



# **City of Rochester**

**31 Wakefield Street  
Rochester, NH 03867-1917**

## **MASTER PLAN**

### **NATURAL RESOURCES CHAPTER**

**Prepared for the City of Rochester Conservation Commission  
by Strafford Regional Planning Commission  
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***Note: Full size maps are located in the City of Rochester, Department of Planning and Development, 31 Wakefield Street. These maps can be viewed and downloaded from the City's website.***

## 1.0 INTRODUCTION AND SUMMARY

### 1.1 Vision Statement

The Natural Resources Chapter is a study of Rochester's natural resource base that includes our surface water systems, wetlands, soils, forests, aquifers, and ecological environment. This Chapter provides a framework to gain insight into our individual and collective steps to protect, preserve, safeguard and conserve, our natural resources and ecological environment.

The Implementation Plan lays out a tiered approach – of short term, intermediate term and long term actions – that focuses on critical natural resource issues that need to be addressed and that, in some cases, the City needs to learn more about at a fundamental level. The goal of the Implementation Plan is to increase our information base regarding issues, make that information available to the public and decision makers in an accessible, clear and consistent manner, and to use that information to inform the City's efforts to manage and protect its natural resources for the future.

To achieve the goals and recommendations of this Chapter, the City should use this plan as a document to guide policy decisions, development of regulations and standards, and resource planning initiatives. It is realistic to view this Chapter as an adaptive tool that can be revised and updated as new information and technology become available. The Planning Board encourages the use of volunteers and funding sources other than local property tax revenue to implement the recommendations whenever possible.

Rochester's natural resources contribute to the quality of life, economic vitality, and public health of the City as well as to our surrounding communities and the region. City residents have traditionally supported strong conservation and preservation measures to protect the rich array of natural resources found in the community, including protection of water supply sources, adoption of resource based regulations and ordinances, and land protection.

The City seeks to continue concentrating growth and development in Rochester within the urban core area of City and to interconnect the core of the community through greenways and parks that connect with the more rural portions of the City and rural areas in the surrounding communities. Within the rural areas, the vision is to protect open space and critical resources through a greenway network consisting of large tracts of land with important ecological, social, economic, recreational, and agricultural value.

The City recognizes natural resources that have been particularly vulnerable in recent years, such as degradation of wetlands and protection of drinking water supply source areas. The Conservation Commission identifies one of the causes of resource degradation as poorly planned and executed development, and the single-most affective action to protect natural resources is to consistently and effectively enforce the regulations currently in place to protect them.

The City seeks to preserve Rochester's quality of life and economic vitality by protecting its natural resources, recognizing that all residents are responsible for making this a reality. City

boards and commissions, elected officials, and City staff should strive to facilitate these actions whenever and wherever possible.

## **1.2 Introduction**

Rochester is an urbanized city with a population of 30,004<sup>1</sup> covering 29,081 acres (45 square miles) in southeastern New Hampshire. Water and wetlands occupy 3,492.1 acres or 12 percent of the City's total land area. The City of Rochester is located in Strafford County and borders the State of Maine along the Salmon Falls River. Its diverse land uses and landscape features in combination with the many streams, forests, conservation lands, open lands, and farmlands provide a high quality of life for Rochester residents and an abundance of natural resources (refer to [Figure 1 Base Map](#)).

This Natural Resources Chapter is a description and analysis of the significant natural resources found in the City of Rochester. This information is intended to be a resource for landowners, City officials, and citizens who are the long-term stewards of Rochester's natural resources. Specifically, it can be used to:

- Educate and promote awareness about Rochester's natural resources;
- Document current conditions so changes over time can be assessed;
- Develop land conservation priorities and an open space plan for Rochester;
- Provide a basis for master planning, development and revision of ordinances and regulations, and as a guide for planning decisions.<sup>2</sup>

Census data reveals that New Hampshire's population is increasing more rapidly than any other state in the Northeast. Rochester, along with the other cities and towns in the state, must consider conserving significant natural resources in the face of increasing development and population pressures. This Chapter can provide the community with an inventory to evaluate the status of natural resources and plan for their conservation into the future.

### *City of Rochester Master Plan*

#### **From section 41.8 of the City of Rochester's general ordinances section: Master Plan.**

It shall be the function and duty of the Planning Board to make and to perfect from time to time, so far as funds appropriated by the Council for such purpose will permit, a master plan for the development of the city. Such master plan, with the accompanying necessary maps, plats, charts and description matter, shall be designed with the intention of showing as fully as is possible and practicable the Planning Board's recommendations for the desirable development of the territory legally and logically within the scope of its planning jurisdiction, including, on the basis, among other things, the general location, character and extent of streets, bridges, waterways, waterfronts, boulevards, parkways, roadways in streets and parks, playgrounds, squares, parks, aviation fields, and other public ways, places, grounds and open spaces, sites for public buildings and other public property, routes of railroads, omnibuses and other forms of public transportation, and the general location and extent of public utilities and terminals, whether publicly or privately owned or operated, for water, light, heat, sanitation, transportation,

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<sup>1</sup> US Census Bureau, 2005.

<sup>2</sup> Stone, Amanda J.L., *Natural Resources Inventories, a Guide for New Hampshire Communities and Conservation Groups*, UNH Cooperative Extension, Durham, NH, 2001.

communication, power and other purposes; also the acceptance, removal, relocation, widening, narrowing, vacating, abandonment, change of use of, or extension of, any of the following ways, grounds, places, open spaces, buildings, properties, utilities or terminals and other planning features, as well as a zoning plan for the control of the height, area, bulk, location and use of private and public structures, buildings and premises and population density; the general character, layout and extent of any community center, and any other matter permitted by RSA 36 of the Laws of the State of New Hampshire.

**41.9 Preparation of Master Plan.**

In the course of the preparation of such master plan the Planning Board may make careful and comprehensive surveys and studies of existing conditions and of data and information relative to the probable future growth of the City. The master plan shall be made within the general purpose of guiding and accomplishing a coordinated, adjusted and harmonious development of the City, which will, in accordance with existing and probable future needs, best promote health, safety, morals, order, convenience, prosperity, or the general welfare as well as efficiency and economy in the process of development; including among other things, adequate provisions for traffic, the promotion of safety from fire and other damages, adequate provision for light and air, the promotion of good civil design and arrangement, wise and efficient expenditure of public funds, and the adequate provision of public utilities and other public requirements.

Other chapters of the City’s Master Plan broadly support conservation and preservation of natural resources. The Land Use Chapter recognizes specifically natural resources and water resources, and identifies development issues – such as rapid growth, sprawl and land conservation – that should be considered when planning for protection of these resources.

**1.3 Natural Resources Goals**

The overarching goals of the Natural Resources Chapter are to:

- ✓ **Advocate for protection and conservation of natural resources**
- ✓ **Enhance quality of life for the future**
- ✓ **Maintain the functions and services natural resources provide to benefit the public**

**1.4 Recommendations**

ID	Action
GR 1	Develop an outreach strategy to inform the public about the utility and importance of the Natural Resource Chapter. <i>Priority Ranking: Highest</i>
GR 2	Develop an education and outreach plan focused on encouraging implementation of specific recommendations of the Natural Resources Chapter by students as part of the school curriculum, civic organizations, landowners and business owners. <i>Priority Ranking: Highest</i>

## 2.0 OVERVIEW

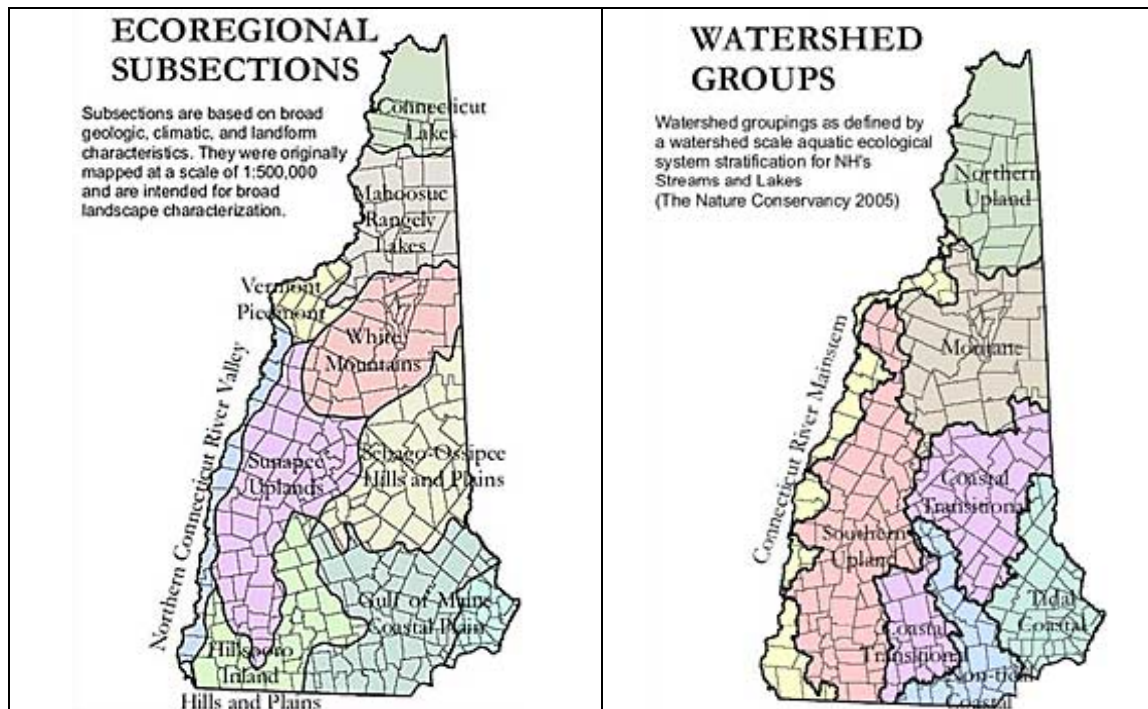
### 2.1 Ecological Regions

The U.S. Forest Service has classified various sections of the country based on ecological and environmental characteristics – the Ecoregional Subsections classification and the Watershed Group classification. The Ecoregional Subsections classification was based on land formations, geology, topography, regional climate, and dominant natural vegetation (see graphic below). The boundaries were refined based on how natural communities were more common in different groups of non-living factors. The U.S. Forest Service has divided New Hampshire into the following three principal biophysical or ecological regions and subsections:

Principal Regions    ***Southern New England Coastal Plain - Hills Section (southeastern NH)***  
                                  Vermont-New Hampshire Upland Section (southwestern NH)  
                                  White Mountain Section (northern NH)

Subsections of the Southern New England Coastal Plain and Hills Section  
                                  Gulf of Maine Coastal Lowland (immediate coastal region)  
                                  ***Gulf of Maine Coastal Plain (southern portion)***  
                                  Sebago-Ossipee Hills and Plain (northern portion)

Rochester is part of the Southern New England Coastal Plain and Hills section, and the Gulf of Maine Coastal Plain subsection.



**Figure 2: Ecoregional subsections and watershed group classifications of New Hampshire**

The Watershed Group classification is based on geology, topographic features (elevation, gradient and landform), connectivity, and local climate patterns that effect watersheds over long time periods (see graphic below). *Rochester is in the Tidal Coastal watershed group.*

## 2.2 Summary of Land Use

### *Land Cover Types*

Following is a summary of data, including acreage and percent cover, by general categories of land use type. By far, undeveloped lands, 70 percent of the total land cover type, represent the City’s prevalent land cover type. Residential uses represent 20 percent, while Commercial, Industrial and Mining, Institutional, Transportation and Utilities combined represent 10 percent of the total land cover type. Conserved and protected lands (both municipal and private) represent less than three percent of the total land cover type.

**Table 1: Land use by type and acreage**

<b>Land Use Type</b>	<b>Acres</b>	<b>% Total City Area</b>
Residential (single-family, two-family, multi-family, mobile home parks, other lodging)	5,855.5	20.1
Commercial (wholesale, services, retail, office, mixed use)	463.9	1.6
Industrial and Mining	342.3	1.2
Institutional (government, educational, cultural, cemetery)	316.5	1.1
Transportation (air, rail, roads, highways, right-of-way, parking)	833.1	2.9
Utilities (utilities, water, wastewater, solid waste)	865.2	3.0
Undeveloped Lands (agriculture, forests, water, wetlands, rivers, vacant)	20,470.5	70.4
Conserved and Protected Lands	768.05	2.6

[Source: Strafford Metropolitan Planning Organization (SMPO) Database, April 2007]

Note: The data in this table is from the 2001 New Hampshire Land Cover Assessment based on LANDSAT satellite imagery. This data is accurate to within approximately 0.2 acres. A detailed explanation of the methodology behind this data can be found in *New Hampshire Land Cover Assessment Final Report*; Complex Systems Research Center, UNH, January, 2002.

### **Zoning Districts**

At 60.4 percent of the total land area, Agricultural is the largest zoning district in the City, followed by Residential districts (24 percent combined), Industrial districts (13 percent combined), and Business districts (3 percent combined). Refer to [Figure 3- Zoning Map](#) for the geographic area for each zoning district.

**Table 2: Summary of zoning districts and acreage**

Zoning Code	Zoning Districts	Acres	% Total City Area
A	Agricultural	17,554.1	60.36
R-1	Residence 1	5,419.0	18.63
R-2	Residence 2	1,430.7	4.92
B-1	Business 1	114.8	0.39
B-2	Business 2	704.0	2.42
H	Hospital	57.1	0.20
I-1	Industry 1	350.2	1.20
I-2	Industry 2	1,933.7	6.65
I-3	Industry 3	600.0	2.06
I-4	Industry 4	759.8	2.61
I-4A	Industry 4A	118.8	0.41
Overlay Districts and Zones			
SD	Special Downtown Overlay	153.4	0.53
F	Regulatory Floodway Overlay	2,413.04	8.3
AP	Aquifer Protection Overlay	1,461.51	5.03
AA	Airport Approach Overlay	unknown	---
W	Conservation Overlay	unknown	---
	Historic District Overlay	unknown	---

[Sources: City of Rochester and FEMA]

### 2.3 Environmental Constraints

Natural resources that are regulated by local ordinances or regulations are considered “constrained lands” or areas of the City that are not appropriate for development due to sensitive resources and where regulations exist that restrict and/or regulate development. Constrained land includes parcels under conservation easements as well as lands within required setbacks and buffers to these resources. Regulated resources include: the Cochemo, Salmon Falls and Isinglass Rivers; certain other named streams and surface waters; wetlands including poorly and very poorly drained soils, and vernal pools; floodplains; and aquifers.

Areas where development is regulated in Rochester include the Conservation Overlay, Regulatory Floodway Overlay, and Aquifer Protection Overlay Districts, the 100-foot buffer from the Isinglass River, a protected river under the State’s Rivers Management and Protection Program, and setbacks for certain uses along the Cochemo and Isinglass Rivers and from City owned right of ways. Refer to the table below for a listing of these requirements.

**Table 3: Summary of municipal land use setback and buffer requirements**

<b>Land Use Type</b>	<b>Description</b>	<b>Setback/Buffer</b>
Conservation Overlay District	Named streams and surface waters <sup>1</sup> and Wetlands (including poorly and very poorly drained soils, and vernal pools)	50 feet
	Structural and land disturbance setback from the Cocheco, Salmon Falls and Isinglass Rivers	75 feet
Solid Waste Facilities	Setback from 100-year floodplain of the Cocheco and Isinglass Rivers	100 feet
Recycling and Materials Recovery Facility	Setback from City-owned right of ways	100 feet
Transfer Station or Composting Facility	Setback from City-owned right of ways	150 feet
Solid Waste Facilities	Setback from Cocheco and Isinglass Rivers	200 feet

[Source: City of Rochester Zoning Ordinance]

<sup>1</sup> From Conservation Overlay District Table I: Axe Handle Brook (Rickers and Howard Brooks), Health Brook, Hurd Brook, Willow Brook (Wardley Brook), Clark Brook, Baxter Lake, Rochester Reservoir, Hanson Pond (Squamagonic Pond), Little Long Pond



## 3.0 TOPOGRAPHY

### Policy Statement

**Provide regulatory, educational, and voluntary measures to protect natural resources and property from the adverse effects of human activities on steeply sloping lands.**

Growth and development on steeply sloping lands can often result in greater disturbance and consequences such as flooding, soil erosion, loss of forested and vegetated landscapes, and increased velocity of runoff. Standards to prevent these adverse effects and to limit development under certain conditions are necessary to protect degradation of natural resources and the public welfare.

