing resources. The Crommet Creek Management Plan is an enactment of this collaborative approach to stewardship.

Land Protection: Steady Progress, Long Term Accomplishments

The Partnership uses a science-based approach to identify the most significant lands and then works with willing landowners on conservation options, including the purchase or donation of land and conservation easements. Since 1994, the Partnership has protected over 5,870 acres in thirteen communities surrounding Great Bay. The Partnership's steady progress has added to the over 46,392 acres of conservation land in the 24-town region. Land conserved by the Partnership protects valuable forests, open fields, wetlands and shorelines, and ensures continued public access and recreational opportunities. Working voluntarily with landowners, the Partnership offers conservation solutions based on the natural resource characteristics of the land and goals of the landowner.

Working collaboratively, the Partnership has been able to leverage land acquisition funds from the National Oceanic and Atmospheric Administration (NOAA) and North American Wetland Conservation Act (NAWCA) with additional funds from federal, state, municipal, non-profit & private sources, and landowner contributions.

Recreation and Education: Connecting People to the Land & Water

The seacoast of New Hampshire has become an increasingly popular recreation destination. To meet the needs of people while protecting sensitive natural areas, the Partnership seeks to provide quality public recreational and educational opportunities that are compatible with natural resource protection and management. The Partnership works closely with communities and local stewards to monitor activities. The Partnership conservation lands typically allow for traditional public uses such as fishing, wildlife and waterfowl hunting, and non-motorized recreational activities such as hiking, cross-country skiing, bird watching and canoeing/kayaking. Snowmobiles are permitted on designated state trails. Several properties in the Crommet Creek Conservation Area have limitations on public access and hunting. Detailed public access information for conservation properties is available on the Partnership website (www.greatbaypartnership.org).

GBRPP Conservation Goals

Table 1. Conservation Goals of the Great Bay Resource Protection Partnership

GBRPP Goals		
Goal # 1	**Migratory Bird Populations**	*To maintain or improve current distributions of waterfowl and other migratory bird populations, and to help maintain optimum population levels, distributions, and patterns of migration.*
Goal #2	**Wetland Ecosystems and Significant Habitats**	*To protect, enhance, restore, and manage an appropriate distribution and diversity of wetland ecosystems and other habitats essential and significant for migratory birds, fish, shellfish and other wildlife.*
Goal #3	**Exemplary Natural Communities**	*To protect, enhance, restore, and manage exemplary natural and characteristic natural communities and habitats for rare, threatened, and endangered species of animals, plants, and*

	and Habitats	*natural communities.*
Goal #4	**Recreational and Educational Opportunities**	*To protect natural areas that are important for aesthetic purposes and provide for quality public recreational and educational opportunities that are compatible with the waterfowl and wildlife resources and their management, and rare, threatened and endangered species and natural communities and their protection.*
Goal #5	**Landscape Management**	*To manage the project area from a landscape perspective that respects the integrity of the entire ecosystem.*

d. History of Land Conservation and Stewardship

There is a rich history of conservation and land stewardship around the Bay and in the Crommet Creek Conservation Area. Many of the families that settled in the early 1700s maintained ownership of their family lands for generations and continue to the present day.

1970s Community Activism in Crommet Creek

In 1973, oil tycoon Aristotle Onassis identified the Durham Point Road area - the Crommet Creek Conservation Area - as a potential location to develop the world's largest oil refinery. Promoters of the proposal claimed that the refinery would supply New England with a third of its oil needs, sending crude oil from a terminal at the Isles of Shoals to Concord Point in Rye and then into Great Bay in Durham. In preparation of this massive development effort, Onassis' team contacted landowners in the Crommet Creek Conservation Area in an attempt to secure options to purchase the land; they were met with mixed responses from landowners, with many prominent, long time families refusing to sell options on their lands.

Meanwhile, a local opposition group called SOS (Save Our Shores) was formed, and through an effective grassroots campaign countered the organized and well-funded refinery effort. Through a series of highly publicized events, the oil refinery proposal was defeated in 1974 both at the local level at Town Meeting and then through legislative action in the State Legislature.

Great Bay Conservation, 1980s - 1990s

The refinery fight fortified local appreciation for Great Bay and its resources at the local and state level. On a national and international scale, scientists were evaluating the estuary for its conservation significance. In 1986, the North American Waterfowl Management Plan – ratified by the United States, Canada, and Mexico – identified Great Bay as one of several focus areas for waterfowl conservation. The plan identified Great Bay's abundant wetlands and associated uplands as critical waterfowl wintering, migration and production habitat.

In 1989, the North American Wetland Conservation Act (NAWCA) was established by Congress, providing funding framework for partnership conservation efforts in the Great Bay focus area identified in the waterfowl plan. NAWCA's intent was to help conserve wetland ecosystems that are critical to waterfowl and other migratory birds, fish and wildlife. The act was aimed at encouraging partnership efforts of federal,

state and local governments, private non-profit organizations and private landowners to protect habitats in priority areas.

The late 1980s and early 1990s also marked several significant land conservation actions on Great Bay. In 1989, the Great Bay was designated as one of several National Estuarine Research Reserves around the country. The designation in this program, administered by the National Oceanic and Atmospheric Administration (NOAA), helped secure funding and resources for land protection, research, stewardship and conservation measures for the area adjacent to the Bay and the surrounding environs.

Also during the late 1980s the largest landowner on Great Bay, Pease Air Force Base, was slated for closure by the military. In 1992, the Great Bay National Wildlife Refuge was established, consisting of about 1,100 acres of the former base – including seven miles of shoreline on the Bay.

Additional conservation lands held by the town, state and a nonprofit conservation organization were added to the Crommet Creek Conservation Area during this period:

- The New Hampshire Fish and Game Department's 80 acre Adam's Point property (1961), located in Durham.
- The Town of Durham's 73-acre Longmarsh Preserve. The Preserve includes three parcels Colby Marsh, Horsehide Creek and Langmaid Farm (purchased between 1972 – 1980).
- The New Hampshire Fish and Game's Smas easement, located in Newmarket was protected through the Land and Water Conservation Program.
- The Nature Conservancy's Durham Point Sedge Meadow Nature Preserve.

Growth and Change in the Great Bay Region

The Crommet Creek Conservation Area is located in the Town of Durham (Strafford County) and the Town of Newmarket (Rockingham County) - an area that has sustained varying cycles of growth since the 1950s.

The State of New Hampshire's population more than doubled from 1950 through the end of the 1990s. New Hampshire was the fastest growing state in New England during this period (Sundquist & Stevens 1999). Between 1990 and 1998, the state's population grew 6.8%, a gain of 76,000 additional people. The development pressures impacting the seacoast of New Hampshire began to escalate during the 1970's through the 1990's. Rockingham and Strafford counties have historically led the state with the fastest rate of growth in population gains and housing starts. The economic downturn in the late 1980's and then in the early 1990's only temporarily tempered growth rates in the region. The rate of growth accelerated in the first part of the 1980's and again in the late 1990's.

Despite the impacts of the economic downturn in late 2000s, there has continued to be measurable population gains in the seacoast and the State. The State's population growth from 2010 to 2030 is projected to increase 13.5%. The projected population increase during this period for Strafford and Rockingham Counties are 11.1% and 12.5% respectively (OEP 2010). The amenities that have attracted past periods of growth are expected to support additional growth in the future. Much of the projected future growth is anticipated to follow the trend toward rural residential, resulting in sprawl development impacts such as habitat fragmentation.

Great Bay Resource Protection Partnership Land Protection Activities

The Partnership's *Habitat Protection Plan* identified the Crommet Creek Conservation Area as a priority protection area within the Great Bay region. The Crommet Creek Conservation Area was the first priority area the Partnership focused its land protection efforts, beginning in 1994. Funding from a North American Waterfowl Conservation Act (NAWCA) grant enabled the acquisition of the first two properties – NHFG 5c and 5d - in 1996. The successful implementation of the first NAWCA grant was followed with additional NAWCA grant funding, and continued purchases of land and conservation easements in the Crommet Creek Conservation Area.

In addition to NAWCA funds, other federal, state, municipal and private sources of funds have been utilized in the Crommet Creek Conservation Area. A primary source of funding for the Partnership's conservation activities since 1997 through 2010 has been provided by the National Oceanic and Atmospheric Administration, in collaboration with the Great Bay National Estuarine Research Reserve. Other sources include private foundations, private fund raising efforts by nonprofit conservation organizations, state and municipal funds. Several Crommet Creek landowners that have sold their land or a conservation easements have made charitable contributions by making a 'bargain sale' - accepting less than the full appraised value of land and / or a conservation easement.

As of January 2012, the Partnership has protected 105 properties totaling 5,870 acres (Figure 2). Thirty-six of those conservation properties, or 1,787 acres, are located in the Crommet Creek Conservation Area (Figure 2). Combined with other conservation lands, protected by municipalities, the state and non-profit conservation organizations, the Crommet Creek Conservation Area includes 53 properties totaling 2,425 acres of conservation land (Figure 3).

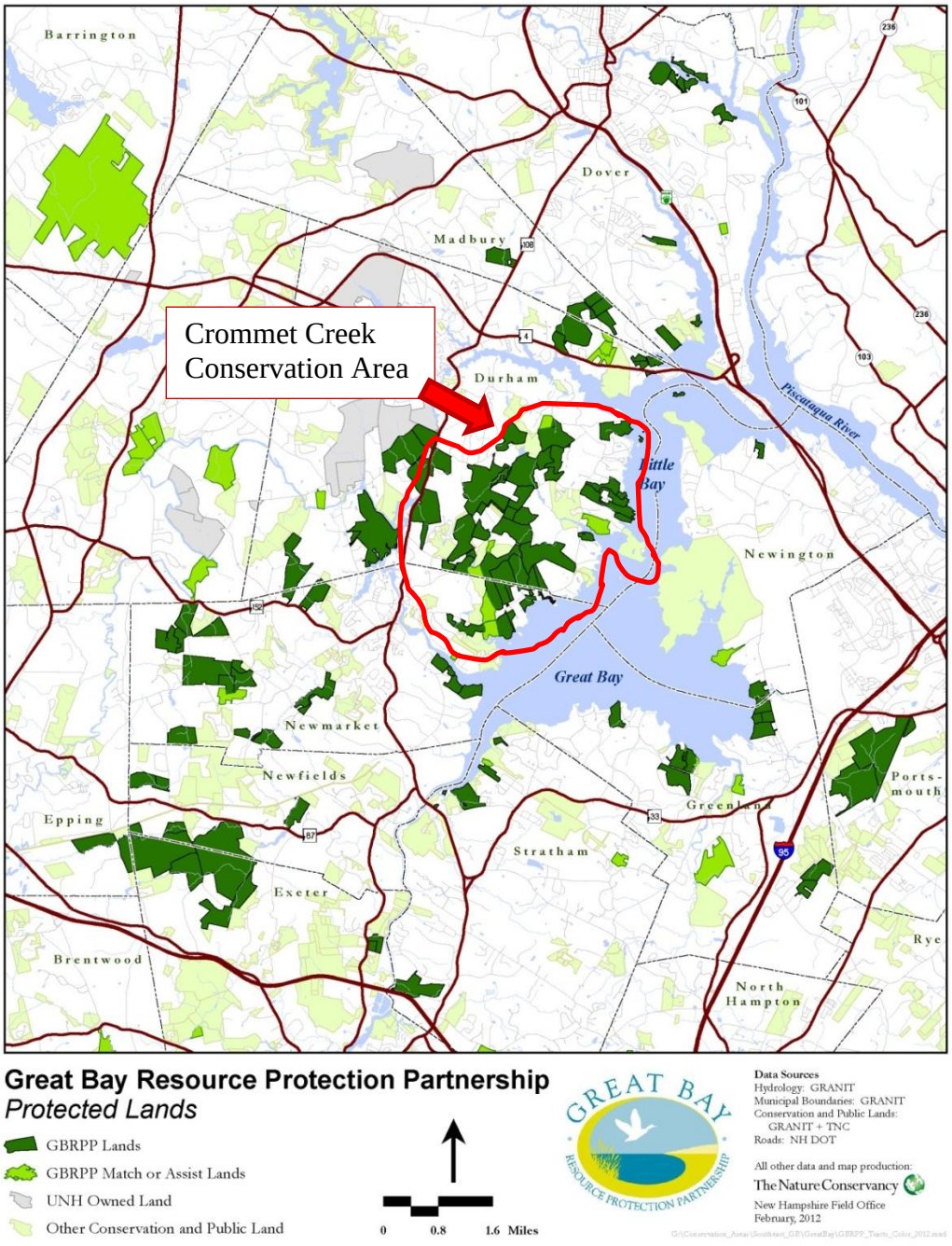


Figure 2. Map showing the lands protected by the Great Bay Resource Protection Partnership to date, and the approximate boundary of the Crommet Creek Conservation Area.

Table 2. Conservation Land owned in Fee by Conservation Organization within the Crommet Creek Conservation Area

Conserved Area Name	ID # on MAP	Property Name	Owner	CE Holder	Acres	Year Protected
Adams Point	1	Adams Point	NHFG		70.5	196X
Browne Center	2	Browne-Beckworth	UNH	NHFG	23	
Dame Forest	3a	Minichello	SPNHF		95	1997
	3b	Ryan	SPNHF		21	2005
	3c	Sawtell	TNC (transfer pending to SPNHF)		40	2001
Durham Point Sedge Meadow	4a	Chase 2	TNC		78.3	2000
	4b	Chase 1	TNC		17.8	2000
	4c	Chase C.	TNC	SPNHF	3	2000
NH Fish and Game / Great Bay NERR Wildlife Management Area	5a	Atherton	NHFG		0.7	2010
	5b	Baker	NHFG		17	2004
	5c	Cheney North	NHFG		44	1996
	5d	Cheney South	NHFG		132	1996
	5e	Gowdy & Farrell	NHFG		55	2003
	5f	Keefe	NHFG		15	2003
	5g	Kitfield	NHFG		64	2003
	5h	Newsky	NHFG		20	2002
	5i	Piecuch	NHFG		29	2000
	5j	Pitman I /Zuk	NHFG		45	2007
	5k	Powers	NHFG		92	2003
	5l	Rollins	NHFG		10	2002
	5m	Solomon	NHFG		92	2002
	5n	Willey	NHFG		82	2004
	5o	Klein	NHFG		37.2	2008
	5p	Pitman/Zuk/ContAdvs	NHFG		3.6	2007
	5q	Wilcox Point	NHFG		35	
Longmarsh Preserve	6a	Langmaid Farm	Town of Durham		11.5	1972
	6b	Colby Marsh	Town of Durham		50	1972
	6c	Horsehide Creek	Town of Durham		11.5	1980
	6d	Willey	Town of Durham		30.5	1955
Lubberland Creek Preserve	7a	Averhill	TNC		9	2006
	7b	Billeter	TNC		11	2001
	7c	Gonet	TNC		27	2003
	7d	Homiak	TNC		89	1999
	7e	Knox	TNC		90	1999
	7f	Pazdon	TNC		6.4	2006
	7g	Smas	TNC		32	2005
	7h	Cochrane	TNC		13	1997
Subdivision Openspace	8a		Town of Newmarket		22	
	8b		Town of Durham		59	

Table 3. Privately Owned Land Protected by Conservation Easements in the Crommet Creek Conservation Area

Property Name	ID # on MAP	Owner	CE Holder	Acres	Year Protected
Borner (CE)	9	private	TNC	46	2000
Langley (farm, CE)	10	private	TNC	56	2006
Langley (woodlot, CE)	11	private	SPNHF	31	2006
Pearson (field, CE)	12	private	TNC	40	2000
Pearson, (woodlot, CE)	13	private	NHFG	75	2000
Popov (CE)	14	private	TNC	16.7	2007
Popov (Woodlot)	15	private	NHFG	62.4	2007
Popov III & IV	16	private	NHFG	91	2009
Rollins II (CE)	17	private	TNC	77	2002
Rollins III (CE)	18	private	TNC	56.6	2008
Winecellar	19	private	NHFG	210	2003
McPhee	20	private	NHFG	67.3	
Graf	21	private	NHFG	28	

Conservation Easement on Great Bay (private,12)

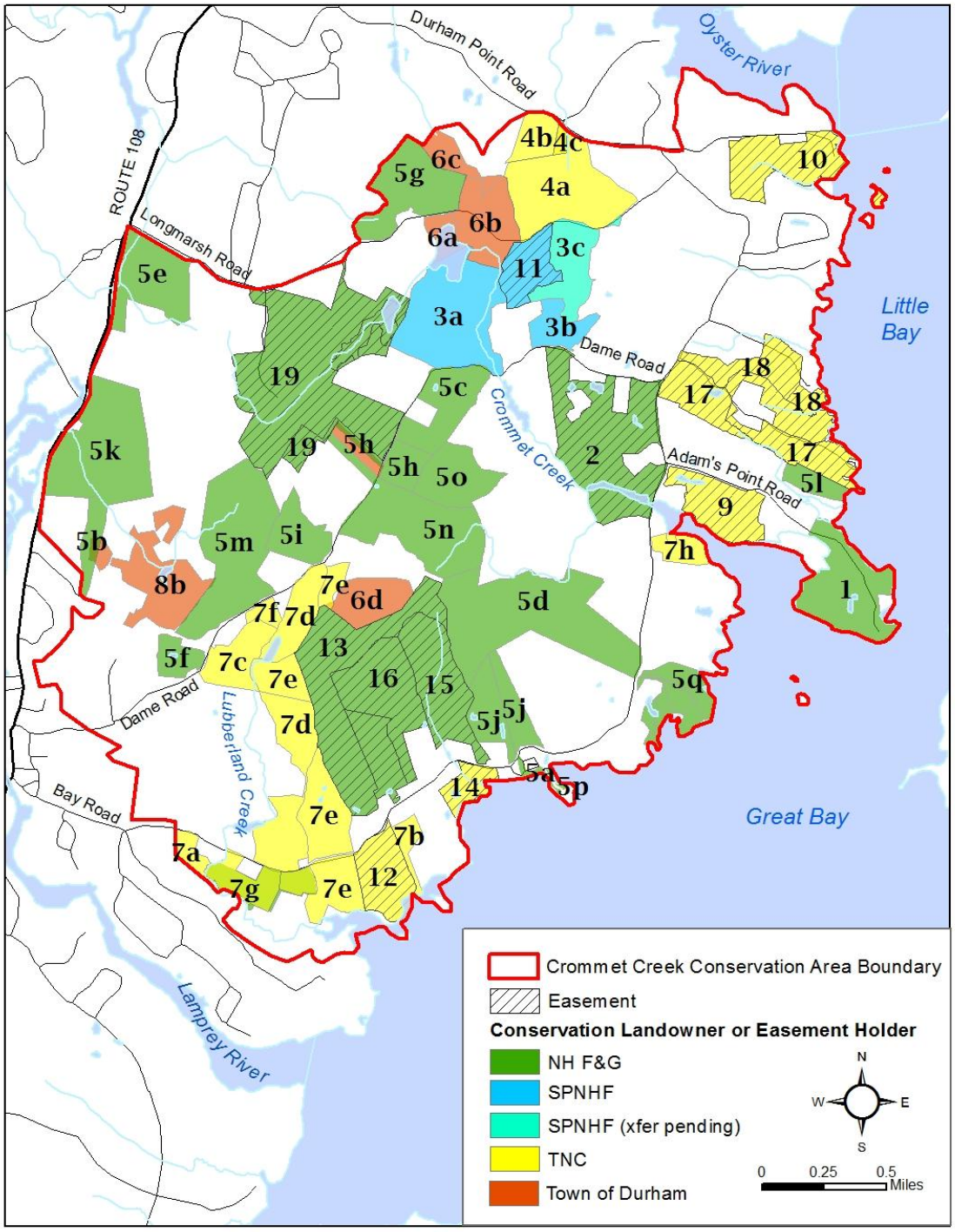


Figure 3. Conservation land and ownership within the Crommet Creek Management Plan boundary. Refer to Table 2 & Table3 to link property information to labels shown on map.

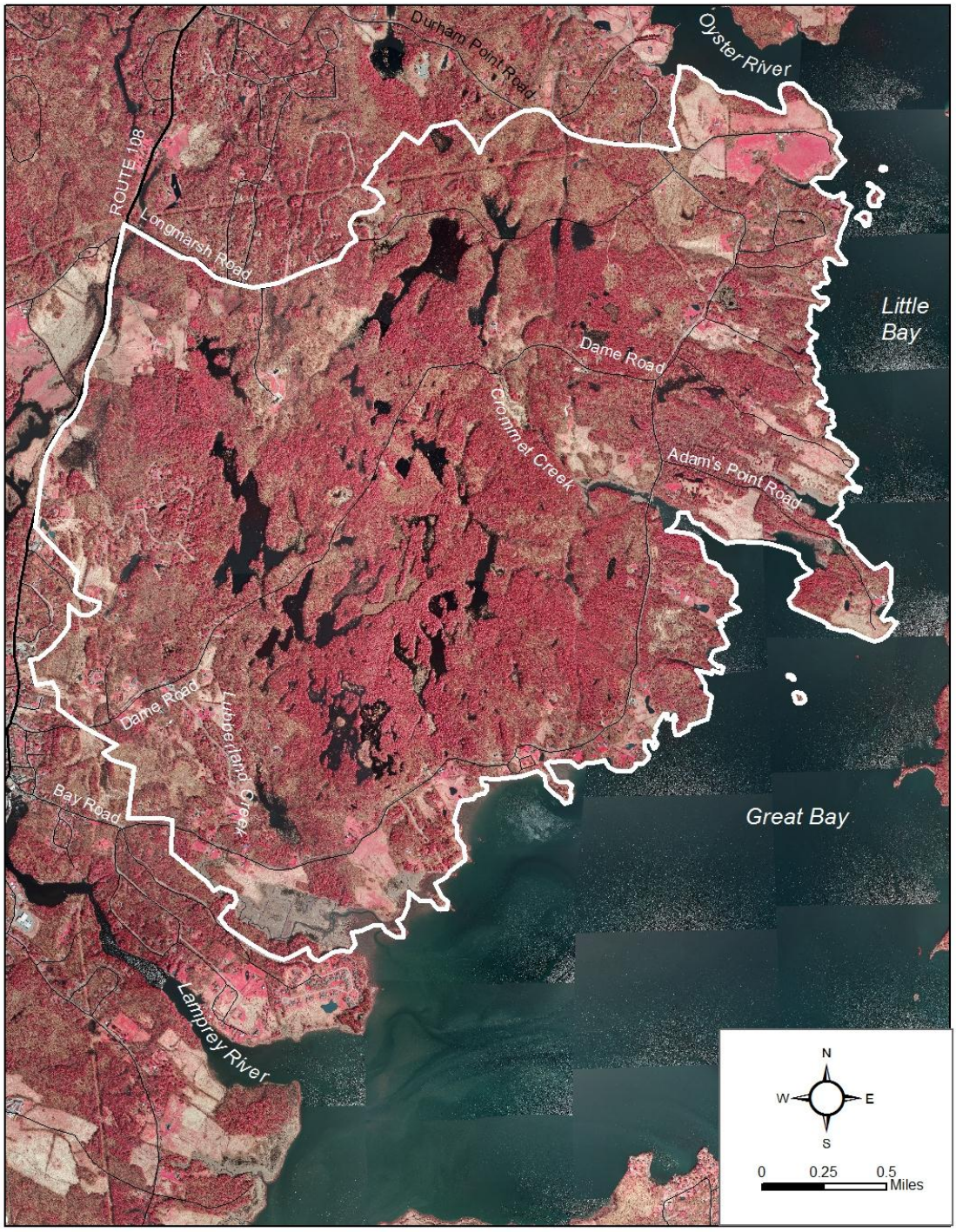


Figure 4. Leaf-off, color infra-red, aerial photograph of the Crommet Creek Conservation Area (source: NAIP, 2010).

