Exeter-Squamscott River

Watershed Management Plan Update

Exeter-Squamscott River
Athletic fields of Phillips Exeter Academy are seen alongside the Exeter River in the lower right side of the photo; the Exeter River widens in the center of the photo as it flows over Great Dam in downtown Exeter and becomes the tidal Squamscott River

Photo credit: Ralph Morang

Exeter-Squamscott River Local Advisory Committee

December 2012

Acknowledgements

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Exeter-Squamscott River Local Advisory Committee
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Victor Schmalzer – Brentwood
Patrick Seekamp - Brentwood
Mark Traeger – Sandown

For more information on the Exeter-Squamscott River Local Advisory Committee, please contact the Committee via the Rockingham Planning Commission at 603-778-0885.

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EXETER-SQUAMSCOTT RIVER LOCAL ADVISORY COMMITTEE

Exeter-Squamscott River Management Plan Update
December 2012

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I. Purpose of the Management Plan Update

The Exeter-Squamscott River Watershed Management Plan Update (Plan) was developed by members of the Exeter-Squamscott River Local Advisory Committee (ESRLAC) with assistance from the Rockingham Planning Commission with funds provided by the New Hampshire Department of Environmental Services. The Plan describes the goals and actions for ESRLAC in the coming decade and provides an overview of current conditions in the watershed, which comprises twelve towns in southeastern New Hampshire.

The purpose of the Plan is to provide the Exeter-Squamscott River Local Advisory Committee, landowners, municipal officials, municipal boards and committees, and regional and state agencies and organizations with an action plan for working together to protect water quality, water quantity, wildlife habitat and recreational opportunities in the watershed.

II. Exeter-Squamscott River Local Advisory Committee

In 1995, several Exeter River watershed residents were successful in enrolling the Exeter River in New Hampshire's Rivers Management and Protection program (RMPP). The Exeter River Local Advisory Committee, known as ERLAC, was established in 1996 to oversee the development and implementation of a river management plan. This first watershed management plan was completed in 1999 and ERLAC members continued to meet monthly to discuss land use activity in the watershed and design and implement many public education programs in cooperation with landowners, local Conservation Commissions, the Rockingham Planning Commission, state agencies, and organizations interested in protecting water quality and wildlife habitat in the river and promoting public recreation.

In 2011, ERLAC and the Rockingham Planning Commission worked with the towns of Newfields and Stratham and staff from the NH Department of Environmental Services (DES) to enroll the Squamscott River into the RMPP. It had been a goal of ERLAC for several years to have the tidal portion of the river enrolled into the RMPP in order to have towns within the entire watershed, fresh water and salt water, working together to advocate for the river. The Squamscott River was enrolled in the RMPP in June 2011 and ERLAC changed its name to the Exeter-Squamscott River Local Advisory Committee, referred to as ESRLAC. The Committee continues to meet the 4th Tuesday of the month in Brentwood at the Rockingham County Nursing Home. For more information, please contact ESRLAC via the Rockingham Planning Commission, 603-778-0885, email@rpc-nh.org. For more information on the Rivers Management and Protection Program, visit the program's website:
http://des.nh.gov/organization/divisions/water/wmb/rivers/index.htm

III. Exeter-Squamscott River Local Advisory Committee's Goals 2012-2022

- Improve water quality in the Exeter-Squamscott River watershed to meet federal and state standards.
- Maintain proper stream channel integrity to minimize flooding and erosion.
- Preserve and enhance aquatic, riparian and upland habitats.
- Inventory and promote important historical, cultural, and recreational resources in the watershed.
- Partner with landowners, watershed communities and others to implement Management Plan goals.

IV. Overview of the Exeter-Squamscott River Watershed The Exeter-Squamscott River: One River, Two Names

The Exeter River rises from a group of spring-fed ponds in Chester, New Hampshire and flows 33 miles to downtown Exeter where its name changes to the Squamscott River and becomes a tidal river and primary tributary to the Great Bay estuary. From Chester to Exeter, the freshwater of the Exeter River meanders through broad wetland complexes in Fremont and Danville, several short stretches of rapids in Brentwood, and through the forested canopy of the Phillips Exeter Academy forest in downtown Exeter. After falling over the Great Dam in downtown Exeter, the river becomes tidal and its name changes to the Squamscott River. Flowing for nine miles, the river makes a gradual transition from a freshwater ecosystem to a salty, estuarine ecosystem. The river enters the Great Bay Estuary nine miles from Great Dam. Freshwater marshes below the dam in Exeter become saltwater marshes in Stratham and Newfields. The tidal influences of Great Bay bring a different rhythm to the river, changing the river's character greatly from the small spring at the headwaters.