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### **3.1 Topographic Features**

The topography of Rochester forms moderately sloping landscapes dominated by low hills and the broad floodplain of the Cocheco River valley, which trends north to south through the central portion of the City. The floodplain is surrounded by gently sloping hills that gradually rise toward the City's eastern and western boundaries punctuated by isolated areas of steeply sloping terrain (>15 percent). The highest elevations in the City include:

<i>Unnamed Hill #1</i>	660 feet (approx.)	West of Route 16 and east of Cross Road
<i>Chesley Hill</i>	588 feet (approx.)	Southeast of Chesley Hill Road
<i>Unnamed Hill #2</i>	573 feet	Northeast of Round Pond at Barrington boundary
<i>Gonic Hill</i>	500 feet (approx.)	Southeast of Route 108 and Tebbetts Road
<i>Unnamed Hill #3</i>	500 feet (approx.)	East of Little Long Pond at Barrington boundary
<i>Hayes Hill</i>	497 feet	Southwest of Route 202 and Chesley Hill Road

Refer to [Figure 4- Topographic Map](#) for detailed information about the general topography and distribution of steep slopes in Rochester.

### **3.2 Steep Slopes**

Based on the NRCS Strafford County Soil Survey (1973), Rochester has 1,426.3 acres of steep slopes (fifteen percent or greater) or 4.9 percent of the total land area of the City. As reported in the 1973 Strafford County Soil Survey, slopes of 15 percent and greater are considered steep. The rationale for establishing this specific percent slope limit for steep slopes is based on specific properties of the overlying soil including erodibility, grain size and composition, aspect, slope and elevation.

As shown in [Figure 4- Topographic Map](#), slopes of 20 percent and greater are concentrated west of NH Route 125 between NH Routes 202A and 125. Isolated areas of slopes greater than 20 percent are located in the northern tip of the City west of NH Route 16 near the Farmington border and between NH Routes 16 and 108 south of Tebbetts Road.

### **3.3      Recommendations**

<b>ID</b>	<b>Action</b>
TP 1	Develop specific standards to minimize or eliminate disturbance to steep slopes that are contiguous with or drain to state and locally regulated buffers to protect water quality of surface waters and wetlands. <i>Priority Ranking: Intermediate</i>
TP 2	Support enforcement and implementation of the provisions of City Ordinance Chapter 50 as they relate to erosion and sedimentation control and stormwater best management practices for development on steep slopes to protect the quality of surface waters and wetlands. <i>Priority Ranking: Long Term</i>

## 4.0 SOILS

### **Policy Statement**

**Work cooperatively with local, state and federal programs to provide incentives for landowners to preserve important farmlands.**

Rochester's agricultural heritage is no longer as prominent use of land within the community as it once was; however, a number of continually operating farms remain in the City. These farms still contribute significantly to the character of the community and provide an economically beneficial use of the land for both the City and the landowner.

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### **4.1 Overview of Soils**

Soil is the unconsolidated mineral and organic matter on the immediate surface of the earth that serves as a natural medium for the growth of land plants. Understanding the nature and properties of soils is critical to managing and conserving natural resources.

Through its Soil Survey Program, the Natural Resources Conservation Service (NRCS) studies and inventories soil resources across the country. The geographic extent of these soil surveys is typically the County level. Soil surveys contain information in the form of detailed soils maps, data tables and text narratives that can be used in order to determine appropriate uses for the land. Soil surveys also contain predictions of soil behavior for selected land uses and highlight limitations and hazards inherent in the soil and the impact of selected land uses on the environment.

The U.S. Department of Agriculture Natural Resource Conservation Service issued the most recently published edition of the Strafford County Soil Survey in 1973. The smallest soil area that can be shown on the county soil survey is three acres in size. The data and soils maps for this section were derived from digitized maps from the 1973 survey. The following figures show the distribution of different soil types: agricultural soils on [Figure 5- Agricultural Soils Map](#), wetlands soils (Hydric A and B soils) on [Figure 11- Water Resources Map](#) and general soils classes on [Figure 7- General Soils Map](#).

#### ***Soil Class***

Soil classes are land capability classifications, which is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time.

#### ***Soil Classification Factors***

Soil classification is the systematic categorization of soils based on soil morphology (distinguishing characteristics such as color, texture, structure, parent material, depth and

thickness) as well as criteria that dictate choices in land use (slope, landscape surface configuration, permeability, erodibility, soil water, vegetation). In the USDA soil surveys, soil classification criteria is based on soil morphology in addition to characteristics developed during soil formation (chemical weathering due to climate, actions of living organisms, and parent material). Criteria are designed to guide choices in land use and soil management. Soil taxonomy based soil map units are additionally sorted into classes based on technical classification systems such as land capability classes, hydric soils, and prime farmland soils.

**Table 4: Soils by soil class and acreage**

<b>Soil Class</b>	<b>Description</b>	<b>Acres</b>	<b>% City Area</b>
IA	Deeper, loamy soils, moderately to well-drained (northern hardwood forest type)	7,438	25.6
IB	Sandy or loamy soils, moderately to well-drained (mixed hardwood forest type)	6,983	24.0
IC	Outwash sands and gravels (pine forest type)	6,374	21.9
IIA	IA and IB soils with limitations such as steepness, shallow bedrock or rocky conditions	880	3.0
IIB	Poorly drained soils	5,282	18.2
Unclassified	Muck and peat, rock outcrop, gravel pits, marsh	2,089	7.2
<b>Total</b>		<b>29,045</b>	

[Source: Natural Resource Conservation Service (NRCS) Strafford County Soil Survey (1973)]

#### **4.2 Soil Drainage Characteristics**

Soil drainage characteristics can be described as a soil's permeability or the ability of air and water to move through it. Permeability is influenced by the size, shape, and continuity of the pore spaces, which is dependent on the soil density, structure and texture. Of these characteristics, texture is one of the most important because it influences many other properties of great significance to land use and management, such as irrigation needs, erosion potential and fertility. Soil texture describes the proportionate distribution of the different sizes of mineral particles in a soil, not including organic matter. Generally, sandy soils tend to be low in organic matter content and fertility, low in ability to retain moisture and nutrients, well drained and therefore well suited for road foundations and building sites. Finer-textured soils generally are more fertile, contain more organic matter, are better able to retain moisture and nutrients, and permit moderately drained. When soils are so fine-textured as to be classified as clay, however, which are somewhat difficult to manage for cultivation, and have characteristics that affect their suitability adversely for use as building sites and for road construction (can retain water and shrink when dry).

**Table 5: Soil drainage characteristics and acreage**

<b>Characteristic</b>	<b>Acres</b>	<b>% Total City Area</b>
Excessively Drained	6,322.8	21.7
Somewhat Excessively Drained	2,951.2	10.2
Well Drained	8,216.1	28.3
Moderately Well Drained	4,183.5	14.4
Poorly Drained (Hydric B)	5,542.5	19.1
Very Poorly Drained (Hydric A)	1,166.1	4.0
<b>Total</b>	<b>28,382</b>	

[Source: Natural Resource Conservation Service, Strafford County Soil Survey (1973)]

### **4.3 Farmland Soils**

Following are descriptions of the three classifications of farmland soils presented in Table 6.

Prime Farmland. Prime Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when the land is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources and causes the least damage to the environment. Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has a favorable temperature and growing season and acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and either does not flood frequently or is protected from flooding. The slope ranges mainly from 0 to 8 percent. Prime farmland may now be in crops, pasture, or woodland, but not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Farmland of Statewide Importance. Farmland of Statewide Importance is land, in addition to prime and unique farmlands that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. Generally, these farmlands include those areas that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.

Farmland of Local Importance. Farmland of Local Importance includes certain additional farmlands for the production of food, feed, fiber, forage, and oilseed crops.

Table 6 below summarizes the acreage of each farmland soil type and the distribution of the farmland soils as shown in [Figure 5- Agricultural Soils Map](#)

**Table 6: Acres of farmland soils by type**

<b>Farmland Soil Type</b>	<b>Acres</b>	<b>% Total City Area</b>
Farmland of Local Importance	6,779.5	23.2
Prime Farmland	2,961.5	10.2
Farmland of Statewide Importance	1,128.0	3.9
<b>Total</b>	<b>10,869.0</b>	<b>37.3</b>

[Source: Natural Resource Conservation Service, Strafford County Soil Survey (1973)]

### *Undeveloped Farmland Soils*

Rochester's undeveloped prime farmland soils are located in the suburban fringe areas in southern part of the City between NH Routes 16 and 125, the intersection of Salmon Falls Road and Old Salmon Falls Road to the Somersworth-South Berwick municipal boundaries, and along NH Route 108 from the intersection with Tebbetts Road east to the Somersworth municipal boundary.

Undeveloped farmlands of statewide importance are interspersed among the prime farmland soils in the suburban fringe areas in southern part of the city between NH Routes 16 and 125.

Undeveloped farmlands of local importance are dispersed equally throughout the City, primarily located on large lots and parcels and interspersed among the prime farmland in the suburban fringe areas in the southern part of the city between the Spaulding Turnpike (NH Routes 16) and NH Route 125.

### *Developed Farmland Soils*

Significant acreage of farmlands of local importance is located in the City's urban core and downtown district and along the major transportation corridors leading to and from the urban core. These areas are densely developed, where development has followed and expanded upon colonial settlement patterns. Lesser acreage of developed farmlands of statewide importance are located along the major transportation corridors – Routes 108, Route 202, Route 202A, Ten Rod Road and Meaderboro Road - leading to and from the urban core.

## **4.4 Agriculture**

Agriculture is no longer as prominent in Rochester as it was historically; however, a number of operating farms remain in Rochester. These farms and properties still contribute significantly to the character of the community and provide an economically beneficial use of the land for both the City and the landowner. Agricultural preservation is an important component of preserving rural character. Refer to Section 14.2 for discussion of agricultural preservation efforts in Rochester.

<u>Property Name</u>	<u>Location</u>
Vickery Orchard	Meaderboro Rd
Parcell Farm	Pickering Rd
Great Elm Farm	Pickering Rd
Fowler Farm	Salmon Falls Rd
Gagne Farm	Rochester Hill Rd
Barden Tree Farm	

The following properties are currently in use for hay production:

Laverdiere property	Ten Rod Rd
Meader property	Meaderboro Rd
Jacob property	Portland St

As in many areas throughout the state, landowners engage in home based, noncommercial agricultural production, such as roadside stands and farmers markets, which offer produce, plants, flowers, maple syrup and other products produced on their property. However, these activities have not been inventoried or documented in Rochester. There are likely additional properties and lands throughout Rochester that are not included in the list above being used for agricultural purposes such as food production, haying activities, and other residents who raise small herds of livestock and other farm animals, raise vegetables, fruits, flowers, herbs and produce maple syrup products for their own consumption and to share with others.

**4.6        Recommendations**

<b>ID</b>	<b>Action</b>
SL 1	Encourage revisions to ordinances and regulations to provide for preservation of land that contains the Farmland soil type. (For example, consider changes to the cluster development zoning regulations [Section 42.24] to encourage preservation of farmland soils.) <i>Priority Ranking: Highest</i>
SL 2	Continue the practice of preserving farmland soils as criteria for prioritization of land conservation planning and acquisition of conservation lands. <i>Priority Ranking: Intermediate</i>

## 5.0 FORESTS AND URBAN TREES

### **Policy Statement**

**Create a greenway network system in both suburban and urban areas that encompasses large unfragmented forests and woodlands, particularly along major stream, river and wetland systems**

Rochester currently has a relatively dense network of forests and woodlands both in rural and suburban; however, connections between large conservation parcels and other conserved lands could be strengthened through land protection measures and by allowing regeneration of forested lands. Rochester lacks an interconnected network of forests, groups of trees and street trees within the urban core area.

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### **5.1 Overview of Forests and Trees**

Forest resources provide economic, recreational and aesthetic functions and values to the community. Rochester's forest resources provide the following: fire wood and wood products, wildlife habitat, scenic beauty, stabilization of land, removal of pollutants, maintenance of stream quality and habitat, improvements to air quality and temperature, and research opportunities. Forests and woodlands provide recreational functions including scenic trails for hiking, walking, biking and horseback riding, hunting grounds for bird and game species, and a natural laboratory for botanists, bird watchers and scientific research. Forest and woodland buffers along roads and between properties provide aesthetic benefits such as visual screening, and reduce sound, noise and air pollution from developed areas.

### **5.2 Forest and Woodland Cover**

Rochester is 53 percent forested with 15,272.85 acres of mixed hardwood, deciduous and coniferous forest. Many of Rochester's forests have grown from abandoned agricultural land and clear-cut areas that have regenerated and matured over the last half century. Densely forested areas are located outside the urban core of the City, areas west of Route 16 and areas east of Route 108 to the Salmon Falls River. Forest types and acreages are summarized below in Table 7 and shown on [Figure 8- Forest Types and Contiguous Forest Blocks Map](#).

However, due to increased population and development, forested lands are decreasing in the region. It is estimated that by 2020, forest cover is predicted to decline to 80% of the state's land area, with a total loss between 1993 and 2020 of 144,000 acres. The greatest loss of forested land is expected to occur in southeastern New Hampshire, with about 60,000 acres lost in



Rockingham, Hillsborough, and Strafford Counties, where 85% of the growth from 1998 to 2020 is expected to occur.<sup>1</sup>

**Table 7: Forest land cover by type and acreage**

<b>Forest Type</b>	<b>Acres</b>	<b>% Total Land Area</b>
Mixed Forest	8,732.53	30.03
Beech/Oak	1,869.42	6.43
Other Hardwoods	1,680.01	5.78
White/Red Pine	2,114.68	7.27
Hemlock	219.9	0.76
Forested Wetland	630.93	2.17
Orchard	25.38	0.10
<b>Total</b>	<b>15,272.85</b>	<b>52.52</b>

[Source: NH Fish and Game, June 2007]

### **5.3 Contiguous Forest Blocks**

Contiguous forest blocks function as prime habitat for all local species and connections between them provide species access to important breeding, hunting and foraging. As shown in [Figure 8- Forest Types and Contiguous Forest Blocks](#), Rochester has several large unfragmented forested blocks comprising 15.4 percent of the total land area of the City.

Area #3 Hemlock Hardwood Pine, the largest contiguous forest block comprising 1,404 acres, is located northeast of Salmon Falls Road to the banks the Salmon Falls River. This block also contains forested floodplain, an important habitat for migratory and predatory birds in the region, and mammal species such as river otter and beaver.

Area #5 Appalachian Oak Pine, the second largest contiguous forest block comprising 1,232 acres, is located on the Strafford boundary northwest of Estes Road between Routes 202A and 202. This block contains several large riverine wetland complexes and is bisected by Howard Brook and Axe Handle Brook, major tributaries of the Cochecho River.

Area #1 Appalachian Oak Pine, the third largest contiguous forest block comprising 869 acres, is located on the Farmington boundary and bounded by Little Falls Bridge Road and Chestnut Hill Road. This block contains the northern most reach of the Cochecho mainstem in Rochester and extensive stratified drift aquifers containing municipal drinking water supply wells and several community wells.

For additional information about the habitat values of contiguous forest blocks, refer to Section 6 Areas of Ecological Significance.

