

NATURAL RESOURCES

The following Supplemental Material of the Natural Resources Section of the Durham Master Plan 2015 are available to provide valuable background information that helped generate the conclusions and perspectives of the chapter:

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I. Overview of Durham's Natural Resources and Justification for Protection

For many years, Durham residents have expressed strong support for environmental protection and conservation. These values have translated into the creation of a beautiful community that has kept many of its natural systems intact and permanently protected a significant percentage of its land. Furthermore, Durham's location on Great Bay and its two large river systems (Lamprey and Oyster) make it ecologically important to the state. New Hampshire has been the fastest growing state in the northeastern US and Durham is in the fastest growing region of the state.¹ At the same time, responses to the May 2011 Master Plan Survey indicate that the community is seeking balance among its conservation and development interests.

In addition to its significant contribution to the character and quality of life in the community, Durham's natural resources provide a number of free benefits – ecosystem or natural services – which, if lost, would affect human health, safety, and some forms of economic opportunity. The Natural Services Network is a GIS-based tool² that identifies lands that provide important ecological services such as drinking water, storage of flood waters, high value and productive agricultural soils, energy conservation in building, increased property values, and important wildlife habitat.³ The Network was created by a collaboration of planning and natural resources professionals and was adapted to incorporate additional information such as resources of local importance. In some cases, the loss of these ecological functions could require considerable capital outlays to replace or address (see Figure M-3 Natural Services Network).

In 1999 the Society for Protection of New Hampshire Forests released its first edition of New Hampshire's Changing Landscape, which was updated in 2005 and 2010. The reports explored the relationships between population growth, land use change, and the impact of development on the state's natural resources, forests, agricultural lands, critical water supply resources, and biodiversity. It also includes various demographic and natural resource data to create a profile for each New Hampshire municipality. In its latest iteration, it includes an online interactive database that is regularly updated, along with maps, graphics, and electronic slides.⁴ A snapshot of trends is described in New Hampshire's Changing Landscape below:

1 However, that growth is modest relative to other parts of the US. See <http://www.carseyinstitute.unh.edu/publications/Report-Johnson-Demographic-Trends-NH-21st-Century.pdf>

2 <http://www.pelhamweb.com/planning/NSN%20User%20Guide%20Final.pdf>

3 Highly transmissive aquifers (US Geological Survey) and favorable gravel well sites (NH Department of Environmental Services) define water supply lands. 100-year floodplains (Federal Emergency Management Administration), and lacustrine, riverine, and palustrine wetlands (USFWS National Wetlands Inventory) make up flood storage lands. Prime farmland and farmland soils of statewide importance (US Natural Resource Conservation Service) make up productive soils. Habitat of statewide and ecoregional priority (NH Fish & Game Department Wildlife Action Plan) make up important wildlife habitat.

4 See New Hampshire's Changing Landscape Report

- New Hampshire continues to rapidly develop its sources of clean drinking water – almost 20,000 acres of land over aquifers was converted from natural land cover to urban land uses from 2002 to 2010. Only 22% of important aquifers are protected from future development.
- Based on current trends and predictive models, New Hampshire’s forested lands will continue to decline. Forest loss linked to population growth indicates the conversion of another 225,000 acres by 2030, dropping New Hampshire forest land to 78.5% of total land area.
- New Hampshire continues to lose farmland. Over the last two decades, the state has seen a 23% decline in acres used for cropland and pasture.

In addition, the Durham Conservation Commission identified the following future areas of concern to the community:

- Adequate drinking water supply,
- Nitrogen pollution in Great Bay,
- Effects of climate change & sea level rise,
- Spread of non-native invasive plants,
- Growing concerns for local agriculture, food security, and food production (will we have land to allow us to grow our own food in the future?), and
- Potential large groundwater withdrawal in the fractured bedrock aquifer in the western part of Durham and the Nottingham and Barrington areas that if allowed to move forward would affect both the Oyster and Lamprey River watersheds in Durham.

II. Accomplishments from 2005-2012

Durham has made progress on its environmental priorities since adoption of the 2000 Master Plan, including:

- Developed a land conservation acquisition and management system for the community. This system identified priority areas,⁵ established criteria to identify and prioritize land conservation projects,⁶ prepared detailed site management plans for some Town owned and conserved properties,⁷ established a Conservation Fund, procured numerous grants from outside sources for conservation acquisitions and management, trained volunteers and informed the public about conservation issues, and partnered with numerous agencies, organizations, and groups with shared interests.
- Approved Town Warrant article for \$2.5 million dollar Open Space bond in 2003.

⁵ Priorities are mapped as conservation focus areas, water resources, agricultural soils, wildlife habitat.

⁶ http://www.ci.durham.nh.us/sites/default/files/fileattachments/boc_conservation/conservation_land_acquisition_guidelines_-_revision_adopted_by_town_council_051908.pdf

⁷ Detailed stewardship plans have been developed for Wagon Hill Farm, Longmarsh Preserve, Doe Farm, and the Weeks property. Forest management plan was prepared for the Spruce Hole parcels.

- As of 2014, there are ten new conservation easements totaling 735 acres of permanently conserved land. Approximately \$1.62 million from the Conservation Bond (\$889,000 remains) and nearly \$1.35 million from the Conservation Fund, which contains revenue allocated from the Land Use Change Tax, and a number of grants were used for these easements.
- Authorized allocation of 100% of Current Use Change Tax funds to the Conservation Fund.
- Secured conservation easements on Fogg Farm and gravel pit located in Lee to protect the Town's drinking water intake and an important aquifer.
- Secured conservation easement on the Amber Acres farm and purchased more than 170 acres of the Oyster River Forest in part to provide protection of their frontages along the Oyster River.
- Prepared stewardship/management plans for Wagon Hill Farm, Longmarsh Preserve, Doe Farm, and Spruce Hole and Weeks properties. Private conservation groups led the way for a new 4-mile recreational trail, the *Sweet Trail*, connecting extensive network of conservation lands in the Crommett Creek watershed (Durham to Newmarket).
- Supported designation of Oyster River and additional sections of Lamprey River to the State's Rivers Management and Protection Program.
- Created the Oyster River Watershed Association.
- Developed initiatives to reduce townwide greenhouse gas emissions.
- Hosted annual work day to control increasing invasive plant encroachment at Town forests.
- Reviewed and conducted site visits and commented on various dock, conditional use, zone change, and numerous site plan, conservation subdivisions, wetlands, shoreland, dredge and fill, oyster beds, and septic installation applications for the Planning Board and New Hampshire Department of Environmental Services (DES).
- Secured wetlands permit and insurance to manage Mill Pond. While volunteer efforts have been undertaken to remove vegetative growth along the shoreline to open up views, efforts to secure help from the US Army Reserves to dredge the impoundment were unsuccessful. Though the Conservation Commission advocated for additional engineering and scientific studies, no further progress has been made until recently when the Town Council began to discuss the need to maintain the dam.
- Formed a committee to guide improvements to Jackson Landing, secured outside grant, and expended monies from the Conservation Fund to construct a ¼ mile universal access education trail and new parking area, and landscape the water's edge.
- Town Council approved a limnological study of the Oyster River, Mill Pond, and Beard's Creek.
- Received bronze plaque from the National Park Service acknowledging Spruce Hole Bog as a unique geological occurrence, a National Natural Landmark.
- Worked with Planning Board to create, review, and/or amend stormwater, wetland, shoreland, aquifer protection provisions and required usable area calculation regulation as well as variance and administrative procedures to result in a more timely review process.

- Created conservation subdivision ordinance, which guides the subdivision process in Durham.
- Increased public awareness of the Town's conservation work and appropriate use of Town owned conservation lands through information tables at Wagon Hill Farm, guided nature walks, preparation and distribution of *Scenic Durham* and the *Conservation Corner* as part of Friday Updates, updating of conservation on the Town's website along with creation of a Conservation Lands Page.

For more information see Table 4. on page 29 of this appendix

On September 7, 2006 the Town of Durham, the Society for the Protection of New Hampshire Forests (SPNHF), and the Natural Resources Conservation Services closed a conservation easement on the Emery Farm property located off Route 4; one of five conservation easement purchases made in 2006. Back Row (l-r): Mark Dunn, Attorney for the SPNHF; Duane Hyde, member of the Conservation Commission and Land Protection Working Group; Paul Doscher, SPNHF; David Hills, owner of the Emery Farm. Front Row (l-r): Todd Selig, Town Administrator; Anne McBride, SPNHF; Dea Brickner-Wood, member of the Land Protection Working Group.



III. Surface Water and Estuarine Resources

The Town has an obligation to protect water quality, including freshwater resources used for public drinking water and as habitat for aquatic, shoreland, and marine wildlife. Conservation efforts in the past have helped to protect these resource values through the Town's wetlands, aquifer, and shoreland protection ordinances and through the acquisition of conservation land or easements (See Figure NR-2).⁸

⁸ Floodplains are mapped based on the most recent published sources of information; however, one member of the Conservation Commission notes that current stormwater flows, which overtop Longmarsh Road and Rt. 108, are not included on the map. She points out that Oyster Creek (Hamel Brook) is an "important relief valve for the Lamprey River watershed."

As towns in the Seacoast region grow, the water quality of both Durham's salt and fresh water bodies become increasingly vulnerable to degradation by residential septic systems, lawn fertilizers, herbicides, pesticides, wastewater treatment plants, accidental spills, erosion, and stormwater runoff.⁹ For example, the Piscataqua-Salmon Falls watershed in New Hampshire and Maine has been identified as one of the country's top 15 watersheds that are most at risk for potential decline in water quality resulting from conversion of private forest land to housing development.¹⁰ Related to land use disturbances, sediment and stormwater runoff into the estuary has been identified as significant contributors to water quality decline by the Piscataqua Region Estuaries Partnership (PREP).¹¹ Furthermore, encroachment on shorelands by development reduces the availability of important habitats for wildlife. Over the long term, the cumulative, incremental impact of stormwater runoff that is not managed appropriately is a substantial threat to the environmental health of the estuarine system.

How Durham's three primary watersheds – Oyster River, Crommet Creek/Great Bay, and Lamprey River – are managed defines the health of both Great and Little Bays (See Figure NR-11). Stormwater runoff, wastewater management, and identification and control of point source contaminants all impact the environmental health of these estuarine systems. According to the NHDES, the Oyster River watershed contributes the highest amount of nitrogen of any watershed in Great Bay (See Map 1 below).

In 2009, NHDES concluded that 11 of the 18 subestuaries in the Great Bay Estuary, including the Lamprey and Oyster River watershed, were *impaired* for eelgrass and nitrogen.¹² Recognizing these challenges and in compliance with the Clean Water Act of 1972, which requires a study to determine how much existing nutrient and pollution loads must be reduced to meet water quality standards, the NHDES developed models to determine existing loads and thresholds to bring the subestuaries into compliance.

9 Stormwater runoff is drainage that is generated from precipitation and snowmelt, including any debris, chemicals, sediment, or other substances carried along with the water.

10 US Department of Agriculture, Forest Service, Pacific Northwest Research Station, Private Forests, Public Benefits: Increased Housing Density and Other Pressures on Private Forest Contributions, A Forests on the Edge Report. General Technical Report PNW-GTR-795, December 2009.

<http://www.fs/fed/openspace/fote/benefits.html>

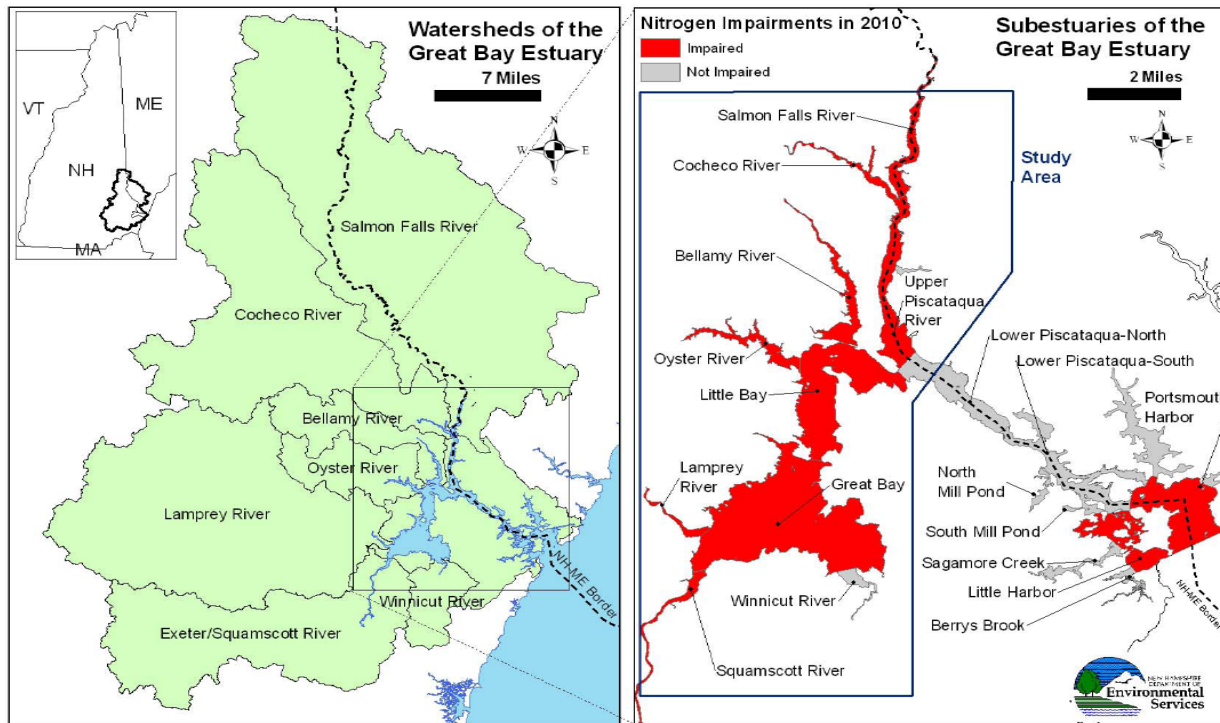
11 Wake, Cameron. Indicators of Climate Change in the Northeast over the Past 100 Years. Climate Change Research Center, EOS, University of New Hampshire. Undated (based on report published in 2005, available from the Clean Air – Cool Planet website)

<http://www.cleanair-coolplanet.org> <http://www.climateandfarming.org/pdfs/FactSheets/1.2Indicators.pdf>

12 NH Department of Environmental Services. Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed. December 2010. An impaired watershed is defined as a watershed that does not meet water quality standards and therefore does not support designated uses for aquatic life and recreation.

http://des.nh.gov/organization/divisions/water/wmb/coastal/documents/gb_nitro_load_analysis.pdf

Figure 1. Nitrogen Impairments in 2010 in the Great Bay Estuary



Part of Durham’s contribution of nitrogen to Great Bay comes from its wastewater treatment plant. The Town is operating its waste water treatment plant under an Environmental Protection Agency (EPA) permit which expired in 2004 and will continue to do so until a new permit is issued. Most towns in the Great Bay watershed are operating under expired permits as the EPA reviews nearly a decade worth of state water quality studies. In the meantime, the Bay has been designated as *impaired for eelgrass decline and elevated nitrogen*. The EPA has issued final draft permit for Newmarket and Exeter, which discharge directly to Great Bay. Those towns have been directed to upgrade their systems to reduce total nitrogen to 3 mg/L (the limit of current technology) within 10 years.

Durham began upgrading the waste water treatment plant in 2000, which reduced nitrogen discharges from the Town’s plant from 25 to 8 mg/L in 2013, among the lowest in the Seacoast region. As a result of these upgrades, Durham is low on EPA’s priority list for new permits as it focuses on other communities. EPA will issue a new permit if the Town wants, but is supportive of Durham’s efforts to address nitrogen levels discharged from its watersheds. Durham’s approaches are multipronged and have been developed over several years.

One effort is an *Integrated Watershed Management Plan*, an innovative way to reduce total nitrogen coming from the entire watershed to required levels. The Plan, which is being prepared by Vanasse-Hangen-Bruslin and Woodard and Curran, will include a water quality model for the Oyster River watershed, based on the state plan for Great Bay. Another approach the Plan contemplates is an integrated permit strategy for both the Town and UNH’s water and waste water treatment plants. The Draft Plan was released in March 2013; monitoring will end in October 2013, and the implementation plan, which is characterized as an *adaptive management plan*, is due to be released in March

2014. If successful, Durham will be the first community in the country to take this route to managing nitrogen contamination – an approach that EPA is encouraging all communities to undertake.

Nonpoint sources contribute approximately 68% of the total nitrogen load in Great Bay. Wastewater treatment plants contribute the remaining 32% of the total nitrogen load.¹³

INTEGRATED WATERSHED MANAGEMENT PLAN 2015 UPDATE:

Lawn fertilizer, impervious cover, septic systems, and agricultural fertilizer account for approximately 80% of the overall nitrogen load in the Oyster River Watershed. Natural vegetation, which comprises 73% of the watershed, contributes approximately 16% of the overall watershed load. The distribution of estimated loads is similar in Durham, with lawn fertilizer accounting for the greatest portion (23%) of the estimated nitrogen load, equivalent to approximately 11.1 pounds per acre per year.