III. Landscape Features

a. Geomorphology

Bedrock geology underlying Great Bay and Little Bay is primarily metamorphic and falls under two basic types: the Kittery and Eliot Formations (Figure 5). The dark gray, highly erosion resistant slate of the Kittery formation is visible as outcrops along the northern and western shores. The Eliot Formation along the eastern and southern shoreline is composed of slate and pyllite. Both Formations form outcrops and ridgelines where it is exposed, creating a landscape with folded microtopography. Large outcrops of the slate serve as an important source of stable substratum for macroalgal attachment and contribute to the shingle beach common around Great Bay. These outcrops and shingle beach formations are especially evident at Adams Point. Throughout the Crommet Creek area, a granite intrusion of Exeter diorite comprising the Exeter pluton (i.e. part of the Hillsboro plutonic series) is present (Figure 5). Exeter Diorite is composed of Devonian age rock (395-345 milllion years old) that is highly variable in composition, from nearly pure granite to a basalt-like metamorphic rock called gabbro (Van Diver 1987).

The region surrounding the Great Bay is included in the Seaboard Lowland section of the New England Province. The most recent glaciation of the area ended in the Wisconsin stage of the Pleistocene epoch (10,000 to 20,000 years ago). The glaciation proceeded through the area in a southeasterly direction, resulting in the orientation of the many landscape features such as drumlins in the area. As the glaciers were receding from the area approximately 15,000 years ago, the melting ice released and resorted sediment. Sand, coarse sediment, and till were deposited further north while fine sediment – silts and clays – were washed out to sea or settled in valleys and silt plains.

Crustal depression from glacial weight was on the order of 12.2 m (40 ft.). The weight of the ice depressed much of the land mass that currently makes up New Hampshire's Seacoast area, and as the glaciers melted, it formed a shallow coastal sea that at one time spread 15 to 20 miles further inland. In fact, the Lamprey and Piscassic river basins show evidence of having been an inland estuary at one point (Strafford 1998). After glacial melt, crustal rebound slowly occurred. However, the uplift was not uniform throughout the region and Great Bay and Little Bay represent sagging along the surface. The low-lying area was filled by rising sea level from glacial melting. Thus, the Great Bay estuary is representative of a drowned-river valley. Present sea level was reached approximately 3,000 to 5,000 years ago.

Most of the ridges and high ground are formed by bedrock, with till and fine sediments filling in the silt plains and valleys. Forests reflect this pattern, with hemlock and pine growing on the thinner soils over bedrock and Appalachian hardwoods (e.g. oak, hickory, black birch, and other deciduous trees) growing on the deeper, "sweeter" soils. Much of the Crommet Creek Conservation Area has a highly diverse forest structure and composition, reflecting the rolling bedrock ridges and swale microtopography of this region.

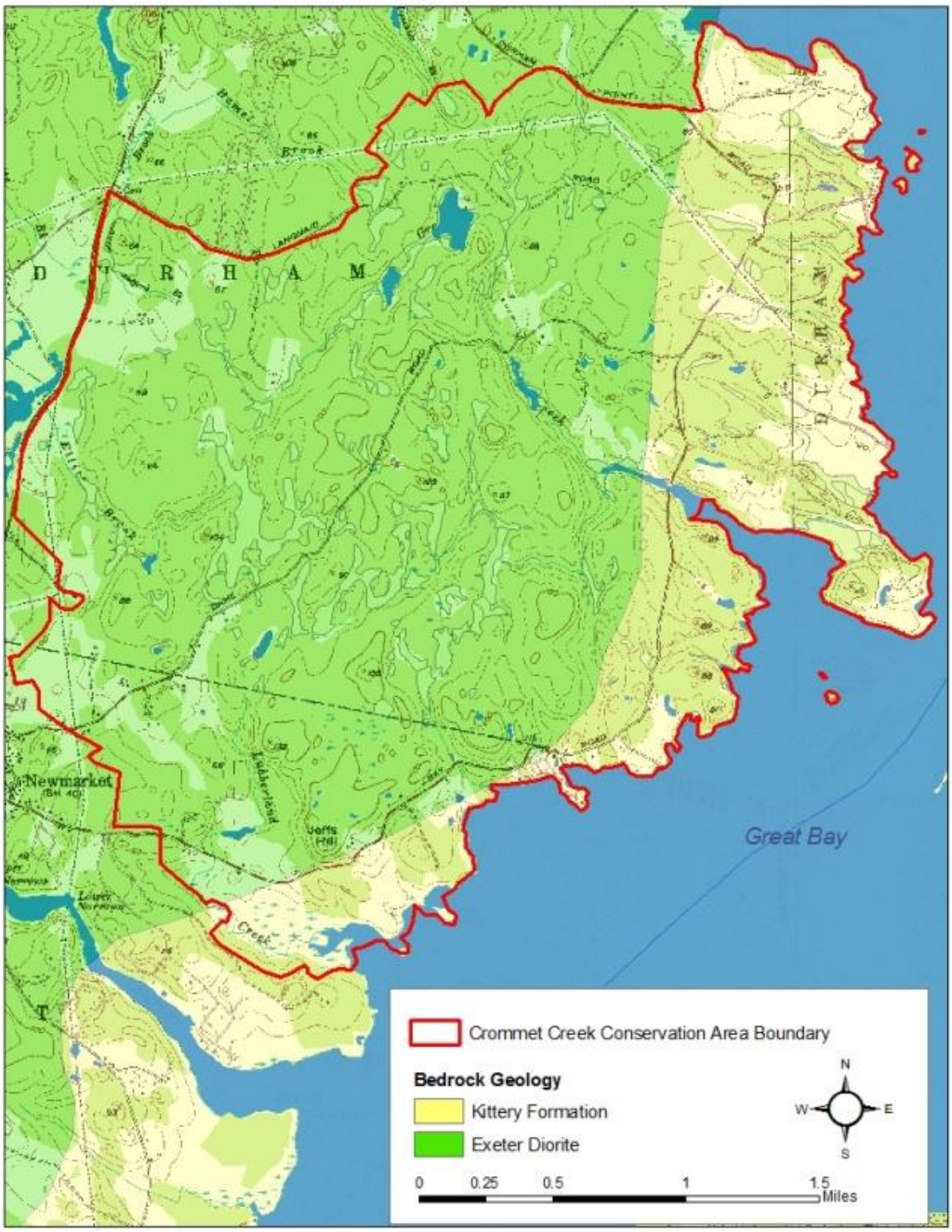


Figure 5. Bedrock Geology of the Crommet Creek Conservation Area.

b. Soils

The soils within the Crommet Creek Conservation Area are primarily defined by well-drained associations that overlie till or poorly-drained soils overlaying the marine silts or clays (Table 4). Hydric soils account for approximately 1,000-acres or 20% of the total project area (Figure 6).

The fields and farms in the Crommet Creek Conservation Area occur on high quality and productive soils that are the result of their source material: marine silts and clay mineral soil. Approximately 200-acres of the Conservation Area or 4%, is recognized as Prime Farmland due to its Buxton-silt loam soils.

In addition to hydric and prime agricultural soils, there are abundant Important Forest Soil Groups within the Conservation Area that support productive forest growth (Figure 6). Soils Group IA and IB are fertile soils, with favorable soil moisture regimes, and tend to support higher quality, late successional hardwoods, such as maple and beech. Soil Group IB tend to be more sandy and less fertile, but still support high quality timber growth. There are many types of soils in these forest groups: several examples (Group IA and IB) include Charlton fine sandy loams and Boxford silt loam. Many, if not most, prime farmland soils are also highly fertile forest soils.

Marshes bordering streams such as Crommet and Lubberland Creeks are generally sulfihemists. The fringing marshes also have sulfihemist soils of varying thicknesses and overlaying a variety of substrata. The sulfihemist soil type has slow internal drainage, a very high water table and contains high amounts of organic matter and sulfitic minerals.

In the uplands, the primary soil associations found in Crommet Creek area are Hollis-Charlton-Buxton-Merrimac-Scantic. These soil associations range from well drained to poorly drained depending on the amount of marine silt and clay deposits.

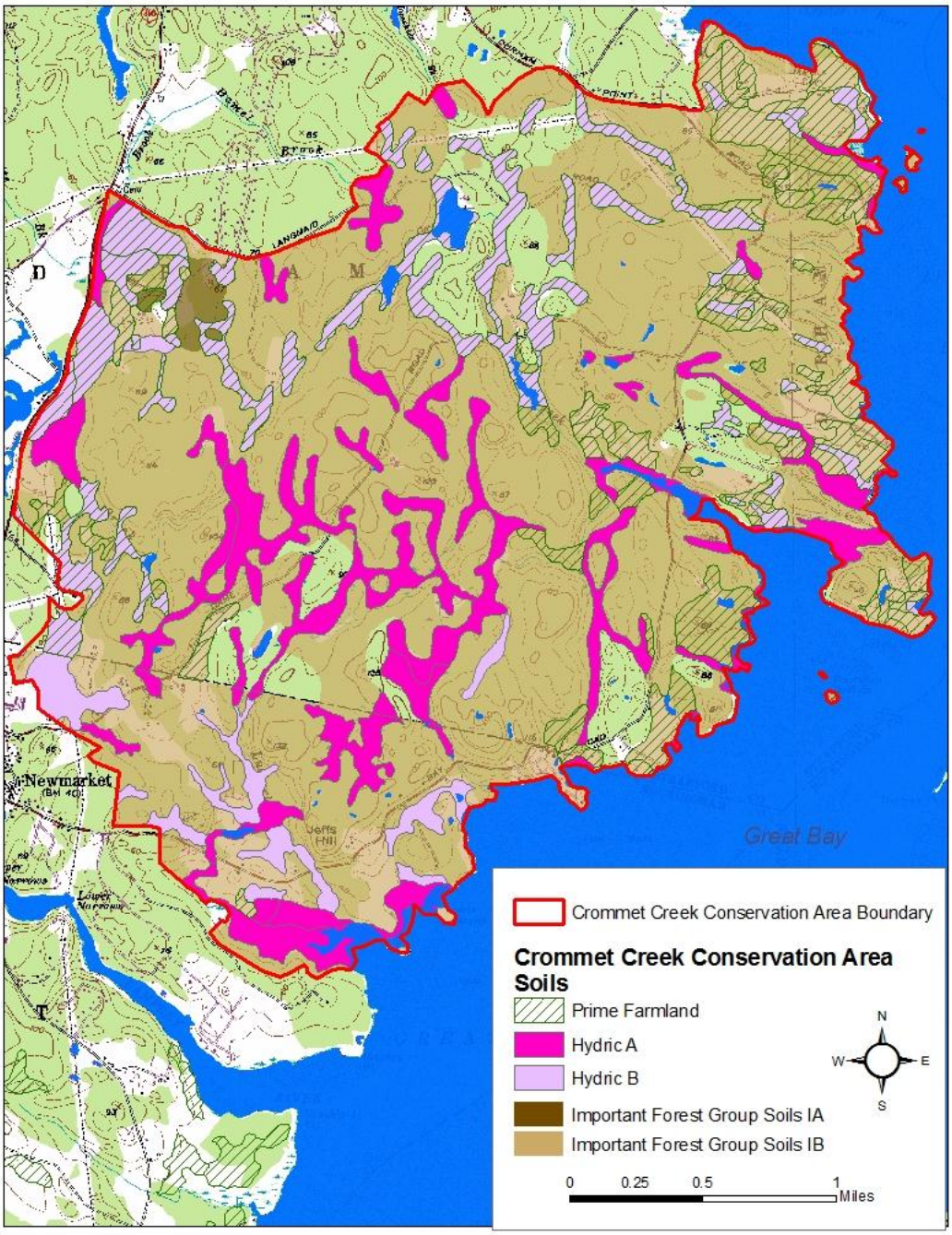


Figure 6. Soils of the Crommet Creek Conservation Area.

Table 4. Soil types within the Crommet Creek Conservation Area

Soil Name	*Drainage*	*Hydric*	*Prime Farmland*	*Erodible*	*Parent Material*	*Acres*	*%*
HOLLIS-CHARLTON FINE SANDY LOAMS COMPLEX	Well drained	N	N - locally important	Potentially – highly	Till	3071	69
SCANTIC SILT LOAM COMPLEX	Poorly Drained	Y	N - locally important	N - potentially	Marine /Lacustrine sediments	353	8
MUCK AND PEAT	Very Poorly Drained	Y	N	N/A	Organic Material	220	5
BIDDEFORD SILTY CLAY LOAM	Very poorly drained	Y	N	N	Marine /Lacustrine sediments	189	4
BUXTON SILT LOAM	Moderately well drained	N	Y	potentially	Marine /Lacustrine sediments	183	4
SCITICO SILT LOAM	Poorly Drained	Y	N	N	Marine /Lacustrine sediments	102	2
TIDAL MARSH	Very poorly drained	Y	N	N/A	Organic Material	89	2
BOXFORD SILT LOAM	Moderately well drained	N	N	N	Marine /Lacustrine sediments	87	2
SUFFIELD SILT LOAM	Well Drained	N	N - Statewide important	highly	Marine /Lacustrine sediments	44	1
FRESH WATER MARSH	Very Poorly drained	Y	N	N/A	Organic Material	25	0.5
CHARLTON VERY STONY FINE SANDY LOAM	Well drained	N	N	potentially	Till	22	0.5
LEICESTER-RIDGEBURY VERY STONY FINE SANDY LOAMS	Poorly drained	Y	N	N	Till	13	0.3
SUTTON VERY STONY FINE SANDY LOAM	Moderately Well drained	N	N	potentially	Till	11	0.2
HOLLIS-GLOUCESTER VERY ROCKY FINE SANDY LOAMS COMPLEX	Well drained / somewhat excessively drained	N	N	Potentially - highly	Till	6	0.1

c. Landscape Overview

The Crommet Creek Conservation Area includes a great diversity of natural communities and wildlife habitats due in large part to the diverse soils, topography, and water salinities, the land use history, and the ever-present influence of beaver activity on the current status of streams and wetland structure within the watershed. In addition, the Crommet Creek Conservation Area is located in New Hampshire's narrow coastal zone where the moderate climate allows for many southern species of plants to reach their northern limits.

Forests

As with much of the state, the land within the Crommet Creek Conservation Area was cleared of trees for much of the 1800s and was either planted with crops or fruit trees, or used for livestock pasture. Although the majority of these farms have been abandoned and the land has since reverted back to forest, remnants of this past land-use are evident throughout the Conservation Area. Stonewalls criss-cross throughout the Conservation Area marking former field edges and the walls of sheep pastures. Live and dead specimens of eastern red cedar (*Juniperus virginiana*) are commonly found in the understory of the current forested land. This tree species can only become established in open, sunny locations, such as a pasture. The wide open crowns of stately wolf trees are being crowded by young second-growth tree species. In addition, many landowners continue to harvest trees on their land for firewood, timber sales, and habitat management. Consequently, the general age of the forest within the Crommet Creek Conservation Area is quite young. With the forest being in an early successional or managed state, it is frequently difficult to neatly match the forest types found within the Conservation Area to the Natural Communities of New Hampshire forest types as defined by Sperduto & Nichols (2004). That being said, there does appear to be five main forest types within the Conservation Area that appear to be correlated with soil type, moisture, and land use.

Hemlock-beech-oak-pine forest

The well drained glacial till soils within the Conservation Area tend to support **hemlock-beech-oak-pine forest** (S5). This plant community is commonly found in mid-low elevations throughout the state. Within the Crommet Creek Conservation Area, it is common to find early and mid-successional species such as red maple (*Acer rubrum*), white pine (*Pinus strobus*), and paper birch (*Betula papyrifera* var. *papyrifera*) abundant in the canopy, and species more commonly associated with later successional Hemlock – beech – oak – pine forests including hemlock (*Tsuga canadensis*) and American beech (*Fagus grandifolia*) dominant in the subcanopy and shrub layer. Often times the dense shade cast by the hemlock subcanopy results in little herbaceous species cover throughout this community. Scattered individuals of Canada mayflower (*Maianthemum canadense*), white pine and hemlock seedlings, marginal wood fern (*Dryopteris marginalis*), and moss can be infrequently found growing on the thin soils and in cracks in exposed bedrock and boulders. Good examples of this community type can be found on the NHFG #52 and the TNC-SPNHF #3c.

Hemlock-beech-oak-pine forest (S5) – NHFG 5n

Dry oak forests

Variants of the hemlock – oak – beech – pine forest found within the Conservation Area include **dry Appalachian oak-hickory forest** (S1S3) and the **dry red oak – white pine forest** (S3S4). These forest types are common throughout southern NH and are both considered classical old-field successional communities. Within the Conservation Area they tend to occur on more rocky and drier soils, and are often described from the more recently logged areas. Consequently, these forest types may simply be present within the Conservation Area because of this past forest disturbance, and if allowed to mature without future disturbances would follow the same pattern of succession as the hemlock – beech – oak – pine forest. However, the dry and shallow sandy soils, the presence of dry-site species, and the relative low abundance of white pine found in the forests does suggest this forest community may persist for an extended period of time in some areas. These forest type differs from the previous forest type due to a more open canopy allowing abundant dry site shrubs and herbaceous species to be established in the understory. Also, the Appalachain oak-hickory forest contains southern species that reach their northern range in NH including white oak (Quercus alba), black oak (Quercus velutina), and shagbark hickory (Carya ovata). In both cases, oak species are the dominant canopy tree, often with many resprouts due to past land management. The vegetated forest floor can sometimes be carpeted with a lawn of sedges, or be dense with huckleberries, blueberries, and bracken ferns.

Moister site and more species rich Appalchian oak and oak-hickory forests

Two variants of Appalachian oak – hickory forests also occur less frequently throughout the Conservation area. Lower and moister microsites within these forests often support **mesic Appalachian oak – hickory forest** (S2S3). These pockets of low nutrient, mesic soils tend to support more moisture loving plant species as well as dense poison ivy. Rocky till hillsides, and enriched talus slopes within the Conservation Area support **rich Appalachian oak rocky woods** (S1). This rare forest type is similar in canopy trees to the mesic Appalachian oak – hickory forest, but also supports many

herbaceous species that require enriched soils such as hepatica, ebony spleenwort, and butternut. Good examples of Appalachian oak – hickory forests can be found on the TNC 7c, and the NHFG 5h.

Dry red oak – white pine forest (S3S4) – NHFG 5n

Dry Appalachian oak – hickory forest (S1S3) – TNC 7c

Wetlands

The wetlands within the Conservation Area are similarly diverse, supporting a great deal of wetland habitat types in a relatively small geographic area. Two main streams flow through the Conservation Area: Lubberland and Crommet Creeks. Extensive beaver activity occurs along the length of both these streams creating a wealth of diverse and dynamic wetland habitats that supports an abundance of wildlife and floristic diversity.

Overall, the majority of the wetland habitat within the Conservation Area can be defined as an **Emergent Marsh – Shrub Swamp System** as described by the New Hampshire Natural Heritage Bureau (Sperduto 2004). This wetland system is frequently linear in nature, following stream corridors or pond margins, and having distinct zones of plant communities that correspond to water depth, flooding regime, and soil substrate.

In general, the permanently flooded, deepwater zone in the middle of active beaver ponds support a community of floating aquatic plants such as water shield, water lilies, and other plants common to the **Aquatic Bed (S4S5)** natural community. In the semi-permanently flooded zone closest to the open water, a ring of **Emergent Marsh (S4)** is commonly found. This zone is occupied by spongy-tissued herbaceous plants such as arrow-heads and bur-reeds. The seasonally flooded shallower water zone around the edges of the beaver ponded wetlands, in shallow back-waters, and along stream edges are commonly occupied by either the many tall grasses and sedges that make up a **Tall Graminoid Emergent Marsh (S4),** a **Cattail Marsh (S4) or Peaty Marsh (S4).** However, in areas where beaver activity has somewhat subsided, these plant communities are succeeding into a **Mixed tall graminoid – scrub shrub marsh (S4S5)**, where woody species such as blueberries, winterberry, and meadowsweet are becoming established on the raised tussocks**.**

Aquatic Bed community
NHFG 5d

Cattail Marsh with beaver chewed trees in foreground – TNC 7d

Emergent Marsh
NHFG 5d

Mixed Tall Graminoid – Scrub Shrub Marsh
NHFG 5g

Tall Graminoid Emergent Marsh – on perimeter of beaver pond.
NHFG 5m

Forested seep
NHFG 5j

The wetland diversity within the Conservation Area is not restricted to the stream corridors. **Vernal pools, forested seeps**, and other isolated wetlands and basin swamps are common throughout. In addition, the high groundwater table in many areas in conjunction with the enriched marine soils has created seepage swamps of great floristic diversity. Several of the **herbaceous seepage marshes (S3)** and forested seepage swamps within the Conservation Area contain rare plants, only known to occur in these nutrient rich situations.

Buttonbush basin swamp
NHFG 5j

Vernal pool
NHFG 5j

Herbaceous seepage marsh
TNC 7c

Low marsh along Lubberland Creek
TNC 7g

Intertial Habitats

The Crommet Creek Conservation Area sits on the shores of the tidal Great Bay Estuary. The coastal shoreline supports numerous intertidal habitats. Most of the Crommet Creek Conservation Area shoreline on Little Bay and Great Bay is a short steep bank of exposed and crumbling slate bedrock. This **intertidal rocky shoreline (S3)** supports a community of macroalgae and crustaceans, but is too steep to support more than a thin fringe of **low salt marsh (S3)**. Broad expanses of **high salt marsh (S3)** are only found at the mouths of Lubberland and Crommet Creek. The salt marsh at the mouth of Lubberland Creek is the second largest expanse of high salt marsh within the Great Bay Estuary, and is known to support populations of salt-marsh sparrows. Within the salt marshes are numerous **salt pannes and pools (S3)** where tiny mummichugs take refuge in great numbers. Beyond the salt marshes and rocky shoreline habitat is a broad expanse of **saline/brackish intertidal mud flats (S3)** and **eelgrass beds (S1)**. At low tide 1,200-acres of mud flats are exposed in both Great and Little Bays, and over 2,000-acres of eel grass beds grow in the deeper water areas of Great Bay.

High marsh along Lubberland Creek
TNC 7g

Fringe of Low Salt Marsh and intertidal mud flats of Crommet Creek
TNC 7h

Intertidal rocky shoreline with macroalgae
TNC 7h

Agriculture

Although much of the agricultural land within the Conservation Area has been abandoned and allowed to revert back to forest, a few farms and open lands still exist. These lands are managed as small family farms, and some of the current uses include hay production and pasture. These open grasslands can provide excellent wildlife habitat to declining species of grassland nesting birds such as bobolink and eastern meadowlark if managed appropriately.

In addition to losses in open lands within the Conservation Area, there has also been a considerable loss of early successional shrublands. The wildlife species that breed and live in dense shrublands of early successional species have also seen declines in their populations as the New England forests have been allowed to mature. Small patches of more recently abandoned fields support early successional habitats within the Conservation Area. In addition, due to the numerous wildlife benefits, there is much interest in creating more patches of this specific habitat within the Conservation Area.