<sup>1</sup> *New Hampshire's Changing Landscape Population Growth, Land Use Conversion, and Resource Fragmentation in the Granite State* (October 1999), Prepared by: Dan Sundquist, The Society for the Protection of New Hampshire Forests and Michael Stevens, The New Hampshire Chapter of The Nature Conservancy

**Table 8: Contiguous forest blocks by dominant forest type**

Area Number*	Dominant Forest Type	Habitat Priority Rank	Acres
1	Appalachian Oak-Pine	Tier 2	869.04
2	Appalachian Oak-Pine	Tier 1	493.31
3	Hemlock Hardwood-Pine	Tier 2	1,403.96
4	Hemlock Hardwood-Pine	Tier 1	82.71
5	Appalachian Oak-Pine	Tier 2	1,231.78
6	Appalachian Oak-Pine	Tier 1	407.96
	<b>Total</b>		<b>4,488.76</b>

[Source: NH Fish and Game, Wildlife Action Plan, June 2006]

\* Area Number as shown in [Figure 8- Forest Types and Contiguous Forest Blocks](#)

Note: The NH Wildlife Action Plan defines Tiers as follows: Tier 1-Highest Ranked Habitat by ecological condition in NH; Tier 2-Highest Ranked Habitat by ecological condition in Biological Region

#### *American Forests' National Register of Big Trees*

Since 1940, American Forests has documented the largest known specimens of every native and naturalized tree in the United States in the American Forests' National Register of Big Trees. The largest tree of its species in the country is the National Champion. National champion trees are truly impressive not only for their size and strength, but because they are symbols of all the good work trees do for the quality of the environment and our quality of life.

#### *NH Big Tree Program*

In an effort to find, record, and recognize individual landmark specimen trees, the New Hampshire Big Tree Program was started in 1950, and works cooperatively with the National Register of Big Trees. The list of recorded champions now includes more than 200 giant trees. Community Tree Steward volunteers help identify, measure, and record these giant trees at the state, county and national levels. The NH Community Tree Steward Volunteer Program publishes a list of the biggest trees of each species throughout the state (available at <http://extension.unh.edu/forestry/BigTree.htm>). The list reports information about the largest specimen of each species including: height, circumference, average crown diameter, year of measurement, location by city and county, and health status. Note: The location of individual trees is not published to protect the integrity of the resource. Table 9 below lists the inventory of Big Trees in Rochester.

**Table 9: Inventory of Big (Champion) Tree species in Rochester**

Species	Latin Name	CBH (inches)	Height (feet)	Status	Year	Condition
Butternut	Juglans cinera	158	67	County	1972	unknown
Eastern Hophornbeam	Ostrya virginiana	64	52	County	1975	Poor
White Oak	Quercus alba	164	70	County	1984	Good
Scotch Pine	Pinus sylvestris	98	72	State	2006	Fair

[Source: State and County Listing of NH Big Trees]

CBH = Circumference at Breast Height; forestry convention for measuring tree circumference

Large mature trees provide more cooling shade and more places for wildlife to perch and nest, and sequester more carbon dioxide, trap more pollutants, and purify more water. Although many tree species can outlive humans - 100 to 200 years is not unusual – trees naturally succumb to age, disease and insects, and environmental conditions such as wind, rain, and drought. And now, all too often, these trees are sometime lost to development. All trees contribute to the improvement our environment in various ways. It is society’s responsibility to maintain a healthy environment that allows trees to grow to champion status.

#### 5.4 **Environmental Importance of Forests and Trees**

Forests provide many social, health, ecological, and economic benefits on local, regional and national levels. Forests process rainwater through absorption and evapotranspiration, reduce carbon dioxide in the atmosphere, increase groundwater infiltration, and improve surface water quality by removing pollutants and nutrients from runoff, and serve as buffers to protect wetlands from sedimentation and contamination. Near surface water bodies, homes, roads and urban areas, trees cool summer temperatures, break winter winds, and filter dust and pollutants from the air. American Forests (a national non-profit forestry research and advocacy group) estimates that many cities have seen a decline in natural tree cover by as much as 30% over the last several decades while impervious surface coverage has increased rapidly. As urban areas expand and populations move outward to suburban areas, there is ecological and economic value to evaluating this important conservation issue.

##### *Value of Trees*

Studies prove that trees have a positive effect on many aspects of people’s lives, including their health, homes, businesses, communities, drinking water, and air quality.

**Table 10: Statistics of the positive effects of trees on daily life and well being**

<b><i>Economic Contributions</i></b>
<p>✓ Research shows that shoppers in well-landscaped business districts are willing to pay more for parking and up to 12% more for goods and services.                      [Source: Wolf, K. L. 1999. Nature and Commerce: Human Ecology in Business Districts. In: Kollins, C., ed. Building Cities of Green: Proceedings of the 9th National Urban Forest Conference, Washington, DC: American Forests.]</p>
<p>✓ Landscaping, especially with trees, can significantly increase property values. Example: A value of 9% (\$15,000) was determined in a U.S. Tax Court case for the loss of a large black oak on a property valued at \$164,500.                      [Source: Neely, D., ed. 1988. Valuation of Landscape Trees, Shrubs, and Other Plants, 7th ed. Council of Tree and Landscape Appraisers, International Society of Arboriculture.]</p>
<p>✓ Trees reduce runoff and erosion from storms by about 7% and reduce the need for erosion control structures, and the use of smaller drainpipes can save cities on materials, installation and maintenance.                      [Source: Miller, Alban L.; Riley, J.; Schwaab, E.; Rabaglia, R.; Miller, K. 1995. Maryland’s Forests: A Health Report. Annapolis: Maryland Department of Natural Resources Forest Service.]</p>
<p>✓ Amenity and comfort ratings were about 80% higher for a tree-lined sidewalk compared with those for a non-shaded street.                      [Source: Wolf, Kathy L. 1998. Trees in Business Districts: Positive Effects on Consumer Behavior! Fact Sheet #5. Seattle: University of Washington, College of Forest Resources, Center for Urban Horticulture.]</p>

<b><i>Energy Savings</i></b>
<p>✓ The net cooling effect of a young, healthy tree is equivalent to 10 room-size air conditioners operating 20 hours a day.            [Source: The National Arbor Day Foundation. 2004. The value of trees to a community. (January 12)]  <a href="http://www.arborday.org/trees/Benefits.cfm">www.arborday.org/trees/Benefits.cfm</a></p>
<p>✓ Trees properly placed around buildings as windbreaks can save up to 25% on heating costs.            [Source: Heisler, G.M. 1986. Energy Savings With Trees. Journal of Arboriculture 12.]</p>
<p>✓ As few as three trees properly positioned can save the average household between \$100 and \$250 annually in energy costs.            [Source: U.S. Department of Energy. 2003. Energy Savers, Tips on Saving Money and Energy at Home. Energy Efficiency and Renewable Energy Clearinghouse.]</p>
<p>✓ Shade from two large trees on the west side of a house and one on the east side can save up to 30% of a typical residence's annual air conditioning costs.            [Source: Simpson, J.R.; McPherson, E.G. 1996. Potential of Tree Shade for Reducing Residential Energy use in California. Journal of Arboriculture 22(1).]</p>
<p>✓ Compared with an open area, a good windbreak that does not shade the house will save about 15% of the heat energy used in a typical home.            [Source: Heisler, Gordon M. 1990. Tree plantings that save energy. In: Rodbell, Philip D., ed. Proceedings of the Fourth Urban Forestry Conference; 1989 October 15-19; St. Louis, MO, Washington, DC: American Forestry Association.]</p>
<b><i>Environmental Contributions</i></b>
<p>✓ Modest increases of 10% canopy cover along the East Coast from Baltimore to Boston were shown to reduce peak ozone levels.            [Source: Luley, Christopher J.; Nowak, David J. 2004. Help Clear the Smog with Your Urban Forest: What You and Your Urban Forest Can Do About Ozone. Brochure. Davey Research Group and USDA Forest Service, Northeastern Research Station.]</p>
<p>✓ Research indicates that 100 mature tree crowns intercept about 100,000 gallons of rainfall per year, reducing runoff and providing cleaner water.            [Source: USDA Forest Service. 2003. Benefits of Urban Trees. Urban and Community Forestry: Improving Our Quality of Life. Forestry Report R8-FR 71. [Atlanta, GA:] Southern Region.]</p>
<p>✓ An area of trees 98 feet wide and 49 feet tall can reduce highway noise by 6 to 10 decibels.            [Source: New Jersey Forest Service. [undated]. Benefits of trees. Fact sheet. Jackson, NJ: Forest Resource Education Center.]</p>
<p>✓ Trees in parking lots have been shown to reduce asphalt temperatures by as much as 36 degrees Fahrenheit, and car interior temperatures by over 47 degrees Fahrenheit.            [Source: Scott, Klaus I.; Simpson, James R.; McPherson, E. Gregory. 1999. Effects of Tree Cover on Parking Lot Microclimate and Vehicle Emissions. Journal of Arboriculture 25(3).]</p>
<p>✓ A typical community forest of 10,000 trees will retain approximately 10 million gallons of rainwater per year.            [Source: USDA Forest Service. 2003. Is All Your Rain Going Down the Drain? Look to Bioretainment—Trees are a Solution. Davis, CA: Pacific Southwest Research Station, Center for Urban Forest Research.]</p>

[Source: *Urban and Community Forestry Appreciation Tool Kit*, USDA Forest Service NA-IN-02-04]

### ***Forest Habitats***

Forests are often comprised of multiple species and several forest types. Forest types are distinctive associations or communities of trees, shrubs, and herbaceous plants. They are named for the predominant tree species occurring in the forest type. A forest type may be dominated by a single tree species (called a monoculture as often seen in pine forests) or it may be dominated by several species growing together to form a complete vertical forest structure or any combination of canopy, understory and groundcover. Forest types in Rochester are listed in Table 7. Refer to Section 6.0 Areas of Ecological Significance for a detailed discussion of forest habitats.

### ***Economic Valuation of Urban Forests and Trees***

The values of urban forests can also be estimated based on the functions that they perform (aesthetics, pollution removal, and temperature modification). These functional values are only indirectly related to the compensatory value of the tree. The compensatory value of a tree – the dollar value of compensation for loss and/or replacement - is based on four factors: size, species or classification, condition, and location. In general, the greater the compensatory value of the forest the greater the ability of the forest to produce functional benefits. Compensatory values are one of several ways by which urban forests can be valued. Compensatory values are based, in part, on replacement costs and are related to compensation of owners for tree loss. The estimates of compensatory value are an approximation of the structural asset value of a tree with a specific species, size, condition, and location.<sup>2</sup> Refer to the following section on Air Quality and Sequestration following for information about the economic benefits of improved air quality provided by forests and tree cover.

### ***Urban Forestry***

The urban forest is commonly defined as an ecosystem that consists of all the trees, associated vegetation, wild animal life and other natural resources extending from the City center to the edges of the suburban fringes. Over time, the science and practice of urban and community forestry has evolved into a comprehensive effort to manage, conserve, and enhance forest and tree resources in and around cities, towns, and suburban areas. But unlike traditional forestry, urban and community forestry focuses on managing trees and forests for a variety of societal benefits, primarily in response to population growth and development resulting in expansion of urban and suburban areas.

Street trees, private lawn trees, trees in parks and riparian areas, and small urban forest blocks all play an important role in the lives of urban residents, business owners and wildlife. The benefits provided by urban forests and the challenges in managing them present the urban forester with a unique opportunity to improve the appearance and appeal of communities. While traditional forestry looks more at forest products, recreation potential, and wildlife benefits provided by

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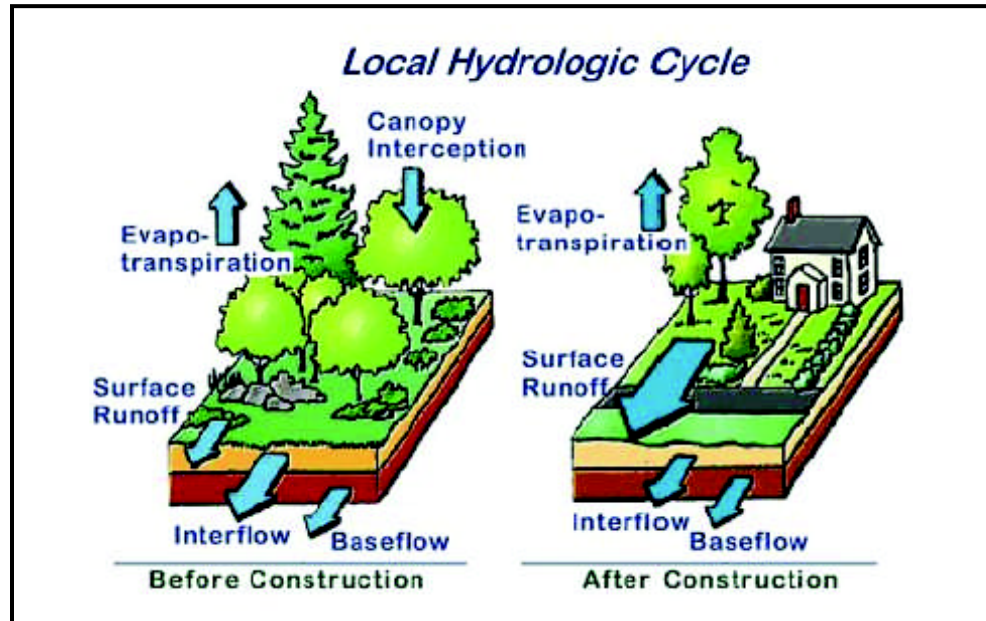
<sup>2</sup> From Nowak et al.: Compensatory Values of Urban Trees in the U.S. at <http://www.treelink.org/joa/2002/july/05Nowak.pdf>

forests, urban forestry focuses more on the interaction of trees and people, landscape design, and individual tree management (arboriculture).<sup>3</sup>

### ***Urban Tree Canopy***

Urban tree canopy is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. The function of the urban tree canopy is to improve water quality in urban areas by increasing canopy cover and reducing surface runoff (refer to Figure 9 below).

**Figure 9: Role of urban tree canopy in managing stormwater runoff**



[Source: Maryland Department of Natural Resources, Urban & Community Forestry Program]

Trees provide two stormwater management functions: first, by leaves and branches intercepting and absorbing some rainfall, and second, by reducing the size and velocity of intercepted raindrops before they reach the ground. Maintaining and restoring riparian forests is an effective method to manage and treat runoff before it reaches surface waters and wetlands. In urban areas, stormwater is efficiently collected from an impervious surface to a conveyance (like a curb and gutter) to an inlet to a pipe and into surface waters and wetlands. Disconnecting this conveyance “train” to allow interception of rainfall and runoff is a critical step to restoring the stormwater management function of the urban tree canopy.<sup>4</sup>

<sup>3</sup> Maryland DNR, Urban & Community Forestry Program:  
<http://www.dnr.state.md.us/forests/programs/urban/urbantreecanopygoals.asp>

<sup>4</sup> Maryland DNR, Urban & Community Forestry Program:  
<http://www.dnr.state.md.us/forests/programs/urban/urbantreecanopygoals.asp>

## ***Air Temperature and the “Heat Island” Effect***

For many urbanizing areas and cities, the “heat island effect” is of growing concern. This phenomenon describes urban and suburban temperatures that are 2 to 10°F (1 to 6°C) hotter than nearby rural areas and the surrounding natural land cover. Elevated temperatures result from the conversion of natural land cover to impervious surfaces such as parking lots, structures and roads. Natural lands such as parks, open land, trees and bodies of water can create cooler areas in an urban setting. Elevated temperatures can impact communities by increasing peak energy demand, air conditioning costs, air pollution levels, and heat-related illness and mortality. Strategies to mitigate and reduce the heat island effect include:

- Energy Savings – reduce energy demand by installing cool roofs (light colored to reflect sunlight) and cool pavements, planting shade trees and vegetation (evapotranspiration cools air), installing energy efficient appliances and light bulbs, and constructing energy efficient buildings.
- Heat, Health and Environment – develop community strategies to address excessive heat events and heat-response programs to coordinate a comprehensive community wide action plan.
- Research – incorporate in planning initiatives national research on new technologies and building materials, and evaluate the local effects of heat and land cover conversion.
- Community Action – implement education and outreach about heat reducing techniques such as tree planting, landscaping and energy conservation methods.<sup>5</sup>

## ***Air Quality and Sequestration***

Atmospheric Pollutants. The process of sequestration is the removal of pollutants from the atmosphere and water storage in living vegetation or biomass. Trees sequester many pollutants in the atmosphere (greenhouse gases or GHGs) including nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), ozone (O<sub>3</sub>), carbon monoxide (CO), and particulate matter of ten microns or less. The air quality benefits and economic value of trees with respect to air pollution has been shown to be significant in urban and metropolitan areas across the country, totaling in the millions of dollars annually in cost savings in areas such as health care and pollution abatement.<sup>6</sup>

Carbon Sequestration. Forests can sequester carbon over decades or even centuries, when the forest ecosystem reaches maturity and eventually a stage of carbon saturation. Carbon from forests can also be stored in wood products such as furniture and housing lumber for years to decades. Natural decay and disturbances such as fire or harvesting can release carbon back into the atmosphere as CO<sub>2</sub>. Carbon sequestration duration and effectiveness differs by individual forestry and agricultural practices.<sup>7</sup> *Afforestation*, the natural generation of forests, and *reforestation*, the active planting of forests, sequester approximately 0.3 to 2.6 metric tons of carbon per acre of forest per year over the average life span of approximately 90 to 120 years for most trees.<sup>8</sup>

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<sup>5</sup> U.S. Environmental Protection Agency, Heat Island Reduction Initiative: <http://www.epa.gov/hiri/>

<sup>6</sup> American Forests: <http://www.americanforests.org/graytogreen/air/>

<sup>7</sup> EPA, Climate Change Program: <http://www.epa.gov/sequestration/>

<sup>8</sup> EPA Carbon Sequestration in forestry and Agriculture at <http://www.epa.gov/sequestration/practices.html>

The manner in which forest products are utilized results in different carbon sequestration profiles. When forest products are burned for fuel carbon is released into the atmosphere. When forest products are used for building materials carbon is sequestered for the lifetime of the structure and can be prolonged when building materials are recycled for new construction or renovation of structures. The manufacture of paper products effectively sequesters carbon providing these materials are recycled and not disposed of in landfills or burned.