The Exeter-Squamscott River watershed drains an area of approximately 128 square miles (81,726 acres) and includes portions of 12 towns in southeastern New Hampshire. Watershed communities include Chester, Raymond, Fremont, Danville, Sandown, Kingston, East Kingston, Kensington, Brentwood, Exeter, Newfields and Stratham. The total population for watershed communities in 2010 was 68,245.

The river is a primary tributary to the Great Bay Estuary, a tidal estuary encompassing over 6,000 acres. Great Bay lies at the confluence of tidally driven salt water from the Gulf of Maine and fresh water from the Salmon Falls, Cocheco, Bellamy, Oyster, Lamprey, Squamscott, and Winnicut rivers. Before reaching Great Bay, seawater travels 15 miles inland through the Piscataqua River and Little Bay. This geographic configuration makes Great Bay one of the nation's most recessed estuaries. The large quantities of water that move in and out of the Great Bay Estuary create some of the strongest tidal currents in North America. This tidal exchange structures the Great Bay ecosystem by affecting water quality, habitat extent, and species distributions. The rivers that flow into the Great Bay, including the Exeter-Squamscott River, drain a watershed that extends more than 1,000 square miles. The quantity and quality of freshwater flowing from the Exeter River into the Squamscott River and into Great Bay plays a critical role in the health of the Great Bay Estuary ecosystem.

For more information on the Great Bay Estuary and environmental indicators associated with threats to Great Bay water quality, visit the Great Bay National Estuarine Research Reserve website, www.greatbay.org and the Piscataqua Region Estuaries Partnership website, www.prep.unh.edu.

V. Existing Conditions in the Exeter-Squamscott River Watershed

A. Description of the Exeter-Squamscott River

The Exeter-Squamscott River watershed is characteristic of a "dendritic" or branching, tree-like drainage pattern, with smaller streams and tributaries feeding into the river's main channel. These tributary streams are critically important to the river's water quality and quantity. The watershed features a number of tributary streams, including Wason Brook and Towle Brook in Chester, Fordway Brook in Raymond, the Phillips/Lily Pond drainage in Sandown, the Little River in Brentwood and Exeter, another Little River in Kingston, Dudley/Bloody Brook in Exeter and Brentwood, and Great Brook in Kensington and Exeter. Important freshwater tributaries to the tidal Squamscott River include Sloan's Brook, Rocky Brook, Norris Brook, Dearborn Brook, and Wheelwright Creek in Exeter, Parting Brook in Newfields, and Mill Brook and Jewell Hill Brook in Stratham. Ponds are not a dominant feature of the landscape in the Exeter-Squamscott River watershed. Phillips Pond in Sandown is the largest pond at 85 acres. The remaining 12 names ponds are relatively small and scattered throughout the watershed, having acreages of 20 acres or less.

B. Land Use in the Exeter-Squamscott River Watershed

Land use in the watershed has changed since the first watershed management plan was completed in 1999. More homes and retail and industrial sites have been built, adding to an increase in impervious surfaces and wildlife habitat fragmentation. The Exeter-Squamscott River watershed includes some of the fastest growing communities in New Hampshire. Population growth and land development have created increasing amounts of impervious

surfaces from roads, parking lots, and building roofs, fragmentation of forestland and wetlands, installation of septic systems, and increases in groundwater withdrawals for drinking wells.
Table 1 illustrates population growth in watershed municipalities from 1970 to 2010. Many towns in the watershed have seen dramatic rises in population during this time period, a reflection of growth and development that occurred across southern New Hampshire in the second half of the last century.

Table 1
Municipal Populations 1970-2010
Source: US Census Bureau

Town	1970	1980	1990	2000	2010	% change 1970-2010	% change 2000-2010
Chester	1,382	2,006	2,691	3,792	4,768	245.0%	25.7%
Raymond	3,003	5,453	8,713	9,674	10,138	237.5%	4.8%
Fremont	993	1,333	2,576	3,510	4,283	331.3%	22.0%
Danville	974	1,318	2,534	4,023	4,837	396.6%	9.0%
Sandown	741	2,057	4,060	5,143	5,986	695.7%	16.4%
East Kingston	838	1,135	1,352	1,784	2,357	181.3%	32.1%
Kingston	2,882	4,111	5,591	5,862	6,025	109.0%	2.8%
Kensington	1,044	1,322	1,631	1,893	2,124	103.4%	12.2%
Brentwood	1,468	2,004	2,590	3,197	4,486	205.6%	40.3%
Exeter	8,892	11,024	12,481	14,058	14,306	60.9%	1.8%
Stratham	1,512	2,507	4,955	6,355	7,255	379.8%	14.2
Newfields	843	817	888	1,551	1,680	99.3%	8.3%
TOTAL	31,665	35,087	50,062	60,842	68,245	115.5%	12.2%