Open field habitat
Landowner - TNC 10

Early successional shrubland
TNC 7d

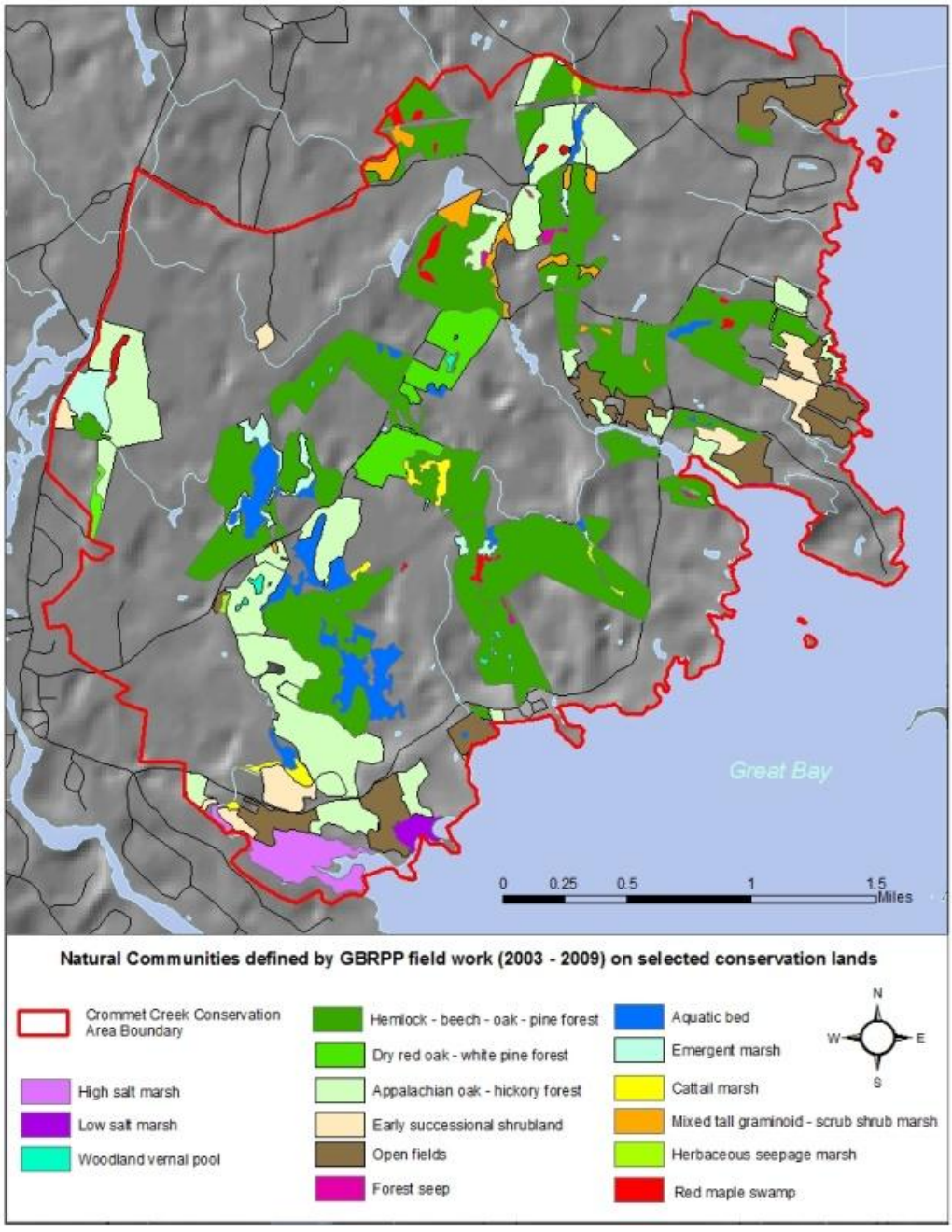


Figure 7. Natural Communities on selected conservation lands within the Crommet Creek Conservation Area defined by GBRPP field work from 2003-2009.

The State of New Hampshire's Wildlife Action Plan ("WAP"), completed by New Hampshire Fish and Game Department (2007), recognizes several large and small-scale wetland and upland habitats of conservation importance in the Crommet Creek Conservation Area (Figure 8). These habitats include:

- Appalachian oak pine forest
- Wet meadow / shrub wetland
- Grasslands
- Peatlands
- Floodplain forest
- Salt marshes
- Coastal islands

The WAP identifies the Appalachian oak pine forest, coastal islands, grasslands, and salt marshes as habitats of greatest risk in the state due to factors including development, climate change, recreation, and introduced species.

Appalachian oak –hickory forest (private, 12)

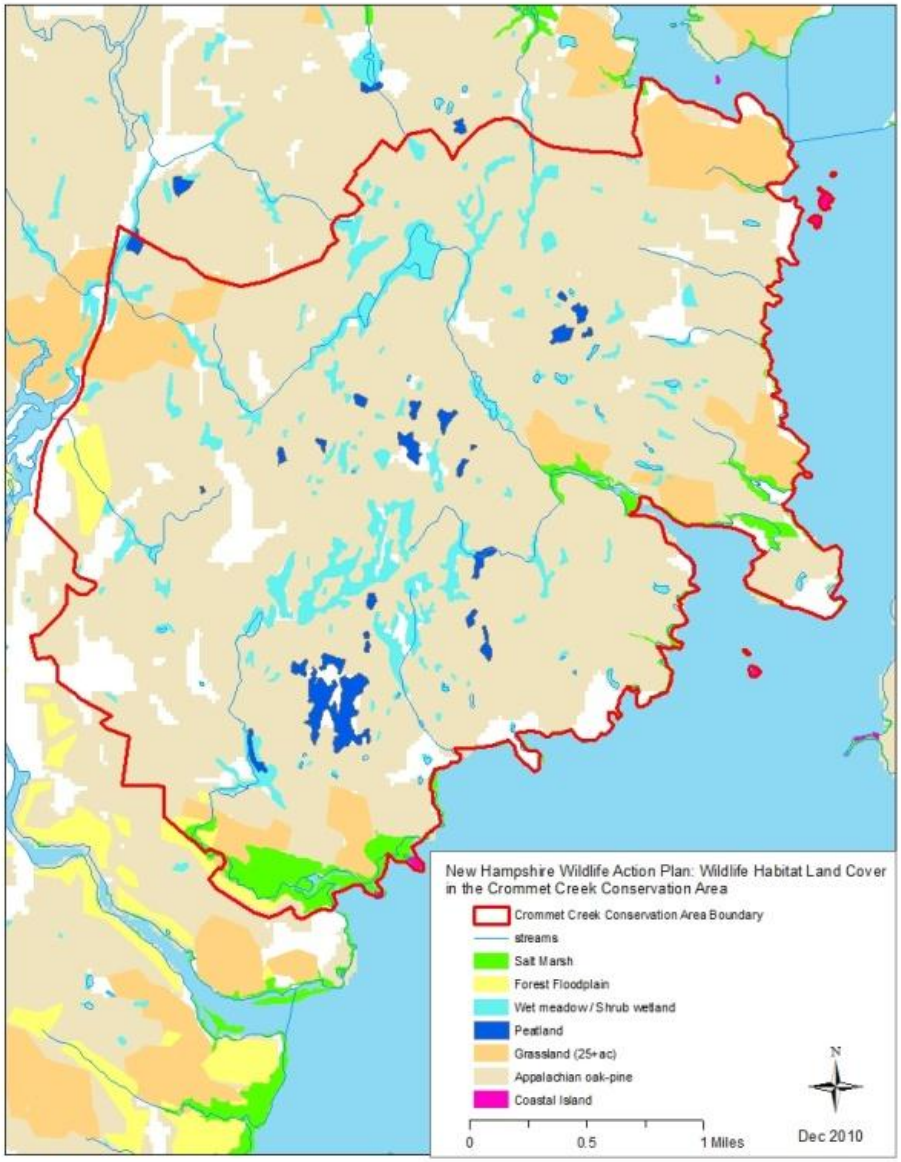


Figure 8. Wildlife Habitat and Land Cover Map of the Crommet Creek Conservation Area from the New Hampshire Fish and Game Wildlife Action Plan.

Additionally, the Crommet Creek Conservation Area is within a "Core Conservation Focus Area" as identified by the *Land Conservation Plan for New Hampshire's Coastal Watershed* (Zankel et al 2006). This plan identified core areas using ecological factors such as unfragmented forest block size (>1000-ac), stream watershed condition (minimal development in the basin and natural riparian buffers), and presence of rare species or exemplary natural communities.

The Crommet Creek Conservation Area is one of the largest unfragmented forest blocks in the Great Bay watershed. It has been recognized as a conservation priority at the state and ecoregional scale (Andersen et al 2006). Forty percent of the North Atlantic

Coast has been lost to land conversion from forest or farmland to development. As such, the contiguous and ecologically complete forest ecosystems that once dominated this coastal eco-region are now largely young, simplified and heavily fragmented by roads and development (NAC Ecoregional Assessment, Anderson et al 2006). Therefore, the remaining contiguous blocks of unfragmented, naturally vegetated lands within this eco-region are themselves an endangered species and deserving of priority conservation efforts and strategic and careful land management.

d. Human Land Use History and Cultural Features

Early Inhabitants

The arrival of the Native Americans, now known as the seacoast of New Hampshire, is estimated to date back as far as 10,000 years ago (Tardiff 1986). Abenakies, "People of the Dawnland," were the Nation that ranged along the coast of Great Bay. The Native American "tribes" (a name used by historians) living in the area included Cocheco, Piscataqua, and Squamscott (or Msquamskek). The identification of the tribes with the major rivers of the region indicates the reliance on water resources and the associated upland. Archeological evidence and verbal history shows the tribes found the rivers and the Bay full of fish in a seemingly limitless supply, roaming game, lush forests, and fertile soils. These resources sustained the Native Americans until the European arrival.

In the 1600s European settlement began. The presence of the European traders and settlers brought disease and conflict that led to a migration of the surviving Native Americans to the protective wilds of Canada. European trappers, traders, and fishermen traveled to the area in search of resources and prosperity. The first official settlement of the region is credited to Edward Hilton, a commercial fishmonger, in the 1620s in what is now known as Hilton Park. The settlement of Dover was quickly followed by settlement of nearby towns. The European population continued to grow as mills were constructed along the shores of the Bay and tributaries.

The Oyster River, which flows through Durham and enters Great Bay at Durham Point, was known by the Native Americans as the Shankhassick. In the early 1630s it served as the settlers' route into the interior of the Great Bay system, and 1639 marked the beginning of the English village settlement known as the 'Oyster River Plantation', which was legally part of the Dover settlement. In 1732 the town of Durham was incorporated.

Lumber & Shipbuilding

During the seventeenth and early eighteenth century, settlement expanded from along the rivers and bay shoreline. White pine and oak surrounding the Estuary were utilized by the early settlements. The first plantations set up sawmills and began shipbuilding. Lumber and ship building activities continued as significant industries in New Hampshire for the 200 years prior to the Industrial Revolution. In 1665, 20 saw mills were established on Great Bay and its tributaries, including the Thomas Beard sawmill in 1649, located in Durham along the Oyster River. By 1700, 90 sawmills

existed in the Great Bay area. Much of the sawdust produced at these mills was dumped directly into the Great Bay and the tributaries, filling in significant lengths of Great Bay, riparian areas, as well as filling in salt marshes.

Lumbering operations removed significant tracts of forest around the Bay changing surface patterns and in some areas allowing silt and soil to erode and fill shallow areas of tributaries and the Bay edge (Short 1992). Exports of lumber included 150-200 foot tall, straight White pines for masts and spars, planks, barrel staves, scaffolding and furniture. However, after the 1860s, steam powered vessels replaced sailing vessels. Portsmouth shipyards were unable to compete and became less active. Lumber continued to be used for both building material and papermaking.

An important vessel used during the 1800s and 1900s, unique to the Great Bay area, was the gundalow, a commercial sailing rig used to transport hay, timber, granite, and people. The gundalow had a combination of special features, including a flat bottom, making it the ideal cargo vessel for the shallow Great Bay Estuarine system.

Bricks

Throughout the 1700s brickmaking was another important resource from the shores of the Estuary. Blue marine clay was taken from the shoreline and adjacent lands with clay deposits, using horses pulled plows (Whitehouse 1988). One of the area brickyards was located on the Langley Farm off of Durham Point in the Crommet Creek Conservation Area. Bricks were exported down the coast and abroad. Since brick making required a firing process, the industry created a demand for millions of cords of firewood, which required the constant clearing of land along the rivers. (Adams 1976)

Tanneries

In the 20th century, tanneries were located along the tributaries along the Bay. The chemical tanning process produced chrome sludge and acid solution wastes that were discharged into the waterways (Short 1992).

Farming

By 1750s the farming industry expanded to produce exportable animals and animal products. Beef cattle, sheep, and oxen were exported. Hay, butter, lard, bread, flour, corn, beans, and cider were also exported. While providing economic support to the region, this expansion of farming contributed also to the increase of bacterial pollution into the water and salt marsh degradation.

Salt Marsh Hay Farming

For hundreds of years, salt marsh haying was a way of life for New England farmers. For the early settlers, it was easier to harvest salt marsh hay than clearing forests and planting hay fields for later harvest. Beginning in late summer, farmers would cut, dry and rake the hay on to staddle posts where the hay would remain until winter. Along the shores Great Bay, salt marsh hay was highly prized for its many practical uses. The hay was used for feed and bedding for animals, stuffing mattresses, and home insulation.

Environmental Impacts

Great Bay's rich marine resources were heavily harvested throughout the 17th and 18th centuries. European settlers reported the plentiful fish and shellfish (Jackson 1944). Oysters, clams, lobsters, and finfish were traded to Boston, Canada, Spain, Portugal and the West Indies in exchange for rum, sugar, molasses and salt.

In 1941, the Marine Fisheries Commission authorized a survey to determine the status of the original fish populations, the extent of their diminishment from colonial times and restoration options. The survey, done by C.F. Jackson documented the impact humans have had on the physical and biological resources of Great Bay. By the mid-18th century to the early 19th century, fish populations started to decline. Weirs, nets, and drag seines were all used in the Bay, using non-selective methods that may have contributed to the overfishing of some species of fish (Jackson 1944).

Several factors impacted the anadromous fish's reproduction and access to breeding grounds: destruction of breeding grounds through deposits of sediments; dams which completely cut off many species from their breeding grounds; weirs which were detrimental taking the fish either on their way to the breeding ground or on the return route; overfishing; and taking immature fish by weirs and drag seines in the Bay and its tributaries. The implementation of state regulations over time have led to improvements in local fisheries.

The lumber industry made a lasting impression on the landscape of the region. The sawdust dumped in the rivers over several centuries was still evident in 2000 when core samples were extracted from river bottoms. In 1750, Birket, a visitor to the Piscataqua district wrote that salmon had forsaken the Piscataqua because of sawdust from the mills (Jackson 1944). The lumber industry was not solely responsible for the deforestation. Huge quantities of potash (used for fertilizer) and charcoal (fuel for iron furnaces) were produced as well (Tardiff 1986). In addition, colonists were using 4 and 5 logs a day in their fireplaces. The concept of conservation and sustainable harvesting was centuries away.

IV. Conservation Features ("Targets")

The conservation landowners also serving as Principal Partners in the GBRPP sought to collaborate on stewardship activities in the Crommet Creek Conservation Area. In 2008, staff from The Nature Conservancy, Society for the Protection of NH Forest, New Hampshire Fish and Game and Great Bay Estuarine Research Reserve realized the benefit of collaborating, and formed a Crommet Creek Conservation Area Management Planning group (CAMP). The Crommet Creek CAMP planning group collectively agreed on a set of conservation targets to highlight in the plan as priority habitats and species for consideration when planning any management activities on lands within the Conservation Area boundary. These Conservation Targets directly complement the species and habitat based conservation goals of the GBRPP (Table 1). The targets are relevant considerations to all landowners within the Crommet Creek Conservation Area during land management decision making. A collaborative and cooperative approach on an ecological landscape scale with respect to these Conservation Targets will help to ensure that the main habitats, species, and ecological functions that had originally motivated the acquisition and protection of land in the Crommet Creek Conservation Area will be maintained, restored and/or improved.

Target #1: <u>Primary and Secondary Wildlife Species</u>

Primary and Secondary Wildlife species identified for the Crommet Creek Conservation Area were determined by using NHFG's *Wildlife Action Plan* (WAP). The WAP identifies the wildlife species of conservation and management concern that occur throughout the state and correlates these with large and small scale habitat types. By knowing the habitat types that occur within the Crommet Creek Conservation Area the following information may be generated on the primary and secondary wildlife species of concern within the Crommet Creek Conservation Area. This list was further refined by NHFG field staff determined by on-the-ground knowledge of the Crommet Creek Conservation Area.

Historically, the most significant ecological processes for the Crommet Creek Conservation Area were the various forms of flooding (e.g., beaver flowages, seasonal flooding along streams, high tides) and fire. These processes interacted to maintain early-successional aquatic and terrestrial habitats that produced the highest concentration of wildlife diversity in New Hampshire. To present day, the Great Bay region supports the highest diversity of wildlife in the state. This diversity is represented by an amazing variety of waterfowl (29 species) that utilizes Great Bay and the Crommet Creek Conservation Area for migratory and wintering habitats and some of the species of greatest conservation or management concern in the state (e.g., Blanding's turtle, ringed bog haunter, and New England cottontail).

Populations of the species noted above have shown decline in part because ecological processes (i.e, flood, fire, etc.) that had occurred historically within the Crommet Creek Conservation Area are not as prominent as they once were. Fires are understandably controlled to protect persons and private property. Natural hydrological functions have been minimized by the ditching of wetlands, and the near extirpation of beavers in the state in the late 1800s. The primary target species listed below are primarily those that depend on these ecological processes or surrogate processes (e.g., mowing) to maintain their habitats. Beavers are listed as a primary target species because they are a means of restoring and maintaining natural hydrologic functions in the Conservation Area's wetland complexes.

Secondary target species meet one or more of the following criteria:

- Species may, but are not necessarily likely to occur, or occurrences currently unknown within the Crommet Creek Conservation Area;
- Level of conservation or management concern is not as high as primary targets species;
- Habitats in Crommet Creek Conservation Area are not as critical to maintaining statewide or regional populations;
- Species may not benefit from restoration of natural ecological processes or the use of surrogate processes to maintain habitats.

PRIMARY WILDLIFE SPECIES *

Ringed boghaunter [E]
Black racer[T]
Eastern hognose[E]
Blanding's turtle [E, RC]
Spotted turtle [T, RC]
Wood turtle [SC, RC]
American black duck
American woodcock
Osprey
Whip-poor-will
New England cottontail [E, RC]
Wood duck
North Atlantic population Canada geese (Maritime)
Greater Scaup
Beaver
Great Blue Heron
Ruffed grouse
Golden-winged warbler
Bald eagle[FT]

SECONDARY WILDLIFE SPECIES *

Northern leopard frog [SC, RC]
Ribbon snake [RC]
American bittern [RC]
Cooper's hawk
Eastern meadowlark
Eastern towhee
Grasshopper sparrow[T]
Least bittern [SC]
Northern goshawk
Northern harrier[E]
Pied-billed grebe [T, RC]
Red shouldered hawk [SC]
Sedge wren [E, RC]
Turkey
Veery
Vesper sparrow
Saltmarsh Sharp-tailed sparrow
Nelson's Sharp-tailed sparrow
Willet
Wood thrush
Eastern pipistrelle [SC]
Eastern red bat [SC, RC]
Silver-haired bat [SC, RC]
Blue-spotted salamander[SC]

**Superscript letters denote the rarity rank for each wildlife species. E =Endangered; T = Threatened; SC = Species of Species Concern; RC = Species of Regional Concern*

Target #2: <u>Freshwater wetland complexes</u>

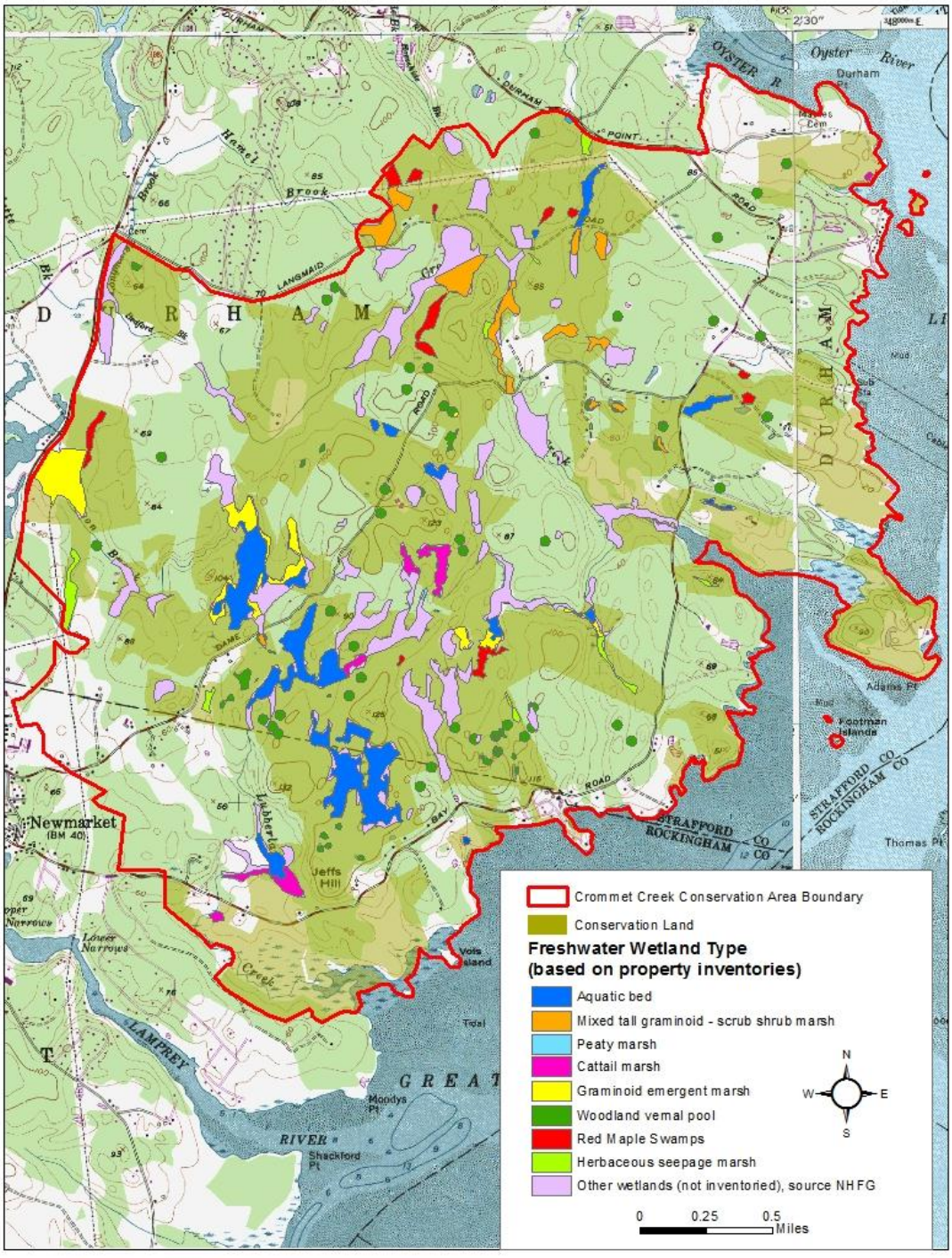


Figure 9. Priority freshwater wetlands within the Crommet Creek Conservation Area (as determined by NHFG analysis and property natural resource inventories).