The protection of forests through land conservation allows the maximum period of carbon sequestration by allowing forests to remain intact until maturity. Even if actively timbered, afforestation continues the sequestration cycle. Additionally, preservation of riparian and wetland buffers serve the same purpose, on a smaller scale, by retaining forests and trees in developing suburban and developed urban areas.

Pollutants From Runoff. Trees and other types of vegetation remove dissolved and particulate forms of pollutants from stormwater runoff where they are stored in biomass (which includes their roots and above ground parts). Thus, natural vegetation on the landscape, particularly near surface waters and wetlands, provide benefits to the community by performing stormwater management functions that protect water quality.

Ozone. Certain atmospheric conditions - excessive heat temperatures and sunlight - can increase the rate of ground-level ozone formation (also called smog). Ground level ozone is not emitted directly into the atmosphere, but it is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the presence of sunlight. Emissions from industrial facilities, electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOCs<sup>9</sup>. Ground-level ozone can present a threat to health and ecosystems within and downwind of urban and industrial areas. Exposure to elevated ambient ozone levels can pose health problems in vulnerable populations such as children, the elderly, and persons with respiratory conditions. Ozone can damage the foliage of trees and other vegetation, making them susceptible to disease, insects, other pollutants, harsh weather, and reduce crop and forest yields.<sup>10</sup>

#### *Aesthetic and Scenic Quality and Rural Character*

The forested landscapes of New Hampshire help define and enrich our quality of life by providing social, ecological and economic benefits. Forested landscapes are inspiration for artists, writers and naturalists, and local residents and tourists that observe the spectacular fall foliage display each year. Forests are also a living landscape in our region where managed woodlands, farms, pastures, meadows and fields are an integral part of the landscape. Forested lands help sustain dynamic communities with clean water and air, forest and agricultural products, habitat for native plants and animals, scenic beauty, jobs, and recreational opportunities.

As part of the Comprehensive Rezoning Project, the City is considering a Scenic Road Overlay District. If adopted, this ordinance will designate specific roads along which trees and other

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<sup>9</sup> U.S. Environmental Protection Agency, Basic Information, Ground-level Ozone: <http://www.epa.gov/air/ozonepollution/basic.html>

<sup>10</sup> U.S. Environmental Protection Agency, Heat Island Reduction Initiative: <http://www.epa.gov/hiri/>



features will be maintained to preserve the road’s scenic quality. Refer to Section 13.2 for more information and a list of roads.

## 5.5 Recommendations

ID	Action
FR 1	Require to the extent possible the retention and planting of trees within the urban core areas as part of the design of development projects. <i>Priority Ranking: Highest</i>
FR 2	Develop guidelines to identify valuable forests and encourage preservation as part of the design process for development sites. <i>Priority Ranking: Intermediate</i>
FR 3	Develop guidance to retain vegetated areas along local streets and roads outside the urban core areas. <i>Priority Ranking: Intermediate</i>
FR 4	Review current protocol that requires pre-construction inspections by City staff prior to construction or land preparation and disturbance to ensure that protective fencing or markers are installed around trees to be preserved on a site. <i>Priority Ranking: Intermediate</i>
FR 5	Review and revise ordinances and regulations to identify methods to include preservation of large contiguous forested blocks. <i>Priority Ranking: Intermediate</i>
FR 6	Inventory City trees and develop a management strategy. <i>Priority Ranking: Long Term</i>
FR 7	Develop an Urban Forestry Plan and Program for the City. <i>Priority Ranking: Long Term</i>
FR 8	Develop a list of tree species most beneficial to the improvement of environmental and aesthetic conditions, and for efficient maintenance and management. <i>Priority Ranking: Long Term</i>
FR 9	Establish a City Tree Committee to advise elected officials and land use boards about retention of existing forest cover, and the maintenance and planting of City trees. <i>Priority Ranking: Long Term</i>
FR 10	Develop an inventory and management plan of forested lands owned by the City. <i>Priority Ranking: Long Term</i>
FR 11	Develop educational materials for distribution to developers and contractors about best care practices for trees during construction, including installation of fencing or markers around trees to be preserved to delineate protective areas (i.e. canopy drip line). <i>Priority Ranking: Long Term</i>
FR 12	Research the existing and historical extent of native ecosystems in the City. <i>Priority Ranking: Long Term</i>

## 6.0 AREAS OF ECOLOGICAL SIGNIFICANCE

### Policy Statement

**Establish local, state and federal partnerships to prevent the loss of significant wildlife habitat by adopting educational, voluntary and regulatory measures for land conservation in Rochester. Guidance should be provided to encourage property owners, including the City, to manage their properties for wildlife habitat.**

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### 6.1 New Hampshire's Wildlife Action Plan

The New Hampshire Fish and Game Department collaborated with partners in the conservation community to create the state's first Wildlife Action Plan. The plan, which was mandated and funded by the federal government through the State Wildlife Grants program, provides New Hampshire decision-makers with important tools for restoring and maintaining critical habitats and populations of the state's species of conservation and management concern - those species identified by the Northeast Wildlife Diversity Technical Committee as a regional concern because of reduced populations or loss of habitat. 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 New Hampshire plan is a comprehensive wildlife conservation strategy that examines the health of wildlife. The plan prescribes specific actions to conserve wildlife and vital habitat before they become more rare and more costly to protect. The *New Hampshire Wildlife Action Plan* by the U.S. Fish & Wildlife Service (2006) is available at [http://www.wildlife.state.nh.us/Wildlife/wildlife\\_plan.htm](http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm). Refer to Table 11 below for a summary of natural habitat communities and protected lands and as shown on [Figure 10- Areas of Ecological Interest Map](#).

As reported in the *New Hampshire Wildlife Action Plan*, Rochester has the following natural habitat communities.

*Appalachian Oak Pine.* Appalachian oak-pine forests are found mostly below 900 ft. elevation in southern New Hampshire. These forests include oak, hickory, mountain laurel, and sugar maple, and are typically associated with warmer and drier climatic conditions. Appalachian oak-pine forests are fire-influenced landscapes with nutrient-poor, dry, sandy soils. They are home to hognose snakes, whip-poor-wills, silver-haired bats and other species of concern. Intense development has dramatically reduced the area of this forest type, which comprises some 10% of the state's total land area, in New Hampshire's southern tier.

*Floodplain Forests.* Floodplain forests occur in valleys adjacent to river channels and are prone to periodic flooding. Also referred to as riparian forests, they support diverse natural communities, protect and enhance water quality by filtering and sequestering pollution, and control erosion and sediment. Their rich soils have been used in agriculture for centuries, such that many floodplains are no longer forested wildlife habitat.

*Grasslands.* Extensive grasslands are defined as areas greater than 10 hectares (~ 25 acres) that are dominated by grasses, wildflowers, and sedges with little shrub or tree cover. Some

examples include hayfields, pastures, and cropland (cornfields and other row crops). Grasslands in NH must be mowed to prevent them from becoming shrublands or forests. Only 8% of NH grasslands are currently under conservation easements.

*Hemlock/Hardwood Pine.* Hemlock-hardwood-pine forests are transitional forests, occurring between hardwood conifer and oak-pine forests. This common forest type is comprised of dry, sandy soils with red oak and white pine. When hemlock-hardwood-pine forests have been burned regularly over time, they may be able to support a pitch-pine sand plains system.

*Peatlands.* Peatlands have water with low nutrient content and higher acidity caused by limited groundwater input and surface runoff. Conservation of the 11 different natural communities that comprise peatlands is vital to the continued existence of many rare plant and wildlife species in New Hampshire. The most challenging issues facing peatlands habitat are development; altered hydrology (amount and flow of water); non-point source pollutants such as road salt, lawn fertilizers, and pesticides; and unsustainable forest harvesting.

*Wet Meadow/Shrub Wetland.* Emergent marsh and shrub swamp systems have a broad range of flood regimes, often controlled by the presence or departure of beavers. This system, which is an important food source for many species, is often grouped into three broad habitat categories: wet meadows, emergent marshes, and scrub-shrub wetlands. Marsh and wetlands filter pollutants, preventing them from getting into local streams, and help hold water to reduce flooding.

**Table 11: Significant habitats by type and acreage**

Habitat Type	Acres	% Total City Area
Appalachian Oak/Pine	7,842.4	27.0
Floodplain Forest	1,776.0	6.1
Grasslands	3,740.2	12.9
Hemlock, Hardwood, Pine Forest	8,398.0	28.9
Marshlands	912.6	3.1
Peatlands	410.1	1.4
Ridge - Talus	48.1	0.17
<b>Total</b>	<b>23,126</b>	<b>**</b>

[Source: NH Fish and Game, Wildlife Action Plan (2007)]

\*\* Percent cover of habitat types are not mutually exclusive geographic areas and do not cover or equal the total area of the City

## **6.2 The Land Conservation Plan for New Hampshire’s Coastal Watersheds**

Spanning 990 square miles and 46 towns, New Hampshire’s coastal watersheds contain exceptional and irreplaceable natural, cultural, recreational and scenic resources. To advance the long-term protection of these resources, the State of New Hampshire, acting through the NH Coastal Program and the NH Estuaries Project, developed a comprehensive, science-based land conservation plan for the state’s coastal watersheds. The State also engaged a partnership of The Nature Conservancy, Society for the Protection of New Hampshire Forests, Rockingham Planning Commission, and Strafford Regional Planning Commission to develop the plan. The New Hampshire Charitable Foundation’s Piscataqua Region supported this effort as a regional

approach to setting land conservation priorities and strategies, and provided funding for the project. The overarching goal of this land conservation plan is to focus conservation 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. The Plan is available on The Nature Conservancy website at <http://www.nature.org/wherewework/northamerica/states/newhampshire/projects/art19061.html>

The Land Conservation Plan for New Hampshire's Coastal Watersheds prioritizes coastal watershed areas and offers regional strategies for maintaining diverse wildlife habitat, abundant wetlands, clean water, productive forests, and outstanding recreational opportunities into the future. The Plan identifies *Conservation Focus Areas and Supporting Landscapes* - areas considered to be of exceptional significance for the protection of living resources and water quality in the coastal watersheds including (1) *Forest Ecosystems*, (2) *Freshwater Systems*, (3) *Irreplaceable Coastal and Estuarine Resources*, and (4) *Critical Plant and Wildlife Habitat*. Each Conservation Focus Area is comprised of a Core Area that contains the essential natural resources for which the focus area was identified, with the boundary fitted to the real world of roads, forest edges, rivers and wetlands. The *Supporting Landscapes* are lands adjacent to and which provide support functions to the Core Focus Areas.

Four Conservation Focus Areas are identified as wholly or partially located in Rochester.

**Rochester Heath Bog** (entirely with Rochester) contains plants and animals of concern, significant wildlife habitats, exemplary natural communities, high yield aquifers and gravel well sites, wellhead protection areas for public drinking water supplies, and permanently protected and/or managed lands.

**Blue Hills** – Blue Job Mountain area (portion in Rochester) contains large unfragmented and aggregated forest blocks, high quality stream watersheds, plants and animals of concern, significant wildlife habitats, high yield aquifers, wellhead protection areas for public drinking water supplies, prime and statewide important farm soils, and permanently protected and/or managed lands.

**Preston Pond Area** (portion in Rochester) contains large unfragmented and aggregated forest blocks, significant wildlife habitats, exemplary natural communities, a wellhead protection area for a public drinking water supply, prime and statewide important farm soils, and permanently protected and/or managed lands.

**Rochester Neck** (portion in Rochester near Pickering Road and Shady Hill Drive) area contains large unfragmented forest blocks, animals of concern, significant wildlife habitats, exemplary natural communities, high yield aquifers and gravel well sites, and wellhead protection areas for public drinking water supplies, prime and statewide important farm soils, high riparian connectivity, and permanently protected and/or managed lands.

Refer to Table 12 below, to [Figure 10 – Areas of Ecological Interest Map](#) and to the detailed data sheets in Appendix A for more information about each Conservation Focus Areas.

**Table 12: Conservation Focus Areas and Supporting Landscapes**

Conservation Focus Areas	Core/Supporting	Acres	% Total City Area
Blue Hills	Core	83	0.28
Preston Pond	Core	135	0.46
Preston Pond	Supporting	297	1.0
Rochester Heath Bog	Core	1,024	3.5
Rochester Neck	Core	876	3.0
<b>Total</b>		<b>2,414.5</b>	<b>8.24</b>

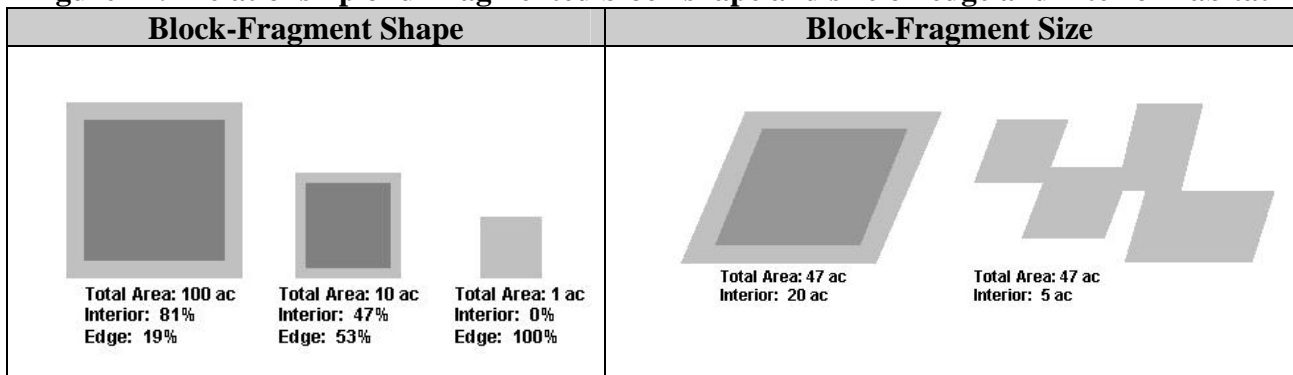
[Source: *The Land Conservation Plan for New Hampshire’s Coastal Watersheds* (2007)]

### 6.3 Wildlife Habitat and Unfragmented Lands

#### *Unfragmented Lands*

Preserving unfragmented blocks of forests and open space are critical for sustaining wildlife populations. Development of the natural landscape results in the direct loss of habitat and fragmentation of habitat. Fragmentation reduces the quality of habitat by altering its size, shape and distribution, creating more “edge” and less “interior”. Edge is a habitat boundary where habitat meets the developed landscape or where two habitat types meet. Edge is typically measured a minimum of 100 feet from a habitat boundary. Interior is undisturbed habitat buffered by the edge from predators and human influence such as light and noise. The diagram below illustrates the concepts of edge and interior habitats, and shows how block size and shape influence the amount of each habitat type within a specific block.