The Integrated Water Management Plan found that the estimated total delivered nitrogen load from roughly 600 acres of agricultural land (of which 85% is categorized as hay fields) in Durham (excluding UNH) was 3,160 pounds per year. UNH fertilizer applied to 144 acres of corn and hay fields contributes an additional 4,090 pounds per year, for a total nitrogen load of 7,250 pounds/year within the town's boundaries.

The goal of the *Integrated Watershed Management Plan* is to reduce total nitrogen from the watershed to about 5 mg/L during the summer months. EPA is interested in this approach because the use of expensive and hazardous chemicals or a significant reduction in design capacity would be needed to reduce the plant's nitrogen discharge to the required standard of 3 mg/L. According to the Town Engineer, Dave Cedarholm, Durham will need to undertake a \$12 million upgrade to the plant soon to enable it to continue to meet EPA regulations.

Despite Durham's considerable investment in bringing secondary treatment capability to its wastewater treatment plant, the sanitary sewer system remains a significant concern with respect to the discharge of nutrients and coliform bacteria into the Oyster River. A study of the fecal coliform levels of all the tributary rivers for Great Bay from 1993 through 1996 found that the freshwater portion of the Oyster River has the second highest coliform levels under wet conditions (300 units/100 ml), behind the Cocheco River. These levels are well in excess of the safe levels for shellfishing and also exceed levels acceptable for State recreational waters. Many factors can contribute to high levels of coliform bacteria, but one of the likely sources is inflow and infiltration from sewer pipes.

Since 2006, the Town has invested in rehabilitating old sewers that have short clay sections and loose, leaking joints. The Town is nearing the limit of effective repairs of the public system. Remaining improvements will have to be made

¹³ NHDES. Great Bay Nitrogen Non-Point Source Study. 2014. <http://des.nh.gov/organization/divisions/water/wmb/coastal/documents/gbnnpss-report.pdf>

in the privately owned and maintained lines that extend from the Town's main to individual properties (homes and businesses) to address infiltration of groundwater into the pipes, as well as manage the connection of roof leaders and sump pumps to the municipal system.

Stormwater runoff contributes significant amounts of nitrogen and other contaminants to Great Bay. Durham has been working closely with UNH to better understand and guide investments, policies, and regulations to address this problem. Headway has been made in the adoption of regulations in the Town's site plan review and subdivision regulations, resulting in significant improvement in the stormwater management system for new development. Furthermore, the Town has opened the door to considering retrofits of existing stormwater systems on both public and privately owned properties, including the construction of a couple rain gardens as demonstration projects. As the Town moves forward with its *Integrated Watershed Management Plan*, it will be well positioned to do good things by creating a pathway to create partnerships to tackle this daunting problem. In addition, the Town Engineer met with the Town Council in 2013 to discuss the need to adopt illicit discharge regulations as part of an update to the Town's water ordinance.

The 2010 report, *Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed*,¹⁴ found that if the EPA's permit for Durham's wastewater treatment facility were to limit effluent nitrogen concentration, which stimulates algal blooms and water quality degradation, to 3 mg N/L at design flow, it would reduce nitrogen discharged into the estuary. In addition, nonpoint sources of nitrogen (i.e., diffuse sources that do not meet the EPA's definition of point sources such as wastewater treatment facilities)¹⁵ would have to be reduced by 13% to prevent low dissolved oxygen and by 25% to protect eelgrass in downstream areas. The Analysis recommends that watershed implementation plans be developed for each impaired watersheds and a comprehensive monitoring program be developed to track the effectiveness of implementation.

Since 2000, Great Bay has been the focus of intense water quality and land protection efforts by groups like PREP and the Great Bay Resource Protection Partnership. In addition, a number of agencies and organizations focus on protecting the water quality, wildlife and their habitats, and overall environment of the Great Bay estuary.

The eastern oyster plays an important role in providing natural filtration that is necessary for healthy eelgrass beds. Since the oyster population largely has become depleted in the Great Bay Estuary, for the past seven years, The Nature Conservancy, UNH, and a number of groups have developed and supported an Oyster Restoration Program in

14 Trowbridge, Philip, P.E. *Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed*. New Hampshire Department of Environmental Services. December 2010.

http://des.nh.gov/organization/divisions/water/wmb/coastal/documents/gb_nitro_load_analysis.pdf

15 See <http://water.epa.gov/polwaste/nps/whatis.cfm>

Great Bay.¹⁶ The Program builds reefs to clean the water and provide fish habitat for spawning oysters. This year the Program built a reef in the mouth of the Lamprey River.

In recent years, northern New England communities have faced the issue of large water withdrawals for commercial operations.

IV. Sea Level Rise, Floodplains, and Climate Change

Cameron Wake's 2011 study of *Climate Change in the Piscataqua/Great Bay*¹⁷ describes how the climate of the region has changed over the past century and how the future climate of the region is likely to be affected by climate change. The report documents that "overall, the region has been getting warmer and wetter over the last century, and the rate of change has increased over the last four decades." It predicts that warmer temperatures will affect the types of trees, plants, and crops that grow in the region. It anticipates long periods of very hot conditions in summer, less extreme cold in the winter, rising winter and spring precipitation, and increasing sea levels. These predictions will improve some conditions (lower heating bills and cold-related injuries and death), but raise concerns about more issues including the increased likelihood of severe storms, demand for electricity in summer, stresses on agriculture, human and ecosystem health, and outdoor recreation opportunities, invasion of cold-intolerant pests, changes to plant ecosystems; and increased riverine and coastal flooding. According to the Wakefield study, "The combined effects of thermal expansion, increases in meltwater, a subsiding coast, and potential changes in ocean circulation make coastal New Hampshire particularly vulnerable to rising sea level. Increases in relative sea level contribute to enhanced flooding of coastal infrastructure, increased coastal erosion, saltwater contamination of freshwater ecosystems and loss of salt marshes. Low-lying shorelines such as sandy beaches and marshes are likely to be the most vulnerable to rising seas."

Depending on future greenhouse gas emissions, the region is expected to see an increase in annual average temperatures by 4°F to 9°F before the end of the century, with greater increases in the summer. Precipitation and the frequency of storms are expected to rise, increasing the risk of flooding. At the same time, snow-covered days are expected to decrease. Sea level is expected to continue to rise, leading to increasingly larger areas of flooding during coastal storms if actions are not taken to mitigate the combined effect of increased greenhouse gas emissions and potential increase in stormwater runoff due to increased building in the watershed.

The study generated projections of coastal flooding for 2050 and 2100, relative to 1990 Analysis of Changes in the 100-Year Coastal Flooding Event. The study projects that the 100 year flood, a standard used in designing stormwater

16 Groups involved with the effort include PREP, NOAA Restoration Center, Natural Resources Conservation Service, State Moose Plates Conservation Program, The Davis Foundation, Coastal Conservation Association, NH Fish and Game, UNH Road and Events Crew, UNH Kingman Farm, The Nature Conservancy members, and the many local volunteers in the Oyster Conservationist and UNH Docents programs.

<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newhampshire/oyster-restoration/index.htm>

17 Wake, Cameron P. *Climate Change in the Piscataqua / Great Bay Region: Past, Present, and Future*. Carbon Solutions New England, 2011.

management systems, could range from 9.4 to 12.9 feet by 2050, and 10.9 to 17.5 feet by 2100, which would result in more severe flooding in coastal New Hampshire 37 to 87 years in the future, if nothing is done to mitigate the effects of climate change and other contributing factors.

See Figure M-5 Current and Potential Future Flood Plains/Sea Level Rise for more information about floodplains and potential flooding and sea level rise.¹⁸

According to Durham's 2012 *Multi-Hazard Mitigation Plan*, Durham has "significant flooding potential along the Lamprey River and its tributaries in the southeast of town and along the Oyster River and its tributaries in the northwest of Town above the Mill Pond Dam."¹⁹ See discussion of Durham Hazard Mitigation Plan 2012 Update in this Appendix. There is also a significant amount of coastal floodplain along the Great Bay/Oyster River Estuary shoreline. While the overall potential for flooding is high in the community because of the significant amount of floodplains, according to the *Multi-Hazard Mitigation Plan*, the Town has seen relatively little development in its floodplains, except in coastal floodplains where private residences have been built in shoreline areas. These homes could be susceptible to coastal flooding and storm surges from hurricanes. The Plan also indicates that the potential for flooding from dam breach or failure in Durham, while it exists, is quite small, though it acknowledges that there is limited information on most of the dams.

The *Multi-Hazard Mitigation Plan*, while recent, was prepared prior to the publication of the most recent study of the impacts on climate change in the northeast, including Durham specific data relative to sea level rise.²⁰ As a result, the many recommendations for upgrades and other investments in drainage structures as well as road, bridge, and dam repair should be reexamined with an eye toward taking predicted increases in surface water elevations and the role the improvements will play in addressing and creating flooding issues as along with the increased number of severe storm events, increases in road elevation, undersized culverts, and other drainage structures would aggravate flooding of roadways and private properties.

18 Floodplains are mapped based on the most recent published sources of information; however, one member of the Conservation Commission notes that current stormwater flows, which overtop Longmarsh Road and Rt. 108, are not included on the map. She points out that Oyster Creek (Hamel Brook) is an "important relief valve for the Lamprey River watershed."

19 Strafford Regional Planning Commission. Durham Multi-Hazard Mitigation Plan 2012 Update. New Hampshire Homeland Security & Emergency Management. 2012.

20 Complex Systems Research Center, A Preliminary Assessment of Tidal Flooding along the New Hampshire Coast: Past, Present and Future. 2012.

SOURCES OF INFORMATION:

Wake, Cameron P. *Climate Change in the Piscataqua / Great Bay Region: Past, Present, and Future*. Carbon Solutions New England, 2011.

Strafford Regional Planning Commission. *Durham Multi-Hazard Mitigation Plan 2012 Update*.

New Hampshire Homeland Security & Emergency Management. 2012.

Climate Adaptation Chapter: *Developing Strategies to Protect Areas at Risk from Flooding due to Climate Change and Seal Level Rise*. Final. June 4, 2013.

The National Wildlife Federation (NWF) has produced a variety of materials that can be used by local governments, organizations and citizens looking to address climate change, including:

- **Guidebook** – Downloadable, offers guidance on how to replicate website and tool for community. Also includes section that highlights resources for improving forest health in 7 urban regions of the country, and climate-smart forestry practices.
- **Online Training Course** – Free course highlights why healthy forests are important and provides general recommendations of actions landowners can take to address climate change.
- **Forestry CPR Webinar** – Archived webinar to introduce Forestry CPR, explain the connection between healthy forests and climate change, and highlight available NWF resources.
- **Promo Card** – Free cards to help promote Forestry CPR (order through NWF).

V. Wetlands

Durham has a significant number of wetlands, including salt marshes, one of the most productive types of wetlands. While for some, wetlands may simply be perceived as obstacles to development, in fact, they provide the community with a multitude of values that include flood control, wildlife habitat, fish habitat, pollutant removal, recreation, groundwater protection, and stabilization and erosion control of the shoreline. Therefore, bisecting wetlands with roads or increasing the height of roads without mitigating measures should be avoided to prevent increases in the frequency and magnitude of flooding events.

Large wetland systems that provide significant water quality and wildlife benefits can be found throughout the Town. The wetland systems associated with the Lamprey River, Oyster River, Ellison Brook, LaRoch Brook, Hamel Brook, Crommet Creek, Johnson Creek, Bunker Creek, and Horsehide Brook have all been identified as significant due to their size, interconnected nature, and wildlife habitat that they provide. See Figure M-6 Wetlands.

VI. Aquifers, Drinking water, and Sand and Gravel Deposits

Ten thousand years ago the rivers created by the melting waters of the retreating glacier carried sand and gravel along their courses, depositing this sand and gravel as much as 80 feet deep in a northwesterly-southeasterly direction in Durham. These deposits, which make up a large *stratified drift formation* that contains an aquifer of municipal quality, are in the westerly part of Durham and extend into Lee, Newmarket, and Madbury. In the towns of Lee and Newmarket there are large gravel pits with open-pit mining of these deposits (see Figure M-8 Sand and Gravel Deposits).

Durham's municipal water supply comes from a combination of wells drawing from this sand and gravel aquifer and directly from the Lamprey and Oyster Rivers and is in the process of developing an additional water supply at the Spruce Hole Aquifer, which may be connected to the Town system in 2014 (see Figure M-7 Aquifers and Public Water Supplies). The new system will include an innovative recharge feature for the Aquifer. The engineered system will capture and store water during high flow periods which will be used during lower flow periods in August and September. According to the Town Engineer, Dave Cedarholm, the development of the Aquifer and planned innovations will significantly improve the quantity and quality of the Town's water supply.²¹

A regional approach to the management of groundwater assets is essential as groundwater flows across municipal boundaries. Activities in Durham, Lee, Madbury, Newmarket, Nottingham, and Barrington will affect the same resource that all these communities rely on for drinking water. Soon after the Town adopted its 2000 Master Plan, it began working with the Groundwater Trust to reclassify areas around Spruce Hole and the Oyster River to GAA, which affords the state's highest protection to groundwater resources. While the designation offers only limited protection, the Town is invested in surveying these areas for potential contamination approximately every four years.

Aquifers in the eastern portions of Durham are bedrock aquifers with water deposits located in fissures and cracks in the strata of the rock formations. The complexities of subsurface water flows within bedrock aquifers can cause contamination at distant locations. The flow of the water through a bedrock aquifer depends on the relative location of relatively impermeable and permeable layers. Only a sophisticated geological survey and programs of multiple well head testing can reliably monitor problems of point source contamination. Indeed, Durham's aquifer is vulnerable to point source contamination from within its own borders as well as from adjacent towns upstream of the subsurface flows. Since 2000, Durham has protected the Fogg Farm using NHDES aquifer protection funds and the towns of Lee and Newmarket have also done significant land protection to protect drinking water supply lands.

The Durham Point landfill at the transfer station is no longer a potential source of contamination for Durham's drinking water resources, though some private wells may be sources of contamination in the watershed. The Town paved the transfer station and placed an impervious cap on the closed landfill in 2004. The Town samples monitoring

²¹ Personal communication, 9/17/2013.

wells three times each year and provides a summary report to the state annually. Water quality monitoring results document increasing contamination levels from the 1980's to 2004, after which contamination levels have declined. The Town should continue to assess and monitor the wells as part of the landfill capping plan.²² Surface flows in the area of the Town landfill do not necessarily reflect subsurface flows through the rock strata. See list of sites that are regulated for handling or use of hazardous materials in section XV of this appendix.

Sand and gravel deposits, as well as drinking water aquifers, were laid down in the western areas of Durham during the Ice Age. If gravel is removed without careful study and consideration of the underlying aquifer, then there could be a loss of storage capacity in the aquifer and seasonal variations in flow could become more critical. The Town owns several sand and gravel pits and should reclaim them once financially viable deposits have been removed. One of the Town's pits in Lee has been reclaimed and repurposed for ball fields and natural areas.

VII. Wildlife and Wildlife Habitat Management

Despite its location in a relatively developed part of the state, but thanks to its location along the Seacoast and its large areas of undeveloped land, Durham hosts a wealth of diverse and significant wildlife habitats and species, as identified through numerous wildlife research projects conducted by UNH students and professors.

Much of the recent success with land conservation in Durham has been the result of conservation organizations working to conserve wildlife and its habitat in Durham, particularly in Crommet Creek and Folletts Brook, which were identified as the most important unfragmented habitat blocks in the 2000 Master Plan.

WHY IS IT IMPORTANT TO CONSERVE WILDLIFE CORRIDORS?

Greenways are corridors of protected open space managed for conservation and recreation purposes. In rural areas, greenways often serve as wildlife corridors that link large unfragmented natural areas that are often important habitats. Rural greenways also provide migration routes to other parts of the landscape for breeding and feeding activity.

Greenways often follow natural land or water features and link nature reserves, parks, cultural features, and historic sites with each other and with populated areas.

Although much land conservation has been accomplished, there are still significant habitat areas that remain unprotected in Durham. The Town can continue to work with private landowners to manage their land to help wildlife, particularly those of conservation concern, to permanently protect these areas.

²² 2004 Durham Landfill Closure Record Drawing, prepared by Underwood Engineers, is available at the Durham Department of Public Works and the New Hampshire Department of Environmental Services.