Land use in the Exeter-Squamscott River watershed is predominantly woodland and scattered rural and suburban residential development. Analysis of 2006 aerial data for the watershed identifies the following land use categories: 58% forested, 9% developed, 15% farmland, 15% wetlands, 2% shrub/scrub land, and 1% open water. Commercial and industrial activity is scattered throughout the watershed with concentrations along state highways, including NH Routes 101, 108, 125, 111, and 102.

With population growth and development comes increases in the amount of impervious surfaces in the watershed. Impervious surfaces such as paved roads, parking lots, and buildings prevent snowmelt and rainwater from soaking into the ground, sending pollutants from these surfaces into streams and rivers. Studies conducted in other regions of the country have demonstrated water quality deterioration when impervious surfaces cover greater that 10% of the watershed area (Center for Watershed Protection, 2003). Two towns in the watershed, Exeter and Stratham, have greater than 10% impervious surface. In 2005, a study in New

Hampshire demonstrated the percent of impervious surface in a watershed can be used as indicators of water quality and aquatic life health (Deacon et al., 2005). Sampling sites in the Exeter-Squamscott River watershed were used in this study. For more information on the New Hampshire study, visit http://pubs.usgs.gov/sir/2005/5103/

Table 2
Percentage of Impervious Surface
Source: Piscataqua Region Estuaries Partnership (PREP)

Town	1990	2000	2005
Chester	2.5%	4.3%	5.1%
Raymond	3.8%	8.0%	9.3%
Fremont	3.0%	4.9%	5.9%
Danville	3.5%	6.0%	7.2%
Sandown	3.8%	6.1%	7.9%
East Kingston	3.5%	5.3%	7.0%
Kingston	5.2%	8.2%	9.7%
Kensington	3.2%	5.0%	6.2%
Brentwood	5.0%	7.7%	9.5%
Exeter	7.5%	11.0%	12.4%
Stratham	6.5%	10.1%	12.9%
Newfields	3.1%	5.5%	6.8%

Municipalities in the watershed have enacted many different types of land use regulations designed to protect water quality and maintain water quantity. These regulations include stormwater management requirements for erosion control and drainage, aquifer protection ordinances regulating the types of land use activities that can occur over groundwater aquifers, wellhead protection regulations to protect areas around municipal and community wells, prohibition of development in floodplains, septic system requirements more stringent than state standards, and regulations establishing development setbacks from wetlands and surface waters.

In 2009, the Piscataqua Region Estuaries Partnership (PREP) conducted an assessment of land use regulations and policies in the 52 communities in PREP's coastal watershed region, including the 12 towns in the Exeter-Squamscott River watershed. Results of the study may be found at PREP's website:
http://www.prep.unh.edu/resources/pdf/piscataqua_region_environmental-prep-10.pdf
PREP will be updating the assessment in 2013.

Advocating for the protection of undisturbed and undeveloped land along the shoreland of the Exeter-Squamscott River, all of the river's tributary streams, as wells as the ponds and wetlands in the watershed is a primary goal of ESRLAC. Establishing buffer zones around surface waters

to limit disturbance from development is key for filtering pollutants from stormwater running off of parking lots and roads, protecting wildlife habitat, and providing flood storage. Buffers physically protect rivers, streams and wetlands from encroachment or disturbance caused by development. The manual entitled "Buffers for Wetlands and Surface Waters - A Guidebook for New Hampshire Municipalities" (Chase et al. 1995, rev. 1997), provides a scientific basis for the importance of naturally vegetated buffers next to wetlands and surface waters. The manual recommends a 100' minimum vegetated buffer width to assist with the removal of pollutants such as nitrogen, phosphorus, and sediments. Buffers of greater than 100' are needed around sources of drinking water supply and sensitive wetlands. The manual is available from the UNH Cooperative Extension Service: http://extension.unh.edu/commdev/Buffers.pdf

The University of New Hampshire's Complex Systems Research Center (CSRC) has developed an online mapping tool that municipalities may use to display shoreland buffers in increments of 50', 100', 150', 200', 250' and 300'. The mapping tool may be found at the CSRC website: http://granitview.unh.edu/