**Figure 12: Relationship of unfragmented block shape and size on edge and interior habitat**



[Source: After the Maine Audubon Society (Spring 2000) *Conserving Wildlife in Maine’s Developing Landscape*]

Rochester’s forests, farmland, and abundance of aquatic environments provide rich and diverse habitat for many animal and plant species. An inventory of animal and plant species for Rochester has never been conducted, so the extent of special habitats, rare species and common species is unknown. However, it is important to recognize that these special habitats and unfragmented natural lands need to be conserved in order to prevent common species from becoming rare and rare species from being eliminated from New Hampshire.

### *Large Forest Blocks*

Large blocks of forest, wetlands and farmland that are unfragmented by development or public roads are valuable for many reasons. They:

- Provide essential forest interior habitat for species such as some songbirds that need to be distanced from human activity, pets, and the forest edge in order to survive;
- Provide habitat for mammals that have large home ranges and prefer to avoid human contact such as bobcat, otter, and moose;
- Enable owners of large parcels of forestland to conduct timber harvests that are economically viable;
- Minimize conflicts that can arise when managed forests and farms are surrounded and interspersed with development;
- Offer opportunities for remote recreation, including hunting, hiking and snowmobiling, where landowners allow.

Larger forest blocks are more likely to support viable populations of species and therefore act as a source of individuals that can interact with populations in other blocks. Small block fragments may be unable to support breeding populations. Persistent and widespread fragmentation may lead to genetic changes and a loss of genetic diversity, as populations are subdivided into small locally breeding populations.

Many large blocks of forestland are still intact in Rochester. Approximately 15.4 percent of Rochester’s land area and forests are part of contiguous areas of unfragmented forested lands. Table 13 below lists the largest areas of unfragmented lands (contiguous open space) and some of their major attributes. The location of these large forested blocks is shown in [Figure 8- Forest Types and Contiguous Forest Blocks Map](#). The map subtracts a 300-foot buffer around all roads (mostly Class V or state highways) and excludes developed lands. Water bodies and streams are also shown on the map. (Note that no minimum acre threshold was used to identify blocks.)

**Table 13: Unfragmented lands and contiguous open space blocks**

	Total Acres	Upland Acres	Surface Water Acres	Acres in Conservation	Wetland Acres
Total Acres	15,379	13,702	445	436	1,129
% Total Lands	53	47	1.5	1.5	3.9

[Source: NH Fish and Game, June 2007]

### *Habitat Requirements for Local Species*

Conserving large unfragmented blocks of contiguous open space lands and connections between other significant habitat areas is important if residents want to retain the species that need larger and diverse home ranges and territories. Habitat block size requirements vary widely among bird, mammal and other native species. Many species can and do thrive in unfragmented areas of lesser size than the minimum cited; however, reduced habitat places stresses on species making their populations more susceptible during times of drought, disease or competition for basic resources. Species that require specialized habitat – those that rely on specific plant communities for their life cycle – are particularly vulnerable to habitat loss and fragmentation.

**Table 14: Unfragmented block requirements for selected species**

Minimum Acres	Species
250-500	Range for Scarlet Tanager
	Range for Whippoor-will
<250	Minimum for Tufted titmouse, white-breasted nuthatch, Red-eyed Vireo
500-1,000	Minimum size for a Red-shouldered Hawk
500-1,000	Range Fish and Game Habitat Manual Analysis for viable population of Wood Thrush
500	Approximate maximum dispersal area for wood, spotted or Blanding's turtle
5-75	Home range for Bobolink
15-20	Home range for Eastern Meadowlark
4,700-9,600	Minimum home range for fisher
15-30 linear miles	Area required for river otter
5,760	Average home range of fox

[Source: From the publication *Conserving Wildlife in Maine's Developing Landscape* by the Maine Audubon Society (Spring 2000)]

## 6.4 Recommendations

ID	Action
EC 1	Identify important wildlife corridors, natural communities, and habitat for rare, threatened and endangered species, including connections between terrestrial and aquatic habitat, seasonal habitat, breeding areas, foraging habitat, and migratory corridors. <i>Priority Ranking: Highest</i>
EC 2	Submission of an inventory of important wildlife corridors, natural communities, rare/threatened /endangered species may be required for any subdivision and site plan review applications. <i>Priority Ranking: Highest</i>
EC 3	Protect large unfragmented blocks, wildlife corridors, natural communities, and rare, threatened and endangered species as part of land conservation and open space planning. <i>Priority Ranking: Intermediate</i>
EC 4	Encourage the City to protect significant wildlife habitat by: adopting development regulations, developing management guidelines for land owners, and providing land owner education about protection and conservation. <i>Priority Ranking: Intermediate</i>
EC 5	Develop an outreach and signage campaign to identify important wildlife corridors. <i>Priority Ranking: Long Term</i>
EC 6	Evaluate the current status of natural resources and biodiversity in Rochester. <i>Priority Ranking: Long Term</i>

## 7.0 WILDLIFE AND INVASIVE SPECIES

### Policy Statement

**Provide regulatory, educational, and voluntary measures and incentives for conservation of native species of flora and fauna.**

The rate of loss and deterioration of biological diversity is linked with the rate of landscape alteration and conversion. Rochester has the opportunity to maintain a healthy and diverse natural environment within its boundaries; however, this will require the commitment of the citizens of the City to sustaining the high quality of its natural environment. The current status of Rochester's natural resources and biodiversity has not been comprehensively evaluated. The purpose of such an inventory would be to:

1. collect information on species and communities to form a detailed inventory of habitats and biodiversity;
  2. enhance knowledge and appreciation of Rochester's natural resource base;
  3. serve as a starting point for developing conservation and protection measures; and
  4. provide information useful for conservation planning.
- 

### 7.1 Locally Observed Species

#### *Birds*

An inventory and listing of observed common and rare birds can be found in Appendix B. This observational data for was provided by Rochester resident, Dan Hubbard. Mr. Hubbard is part of a group of highly skilled and experienced birders who have, through their volunteer efforts, contributed much data to the NH Audubon Society for populations monitoring of bird species of New Hampshire. The data for this list of birds was collected over a period of approximately 20 years by this group of volunteer observers and local bird watchers from several popular bird watching locations in Rochester including Old Ox Road, Pickering Ponds Trails at Rochester Wastewater Treatment Plant, Ten Rod Road, Fowler Farm, Salmon Falls Road, and Pickering Road. The inventory in Appendix B will be updated periodically based on reported sightings from this group of observers.

#### *Mammals*

Mammals reported in Table 15 below were observed on the property of Turnkey Recycling and Environmental Enterprises in Rochester, NH, located off NH Route 125 at Rochester Neck Road. Black bears have been sighted in urban areas of the City and at several of the bird observation sites listed above.



**Table 15: Species observed at Turnkey Recycling and Environmental Enterprises, Rochester**

Beaver	Meadow Vole	Red Squirrel
Deer Mouse	Moose	Shorttail Shrew
Eastern Chipmunk	Northern Flying Squirrel	Shorttail weasel
Eastern Gray Squirrel	Porcupine	Striped Skunk
Harytail Mole	Raccoon	Whitetail Deer
Meadow Mole	Red Fox	Woodchuck

[Source: Biodiversity Baseline Inventory and Management Plan (August 1995) prepared for Turnkey Recycling and Environmental Enterprises, Strafford County, New Hampshire by Rust Environment and Infrastructure]

## 7.2 Rare and Endangered Species

Rochester has occurrences of rare species and exemplary natural communities identified by the New Hampshire Natural heritage Bureau including: 4 bird species, 3 plant communities, 9 plants species and 4 reptile species. Data reported by the Natural heritage Bureau (June 2008) is summarized in Table 16 below.

**Table 16: Known occurrences of rare species and exemplary natural communities**

Species/Community	Federal	State	Rank	Precision	Last Observed
<b><i>Birds</i></b>					
Common Moorhen ( <i>Gallinula chloropus</i> )	--	--	H	S	1983
Pied-billed Grebe ( <i>Podilymbus podiceps</i> )	--	E	NR	S	1997
Purple Martin ( <i>Progne subis</i> )	--	E	H	S	1982
Upland Sandpiper ( <i>Bartramia longicauda</i> )	--	E	H	S	1984
<b><i>Plant Community</i></b>					
Poor level fen/bog system	--	--	B	S	1998
Red maple floodplain forest	--	--	B-	S	2004
Red oak - ironwood - Pennsylvania sedge woodland	--	--	H	S	1985
<b><i>Plants</i></b>					
Engelmann's Quillwort ( <i>Isoetes engelmannii</i> )	--	E	H	M	1946
Inflated Sedge ( <i>Carex bullata</i> )	--	E	C+	S	2007
Inflated Sedge ( <i>Carex bullata</i> )	--	E	B	S	1989
Long's Bulrush ( <i>Scirpus longii</i> )	--	E	C	S	2004
Many Forms Sedge ( <i>Carex polymorpha</i> )	--	E	B	S	2007
Nuttall's Reedgrass ( <i>Calamagrostis cinnoides</i> )	--	E	B	S	1989
Piled-up Sedge ( <i>Carex cumulata</i> )	--	E	D	S	1994
River Bank Quillwort ( <i>Isoetes riparia</i> )	--	E	H	M	1941
Wild Lupine ( <i>Lupinus perennis</i> )	--	T	H	M	1950
<b><i>Reptiles</i></b>					
Blanding's Turtle ( <i>Emydoidea blandingii</i> )	--	--	NR	S	2005
Blanding's Turtle ( <i>Emydoidea blandingii</i> )	--	--	NR	S	2000
Spotted Turtle ( <i>Clemmys guttata</i> )	--	--	NR	S	1999
Wood Turtle ( <i>Glyptemys insculpta</i> )	--	--	NR	S	1998

[Source: New Hampshire Natural heritage Bureau, June 2008]

**Listing Status**  
 T = Threatened  
 E = Endangered  
 M = Monitored  
 -- = Special Concern

**Ranks**  
 A-D = Excellent (A) to poor (D)  
 H = Historical (last seen > 20 years)  
 X = Extirpated  
 NR = Not Ranked

**Precision**  
 S = Location known to within ca. 300 feet  
 M = Location known to within ca. 1.5 mile  
 G = Location known only to place name (ca. 5

### 7.3 Native and Beneficial Plant Species

In 1987, the New Hampshire legislature passed the Native Plant Protection Act (RSA 217-A) which formally recognized that “for human needs and enjoyment, the interests of science, and the economy of our state, native plants throughout this state should be protected and conserved; and .....their numbers should be maintained and enhanced to insure their perpetuation s viable components of their ecosystems for the benefit of the people of New Hampshire.” Through the Native Plant Protection Act, the NH Natural Heritage Bureau compiles data and maintains lists to identify and protect threatened and endangered plant species, and develop recommendations to ensure that populations are recovered and sustained. Refer to Section 7.2 for a list of threatened and endangered species identified by the Natural Heritage Bureau in Rochester.<sup>11</sup>

**Table 17: Native and beneficial species by habitat and environmental conditions**

Habitat-Environmental Conditions	Native Plants
<b>Dry Sites</b>	Pitch Pine, Native Lupine, Bayberry, Butterfly-weed, Stiff Aster, Red Pine, Scrub Oak, Lowbush Blueberry, Bracken Fern, Sweetfern, Little Bluestem, Switch Grass, Big Bluestem, Wild Rye
<b>Moist Sites</b>	White Pine, Beech, Red Oak, Hemlock, White Ash, Sugar Maple, Yellow Birch, Flowering Dogwood, Sassafras, Basswood, Solomon’s Seal, Black Cherry, Elderberry, Wood Fern, Wild Yellow Lilly, Virgin’s-bower, Highbush Blueberry, Bee-Balm, Columbine, Jewelweed
<b>Wet Sites</b>	Jack-in-the-pulpit, Cardinal Flower, Prairie Cordgrass, Ostrich Fern, Rushes, Sedges, Red Osier Dogwood, Silky Dogwood, Turtlehead, Balsam Fir, Red Spruce, Red Maple, Hemlock, Northern Arrowwood, Winterberry, Atlantic White Cedar, New England Aster, Blue Flag Iris, Sweet Flag
<b>Streambanks and Shorelands</b>	Willow, Silver Maple, Speckled Alder, Smooth Alder, Sycamore, Monkey Flower, Switch Grass, Pussy Willow
<b>Shallow Ponds</b>	Bur-reed, Buttonbush, Pondweed, Sedges, Rushes, Duck Potato, Fragrant Water Lily, Yellow Water Lilly, Pickerelweed, Wild Rice, Duck Weed

[Source: U.S. Department of Agriculture, New Hampshire Natural Resources Conservation Service]

<sup>11</sup> New Hampshire Department of Resource and Economic Development, Division of Forests and Lands, Natural Heritage Bureau. Website at <http://www.dred.state.nh.us/divisions/forestandlands/>

New Hampshire's existing native plant communities have developed and evolved since the end of the last ice age, adapting to variations in climate and nature succession. Native plants form the structure of our natural landscapes – the canopy, understory and groundcover of forests, riparian areas adjacent to rivers and streams, and open meadows. Native plant communities provide vital and specific habitat for wildlife that depend on them for food and shelter.

It is important to note that certain types of native plants thrive when planted or maintained in their natural landscapes. The table below lists native plants commonly found in certain habitat and environmental settings.

Native plants have several advantages over exotic or introduced species, including seasonal hardiness, resistance to pests (fewer chemical treatments), and low maintenance needs (less water and fertilizer). These advantages are due to the adaptation by native plants to local climate and environmental conditions. For these reasons, native plants are often:

- ✓ easier and less costly to care for;
- ✓ reduce potential sources of water pollution; and
- ✓ reduce potential negative effects of pesticides and insecticides on wildlife and humans.

#### **7.4 Statewide Invasive Species**

What Is An Invasive Species? An invasive species is a plant, insect, and/or fungal species that is not naturally present in a particular region and has the ability to thrive and spread aggressively outside its natural habitat or climatic range. It is important that residents be informed about and aware of invasive species of plants, insects and fungi because of their potential to displace native species that are vital to sustain local ecosystems and biodiversity. Rich, diverse plant communities can become monocultures of invasive plants with limited value to sustain native wildlife. The public must be educated to control existing invasive plants, especially when purchasing landscaping plants and materials.

Why and Where Are Invasive Species A Problem? Invasive species typically possess certain traits that give them an advantage over many native species, including the production of many offspring, early and rapid development, easily and efficiently spread, adaptability, tolerance of a broad range of environmental conditions, resistance to disease, and absence of natural controls to keep them in check (disease, competition, predators). These traits allow invasive species to be highly competitive and, under certain conditions, suppress or completely replace native species. In this manner, invasive species can reduce natural diversity, impact endangered or threatened species, reduce wildlife habitat, create water quality impacts, stress and reduce forest and agricultural crop production, damage personal property, and cause health problems.<sup>12</sup>

In 2000, the State of New Hampshire enacted legislation (House Bill 1258-FN) which required the state to conduct research and educational activities which address the effects of invasive plant, insect and fungal species upon the state, and to publish annual lists of invasive species that present potential or immediate danger to the environmental and economic interests of the state.