In 2005, the UNH Cooperative Extension and NH Fish and Game Department worked together with partners in the conservation community to create the state's first *Wildlife Action Plan*, which was mandated and funded by the federal government through the State Wildlife Grants program. The NH Wildlife Action Plan provides decision makers with important tools to restore and maintain critical wildlife habitats and populations of the species of conservation and management concern. It is a pro-active effort to define and implement a strategy that will help keep species off of rare species lists, in the process saving taxpayers millions of dollars. The Plan includes conservation planning tools to assist local conservation planners, maps and descriptions of resources that are mapped, descriptions of habitats and management approaches, and workshops and presentations to inform those interested about how to use the Plan.²³ NH Cooperative Extension has also published a series of habitat stewardship brochures to help landowners who own significant wildlife habitat learn about and help conserve important wildlife habitats on their land through guidelines for voluntary stewardship.²⁴

New Hampshire completed a detailed *Wildlife Action Plan* for the state in 2006 and updated it in 2010. The Plan was created to identify wildlife and habitats at risk, map habitats statewide, and assess risks to species and habitats, with a goal of developing conservation strategies through further research, inventorying, and monitoring. A series of state-wide maps, useful at a town-wide scale, were created identifying wildlife habitat land cover and highest quality wildlife habitat. Much of Durham's landscape is designated as part of the highest ranked wildlife habitat by ecological condition in the state or biological region. Much of the remaining Durham landscape is designated as valuable supporting landscape (see Figure M-9 New Hampshire Wildlife Action Plan).

Significant wildlife habitats in Durham include:

- **Floodplain Forest:** Floodplain forests are unique because of their periodic flooding. These regular disturbances, which deposit silt and sand along the banks of waterways, help create and maintain unique communities of plants that tolerate flooding and require nutrient rich soils. Floodplain forests contribute many free ecological services to our society: they help filter pollutants to prevent them from entering streams, improve water quality, are critical in controlling erosion, and help buffer rivers against catastrophic flooding. Floodplains are home to a diversity of wildlife. The damp soils create rich insect and amphibian breeding habitats, and these species in turn become prey for birds such as woodcock and barred owl, for mammals such as mink and raccoon, and for reptiles such as smooth green snake and wood turtle. Research in the Connecticut River region has shown that spring flooding thaws the soils of floodplain forests earlier than soils in surrounding areas. This early thaw means that insects become available to birds, as food, earlier in floodplain forests, so birds will feed in, follow, and depend more heavily on floodplain forests than other forested habitats during the early spring migration. Floodplains provide corridors that allow wildlife to move from one habitat to another, especially in urban areas where

23 http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm

24 <http://extension.unh.edu/Habitat-Stewardship-Brochures>

development has fragmented alternative travel routes for wildlife. The overhanging canopy in floodplain forests also helps maintain cool waterways in the summer, which helps species such as brook trout.

- **Grasslands:** Grassland habitats are an increasingly rare site in New Hampshire. More than 70 species of wildlife use these open areas of fields and wildflowers to meet their needs for food, cover, or breeding. Bird species that depend on grasslands have declined, along with their habitats, faster than any other group of birds in New England. Most grassland nesting birds are *area sensitive*, which means they won't nest in fields smaller than a certain size. Most of today's grasslands are the result of land clearing, and require maintenance. If left alone, without the work of farmers and other landowners, most grassland habitats will grow back into shrubs and small trees, reverting eventually to forest. However, the timing of mowing can affect a field's ability to provide habitat for grassland nesting birds and other wildlife. Farmers growing high quality forage for livestock usually mow their fields two or three times during the summer. At least one of these mowings typically occurs between May and mid-July, a time that corresponds with the nesting season for most grassland nesting birds. Mowing during this period can destroy nests and eggs, kill fledglings, or cause adult birds to abandon their nests.
- **Coastal Islands:** Coastal islands have rocky shores, and are usually remote, undisturbed, and free of predators. As well as providing critical wildlife habitat, these islands are evidence of New Hampshire's rich and vibrant maritime past. Vegetation on these islands typically includes grasses, herbaceous plants, and shrub thickets growing among rocky outcrops, with few to no trees. In addition to birds, other wildlife species that use these islands include seals, barnacles, and monarchs. The most challenging issues facing coastal island habitat and seabird communities are large populations of predators, such as gulls. Other threats include recreation and climate change. Habitat protection, controlling overpopulated predators, and preparing for oil spills are a few of the conservation strategies for coastal islands.
- **Salt marsh:** Salt marshes are grass dominated tidal wetlands existing in the transition zone between ocean and upland. They are among the most productive ecosystems in the world and provide habitat for many bird species including American bittern, Nelson's sharp-tailed sparrow, salt marsh sharp-tailed sparrow, seaside sparrow, and semipalmated sandpiper. Salt marsh plants are salt tolerant and adapted to fluctuating water levels. Nutrients that stimulate marsh plant growth are carried in and organic matter that feeds fish and other organisms is carried out by the tides. Over time, organic matter accumulates on the marsh and forms peat. By building up more peat, salt marsh elevation can keep pace with rising sea level, unless the rate of sea level rise becomes too great, such as is predicted from climate change. Salt marshes help protect coastal areas from storm surges, but an estimated 30-50% of New Hampshire's original salt marsh habitat has been lost to development. Some of the conservation strategies for salt marshes are restoring and protecting the remaining salt marsh habitat and surrounding upland buffer habitat.
- **Peatland:** Peatland habitats are extremely important for carbon sequestration on a local and global scale. The water in peatlands has low nutrient content and typically high acidity caused by limited groundwater input and

surface runoff. These environmental conditions are such that plant and animal material take a very long time to decompose. Organic material contains carbon and other nutrients, storing and slowly releasing it into the atmosphere. Drainage and destruction of peatlands releases this carbon into the atmosphere quicker, increasing greenhouse gases. Conservation of the 11 different natural communities that comprise peatlands is also vital to the continued existence of many rare plant and wildlife species in New Hampshire. The state endangered ringed bog haunter uses peatlands and the surrounding uplands in the southern part of the state. The northern bog lemming inhabits burrows in the sphagnum moss and associated grasses. Typical vegetation in a peatland includes sphagnum moss, leather leaf, northern white cedar, and American larch. Threats to peatland habitats are development, altered hydrology (amount and flow of water), and unsustainable forest harvesting. Nonpoint source pollutants, such as road salt, lawn fertilizers, and pesticides, also threaten this habitat by altering the acidity and nutrients. Establishing buffers around this habitat is one conservation strategy that will help minimize the threats to peatland habitats.

- **Marsh & Shrub Wetland:** Marsh and shrub wetlands are rich habitats that provide a number of critical ecosystem functions such as flood control, filters for pollutants, erosion control, and wildlife habitat. Marshes are important for fish, breeding amphibians, and waterfowl and they connect people to habitat through hunting, fishing, tourism, and recreation. Shrub wetlands may seem inhospitable to people, but their dense thickets provide reliable cover from predators for many wildlife species. Historically, New Hampshire has lost fewer wetlands to development than many other states. However, we also have little direct protection of these important parts of our ecosystem. As southern New Hampshire faces increasing development pressure, wetlands and their surrounding uplands are at risk. Construction setbacks aren't always required around wetlands in NH, except for septic systems, and wetlands are routinely filled and damaged by driveway and road crossings. Loss of upland habitat, pollution, salt runoff from roads, and destruction of beaver dams, because of their proximity to backyards, all have a detrimental effect on our marsh and shrub wetland communities. Invasive plants such as purple loosestrife, common reed (*Phragmites*), and Japanese knotweed threaten the diversity of plants in marshes, and several woody plants such as glossy buckthorn are a problem in shrub wetlands. Invasive plants take over native vegetation and offer less valuable habitat and food sources for many species of wildlife.
- **Appalachian Oak-Pine Forests:** Appalachian oak-pine forests occur in southern and central New Hampshire below 900 feet of elevation and on dry, rocky ridges at higher elevations. Here, the warmer and drier climate promotes tree species adapted to drier soils. White pine and oak trees dominate the tree canopy. The presence of tree species typical of southern, Appalachian states sets this habitat apart from the more common oak-pine forest type, also called hemlock-hardwood-pine. Appalachian oak-pine forests, with their abundance of nut-bearing oaks and hickories, provide a rich food source for wildlife such as ruffed grouse, turkey, black bear, squirrels, mice and chipmunks. In turn, raptors such as northern goshawk feed on small mammals and find nesting and perching sites in white pines in the tree canopy. Near water, white pines provide key nest and perch sites for bald eagles, great blue herons, and osprey. Most Appalachian oak-pine forests are in southeastern New

Hampshire, coincide with the highest densities of people. Well drained soils in these forests are readily developed for homes, buildings, and septic systems. Much of New Hampshire's historical Appalachian oak-pine forest is already permanently lost to human development. Large, intact blocks of this forest type are relatively rare, and only 12% of existing forests are permanently conserved.

- **Hemlock Hardwood Pine Forests:** Hemlock-hardwood-pine forests are comprised of mostly hemlock, white pine, beech, and oak trees. Since this is a transitional forest, it can occur at different elevations and over different types of soil and topography, so the composition of vegetation can be variable. This forest type is the most common in New Hampshire and covers nearly 50% of the state and provides habitat for numerous wildlife species such as the cerulean warbler, eastern pipitrelle, and bobcat. Many of the species that use this habitat type require large blocks of unfragmented forest such as the northern goshawk and black bear. Since this forest type is so common, it is sometimes overlooked in conservation efforts. Development and fragmentation is a huge threat to the continued existence of hemlock-hardwood-pine forest. Some conservation strategies for hemlock-hardwood-pine forests are incorporating habitat conservation into local land use planning, protecting unfragmented blocks of land, and educating landowners.
- **Headwater Streams (not mapped):** Headwater streams are small streams and wetlands at the highest end of a watershed. Some are so small that they don't show up on maps. If a river network is the circulatory system of the landscape, headwater streams are the small capillaries that fan into the larger veins and arteries. Headwater streams can start as small forested wetlands, beaver impoundments, or cascading mountain streams, varying according to the topography and geology of the surrounding landscape. Many headwater streams are scoured by ice in winter, flood in the spring and fall, and are dry in the summer. Wide variations in water flow and temperature make life difficult in headwater streams. A unique group of plants, amphibians, and insects are adapted to survive in these difficult conditions. These small streams also have a large impact on the health and integrity – both for water quality and wildlife – of major rivers downstream. Headwater streams are places where forest and stream habitats converge, leading to high densities of insects around the streams. Stoneflies, mayflies, and dragonflies, whose larvae live underwater, are found alongside upland insects such as moths, beetles, and grasshoppers. This concentration of food attracts predators from the surrounding forest including northern long-eared bat, red-shouldered hawk, raccoon and ribbon snake. Many species take advantage of the relative safety of headwater streams for reproduction. Green frogs and spring and two-lined salamanders lay their eggs in intermittent, fishless streams. Common white suckers and rainbow smelt, two fish species, migrate every year into small streams to spawn. Headwater streams also can act as travel corridors for wildlife such as mink, otter, beaver, forest birds, and forest dwelling bats. The isolation and harsh conditions of headwater streams can also provide native fish with a refuge from introduced species. Natives such as banded sunfish, redbin pickerel, and redbelly dace can thrive in headwater streams, but are overrun by introduced fish in the more stable and often degraded habitats of larger rivers and lakes.

- **Shrublands (partially mapped):** Shrubland habitats are shrub dominated areas with scattered forbs and grasses. These habitats are typically the result of some disturbance and include dry shrublands, utility rights-of-way, old agriculture fields, and reverting gravel pits. Shrublands and other woody early-successional habitats are declining in New Hampshire and throughout the Northeast as are the associated wildlife species. Patch size is a key component of shrublands as wildlife habitats. For example, golden-winged warblers occupy patches that are at least 10 hectares, whereas state endangered New England cottontails occupy patches in southeastern New Hampshire ranging from 0.2 to 15 hectares. Vegetation structure is also very important to shrubland habitat as some species require thick understory such as the New England cottontail, American woodcock, and other species. Some of the other species that can be found in shrublands include ruffed grouse, smooth green snake, wood turtle and the state threatened black racer. If left alone, many shrublands will naturally succeed into forests and therefore, natural disturbances or specific management practices should be allowed to occur to sustain this habitat. Additionally, habitat fragmentation and habitat loss due to development threatens shrubland habitats. Durham is one of very few towns in New Hampshire where New England cottontails still exist. As a result, Durham has a special responsibility for this imperiled species. Some conservation strategies for shrublands include habitat restoration and management.
- **Vernal Pools (not mapped):** Vernal pools are wetland depressions characterized by small size, physical isolation from other wetlands, periods of flooding and drying, and a lack of fish. Vernal pools can be found in almost every other habitat type and many wildlife species use them as a place to take a quick drink as they are passing through the area. Some species though are vernal pool dependant and the loss of this habitat can result in local extinction of these species such as the fairy shrimp, wood frog, spotted salamander, blue-spotted salamander, Jefferson salamander, and the state endangered marbled salamander. The loss of vernal pool habitat due to development is therefore a huge threat, but the surrounding habitat is also just as important as the vernal pool itself as most wildlife species that use vernal pools also spend a great deal of time in the surrounding habitat. Removing the tree canopy around a vernal pool changes the amount of sunlight reaching the pool and can alter temperature and flooding and drying cycles. Some conservation strategies for vernal pools include habitat protection and regulations that do not allow dredging and filling. Creating a model for vernal pools is very difficult because they can be found within so many other habitat types and because the flooding and drying cycle often causes vernal pools to be over looked during certain seasons and drier years. Due to this challenge they were not mapped initially as part of the Wildlife Action Plan. New and important data was provided to fill this gap in 2005.

These habitats are identified in the Land Conservation Plan for NH's Coastal Watersheds²⁵ and should be prioritized for conservation initiatives.

VIII. Species of Special Concern

The Natural Heritage Inventory (NHI) is a State program in the Division of Forest and Lands. The NHI finds, tracks, and facilitates the protection of New Hampshire's plant and animal species of concern and exemplary natural communities. Exemplary communities are distinctive communities of forests, wetlands, grasslands, etc., that are found in few other places in New Hampshire, or are communities that are very old and in good condition. Species of concern are those species listed as threatened or endangered under the NH Endangered Species Conservation Act of 1979 or under the NH Native Plant Protection Act of 1987 (see Table 1).

The NHI data represents the best available information for locations and status of species of concern and natural communities in New Hampshire, but there are certainly occurrences that have not yet been found since a comprehensive inventory of neither the State or Town has been done.

Currently, Durham does not have any known occurrences of federally listed endangered or threatened species, though river herring are proposed for listing, which would have implications for Durham's tidal rivers and the listing of the New England cottontail could have implications for forest or field management. There are 12 known state listed endangered species found in Durham and an additional 20 known state listed threatened species. In order to protect the species of concern and the rights of property owners, the NHI places an un-centered 0.75 mile buffer around known occurrences of a species, to make it more difficult to detect the exact location of the species of concern. Thus, due to the map reporting requirements of the NHI and the number of species of concern listed for Durham, a [map of the known occurrence locations is not useful since the entire map essentially turns into one large buffer circle.](#)

Table 1. Rare Species and Exemplary Natural Communities in Durham

Rare Species and Exemplary Natural Communities in Durham					
		Listed?		# Locations Reported in Last 20 Years	
Importance	Species or Community Name	Federal	State	Town	State
	Natural Communities – Terrestrial				
**	Hemlock – beech – oak – pine forest	-	-	1	11
**	Rich Appalachian oak rocky woods	-	-		17

25 Zankel, M., C. Copeland, P. Ingraham, J. Robinson, C. Sinnott, D. Sundquist, T. Walker, and J. Alford. 2006. The Land Conservation Plan for New Hampshire's Coastal Watersheds. The Nature Conservancy, Society for the Protection of New Hampshire Forests, Rockingham Planning Commission, and Strafford Region Planning Commission. Prepared for the New Hampshire Coastal Program and the New Hampshire Estuaries Project, Concord, NH. <http://www.rpc-nh.org/coastal-conservation.htm>

Rare Species and Exemplary Natural Communities in Durham					
Importance	Species or Community Name	Listed?		# Locations Reported in Last 20 Years	
		Federal	State	Town	State
	Natural Communities - Palustrine				
**	Herbaceous seepage marsh	-	-	1	5
**	Kettle hole bog system	-	-	1	24
**	Red maple – lake sedge swamp	-	-	1	1
**	Red maple – red oak – cinnamon fern forest	-	-	1	1
**	Red maple – sphagnum basin swamp	-	-	1	8
*	Red maple floodplain forest	-	-	1	15
	Natural Communities - Estuarine				
**	Brackish marsh	-	-	2	12
**	High salt marsh	-	-	3	14
**	Salt marsh system	-	-	1	6
**	Sparsely vegetated intertidal system	-	-	1	1
**	Subtidal system	-	-	1	3
	Plants				
	American waterwort	-	E	historical	2
**	Black maple (<i>Acer nigrum</i>)	-	T	2	10
	Blunt sphenopholis (<i>Sphenopholis obtusata</i>)	-	E	historical	2
**	Blunt-lobed woodsia (<i>Woodsia obtusa</i>)	-	E	1	9
	Downy false foxglove (<i>Aureolaria virginica</i>)	-	E	historical	15
	Dwarf Glasswort (<i>Salicornia bigelovii</i>)			historical	7
	Engelmann's quillwort (<i>Isoetes engelmannii</i>)	-	E	historical	15
	Flat-leaved rush (<i>Juncus dichotomus</i>)	-	E	historical	1
	Fringed gentian (<i>Gentianopsis crinita</i>)	-	T	historical	27
	Giant rhododendron (<i>Rhododendron maximum</i>)	-	T	historical	13
	Goodenough's sedge (<i>Carex nigra</i>)	-	E	historical	11
	Hairy brome grass (<i>Bromus pubescens</i>)	-	E	historical	5
	Horned pondweed (<i>Zannichellia palustris</i>)	-	E	historical	6
**	Knotty pondweed (<i>Potamogeton nodosus</i>)	-	T	1	19
**	Large bur-reed (<i>Sparganium eurycarpum</i>)	-	T	6	20
	Large-spored quillwort (<i>Isoetes lacustris</i>)	-	E	historical	5
	Leafy bulrush (<i>Scirpus polyphyllus</i>)	-	E	historical	3
	Lined bulrush (<i>Scirpus pendulus</i>)	-	E	historical	5
**	Loesel's twayblade (<i>Liparis loeselii</i>)	-	T	1	24
*	Marsh elder (<i>Iva frutescens</i>)	-	T	2	11
	Marsh horsetail (<i>Equisetum palustre</i>)	-	E	historical	12