In 2007, CSRC developed maps for each town in the watershed characterizing the development status of shoreland buffers along surface waters. The maps identify developed and undeveloped areas along rivers and streams. The maps may be found at the CSRC website, http://www.granit.unh.edu/Projects/Details?project_id=42

Watershed towns interested in land use ordinances and regulations designed to protect water quality, protect property from erosion and flooding, and protect wildlife habitat have many choices, all detailed in the 2008 "Innovative Land Use Planning Techniques Handbook". The manual provides both the background and purpose and model ordinances for a wide variety of environmental characteristics zoning, including:

- Stormwater management
- Steep slopes
- Habitat protection
- Wetland protection
- Protection of groundwater and surface water resources
- Protection of shoreland and riparian buffers
- Flood hazard area zoning
- Erosion and sediment control during construction
- Landscaping

The handbook is available at the DES website:
http://des.nh.gov/organization/divisions/water/wmb/repp/innovative_land_use.htm

ESRLAC urges all towns in the watershed to review local land use regulations and policies to ensure water quality protection.

NH DES has published a guide to help residential homeowners better manage stormwater on their properties. It can also be used by communities as an outreach tool to encourage better stormwater management by residents. The guide is available at the DES website: http://des.nh.gov/organization/divisions/water/stormwater/stormwater-mgmt-homeowners.htm

C. Water Quality in the Exeter-Squamscott River Watershed

Research and data on the water quality in the Exeter-Squamscott River is, or has been, collected by a number of organizations, including the Town of Exeter, NH Department of Environmental Services, ESRLAC members and other volunteers participating in the State's Volunteer River Assessment Program, the Great Bay National Estuarine Research Reserve, the Piscataqua Region Estuaries Partnership, and the University of New Hampshire. Since 1991, the surface waters of New Hampshire have been classified by the state legislature (RSA 485-A:8) as either Class A or Class B. Class A waters are considered to be of the highest quality and considered optimal for use as water supplies after adequate treatment. Sewage discharges are prohibited in these waterbodies. Class B waters are considered acceptable for fishing, swimming, and other recreational purposes, and for use as water supplies after adequate treatment has been applied. The State has designated the Exeter-Squamscott River as Class B.

The NH Department of Environmental Services (DES) Surface Water Quality Assessment Program produces two surface water quality documents every two years, the "305(b) Report" and the "303(d) List". As the two documents use the same data, the 305(b) Report and 303(d) List were combined into one Integrated Report starting in 2002. The Integrated Report describes the quality of New Hampshire's surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water.

DES has identified several issues impacting water quality in the Exeter-Squamscott River, resulting in the river being placed on the State's listing of impaired waters. Impairments include:

- Low dissolved oxygen levels
- Mercury from atmospheric deposition and sources unknown
- Polychlorinated biphenyls from sources unknown
- Chlorophyll-a from sources unknown
- Enterococcus from combined sewer overflows, nonpoint sources, and wet weather discharges
- Nitrogen from sources unknown
- Dioxin from sources unknown

DES has prepared Watershed Report Cards detailing the type of impairments and impairment locations in the watershed. The report cards may be found at the DES website, http://des.nh.gov/organization/divisions/water/wmb/swqa/report_cards.htm

Finding solutions to water quality impairments is another priority for ESRLAC and the Committee has been actively working with DES for several years on projects to identify site-specific impairments along the Exeter River and develop projects to address threats to water quality and river stabilization. Types of projects identified include protecting land along the river corridor, planting and improving vegetated shoreland buffers, replacing or retrofitting culverts and bridges that are currently causing riverbank scouring and erosion, and mitigating stormwater runoff flowing off of impervious surfaces.

For more information on the March 2009 Exeter River Geomorphic Assessment project for the Upper Exeter River, Fordway Brook, Dudley-Bloody Brook, Fordway, and Lower Exeter River, visit the DES website for the complete report:
http://des.nh.gov/organization/divisions/water/wmb/was/documents/wbp_exeter_main.pdf

For more information on the May 2010 Exeter River Geomorphic Assessment project for the Middle Exeter River (Fremont and Brentwood), visit the DES website for the complete report:
http://des.nh.gov/organization/divisions/water/wmb/was/documents/middle_exeter_wbp.pdf