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<sup>12</sup> NH Department of Agriculture, Division of Plant Industry, [http://agriculture.nh.gov/divisions/plant\\_industry/index.htm](http://agriculture.nh.gov/divisions/plant_industry/index.htm)

From this legislation, the New Hampshire Invasive Species Committee was formed with representatives from the Department of Agriculture, Department of Environmental Services, Department of Resources and Economic Development, Department of Transportation, NH Fish and Game, the University of New Hampshire, The Nature Conservancy, the horticultural community, and the general public. The Committee is a volunteer group that considers and evaluates the adverse environmental and economic effects of invasive terrestrial plants, insects, and fungal species upon the state.<sup>13</sup>

NH Prohibited Invasive Species List. The list of Prohibited Species below is reported annually by the NH Department of Agriculture. The list includes invasive species considered to present an immediate danger to the health of native species, to the environment, to commercial agricultural or forest crop production or to human health. These species are prohibited from sale, transport, distribution, propagation or transplantation in New Hampshire.

**Table 18: Prohibited plant and tree species in New Hampshire**

<i>Acer platinoides</i>	Norway Maple
<i>Ailanthus altissima</i>	Tree of Heaven
<i>Alliaria petiolata</i>	Garlic Mustard
<i>Berberis thunbergii</i>	Japanese Barberry
<i>Berberis vulgaris</i>	European Barberry
<i>Butomous umbellate*</i>	Flowering Rush
<i>Celastrus orbiculatus</i>	Oriental Bittersweet
<i>Cynanchum nigrum</i>	Black Swallow-wort
<i>Cynanchum rossicum</i>	Pale Swallow-wort
<i>Egeria densa*</i>	Brazilian Elodea
<i>Elaeagnus umbellate</i>	Autumn Olive
<i>Euonymus alatus</i>	Burning Bush
<i>Heracleum mantegazzianum</i>	Giant Hogweed
<i>Hydrilla verticillata*</i>	Hydrilla
<i>Hydrocharis morsus-ranae*</i>	European Frogbit
<i>Iris pseudacorus</i>	Water-flag
<i>Ligustrum obtusifolium</i>	Blunt-leaved Privet
<i>Lonicera x bella</i>	Showy Bush Honeysuckle
<i>Lonicera japonica</i>	Japanese Honeysuckle
<i>Lonicera morrowii</i>	Morrow's Honeysuckle
<i>Lonicera tatarica</i>	Tartarian Honeysuckle
<i>Myriophyllum heterophyllum*</i>	Variable Milfoil
<i>Myriophyllum spicatum*</i>	European Water-Milfoil
<i>Najas minor*</i>	European Naiad
<i>Nymphoides peltata*</i>	Yellow Floating Heart
<i>Polygonum cuspidatum</i>	Japanese Knotweed
<i>Potamogeton crispus*</i>	Curly-leaf Pondweed
<i>Rhamnus cathartica</i>	Common Buckthorn
<i>Rhamnus frangula</i>	Glossy Buckthorn
<i>Rosa multiflora</i>	Multiflora Rose

<sup>13</sup> Final Version HB 1258-FN.

<i>Trapa nutans*</i>	Water Chestnut
<b>Aquatic Species</b>	
<i>Cabomba caroliniana*</i>	Fanwort
<i>Myriophyllum aquaticum*</i>	Parrot Feather
<i>Lythrum salicaria*</i>	Purple Loosestrife
<i>Phragmites australis*</i>	Common Reed
* Indicates that the species is currently regulated by the Department of Environmental Services [DES]	

[Source: NH Natural Heritage Bureau, 2008)

NH Restricted Species List. Species that present the potential for environmental or economic harm, but such potential may be reduced or eliminated by cultural or biological practices. These species exhibit invasive tendencies, but do not meet all the criteria to be listed as Prohibited.

**Table 19: Restricted plant and tree species in New Hampshire**

<i>Ampelopsis brevipedunculata</i>	Porcelain-berry
<i>Centaurea maculosa</i>	Spotted Knapweed
<i>Cirsium arvens</i>	Canada Thistle
<i>Coronilla varia</i>	Crown Vetch
<i>Eleagnus angustifolia</i>	Russian Olive
<i>Euonymus fortunei</i>	Wintercreeper
<i>Glyceria maxima</i>	Sweet Reedgrass
<i>Ligustrum vulgare</i>	Common Privet
<i>Lonicera maakii</i>	Amur Honeysuckle
<i>Lysmachia nummularia</i>	Moneywort
<i>Microstegium vimineum</i>	Japanese Stilt Grass
<i>Phalaris arundinacea</i>	Reed Canary Grass
<i>Populus alba</i>	White Poplar
<i>Pueraria lobata</i>	Kudzu
<i>Robinia pseudoacacia</i>	Black Locust
<i>Ulmus pumila</i>	Siberian Elm

[Source: NH Natural Heritage Bureau, 2008)

NH Prohibited Invasive Insect Species List: Following is a list of invasive insect species that pose a threat to native species of the state.<sup>14</sup>

**Table 20: Prohibited invasive insect species in New Hampshire**

<i>Acarapis woodi</i>	Honeybee Tracheal Mite
<i>Adelges tsugae</i>	Hemlock Woolly Adelgid
<i>Aeolesthes sarta</i>	City Longhorned Beetle
<i>Anoplophora glabripennis</i>	Asian Longhorned Beetle
<i>Callidellum rufipenne</i>	Cedar Longhorned Beetle
<i>Dendrolimus sibericus</i>	Siberian Silk Moth
<i>Hylurgus lingniperda</i>	Redhaired Bark Beetle
<i>Ips typographus</i>	European Spruce Bark Beetle
<i>Lymantria dispar</i>	Asian Gypsy Moth
<i>Popillia japonica</i>	Japanese Beetle
<i>Pyrrhalta viburni</i>	Viburnum Leaf Beetle
<i>Rhizotrogus majalis</i>	European Chafer
<i>Symantria monacha</i>	Nun Moth
<i>Tetropium fuscum</i>	Brown Spruce Longhorn Beetle
<i>Varroa destructor</i>	Varroa Mite

[Source: NH Natural Heritage Bureau, 2008)

## 7.5 Recommendations

ID	Action
WI 1	Support state regulations and guidelines for proper prevention, removal and disposal of invasive species. <i>Priority Ranking: Highest</i>
WI 2	Locate and develop remediation plans to remove significant populations of invasive species. Species of particular interest include Phragmites, Purple Loosestrife, Burning Bush, Bittersweet, Buckthorn, Japanese Barberry and Japanese Knotweed. <i>Priority Ranking: Highest</i>
WI 3	Educate landowners and business owners about the benefits of native plants and the negative impacts of invasive species on native ecosystems. <i>Priority Ranking: Highest</i>
WI 4	Educate landowners about how to manage or eliminate invasive species and encourage voluntary removal of invasive species. <i>Priority Ranking: Highest</i>
WI 5	Evaluate City management and maintenance practices to eliminate sources and distribution of invasive species contained in road sand and fill, and during municipal construction projects. <i>Priority Ranking: Highest</i>
WI 6	Seek partnerships to assist in evaluating the extent and presence of invasive species in the City and to develop management options. <i>Priority Ranking: Highest</i>

<sup>14</sup> General Court, State of New Hampshire Rules, Chapter Agr 3800 Invasive Species

- WI 7 Provide information to homeowners, neighborhood groups, landscapers and developers about the benefits of using native plants in landscaping.  
*Priority Ranking: Highest*
- WI 8 Encourage the use of native plants and trees in landscaping plans as part of subdivision and site plan review approvals.  
*Priority Ranking: Highest*
- WI 9 Develop wildlife management policies to protect migratory wildlife (such as signage at common crossing locations).  
*Priority Ranking: Intermediate*
- WI 10 Obtain wildlife videos to air on the Government Channel and public access television.  
*Priority Ranking: Intermediate*
- WI 11 Encourage development of a management plan for the City to control invasive species in the maintenance area surrounding municipal stormwater management structures (basins, swales, access ways) and within wetland buffers if nearby these structures.  
*Priority Ranking: Intermediate*
- WI 12 Whenever beneficial and possible as a condition of approval, encourage removal of invasive species as part of all development projects.  
*Priority Ranking: Long Term*
- WI 13 Develop a workshop and field trip about locally significant wildlife for education and outreach to the public, elected officials and land use boards. Coordinate with wildlife and other groups to provide this training.  
*Priority Ranking: Long Term*

## 8.0 WETLANDS

### Policy Statement

**Rochester should provide for comprehensive protection of the wetlands and their buffers through regulatory, educational, and voluntary efforts. The loss of wetlands and their through variances, waivers and through illegal activities should be minimized.**

Wetlands provide the following functions and benefits:

- √ filter and store sediments
- √ act as a filter and storage area for pollutants
- √ slow the velocity of run-off
- √ store flood waters
- √ – provide important wildlife and aquatic habitat

Wetland buffers are the vegetated area adjacent to a wetland that reduces the adverse effects of human activities on these resources. The primary function of a buffer is to physically protect and separate a wetland from future disturbance by:

- √ absorbing and filtering runoff to protect water quality
- √ intercepting and slowing runoff to prevent erosion
- √ providing habitat for wetland species and upland species
- √ improving landscape aesthetics
- √ maintaining recreational uses

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### 8.1 Overview of Wetlands

The U.S. Fish & Wildlife Service defines wetlands as<sup>1</sup>:

*"lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of the year."*

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<sup>1</sup> *Classification of Wetlands and Deepwater Habitats of the United States* by Lewis M. Cowardin, U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Jamestown, ND, Virginia Carter, U.S. Geological Survey, Reston, Virginia, Francis C. Golet, Department of Natural Resources Science, University of Rhode Island, Kingston, RI, and, Edward T. LaRoe, U.S. National Oceanographic and Atmospheric Administration, Office of Coastal Zone Management, Washington, DC. Performed for U.S. Department of the Interior, U.S. Fish and Wildlife Service, Office of Biological Services, Washington, DC FWS/OBS-79/31 December 1979



A wetland is defined by the three factors:

- **Hydrophytes** - vegetation specifically adapted to wet conditions, to grow partly or wholly in water;
- **Hydrology** - level of groundwater and surface within the soil profile or at the intersecting land surface; and
- **Hydric soils** - formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

Wetlands are an integral part of Rochester’s natural resources and landscape. They are important for removing excess nutrients and sediment from the water, slowing and storing floodwaters, promoting groundwater infiltration, and providing habitat for a variety of vegetation and wildlife. In addition, wetlands provide recreational, educational and research opportunities. Vernal pools are a special type of wetland that dry out completely in the summer, have no fish population, and are especially valuable for amphibian reproduction. Vernal pools have not been inventoried or mapped in Rochester. Please see Section 8.3 of this report for more information on vernal pools.

There is a diversity of wetland types in Rochester, including freshwater emergent, forested/shrub and pond types, and riverine and lacustrine types. The U.S. Fish and Wildlife Service as part of the National Wetlands Inventory (NWI) have mapped wetlands greater than 2 acres in size from aerial photos. The NWI wetlands do not include all wetlands, particularly those that do not typically have standing water in the spring or are small in size (less than 1 acre). Therefore, this is an underestimate of the amount of total wetland coverage in a given area.

The total area of NWI wetlands mapped in Rochester is 2,853.7 acres or 9.8% of the City’s land and water area. [Figure 11- Water Resources Map](#) identifies wetlands by their NWI codes, which group wetlands by their dominant hydrologic regime and vegetation type. The NWI wetland classification codes are listed in Appendix C. The total acreage of each NWI wetland type in Rochester is listed below in Table 21 and on [Figure 6- Wetlands Map](#).

**Table 21: Wetlands by type as identified by the National Wetlands Inventory**

NWI Wetland Type	NWI Code	Acres	% Total City Area
Palustrine - Freshwater Emergent	PEM	200	0.7
Palustrine - Freshwater Forested/ Shrub	PFO	2,040	7.0
Palustrine - Freshwater Pond	PUB	239	0.8
Lacustrine (Lake)	L1UB	291	1.0
Riverine	R2UB	84	0.3
<b>Total</b>		<b>2,855</b>	<b>9.8</b>

[Source: U.S. Fish and Wildlife Service, National Wetlands Inventory (NWI), 2007]

Rochester’s freshwater wetlands have been inventoried in detail in the report “*Rochester Freshwater Wetlands Project: An Inventory and Evaluation*” (1995) by Mr. George Bailey, former Chairman of the Rochester Conservation Commission and retired Soil Conservation Service scientist, including completion of the field study with assistance from the Strafford Regional Planning Commission. Additional information is available from the U.S. Fish and

Wildlife Service National Wetland Inventory maps and supporting geographic information systems (GIS) database. Based on the freshwater wetlands study and the NWI maps and database, the largest wetlands and wetland complexes in Rochester are located in low-lying areas between the Salmon Falls River and NH Route 16, bounded by Chestnut Hill Road and Sonata Court. Another large wetland complex is dispersed between Salmon Falls Road and Whitehall Road. It is important to note that many of these wetland complexes are located in the headwater areas and riparian and flood plain areas of the Cochecho River and thus, the effects of regulatory requirements and management policies for these wetlands could impact communities downstream within these larger watersheds especially with respect to the quality of surface waters, aquifers and public drinking supplies derived from surface waters.

## 8.2 Prime Wetlands and Wetlands of Significance

Prime wetlands status, as defined in RSA 482-A:15, is designated by the NH Wetland Bureau at the request of the governing body of a municipality, following completion of a wetland study consistent with the methodology described in the RSA.

The study “*Rochester Freshwater Wetlands Project: An Inventory and Evaluation*” evaluated 115 freshwater wetlands ranging in size from 5 to 620 acres for designation as prime wetlands. The study incorporated the methodology of “The Method for the Comparative Evaluation of Nontidal Wetlands in New Hampshire” developed by the Audubon Society of NH. Each wetland was evaluated on at least 9 of the 15 functions a wetland may serve; 24 wetlands rated high in functions related to public safety (flood control, sediment trapping and nutrient attenuation). Eleven candidates for prime wetland status were identified in this report. Of the 4,106 acres of wetlands evaluated, the study recommends 956 acres (23.3 percent) for prime wetland designation. Wetlands recommended for prime designation are described in following table.

**Table 22: Wetlands recommended for prime designation in Rochester**

Ward	Wetland ID	Acreage	Location
1	E-17	9	On Wandley Brook between White Hall Road and Franklin Street
	E-31	136	On the Salmon Falls River, northeast of Salmon Falls Road and north of the Somersworth municipal boundary
3	W-13	103	Along the Isinglass River, south of Flagg Road along the Barrington municipal boundary
	W-14	17	At the intersection of Hansonville Road and Flagg Road
	W-17	8	West of Route 202 next to Little Long Pond, along the Barrington municipal boundary
	W-19	19	South of and adjacent to Dry Hill Road and west of Route 202
4	W-26	24	Between Route 202A and Sheepboro Road, along the Strafford and Farmington municipal boundaries
	N-01	125	On the Cochecho River between Route 16, Route 125 and north of Route 202A
	N-33	350	Eastern portion of Baxter Lake on the Farmington municipal boundary
5	N-06	15	North of the intersection of Route 16 and Chestnut Hill Road
	N-15	15	East of Chestnut Hill Road and north of Elmo Lane
<b>Total</b>		<b>821</b>	

[Source: *Rochester Freshwater Wetlands Project: An Inventory and Evaluation*” (1995)]

The Rochester Conservation Commission has identified designation of prime wetlands as a goal of particular importance. Working toward this goal, the Commission recommends that the previous freshwater wetland study be expanded to include wetlands of 2-5 acres in size for consideration for prime designation. This expanded and updated wetlands study will be used to develop a formal submittal to the NHDES for designation of prime wetlands in Rochester.