Rare Species and Exemplary Natural Communities in Durham					
Importance	Species or Community Name	Listed?		# Locations Reported in Last 20 Years	
		Federal	State	Town	State
	Missouri rock cress (<i>Boechera missouriensis</i>)	-	T	historical	13
	Netted chain fern (<i>Woodwardia areolata</i>)	-	E	historical	4
	Northern blazing star (<i>Liatris novae-angliae</i>)	-	E	historical	16
	Pale duckweed (<i>Lemna valdiviana</i>)	-	E	historical	4
**	Pale green orchid (<i>Platanthera flava</i> var. <i>herbiola</i>)	-	E	1	10
	Philadelphia panic grass (<i>Panicum philadelphicum</i>)	-	E	historical	8
**	Prolific knotweed (<i>Polygonum ramosissimum</i> ssp. <i>prolificum</i>)	-	E	1	9
	Purple clematis (<i>Clematis occidentalis</i>)	-	E	historical	25
	Purple milkweed (<i>Asclepias purpurascens</i>)	-	E	historical	4
	Rigid sedge (<i>Carex tetanica</i>)	-	-	historical	1
*	Robust knotweed (<i>Persicaria robustior</i>)	-	E	1	6
**	Salt-marsh gerardia (<i>Agalinis maritima</i>)	-	E	1	9
	Sharp-flowered mannagrass (<i>Glyceria acutiflora</i>)	-	E	historical	9
	Small spike-rush (<i>Eleocharis parvula</i>)	-	T	historical	22
**	Small-crested sedge (<i>Carex cristatella</i>)	-	E	3	12
	Smooth rock cress (<i>Boechera laevigata</i>)	-	E	historical	6
**	Star duckweed (<i>Lemna trisulca</i>)	-	E	1	5
**	Tufted loosestrife (<i>Lysimachia thysiflora</i>)	-	T	1	10
	Tundra alkali grass (<i>Puccinellia pumila</i>)	-	E	historical	7
*	Turk's cap lily (<i>Lilium superbum</i>)	-	E	1	1
	Virginia three-seeded mercury (<i>Acalypha virginica</i>)	-	E	historical	5
**	Water marigold (<i>Bidens beckii</i>)	-	T	2	12
**	Water-plantain spearwort (<i>Ranunculus ambigens</i>)	-	E	1	3
Vertebrates - Mammals					
**	New England cottontail (<i>Sylvilagus transitionalis</i>)	-	E	1	20
Vertebrates - Birds					
**	Bald eagle (<i>Haliaeetus leucocephalus</i>)	M	T	1	73
**	Common tern (<i>Sterna hirundo</i>)	-	T	2	9
**	Golden-winged warbler (<i>Vermivora chrysoptera</i>)	-	SC	1	4
	Great blue heron (Rookery) (<i>Ardea Herodias</i>)	-	-	historical	39
**	Least bittern (<i>Ixobrychus exilis</i>)	-	SC	1	4
**	Osprey (<i>Pandion haliaetus</i>)	-	SC	5	103
**	Sedge wren (<i>Cistothorus platensis</i>)	-	E	1	4
**	Upland sandpiper (<i>Bartramia longicauda</i>)	-	E	1	6

Rare Species and Exemplary Natural Communities in Durham					
		Listed?		# Locations Reported in Last 20 Years	
Importance	Species or Community Name	Federal	State	Town	State
	Vesper sparrow (<i>Pooecetes gramineus</i>)	-	SC	historical	12
Vertebrates - Reptiles					
***	Blandings turtle (<i>Emydoidea blandingii</i>)	-	E	12	568
	Eastern hognose snake (<i>Heterodon platirhinos</i>)	-	E	historical	38
**	Northern black racer (<i>Coluber constrictor constrictor</i>)	-	T	1	47
***	Spotted turtle (<i>Clemmys guttata</i>)	-	T	4	99
**	Wood turtle (<i>Glyptemys insculpta</i>)	-	SC	2	164
Vertebrates – Fish					
	American brook lamprey (<i>Lampetra appendix</i>)	-	E	historical	2
	Atlantic sturgeon (<i>Acipenser oxyrinchus</i>)	-	-	historical	1
**	Banded sunfish (<i>Enneacanthus obesus</i>)	-	SC	1	30
**	Redfin pickerel (<i>Esox americanus americanus</i>)	-	SC	1	32
**	Swamp darter (<i>Etheostoma fusiforme</i>)	-	SC	1	13
Invertebrates – Butterflies and Moths					
	A noctuid moth (<i>Chaetagnalea cerata</i>)	-	-	historical	5
	A noctuid moth (<i>Chytonix sensilis</i>)	-	-	historical	3
	A noctuid moth (<i>Trichosilia manifesta</i>)	-	-	historical	2
	Bog elfin (<i>Callophrys lanoraieensis</i>)	-	-	historical	1
**	Columbine duskywing (<i>Erynnis lucilius</i>)	-	-	1	4
	Frosted elfin (<i>Callophrys irus</i>)	-	E	historical	7
***	Ringed Bognaunter (<i>Williamsonia lintneri</i>)	-	E	1	13
Listed? E = Endangered T = Threatened SC = Special Concern M = Monitored (after delisting)					
Importance **** = Highest importance *** = Extremely high importance ** = Very high importance * = High importance					
Based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in Durham. Please, contact Natural Heritage Inventory at (603) 271-3623 to learn more about this or alternative ways of setting priorities.					
Source: New Hampshire Natural Heritage Bureau, January 2012.					

IX. Wildlife Corridors and Greenways

Durham is a waterfront community and the Town owes much of its appeal to the beauty of its shorelands along the Great and Little Bay the Oyster and Lamprey Rivers. The Great Bay has been singled out as one of the Environmental Protection Agency's 28 National Estuary Program sites. The Lamprey and Oyster Rivers are both designated under the

NH River Management and Protection Program and the Lamprey is one of only two National Wild and Scenic Rivers in New Hampshire. Many streams, three watersheds, and several ponds, marshes, and wetlands are widely dispersed through the Town. All of Durham's tidal estuaries, freshwater streams, saltwater wetlands, and freshwater wetlands are vitally important wildlife corridors or greenways.

Conservation of Durham's greenways, tidal estuaries, and streams will preserve the wildlife corridors that penetrate all of our neighborhoods and into the Town core. These corridors provide not only areas for maintenance of wildlife and plants, but they are also areas of recreation immediately available to those living adjacent to them. The protection of the estuarine and marine environments, Little Bay and Great Bay, depend ultimately upon the maintenance of these waterways as greenways. Natural processes will help minimize the adverse effects of contaminants as long as the greenways are not degraded.

The Oyster River is a historic connection with the Great Bay communities and provides a tangible physical connection to Little Bay, Great Bay, and the Piscataqua River. The Oyster River is a visible link to Durham's history as a vital colonial center and, thus, it is the centerpiece of the greenway in Durham's urban core.

Wildlife corridors provide travel ways and migratory routes and linkages between habitat areas. They are often located along stream and river paths and significant geological features such as ridgelines. Greenways serving as wildlife corridors can be virtually any type of traversable land of at least 200 feet in width.

X. Gaps in Trails and Wildlife Corridors

The 1989 and 2000 Master Plan recognized several important wildlife corridors that have been preserved as part of the Great Bay Resource Protection Partnership's *Sweet Trail*, which connects conservation lands in Durham along a four mile stretch to Newmarket. Other trails are described in the Recreation Chapter. Some are owned by the Town; others by UNH or the State. See Figure M-15 Town Trail System for a map of trails.

WHY IS IT IMPORTANT TO CONSERVE GREENWAYS?

Greenways are corridors of protected open space managed for conservation and recreation purposes. In rural areas, greenways often serve as wildlife corridors that link large unfragmented natural areas that are often important habitats. Rural greenways also provide migration routes to other parts of the landscape for breeding and feeding activity.

Greenways often follow natural land or water features and link nature reserves, parks, cultural features, and historic sites with each other and with populated areas. Some greenways are publicly owned, some are privately owned, and some are the result of public/private partnerships. Some are open to visitors, other are not. Some appeal to people, others attract wildlife.

In more developed areas, greenways can encompass natural or built features and can be managed primarily for resource conservation or recreation.

This Master Plan seeks to work with the Recreation Committee to identify gaps between these corridors and opportunities to connect them with each other as well as with conserved land, the Downtown, neighborhoods, and community.

XI. Forest lands, Open Space, and Other Cover Types

Except in the Town core and along portions of Route 4, Durham's land cover map illustrates that the community remains predominantly vegetated in various forests and managed agricultural cover. Nearly 60% of the Town's land area, or 8,418 acres, is forested (see Figure M-13 Forest Resources).

The type, quality and extent of forestland and other vegetative cover in Durham are key indicators of environmental health and impacts on the other resources discussed in this Chapter. Protection and management of forests, trees, and other vegetation provides many benefits, services, and products including;

- Improved wildlife habitat for specific species of concern
- Places for recreational activities
- Improved scenic quality, community character, and property values
- Watershed protection, reduced impact of stormwater, and improved water quality
- Improved air quality.

Many factors have a negative impact on our landscape. Development nearly permanently replaces forested land cover with impervious surfaces. Invasive species, which are predicted to gain increasing footholds in our region as one impact of climate change, can stress and ultimately replace species that cannot adapt quickly enough or poorly compete with new species that are better fitted for changing environmental conditions. Over use and/or poor management of sensitive land covers – clear cutting, high intensity agriculture, disturbing shorelands, among others – can degrade and ultimately undermine different land covers.

Open land cover types include water or riparian cover (open water and wetlands), agriculture (row crops, hay/pasture, orchards), and various forest (beech/oak, other hardwoods, white/red pine, spruce/fir, hemlock, pitch pine, mixed) (Table 2). One often overlooked forest type is the urban forest, which not only provides aesthetic value, but air purification, energy conservation, and microhabitat value.

Table 2. Acreages of Different Land Cover Types

LU Code	Description	Acres
100	Residential/Commercial/Industrial	553.8
140	Transportation	1061.2
211	Row Crops	81.7
212	Hay/Pasture	1029.8
221	Orchards	53.4
412	Beech/Oak	998.9
419	Other Hardwoods	1075.6
421	White/Red Pine	1466.6
422	Spruce/Fir	1.8

423	Hemlock	182.6
424	Pitch Pine	11.0
430	Mixed Forest	5211.5
500	Open Water	2024.0
610	Forested Wetland	185.6
620	Open Wetland	280.0
630	Tidal Wetland	55.2
710	Disturbed Land	38.3
790	Other Cleared	1539.9
Source: NHGRANIT 2001 Land Cover Assessment		

While most residents value the open, rural character of Durham, we often do not stop to consider who owns these important community resources. Some open lands are owned by the Town. Some are owned by UNH. Others are owned by the state or federal government. Still others are owned by private, nonprofit organizations. And some are owned by private individuals who offer varying levels of permission for public to access and use their property.

XII. Lands Identified for Conservation

Durham's conservation and public lands afford various levels of conservation protection of land and resources. Since 2000, Durham has gone through a highly-successful period of private and public land conservation in Durham. Important natural, agricultural, and scenic resources remain unprotected, and Durham should work to permanently conserve these. See Figure M-10 Conservation Lands.

The *Land Conservation Plan for New Hampshire's Coastal Watersheds* was prepared by The Nature Conservancy, the Society for the Protection of New Hampshire Forests, Rockingham Planning Commission, and the Strafford Planning Commission in 2010.²⁶ The project, undertaken in a partnership among the four agencies, was funded through the New Hampshire Coastal Program, the New Hampshire Estuaries Project, and the New Hampshire Charitable Foundation. The Plan identifies 75 Conservation Focus Areas as the most important lands to retain as open space so as to protect living resources and water quality. The Plan also sets out regional strategies including voluntary measures and regulatory tools, to maintain diverse wildlife habitat, abundant wetlands, clean water, productive and contiguous forest blocks, and outstanding recreational opportunities. The analysis involved geospatial data and complex GIS modeling of the coastal watersheds to identify a network of important areas for conservation.

The areas of highest priority consider large, unfragmented forest blocks, intact floodplains and riparian zones, high quality stream networks and small watersheds, irreplaceable coastal and estuarine features, significant fish and wildlife habitats, critical habitat supporting rare species and exemplary natural communities, and connections among

²⁶ <http://www.rpc-nh.org/coastal-conservation.htm>

important land areas. Identifying and protecting these critical conservation areas is essential to maintain the ecological function and services provided by our natural resources.

The Town also plays the role of steward to a variety of properties, some of which have some level of conservation restriction. In 2009, the conservation Commission hired a consultant to review conservation values and recommend objectives for four Town owned properties. These recently completed land stewardship plans now should be implemented. For example, Wagon Hill Farm, a town-owned parcel, should be permanently protected with a conservation easement to prevent future development of the site, while still allowing for public use, recreation, habitat management, and agricultural activity. The easement should allow the historic buildings on the property to be creatively used. In addition, the Conservation Commission, Agricultural Commission, and Recreation Committee should prioritize the properties that need stewardship plans, including consideration of the newly acquired Oyster River Forest property.

During the 1990’s, the Town did not aggressively pursue the purchase of conservation lands. Instead it relied on volunteer organizations such as the Great Bay Partnership, The Nature Conservancy, Society for the Protection of New Hampshire Forests, and the Lamprey River Advisory Committee to purchase conservation lands within its borders. The Great Bay Partnership and The Nature Conservancy were particularly active in purchasing property and easements within the Crommet Creek watershed. However, the efforts of these organizations did not always target lands on which the Town as a whole would place a priority (e.g., The Nature Conservancy only protects habitat for endangered species, and the Forest Society eschews plots smaller than 100 acres). Since 2000, the Town has more actively pursued acquisition of conservation lands according to its own set of priorities.

The deeds of *conservation* land and conservation easements owned by Durham were reviewed with respect to any restrictions that may be on the property and thus prevent future development. Of the properties owned by the Town, the following properties have conservation restrictions of one type or another.

Table 3. Restrictions on Town Owned Conservation Land

Restrictions on Town Owned Conservation Land	
Property	Conservation Restrictions
Bagdad Road	Scenic easement
Coe Drive/Beard’s Creek	Scenic easement
Colby Marsh-Beaver Brook Conservation Area	Deed restriction grants the land for conservation and requires the land be managed and controlled by the Conservation Commission.
Doe Farm	Deed restriction prevents the Town from ever selling the property.

Restrictions on Town Owned Conservation Land	
Property	Conservation Restrictions
Durham Point Road/York Drive	Scenic easement that requires the property to forever be used for open space, agriculture, forestry, and general conservation purposes.
Father Lawless Park	Developed with Land and Water Conservation Funds which require that the property never be converted to any other use except public outdoor recreation, unless approved by National Park Service.
Langmaid Farm	Deed restriction prevents the property from being further subdivided and specifies that the land be used only for conservation purposes.
Oyster River access parcel	Given to the Town under Land Conservation Investment Program, the land is managed by the Conservation Commission. The Town must retain the parcel as undeveloped shoreline and is prohibited from selling the parcel.
Packers Falls property	Deed restriction to maintain, improve, protect, and limit the future use of or otherwise conserve the property.
Spruce Hole	Deed restriction that allows the Conservation Commission to maintain, improve, protect, and limit the future use of or otherwise conserve the property.
Stolworthy Wildlife Sanctuary	Deed restriction prohibiting any other use of the property except as a wildlife sanctuary.
Williams Way boat landing	Deed restriction that allows the Conservation Commission to maintain, improve, protect, and limit the future use of or otherwise conserve the property.

XIII. Funding for Conservation

Durham’s Conservation Fund (based on RSA 36A) has helped fund a variety of important conservation projects in the town over the last decade: acquisition of conservation easements; purchase of fee titles to properties (i.e., the Oyster River Forest); preparation of stewardship plans, education materials, recreational enhancements; land surveys; and the purchase of conservation easement boundary marker tags, and more. These projects were made possible when Durham allocated 100% of its Land Use Change Tax (LUCT) to the Conservation Fund.

The LUCT is funded by revenue the Town receives when property no longer qualifies for a current use designation, often when it is developed.