Working with watershed communities to manage stormwater and other nonpoint sources of pollution is also a priority for ESRLAC. As it flows over the landscape, stormwater runoff collects and transports pollutants including sediment and organic matter, pet waste, automotive fluids, road salt, pesticides and fertilizers, and litter. Traditional stormwater management practices are designed to collect, detain and divert runoff to the nearest surface water body via culverts and ditches. It is now known that this approach does not adequately address the negative impacts on water quality caused by stormwater. An essential part of stormwater management is maintaining the natural hydrology of a site to the maximum extent possible. This is accomplished by slowing down the flow of stormwater to increase infiltration into the ground and treating stormwater on site rather than sending it off site to rivers and streams. Buffers of natural vegetation around rivers, streams, wetlands, lakes and ponds are considered among the most effective stormwater management practices. Stormwater management is necessary during all stages of site development including site planning and design, design review, construction and post-construction permanent controls. Approval of stormwater management plans by local officials should include regular monitoring.

The US Environmental Protection Agency (EPA) will soon require every community in the watershed to develop stormwater management programs to reduce stormwater runoff. These programs are commonly referred to as an MS4 program. MS4 stands for Municipal Separate Storm Sewer Systems and are defined as conveyances such storm drains, culverts, pipes, ditches, etc. that discharge to waterbodies. Larger communities such as Exeter are already required to obtain a National Pollution Discharge Elimination System (NPDES) permit to reduce

the contamination of stormwater runoff and prohibit illicit discharges into waterbodies. EPA has developed a menu of Stormwater Best Management Practices based on six different control measures. The control measures are: public education, public involvement, illicit discharge detection and elimination, construction, post-construction, and pollution prevention and good housekeeping. Visit the EPA website for more information:
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

Faulty septic systems are also a source of water pollution in the watershed. Of particular concern are the nutrients nitrogen and phosphorus that are found in septic system effluent. Educating watershed residents about proper septic system use and maintenance is a priority for ESRLAC.

Members of ESRLAC have participated in the State's Volunteer River Assessment Program (VRAP) for many years. VRAP is administered by the NH Department of Environmental Services and relies on volunteers trained to conduct on-site water quality testing. In 2010, volunteers measured water temperature, pH, and dissolved oxygen levels at 8 sites along the Exeter River and little River in Exeter. DES issues annual water quality reports based on testing results. Reports for the Exeter River may be found at the DES website:
http://des.nh.gov/organization/divisions/water/wmb/vrap/exeter/index.htm

D. Water Use and Water Quantity in the Exeter-Squamscott River Watershed

The Exeter River and its watershed serve as a water supply for the Town of Exeter's municipal water system. The Town withdraws approximately 1.5 million gallons per day off the Exeter River using an intake pipe located about a half mile upstream of the Great Dam in downtown Exeter. The water from the Exeter River is pumped to the Town's water treatment plant. The Town of Exeter also uses water from the Exeter Reservoir, which holds water flowing from Dearborn Brook in Exeter and Skinner Springs in Stratham, and a groundwater well on Lary Lane. The Town of Newfields also operates a municipal water system, relying on a groundwater well. The majority of watershed residents rely on private groundwater wells for drinking water.

Phillips Exeter Academy in Exeter pumps up to 18,000 gallons per day in the winter from the Exeter River for boiler makeup water. An additional 25,000 to 30,000 gallons per day is used during the summer months by the Academy for irrigation, approximately four days per week.

The Exeter Mills apartment complex located along the Squasmcott River just below Great Dam in Exeter includes 152 housing units. The complex obtains water from the Exeter River via the penstock at Great Dam. This water is used for the cooling system for four of the main buildings. It is estimated that the Mills use 50,000 to 150,000 gallons per day from the Lower Exeter River during the summer months for cooling. The Mills can also use the river water for their irrigation system and fire suppression. The water used by the cooling system is discharged into the Squamscott River via a heat exchanger system.

Table 3: Water Withdrawals from the Exeter-Squamscott River
Source: Town of Exeter Water Supply Alternatives Study, 2010, Weston and Sampson

Withdrawal	Purpose	Location	Amount
Town of Exeter	Water supply	½ mile upstream of Great Dam , Exeter River	1.5 million gallons/day
Phillips Exeter Academy	Irrigation, heating and cooling, ice rink condenser	Off Court Street next to PEA ice rink, Exeter River	18,000 – 30,000 gallons/day
Exeter Mills Apartments	Irrigation, fire suppression, cooling	Great Dam, Exeter River	50,000 – 150,000 gallons/day

The Towns of Exeter and Newfields operate wastewater treatment plants that discharge effluent to the Squamscott River. Exeter's treatment plant discharges up to 4 million gallons a day. The Town has received a draft discharge permit from EPA requiring the Town to modify the plant to significantly reduce the amount of nitrogen and other pollutants entering the Squamscott River. The Town of Newfields operates a small wastewater treatment plant discharging 50,000 gallons per day into the Squamscott River. The plant has a treatment capacity of 117,000 gallons per day.