### 8.3 Vernal Pools

#### *Definition*

Vernal pools are temporary bodies of water that flood each year for a limited time during wet months, typically early spring to mid- or late summer months. Their common characteristics are the absence of fish, temporary flooding regime, and the presence of vernal pool species. The hydrology of vernal pools is maintained primarily by runoff from melting snow and precipitation, and in some cases groundwater flow. Vernal pools usually dry up by mid to late summer, depending upon climate factors such as the amount of rain and temperature. Some deep pools may remain flooded for a few years, especially when there is groundwater contribution, but become completely dry in seasons with very low rainfall. Autumnal pools fill during the fall with rising groundwater. Vernal pools vary in size, ranging from several square feet to several acres. They can be found in a variety of landscapes, such as isolated depressions in forests or meadows, kettle holes, and gravel pits. Many pools are contained within larger wetland complexes, oxbows in river floodplains and pools in forested swamps or scrub-shrub wetlands. To support life, vernal pools must have enough leaf litter and other debris to provide food sources and cover for the species that breed in them. Because vernal pools are not permanently flooded and do not support fish populations, they provide safe breeding sites for various amphibian and invertebrate species, including wood frogs, spotted salamanders, and fairy shrimp. These species depend upon the hydrology of temporary pools for specific phases of their life cycle. One easy way to locate vernal pools is to listen for wood frog choruses, which are groups of males singing to attract females.<sup>16</sup>

#### *Vernal Pool Species*

A variety of amphibian, reptile and invertebrate species commonly inhabit vernal pools in New Hampshire. These species, listed in Table 23 below, may or may not be present in Rochester.

**Table 23: Species commonly found in vernal pools in New Hampshire**

<b>Amphibians</b>	<b>Reptiles</b>	<b>Invertebrates</b>
Wood Frog, Spring Peeper, Green Frog or Bullfrog Spotted, Jefferson and Blue-spotted Salamander, Marbled Salamander, Eastern Spotted Newt and Four-toed Salamander	Spotted Turtle Wood Turtle	Fairy Shrimp

[Source: Audubon Society of New Hampshire: <http://www.nhaidubon.org/conservation/vernal.htm>]

<sup>16</sup> Audubon Society of New Hampshire: <http://www.nhaidubon.org/conservation/vernal.htm>

Refer to Appendix C for a detailed listing and description of species that commonly inhabit vernal pools.

### ***Threats to Vernal Pools***

Some vernal pools are classified as wetlands under the jurisdiction of the New Hampshire Department of Environmental Services' Wetlands Bureau. However, because they are often very small in size and are dry for several months of the year, they may be incorrectly identified as "low value" wetlands or due to the absence of hydrophytic vegetation and/or hydric soils, not recognized as wetlands at all. This often leads to direct loss of vernal pools through filling for development purposes.

Land use adjacent to pools affects their value as productive amphibian breeding sites. The loss of surrounding trees and other types of vegetation results in decreased shading, rising water temperatures, decreased oxygen content, increased evaporation, and alteration of the hydrologic regime. There may also be less debris to provide cover, nutrients, and attachment sites for egg masses. Many of the amphibians and reptiles that use vernal pools spend most of their year in the surrounding habitat, both uplands and wetlands. For example, spotted salamanders spend much of the year under leaves on the forest floor. Wood frogs and salamanders may come to breed in vernal pools from as far away as 1000 feet, and turtles from even farther. Because these species are usually reluctant to cross large areas of altered terrain such as lawns or fields, changes to the terrain surrounding a vernal pool, such as clearing, creation of lawn, or building and paving, will have a detrimental impact on the species that use the nearby pool. Roads provide a lethal barrier to many species that must cross them to reach a vernal pool. Heavy traffic on the rainy nights when salamanders and frogs migrate can cause a great deal of mortality and impact local populations. Road salt and other chemicals from the road may also have an effect on the water quality in nearby vernal pools. In short, the upland area around the pool is just as important to these species' survival as the vernal pool itself.<sup>17</sup>

Identification and Documentation of Vernal Pools in New Hampshire is available from the Nongame and Endangered Wildlife Program of the New Hampshire Fish and Game Department by calling (603)271-2461.

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<sup>17</sup> Audubon Society of New Hampshire: <http://www.nhaidubon.org/conservation/vernal.htm>

## 8.4 Recommendations

<b>ID</b>	<b>Action</b>
WT 1	Expand upon the previous freshwater wetland study to include wetlands of 2-5 acres in size for consideration for prime designation. <i>Priority Ranking: Highest</i>
WT 2	Use the results of the freshwater wetland study to develop a formal submittal to the NHDES for prime wetlands designation. <i>Priority Ranking: Highest</i>
WT 3	Protect remaining undeveloped portions of Heath Bog, a designated Conservation Focus Area in <i>The Land Conservation Plan for New Hampshire's Coastal Watersheds</i> . Include Heath Bog in future recommendations for designation of prime wetlands. <i>Priority Ranking: Highest</i>
WT 4	Encourage pre-construction inspections by City staff to ensure that protective fencing or markers are installed at the edge of the wetland buffers prior to construction. <i>Priority Ranking: Highest</i>
WT 5	Since the adoption of Chapter 50 of the City's general ordinances, Stormwater Management and Erosion Control, information about the affects of stormwater management on the hydrology of wetlands should be requested as part of Subdivision and Site Plan Review applications (i.e. affects of clearing large tracts of adjacent forests on changes in the groundwater table; diversion of water from soil infiltration and groundwater recharge). <i>Priority Ranking: Highest</i>
WT 6	Research habitat-friendly designs for culverts and other structures for the safe passage of wildlife at stream and wetland road crossings. <i>Priority Ranking: Intermediate</i>
WT 7	Obtain information about the effectiveness of detention basins versus infiltration basins in maintaining wetland hydrology. <i>Priority Ranking: Intermediate</i>
WT 8	Develop a GIS database of vernal pool locations and ecology. Require GIS data to be submitted for vernal pools with all applications for Subdivision and Site Plan Review. <i>Priority Ranking: Long Term</i>
WT 9	Inventory vernal pools on City owned lands. <i>Priority Ranking: Long Term</i>

## 9.0 AQUIFERS

### Policy Statement

**Rochester has an obligation to protect the volume and quality of local aquifers for use as a drinking water source and to protect the hydrology of surface waters and wetlands.**

Rochester has extensive stratified drift aquifers with high transmissivity rates along the Cocheco River and Salmon Falls River, and a bedrock aquifer underlying throughout.

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### 9.1 Aquifer Types

In New Hampshire, aquifers are classified into two major types: bedrock and stratified drift.

#### *Stratified Drift Aquifer*

Stratified drift aquifers are composed of layers of sand and gravel deposited by retreating glaciers. These layers are partially or fully saturated by groundwater below the land surface. Water yield from stratified drift aquifers is highly affected by groundwater recharge from precipitation and snowmelt and atmospheric conditions (drought). These sand and gravel deposits are widespread in large river valleys and form broad gently to steeply sloping hills on the landscape.

Rochester has approximately 11,285 acres of stratified drift aquifer.

**Table 24: Acreage of stratified drift aquifers in Rochester**

<b>Aquifer Type</b>	<b>Acres</b>	<b>% Total City Area</b>
Stratified Drift	11,285.2	38.8
Till	1,370.1	4.7
<b>Total</b>	<b>12,655.3</b>	<b>44</b>

[Source: NH GRANIT March 2001]

As part of a 2003 groundwater development study by Emery & Garrett Groundwater, Inc., the City's stratified drift aquifer was mapped in detail. This stratified drift aquifer is located largely within the Cocheco River floodplain and valley and several of its major tributaries including Axe Handle Brook and Wardley Brook, and beneath Rochester Heath Bog. Transmissivity in the aquifer ranges from less than 2,000 square feet per day to greater than 8,000 square feet per day. The highest transmissivity rates are found immediately adjacent to the Cocheco River and areas north and south of its intersection with NH Route 16.<sup>18</sup>

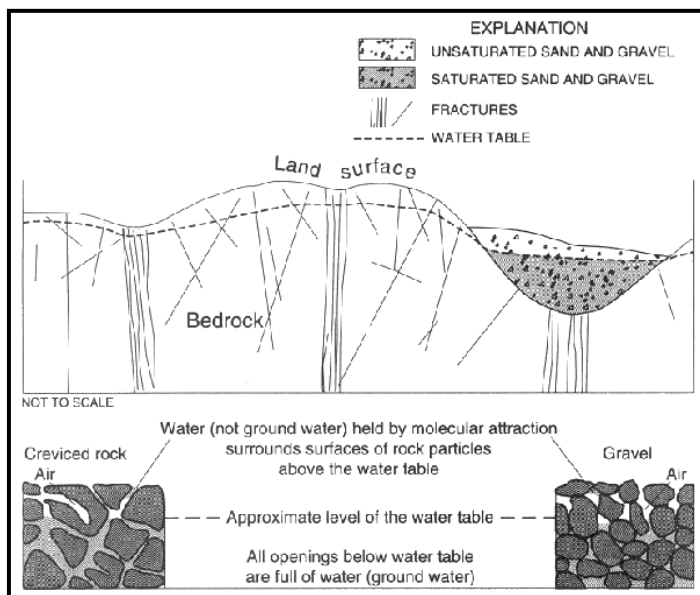
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<sup>18</sup> *Preliminary Hydrogeologic Investigation: City of Rochester Groundwater Development Wells RCH-1C and RCH-2A1* (January 2003) by Emery & Garrett Groundwater, Inc.

### *Bedrock Aquifer*

Bedrock aquifers consist of fractured bedrock and ledge (highly fractured shallow bedrock). Interconnected fractures form fracture systems, which are highly variable in their occurrence, connectivity and potential water yield. Groundwater may be stored within fractures, and wells drilled into large fractures or extensive fracture systems may yield high amounts of groundwater. However, wells that do not hit a fractured area are likely to yield little water if any. One of the most reliable but often costly methods for locating fractures and fracture systems is by conducting geophysical mapping of the subsurface bedrock. Test wells are necessary to quantify potential water yield.

In Rochester, areas not covered by stratified drift deposits are underlain by bedrock capable of producing sufficient water yield for residential and commercial purposes



**Figure 13: Illustration of groundwater interaction between stratified drift aquifers and bedrock aquifers**

[Source: NH DES Environmental Fact Sheet GEO-6 New Hampshire Bedrock Aquifer Resource Assessments]

## **9.2 Local Aquifer Protection Measures**

### ***Aquifer Protection***

#### *Existing Ordinance*

The City of Rochester Zoning Ordinance, Chapter 42.21 the Aquifer Protection Zone, was adopted for the purpose of protecting groundwater resources from adverse development or land use practices that might reduce the quality and quantity of water that may be available for use as a future source of supply for Rochester's municipal water system. The ordinance prohibits specific high-risk uses within the City's mapped stratified drift aquifer areas including:

- 1) Coverage of more than forty percent (40%) of any lot with impervious surfaces, except that the Planning Board may allow up to sixty percent (60%) coverage of any lot with impervious surfaces if engineering design provides adequate purification and recharge conditions);
- 2) On-site disposal of solid wastes, other than brush and stumps;

- 3) On-site disposal of liquid or leachable wastes other than from a septic system serving only domestic wastes; and
- 4) On-site disposal of any materials or substances classified as hazardous by the rules and regulations of the New Hampshire Water & Supply Pollution Control Commission or the Environmental Protection Agency.

The ordinance contains Special Provisions permitting on-site storage of petroleum, gasoline, or other materials when storage is in compliance with the rules and regulations of the New Hampshire Water Supply & Pollution Control Commission for Control of Nonresidential Underground Storage and Handling of Oil and Petroleum Liquids.

#### *Comprehensive Rezoning - Draft Ordinance*

As part of the Comprehensive Rezoning initiative, the City has produced, but not yet adopted, a draft Aquifer Protection Overlay District ordinance that applies to two aquifer protection districts in the City. The purpose of the draft ordinance is to protect existing and potential groundwater supply areas and surface waters that are fed by groundwater by regulating all land uses which could contribute pollutants to aquifers that will likely be needed to supply Rochester's municipal drinking water system some time in the future. The draft ordinance provides water quality protection that exceeds the existing ordinance by requiring performance standards for regulated substances that apply to all uses and activities in the districts, and by prohibiting specific uses that pose high risk for contamination or the introduction of pollutants to aquifers.

#### ***Aquifer Recharge***

Currently, the City does not conduct aquifer recharge as part of their public drinking water supply systems, which derive their source water from a surface water source and the City's Water Treatment Plant. The NHDES has permitted 2 new groundwater production wells for the City, which will be going online in 2008. Refer to Appendix E for a summary of the NHDES permit requirements for these new wells.

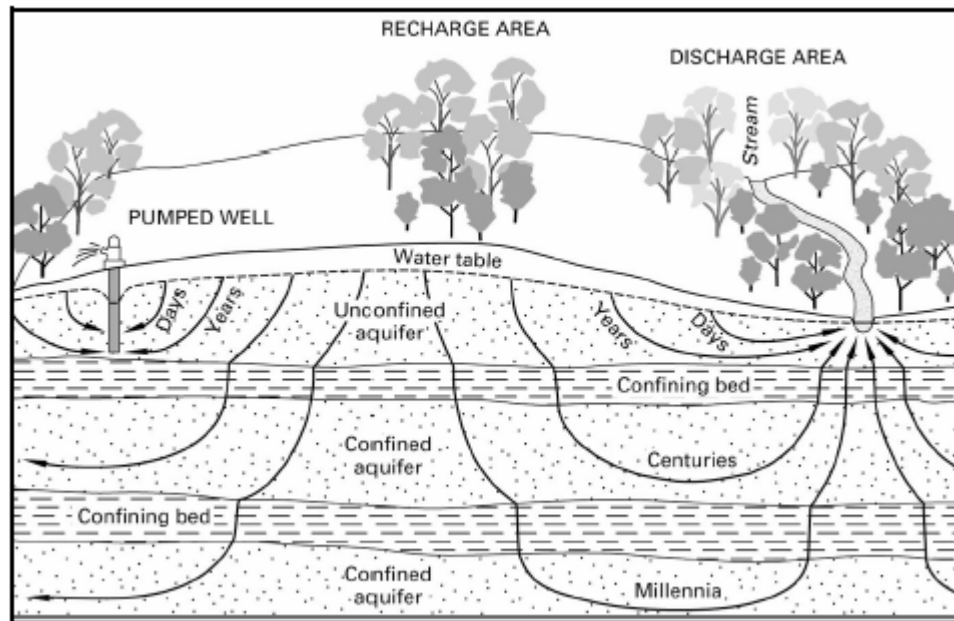
#### *Low Impact Development*

Low Impact Development (LID) is a process of developing land in a manner that mimics the natural hydrologic functions on the developed landscape. LID helps to manage the impacts that stormwater runoff has on the hydrology of natural resources, including recharge of groundwater aquifers. Under natural conditions, rainfall and surface runoff infiltrates into the ground, recharges the groundwater aquifers and provides base flow to streams, rivers and wetlands. The remainder of rainfall is converted to runoff and flows into surface waters. LID seeks to preserve the natural water balance and recharge functions on developed lands:

- ✓ decreasing impervious surface area and maximizing the amount of ground area capable of infiltration (i.e. soils with high infiltration capacity)
- ✓ implementing stormwater best management practices that perform infiltration
- ✓ preserving and utilizing naturally vegetated areas to treat and absorb runoff
- ✓ maintaining natural surface drainage patterns



**Figure 14: Illustration of groundwater flow paths (and their relationship to the local water table, surface waters and pumped wells).<sup>19</sup>**



### 9.3 Recommendations

ID	Action
AQ 1	Retain the existing aquifer recharge volumes and recharge functions on all development sites. <i>Priority Ranking: Highest</i>
AQ 2	Encourage reductions in impervious surface cover in aquifer recharge areas, both on residential and non-residential properties. <i>Priority Ranking: Highest</i>
AQ 3	Revise ordinances and regulations to include preservation of aquifer recharge areas. <i>Priority Ranking: Intermediate</i>
AQ 4	Provide options in regulations for implementation of low impact development techniques to provide aquifer recharge on all development sites through stormwater management. <i>Priority Ranking: Long Term</i>

<sup>19</sup> *Subaqueous Capping and natural Recovery: Understanding the Hydrogeologic Setting At Contaminated Sediment Sites* (July 2002), U.S. Army Corps of Engineers, Environmental Laboratory

## 10.0 SURFACE WATER RESOURCES

### Policy Statement

**Rochester should provide for comprehensive protection of shoreland to protect the quality of surface waters through regulatory, educational, and voluntary efforts. The loss of shoreland buffers through variances, waivers and through illegal activities should be minimized.**

Shorelands are the vegetated areas adjacent to a wetland where disturbance to land and vegetation is restricted or prohibited. The primary function of a buffer is to physically protect and separate a wetland from future disturbance by:

- √ absorbing and filtering runoff to protect water quality
- √ intercepting and slowing runoff to prevent erosion
- √ providing habitat for wetland species and upland species
- √ improving landscape and recreational aesthetics

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### 10.1 Watersheds

A watershed is the land that drains into a particular river system or body of water. How land is used and developed within a watershed determines the quality of the water in the lakes, streams, wetlands, and groundwater.