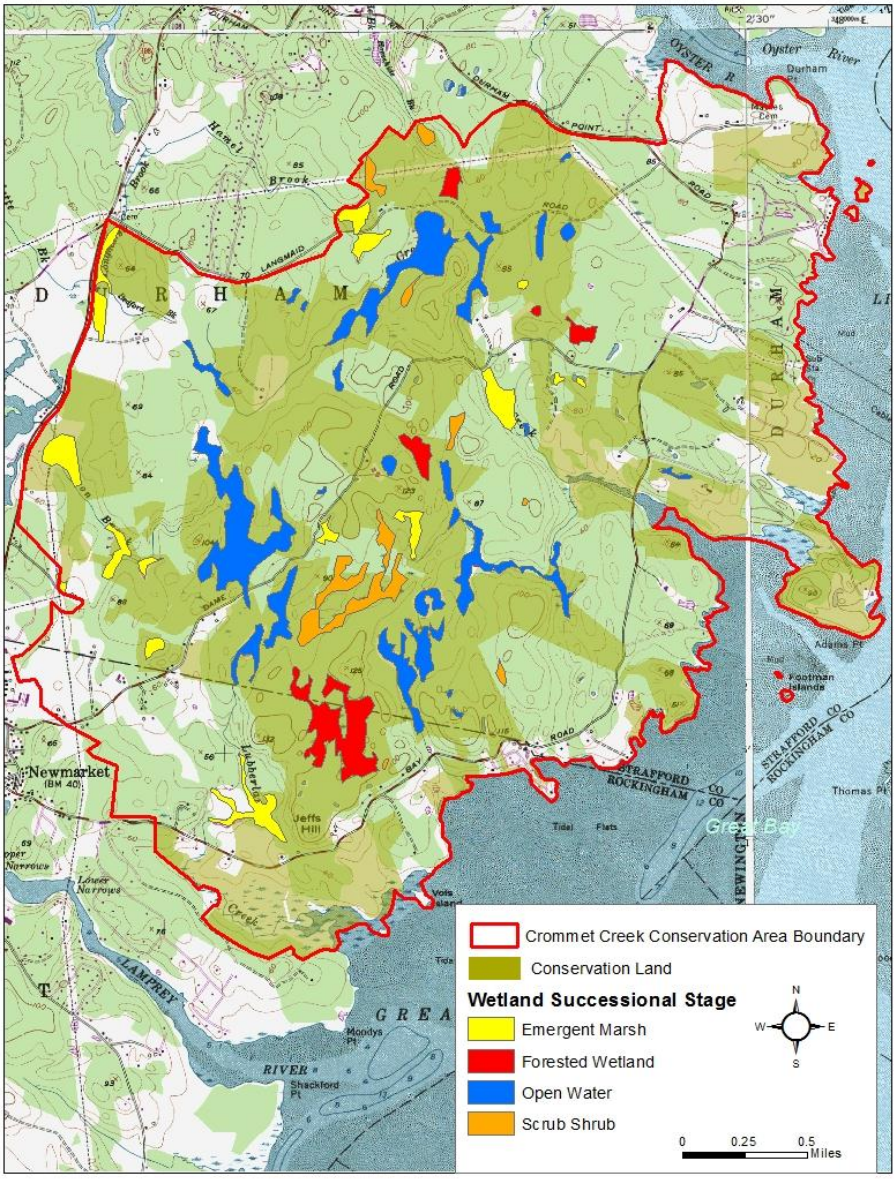


Figure 10. Current Successional Stage of freshwater wetland within the Conservation Area as determined by NHFG field varification.

Wetlands	Acres within Crommet CA	% Protected
NWI + wetland soils	1327	62
NWI	693	69
Priority wetlands	433	91

Approximately 1,327-acres within the Crommet Creek Conservation Area are identified as wetlands by the National Wetlands Inventory (NWI) and the county soil maps. Therefore, 30% of the Crommet Creek Conservation Area has been identified as wetland habitat. Most of this wetland habitat is associated with the flowing water of

Lubberland or Crommet Creek or other smaller unnamed drainages flowing into Great Bay.

Freshwater wetlands are a Conservation Target as they are one of the five primary conservation goals of the GBRPP, and instrumental in maintaining and improving habitat for waterfowl and other migratory birds (another GBRPP goal) (Table 1). The freshwater wetlands shown on the above maps (Figure 9) were identified by NHFG as "target wetlands" within the Conservation Area boundary. These priority wetlands were identified through the Wildlife Action Plan process, and were based on an analysis of wetland habitat quality using many factors including presence of rare species, landscape context, connectivity, etc. These priority wetlands total 433-acres. Of these priority wetlands, 393-acres (91%) are protected. Natural resource inventory data was collected for many of the GBRPP properties within the Conservation Area boundary between 2003 and 2009 by TNC staff. Figure 9 shows the broad natural community type identified for each inventoried wetland. In addition, NHFG staff classified the current "successional stage" of each target wetland as a baseline for tracking changes to the wetland complexes in the Conservation Area by beaver activity (Figure 10, Table 5).

Table 5. Current distribution of wetland types in Crommet Creek Conservation Area based on 2008 field reconnaissance and aerial photo interpretation

*EM= Emergent vegetation; FO = Forested; OW = Open water; SM = Saltmarsh; SS = Scrub-shrub

DOMINANT WETLAND TYPE *	# WETLANDS	ACRES	AVG. SIZE	#W/SNAGS	#W/MGMT ACCESS
EM	23	97.26	4.23	7	8
FO	5	58.84	11.77	2	1
OW	33	195.37	5.92	6	5
SS	8	46.42	5.80	2	2
TOTAL	**71**	**407.89**	**5.74**	**17**	**16**

DETAILED WETLAND TYPE	# WETLANDS	ACRES	AVG. SIZE	#W/SNAGS	#W/ACCESS
EM	8	26.29	3.29	2	3
EM-FO	2	10.71	5.36	1	1
EM-OW	9	34.57	3.84	4	2
EM-SS	4	25.68	6.42	0	2
FO	1	4.65	4.65	0	0
FO-EM	3	49.71	16.57	2	1
FO-OW	1	4.49	4.49	0	0
OW	11	28.37	2.58	1	2
OW-EM	19	146.94	7.73	4	2
OW-FO	2	9.73	4.87	1	0
OW-SS	1	10.35	10.35	0	1
SS-EM	4	41.09	10.27	1	2
SS-FO	3	4.96	1.65	1	0
SS-OW	1	0.37	0.37	0	0
TOTAL	**71**	**407.97**	**5.75**	**17**	**16**

Target # 3: Early Successional Habitat

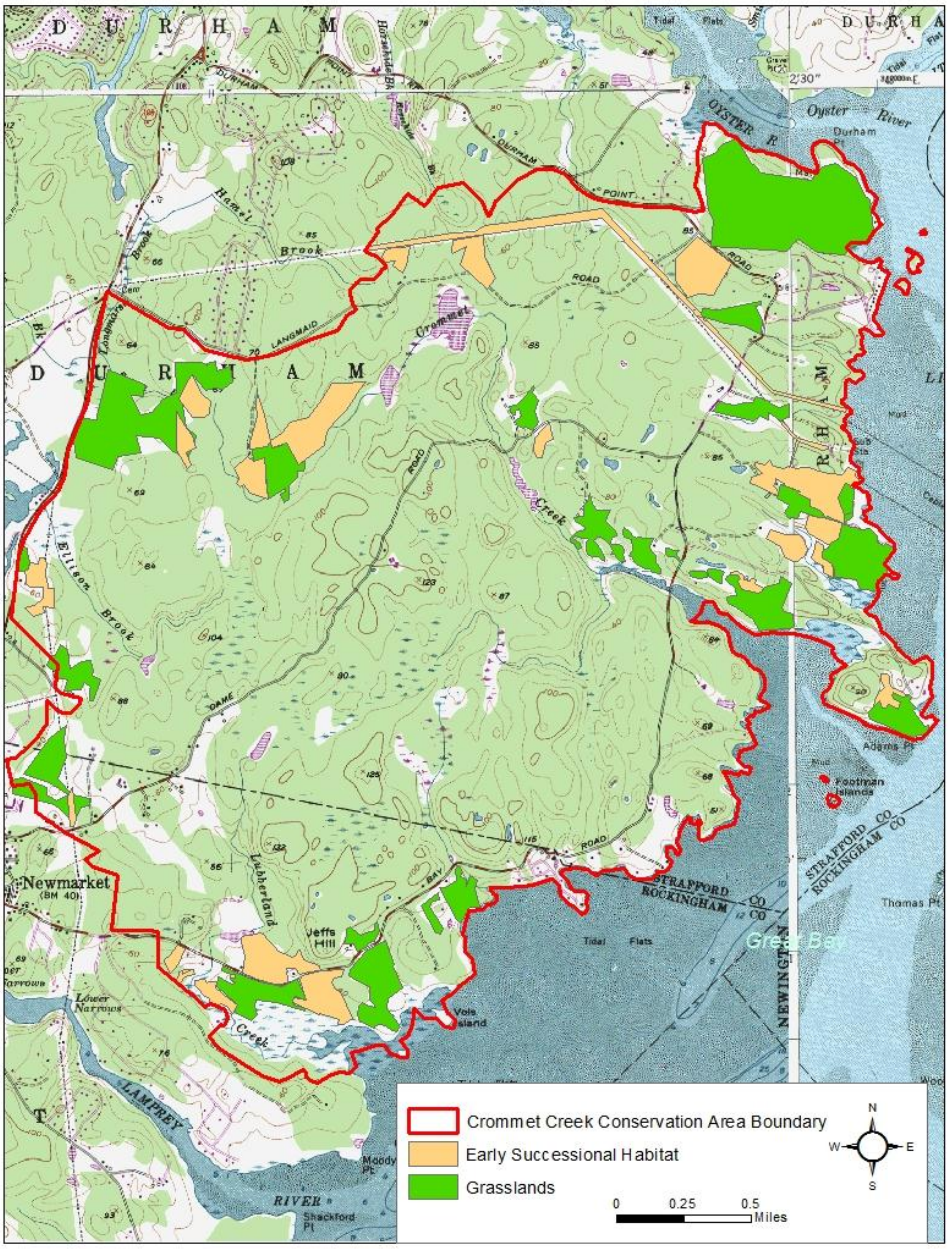


Figure 11. Early Successional and grassland habitat within the Crommet Creek Conservation Area.

Target Habitat	Acres within Crommet CA	% Protected
Early Successional	222	68
Grassland	405	50

Approximately 222-acres within the Crommet Creek Conservation Area are identified as Early Successional Habitat. The habitat areas shown on the map in Figure

11 were identified as Early Succesional through the natural resource inventory work performed on many GBRPP protected lands by TNC field staff. The map was then completed in GIS by manually digitizing other areas within the Crommet Creek Conservation Area also appearing as early successional habitat through examination and interpretation of a series of aerial photographs (DOQ 1992; NAIP 2003; NAIP 2008).

This habitat type was selected as a Conservation Target for the following reasons:

- Fifty-four species of birds, 12 mammals, and 8 reptiles depend on early successional habitat and young forests for part or all of their habitat needs (WMI 2010).
- It is a declining habitat state-wide as forests mature and fields are abandoned
- Young forests and early successional shrublands are attractive to many species of wildlife because the dense vegetation provides protective cover from owls and other predators, and the many berry producing woody shrubs provide a readily available food source.
- The increasingly rare golden-winged warbler, the American woodcock, and the New England cottontail (known from the Crommet Creek Conservation Area) use this habitat type.

Target #4: <u>Grassland Habitat</u>

Approximately 405-acres within the Crommet Creek Conservation Area are currently managed as grasslands. The grassland areas shown in Figure 11 were generated by NHFG's Wildlife Action Plan models. The modeled grassland areas were then refined based on on-the-ground knowledge from field staff on the Crommet Creek Management Planning Team (CAMP).

This habitat type was selected as a Conservation Target for the following reasons:

- It is a declining habitat state-wide as fields are abandoned and forests mature.
- Small grasslands provide breeding, nesting, and feeding habitat to many species of grassland birds that are in decline nationwide such as the bobolink, eastern meadowlark, and savannah sparrows.
- Small grasslands provide habitat to small mammals such as meadow jumping mice and meadow voles, which are important food for many birds of prey and other predators such as grey foxes
- Grasslands support a rich diversity of grasses and wildflowers. These attract many species of insects for food (nectar) and cover. These insects provide pollinator services to the plants, and are also an important food source for many species of birds and mammals.

Target #5: Salt Marsh

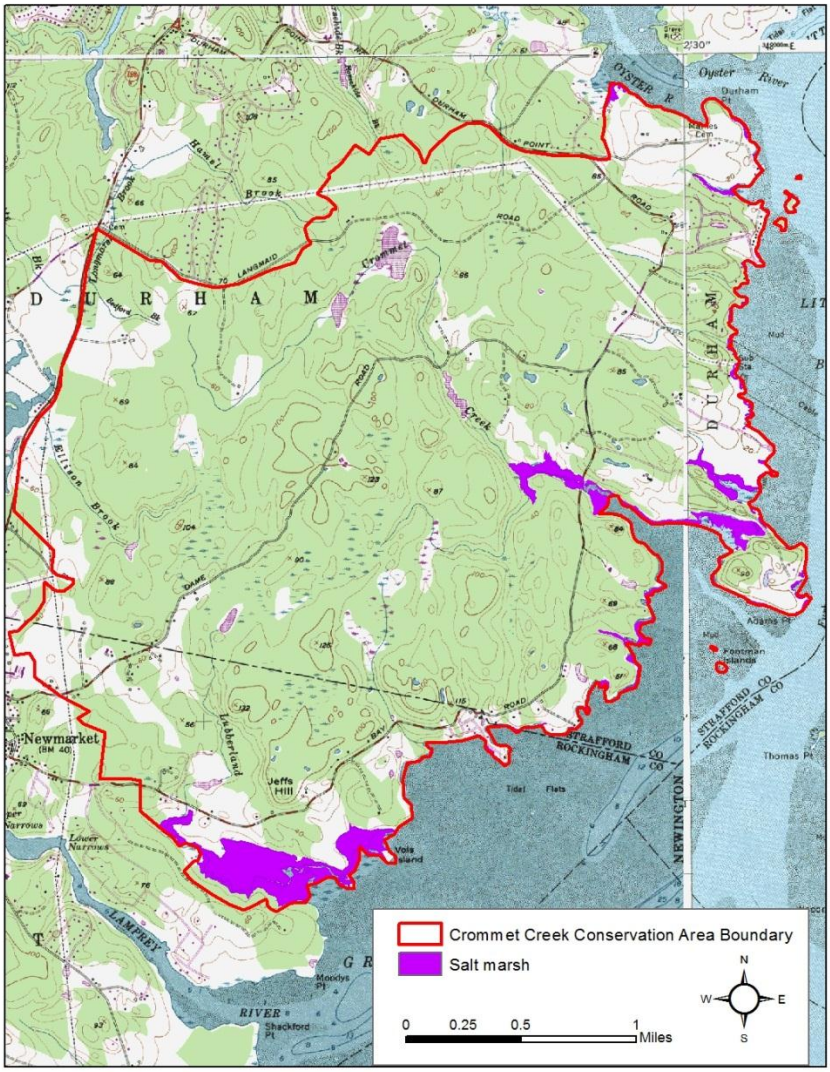


Figure 12. Salt marsh within the Crommet Creek Conservation Area

Target Habitat	Acres within Crommet CA	% Protected
Salt marsh	120	93

Approximately 120-acres of salt marsh occur in the Crommet Creek Conservation Area. The vast majority of the salt marsh is located at the mouth of Lubberland Creek where 66-acres of contiguous high and salt marsh occur. The remaining marsh area is a fringe of low marsh that is common around the entire perimeter of Great Bay and the islands. The map of the salt marsh habitat shown in Figure X was partially digitized for the New Hampshire Coastal Program by Normandeau Associates Inc., using 2004 aerial photography and partially generated by the Great Bay National Estuarine Research Reserve (GBNERR) staff using high-accuracy hand-held GPS and field mapping.

This habitat type was selected as a Conservation Target for the following reasons:

- Salt marshes stabilize intertidal sediments along the shore, take up nutrients, and prevent shoreline erosion
- Provide a screen for waterfowl, cover for fish, aquatic invertebrates, and crustaceans
- In their salt pannes, intertidal creeks, ditches, and high and low marsh habitat, they provide breeding, nesting, and feeding habitat to many species of fish, including mummichug which live in salt pannes on the marsh surface and in the intertidal creeks.
- Much of the food resources that pass up through the marine food chain can be traced to the salt marshes, as they function as a nursery for young fish and lobster and house and shelter many species of prey.

Target #4: Exemplary Natural Upland Communities

Target Habitat	Acres	% Protected
Exemplary Natural Communities	70	75

Four exemplary upland natural communities have been identified within the Crommet Creek Conservation Area. Three areas were identified through a natural resource inventory of selected areas performed by the NH Natural Heritage Bureau (NHB) in 1997. One additional natural community description was submitted to NHB by SPNHF staff following a natural resource inventory of SPNHF lands in the Conservation Area. Exemplary Natural Communities are identified as a Conservation Target as they are included as one of the five primary conservation goals of the GBRPP (Table 1).

The Natural Heritage Bureau places particular emphasis on some examples of natural communities in the state and gives them an "exemplary" designation. In order to achieve the "Exemplary" status, the Natural Heritage Bureau looks at the rarity of the community type, the size, condition, and surrounding landscape. Exemplary natural communities represent the best remaining examples of New Hampshire's flora, fauna, and ecological processes and typically include:

- Good diversity of characteristic plant species
- Evidence of healthy regeneration
- Multiple age classes
- Diverse structure and features
- Intact natural soil and hydrologic processes
- Little direct evidence of human disturbance
- Intact surrounding landscapes of relatively few human disturbances
- A size large enough to allow for natural processes to occur

This data is considered sensitive and is not shown in this report. Landowners may contact the NH Natural Heritage Bureau to request a report on any exemplary natural communities that have been documented from their property. Complete the

DataCheck form on the following website to request this information: http://www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/services/. This information is useful to consider when planning management activities.

Natural Community Type	State Rarity Rank	Number of Occurrences in Crommet Creek CA
Rich Appalachian Oak Rocky Woods	S1	3
Mesic Appalachian Oak Hickory Forest	S2S3	1

Target #5: Rare Plants

Conservation Target	Populations	% Protected
Rare Plants	30	77

Seventeen species and 30 populations of rare plants exist in the Crommet Creek Conservation Area (Table 6). Rare plants are identified as a Conservation Target as they are included as one of the five primary conservation goals of the GBRPP (Table 1).

Known populations of rare plants are tracked in a database of NH's species diversity managed by the Natural Heritage Bureau (NHB). This data is highly sensitive and is not shown in this report. Landowners may contact NHB to request a report on any rare species that have been documented from their property by completing the DataCheck form on the following website: http://www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/services/. This information is useful to consider when planning management activities.

Table 6. Rare plant species of the Crommet Creek Conservation Area and their associated habitat.

Rare Species Name							
Common Name	Latin Name	State Rarity Rank *	Number of Populations in CA	Freshwater wetlands	Intertidal habitats	Upland Forest	Early successional /Grassland
Black Maple	*Acer nigrum*	S1	2			x	
Seaside Gerardia	*Agalinus maritima*	S2	2		x		
Missouri rock-cress	*Arabis missouriensis*	S1S2	1			x	
Hairy brome-grass	*Bromus pubescens*	S1	1			x	
Small crested sedge	*Carex cristatella*	S1	2	x			
Marsh elder	*Iva frutescens ssp. oraria*	S2	4		x		
Pale green orchis	*Platanthera flava var herbiola*	S2	2	x			
Prolific knotweed	*Polygonum prolificum*	S1	1		x		
Water-plantain	*Ranunculus ambigens*	S1	1	x			
Dwarf glasswort	*Salicornia bigelovii*	S1	1		x		
Lined bulrush	*Scirpus pendulus*	S1	2	x			
Stout bulrush	*Bolboschoenus robustus*	W	1		x		

Large bur-reed	*Sparganium eurycarpum*	S2	6	x			
Small spike-rush	*Eleocharus parvula*	S2	1		x		
Loesel's twayblade	*Liparis loeselii*	S2	1	x			
Tufted loosestrife	*Lysmachia thrysifolia*	S2	2	x			
Horned pondweed	*Zanichellia palustris*	S1	1	x	x		

**The degree of rarity of a species in New Hampshire is noted as it's State Rank. Ranks are given on a scale of 1-5, with a 1 indicating critically imperilment, a 3 indicating that the species is vulnerable, and a 5 indicating that the species is secure. W indicates that the species is on the State Watch List and is being considered for ranking as an S2 orS1.*

V. Landscape Scale Management Opportunities/Strategies

Lands protected through the Great Bay Resource Protection Partnership, acquired using money granted from NOAA and NAWCA, are obliged to meet the goals of the Partnership as part of their ownership and management of their properties (Table 1). Some of the management issues relevant to these goals, and addressing the threats to the Conservation Targets are best dealt with at a landscape scale, and are good candidate topics for the Crommet Creek Conservation Area Management Planning group to discuss and coordinate on through ongoing planning and land management activities. The following management topics are presented as opportunities for collaboration between conservation landowners within the Conservation Area. For each topic, the main topic is introduced, relevant data is presented as available, additional resources are noted, and management recommendations suggested.

a. Forest Management for Wildlife and Timber Harvest

All five of the GBRPP primary conservation goals (Table 1) address protecting, restoring, and maintaining the quality and diversity of wildlife habitats and the species they support. Development around the Great Bay Estuary is threatening to isolate patches of natural lands and disconnect them from each other. Taking a landscape scale approach to some wildlife management decisions can help retain connections between important habitats to promote and allow species movement both within and outside of the Conservation Area. Additionally, some management techniques may favor one species or suite of species over another. Communication between landowners on these management decisions may help insure compatible management on adjacent properties that may augment the wildlife benefit of smaller projects. At the same time, good communication between land managers can insure that independently made management decisions don't inadvertently all work towards reducing diversity at the site. Regular communication on management plans and actions would be to promote the maintenance of habitat and species diversity within the Conservation Area.

The diverse habitats in the Crommet Creek Conservation Area support a great diversity of wildlife species both common and rare. For example, migrating waterfowl stop over at the Great Bay estuary in large numbers to rest and feed as they continue on

their migration route. Many species of birds migrate to the area to breed in the interior forest, grasslands, shrublands, and open wetlands. Numerous reptile and amphibian species rely on the complexes of vernal pools scattered throughout the Conservation Area to complete their life-cycles, find food, and escape predation. Towering pine trees along the Great Bay shoreline serve as roost sites for osprey and bald eagles. Beaver flooded forests create standing dead snags important for heron rookeries, and osprey nest sites. The flooded impoundments along the freshwater creeks support numerous species of turtles, fish, and invertebrates that are attractive prey to many species of birds, mammals, and reptiles. The scrubby shrublands offer safety for nesting birds and rabbits from birds-of-prey. The open fields offer hunting grounds for raptors, and wildflowers for butterflies and other insects in search of nectar. The salt-marsh, intertidal creeks, and mudflats are a nursery for fish and lobsters, safely protecting them from the larger predators in deeper waters.

As such, land owners in the Crommet Creek Conservation Area should recognize that any land management decision they make will have impacts to many species of wildlife in the area. Therefore, much thought was put into developing wildlife habitat management recommendations for this Conservation Area. These recommendations are explained in detail in the Management Recommendations Section (Section IV) of the plan. However, constant themes throughout the recommendations include:

- Maintaining diversity – both across habitat types and successional stages within habitats type (i.e. oak-pine woodlands)
- Protecting wetland habitat and water quality
- Limiting fragmentation within the Conservation Area

Management Recommendations

When a timber harvest is planned for an area within the Crommet Creek Conservation Area, the following considerations are recommended:

- Consider how the cut can accomplish the objectives of gaining revenue, timber stand improvement, and wildlife habitat improvement
- Follow the guidance and best management practices put forth in Good Forestry in the Granite State
- Hire a licensed forester or consult with the county forester to prepare a forest management plan
- Inventory lands for rare species and other Conservation Targets identified in this plan, and try to minimize impacts or even improve the habitat or condition of the Conservation Target

b. Research & Monitoring

Supporting Research

In general, the conservation landowners within the Crommet Creek Conservation Area welcome research and monitoring on their lands by other parties (such as UNH

students). However, before setting up a research project, prospective researchers are requested to check with the landowner regarding their specific policy. In most cases, a proposal is needed prior to setting up a research or monitoring project, and a final report requested upon project completion. Landowners typically value research projects as the information may add to ecological understanding and help guide management decisions. Some research projects that have included the Crommet Creek Conservation Area include:

- Salt marsh habitat connectivity and use by the American Eel, *Anguilla rostrara*. A. Eberhardt, PhD candidate. University of New Hampshire. Ongoing project.
- The flow of nutrients through salt marsh food chains in northern New England. Sarah Donelan. Northeastern University. Ongoing project.
- Ribotyping Field Study: Crommet Creek. Jones & Edwards, 2007. University of New Hampshire.
- Waterfowl utilization of beaver impoundments in southeastern NH. Nevers, H.P., 1965. University of New Hampshire. Master of Science Thesis.
- Developing a conservation strategy to protect land habitat functions for New Hampshire's Reptile & Amphibians using the Blanding's Turtle (*Emydoidea Blandingii*) as a flagship species. 2003. R. Jenkins & K. Babbitt. University of New Hampshire.
- Ecology of nuisance, suburban black bears in southern NH. W. E. Smith. 2008. University of New Hampshire. Summer Undergraduate Research Fellowship Final Report.
- Effects of timber harvest and buffers on salamander movement and vernal pool ecology. University of NH Master's Thesis. Name??