Between 2004 and 2013, Durham protected 465 acres of undeveloped land, leveraging local funds by 69%. For every \$1 of local funds spent, we received more than \$3.20 in value from conservation partners. Reliable funding for land conservation will likely continue to be a challenge in the Seacoast region, where land prices and development pressures remain high.

Maintaining a significant balance in the Conservation Fund allows Durham to leverage dollars with conservation partners and respond to conservation opportunities quickly. The Conservation Fund balance varies over time and its source, based on development projects, is unpredictable, so it is important to preserve the 100% allocation of LUCT into the Fund.

Table 4. Accomplishments from 2005-2012

Year	Category	Accomplishments	Goals for Following Year
2005	Protect Land and Scenic Vistas	Recommended to Town Council (Council) the purchase of a 26-acre scenic easement on land owned by Tom and Mary Merrick. Provided financial support for land appraisals on parcels that owners are interested in conserving. Secured \$200,000 EPA grant to remediate a brownfield site. Submitted application for another \$200,000 grant.	Continue work for open land and scenic vista preservation. Develop protocol for monitoring conservation easements held by Town.
2005	Manage/Steward Town Owned Lands and Easements and Land Use/Trails Subcommittee	Worked with a joint subcommittee of the Conservation Commission and Parks and Recreation Committee to prepare and present a <i>Town Owned Lands Report</i> , which makes recommendations for recreational uses and conservation, to Council. Focused on Town lands around Longmarsh Road, trail signs, and a boardwalk to bridge a wetland area.	Establish Adopt-a-Trail to more actively involve Durham residents in care and maintenance of Town conservation lands and trails.
2005	Site Plan, Wetlands, Shoreland, Aquifer, Dredge and Fill Applications	Conducted 2 site visits to parcels on which work was proposed which would incur an environmental impact. Reviewed 10 wetland-related applications, including dock/pier construction, retaining walls, sidewalk construction, trails work, pond cleaning, and new residence hall construction at UNH adjacent to a wetland.	
2005	Conservation Expertise/Guidance on Town Regulations	Continued review of draft Wetland, Shoreland sections of zoning ordinance. Aquifer Conservation Overlay District approved.	
2005	Mill Pond Dam and Impoundment Restoration	Secured NH Dept of Environmental Services (NH DES) wetlands permit to dredge Mill Pond and insurance obtained for the work. Worked with Dept of Public Works (DPW) to identify site for dredged sediment. Volunteers cut back new growth along	Continue efforts to remove and dispose of sediment from Mill Pond. Continue to remove brush on Town owned shorelines of the Pond. With help of DPW, develop long-term plan to reduce sediment and nutrient input to Mill

Year	Category	Accomplishments	Goals for Following Year
		shore.	Pond.
2005	Jackson's Landing	Began to form Jackson's Landing Committee to study how to make the Landing a vibrant recreation area for the Town.	Work with Parks & Recreation Committee (P&R) to prepare report for Council on how to improve recreational value of Jackson's Landing and minimize erosion at the site.
2005	Public Awareness and Education	With P&R set up a table at Wagon Hill to show citizens what the two groups are doing.	
2006	Protect Land and Scenic Vistas	Purchased conservation easements on 4 parcels totaling 292 acres to help preserve open space (Emery, Langley, Fogg, Braudette properties).	Develop a protocol for the monitoring of conservation easements held by the Town. Cut trails so residents could use and enjoy the properties.
2006	Manage/Steward Town Owned Lands and Easements and Land Use/Trails Subcommittee	Obtained grant from NH DES and constructed a boardwalk over wetland areas at Longmarsh Preserve. Erected new signs at trailheads. Conducted 4 site visits to evaluate impact of proposed development on wetlands and/or to look at potential acquisition of conservation easements.	
2006	Site Plan, Wetlands, Shoreland, Aquifer, Dredge and Fill Applications	Reviewed 17 applications submitted to the NH DES for construction in shoreland and wetland areas, including construction of dock/piers, retaining walls, and culverts and for dam maintenance.	Continue to monitor dredge and fill permit applications.
2006	Conservation Expertise/Guidance on Town Regulations	Continued review of draft Wetland, Shoreland, and Aquifer Conservation Overlay District sections of zoning ordinance.	
2006	Mill Pond Dam and Impoundment Restoration	Sought help from US Army Reserve (Reserve) on dredging Mill Pond. Volunteers cut back new growth along shore to maintain open vistas of water from peninsula.	Continue effort to get the Reserve to dredge Mill Pond. Continue efforts to keep brush from growing up on Town land along the shore of Mill Pond.
2006	Jackson's Landing	Completed and presented <i>Jackson's Landing Park Proposal for Improvements</i> to Council. Submitted pre-proposal for funds to control erosion to NH DES.	Work to eliminate erosion problems at Jackson's Landing.
2006	Climate Change		With help of others, develop townwide initiative to reduce greenhouse gas emissions.
2006	Public Awareness and Education	With P&R set up a table at Wagon Hill to show citizens what the two groups are doing.	
2007	Protect Water Resources	Prepared letter to accompany dog license renewals highlighting the importance of proper handling of pet waste. Advocated for restoration and protection of College Brook in Mill Plaza redevelopment project. To help protect future drinking water supply, purchased conservation easement on the 85-acre Fogg property with matching funds from NH DES.	
2007	Protect Land and Scenic Vistas	Held workshop to facilitate local partners working together to prioritize future land conservation initiatives.	Work with partners and Council to identify land conservation opportunities. Priority areas continue to be farms, land overlaying aquifers,

Year	Category	Accomplishments	Goals for Following Year
			large unfragmented blocks of land in the Folletts Brook and Crommet Creek areas, and scenic vistas, as identified in the Master Plan.
2007	Conservation/Land Use Change Tax Fund	Met with the Council to discuss future disposition of Land Use Change Tax, 100% of which currently goes into the Conservation Fund. One time commitment of \$63,205 from the Account for interest accrued on 2007 bonds used for conservation easements because of purchase of 3 easements in 1 year.	Come to consensus with the Council regarding the allocation of Land Use Change Tax.
2007	Manage/Steward Town Owned Lands and Easements	Working on management plan for Town owned lands and conservation easements. Worked with P&R to improve trail on Langmaid Farm. Worked with Committee and local conservation groups to improve and complete the 4-mile trail network connecting Longmarsh Preserve to Lubberland Creek in Newmarket.	Continue to develop and implement management plans for Town owned lands.
2007	Site Plan, Wetlands, Shoreland, Aquifer, Dredge and Fill Applications	Commented on conditional use permit in Wetland Conservation Overlay District, 2 conservation subdivisions, and a request for a zoning change. Reviewed applications submitted to the NH DES for construction in shoreland and wetland areas involving mostly piers, docks, and culverts.	Participate with Planning Board (PB) in site development approval process as needed. Continue to advocate for improvements to College Brook in the Mill Plaza redevelopment effort. Continue to monitor dredge and fill permit applications.
2007	Conservation Expertise/Guidance on Town Regulations	Worked with PB and Town Planner (Planner) to improve procedures in zoning and site plan regulations that will result in a more timely review process.	
2007	Mill Pond Dam and Impoundment Restoration	Continued to seek Reserves' help in dredging Mill Pond. Contacted Congressional Delegation to seek assistance with project.	Continue to work toward the dredging of Mill Pond.
2007	Jackson's Landing	With P&R, secured \$20,000 in matching funds to build universal access educational trail system at the landing. Efforts continue to identify funding for improvements to the parking area to alleviate erosion issues.	Participate in efforts to improve Jackson's Landing.
2008	Protect Water Resources	Recommended that Council protect drinking water sources. Commented on proposed changes to Shoreland Protection Overlay zoning and on modified 401 Water Quality Certificate for Durham's Lamprey River pump station and Wiswall Dam.	Continue to provide input to PB and Council regarding the protection of Durham's drinking water sources through appropriate zoning ordinance measures and through reviews of engineering plans for work at the Wiswall Dam and Mill Pond Dam and development plans before the PB, such as those near the Spruce Hole Aquifer and Oyster River.
2008	Conservation/Land Use Change Tax Fund	Worked with Council on future of Land Use Change Tax and <i>Guidelines for Acquiring Legal Interest in</i>	

Year	Category	Accomplishments	Goals for Following Year
		<i>Conservation/ Open Space Land.</i> Used \$170,000 from Conservation Fund for Durham's portion of Roselawn Farm easement; \$53,545 toward the completion of Jackson Landing restoration; \$25,213 to make up the grant shortfall for the Fogg easement; and \$15,000 toward transaction costs for easement on Florence Smith Farm.	
2008	Manage/Steward Town Owned Lands and Easements and Land Use/Trails Subcommittee	Updated conservation priority areas. Identified resource areas overlying and buffering drinking water aquifers as top priority. Met with Economic Development Committee to discuss where areas overlap with economic development interests. Partnered with Madbury, Strafford Rivers Conservancy, and the USDA Natural Resource Conservation Service (NRCS) to purchase conservation easement on Roselawn Farm. Worked with P&R to build 1/4-mile trail at Jackson Landing and continued work with Committee and Great Bay Resource Protection Partnership to complete 4-mile trail network connecting Longmarsh Preserve to Great Bay in Newmarket. Marked and cleared trails within Preserve.	Hire consultant to develop stewardship plans for Town owned lands and easements. Determine which properties need surveys. Mark boundaries and begin establishing baseline monitoring plans. Continue to pursue avenues of communication with other boards regarding common land use goals.
2008	Site Plan, Wetlands, Shoreland, Aquifer, Dredge and Fill Applications	Participated in review of several projects. Conducted 6 site visits, reviewed and commented on 11 permits involving docks, oyster bed, septic installations, work at Jackson Landing, and Wiswall Bridge replacement.	Continue to actively research and respond to all wetland permit requests.
2008	Conservation Expertise/Guidance on Town Regulations	Continued to work with Planner and PB to improve process by which the Commission is brought into a project based on changes to zoning.	
2008	Mill Pond Dam and Impoundment Restoration	Learned Reserves will not help Town dredge Mill Pond. Report on condition of Mill Pond dam expected in late 2010 to help determine course of action.	
2008	Jackson Landing	Began work on restoration of Landing. Trails created, new parking area built and paved. Landscaping at water's edge proceeding.	
2008	Public Awareness and Education	Held nature walks at Emery Farm, Merrick Property, and Roselawn Farm. Mailed third issue of <i>Scenic Durham</i> to Durham residents.	Enhance website to promote better understanding of conservation work and encourage appropriate use of Town owned conserved lands. Schedule additional guided public visits to conserved Town properties.
2009	Protect Drinking Water Resources	Identified and worked with PB on groundwater and stormwater issues. Visited Colasante property, near proposed future well site at Spruce Woods and	Continue to advocate for protection of drinking water, including Spruce Hole aquifer, Oyster River, and Mill Pond.

Year	Category	Accomplishments	Goals for Following Year
		recommended the property be conserved as a ground water protection measure.	
2009	Manage/Steward Town Owned Lands and Easements and Land Use/Trails Subcommittee	Endorsed joining with Lamprey River Advisory Council to purchase conservation easement on Thompson property off Wednesday Hill Road along Lamprey River. Prepared detailed stewardship plans for Wagon Hill Farm, Longmarsh Preserve, Doe Farm, and Weeks properties. Supported use of Wagon Hill Farm for community gardens.	Continue to endorse conservation of undeveloped land important for resource protection. Continue to manage Town owned land. Address recommendations in stewardship plans for Wagon Hill Farm, Longmarsh Preserve, Doe Farm and Weeks properties.
2009	Site Plan, Wetlands, Shoreland, Aquifer, Dredge and Fill Applications	Reviewed several development proposals that involved wetlands or conservation subdivisions. Reviewed and commented on 7 wetland applications.	Continue to review all wetland applications.
2009	Mill Pond Dam and Impoundment Restoration	Advocated for additional engineering and scientific studies prior to deciding what to do about the Mill Pond Dam and impoundment.	
2009	Spruce Hole Bog	Received bronze plaque from National Parks Service (NPS) recognizing Spruce Hole Bog as a unique geological occurrence.	
2010	Protect Drinking Water Resources	Disbursed Conservation Funds to appraise conservation easement on Thompson property (site of drinking water intake on Lamprey River). Worked extensively with PB to update site plan review regulations with respect to stormwater management and proposed updates to Aquifer Protection Overlay District.	Advocate for protection of drinking water and other natural resources, including Spruce Hole aquifer, Oyster River, and Lamprey River.
2010	Manage/Steward Town Owned Lands and Easements and Land Use/Trails Subcommittee	Worked with Trust for Public Land (TPL) and NH Fish & Game (NH F&G) to acquire 176 +/- acres (known alternately as the Oyster River Forest and Sprucewood Forest) through local fund-raising, Town participation, and the Coastal and Estuarine Land Conservation Program. Project pending. Supported forestry management on Town owned lands, including a timber harvest on Spruce Hole parcels.	Endorse conservation of undeveloped land determined to contain natural resources valuable to community. Address recommendations in stewardship plans for Wagon Hill Farm, Longmarsh Preserve, Doe Farm, and Weeks property. Conduct additional assessments of conservation lands and guide regulations as needed.
2010	Site Plan, Wetlands, Shoreland, Aquifer, Dredge and Fill Applications	Reviewed several development proposals involving wetlands or conservation subdivisions, including advising two applicants at the conceptual review stage. Commented on several wetland applications for NH DES.	Review all wetland applications.
2010	Conservation Expertise/Guidance	Allocated up to \$4,000 each from Conservation Fund to hire consultants to recommend	

Year	Category	Accomplishments	Goals for Following Year
	on Town Regulations	amendment of Aquifer Protection Overlay District and calculation of usable area, §175-55 (F) of the zoning ordinance.	
2010	Jackson Landing	Allocate an additional \$36,056.82 from the Conservation Fund to cover outstanding project expenditures (total expenditure for project to 163,056.82). Entire project was funded through in-kind service from DPW and grants from NRCS and Conservation Fund, for a total cost of \$317,686.	
2010	Spruce Hole Bog	Received bronze plaque from NPS recognizing Spruce Hole Bog as unique geological occurrence.	
2010	Designated River Program	Supported nominations of Oyster River and additional segments of Lamprey River for designation in the Rivers Management and Protection Program.	
2011	Protect Drinking Water Resources	Disbursed Conservation Fund for appraisal of a conservation easement on Thompson property on the Lamprey River (drinking water intake). Worked with PB to update site plan review regulations with respect to stormwater management and aquifer protection.	Continue to advocate for protection of drinking water, including Spruce Hole aquifer, Oyster River, and Lamprey River.
2011	Manage/Steward Town Owned Lands and Easements and Land Use/Trails Subcommittee	Worked with TPL and NH F&G to purchase and conserve 170 acre Oyster River Forest property. Reviewed and approved a forestry management plan on Town owned lands, including a timber harvest on Spruce Hole. Approved request by The Nature Conservancy, working on behalf of the Great Bay Resource Protection Partnership, for Conservation Fund to conserve a 66 acre portion of the Beaudette Farm on Bennett Road, ultimately approved by Council. With Recreation Committee and Agricultural Commission, formed Land Stewardship Committee.	Continue to endorse conservation of undeveloped land determined to contain natural resources of long term value to the community. Continue to address recommendations in stewardship plans for Wagon Hill Farm, Longmarsh Preserve, Doe Farm, and Weeks properties. Conduct additional assessments of Town's permanently protected lands and regulations as needed. Continue to monitor conservation easements. Continue to plan volunteer stewardship opportunities. Continue to coordinate with P&R to promote responsible enjoyment of Town conservation lands that have public access.
2011	Site Plan, Wetlands, Shoreland, Aquifer, Dredge and Fill Applications	Reviewed several development proposals involving wetlands or conservation subdivisions, including advising 2 applicants at the conceptual review stage. Reviewed several wetland applications for the NH DES.	Continue to review all wetland applications.
2011	Conservation Expertise/Guidance	Allocated Conservation Fund to hire consultant to recommend amendment of §175-55 (F) Calculation	

Year	Category	Accomplishments	Goals for Following Year
	on Town Regulations	of Usable Area of the zoning ordinance.	
2011	Jackson Landing Improvements	Allocated Conservation Fund to cover project expenditures, combined with in-kind service from DPW and a NRCS grant.	
2011	Designated River Program	Supported nomination of Oyster River and segments of Lamprey River for designation in Rivers Management and Protection Program, which was approved by state in summer.	
2011	Control Invasive Species	Hosted spring and fall work days on Doe Farm to help control a growing invasive plant problem.	
2011	Update Master Plan	Provided questions for the Master Plan Survey, served on Survey Subcommittee.	
2011	Public Awareness and Education		Continue to plan volunteer stewardship opportunities. Continue to coordinate with P&R to promote responsible enjoyment of Town conservation lands that have public access.
2012	Protect Drinking Water Resources	Worked with PB to update site plan review regulations with respect to stormwater management and aquifer protection.	
2012	Manage/Steward Town Owned Land and Easements	Worked with several partners to conserve 211 acres, bringing together two projects that link and lie within the Oyster River Core Focus Area – Oyster River Forest, in part with a large Wetland Reserve Program grant funds, and Amber Acres, in part with the NRCS Farm & Ranchland Protection Program. Finalized Capstone easement which protects forested areas along the Oyster River at the Cottages development, including monitoring by Strafford River Conservancy. Conducted monitoring visits on existing easements on Fogg, Weeks, and Capstone properties. Formed Land Stewardship Subcommittee to work with P&R and Agricultural Commission to “promote responsible management and use of Town conservation lands that have public access,” including working with NH F&G to promote cottontail rabbit management project on Wagon Hill Farm.	
2012	Site Plan, Wetlands, Shoreland, & Aquifer Permits	Reviewed and commented on six wetland applications to NH DES.	
2012	Conservation Expertise/Guidance on Town Regulations	Began work on proposed zoning ordinance variance amendment. Provided advice and input on various projects and issues such as the NH House bill on the LUCT, Town’s Technical Review Group, Adams Point erosion control project, Madbury	

Year	Category	Accomplishments	Goals for Following Year
		Road/Pettee Brook project.	
2012	Control Invasive Species	Organized invasive plant control workday with Timberland employees to eliminate 2 acres of buckthorn from Doe Farm.	
2012	Update Master Plan	Formed subcommittee to begin work on revising the Environmental Chapter of the Master Plan.	
2012	Public Education/Awareness	Hosted field walk at Wagon Hill Farm. Included periodic articles, called <i>Conservation Corner</i> in the Town's Friday Updates email. Established and revised new <i>Conservation Lands</i> page on Town website.	Continue to provide an internet-accessible inventory of Town conservation lands. Continue to enhance website to better inform the community. Support and coordinate public education and outreach about the importance and value of protection the Town's water resources.