It is important to note that many watershed residences and businesses rely on individual septic systems for on-site treatment of wastewater. Educating septic system users about proper maintenance of septic systems is needed to help improve and protect water quality in the watershed.

Table 4: Surface Water Discharges to the Exeter-Squamscott River
Source: Town of Exeter Water Supply Alternatives Study, 2010, Weston and Sampson

Discharge	Purpose	Location	Amount
Town of Exeter	Wastewater treatment	Newfields Road Squamscott River	4 million gallons/day
Exeter Mills	Cooling system	Below Great Dam, Squamscott River	50,000 – 150,000 gallons/day
Town of Newfields	Wastewater treatment	Hervey Court, Squamscott River	50,000 gallons/day

The longest record of daily streamflow in the Exeter River is derived from USGS gage 01073587, located on Haigh Road in Brentwood, above the confluence of the Exeter River and Great Brook. Installed in the summer of 1996, the gage provides over 17 years of continuous streamflow measurements that can be used to assess the hydrology of the Exeter River. The average daily discharge measured at the gage between June 1996 and November 2012 was 125

cubic feet per second. The annual peak discharge for the same period ranged from 462 cubic feet per second in March 1999 to 3,520 cubic feet per second in May of 2006. Gage data is available from the USGS website:
http://waterdata.usgs.gov/nwis/nwisman/?site_no=01073587&agency_cd=USGS

A second gage was installed by USGS along the Exeter River in September 2008 at Odell Road in Sandown. The average daily discharged measured at the gage between September 2008 and November 2012 was 35 cubic feet second. The annual peak discharge ranged from 307 cubic feet per second in December 2008 to 822 cubic feet per second in February 2010. Gage data is available from the USGS website:
http://waterdata.usgs.gov/nwis/nwisman/?site_no=010735562&agency_cd=USGS

Flooding from storm events has been significant along the river, with storm events in October 1996, April 2007, May 2006, and two events in March 2010.

Variations in the Exeter River's flow velocity can have a profound effect on water quality, with low flow typical in August and September. Low flows result in low levels of dissolved oxygen in the Exeter River and insufficient water flow over the Great Dam, both of which impact fish species.

E. Wildlife Habitat in the Exeter-Squamscott River Watershed

The Exeter-Squamscott River watershed supports a variety of landscapes including wetlands, forests, ponds, streams, vernal pools, tidal marshes and tidal mud flats. These different environments provide habitat for many species of flora and fauna. The watershed falls within the Gulf of Maine Coastal Plain biophysical region which is dominated by hardwood and transitional forests. Large tracts of undeveloped land provide important habitat for moose, black bear, and forest dwelling birds. The watershed also provides habitat for several species of concern in New Hampshire including Blanding's turtles, New England cottontail, and the blue spotted salamander. The Exeter-Squamscott River is both a cold and warm water fishery that provides habitat for over 17 resident species including brook trout, small and large mouth bass, yellow perch, and chain pickerel. The river also serves as a spawning area for alewife and blueback herring.

The Land Conservation Plan for New Hampshire's Coastal Watersheds (The Nature Conservancy et. al 2006) identifies Conservation Focus Areas in the 42 town coastal watershed. These areas are considered to be of exceptional significance for water quality and living resources. The goal of the plan is to focus conservation efforts on those lands and waters that are most important for conserving living resources – native plants, animals, and natural communities – and water quality in the coastal watersheds. Forests and wetlands, freshwater aquatic habitats and fisheries, coastal and estuarine resources, and rare species and exemplary natural communities were mapped in the Plan. Wildlife habitat data used in the Plan was developed for the 2005 NH Fish and Game Wildlife Action Plan.

Table 5 describes the Conservation Focus Area identified in the 2006 The Land Conservation Plan for New Hampshire's Coastal Watersheds.