Partner Research and Monitoring

Several conservation landowners have ongoing research and monitoring projects:

New Hampshire Fish and Game / Great Bay National Estuarine Research Reserve

- Long term monitoring of sea level rise through salt marsh elevation and vegetation data collection
- Watershed wide invasive plant prioritization strategy

New Hampshire Fish and Game / Society for the Protection of NH Forests

- New England Cottontail habitat and population efforts to help the declining species regionally. Projects include Bellamy River WMA and Palmer Tract (NHFG) and Hills Forest (Forest Society). www.newenglandcottontail.org

New Hampshire Fish and Game, Non-game and Endangered Wildlife Program

- Coordinated regional monitoring strategy for Blanding's Turtle in the Northeast United States.

The Nature Conservancy

- Early Detection/ Rapid Response of invasive plants in The Nature Conservancy's Lubberland Creek Preserve
- Monitoring the results of chemical and mechanical invasive plant control techniques within The Nature Conservancy's Lubberland Creek Preserve
- The effects of different grassland management practices on grassland nesting bird productivity

The Nature Conservancy / University of New Hampshire

- Oyster Restoration and Monitoring in the Great Bay Estuary

University of New Hampshire

- Nitrogen pathways and sources study in the Great Bay Watershed. B. McDowell. Ongoing project.

Research Needs

The Great Bay conservation community would continue to benefit from research that contributes to the greater understanding of issues pertaining to water quality, climate change, restoration and management of critical species of conservation concern, invasive species, and stream connectivity. These research needs are more specifically detailed in the 2010 Piscataqua Region Comprehensive Conservation and Management Plan (CCMP), available online at: http://prep.unh.edu/plan.pdf.

c. Invasive Species Management

Crommet Creek Data

Invasive species management was noted early on by Crommet CAMP team members as a threat to the target habitats and species. As such, a mapping effort was undertaken to understand the species of concern and their distribution and abundance throughout the Conservation Area. The mapping effort involved staff from The Nature Conservancy, Great Bay National Estuarine Research Reserve, New Hampshire Fish and Game, Department of Environmental Services / Coastal Program, and the Natural Resources Conservation Service.

In total, 3,477 occurrences, and 103-acres of invasive plants were mapped in the Crommet Creek Conservation Area. This represents 2% of the total Conservation Area, and 4.6% of the inventoried lands in the Conservation Area (2,234 acres). A suite of upland woody shrubs and one vine were the most frequently found and abundant invasive plant species within the Crommet Creek Conservation Area. This suite of woody species includes glossy buckthorn (Rhamnus frangula), common barberry (Berberis vulgaris), honeysuckle (Lonicera sp.), common buckthorn (Rhamnus cathartica), multiflora rose (Rosa multiflora), Asiatic bittersweet (Celastrus orbiculatus), and Japanese barberry (Berberis thunbergii). Of note, the majority of all populations were fairly small, falling into the "1" or "<20 individuals" abundance class (Figure 13).

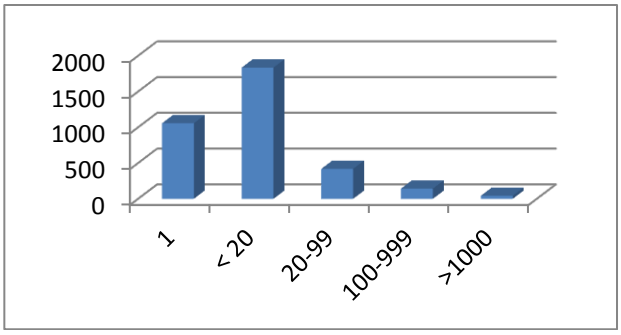


Figure 13. Number of invasive plant occurrences (y axis) within each abundance class (x axis) within the Crommet Creek Conservation Area.

The sixteen species can be divided into 2 main categories based on abundance and distribution. Those that are abundant and well established throughout the project area (Present and Abundant), and those that have limited distribution or few populations (Present and Sparse). An arbitrary value of 35 populations and 2-acres was used to define the distinction between the 2 categories (Table 7).

Table 7. Number of Populations and Acres of 16 Invasive Plant Species mapped in the Crommet Creek Conservation Area.

Invasive Plant Latin Name	Common Name	# Populations	Acres	Abundance/Distribution Category
Berberis thunbergii	Japanese Barberry	337	14.8	Present & Abundant
Berberis vulgaris	Common Barberry	780	15.9	Present & Abundant
Celastrus orbiculatus	Oriental Bittersweet	190	8.4	Present & Abundant
Elaeagnus umbellata	Autumn Olive	292	5.5	Present & Abundant
Lonicera spp	Honeysuckle	453	15.5	Present & Abundant
Rhamnus cathartica	Common Buckthorn	482	15.2	Present & Abundant
Frangula alnus	Glossy Buckthorn	295	16.1	Present & Abundant
Rosa multiflora	Multiflora Rose	458	7.7	Present & Abundant
Acer platanoides	Norway Maple	25	0.1	Present & Sparse
Cynanchum louiseae	Pale Swallowwort	1	0	Present & Sparse
Euonymus alatus	Burning Bush	88	0.7	Present & Sparse
Lythrum salicaria	Purple Loosestrife	35	1.8	Present & Sparse
Phragmites australis	Common Reed	15	0.5	Present & Sparse
Polygonum cuspidatum	Japanese Knotweed	6	0.1	Present & Sparse
Robinia pseudoacacia	Black Locust	19	0.7	Present & Sparse

Present and Abundant

Eight species are recognized to be present and well established throughout the conservation area (Table 7). These eight species occupied 99-acres within the Conservation Area and include 94% of the total number of occurrences, and 96% of the total infested acres documented through this project. These species are not only widely

distributed, but they were also frequently noted within almost all of the conservation targets of the Crommet Creek Conservation Area (Table 8). Consequently, they show little restriction of habitat. Additionally, they were noted to be present in association with many different disturbances, both human and natural, and all species were frequently found in locations where no apparent disturbance was noted.

Table 8. Noted presence of "Present and Abundant" invasive plant species within conservation targets of the Crommet Creek Conservation Area.

Invasive Plant Species	Grasslands	Wetlands	Exemplary Natural Communities	Early Successional Habitat	Salt Marsh	Vernal Pools	Rare Plants
Glossy Buckthorn	x	x		x		x	x
Common Barberry	x	x	x	x		x	x
Honeysuckle	x	x	x	x		x	x
Common Buckthorn	x	x	x	x			x
Japanese Barberry	x	x	x	x		x	x
Oriental Bittersweet	x	x	x	x			x
Multiflora Rose	x	x	x	x		x	x
Autumn Olive	x	x	x	x			x

Present and Sparse

Seven species were present in the Crommet Creek Conservation Area, but their numbers were fairly low (Table 7) or their distribution somewhat restricted (Table 9). These six species occupied 10-acres within the Conservation Area and include 3% of the total number of occurrences, and 10% of the total infested acres documented through this project. As with the total dataset, the majority of these populations consist of few individuals, falling into the "1" or "<20 individuals" abundance classes; therefore these populations or species may conceivably be controlled or contained at their current sites.

Table 9. Noted presence of "Present and Sparse" invasive plant species within conservation targets of the Crommet Creek Conservation Area.

Invasive Plant Species	Grasslands	Wetlands	Exemplary Natural Communities	Early Successional Habitat	Salt Marsh	Vernal Pools	Rare Plants
Norway Maple	4	0	0	0	0	0	0
Pale Swallowwort	0	0	0	1	0	0	0
Purple Loosestrife	4	8	0	4	0	0	1
Common Reed	0	8	0	1	0	0	2
Japanese Knotweed	0	0	0	0	0	0	0
Black Locust	0	2	0	3	0	0	1

Rare Species and Invasive Plants

Ten of the 30 rare species locations known from the Crommet Creek Conservation Area have been found to be in growing in close proximity to an invasive plant species of concern. These species are indicated in the table below. A map is not provided in this plan due to the sensitive nature of the information.

Rare Species	Landowner	Invasive species of threat within 100ft buffer
Acer nigrum	private	Honeysuckle & Glossy buckthorn
Acer nigrum	private	European barberry, Asiatic bittersweet, Autumn olive, Honeysuckle, Common buckthorn, Multiflora rose
Carex cristatella	private	Glossy buckthorn
Carex cristatella	NH Fish and Game	Common Reed
Lasius minutis	The Nature Conservancy	Glossy buckthorn and multiflora rose
Scirpus pendulus	NH Fish and Game	Asiatic bittersweet, Purple loosestrife
Sparganium eurycarpum	NH Fish and Game	Common Reed
Sparganium eurycarpum	NH Fish and Game	Purple loosestrife
Sparganium eurycarpum	NH Fish and Game	Glossy buckthorn, bittersweet
Williamsonia lintneri	The Nature Conservancy	Purple loosestrife

Invasive Species Management Recommendations

The Nature Conservancy developed a pilot invasive species control program at Lubberland Creek based on the data previously discussed. As part of this project, The Nature Conservancy generated a decision chart (Figure 14) that was a helpful tool in developing the rationale behind choosing one area over another for invasive species control. This tool could be applied to any area where invasive species management is being considered and is provided below.

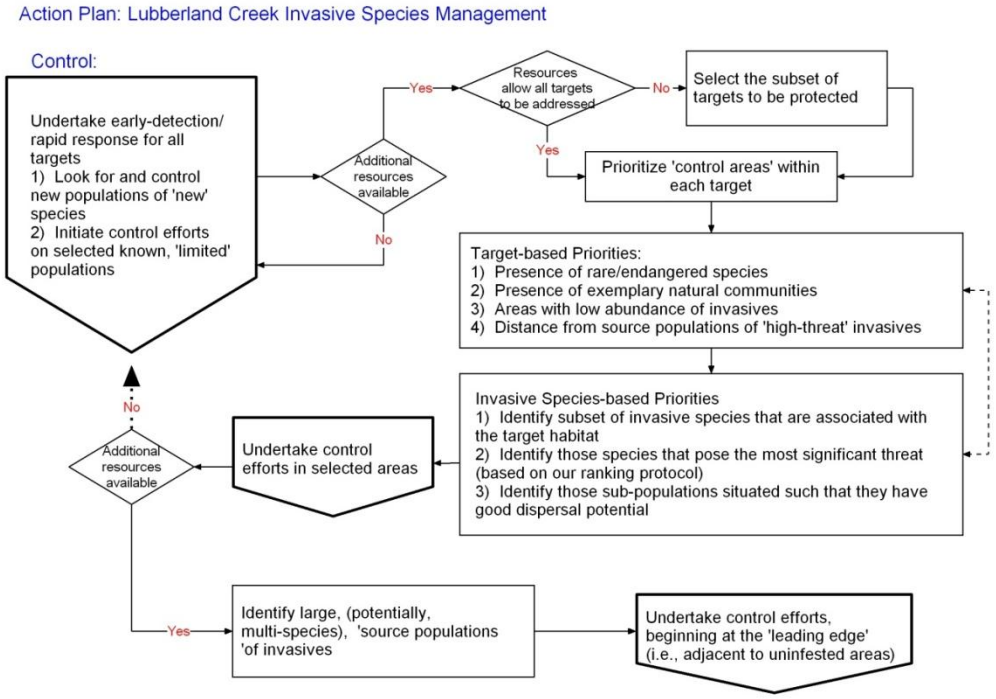


Figure 14. Decision chart for determing invasive species control priorities on a large scale.

Several general recommendations emerged from evaluating the Crommet Creek data and applying a control and monitoring plan to the small scale Lubberland Creek Preserve pilot area within this Conservation Area. These include:

1. Establish an Early Detection and Rapid Response team and protocol for the Crommet Creek Conservation Area. The monitoring program should be focused on species and target based monitoring. The main monitoring goals should be:
    a. Monitor key conservation target areas for ANY invasive species of direct threat to the target.
    b. Monitor everywhere for "Present & Sparse" as well as true "Watch List" species that are potential new threats to the habitats within the Conservation Area. (This "Watch List" is currently being developed by the Natural Heritage Bureau.)
    c. Monitor areas that are currently invasive species free for ANY invasive species to maintain the high quality native habitat.

2. Focus control efforts in areas where there is a direct threat between the invasive species population and a conservation target

3. Quickly control any population identified by the Early Detection team.

4. Where feasible control large source populations of invasive plants from their leading edge to prevent further creeping of the population into largely uninfested areas.

Regional Invasive Species Initiatives and Projects

The results presented above will be augmented by a modeling project currently underway by The NH Fish and Game Department Invasive Species Committee. They are currently developing a landscape scale prioritization strategy for invasive plant management projects on Wildlife Management Areas throughout the State. They plan to combine this strategy with the local mapping efforts described above to help refine priority areas for invasive plant control on NH Fish and Game lands across the state, including those within the Crommet Creek Conservation Area. In addition, NHFG began an invasive plant control project on Fish and Game lands within the Crommet Creek Conservation Area using an experimental design to quantitatively assess the effectiveness of some mechanical and chemical control techniques most commonly used by natural resource managers in this region. The results will inform natural resource managers towards the optimal control techniques for many of the invasive plants growing in this area.

The Great Bay Estuarine Research Reserve offers a free tool loan program to landowners who wish to immediately control invasive plant populations on their lands. "Weed wrenches" are specialized tools useful for manual removal of invasive shrubby plants such as glossy buckthorn, autumn olive, multiflora rose, or honeysuckle. Multiple weed wrenches are available for free loan to community members, land trusts, and other conservation organizations throughout the Crommet Creek Conservation Area. The program was funded by the Lamprey River Advisory Committee and tools are housed at the Great Bay Discovery Center in Greenland. If you wish to schedule the use of these weed wrenches, please contact the Great Bay Discovery Center at 603-778-0015.

The Coastal Watershed Invasive Plant Partnership (CWIPP) is a Partnership of 11 organizations that all work together towards collaborating, cooperating, and assisting each other with invasive species issues in the Coastal Watershed of NH. Specifically, the goal of this Partnership is to maintain equipment and personnel for the purpose of controlling invasive plants within their respective jurisdictions; administer programs involving invasive plant control; make recommendations for invasive plant treatment; and provide education involving invasive plants. Meeting minutes, fact sheets, and other information on CWIPP can be obtained online at:
http://des.nh.gov/organization/divisions/water/wmb/coastal/cwipp/index.htm

d. Water Quality

Water quality in the Great Bay Estuary is declining (PREP, 2009). This is in large part due to increased nitrogen and sediments being delivered to the estuary, a rise in development in the watershed, and a decline in filter feeding organisms in the water such as oysters. The total nitrogen load to Great Bay has increased by 42% in the past 5 years (PREP, 2009). As a result, nuisance algae blooms are more common, and as decomposition threatens to deplete dissolved oxygen in the estuarine waters. Development in the watershed is also increasing impervious surfaces and non-point sources of pollution. As a result, the estuary is receiving more toxic contaminants, sediments, fertilizers, and human waste by means of groundwater, streams, and storm drains. The impacts of this water quality decline are being observed in many species of plants and animals.

There are many efforts under way to reverse the degrading trend. One project by The Nature Conservancy and the University of New Hampshire is working to restore oyster populations to the Great Bay Estuary as a means to filter some water and improve water quality. Ninety-five percent of the oyster population in the Bay was lost in the 1990's. Currently, the restoration project has managed to restore 4.2 acres (800,000-oysters) to the system.

Management Recommendations

Land owners in the Great Bay watershed (including the Crommet Creek Conservation Area) can also help maintain or improve water quality within the Bay by the land management decisions they make. Some examples include:

- Maintain wherever possible 100ft wide buffers of vegetation along streams and wetlands that feed the estuary as important filters for sediments and nutrients in surface and groundwater.
- Pump septic systems regularly to keep them functioning properly and prevent excess nitrogen and other nutrients from entering the groundwater
- Limit use of nitrogen fertilizers on lawns and agricultural lands, especially during times when plants are not actively growing and able to take these nutrients up
- Control erosion and limit sediment delivery to wetlands or streams during construction, agricultural, or timber activities through best management practices
- Pick up pet waste

Many concerned citizens, conservation groups, and politicians are actively engaged in trying to remedy the water quality issue of Great Bay. Without maintaining a minimum water quality standard within the Bay, there will be a decline in fisheries and wildlife. Consequently, a watershed-wide study of non-point sources of pollution is currently underway by UNH, a policy working group has been formed, and restoration partnerships have formed.

The Crommet Creek Conservation Area represents one of the most intact and naturally vegetated watersheds flowing into the Great Bay. It plays an instrumental part in influencing the water quality of the estuary. Land managers in the Conservation Area should be aware of the water quality impacts of any management activity on conservation lands.

e. Public Access and Recreation

The GBRPP's Recreation and Education Goal is as follows:

To protect natural areas that are important for aesthetic purposes and provide for quality public recreational and educational opportunities that are compatible with the waterfowl and wildlife resources and their management, and rare, threatened and endangered species and natural communities and their protection.

Overview of public access on GBRPP protected lands

Properties are selected for conservation by the GBRPP primarily for the purpose of protecting significant conservation resources. In recognition of the long standing New Hampshire tradition of allowing public access and hunting on private and public lands, GBRPP conservation lands typically allow for public access and are open to hunting, unless property-specific restrictions are otherwise noted.

The GBRPP's website (www.greatbaypartnership.org) provides a public access map (Figure 15) and a hunting map (Figure 16) labeled 'Crommet and Lubberland Creeks', and links to hiking and outdoor information. The kiosks at TNC's Lubberland Creek Preserve on Bay Road and the NHFG Crommet Creek WMA on Dame Road also post information regarding access.

A majority of the conserved properties in the Crommet Creek Conservation Area are owned by public and nonprofit conservation organizations. As of January, 2012, the GBRPP has conserved 53 properties totaling 2,425 acres in the Crommet Creek watershed. As noted, a majority of these properties (or conservation lands) are open to public access and hunting. Allowable public access uses include hiking, nature study, cross-country skiing, snowshoeing, fishing, canoeing, kayaking, pedestrian. Six conservation easement properties allow public access by landowner discretion and permission. The maps on the Partnership website provide specific access detail by conservation property. Provided below are the Public Access Map and Hunting Map (January 2012). The Partnership website, www.greatbaypartnership.org will post current maps for the Conservation Area (Figures 15 and 16).

Hunting is allowed on a majority of the Partnership conservation properties. Six properties have specific hunting considerations and require permission from the landowner. As noted, the maps on the Partnership website provide specific hunting detail by property. Trapping is allowed through landowner permission.

Snowmobiling is allowed only on designated snowmobile trails - however, there are currently no designated snowmobile trails in the Crommet Creek Conservation Area. Mountain biking is not allowed on Partnership protected conservation properties, including the Sweet Trail.

Geocaching is becoming an increasingly popular activity. Any geocaching activity on conservation lands requires the permission of the landowner so as to avoid confusion with other geocaching sites in the vicinity and the placement of geocaching sites in sensitive habitat areas.

The Partnership website and property information kiosks provide the following basic information regarding access and uses on Partnership conserved lands:

- No motorized vehicles including All Terrain Vehicles (ATVs), except Snowmobiles on designated snowmobile trails.
- If there is an existing trail system on a conservation property, please remain on the trail in order to minimize ecological impacts.
- Keep all dogs on a leash: Respect wildlife and others using the trails.
- Carry in / Carry Out Trash.

Developing an Ecologically Sensitive Trail – The Sweet Trail at Crommet Creek

To address the GBRPP goal of providing appropriate public access and educational opportunities in the Crommet Creek Conservation Area, a GBRPP committee was formed in 2003 known as the Recreation Access Team (RA Team). The Recreation Access Team comprised of the staff from GBRPP organizations that own land or hold conservation easements: New Hampshire Fish and Game Department and the Great Bay National Estuarine Research Reserve, The Nature Conservancy, and the Society for the Protection of New Hampshire Forests.

In 2003, the RA Team undertook the task of determining how to provide appropriate public access in the Crommet Creek Conservation Area. The woodlands and shoreline of the Crommet Creek area have historically been open to the public for what are considered ‘traditional uses’ - hiking, hunting and other non-motorized activities. Decades of access to these lands by the public had created a myriad of walking paths that posed both an opportunity and a challenge: Providing public access while protecting the watershed’s ecological values.

Over a four year period the “Sweet Trail” was planned and developed, officially opened in April 2010. The four-mile trail was designed based upon the following parameters:

- Support low impact, non-motorized uses including pedestrian (walking/hiking), cross country skiing, snowshoeing.

- Minimize disruption to sensitive habitat areas including wetlands, rare and endangered plants and species, nesting, breeding or feeding habitats for waterfowl and wildlife.
- Minimize fragmentation and further impacts within the watershed by using existing trails and woods roads as much as possible.
- Restrict motorized uses including snowmobiles and All- Terrain-Vehicles.
- Provide for educational opportunities.
- Provide for handicap accessibility on a portion of the trail.

The four-mile trail includes three trail head and two parking areas, an information kiosk and an educational site.

1. The Longmarsh Road (Town of Durham) parking area.
2. The NH Fish and Game Department/ Great Bay NERR Wildlife Management Area.
   Parking, educational site, handicap accessibility off of Dame Road.
3. The Lubberland Creek Preserve (TNC), Bay Road parking and kiosk site.

The trail's location was determined in a multi-step process. A GPS base map of existing trails was created. A co-occurrence map was developed including overlays of important natural features and rare species, exemplary natural communities, wetlands and buffers, vernal pools, known eagle/osprey/heron nests and buffers, rare reptile and amphibian species habitat, early successional and grassland habitat, roadless blocks and other "hotspots" on the landscape where human impacts should be avoided. The data layers were field checked by regional RA Team staff and community members.

The RA Team established criteria for determining the final location of the trail corridor, allowable public uses, and maintenance considerations. The trail's final location and design was developed with expert assistance from the Appalachian Mountain Club. A variety of funding sources were secured to enable the planning and construction of the trail.

The Sweet Trail is located in fairly easy rolling topography with a few sections of moderate slope and rocky uneven footing. An approximate 700 feet trail, located at the NH Fish and Game Department / Great Bay NERR Wildlife Management Area on Dame Road, is universally accessible. The trail showcases the diversity of upland and wetland habitats unique to the Conservation Area. It passes through various forest types and successional stages of hemlock-beech-oak-pine woods. Beavers are actively managing the forest on many of the parcels, and the trail passes by many beaver ponds, lodges, and three beaver dams. Emergent graminoid marsh vegetation and floating aquatic vegetation is abundant within and around the beaver ponds. One pond has an active great blue heron rookery that is visible from the trail. The southern half of the trail follows and old abandoned road through dry Oak-Hickory woods, passes near two vernal pools, and around a short rocky cliff. The trail concludes at a dedication stone and granite benches on the edge of the salt marsh at the mouth of Lubberland Creek, where views can be enjoyed of Great Bay.

The trail corridor is located across nine (9) conservation properties, including five (5) owners: TNC, SPNHF, NHFG, Town of Durham, and a private landowner. The properties (with the exception of the municipal parcel) were protected utilizing NAWCA and NOAA funding. The primary intent of these funding sources is to address all five of the Partnership's Conservation Goals. Although the trail was built as a collective effort, the RA Team agreed that routine maintenance of the trail would be the responsibility of each landowner. Annually the Partners review trail maintenance needs and identify collaborative opportunities.