XIV. Warrant Article for 2003 Open Space Bond

In 2003, Durham residents petitioned the Town Council to place a warrant article on the March 2003 Ballot for a \$2.5 million conservation bond, which was ultimately approved by voters.

Since approval of the bond, Durham has expended approximately \$1.62 million dollars to secure conservation easements on the Emery and Langley Farms and the Beaudette and Fogg properties. Approximately \$889,000 remains in the bond fund. Other funds expended between 2004 and 2008 from a water supply land grant and the Town's Conservation Fund, generated by land transfer fees, amount to nearly \$460,000.

Table 5. Durham Protection of Open Space

Bonding		Purchase Price	Balance	Source
2003	Approval of Warrant Article		\$2,500,000	
2006	Emery Farm Conservation Easement	\$425,000	\$2,075,000	
2003	Beaudette Conservation Easement	\$200,000	\$1,875,000	
2006	Langley Farm Conservation Easement	\$300,000	\$1,575,000	
2007	Fogg Conservation Easement	\$695,000	\$880,000	
		\$1,620,000		
Other Funds				
2004	Mill Pond Center Easement	\$70,000		Land Use Conservation Tax
2007	Fogg Conservation Easement	\$194,369		Water Supply Land Grant
2007	Fogg Conservation Easement	\$25,213		Land Use Conservation Tax
2008	Gangwer-Roselawn Farm Easement	\$170,000		Land Use Conservation Tax
2008	Smith Farm Conservation	\$15,000		
2008	Roselawn Property	\$201,149		

Bonding		Purchase Price	Balance	Source
2011	Beaudette Conservation Easements (2)	\$45,000		
2013	Amber Acres	\$250,000		
2103	Spruce Forest	\$375,000		
		\$1,345,731		
Source: Town of Durham, 2013				

XV. Waste and Hazardous Material Sites

Table 6. Regulated Sites for Hazardous Materials

Regulated Sites for Hazardous Materials	
Site	Location
Jackson Estuarine Laboratory – UNH	85 Adams Point Road
Durham Village Garage	8 cover Road
Gibbs Oil Gas Station	7 Old Dover Road
Goss International Americas Inc.	121 Technology Drive
Perpetuity Hall – UNH	11 Leavitt Lane
USDA Forest Service	271 Mast Road and Concord Road
Rite Aid Corp 10295	5 Mill Road
Durham Solid Waste Management Facility	100 Durham Point Road
Great Bay Animal Hospital	31 Newmarket Road
Source: NH Department of Environmental Services, 2010	

Table 7. Groundwater Hazard Inventory

Groundwater Hazard Inventory	
Site	Address
Craig Supply	Depot Rd
UNH-Incinerator Ash Landfill Study	UNH Campus
Jackson Lab – UNH	Adams Point Rd
Jackson Lab – UNH	Adams Point Rd
UNH-Woodman Horti-Farm	Spinney Ln
Charles Baldwin	22 Emerson Rd
Durham WWTF Pump Station (Rt. 108)	Rt. 108
Irving Blue Canoe	2 Dover Rd
Charter Station 2605	7 Dover Rd
UNH-Central Receiving	UNH Facilities Services
UNH-Transportation Center	213 Rt. 155A

Groundwater Hazard Inventory	
Site	Address
New England Telephone	McDaniel Dr
E & B Mobil (Durham Mobil)	2 Main St (Rt. 108)
Durham Public Works Department	15 Newmarket Rd
Ruth Chamberlin	28 Newmarket Rd
Durham Shopping Center	5 Mill Rd
Durham Shopping Center	5 Mill Rd
Great Bay Animal Hospital/Kennel	27 Newmarket Rd
NH DOT	Rt. 4
Gabriel Apartments	4-6 Main St
269-273 Durham Point Rd Bedrock Wells	269-273 Durham Point Rd
Woodman Apartments	9 Woodman Ave
Ruth Edwards	12 Valentine Hill Rd
Sweetser Residence	37 Canney Rd
Otis Sproul	8 Garrish Dr
US Postal Service Building	2 Madbury Rd
Zarrow Residence	12 Sunnyside Dr
Great Bay Cleaners	9 Jenkins Ct
Elsa Brodie Residence	45 Edgewater Rd
UNH Cowell Stadium	Main St
Durham Village Garage	8 Dover Rd
UNH Cowell Stadium	Main St
UNH-Public Swimming Pool	Edgewood Rd
George Rochfort	29 Cedar Point Rd
Durham Public Works Department	15 Newmarket Rd
Durham Public Works Department	15 Newmarket Rd
Cumberland Farms 2830	5 Dover Rd
DJHS Sugar Company	Bennett Rd
Beaver Dam Apartments (TKE BLDG)	33 Madbury Rd
Durham Landfill	Durham Point Rd
Pamela Reynolds Residence	7 Bay View Rd
Rockingham Properties	56-58 Dover Rd
Dover Rd Petroleum Contamination	75 Dover Rd
Town of Newmarket Water Works	Wadleigh Falls Rd
Peter Knight	29 Baghdad Rd
Mary Ellis	286 Mast Rd
UNH Heating Plant	Main St
Richard Cochoran	8 Beard's Landing
NH DOT	Rt. 4

Groundwater Hazard Inventory	
Site	Address
UNH Heating Plant	Main St
UNH-Transportation Center	213 Rt. 155A
Oyster River High School	55 Coe Dr
UNH Water Treatment Facility	End Clovis Rd
Durham Village Garage	8 Dover Rd
Terry Sharbaugh	25 Riverview Rd
Lowry Residence	17 Thompson Ln
Yige Wang Residence	27 Garden Ln
Durham Public Works Department	15 Newmarket Rd
PJ Maguire Property	2 Denbow Rd
Stagecoach Farms	2 Meader Ln
Jerry Kwasnik	12 Tall Pine Rd

XVI. Town Guidelines for Acquiring Conservation / Open Space Lands

Durham's Policy for Acquiring Legal Interest in Conservation/Open Space Land was adopted by the Town Council on May 3, 2004 and revised by the Council on May 19, 2008 as Guidelines for Acquiring Legal Interest in Conservation/Open Space Land.²⁷ The document lays out the acquisition process and criteria whereby the Conservation Commission and the Town Council may evaluate a project. The criteria focuses on protecting natural resources, enhancing public access, maintaining scenic vistas and viewsheds; and large blocks and corridors of unfragmented land. These priorities include:

- Prime farmland soils;
- Areas important to drinking water quality or quantity;
- Key wildlife and plant habitats; and
- Areas threatened by development pressure

XVII. Town Owned Properties

The Conservation Commission prepared several inventories of town owned land, most recently updated in November 2008, as follows:

- Town Owned Land with Conservation Commission Oversight
- Town Held Easements with Conservation Commission Oversight

²⁷ http://www.ci.durham.nh.us/sites/default/files/fileattachments/boc_conservation/conservation_land_acquisition_guidelines_-_revision_adopted_by_town_council_051908.pdf

- Town Owned Land with Parks and Recreation Oversight
- Other Town Owned Land – Department of Public Works Oversight or Other

Table 8. Properties described in the inventories.

Back River Road Easement	Milne Lot
Beard’s Creek Scenic Easement	Newmarket Road Lot
Davis Avenue Easement*	Orchard Drive Scenic Easement (1 & 2)*
Doe Farm	Oyster River Access Easement*
Durham Point Road Conservation Land and Scenic Easement (Linn Pond Easement)*	Packers Falls*
East Foss Arm Area, including Mill Road corner, Foss Farm/RR, and Mill Road lot	Simon’s Lane Lots (1 and 2)
Ellingwood Lot*	Spruce Hole Conservation Area, including Lots 1 and 2*
Father Lawless Park (Woodridge Park)	Stolworthy Sanctuary*
Ffrost Drive (Lot 1 and 2)	Sullivan Lot
Fogg Easement*	Thatch Bed
Jackson Landing (Lot 1 and 2)	Wagon Hill Farm
Littlehale Road Lot	Weeks Lot
Longmarsh Preserve, including Langmaid Farm, Colby Marsh, and Horsehide Creek*	Wiley Lot
Merrick Easement*	Williams Way Boat Landing
Mill Pond Road Park	Woodridge Lot
	Wiswall Dam (John Hatch Memorial Park)

*Properties with Conservation Commission oversight

Table 9. Properties Permanently Preserved Since 2000

Property Name
Amber Acres
Beaudette Farm (Bennett Road)
Capstone Easement
Doe Farm
Emery Farm (Route 4) (*viewshed in 2000 MP)
Florence Smith Farm
Fogg Farm (Mill and Packer’s Falls) (*viewshed in 2000 MP)
Longmarsh Preserve/Langley Farm (Durham Point Road) (*viewshed in 2000 MP)
Merrick Property (Rts. 4 and 108 intersection)
Mill Pond Center Fields (Route 108)(*viewshed in 2000 MP)
Oyster River Forest
Roselawn Farm (Perkins Road)
Smith Farm Conservation Project

Property Name
Spruce Forests
Thompson Property
Weeks Property
Amber Acres

Table 10. Partners in Conservation efforts since 2000

Coastal and Estuarine Land Conservation Program	Strafford Rivers Conservancy
Great Bay Resource Protection Partnership	The Nature Conservancy
Lamprey River Advisory Council	Trust for Public Lands
Madbury	USDA Natural Resources Conservation Service
New Hampshire Department of Environmental Services	Wetland Reserve Program
New Hampshire Department of Fish and Game	

XVIII. Land Stewardship Committee

In 2010, a new committee made up of Conservation Commissioners and other interested members of the public and Town staff was formed to help work on stewardship of Town lands. In 2012, the Committee expanded to include members of the Durham Agricultural Commission and the Durham Parks and Recreation Committee. The Committee worked on several initiatives in 2012:

- Developed an online inventory of Town lands (project in process; for related documents, see Town Lands Records)
- Improved public outreach and education on Town lands
- Focused stewardship projects on Wagon Hill Farm, including expansion of parking, community gardening, and agriculture and exploration of habitat management for New England cottontail rabbits.

Durham residents interested in joining the Land Stewardship Committee should [email the Chair of the Conservation Commission](#).

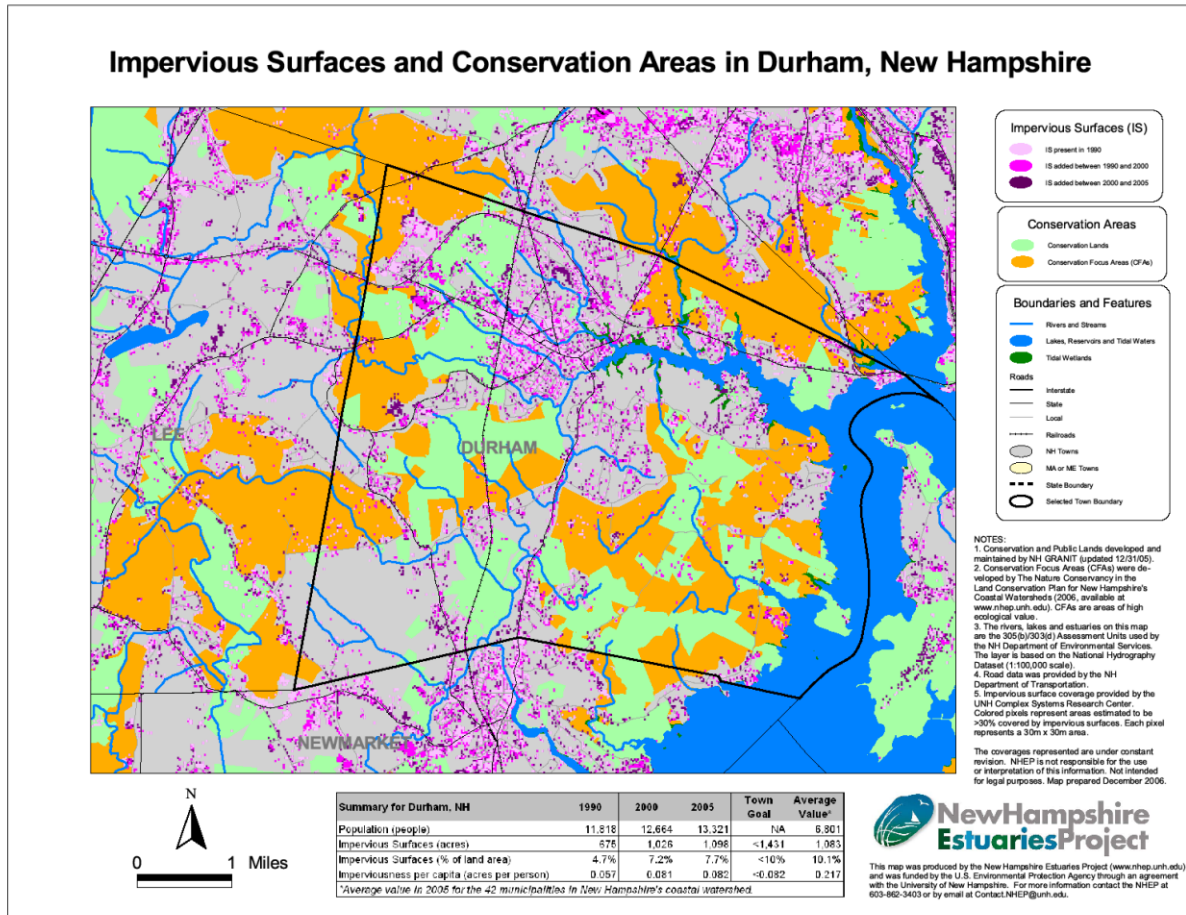
XIX. Increased Housing Density and Other Pressures

Except in the Town core and along portions of Route 4, Durham’s land use map (see Figure M-16) suggests that the community remains predominantly vegetated in various forests and managed agricultural cover.

The Impervious Surfaces Map (Figure 2) suggests that most of Durham’s impervious surfaces were developed prior to 1990 with significant impervious areas added between 1990 and 2000 and relatively few new areas added between

2000 and 2005. The map has not been updated to reflect large areas of new development in the western area of the community since 2005.