Table 5: Conservation Focus Areas in the Exeter-Squamscott River Watershed
Source: 2006 Land Conservation Plan for New Hampshire's Coastal Watersheds

Conservation Focus Area Name	Location	Size (acres)	Significant Wildlife Habitats	Exemplary Natural Communities
Fordway Brook Headwaters	Candia, Chester, Raymond	940	Grassland, marsh, peatland	
Lower Fordway Brook	Raymond, Chester	1,680	Grassland, marsh, peatland	
Upper Exeter River	Chester, Danville, Fremont, Sandown	3,010	Floodplain forest, grassland, marsh, peatland, ridge/talus	
Spruce Swamp	Brentwood, Fremont	1,850	Floodplain forest, marsh, peatland	Medium level fen system
Exeter River	Brentwood, Exeter	620	Floodplain forest, grassland, marsh	Red maple floodplain forest
Dogtown Swamp	Brentwood, Exeter	160	Grassland, marsh, peatland	Swamp white oak basin swamp
Bloody and Dudley Brooks	Brentwood, Exeter	550	Grassland, marsh, peatland	
Upper Great Brook	East Kingston, Kensington	540	Grassland, marsh, peatland	
Muddy Pond	Kensington	160	Grassland, marsh	Circumneutral seepage swamp
Great Meadows	Kensington, Exeter	1,440	Floodplain forest, grassland, marsh, peatland	Semi-rich Appalachian oak-sugar maple forest, tall graminoid emergent marsh
Parkman Brook	Stratham	550	Grassland, marsh, peatland	
Squamscott River	Exeter, Stratham, Newfields, Greenland, Newmarket	2,020	Floodplain forest, grassland, marsh, peatland	Brackish marsh, high brackish tidal riverbank marsh, low brackish tidal riverbank marsh, mesic Appalachian oak-hickory forest, saline/brackish subtidal channel/bay bottom

Complete descriptions of the Conservation Focus Areas identified in the Land Conservation Plan for New Hampshire's Coastal Watersheds may be found at the Rockingham Planning Commission's website:
http://www.rpc-nh.org/PDFs/docs/coastal-conservation/Coastal_Plan_Complete.pdf

The New Hampshire Fish and Game Wildlife Action Plan may be found at Fish and Game's website: http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm

F. Land Conservation in the Exeter-Squamscott River Watershed

Protection of open space along the Exeter-Squamscott River corridor is a high priority for communities in the watershed and ESRLAC, and a high priority for several land conservation organizations working in the region, including the Southeast Land Trust of New Hampshire and the Great Bay Resource Protection Partnership. Municipal Conservation Commissions and Open Space Committees have worked with many land conservation organizations and hundreds of landowners in the watershed to conserve approximately 12,435 acres from development, approximately 15% of the land in the watershed.

Table 6. Conservation Land in the Exeter-Squamscott River Watershed
Source: GRANIT, 2012

Town	Acres Conserved
Chester	850
Raymond	545
Fremont	599
Sandown	680
Danville	141
East Kingston	551
Kingston	651
Brentwood	2725
Kensington	1378
Exeter	2855
Newfields	238
Stratham	1222
TOTAL Conserved Land	12435
TOTAL Land in Watershed	81,727
Percent Conserved	15.2%

G. Recreational Opportunities in the Exeter-Squamscott River Watershed

Recreational opportunities abound in the Exeter-Squamscott River watershed including fresh and saltwater fishing, hunting, boating, walking and running, biking, cross country skiing, snowmobiling, and bird and wildlife watching. ESRLAC has partnered with town conservation commissions, NH Fish and Game, Trout Unlimited, and Eastern Mountain Sports for several years to provide fishing and kayaking programs on the river as well as programs highlighting the importance of water quality and wildlife habitat. ESRLAC will continue these partnerships to offer such programs in the future.

H. Historical and Cultural Resources in the Exeter-Squamscott River Watershed

As the site of one of the first settlements in New Hampshire, the Exeter-Squamscott River corridor has historic resources spanning four centuries. There are several historic residential and commercial structures remaining along the Exeter-Squamscott River and in watershed communities. In the past, a wide variety of manufacturing sites were located all along the river corridor, ranging from shipbuilding to shoe factories.

The definitive history of land use on and along the Exeter-Squamscott River was written by author and Exeter native Olive Tardiff. ESRLAC partnered with the Southeast Land Trust of New Hampshire to republish the book and add additional photos. Copies of the book are available from ESRLAC.

I. Climate Change and Resiliency

Earth's climate has varied throughout time and it will continue to change into the future. However, an overwhelming body of scientific evidence indicates that human activities are now a significant and growing force driving change in the climate system. These changes include sea level rise and erosion and flooding from coastal storms, as well as changes in precipitation patterns, storm intensity, temperature variations, and biodiversity.