The Sweet Trail map and information brochure is available on the Partnership's website (http://www.greatbaypartnership.org/mapsweet.html) and paper copies are available seasonally at information kiosk sites. Three maps are available on the website: Public Access Map, Hunting Map and Sweet Trail Map.

A trail counter was activated in August 3, 2010. Initial data for the first five months indicates healthy usage of the trail. Below is the trail usage data from this initial period (Table 10). Partnership organizations would like to install additional trail counters at other access points to better understand trail use patterns. The use data will assist in determining future trail management considerations. The trail's overall use will be monitored and maintained by conservation organization staff and volunteers.

Table 10. Sweet Trail at Crommet Creek, Trail Counts from 9/2010 - 11/2011.

Month, Year	Count	Hours	Average # triggers* per hour	One trigger* every x minutes	Per Day
September, 2010	220	815	0.27	16	6.4
October, 2010	444	1466	0.30	18	7.2
November, 2010	788	2449	0.32	19	7.7
December, 2010	935	2973	0.31	19	7.5
January, 2011	1042	3625	0.29	17	6.8
April, 2011	3878	5831	0.67	40	15.9
June, 2011	4128	7680	0.54	32	12.9
July, 2011	4366	8660	0.50	30	12.0
September, 2011	4825	9554	0.51	30	12.1
November, 2011	5768	10916	0.53	32	12.6

***** *the counter can be triggered by any movement that breaks the beam it directs across the trail including a person or animal walking, or a branch moving on a windy day.*

Public land use management options and recommendations

Allowable uses

The allowable public access and recreational uses on the conservation land should correspond to the management goals, and thus have minimal impact on water quality, wildlife habitat, rare species, and natural communities.

Allowable and prohibited uses are based upon conservation easement provisions, project funding, and/or ownership goals. All allowable uses should be regularly monitored to ensure they remain consistent with the management goals.

Promote low impact recreation with limited infrastructure.

Human access points and trails should be managed to provide suitable recreational and educational opportunities in the Crommet Creek Conservation Area, while also avoiding and minimizing impacts to sensitive resources and contributing to overall forest fragmentation. Any additional trail systems should be evaluated on a landscape scale, including the entire Crommet Creek Conservation Area. Access points and trails should not be attempted on every parcel. For example, trails should avoid vernal pool habitats and should not circle wetlands or other valuable discrete habitats. Dogs and human presence can adversely impact wildlife through direct mortality and alterations in behavior that could result in lower productivity, fitness and mortality of wildlife. This management recommendation is consistent with all five of the Partnership's primary conservation goals.

Passive Recreation

Hiking

The Sweet Trail serves as the formal hiking trail in the Crommet Creek Conservation Area. The trail was developed based on the Best Management Practices for Erosion Control during Trail Construction and Maintenance (DRED 1996). All current and future maintenance should follow BMP guidelines. Coordination on trail maintenance needs should be continued between conservation landowners.

Hunting

The protected lands in the Crommet Creek Watershed are one of the largest unfragmented natural areas in the Towns of Durham and Newmarket, and consequently offers excellent opportunities for hunting, fishing and trapping. The principle hunting opportunities include mostly small game such as woodcock, rabbits, snowshoe hare, and ruffed grouse, as well as wild turkey and deer. Hunting and fishing requires a license and are only allowed in the appropriate season, and trapping requires landowner permission. Tree stands and blinds require permission from the landowner; removal of stands and blinds are typically required at the end of the season.

As noted, a majority of the conservation properties allow hunting. Six properties have specific hunting and/or access considerations. To communicate these considerations with the public, the Partnership website provides maps and identifying lands where hunters must to first receive permission from the landowners (Figure 16).

Dog Walking

Visitors to the Crommet Creek conservation lands should respect landowner rules and signs with respect to dog walking. In some places visitors are allowed to bring dogs, but generally they are required to be on a leash and/or under the owners control. Many owners may want to exercise their dogs and let them run untethered, however this causes several problems for both wildlife and other visitors that landowners should consider, such as:

- Some species of wildlife perceive canines as threatening, thereby causing wildlife to alter their resting, movement, and feeding behaviors when canines are nearby.

- Dogs allowed to run off-leash may wander freely off trail, impact fragile plant species, harass ground-nesting birds, and disrupt other wildlife.
- Hikers looking for sightings of mammals and birds may be less likely to see wildlife if they are visiting during or shortly after a canine visit.
- Some young children and adults have a fear of dogs. Consider how to minimize potential user conflicts.

Wheeled and Motorized Recreation

Motorized vehicles (except snowmobiles) are not allowed on any GBRPP protected lands, except for management purposes. It is recommended that other lands within the Conservation Area consider the impacts of motorized vehicles before allowing use on their lands.

Snowmobiles

The GBRPP does allow snowmobiles on state-designated trails. As snowmobiles travel on a base of snow, they have little impact to soils and wetlands. However, it is important to monitor and/or gate trails as necessary to prevent use during times when a complete snow base is not present and soil disturbances could occur. Additionally, landowners should consider the noise, pollution, and impact on other users to their land if snowmobile trails were to be allowed. There are currently no state trails in the Crommet Creek Conservation Area, therefore snowmobiling is presently not allowed on these GBRPP protected lands.

ATVs

All Terrain Vehicles (ATVs) pose a serious threat to the wildlife habitat and water quality within the Crommet Creek watershed, and should be prohibited to protect sensitive wetlands, soils, native vegetation, and wildlife. All access points to conservation land should be posted to clearly indicate that ATVs are not permitted, and trails should be monitored and gated as necessary to prevent ATV use.

Potential damage from ATVs include:

- soil erosion and resulting degradation of the water quality and interruption of ecological process that impact the wetland habitats.
- noise disturbance to nesting birds, including disturbance-sensitive neotropical migrants, waterfowl, and wading birds.
- impacted wildlife foraging and movement patterns – many animals will avoid traveling across vehicular roads and trails, changing their natural migration corridors and fragmenting habitat.
- animal mortality (i.e., roadkill), especially for snakes, salamanders, and frogs
- invasive species introduction.

Mountain Biking

Partnership conservation properties, including the Sweet Trail, do not allow mountain biking. The limitation on this activity is precautionary since excessive use of mountain bikes could lead to erosion problems particularly in areas of steep slopes and wetlands.

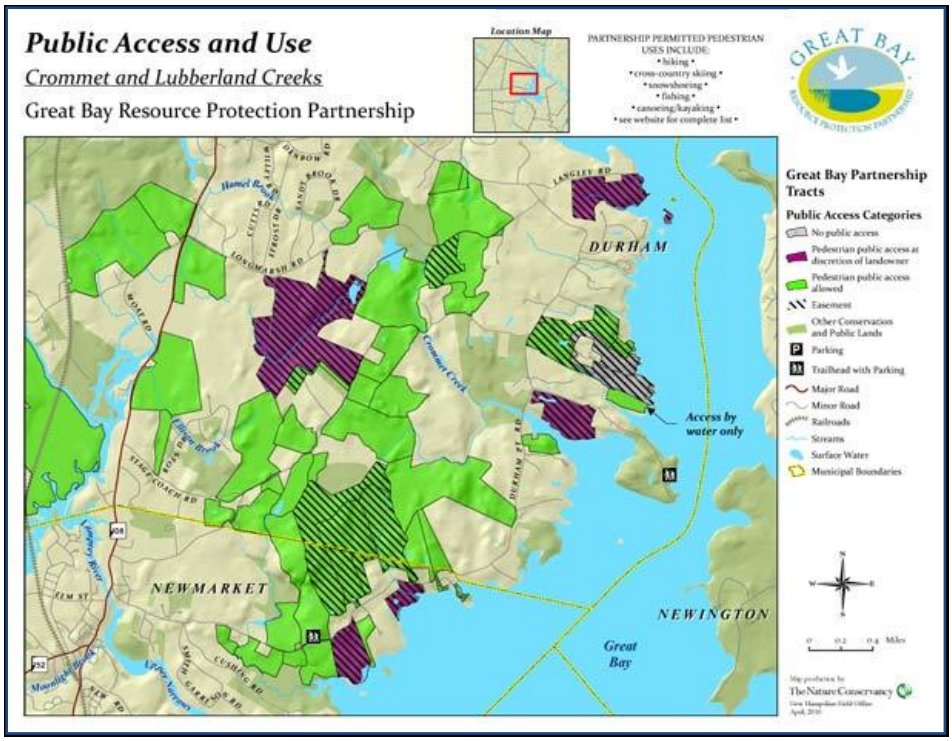


Figure 15. Map of public access on conservation lands in the Crommet Creek Conservation Area as shown on the Great Bay Resource Protection Partnership website as of January 2012.

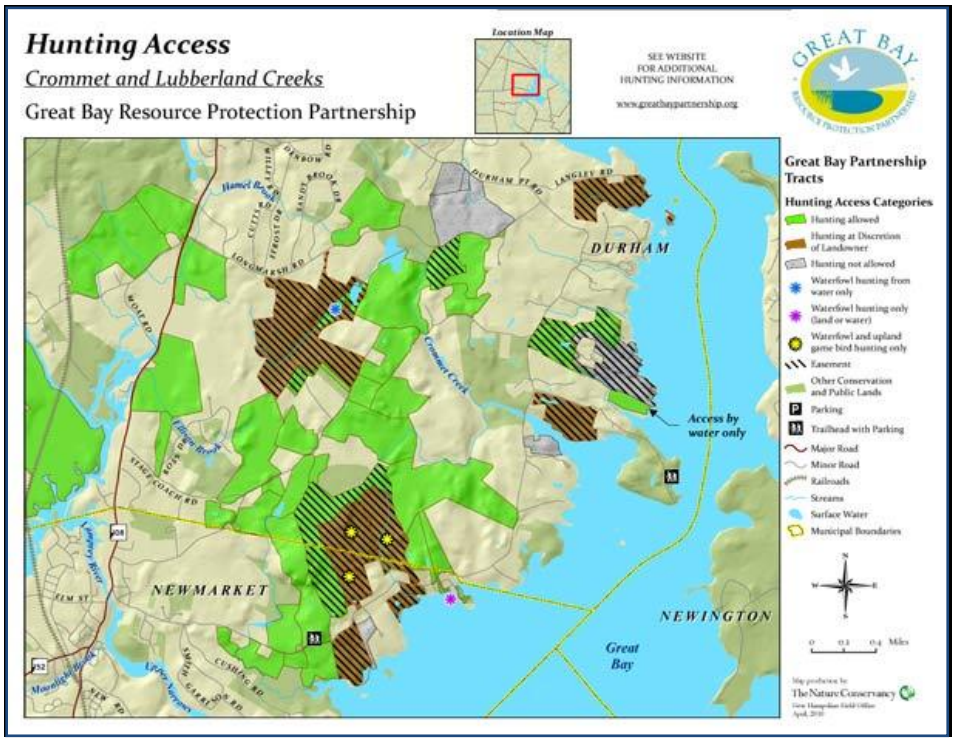


Figure 16. Map of hunting access on conservation lands in the Crommet Creek Conservation Area as shown on the Great Bay Resource Protection Partnership website as of January 2012.

f. Eco-Reserve

Eco-Reserves have been defined and designated by the Society for the Protection of New Hampshire's Forests (SPNHF) for use on some of their protected lands. The following goals and criteria are used by SPNHF, and are presented here for consideration by the landowners within the Crommet Creek Conservation Area. As stewards of one of the most prized and ecologically intact watersheds in NH's unique coastal zone with its rich diversity of habitats and species, it may be worth considering whether and where an Eco-Reserve designation might be beneficial.

The goal of designating areas as Eco-Reserves is to give full recognition and attention to the unique features of those areas. In Eco-Reserves the primary goal and management strategy is to sustain biodiversity and ecological processes; other uses are secondary. Eco-Reserves are identified and designated to meet the following management goals:

1. To protect, manage, or restore (if necessary) natural features in perpetuity, as defined by the Eco-Reserve criteria below.
2. To restore and maintain ecological processes in their own natural cycles.
3. To provide benchmarks for informing how forest management alters species patterns and successional pathways.
4. To provide benchmarks for monitoring the effects of global environmental change, such as atmospheric deposition (acid rain), global climate change, and invasive species.
5. To serve as source areas for plants and animals to recolonize disturbed areas.
6. To provide visitors with an experience that reflects natural conditions of the New Hampshire landscape.

In order to be designated an Eco-Reserve, SPNHF recommends considering several criteria. One or more of the following criteria may be sufficient to warrant Eco-Reserve designation.

- Rare Plants and Animals as defined by the NH Fish and Game Department and the NH Natural Heritage Bureau.
- Exemplary Natural Communities as defined by the NH Natural Heritage Bureau. Critical Wildlife Habitats as defined by the New Hampshire Wildlife Action Plan.
- Uncommon Geologic or Physical Features
- Exemplary Aquatic Communities include.
- Ecological Linkages are areas that provide connectivity to another Eco-Reserve.
- Deed or Donor Restricted Areas are areas where forest management restrictions are specified in the deed or by the donor.

Two different classes of Eco-Reserves are used by the SPNHF. The different classes determine how much management will be allowed in these areas.

Class 1 Eco-Reserves (Strict Nature Reserve). All vegetative management activities are strictly prohibited except in emergency situations (forest fires that threaten nearby habitation, etc.). In these instances, the health and resilience of the ecosystem is presumed adequate enough to warrant no need for restoration management, and the land is left to develop into "Old Growth" on its own.

Class 2 Eco-Reserves (Habitat/Species Management Areas). Active intervention and vegetation management is allowed only in order to insure the maintenance of habitats, meet the requirements of specific species, and/or maintain or enhance other priority ecological values. In this case, the ecosystem is in need of some form of active restoration or maintenance (e.g. prescribed fire, invasive species mitigation) in order to return to its natural state.

SPNHF has designated 46-acres of their 156-acre Dame Forest Reservation (#3a) a Class 2 Eco-Reserve. This designation was prompted by a unique upland forest type, rare plants, a rare turtle, and diverse wetland habitat along Crommet Creek. (Figure 17)

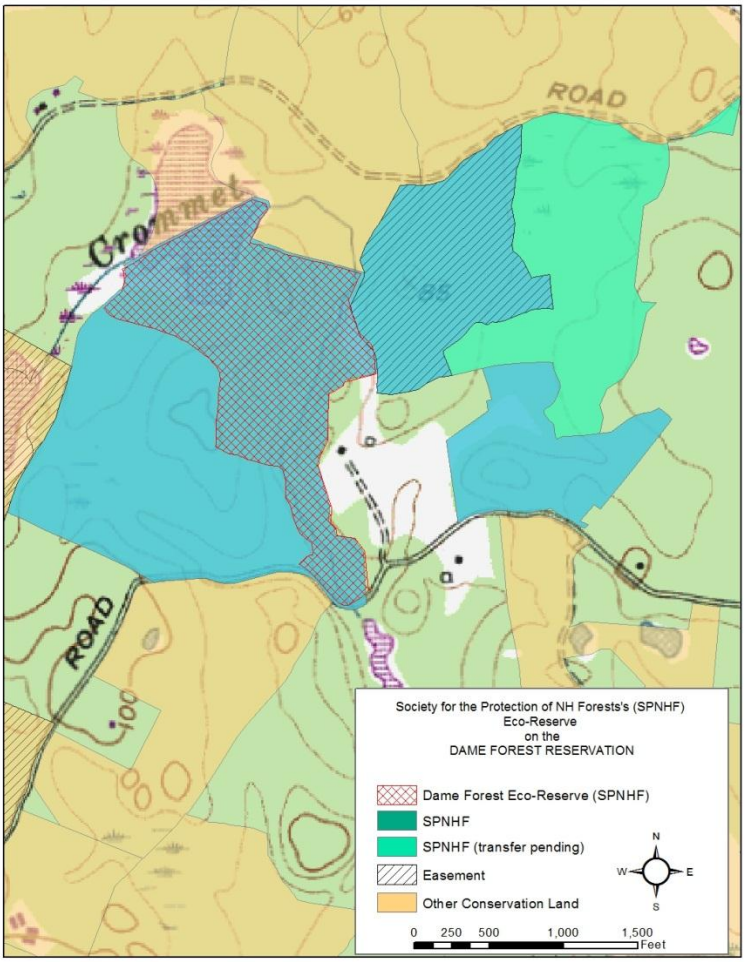


Figure 17. Location of Eco-Reserve on the Society for the Protection of NH Forest's DAME FOREST RESERVATION on Dame Road in Durham, NH.

Additionally, the Great Bay National Estuarine Research Reserve has designated parts of their Reserve as "Core" habitat. These Core areas are treated much as the SPNHF "Class 1 Eco-Reserves" (Figure 18).

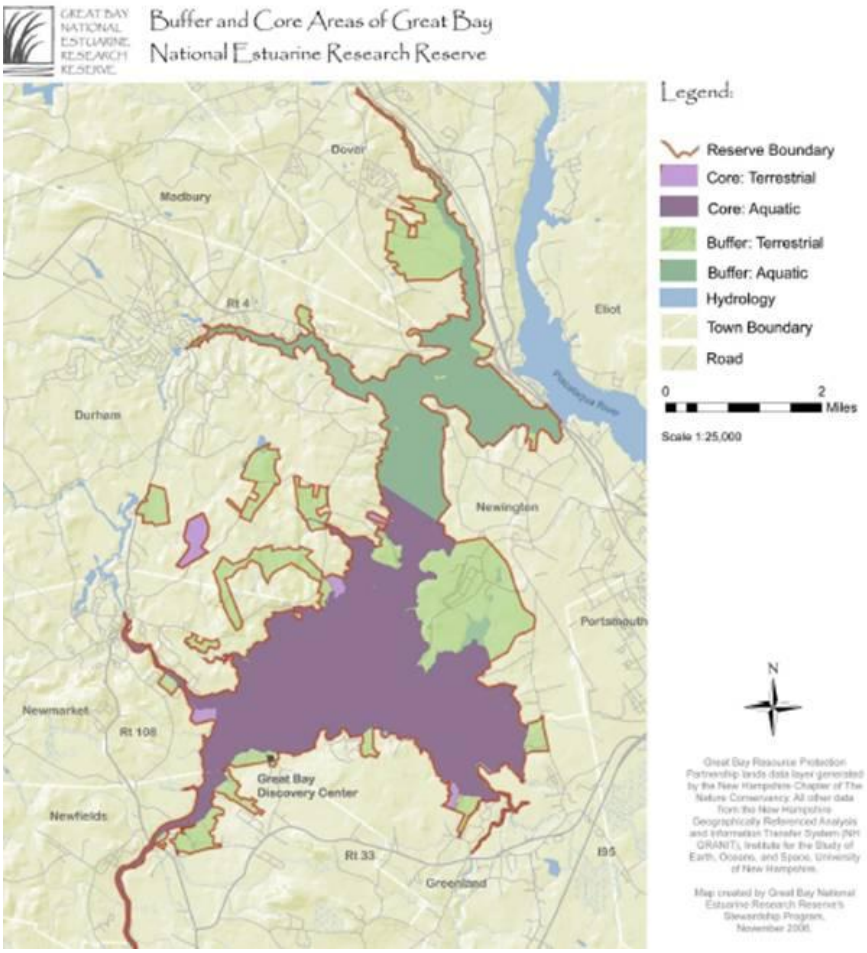


Figure 18. Core Areas designated by the Great Bay National Estuarine Research Reserve.

Management Recommendations

Land managers within the Crommet Creek Conservation Area could consider linkages between the existing SPNHF Eco-Reserve and the GBNERR Core Areas, and/or sensitive species that might need additional protection from management activities through this type of designation.

g. Climate Change Impacts

Increasingly, resource managers are concerned about the long-term impacts due to climate change. A recent report completed by Carbon Solutions New England predicted

some changes to the Piscataqua and Great Bay Region climate under different emission scenarios (Wake et al. 2011). They predicted that by the end of the Century we could see in the Great Bay watershed:

- a rise in average annual temperature by 4-9^{o}F
- the coldest days of the year to be 8-20^{o}F warmer than historical mean
- an increase in average annual precipitation by 12-17%
- an increase in mean high tide water by 4.43 feet
- an increase in 100-year coastal still-water flood height of 13-18.5ft

These dramatic changes in the climate may result in many changes to the physical landscape as well as the ecology of our coastal zone. Some predicted changes that landowners can prepare for include:

- increased flooding along shorelines streams and rivers
- increased freshwater and sediment discharge from major tributaries into the Estuary
- shoreline erosion
- loss of salt marsh and nearshore coastal habitats
- disruption to pollinator services and other plant/insect interactions
- lessened cold temperature influences on abundances and species of biota, i.e. range expansion of invasive species northward

The greatest impact so far experienced by seacoast NH has been the increase in intense storm events. This has caused erosion and flooding problems in a number of communities within the Great Bay estuary especially along the Lamprey River.

The Crommet Creek watershed, which backs up to a large floodplain of the Lamprey along Route 108, has been impacted by past storm events. The main problem is a culvert under Route 108 that drains the fields associated with Crommet Creek. With large amounts of water, the culvert cannot handle the flow and easily back ups. Historically, this has often occurred during large snow melt years as well.

Along the shore, there are fringing areas of salt marsh. To date, sea level rise has been minimal within the estuary (0.7"/decade), and salt marshes have been able to build substrate at a rate that keeps up with this slow rise (Wake et al 2011). However, if sea level rise was to become an issue there are few areas where the salt marsh can retreat. One strategy should be to protect the land behind any salt marshes to allow for future migration.

The greatest threat to Crommet Creek due to warmer temperatures is an increase in invasive plant species. Invasives are already widespread and warmer temperatures will only add to the problem. The presence of the invasive Hemlock Woolly Adelgid in the Conservation Area is of particular concern. This small, aphid-like insect feeds exclusively on hemlocks, eventually killing the tree. Although the Adelgid's presence in the Seacoast has been minimal to date, it could begin to expand its range across the

region accelerated by warmer temperatures. Most of the steep stream banks in Crommet Creek are dominated by hemlocks. The loss of these trees could cause severe erosion problems.

Great Bay Shoreline "Overlay District"

This Plan includes only a small portion of the shoreline of the Great Bay Estuary. Therefore, this plan does not focus a great deal on these shoreline issues, as they are best dealt with at its full scale so all the issues relevant to the shoreline can be addressed at one time. Therefore, the GBRPP plans to develop a similar landscape-scale management plan for a shoreline "overlay district" that will assess multiple coastal management concerns. These concerns include salt marsh condition and restoration, shoreline vegetated buffers, erosion and armoring of shoreline, climate change impacts, etc. This "overlay district" will include both Little and Great Bays and span across multiple Conservation Areas that have been designated by the GBRPP.

Efforts are currently underway to help landowners along the Great Bay Estuary shoreline make good land management decisions. For example, in order to assess where land acquisition efforts along the shoreline may have long term conservation value, researchers are developing marsh potential migration models for different sea level change scenarios. Tax parcels can be evaluated differentially for their ability to support inter-tidal wetlands in the long term. Areas that have barriers to marsh migration, such as railroads or other human infrastructure, are less likely to have long-term conservation value than low lying areas that can support inland marsh migration unimpeded.

In addition, NOAA Research Reserves (including the Great Bay NERR) are being encouraged to develop an ecological and socioeconomic climate change adaptation plan for their sites. One component will be to develop marsh inundation models based on different sea-level change scenarios, most likely using the Sea Level Affecting Marshes Model (SLAMM). SLAMM simulates the dominant processes involved in wetland conversions and shoreline modifications during long-term sea level change. SLAMM was developed with EPA funding by Dr. Richard A. Park in 1986 and has been used extensively by the USFWS and other entities.

As part of developing this "Overlay District" the Great Bay NERR contracted with UNH Complex Systems to map all areas of salt marsh to 1 foot accuracy. Major tidal creeks and ditches have also been digitized. The interface of the high and low salt marsh has been mapped using a sub-meter accuracy GPS unit throughout Great Bay. This line is a vegetative indicator of mean high tide level and change in its location is likely to be an early ecological response to change in mean sea level.