Figure 2. Impervious Surfaces and Conservation Areas



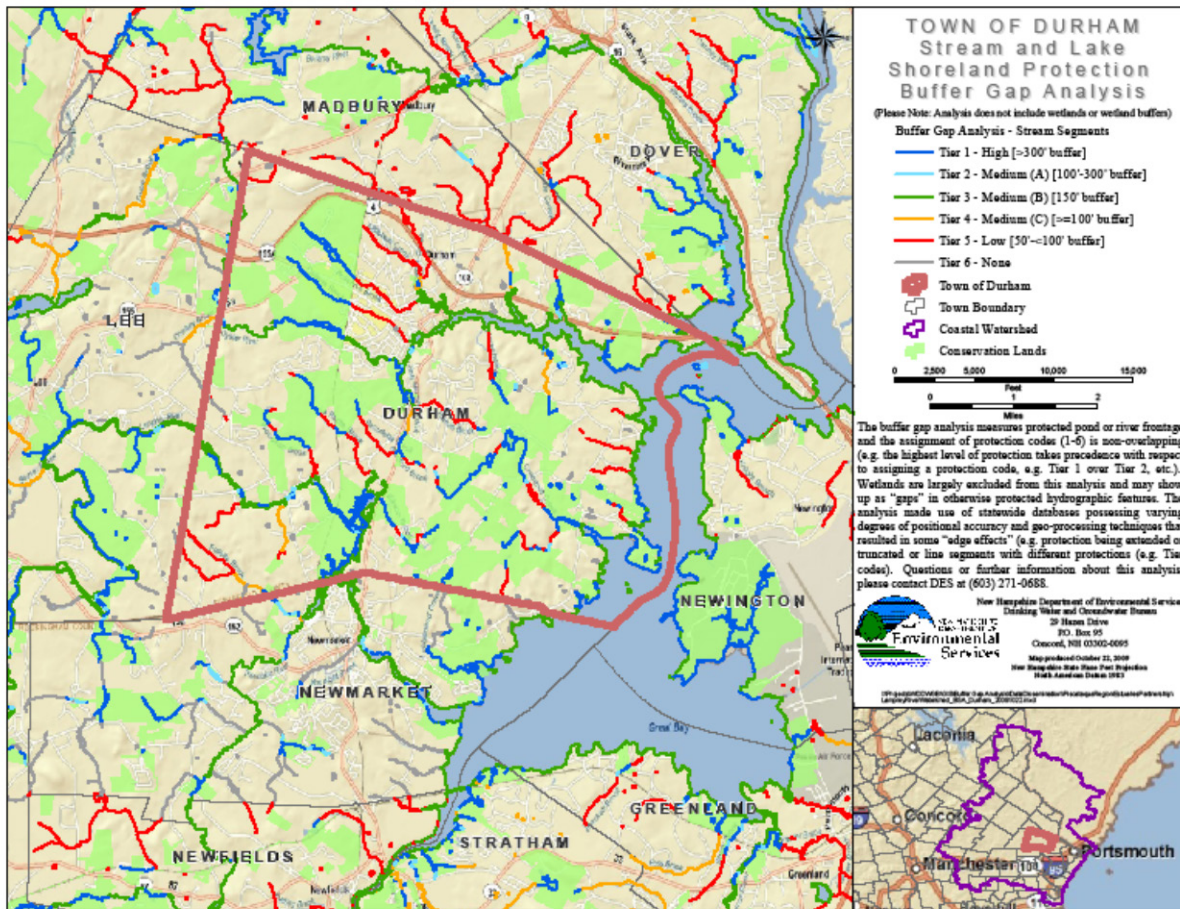
The Complex Systems Research Center at the University of New Hampshire conducted a characterization of second order and higher streams in the Piscataqua/Coastal Basin.²⁸ Existing land use, impervious surface coverage, and transportation infrastructure, and standard buffers around each stream segment were analyzed to produce an indicator representing the status of each stream. The stream segments were categorized as follows:

- Intact <10% impacted
- Mostly Intact 10-25% impacted
- Somewhat Modified 25-50% impacted
- Altered >50% impacted

28 Complex Systems Research Center, Institute for the Study of Earth, Oceans and Space, University of New Hampshire, Durham. June, 2006.

The buffer characterizations are depicted on the map and summarized by town in tables. The map also displays the 300' buffers based on the degree of imperviousness in 2005, and the townwide conservation lands data. Impervious surface coverage by town for 1990, 2000, and 2005, as well as conservation lands acreage by town, are also reported.

Figure 4. Stream and Lake Shoreland Protection Buffer Gap Analysis



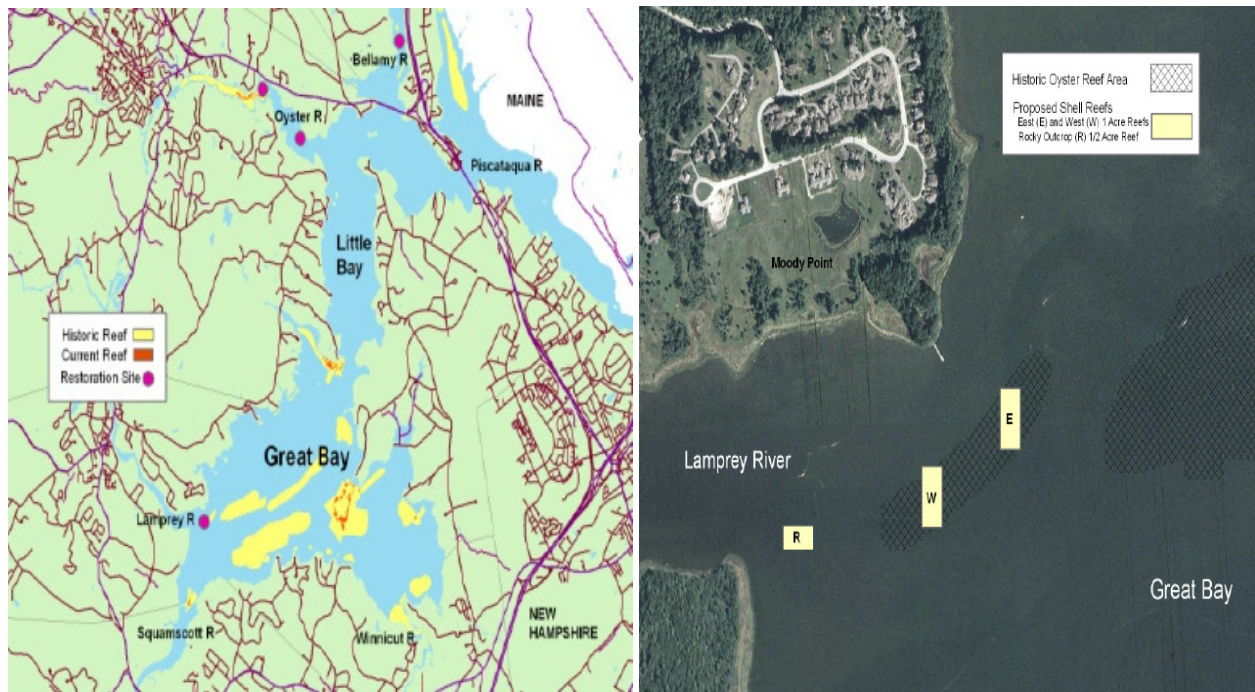
XX. Oyster Restoration Program

For the past seven years, The Nature Conservancy, the University of New Hampshire, and a number of groups have developed and supported an oyster restoration program in Great Bay.²⁹ Today, there are 39 families in the Oyster Conservationist Program.

29 Groups involved with the effort include PREP, NOAA Restoration Center, Natural Resources Conservation Service, State Moose Plates Conservation Program, The Davis Foundation, Coastal Conservation Association, NH Fish and Game, UNH Road and Events Crew, UNH Kingman Farm, The Nature Conservancy members, and the many local volunteers in the Oyster Conservationist and UNH Docents programs.

<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newhampshire/oyster-restoration/index.htm>

Figure 5. Historic and current oyster reefs



On its website, The Nature Conservancy notes that “The eastern oyster (*Crassostrea virginica*) has historically played a vital role in the ecology of Great Bay Estuary. As many as 1,000 acres of live oyster reef may have covered the estuary in 1970, but now over 90% of oysters are lost due to pollution, harvest, and disease. Without oysters, Great Bay Estuary is lacking the natural filtration capacity to maintain healthy eelgrass beds as nitrogen and siltation increase.”

The Program builds reefs to clean the water and provide fish habitat for spawning oysters. Volunteer oyster conservationists raise oyster spat in cages off their docks to contribute to the reconstructed historic reef sites.

This year the Program built a reef in the mouth of the Lamprey River. Two 1-acre areas (East and West) had surf clam and ocean quahog shells placed on the channel bottom at the end of June to create a base for live spat. One ½ acre area (Rocks) has shell scattered on a shallow bottom.

Sources:

New Hampshire, Great Bay Oyster Restoration Program, The Nature Conservancy,

<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newhampshire/oyster-restoration/index.htm>

Lamprey River Oyster Restoration

<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newhampshire/50thanniversary/great-bay-oyster-restoration-flyer-2011.pdf>

XXI. The Land Conservation Plan for New Hampshire's Coastal Watersheds

Table 11. Core and Supporting Landscapes identified in the Land Conservation Plan for NH's Coastal Watersheds

Crommet and Lubberland Creeks		
Location: <i>Town(s)</i>	Durham, Newmarket	
Watershed (HUC 10)	Great Bay Drainage and Lamprey River	
	CORE AREA	SUPPORTING NATURAL LANDSCAPE
Size	3,800 acres	N/A
Significant Ecological Resources		
Forest Ecosystem		
Unfragmented forest block	580 acres, 650 acres, and a 1,390 acre block identified as a Tier 2 priority in the 2005 Wildlife Action Plan	
Aggregated forest blocks	within a 6,500 acre block	
Freshwater Systems		
High quality stream watersheds	includes 500.7 acres of Tier 2, 217.1 acres of Tier 2, and 402.9 acres of Tier 3	
Important stream reaches	none	
Presence/absence of dams (within high quality watersheds)	none	
River & stream miles	includes 9.2 miles of 1st order, 0.2 miles of 2nd order, and 0.6 miles of 6th order	
Coastal & Estuarine Resources		
Coastal and estuarine shoreline	7.1 miles of estuarine shoreline along Great Bay	
Tidal rivers & streams	includes portions of Crommet and Lubberland Creeks and Horsehide Brook as well as numerous unnamed streams	
Coastal forest blocks	2 blocks >500 acres and 1 block > 1000 acres	
Tidal wetlands	55.3 acres of saltmarsh	
Important Plant & Wildlife Habitat		
Plants of conservation concern	<i>Acer nigrum</i> (Black Maple, threatened, G5, S2)	

Crommet and Lubberland Creeks		
	Carex cristatella (Small-crested Sedge, threatened, G5, S2)	
	Sparganium eurycarpum (Large Bur-reed, threatened, G5, S2)	
Animals of conservation concern	Ardea herodias (Great Blue Heron (Rookery), G5, S4)	
	Clemmys guttata (Spotted Turtle, G5, S3)	
	Emydoidea blandingii (Blanding's Turtle, G4, S3)	
	Erynnis lucilius (Columbine Duskywing, G4, S1)	
	Glyptemys insculpta (Wood Turtle, G4, S3)	
	Heterodon platirhinus (Eastern Hognose Snake, threatened, G5, S3)	
	Ixobrychus exilis (Least Bittern, G5, S1)	
	Pandion haliaetus (Osprey, threatened, G5, S2)	
	Vermivora chrysoptera (Golden-winged Warbler, G4, S2)	
	Williamsonia lintneri (Ringed Bog Haunter, endangered, G3, S1)	
Significant wildlife habitats	coastal island, floodplain forest, grassland, marsh, peatland	
Exemplary natural communities and systems	rich Appalachian oak rocky woods (S1)	
Other Resource Features & Public Values		
Water Supply		
High yield aquifer (maximum transmissivity >1,000 ft ² / day)	none	
Surface water intakes	none	
Wells	none	
Wellhead protection areas	Stagecoach Farms (553.9 acres)	
	Wade Farm Condos (5.7 acres)	
Favorable gravel well sites	none	
Agricultural Lands		
Prime or statewide importance farm soils	231.1 acres of prime farmland and 49.4 acres of farmland of statewide	

Crommet and Lubberland Creeks		
	importance	
Landscape Connectivity	moderate connectivity value between conservation lands, and forest blocks	
Other Documented		
Current Conservation Status		
Permanently Protected, Managed as natural area or ecological reserve (GAP 1 & 2)	906 acres	
Permanently Protected, Managed primarily as working forest (GAP 3)	911 acres	
Not permanently protected, but in public or institutional ownership (GAP 3a)	117 acres	
Managed primarily (more than 50% by area) for extractive uses (GAP 4)	-	
Total conserved	1,934 acres	
Relationship to other Plans		
Area identified in other planning initiatives	mentioned in Durham master plan for rural service area greenway priority	
	long-time focus area of the Great Bay Resource Protection Partnership, identified through A Conservation Plan for the Great Bay Region and Habitat Protection Plan	
Johnson and Bunker Creeks		
Location: <i>Town(s)</i>	Durham, Newmarket	
Watershed (HUC 10)	Great Bay Drainage	
	CORE AREA	SUPPORTING NATURAL LANDSCAPE
Size	750 acres	1,010 acres
Significant Ecological Resources		
Forest Ecosystem		
Unfragmented forest block	a portion (~70%) of a 1,130 acre block identified as a Tier 2 priority in the 2005 Wildlife Action Plan	5.20 acres and 1,130 acres (Tier 2)
Aggregated forest blocks	none	
Freshwater Systems		

Crommet and Lubberland Creeks		
High quality stream watersheds	none	none
Important stream reaches	none	none
Presence/absence of dams (within high quality watersheds)	none	none
River & stream miles	0.6 miles of 1st order, 1 mile of 2nd order, 0.9 miles of 3rd order	3.0 miles of 1st order, 0.6 miles of 2nd order
Coastal & Estuarine Resources		
Coastal and estuarine shoreline	none	none
Tidal rivers & streams	includes portions of Gerrish Brook, Johnson Creek, Bunker Creek, and Black River	portions of several unnamed streams
Coastal forest blocks	1 block >1000 acres (overlaps Supporting Natural Landscape)	1 block >500 acres, 1 block >1000 acres (overlaps Core Area)
Tidal wetlands	23.7 acres of saltmarsh	none
Important Plant & Wildlife Habitat		
Plants of conservation concern	none known	none known
Animals of conservation concern	none known	none known
Significant wildlife habitats	grassland, marsh, peatland	floodplain forest, grassland, marsh, peatland
Exemplary natural communities and systems	rich Appalachian oak rocky woods (S1)	none known
Other Resource Features & Public Values		
Water Supply		
High yield aquifer (maximum transmissivity >1,000 ft ² / day)	5.6 acres	66.7 acres
Surface water intakes	none	none
Wells	Johnson Creek (2 community wells)	Cottage By The Bay (1 non-community well)
Wellhead protection areas	Johnson Creek (127.8 acres)	City of Dover Water Dept (113.7 acres)
	Kids N More Daycare (1.7 acres)	Kids N More Daycare (24.7 acres)
	Portsmouth Water Works (11 acres)	Miss Pattys Daycare (80.1 acres)
Favorable gravel well sites	none	62.1 acres
Agricultural Lands		
Prime or statewide importance farm soils	246.5 acres of prime farmland and 59.1 acres of farmland of statewide importance	210.4 acres of prime farmland and 64.2 acres of farmland of statewide importance

Crommet and Lubberland Creeks		
Landscape Connectivity	low connectivity value between conservation lands, and forest blocks	low connectivity value between conservation lands, and forest blocks
Other Documented	none	
Current Conservation Status		
Permanently Protected, Managed as natural area or ecological reserve (GAP 1 & 2)		5 acres
Permanently Protected, Managed primarily as working forest (GAP 3)	162 acres	<1 acre
Not permanently protected, but in public or institutional ownership (GAP 3a)	-	22 acres
Managed primarily (more than 50% by area) for extractive uses (GAP 4)	-	-
Total conserved	162 acres	27 acres
Relationship to other Plans		
Area identified in other planning initiatives	specifically mentioned for scenic and conservation priority in Durham master plan	specifically mentioned for scenic and conservation priority in Durham master plan
	profiles strongly with SRC conservation criteria	
	long-time focus area of the Great Bay Resource Protection Partnership, identified through A Conservation Plan for the Great Bay Region and Habitat Protection Plan	
LaRoche and Woodman Brooks		
Location: <i>Town(s)</i>	Durham	
Watershed (HUC 10)	Great Bay Drainage, Lamprey River	
	CORE AREA	SUPPORTING NATURAL LANDSCAPE
Size	440 acres	660 acres
Significant Ecological Resources		
Forest Ecosystem		
Unfragmented forest block	none	
Aggregated forest blocks	within a 12,700 acre block	
Freshwater Systems		
High quality stream watersheds	none	none
Important stream reaches	none	none
Presence/absence of dams (within	N/A	N/A

Crommet and Lubberland Creeks		
high quality watersheds)		
River & stream miles	includes 2.1 miles of 1 st order	includes 1.1 miles of 1 st order
Coastal & Estuarine Resources		
Coastal and estuarine shoreline	not a coastal/estuarine area	not a coastal/estuarine area
Tidal rivers & streams		
Coastal forest blocks		
Tidal wetlands		
Important Plant & Wildlife Habitat		
Plants of conservation concern	none known	none known
Animals of conservation concern	Cistothorus platensis (Sedge Wren, endangered, G5, S1)	Clemmys guttata (Spotted Turtle, G5, S3)
	Clemmys guttata (Spotted Turtle, G5, S3)	Lampetra appendix (American Brook Lamprey, G4, S2)
Significant wildlife habitats	floodplain forest, grassland, marsh, peatland	floodplain forest, grassland, marsh, peatland
Exemplary natural communities and systems	red maple – lake sedge swamp (S3)	none known
Other Resource Features & Public Values		
Water Supply		
High yield aquifer (maximum transmissivity >1,000 ft ² / day)	none	none
Surface water intakes	none	none
Wells	none	none
Wellhead protection areas	The Inn At Spruce Wood (148.7 acres)	The Inn At Spruce Wood (25.4 acres)
Favorable gravel well sites	none	none
Agricultural Lands		
Prime or statewide importance farm soils	39.8 acres of prime farmland and 4.4 acres of farmland of statewide importance	78.6 acres of prime farmland and 24.4 acres of farmland of statewide importance
Landscape Connectivity	moderate connectivity value between conservation lands, and forest blocks	moderate connectivity value between conservation lands, and forest blocks
Other Documented		
Current Conservation Status		
Permanently Protected, Managed as natural area or ecological reserve (GAP 1 & 2)		80 acres