Communities in the Exeter-Squamscott River watershed need to comprehensively address the existing and future impacts related to climate change, particularly flooding from increased storm frequency and intensity. Preparations to make communities more resilient include vulnerability and risk assessments, prioritization of infrastructure projects, and funding and allocation of both financial and human resources. Mitigation and adaptation will require creativity, compromise and collaboration across all levels of government, the private sector and residents. Examples of site specific projects in the watershed that will improve community resiliency to climate change may be found in both the 2009 and 2010 Fluvial Geomorphic Assessments of the Exeter River Watershed. These reports may be found at the DES website:
http://des.nh.gov/organization/divisions/water/wmb/was/documents/wbp_exeter_main.pdf
http://des.nh.gov/organization/divisions/water/wmb/was/documents/middle_exeter_wbp.pdf

VI. Exeter-Squamscott River Local Advisory Committee's Goals and Actions

ESRLAC has established the following goals and actions to guide the Committee's work in the coming decade, 2012-2022:

Goal: Improve water quality in the Exeter-Squamscott River watershed to meet federal and state standards.
Actions:

- Support and facilitate traditional land uses and stewardship such as farming and forestry.
- Develop a water quality monitoring plan and use the information to inform local and state officials and residents of the need for action.
- Promote shoreline protection program in each town, including protection of 1st and 2nd order streams.
- Promote and support permanent conservation of land in the watershed, with priority on shoreline properties.
- Work with watershed communities to minimize impacts of stormwater.
- Study fertilizer use in the watershed, especially lawns.
- Work with watershed communities to promote proper wastewater disposal, septic system inspection and maintenance.
- Advocate for the identification and protection of prime wetlands in the watershed.
- Encourage watershed communities to characterize and map all culverts and outfalls in the watershed.
- Encourage watershed communities to reduce road salt application and participate in chloride application training and certification programs.

Goal: Maintain proper stream channel integrity to minimize flooding and erosion.
Actions:

- Meet with local land use boards to present the Geomorphic Assessment report, point out areas in each town that are at risk of flooding, shoreland erosion, and channelization, and review model land use regulations concerning stormwater management, erosion, and shoreland buffers.
- Promote a shoreline protection philosophy by towns and residents.

Goal: Preserve and enhance aquatic, riparian and upland habitats.
Actions:

- Advocate for land conservation projects and the protection of wildlife corridors by working with organization such as the Rockingham County Conservation District, USDA Natural Resources Conservation Service, Southeast Land Trust of NH, Forest Society, Nature Conservancy, watershed Conservation Commissions and landowners.

- Continue to partner with watershed Conservation Commissions to offer public information programs about wildlife habitat, such as the annual vernal pool workshop and annual fish ladder tour.

Goal: Inventory and promote important historical, cultural, and recreational resources in the watershed.
Actions:

- Work with communities to increase public access points to the River.
- Partner with heritage commissions, historical societies, recreation committees and other stakeholders to identify, map and promote historical, cultural, and recreational resources in the watershed.
- Develop a plan for consistent signage at public access points.

Goal: Partner with landowners, watershed communities and others to implement Management Plan goals.
Actions:

- Meet with watershed Planning Boards and Conservation Commissions to review the goals of this Management Plan and to discuss opportunities for partnership.
- Recruit Committee members from all twelve watershed communities.
- Share the Management Plan with legislators in the watershed.
- Create and obtain videos and other kinds of educational information for viewing on town websites and local access channels in the watershed.
- Works with neighboring River Advisory Committees and the Southeast Watershed Alliance on mutually beneficial projects.
- Use social media to promote all of the above.

VII. Conclusion and Plan Implementation

ESRLAC is committed to partnering with landowners, municipal Boards of Selectmen, Planning Boards, Conservation Commissions, and with the many organizations and agencies vested in protecting water quality, wildlife habitat, and cultural resources in the Exeter-Squamscott River watershed. Indeed, productive partnerships are the foundation for successful implementation of the goals and actions stated in this Plan.

In the coming months and years, ESRLAC will be presenting this Plan to landowners and decision makers in the watershed to discuss the Committee's goals and actions to identify and strengthen opportunities for partnership and successful Plan implementation.

For more information, please contact ESRLAC via the Rockingham Planning Commission at 603-778-0885, email@rpc-nh.org. www.exetersquamscottriver.org

Maps:
Base Map of the Exeter-Squamscott River Watershed
Aquifers in the Exeter-Squamscott River Watershed
Conservation Land in the Exeter-Squamscott River Watershed