Management Recommendations

The lack of development and minimal fragmentation of the watershed makes the Crommet Creek Conservation Area an ideal sentinel site to monitor long-term impacts from climate change. Landowners should participate in and help support the new and on-going monitoring programs to help coastal land managers better understand the effects of sea-level rise and climate change on the ecosystem.

VI. Habitat Management Recommendations

Table 11: Habitat Management Summary

Management Unit	Goals	Primary Wildlife Species	Secondary Wildlife Species	Associated Rare Plants & Exemplary Natural Communities	Parcels
Freshwater Wetlands	Maintain a network of wetlands representing a variety of successional stages including open water, forested, emergent, and shrub wetland types to support a maximum diversity of plant species and wildlife. Maintain the current distribution of freshwater wetland habitat including vernal pools, forested wetlands, and beaver managed stream systems. Maintain habitat patches and travel corridors that allow for metapopulation dynamics of rare wildlife species (i.e. blue-spotted salamander) both within the conservation area and to nearby conservation areas and riparian corridors. Monitor freshwater wetlands for new invasive plant species	Ringed boghaunter, Black racer, Blanding's turtle, Spotted turtle, Wood turtle, American black duck American woodcock, Osprey, New England cottontail, American black ducks, Wood ducks	Northern leopard frog, Ribbon snake, American bittern, Great blue heron, Least bittern, Pied-billed grebe, Sedge wren, Eastern pipestrelle, Eastern red bat, Silver-haired bat	small crested sedge pale green orchis water plantain lined bulrush large bur-reed Loesel's twayblade tufted loosestrife	FEE PARCELS TNC: 4(a-c), 7(c-h) NHFG/GBNERR: 5(b-k), 5(m-o), 5q SPNHF: 3a-b Town of Durham: 6a-c EASEMENT TRACTS: 2, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20
Early Successional Habitats	Maintain and manage a mosaic of shurblands and young forests with the varying age-class and structure required to meet multiple species habitat requirements. Encourage native species growth and seed production in shrublands	Black racer Eastern hognose snake	Northern leopard frog Smooth green snake	None known	FEE PARCELS TNC: 4a, 7a,d,e,g NHFG/GBNERR:

	through management activities. Discourage invasive plant colonization and re-sprouting in shrublands through active management including chemical control if necessary. Maintain habitat patches and travel corridors that allow for metapopulation dynamics of rare wildlife species both within the conservation area and to nearby conservation areas where this habitat is also prevalent (i.e. UNH lands).	American woodcock Whip-poor-will New England cottontail Golden-winged warbler	Cooper's hawk Eastern towhee Northern goshawk Ruffed grouse turkey		1, 5b,e,g,k,l Town of Durham: 6b EASEMENT TRACTS: 9, 18, 19
Upland Forest	Minimize fragmenting features (such as roads, woods roads, and trails) in the remaining intact forested lands, and assess if some fragmenting features (such as old woods roads, trails) can be abandoned and/or restored. Maintain oak and pine woodlands using prescribed fire and/or forest harvesting techniques. Through active and passive management promote a diversity of successional stages to insure habitats are provided for the maximum diversity of flora and wildlife in the upland forests. Maintain snags and downed woody debris Monitor expansion of invasive plants into interior unfragmented areas, and prioritize keeping invasive species from establishing in areas of interior forest that are currently invasive species free. Monitor forests for newly invading insect species such as EAB, HWA, and ALB, and work closely with the state Forest Health Bureau in developing a plan to control/contain/monitor any newly found insect forest pest infestation.	Black racer Eastern hognose snake Whip-poor-will New England cottontail Wood duck	Eastern towhee, Veery, Wood thrush, Cooper 's hawk, Northern goshawk, Ribbon snake, Ruffed grouse, Wood duck, Silver-haired bat, Great blue heron, Osprey, Turkey	None known	FEE & EASEMENT: *Relevant to all Conservation Landowner tracts within the Crommet Creek boundary*
Grasslands	Minimize fragmenting features (such as hedgerows) from within the	Black racer	Northern leopard frog	None known	FEE PARCELS TNC: 7g

	largest grassland areas to maximize the acres of open grassland habitat for the greatest number of species. Maintain all grasslands greater than 10-acres in size. Consider how the timing and rotation of mowing can accomplish multiple objectives (i.e. delay field mowing until after August 1st to allow for grassland nesting birds to fledge, mow before invasive species go to seed, delay mowing to allow monarch butterflies to pupate, etc.) Through active and passive management promote the creation of a soft edge around open fields to create habitat for a greater diversity of species such as woodcock and other species requiring a combination of early successional and open grassland habitat. Evaluate existing small patches of grassland areas to determine if they should be maintained or converted to a another habitat type (e.g,. shrubland or a mosaic of grass and shrub).	Wood turtle American woodcock Grasshopper sparrow (if in this area) Whip-poor-will	Smooth green snake Eastern meadowlark Vesper sparrow		NHFG/GBNERR: 1 EASEMENT TRACTS: 9, 10, 12, 14, 17, 18, 19, 20, 21
Intertidal Habitats	Maintain or restore a 100ft buffer of natural, unfertilized, vegetation along the intertidal shoreline Passively allow the natural hydrologic regime and drainage patterns within salt marsh habitat to become restored Participate and cooperate with local and regional research efforts aimed at better understanding the impacts of climate change to the Great Bay Estuary Monitor expansion of invasive plants – primarily purple loosestrife and Phragmites into salt marshes	American black duck Osprey North Atlantic population Canada geese (Maritime) Greater Scaup Great Blue Heron Bald eagle	Northern harrier, Pied-billed grebe, Red shouldered hawk, Sedge wren, Vesper sparrow, Saltmarsh Sharp-tailed sparrow, Nelson's Sharp-tailed sparrow, Willet, Eastern pipistrelle	Seaside gerardia Marsh elder Prolific knotweed Dwarf glasswort Stout bulrush Large bur-reed Small spike-rush Horned pondweed	FEE PARCELS TNC: 7a,b,g,h NHFG/GBNERR: 1, 5a,l,p,q EASEMENT TRACTS: 9, 10, 12, 14, 17, 18, 20, 21

Management Recommendations by Management Units / Major Habitat Types

1. Freshwater Wetlands

Proposed Management Goals:

Maintain a network of wetlands representing a variety of successional stages including open water, forested, emergent, and shrub wetland types to support a maximum diversity of plant species and wildlife.

Maintain the current distribution of freshwater wetland habitat including vernal pools, forested wetlands, and beaver managed stream systems.

Maintain habitat patches and travel corridors that allow for metapopulation dynamics of rare wildlife species (i.e. blue-spotted salamander) both within the conservation area and to nearby conservation areas and riparian corridors.

Monitor freshwater wetlands for new invasive plant species

Acres: 1,000+

Primary wildlife target species:

ringed boghaunter, black racer, Blanding's turtle, spotted turtle, wood turtle, American black duck, American woodcock, osprey, New England cottontail, American black ducks, wood ducks

Secondary wildlife target species:

northern leopard frog, ribbon snake, American bittern, Great blue heron, least bittern, pied-billed grebe, sedge wren, eastern pipestrelle, eastern red bat, silver-haired bat.

Rare plants:

small crested sedge, pale green orchis, water plantain, lined bulrush, large bur-reed, Loesel's twayblade, tufted loosestrife

Wildlife Habitat Management Considerations:

Summary: ***A combination of hands-off management and strip cuts around pre-existing beaver ponds may help maintain the wealth of plant and animal species within the Conservation Area by encouraging beavers to maintain some dams/ponds and allowing others to become inevitably abandoned.***

The freshwater wetland system that is present within the Crommet Creek Conservation Area needs little management to continue to provide high quality and diverse wildlife habitats. The natural process of beaver colonization, stream damming and ponding, beaver abandonment of dams and ponds, and forest regrowth will likely continue to happen within this Conservation Area without any human intervention. At

this time there is a great diversity of freshwater wetland habitat due to the active beaver colonies up and down the streams within the Conservation Area.

However, the beavers colonized this area at approximately the same time and consequently the beaver ponds are maturing at the same rate. As they evolve, the beavers will eventually run out of food and could potentially abandon these ponds at near the same time. Therefore, without some active management, there might be overall habitat diversity loss in the future.

Land managers may consider "strip harvesting" along wetland edges to maintain early successional woody species re-growth for beaver forage (50ft x 100ft patches). The forage will encourage beavers to stay in the ponds and tending to their dams and prevent loss of open water habitat. However, halting natural processes and encouraging "over maturation" of the open water habitat would result in all dead standing snags falling down and the eventual loss of nesting habitat for ospreys and herons and the loss of woody cover sought by breeding wood and black ducks (Nevers 1965).

Therefore, a combination of active strip harvesting and natural abandonment would probably best allow for the maintenance of the current wildlife habitat diversity within the Conservation Area.

Invasive Plant Considerations:

Summary: ***Monitor areas of disturbance for key invasive plant species that would have great ecological impact to the Conservation Area.***

Invasive plants are becoming established and dispersing along the stream channel in areas heavily disturbed and opened up by beavers. Regional land managers have noted that beavers appear to avoid browsing on non-native species. Additionally, birds are attracted to the shrubby edges of beaver ponds, and feed on the berries of the invasive shrubs growing there, which aids in moving their seeds around the stream system. Therefore, without some management, invasive species could become much more prevalent in the interior of the Conservation Area as beavers continue to move through the stream corridors.

Four of the six invasive plant species of noted concern within this Conservation Area are species common of wet disturbed edges. Therefore, the potential for new and expanded populations of purple loosestrife, Japanese knotweed, pale swallow-wort, and common reed along these stream corridors with the natural disturbances created by the resident beavers is highly likely. To protect from habitat and species loss from these and other invasive plants, participation in a monitoring and control program of wetland and stream edges is encouraged (such as the The Nature Conservancy's Weed Watcher volunteer program). Rapid removal of any newly established population of these 4 wetland edge invaders should be a priority. Successful control of invasive plants can be gained by recognizing and treating a problem as soon as it is recognized.

Of note, some pesticides do pose a threat to amphibian growth, development and behavior. To avoid possible poisoning of amphibians, invasive plant control within 100ft from a wetland edge could be attempted first by mechanical means. If mechanical means are not resulting in effective control, herbicide control could be considered. When using herbicides near a wetland, special care should be taken to use appropriate herbicides for wetland environments and to use as little of the herbicide as needed. Refer to the NH Division of Pesticide Control's website for further information on the rules and permits that may be required when considering any herbicide control project.

Landowners can look to the Coastal Watershed Invasive Plant Partnership for assistance with the latest invasive plants of concern, resources available to help with species identification, qualified professionals to do chemical control, mechanical control techniques and equipment rental, and potential sources of funding to assist control projects.

Vernal Pool Considerations:

Summary: ***Avoid fragmenting features around pools by maintaining 300ft forested buffers. Avoid alterations to any drainage into or out of a vernal pool.***

The vernal pools of the Crommet Creek Conservation Area support many rare reptiles and amphibians. Many of these species breed in these seasonal water bodies, but spend most of their lives in the nearby forested uplands. They may move several hundred meters from their breeding pools into adjacent upland. Therefore, disturbances such as trails, roads, and timber activities around vernal pools should be avoided as much as possible. These types of land clearing disturbances could result in a real or perceived fragmenting feature that could disrupt movement of salamanders or turtles between pools and the surrounding upland habitat patches. Additionally, tree cutting near or around vernal pools may allow for pre-mature drying of the pools which could result in young salamanders and frogs desiccating within the pool in their larval stages. Therefore, it is vitally important to avoid any alteration of the drainage into or out of a vernal pool and the natural buffer of trees to maintain the natural hydrologic cycle. The state generally recommends a 300ft no disturbance buffer around vernal pools (UNH Co-op Ext, Habitat Stewardship Series: Vernal Pools). In addition, trails may invite the public and domestic pets into close proximity to turtle and salamander nesting or wetland habitat, and increase the threat of disturbance, predation, or collection.

Forested Wetland Considerations:

Summary: ***Allow natural processes to occur and limit all unnatural disturbances.***

The small isolated forested wetlands, and the larger headwater forested wetlands need little to no management to maintain their current high quality wildlife habitat and ecological functions of nutrient cycling, water filtration and groundwater recharge. Several of these forested wetlands contain rare plants and insects due to groundwater seepage. In these situations, nutrient rich groundwater rising to the surface allows

nutrient loving plant species such as Loesel's twayblade and pale green orchis to grow and provides soil conditions ideal for the northern-most populations of fen ants. It is possible that invasive plants could threaten the forested wetlands within the Crommet Creek Conservation Area. Four of the 6 invasive plants of concern are wetland species. However, these are all sun-loving plants that wouldn't ordinarily become established under a continuous canopy of an undisturbed forested wetland. Therefore, disturbances to the forested wetlands are discouraged and monitoring of forested wetland that are subject to natural disturbance such as a windstorm or beaver activity for invasive plant establishment is encouraged. This is especially important for the forested wetlands where rare species exist.

Wetland Buffer Considerations:

Summary: ***Maintain or restore intact buffers of natural vegetation at least 100ft wide around freshwater wetlands, especially in areas where agriculture or residential development is nearby.***

An intact buffer of natural vegetation adjacent to freshwater wetlands provides many beneficial functions. They can filter surface and groundwater moving from the surrounding upland of pollutants, excess nutrients, or sediments before this water enters the wetland. They provide a screen to wildlife using the wetlands to human activities and infrastructure, and provide wildlife habitat themselves. A minimum 100 foot buffer width is recommended to gain many of these benefits. However, the optimal buffer width at any location depends on the upslope land use, the slope of the land, and the soil types. Maintaining healthy buffers between any freshwater wetland and an intensive land use such as a fertilized lawn, septic field, parking lot, driveway, busy road, etc. is especially important to the quality of the wetland and the wildlife habitat it provides.

NHFG also recommends maintaining large diameter forest stands in an uneven-aged condition adjacent to streams/rivers and wetlands to provide shading, a long term source of coarse woody debris falling into the stream/river, potential nesting sites for raptors (e.g,. red-shouldered hawk), and roosting areas for bats. This will be most feasible in areas with the most productive soils.

Restoration Opportunities:

- Road mortality is one of the primary threats to our rare and common amphibians and reptiles. A heavily trafficked road (Rt 108) separates the Conservation Area from lands to the west. Two dirt roads (Dame Road and Longmarsh Road) bisect the Crommet Creek Conservation Area, and one paved road separates the coastal habitats within the Conservation Area from the bulk of the terrestrial habitat (Bay/Durham Pt Road). Traffic monitoring reports by the Town of Durham (1998 – 2007) find Rt 108 to have ~14,000 cars per day, and Durham Point Road to have ~ 1000 cars/day. The dirt internal roads have the benefit of slower and less traffic, and represent less of a fragmenting feature than the paved peripheral roads. Therefore, maintenance of the

dirt roads in their unpaved condition is important to maintain the wildlife connection between the northern and southern half of the Crommet Creek Conservation Area. To insure the long-term health of the turtle populations within the Conservation Area turtle movement could be monitored to identify major crossing areas and safe passages over major road barriers could be evaluated (i.e. maintain connectivity along the Lamprey River corridor).

- Where appropriate, consider restoring wetlands in agriculture fields that have been previously ditched and drained.

- Maintain and improve natural buffers to freshwater wetlands where necessary. The width of the optimal naturally vegetated buffer for any site is dependent on the nearby land use and the slope of the land. A minimum 100-ft natural buffer is recommended to reduce sediment and nutrient delivery to freshwater wetlands from upland land uses.

Special considerations:

- ***Blanding's Turtles***

  The entire Crommet Creek Conservation Area represents only 10% of the optimal area required for a viable Blanding's Turtle population (McCollough 1999). Therefore maintaining connections to surrounding Blanding's Turtle habitat is very important. Determining these connections and road crossings could be of great value. Other monitoring and research needs include mark-recapture Blanding's Turtle studies to evaluate long term trends in the population. Considering the Crommet Creek population is fairly isolated, creation of nest sites could potentially encourage females to stay within the Conservation Area boundary and prevent some road mortality.

- ***Fen ants***

  Many of the fen ant populations are in young forested wetlands. This ant requires sunlight, and therefore could benefit by some limited opening of the canopy immediately above their small populations. The populations within the Crommet Creek Conservation Area are all very small, and it is unknown as to whether this is due to less than ideal habitat (i.e. marginally rich soils and shady habitat) or whether it is simply because these are some of the northern-most known populations.

- ***Rare plants***

  Three species of rare plants are known to grow within the emergent marsh community around the perimeter of the beaver ponds. Any patch cuts around

beaver ponds should consider the location of these rare plants. Rare plant location data is available from the Natural Heritage Bureau through their Data Check Tool. http://www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/

Challenges for Land Managers:

- ***Beaver Management***

  Residential properties within the Crommet Creek Conservation Area inevitably share their yards and forested lands with the animals that live and pass through this large area of wildlands. Although seeing passing birds at feeders can be enjoyable, sometimes other wildlife behavior can be a real or perceived nuisance to homeowners. Specifically, increased beaver activity in the Conservation Area has heightened concerns with flooding damage to private and public infrastructure. State laws prohibit tampering with a beaver dam on state or private land. Therefore, a landowner should contact the New Hampshire Department of Fish and Game if beaver activity and flooding is damaging or threatening damage to their property. A Fish and Game employee will visit to assess the problem and discuss the options available to the landowner. These options may include installing a beaver baffle at a dam, trapping the beaver, or no action depending on the situation.

2. Early Successional Habitat

Proposed Management Goals:

Maintain and manage a mosaic of shrublands and young forests with the varying age-class and structure required to meet multiple species habitat requirements.

Encourage native species growth and seed production in shrublands through management activities.

Discourage invasive plant colonization and re-sprouting in shrublands through active management including chemical control if necessary.

Maintain habitat patches and travel corridors that allow for metapopulation dynamics of rare wildlife species both within the conservation area and to nearby conservation areas where this habitat is also prevalent (i.e. UNH lands?).

Acres: 222. Recommend maintaining 3-5% of forest land within the Conservation Area as Early Successional openings (~150 – 300 acres), with patch sizes >2 acres.

Primary wildlife target species:

Black racer, eastern hognose snake, American woodcock, whip-poor-will, New England cottontail. Golden-winged warbler

Secondary wildlife target species:

Northern leopard frog, smooth green snake, Cooper's hawk, Eastern towhee, Northern goshawk, ruffed grouse, turkey.

Rare plants:

None known

Wildlife Habitat Management Considerations:

Summary: ***Maintain all existing 5+acre patches of shrubland habitat and evaluate need and appropriate locations to create additional new patches of shrubland and other forms of early successional habitat in the Conservation Area as required by our target wildlife species.***

As the natural lands in the New England landscape continue to revert and mature into forested land or be converted to developed lands, the acres of open fields and shrubland habitats is declining. Young forests and early successional shrublands are attractive to many species of wildlife because the dense vegetation provides protective cover from owls and other predators, and the many berry producing woody shrubs provide a readily available food source. Fifty four species of birds, 12 mammals, and 8 reptiles depend on early successional habitat and young forests for part or all of their habitat needs (WMI 2010). This includes the increasingly rare golden-winged warbler, the American woodcock, and the New England cottontail, all three of which are known from the Crommet Creek Conservation Area.

Therefore, it is recommended that all existing shrubland habitat in patches greater than 5-acres should be maintained and managed to prevent loss of early successional habitat in the Conservation Area. Ideally, shrubland habitat should consist of a mosaic of grass/forb and shrub patches with stem densities greater than 10,000 stems/acre in the shrub patches. Maintenance needs will depend on the plant species that exist at these shrub locations. Stable shrublands, consisting of dense colonies of native shrub species such as viburnums, dogwoods, and alders, will require monitoring and occasional selective cutting, mowing, or herbiciding (e.g., cut stem, basal bark, or other very targeted application techniques) of small trees that invade the area (e.g., every five years). Shrublands dominated by regenerating trees or invasive woody plants will require aggressive management over many years to aid in the conversion to a more stable native shrubland. In general, shrubland habitat can be maintained by mowing/brontosaurus work on a 3-8 year basis. However, it is best to mow early successional habitat in a rotation that always leaves some of the original habitat intact to provide food and cover for the resident species. This can be accomplished by defining subunits within each habitat patch. If a 10-acre habitat patch is being managed, 5-acres can be mowed years 1 and 5, and the remaining 5-acres mowed years 3, and 7, etc. Maintaining a mowing rotation allows long term habitat maintenance with the least amount of impact on the wildlife that use these shrublands. Mowing should occur after August 1st and preferably in patches of 5-acre minimum size to allow nesting birds the time to fledge their young.

Invasive Species Management Considerations:

Summary: ***Mowing and/or chemical control strategies should be focused on promoting desirable native shrub species and diminishing the abundances of trees and non-native shrubs.***

Early successional habitat possesses the greatest abundance of non-native species in this Conservation Area. Through the invasive species mapping work on GBRPP lands, they are known to support 12 species of invasive plants and occupy approximately 119-acres, or 54% of this habitat type. There is some debate as to whether the origin of plant species within this habitat type has any impact to the species of wildlife dependent on early successional habitat. Invasive plants tend to invade disturbed open areas with vigor, suppress native tree growth, and create the ideal dense shrub habitat sought by many early succesional specific wildlife. While there is a lack of research on the topic to help land managers with this debate, it is known that certain species, such as the Golden-winged warblers, do not use areas of dense autumn olive (WAP, 2006). It seems likely that the wildlife species dependent on this specific habitat, adapted in many ways to the native suite of species that has defined this community type for thousands of years; and there is much to be gained by maintaining the native ecological interactions in any habitat as much as possible.

Altering management practices can prevent spreading these species from one location to another, and can reduce their abundances at individual sites. Machinery operators should be cognizant of invasive species and should always clean their equipment between fields and before leaving any site. Mowing around native shrubs

allows these plants to grow, go to seed, and promotes their expansion. Repeatedly mowing trees and non-native species will eventually diminish their abundances. However, in many cases, mechanical means alone for controlling invasive species is not realistic. If invasive plants have been present in a shrubland for a long time, there will a large seed bank in the soil, and mature shrubs with large root systems appear to be able to maintain reprouting from an annual or biannual stem cut indefinitely. Better invasive species control can be gained by coupling mechanical control with selective herbicide treatments on non-native plants such as cut-stump or basal bark herbicide application. To minimize herbicide use in an area dominated by non-native woody shrubs, managers can consider mowing or knocking back vegetation with a brontosaurus, then following-up with a foliar herbicide on the resprouts. Mowing should take place as soon after August 1 as possible since mowing during the growing season helps to minimize resprouting. Additionally, early-summer mowing prevents berries and seeds on many of these plants from maturing and being eaten (typically mature between late July and September). This is especially important as most of these invasive woody shrubs produce berries that are highly desirable by many birds and small mammals including robins, starlings, bluejays, and mice, and therefore have the potential to disperse widely once consumed. Funding for these activities on private lands can be applied for through the Natural Resources Conservation Services, Wildlife Habitat Incentive Program grants (WHIP).

Powerline Management Considerations:

Summary: ***Management of early successional habitat in areas adjacent to powerline corridors should involve communication and collaboration with the powerline company towards creating continuity of habitat and improved invasive species management.***

Current powerline management has created a corridor of good quality early successional habitat across the country. Powerlines corridors are typically too small and linear to provide adequate habitat for some shrubland species of wildlife. However, they provide opportunities to connect patches of larger shrub habitat as travel corridors. Powerline management in NH currently prohibits the use of herbicides. Mowing is the primary tool used by the powerline companies for maintaining low growing trees and shrubs. As such, invasive plant species have resprouted and expanded as dense colonies in some powerline corridors. Management of early successional habitat in areas adjacent to powerline corridors should involve communication and collaboration with the powerline company. Perhaps through a cooperative approach, invasive species management can be incorporated into powerline management and the schedule of powerline mowing can be complementary to any contiguous habitat patches managed for early successional wildlife species.