Crommet and Lubberland Creeks		
Permanently Protected, Managed primarily as working forest (GAP 3)	59 acres	73 acre
Not permanently protected, but in public or institutional ownership (GAP 3a)	234 acres	270 acres
Managed primarily (more than 50% by area) for extractive uses (GAP 4)	-	-
Total conserved	292 acres	422 acres
Relationship to other Plans		
Area identified in other planning initiatives	no specific mention of LaRoche or Woodman Brooks in Town of Durham master plan, but LaRoche Farm is cited as a conservation priority, and smaller streams as greenways elements	no specific mention of LaRoche or Woodman Brooks in Town of Durham master plan, but LaRoche Farm is cited as a conservation priority, and smaller streams as greenways elements
	long-time focus area of the Great Bay Resource Protection Partnership, identified through A Conservation Plan for the Great Bay Region	long-time focus area of the Great Bay Resource Protection Partnership, identified through A Conservation Plan for the Great Bay Region
Lower Lamprey		
Location: <i>Town(s)</i>	Durham, Lee	
Watershed (HUC 10)	Lamprey River	
	CORE AREA	SUPPORTING NATURAL LANDSCAPE
Size	1,230 acres	1,640 acres
Significant Ecological Resources		
Forest Ecosystem		
Unfragmented forest block	a portion (~80%) of a 790 block, and a portion (~30%) of a 870 block	790 acres and 870 acres
Aggregated forest blocks	within a 12,700 acre block	
Freshwater Systems		
High quality stream watersheds	none	none
Important stream reaches	includes over 7 miles of good diversity of fish in the Lamprey River including the American Eel, Bridle shiners, Banded Sunfish, Redfin Pickerel, and Swamp Darter; also	none

Crommet and Lubberland Creeks		
	includes stream reaches where brook floater occur	
Presence/absence of dams (within high quality watersheds)	N/A	N/A
River & stream miles	includes 0.9 miles of 1st order, 0.1 miles of 2nd order, 0.1 miles of 3rd order, 0.4 miles of 4th order, and 7.3 miles of 6th order	includes 1.1 miles of 1st order, 0.6 miles of second order, and 0.3 miles of 4th order
Coastal & Estuarine Resources		
Coastal and estuarine shoreline	not a coastal/estuarine area	not a coastal/estuarine area
Tidal rivers & streams		
Coastal forest blocks		
Tidal wetlands		
Important Plant & Wildlife Habitat		
Plants of conservation concern	none known	none known
Animals of conservation concern	Emydoidea blandingii (Blanding's Turtle, G4, S3)	Chaetoglaea cerata (A Noctuid Moth, G3, S1)
	Glyptemys insculpta (Wood Turtle, G4, S3)	Clemmys guttata (Spotted Turtle, G5, S3)
	Notropis bifrenatus (Bridled Shiner, G3, S3)	Emydoidea blandingii (Blanding's Turtle, G4, S3)
		Glyptemys insculpta (Wood Turtle, G4, S3)
		Psectraglaea carnososa (Pink Sallow, G3, SH)
Significant wildlife habitats	floodplain forest, grassland, marsh, peatland	floodplain forest, grassland, marsh, peatland
Exemplary natural communities and systems	none known	none known
Other Resource Features & Public Values		
Water Supply		
High yield aquifer (maximum transmissivity >1,000 ft ² / day)	none	17.5 acres
Surface water intakes	University of New Hampshire - Lamprey River	none
Wells	UNH /Durham Water System (1 community well)	Ferndale Acres Campground (1 non-community well)
	Wellington Camping Park (1 non-	

Crommet and Lubberland Creeks		
	community well)	
Wellhead protection areas	Newmarket Water Works (48.7 acres)	Newmarket Water Works (165.9 acres)
Favorable gravel well sites	none	9.2 acres
Agricultural Lands		
Prime or statewide importance farm soils	243.4 acres of prime farmland and 28.2 acres of farmland of statewide importance	253 acres of prime farmland and 49.1 acres of farmland of statewide importance
Landscape Connectivity	low connectivity value between conservation lands, and forest blocks	low connectivity value between conservation lands, and forest blocks
	high potential connectivity along watercourse	high potential connectivity along watercourse
Other Documented		
Current Conservation Status		
Permanently Protected, Managed as natural area or ecological reserve (GAP 1 & 2)	-	-
Permanently Protected, Managed primarily as working forest (GAP 3)	304 acres	445 acre
Not permanently protected, but in public or institutional ownership (GAP 3a)	69 acres	48 acres
Managed primarily (more than 50% by area) for extractive uses (GAP 4)	103 acres	90 acres
Total conserved	475 acres	583 acres
Relationship to other Plans		
Area identified in other planning initiatives	focus area of the Lamprey River Watershed Association and subject of multiple conservation priorities of the Lamprey River Advisory Committee	
Oyster River		
Location: <i>Town(s)</i>	Durham, Lee, Madbury	
Watershed (HUC 10)	Great Bay Drainage, Lamprey River	
	CORE AREA	SUPPORTING NATURAL LANDSCAPE
Size	2,690 acres	540 acres
Significant Ecological Resources		

Crommet and Lubberland Creeks		
Forest Ecosystem		
Unfragmented forest block	a portion (~80%) of a 1,260 acre block identified as a Tier 2 priority in the 2005 Wildlife Action Plan	1,260 acres (Tier 2)
Aggregated forest blocks	located within a 7,400 acre block	
Freshwater Systems		
High quality stream watersheds	none	none
Important stream reaches	Oyster River; Important American Brook Lamprey rearing habitat	none
Presence/absence of dams (within high quality watersheds)	N/A	N/A
River & stream miles	2.7 miles of 1st order, 0.9 miles of 2nd order, 1.8 miles of 3rd order, 5.3 miles of 4th order	1 mile of 1st order
Coastal & Estuarine Resources		
Coastal and estuarine shoreline	not a coastal/estuarine area	not a coastal/estuarine area
Tidal rivers & streams		
Coastal forest blocks		
Tidal wetlands		
Important Plant & Wildlife Habitat		
Plants of conservation concern	<i>Platanthera flava</i> var. <i>herbiola</i> (Pale Green Orchid, threatened, T4, S2)	none known
Animals of conservation concern	<i>Bartramia longicauda</i> (Upland Sandpiper, endangered, G5, S1)	<i>Emydoidea blandingii</i> (Blanding's Turtle, G4, S3)
	<i>Callophrys lanoraieensis</i> (Bog Elfin, G3, SH)	<i>Pooecetes gramineus</i> (Vesper Sparrow, G5, S2B)
	<i>Clemmys guttata</i> (Spotted Turtle, G5, S3)	
	<i>Enneacanthus obesus</i> (Banded Sunfish, G5, S3)	
	<i>Etheostoma fusiforme</i> (Swamp Darter, G5, S3)	
	<i>Glyptemys insculpta</i> (Wood Turtle, G4, S3)	
	<i>Lampetra appendix</i> (American Brook Lamprey, G4, S2)	
	<i>Notropis bifrenatus</i> (Bridled Shiner, G3, S3)	
	<i>Pooecetes gramineus</i> (Vesper	

Crommet and Lubberland Creeks		
	Sparrow, G5, S2-S3)	
	Williamsonia lintneri (Ringed Bog Haunter, endangered, G3, S1)	
Significant wildlife habitats	floodplain forest, grassland, marsh, peatland	grassland, marsh, peatland
Exemplary natural communities and systems	kettle hole bog system (S2)	none known
Other Resource Features & Public Values		
Water Supply		
High yield aquifer (maximum transmissivity >1,000 ft ² / day)	78.7 acres	7.1 acres
Surface water intakes	University of New Hampshire - Oyster River	none
Wells	The Inn At Spruce Wood (2 community wells)	Moharimet School (2 non-community wells)
	UNH /Durham Water System (1 community well)	
Wellhead protection areas	Oyster River Condos (53.2 acres)	Ambleside Mobile Home Park (34.8 acres)
	The Inn At Spruce Wood (362.4 acres)	Moharimet School (76.8 acres)
Favorable gravel well sites	32.6 acres	0.9 acres
Agricultural Lands		
Prime or statewide importance farm soils	560 acres of prime farmland and 58 acres of farmland of statewide importance	87.8 acres of prime farmland and 9.3 acres of farmland of statewide importance
Landscape Connectivity	moderate connectivity value between conservation lands, and forest blocks	moderate connectivity value between conservation lands, and forest blocks
	high potential connectivity along watercourse	high potential connectivity along watercourse
Other Documented		
Current Conservation Status		
Permanently Protected, Managed as natural area or ecological reserve (GAP 1 & 2)	189 acres	73 acres
Permanently Protected, Managed primarily as working forest (GAP 3)	344 acres	19 acre
Not permanently protected, but in public	159 acres	-

Crommet and Lubberland Creeks		
or institutional ownership (GAP 3a)		
Managed primarily (more than 50% by area) for extractive uses (GAP 4)	79 acres	20 acres
Total conserved	771 acres	112 acres
Relationship to other Plans		
Area identified in other planning initiatives	listed as conservation and scenic priority area in Madbury and Durham master plans	listed as conservation and scenic priority area in Madbury and Durham master plans
	focus area of the Oyster River Watershed Association.	
	long-time focus area of the Great Bay Resource Protection Partnership and multiple TNC projects	

XXII. Mill Pond Dam

The Mill Pond Dam is an approximately 100 years old concrete structure, which was innovative in its day, but was designed to minimize the amount of concrete used in its construction. The last time the dam was repaired was in the 1970's. The 2010 Stephens Associates report which evaluated the Dam projected it would cost \$1.4 million to repair and maintain the dam for the next 30 years and concluded after 30 years, we anticipate the Town would need to perform further repairs of similar or greater magnitude, demolish and reconstruct the Dam, or decommission it."³⁰

The Town Council recently reviewed the situation with the Mill Pond and decided to continue to study the situation over the coming years. See the following Town Council Resolution.

RESOLUTION #2013- 19 OF DURHAM, NEW HAMPSHIRE EXPRESSING THE TOWN COUNCIL'S SUPPORT FOR RETAINING THE MILL POND DAM FOR THE DURATION OF IT'S USEFUL LIFE.

This resolution documents the historical and cultural significance of the Mill Pond Dam, the many benefits it offers to the Durham community, notes that the dam is structurally in good condition, and supports the continuation of the Mill Pond Dam.

Whereas, the current site of the Mill Pond Dam has had an existing dam on it since the 1640s; and

³⁰ 2010. Stephens Associates. Concrete Evaluation Report Oyster River Dam.

Whereas, the current dam was a generous gift of Edith Angela Congreve Onderdonk to the Town of Durham in honor of her step-father, Hamilton Smith, a respected Durham resident, owner of the “Red Tower” estate, who, along with the Andrew Carnegie Corporation, donated funds to build the University of New Hampshire’s first library building, Hamilton Smith Hall; and

Whereas, the present dam at the Mill Pond is a patented Ambursen design which in 1913 incorporated state-of-the-art design (buttress) and new materials (Portland cement and rebar) and is the oldest of only five Ambursen-style dams and the only one that is still intact in New Hampshire; and

Whereas, the dam has a strong connection with UNH as Charles Elbert Hewitt, the Chair of the first Electrical Engineering Department, was the engineer for the dam; and

Whereas, Daniel Chesley, a resident and local quarryman who became adept in the use of reinforced concrete, built the Mill Pond Dam; and

Whereas, the Mill Pond Dam supports the Mill Pond which is a town landmark along our Historic District Gateway, marking the entrance to our Town; and

Whereas, the Mill Pond, created by the Mill Pond Dam, is home to the Durham swans, much beloved by residents, as well as geese, herons, cormorants, several varieties of ducks, turtles, muskrat, beaver, otters and other wildlife, and offers a quiet place to enjoy nature; and

Whereas, many interests of the community will be served by preserving the Mill Pond Dam and all the amenities associated with the dam, including recreation, scenic vistas and the potential for a microturbine; and

Whereas, extensive research and testing in 2011 by Dr. David Gress, University of New Hampshire Professor Emeritus, Civil Engineering, asserts that the current spillway is expected to last another 10 to 20 years with little or no maintenance; and

Whereas, the only repairs cited by Professor Gress are the gates, which will need complete replacement in 5 to 10 years, and the right embankment, which will need repair in 5 to 10 years; and

Whereas, 2013 is the 100th anniversary of the construction of the Mill Pond Dam; and

Whereas, there will be a community celebration on September 15, 2013 honoring this important anniversary;

Now, Therefore Be It Resolved That the Durham Town Council, the governing body of the Town of Durham, New Hampshire does adopt Resolution 2013 – 19 and hereby concurs that the Mill Pond Dam adds immeasurably to the rich fabric of the community and that the Town shall take steps needed to preserve it for the duration of its useful life.

Sources:

2010. Dr. David Gress. Evaluation of the Concrete of the Oyster River Durham Falls Dam.

2010. Stephens Associates. Concrete Evaluation Report Oyster River Dam.

2010. Vanasse Hangen Bruslin. Mill Pond Bathymetric Survey and Sediment Sampling Study.

XXIII. Durham Hazard Mitigation Plan 2012 Update

In 2012, the Strafford Regional Planning Commission prepared an update of Durham's Hazard Mitigation Plan for New Hampshire Homeland Security & Emergency Management. The Plan was prepared prior to the most recent study of the impacts on climate change in the northeast, including Durham specific data relative to sea level rise.³¹ As a result, the many recommendations for upgrades and other investments in drainage structures as well as road, bridge, and dam repair should be reexamined with an eye toward taking predicted increases in surface water elevations and the role the improvements will play in addressing and creating flooding issues as along with the increased number of severe storm events, increases in road elevation, undersized culverts, and other drainage structures could aggravate flooding of roadways and private properties.

The Plan examines existing and anticipated flooding, as well as other potential hazards facing the community and makes recommendations for how the Town and its residents, businesses, and other organizations might anticipate and avoid future problems and better prepare to face those that are unavoidable. Recommendations include education efforts as well as construction projects. Relatively few recommendations are offered for Durham's regulations, except to stay the course the Town has pursued in protecting flood plains, wetlands, and shorelands.

According to Durham's 2012 *Multi-Hazard Mitigation Plan*, Durham has "significant flooding potential along the Lamprey River and its tributaries in the southeast of town and along the Oyster River and its tributaries in the northwest of Town above the Mill Pond Dam."³² The Town experiences chronic road flooding along Rt. 108 where the road bisects the wetlands and reduces the amount of water that flows naturally to the Oyster River. Recent observations of major flooding events, like the 2006 Mother's Day Flood, note that flood waters overtopped Rt. 108 by nearly 3 feet and exceeded the capacity of bridges and culverts at Longmarsh Road and Hamel Brook.³³ The Town should investigate impediments to flow to reduce flooding and assess how to preserve the wetland's ability to act as a relief value during flood events.

There is also a significant amount of coastal floodplain along the Great Bay/Oyster River Estuary shoreline. While the overall potential for flooding is high in the community because of the significant amount of floodplains, according to the *Multi-Hazard Mitigation Plan*, the Town has seen relatively little development in its floodplains, except in coastal floodplains where private residences have been built in shoreline areas. These homes could be susceptible to coastal

31 Complex Systems Research Center, A Preliminary Assessment of Tidal Flooding along the New Hampshire Coast: Past, Present and Future. 2012.

32 Strafford Regional Planning Commission. Durham Multi-Hazard Mitigation Plan 2012 Update. New Hampshire Homeland Security & Emergency Management. 2012.

33 Personal communication from Coleen Furest, member of the Durham Conservation Commission, October 2013.

flooding and storm surges from hurricanes. The Plan also indicates that the potential for flooding from dam breach or failure in Durham, while it exists, is quite small, though it acknowledges that there is limited information on most of the dams.

The Plan identifies eight different areas of likely future development and suggests that their potential for exposure to hazards is relatively low. Though the Spruce Woods development lies in the middle of an ice storm damage area that could have elevated wildfire risk, the risks appears to be minimal given how the complex is being developed and landscaped. New development in the Spruce Woods and Technology Drive areas are avoiding floodplains. Because the Durham Business Park off Route 4 along the Oyster River includes a significant amount of coastal floodplain and storm surge zones, the Town should consider these hazard risks in the site design process.

According to the Plan “Durham has been a member of the National Flood Insurance Program (NFIP) since October 1, 1975...as reported in FEMA’s Biennial Flood Report (last submitted on 05/28/2009), Durham is listed as only having 70 structures in the floodplain and has had no repetitive loss claims... The Town continues to evaluate their flood hazard overlay district and will look to improve floodplain management in the community. Durham also was home to a pilot project that assessed the Oyster River watershed to identify road culverts that are subject to failure during extreme storm events.”

The Plan concludes that the overall potential for flooding in Durham is high and will continue to affect the Town in the future. The Plan identifies the critical facilities and areas that require attention to mitigate future hazards.

Figure 7. Map of historic and potential hazards identified in Durham’s Hazard Mitigation Plan