Restoration Opportunities:

It is challenging to define and describe the ideal early successional habitat, land managers should try to create as it is a catch-all phrase used to described the changing habitat types that re-grow following disturbances and includes many differing age-classes, forest structures, plant species and composition, soil types, and hydrology. Therefore, the woodcock is often used as an umbrella species for early successional

habitat management because it relies on multiple open upland and wetland habitat types of varying structure and age class. If a land manager can provide suitable habitat for woodcock, many other species of wildlife will benefit. The woodcock uses areas of dense vegetation in moist soils, such as alder swamps, for feeding grounds where they probe the moist soils for earthworms and insects. They use open habitat, such as grasslands for displaying and young forests of pole-size trees for roosting and feeding. Therefore, ideal new locations for creating early successional habitat should be around existing grasslands, along stream corridors, near shrub swamps, wet meadows, powerlines, or forests with well developed understories. New areas managed for early successional habitat should be prioritized in areas where they are connected to other areas similarly managed. In the Crommet Creek Conservation Area there are 5 distinct areas where this habitat exists (Table 12). Outside of the Conservation Area there are 3 main areas where this habitat is being created and managed in large acreages (Table 12). The need to expand the early successional habitat within these area and create connections between these habitat patches should be investigated. Guidance as to whether this is an appropriate land management strategy for private landowners may be determined by contacting UNH Cooperative Extension biologists for your county (http://extension.unh.edu; Strafford County, 749-4445; Rockingham County, 679-5616).

The Conservation Area will experience changing pattern of early successional habitat in association with beaver use along the stream corridors. Patches of shrub wetlands and wet meadows along the creek corridors will appear when beaver ponds are abandoned, and young beaver managed forest edges will appear when beavers are active in a ponded area. Allowing natural processes to occur along the length of these creeks and streams is recommended to encourage the long-term presence of this habitat type within the Conservation Area. In addition, restoring the natural hydrology to streams by removing man-made dams can invite beaver management and habitat variability to an otherwise stable water body.

Table 12. Areas with Early Successional Habitat within the Conservation Area and in the surrounding lands.

Inside Conservation Area

Area Name	Landowners	Acres of EA habitat
Longmarsh Road & powerlines	NHFG, TNC, Town of Durham, & private landowners	62.5
Adams Point and Rollins/Borner easements	NHFG, private land with conservation easements	50.3
Rt 108 agricultural lands	NHFG (Powers), private lands, some with conservation easement	58.6
Lubberland Creek Preserve	TNC	44

Outside Conservation Area

Area Name	Landowners	Acres of EA habitat
Bennett Road	NHFG (Beaudette)	13-acres
UNH Lands	UNH	70 – acres grass/shrub
	UNH	20 (will be adding 15 more) early successional
Johnson Creek	SPNHF (Grandpa Watson) & NHFG (Palmer)	16 (8-acres each)

3. Upland Forests

Proposed Management Goals:

Minimize fragmenting features (such as roads, woods roads, and trails) in the remaining intact forested lands, and assess if some fragmenting features (such as old woods roads, trails) can be abandoned and/or restored.

Maintain oak and pine woodlands using prescribed fire and/or forest harvesting techniques.

Through active and passive management promote a diversity of successional stages to insure habitats are provided for the maximum diversity of flora and wildlife in the upland forests.

Maintain snags and downed woody debris

Monitor expansion of invasive plants into interior unfragmented areas, and prioritize keeping invasive species from establishing in areas of interior forest that are currently invasive species free.

Monitor forests for newly invading insect species such as EAB, HWA, and ALB, and work closely with the state Forest Health Bureau in developing a plan to control/contain/monitor any newly found insect forest pest infestation.

Acres: ~4,000

Primary wildlife target species:

Black racer, eastern hognose snake, whip-poor-will, New England cottontail, wood duck

Secondary wildlife target species:

Eastern towhee, veery, wood thrush, Cooper 's hawk, northern goshawk, Ribbon snake, ruffed grouse, wood duck, silver-haired bat, great blue heron, osprey, turkey

Rare plants:

None known

Wildlife Management Considerations:

Summary: ***Consider timber harvesting, fire, and other management techniques to thin white pine and maples and maintain oak dominated woods.***

In the absence of disturbance much of the Appalachian oak-pine woods, which historically were a dominant component of the New Hampshire coastal plain, will become colonized by red maple, beech, and hemlock. Fire was a natural process that thinned out the white pine and maples, and promoted the abundance of oaks in this region. With fire suppression, the long-term persistence of oak dominated forest communities may be in jeopardy. Land managers should identify the potential for managing oak and pine woodlands to create a more open condition with a well developed understory mosaic of shrubs (e.g., stump sprouting oaks, blueberries, laurel, etc.) and forbs especially those woodlands adjacent to maintained shrublands, grasslands, and marsh and shrub meadows. This can be achieved through prescribed burning and forest harvesting practices. Prescribed burning coupled with a commercial or non-commercial

harvest to thin out the overstory prior to a burn would be the best management option to maintain these oak forests and accomplish the vegetation structure that is desirable to many wildlife species. Prescribed burning kills thin barked trees and shrubs, consumes organic duff on the forest floor, prepares a good seed bed for regeneration, and releases nutrients into the soil. Prescribed burning may be necessary every 3-5 years at first, until the desired vegetation structure and species composition is obtained. Thereafter, areas should be burned at 10-20 year intervals. If burning is not possible, a harvest alone (e.g., thinning or shelterwood harvest), brontosaurus, TSI and/or scarification, seeding or planting could somewhat simulate burn conditions. Harvesting goals should be to promote stump sprouts, open the canopy, and to select out tree species not characteristic of an oak woodland.

Dead standing and downed trees provide valuable habitat for birds, mammals, and decomposers, and are a source of nutrients being cycled back into the system. Unless hazardous to human health, or likely to incur property damage, leave all snags and downed woody debris in situ and allow to decompose naturally. Strive for at least 8 snags or cavity recruitment trees (minimum 15 inch dbh) retained per acre. Dead and dying trees within/near wetlands should not be harvested or removed. If planning a harvest, certain trees can be marked for loggers to girdle so that these numbers can be met.

Rare Species and Exemplary Natural Community Considerations:

Several locations within the Crommet Creek Conservation Area have been designated as exemplary examples of a NH forest type by the NH Natural Heritage Bureau. The exemplary status is only given to natural communities that have excellent size, landscape context, and ecological condition. Therefore, land managers should take care to manage these habitats in a way that maintains their high quality ecological condition and does not impact the quality of their surrounding landscape. Within the Crommet Creek Conservation Area there are exemplary examples of both Mesic Appalachian Oak-Hickory Woods, and Rich Appalachian Oak Rocky Woods. Special instructions for managing exemplary natural forested communities is in the 2010 version of Good Forestry in the Granite State, available at www.goodforestry.org, or by contacting UNH Cooperative Extension (Rockingham County 679-5616; Strafford County 749-4445).

Timber Stand Improvement Considerations:

Timber harvesting is a tool that landowners can use to improve wildlife habitat, timber quality, or aesthetics, and provide periodic income to help support the land. All of the landowners in the Conservation Area have their own management styles and goals for their properties. This management plan serves to act as a guide to provide information and a set of recommendations that will enhance the over-arching goals of the Conservation Area partners.

Most of the private land in the Conservation Area have conservation easements which require a management plan prior to harvesting timber. Landowners who wish to harvest timber should first consult with a UNH Cooperative Extension forester or a

licensed forester. A forester will be able to assess the property, write a management plan or harvest plan, and manage any timber sales. A copy of the Crommet Creek Management Plan should be provided to the forester so he or she can work within the goals of the Conservation Area when possible.

The following management recommendations and guidelines provided in this plan should be considered when planning a harvest. While the guidelines below may or may not meet the landowner objectives for a specific timber sale, it's often possible to mesh landowner objectives with some of the guidelines below to satisfy several goals. For example, it might be possible to create openings within a timber sale while meeting objectives to produce revenue and increase timber quality within a stand.

Landowners who are eligible for cost-share money through NRCS, New Hampshire Fish and Game small grants, or other programs may be able to cover the cost of some of this habitat management in conjunction with a timber sale. A forester can walk the landowner through the process of applying for these funds as well as incorporate them into harvest or post-harvest activities.

The following are references that landowners and foresters may use in preparation of a management plan or timber harvest:

1. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire. www.goodforestry.org

Bennett, Karen P. editor. 2010. *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire (second edition)*. University of New Hampshire Cooperative Extension, Durham, N.H. 224 p.

2. State of NH Forest Health
http://nhdfl.org/forest-health/

3. University of NH Cooperative Extension
http://extension.unh.edu/

5. Natural Resource Conservation Services of NH
http://www.nh.nrcs.usda.gov/

Forest Pest Considerations:

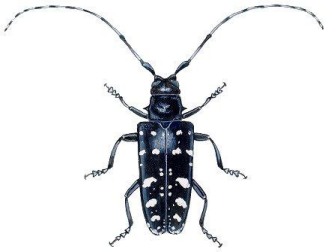
There are many insects that are either a current or future threat to many of the tree species that make up the forest types within the Crommet Creek Conservation Area. The prevalence of elms, chestnuts, and butternuts in this area has already been drastically reduced by invasive insect pests and the bacteria or fungus they facilitate dispersing. The health of beech trees is currently being threatened by the beech bark disease. But, perhaps the biggest threat to the trees in this Conservation Area are the new insect pests that have yet to arrive: hemlock woolly adelgid, emerald ash borer, and Asian long-horn beetle. Land managers should be monitoring trees for these insect pests and report any

potential sightings to foresters at the NH Division of Forests and Lands, Forest Health Bureau at 603-271-7858. More information on these and more forest pests can be found on the Forest Health Bureau Website: http://www.nhdfl.org/forest-health/

There are known occurrences of Hemlock Woolly Adlegid in the Conservation Area as well as known locations in Portsmouth and Newmarket, NH. Currently, the HWA populations are at a low level of infestations, but likely to expand on hemlock trees within this Conservation Area in the near future. This small insect pest attaches itself to young hemlock needles and draws food directly from the trees vascular system. It appears to take HWA ~15years to kill a hemlock tree in NH, but the insect is known to kill mature hemlock trees in Virginia and in as little as 3-5 years. As our climate warms and the HWA becomes more established, land managers should prepare for quicker hemlock mortality.

Maple trees in New Hampshire may soon meet the Asian longhorn beetle. This large beetle bores directly into the tree trunk, disrupting sap flow and the strength of the wood. The closest known population is in Worcester, MA. The Emerald Ash Borer is a future threat to Ash trees in the Conservation Area. The emerald ash borer larvae feed on the inner bark of ash trees, disrupting nutrient and water movement in the tree. Emerald Ash borer has killed millions of ash trees in 14 states and 2 provinces. The closest known populations are in Quebec and New York state.

Emerald Ash Borer



Asian Longhorn Beetle

Hemlock woolly adelgid

4. Grasslands

Proposed Management Goals:

Minimize fragmenting features (such as hedgerows) from within the largest grassland areas to maximize the acres of open grassland habitat for the greatest number of species.

Maintain all grasslands greater than 10-acres in size.

Where practical, delay field mowing until after August 1st to allow for grassland nesting birds to fledge.

Through active and passive management promote the creation of a soft edge around open fields to create habitat for a greater diversity of species such as woodcock and other species requiring a combination of early successional and open grassland habitat.

Evaluate existing small patches of grassland areas to determine if they should be maintained or converted to another habitat type (e.g. shrubland or a mosaic of grass and shrub).

Acres: 405

Primary wildlife target species:

Black racer, wood turtle, American woodcock, grasshopper sparrow (if in this area), whip-poor-will.

Secondary wildlife target species:

Northern leopard frog, smooth green snake, eastern meadowlark, vesper sparrow.

Rare plants:

None known

All grasslands within the Crommet Creek Conservation Area are considered "small", ranging in size from 10 to 75 acres (New Hampshire Audubon). Small grasslands provide breeding, nesting, and feeding habitat to many species of grassland birds that are in decline nationwide such as the bobolink, eastern meadowlark, and savannah sparrows. Small grasslands also provide habitat to small mammals such as meadow jumping mice and meadow voles, which are important food for many birds of prey and other predators such as grey foxes. Grasslands support a rich diversity of grasses and wildflowers. These attract many species of insects for food (nectar) and cover. These insects provide pollinator services to the plants, and are also an important food source for many species of birds and mammals. For example, the monarch butterfly feeds and pupates on milkweed plants common to our New England fields. Marsh hawks fly low over the larger fields in search of small mammals for food. Turkeys visit fields to feed on grasshoppers and other small insects.

Wildlife Management Considerations:

Grassland habitat is in decline across New England due to changes in land uses over time. The New England landscape was once dominated by open fields and pastures that were both maintained by human activities and natural processes (fire and beavers).

However, since the 1800s, most of these fields have been abandoned and allowed to revert to forest. Natural processes such as fire have been suppressed and much of the cleared agricultural land was seen as ideal places for development. Therefore, the grassland habitat in New England today is only a small fraction of what it once was, consisting largely of isolated small fields. These small fields provide critical habitat to declining numbers of wildlife, plant, and insect species dependent on this open habitat. Land managers of open fields, whether in active agriculture or not, can chose certain management practices that will lessen impacts to the suite of species dependent on these open habitats.

To minimize impacts to grassland nesting birds, and allow young to fledge from the nests, land managers should not mow grassland habitat before August 1st. Alternatively, land managers could consider establishing a rotational mowing program in which different parts of a field (or different fields) are mowed at different times. Ideally, the rotation would allow for some areas to be mowed late in the fall (September-October) to allow late-blooming wildflowers to form and provide nectar sources for migrating butterflies. Mowing in the fall will also minimize impacts to reptiles and amphibians. Other areas would be mowed mid to late growing season (late July – August) to provide some control of woody shrubs and trees that may attempt to colonize a field. This type of mowing regime would move from field to field over a course of many years so that all fields would be maintained in the long term while providing significant habitat benefit to a wide array of wildlife. In addition, mower decks can be raised to maintain a residual plant cover of 6 inches in height. This will provide some cover for small mammals and will minimize direct mortality of small mammals, reptiles, and amphibians.

Land managers could also consider using prescribed fire as a tool to maintain open fields. Prescribed burning is the best means of maintaining native grasses and forbs particularly in areas with poor soil. Burning can improve soil nutrients and mimics historical disturbances to grassland habitats. Burning will also help spread native grasses if they already exist in a field and can help reduce the duff layer on the ground improving the quality of the nesting habitat for certain birds.

Most of the remaining grasslands continue to be dominated by the European cool-season grasses first planted for pasture by early settlers to New England. These grasses tend to be colonial and form a dense cover over a field. The native warm-season grasses grow in tufts, allowing for patchy vegetative cover with small spaces of bare ground between tufts allowing for discrete movement for wildlife and better nest sites for grassland birds. In addition, the native grasses provide better winter cover as they do not mat down during heavy snows. Native grasses such as switch grass, Indian grass, and big bluestem, are more difficult to establish, but they offer some benefits to landowners willing to take on the challenge. They require less fertilizer, lime, and herbicides, and are more drought-tolerant. Land managers could consider trying to re-create a native grassland habitat by planting native grasses and forbs in existing fields, particularly in areas with sandy soils. Landowners should avoid using conservation mixes that may have non-native seeds mixed in. Recreating a grassland of native grass species will

probably be most successful in areas where land managers can consider prescribed burning as a management tool.

Grasslands of different sizes support different species of birds in decline. Those at least 5-acres in size can support a breeding bobolink population. Grasslands over 15-acres can support eastern meadowlarks, and those over 20-acres can support breeding Savannah sparrows (UNH Cooperative Extension, Habitat Stewardship Series: Grasslands, 2008). Therefore, if managing for grassland nesting birds, land managers should consider removing tree and shrub lines growing in the middle of fields, as this decrease the useable acreage as perceived by grassland-nesting birds. However, allowing shrubs to colonize edges of fields (or alternatively planting shrubs along field edges) can provide excellent food and cover for many species of wildlife including many primary and secondary shrubland species.

Land managers of open fields will be managing to some degree early successional habitat and vis versa. Shrub growth creeping into an open field creates a wonderful soft edge to the field and can provide excellent habitat to numerous shrubland species such as woodcock. As with all early successional habitat, it must be periodically mowed back to set-back the age and structure of the vegetation. During the few years post-mowing, areas managed as early successional habitats tend to provide excellent grassland open habitat. Therefore, due to the dynamic nature of these two habitats, they are closely intertwined, and at any site, can be best managed through the use of rotational mowing/brontosaurus practices.

Land managers could consider if some small grasslands would serve as greater wildlife habitat if they were allowed to regrow into shrublands. Small grasslands are limited in the benefits they provide for grassland specific wildlife species. However, small areas of shrublands can be beneficial to many shrubland wildlife species, many of which are primary and secondary targets identified in this plan. This is especially so if these areas are located close to water as many reptiles, amphibians, and birds that use wetland areas also rely on adjacent shrubby areas for nesting and foraging.

Active Agriculture Considerations:

Land managers of agricultural land can improve the wildlife habitat it provides if they consider how they can diversify the age-class, structure, and substrate within their fields. For example, rotational mowing or grazing can allow for a patch-work of grass heights that will attract different species of insects and birds; maintaining some areas are bare ground can invite killdeer and horned lark into the fields; and allowing some areas to be mowed every other year will maximize the season for pollinators and migrating butterflies to find nectar sources.

In addition, the following considerations (described in more detail above) can also be applicable to agricultural practices:

- Allowing shrubs to colonize edges of fields (or alternatively planting shrubs along field edges)
- Planting and encouraging native grasses in animal pastures and hayfields
- Delay mowing until after August 1st
- Consider establishing a rotational mowing program in which different parts of a field (or different fields) are mowed at different times.
- Raise mower decks to maintain a residual plant cover of 6 inches in height.

5. Intertidal Habitats

Proposed Management Goals:

Maintain or restore a 100ft buffer of natural, unfertilized, vegetation along the intertidal shoreline

Passively allow the natural hydrologic regime and drainage patterns within salt marsh habitat to become restored

Participate and cooperate with local and regional research efforts aimed at better understanding the impacts of climate change to the Great Bay Estuary

Monitor expansion of invasive plants – primarily purple loosestrife and Phragmites into salt marshes

Acres: 405

Primary wildlife target species:

American black duck, Osprey, North Atlantic population Canada geese (Maritime), Greater Scaup, Great Blue Heron, Bald eagle

Secondary wildlife target species:

Northern harrier, Pied-billed grebe, Red shouldered hawk ,Sedge wren, Vesper sparrow, Saltmarsh Sharp-tailed sparrow, Nelson's Sharp-tailed sparrow, Willet, Eastern pipistrelle

Rare plants:

Seaside gerardia, Marsh elder, Prolific knotweed, Dwarf glasswort, Stout bulrush, Large bur-reed, Small spike-rush, Horned pondweed

Water Quality Considerations:

Maintenance of a natural buffer of vegetation, at least 100ft wide, along the intertidal shoreline is critical to protecting the estuary from the sediments and chemicals that can impact the quality of its water and habitats. The shoreline vegetation slows and promotes infiltration of runoff, takes up nutrients from ground and surface water through roots, and provides conditions for microbial denitrification. All these functions are highly important in preventing excess nutrients from reaching the estuarine waters. Additionally, shoreline trees, shrubs, and other vegetation anchor the earth with their roots and help prevent shoreline erosion. Sedimentation rates within the Great Bay estuary have increased with development along the shoreline as the natural vegetation that previously anchored the shoreline in place is being removed in favour of lawns. However, lawns do not provide the deep root structure needed to naturally anchor the shoreline, and homeowners are then forced to consider construction of permanent seawalls to prevent loss of land. Seawalls prevent the natural tide from accessing parts of the estuarine shoreline that were previously tidal, thus reducing the amount of tidal habitat around the Bay. Seawalls also create a steep uniform unnatural face. The Great Bay Estuary does not have many natural steep rock faces abutting the Bay. The Great Bay's natural intertidal rocky shoreline is composed of crumbling shale beaches with interesting microhabitats including tide pools and rocky boulders that submerge at high tide. The

complex of habitats along the shoreline, and the many crustaceans, aglae, fish, and invertebrates that they support are lost when a seawall is installed. Thus, land managers should consider maintenance or restoration of shoreline vegetation within a 100ft buffer from the hightide line within this Conservation Area.

Saltmarsh Considerations:

The salt marsh around much of Great Bay, and along most of the shoreline within the Crommet Creek Conservation Area is a narrow fringe of low salt marsh (dominated by Spartina alterniflora). This salt marsh provides a screen for waterfowl, cover for fish and other aquatic invertebrates and crustaceans, and helps stabilize some of the intertidal sediment along the shoreline. A few places, most predominantly at the mouth of Lubberland Creek, there are large expanses of high salt marsh. Winding through the high salt marsh are intertidal creek and ditches which offer hiding places for young fish and feeding grounds for ducks. On the salt marsh plain are salt pannes, pools of water captured at high tide that are unable to drain with the tide. Mummichogs, and other small estuarine fish, live in the pannes and throughout the salt marsh as the tide allows. At high tide larger fish move into the salt marsh to feed on the mummichogs, and at low tide these small fish caught in the pannes are preyed upon by shorebirds, wading birds, and ducks. Estuaries are known as nurseries for fish, lobster, and other marine species. Much of the food resources that pass up through the marine food chain begins within the salt marsh and other estuarine habitats. Therefore, the health of the salt marsh environment is important to maintaining the health of the species that migrate out of and through the estuary. As such, land managers should consider the environmental impacts of any activity they consider within a salt marsh on a much larger scale. For example, chemicals introduced into a salt marsh for mosquito control could have impacts on commercially important fish species by travelling through the food chain.

Salt marshes were historically ditched to maximize salt hay production and control mosquitoes. Although marshes are no longer hayed, and the mosquito theory has since been rebuked, the impacts of this previously held belief are still evident throughout the salt marshes of the Atlantic coast. Restoring the natural stream channels through the existing salt marshes is impossible, as there are no photographs or records of what this habitat looked like pre-ditching. Local researches believe the ditched salt marshes appear to be recovering from their past uses as some ditches have collapsed and are once again retaining salt pannes on the salt marsh surface. Therefore, land managers should consider passively allowing the natural hydrology to be restored to the salt marshes of the Crommet Creek Conservation Area.

Climate Change Considerations:

Salt marshes are other intertidal habitats may soon undergo changes in species composition, location, and other unknown factors due to climate change. It is predicted that global sea level rise will increase by 1.7-6.3 feet by 2100 (Wake et al, 2011). With this increase, it is expected that salt marsh habitat will migrate landward, and some loss of the seaward salt marsh face will occur. New invasive species could expand their ranges northward and become established in our intertidal habitats competing with native species for space and resources. Land managers should consider ways to track climate

change at the local scale, and watch for new additions to the flora and fauna of intertidal habitats and cooperate and participate with local and regional research projects aimed at better understanding the effects of climate change in our estuary. The more we understand about climate change impacts on our lands, the better we can prepare and alter our management to accommodate these inevitable changes.

Coastal Islands Considerations:

The Crommet Creek Conservation Area includes several coastal islands that are important breeding grounds for some rare and common bird species. Common terns (S1) are known to breed on one of these islands. This rare tern nests in the open on bare ground, on islands or in salt marshes where they are protected from predators and have easy access to feeding areas. Predation and loss of suitable nesting sites (to gulls) are the Common tern's biggest threats. The Common Tern populations on the Great Bay inshore islands have been subjected to significant predator pressure and human impacts and may not currently support any active nests. In NH, 99% of the Common Terns nested on one island within the Isles of Shoals. Maintaining alternative high quality habitat for terns is important as this species could suffer massive reductions in numbers from a single catastrophic event. Land managers of coastal islands could consider contacting NHFG for a baseline assessment of their islands for Common Tern nesting suitability.

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