**Figure 15: Major watersheds of Rochester**



Rochester lies entirely within the greater watersheds of the Salmon Falls/Piscataqua River and the Cochecho River watersheds. The Salmon Falls/Piscataqua River watershed comprises 7,610 acres or 26 percent of the total area of Rochester. The Cochecho River watershed comprises 21,472 acres or 74 percent of the total area of Rochester.

The Salmon Falls/Piscataqua River and the Cochecho River watersheds are shown at left in Figure 16 below and in [Figure 11- Water Resources Map](#).

Although these watersheds extend far beyond Rochester, the quality of surface waters in these watersheds is certainly influenced by how Rochester landowners care for their land and the land use decisions that are made by the City. Treatment of stormwater, protection of riparian buffer areas, and land conservation are important methods to protect the quality of surface waters in Rochester’s watersheds.

**Table 25: Watershed acreage by USGS Hydrologic Unit Code (HUC)**

HUC 10 Watersheds*	HUC 12 Watersheds	Acres	% Total City Area
<b>Cocheco River Watershed</b> (HUC 0106000306)	Axe Handle Brook (HUC 010600030602)	4,757	16.4
	Long Pond (HUC 010600030606)	413	1.4
	Lower Cocheco River (HUC 010600030608)	1,893	6.5
	Lower Isinglass River (HUC 010600030607)	6,511	22.4
	Middle Cocheco River (HUC 010600030603)	7,898	27.2
<b>Salmon Falls River Watershed</b> (HUC 0106000304)	Middle Salmon Falls River (HUC 010600030405)	7,610	26.2

\* *Note:* Hydrologic Unit Code (HUC) system was developed by the USGS. The United States is divided and sub-divided into successively smaller hydrologic units, which are classified into four levels: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system. Successively smaller units (HUC 10, 12, etc.) are identified on the regional and state level. For more information, refer to <http://water.usgs.gov/GIS/huc.html>.

## 10.2 Rivers, Streams, Lakes and Ponds

Rochester has a dense network of surface waters consisting of rivers and tributary streams connected by large wetland complexes, and lakes and ponds. Surface waters comprise 638 acres or 2.2 percent of the City’s total land area<sup>20</sup>. The most intensive development in Rochester, historically and at present, is located along the banks of the City’s largest surface waterbody systems, the Salmon Falls River and Cocheco River, both of which were important historic power sources and transportation corridors for the numerous mills that lined its banks from the 1700’s to the early 1900’s.

<sup>20</sup> National Hydrography Dataset (NH DES), November 2007

**Table 26: Surface water bodies by type and acreage**

<b>Surface Water</b>	<b>Acres</b>	<b>% Total City Area</b>
Rivers	367	1.3
Lakes	128	0.44
Ponds	143	0.49
<b>Total</b>	<b>638</b>	<b>2.2</b>

[Source: National Hydrography Dataset (NH DES), November 2007]

*Primary Headwater Streams*

Headwater streams with a watershed area generally less than one square mile are considered primary headwater streams, and can be ephemeral, intermittent or perennial. The health of larger streams, rivers, and other surface waters in the watershed depend upon an intact primary headwater stream network. Particularly, the stream network in the upper parts of the watershed greatly affects downstream water quality.

The importance and benefits provided by primary headwater streams include: reduction of sediment delivery downstream, reduction in nutrient loading (nitrogen and phosphorous), flood storage and control, and wildlife habitat corridors and aquatic habitat. The economic reasons to protect and improve primary headwater streams include: protection of public drinking water sources, maintenance of recreational uses of lakes, ponds and rivers, minimizing damage to infrastructure (bridges, culverts, dams) and property, and maintaining channel morphology and land stability.

Headwater streams (first order streams) comprise 53 percent of the total stream miles in Rochester. Headwater streams are particularly important for maintaining water quality due to the sheer number of miles they represent in most watershed drainage systems.

**Table 27: Miles of streams by stream order and type**

<b>Stream Order/Type</b>	<b>Miles</b>	<b>% Total Stream Miles</b>
1 <sup>st</sup> Order	50	52.7
2 <sup>nd</sup> Order	18	18.6
3 <sup>rd</sup> Order	8	8.6
4 <sup>th</sup> Order	17	18.1
5 <sup>th</sup> Order	2	2.0
<b>Total</b>	<b>95</b>	
Perennial	43	44.9
Intermittent	21	22.3

[Source: National Hydrography Dataset (NH DES), November 2007]

Refer to Figure 17 on the following page showing the order of streams and rivers Rochester.

*The Land Conservation Plan for New Hampshire's Coastal Watersheds (2006)* prioritizes coastal watershed areas and offers regional strategies for maintaining diverse wildlife habitat, abundant wetlands, clean water, productive forests, and outstanding recreational opportunities into the future. The Plan identifies four Conservation Focus Areas in Rochester: Rochester Heath Bog (entire), Rochester Neck (portion), Preston Pond (portion), and Blue Hills (portion). These

Conservation Focus Areas contain high quality stream watersheds, high yield aquifers, wellhead protection areas and riparian and wetland habitats. Protection of the water resources in these Conservation Focus Areas from the effects of growth and land conversion is an important strategy for protecting quality of surface waters in Rochester. Refer to Section 6.2 for more detailed information about these resources.

*U.S. Geological Survey Gage Stations*

Isinglass River. The Isinglass River gage station is part of a 2-year multipurpose streamflow monitoring network expansion project for 15 new stream gages across New Hampshire. The expansion project was requested by the New Hampshire Rivers Management Advisory Committee (RMAC), proposed by the Stream Gage Task Force (SGTF), and funding for installation was provided by the New Hampshire Legislature. The station operated in cooperation with the New Hampshire Department of Environmental Services.

USGS Gage Station #010728700 Isinglass River, Strafford, Strafford County, NH  
 Strafford County, New Hampshire  
 Hydrologic Unit Code 01060003  
 Latitude 43°14'05", Longitude 70°57'25" NAD27  
 Drainage Area 73.6 square miles  
 Gage Datum 115 feet above sea level NGVD29

**Table 28: Annual average and peak discharges of the Isinglass River**

Year	Annual Average Discharge (cfs)	Annual Peak Discharge (cfs)
2003	not reported	862
2004	140	1,740
2005	158	1,780
2006	239	4,370

[Source: USGS Gage Station #010728700 Isinglass River, Strafford County, NH]

Cocheco River. The U.S. Geological Survey maintains a gage station on the Cocheco River in Rochester. The USGS estimates that there are 85.7 square miles of drainage basin upstream from this discharge monitoring station. The Rochester gage has been collecting dialing discharge measurements since March 1, 1995. Discharge data from March 1995 to the present and station gage information is available at the USGS National Water Information System Web Interface at <http://waterdata.usgs.gov/nwis/inventory>.

USGS Gage Station #01072800 Cocheco River near Rochester, Strafford County, NH

Latitude 43°16'06", Longitude 70°58'27"  
 NAD27, Gage Datum: 119.38 feet above sea level NGVD29  
 Hydrologic Unit Code: 01060003  
 Drainage Area: 85.7 square miles  
 Data from 1995 through present; Full Record Station

**Table 29: Annual average and peak discharges of the Cocheco River**

Year	Annual Average Discharge (cfs)	Annual Peak Discharge (cfs)
1996	197	2,810
1997	182	3,090
1998	172	3,700
1999	104	1,310
2000	138	1,250
2001	113	1,460
2002	70	959
2003	113	969
2004	149	1,980
2005	171	2,650
2006	266	5,550

[Source: USGS Gage Station #01072800 Cocheco River Near Rochester, Strafford County, NH; Data from USGS National Water Information System: Web Interface]

*Salmon Falls River*

The USGS does not maintain a gage station on the Salmon Falls River.

***Comprehensive Shoreland Protection Act (CSPA)***

In June of 2007, the New Hampshire legislature enacted amendments to the Comprehensive Shoreland Protection Act (CSPA). The CSPA provides protection to the state’s public waters by establishing a forested buffer area as well as restricted use areas within 250’ of lakes, large ponds, and fourth order and larger rivers. As of the date of this Chapter, amendments to the current CSPA will become effective July 1, 2008. An additional 1,391 miles of river will come under the protection of the CSPA as a result of the adoption of the New Hampshire Hydrography Dataset (NHD) for stream order determination. In addition, all rivers designated under the state’s Rivers Management Act will now come under the protection of the CSPA. Refer to Appendix D for information from NHDES about the adopted changes to the CSPA. Refer to Figure 16 on the following page for a diagram of stream orders in Rochester.

**Table 30: Surface water bodies in Rochester under the jurisdiction of the Comprehensive Shoreland Protection Act**

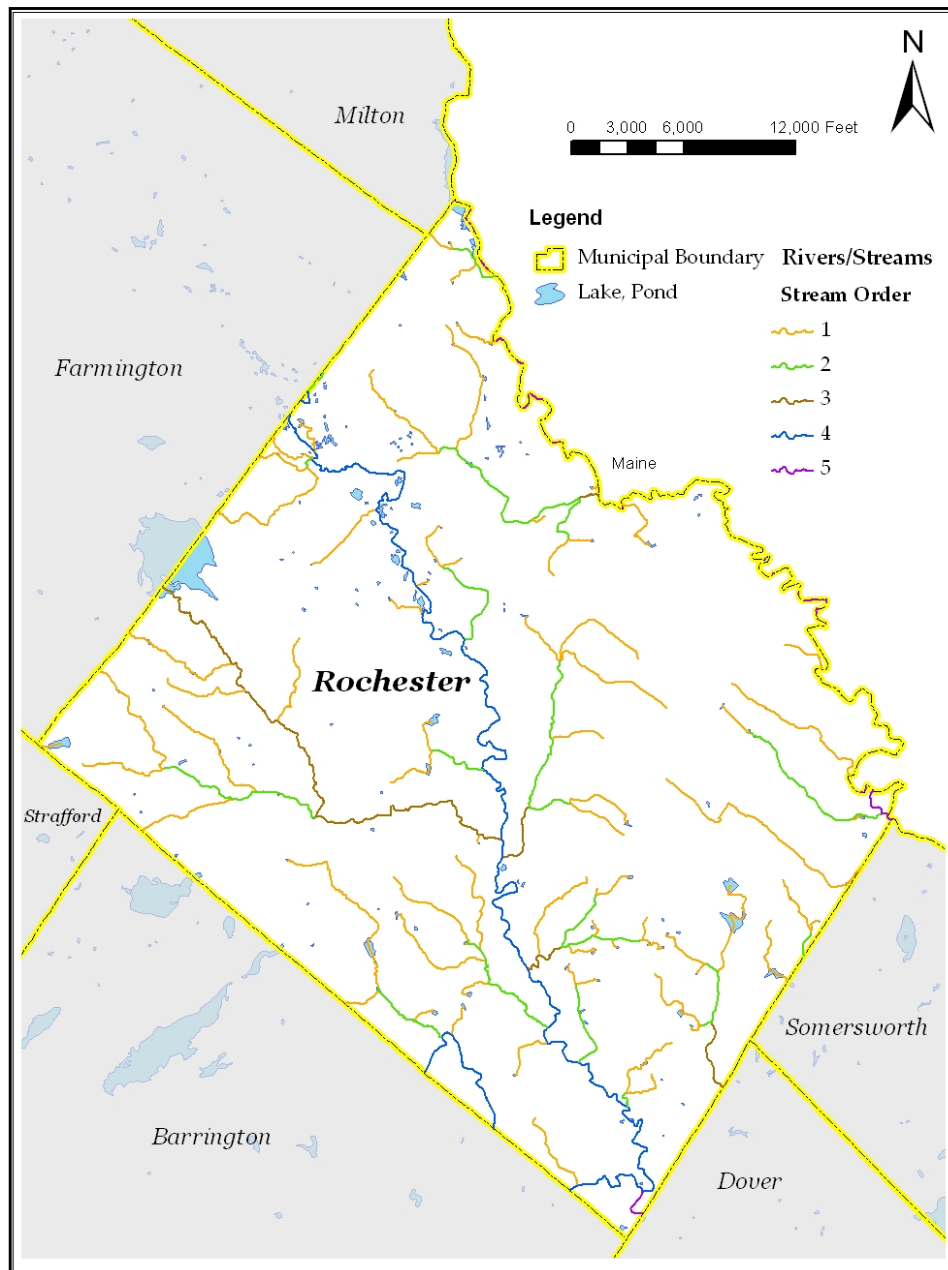
Waterbody	Community resource shared with	River System	Total Acreage
Baxter Lake	Farmington	---	295
Baxter Mill	---	Salmon Falls	58
City Dam 1	---	Cocheco	50
Gonic impoundment	Rochester	Cocheco	107
Rochester Reservoir	---	---	56
Spaulding Pond	Milton		50
<b>Fourth Order and Higher and Protected Rivers</b>	Salmon Falls Rivers, Cocheco River, Isinglass River (protected)		

[Source: NHDES One Stop Database]

*Comprehensive Shoreland Protection Act (CSPA) Exemptions*

Forest management not associated with shoreland development or land conversion and conducted in compliance with RSA 227-J:9 or under the direction of a water supplier for the purpose of managing a water supply watershed, and agriculture conducted in accordance with best management practices as required by RSA 483-B, III are exempted from the provisions of the CSPA. Projects that receive a permit under RSA 482-A, e.g., beaches, do not require a shoreland permit.

**Figure 16: Order classification of rivers and streams in Rochester**



*Municipal and State Setback and Buffer Requirements*

Below is a summary of development setback and buffer requirements for public waters under the Comprehensive Shoreland Protection Act (CSPA) and for streams, rivers, and wetlands.

Rochester’s requirements exceed those of the CSPA for structure setbacks on the Isinglass River and buffers from 4<sup>th</sup> order and higher rivers, and lakes and pond > 10 acres.

**Table 31: Development setbacks and buffers required by the CSPA and Rochester**

Resource	Requirement	CSPA <sup>4</sup>	Rochester
4 <sup>th</sup> Order and Higher Rivers; Lakes and Pond > 10 acres	<b>Structure Setback</b>	50 ft	---
	<b>Septic System Setback</b>	75 ft	---
	<b>River Buffer</b>	50 ft <sup>1</sup>	75 ft
	<b>Impervious Surface Cover</b>	20% <sup>5</sup>	---
Rivers and Streams	<b>Structure Setback</b>	N/A	---
	<b>Stream Buffer</b>	N/A	50 ft <sup>3</sup>
Protected Rivers (Isinglass)	<b>Structure Setback</b>	50-ft <sup>1</sup>	100 ft
Wetlands	<b>Wetlands Buffer*</b>	N/A	50 ft <sup>2</sup>

[Source: Rochester Zoning Ordinance and Comprehensive Shoreland Protection Act]

<sup>1</sup> Limited clearing of trees based on points system; no land disturbance or removal of ground cover

<sup>2</sup> Also from poorly and very poorly drained soils and vernal pools

<sup>3</sup> From named streams and surface waters [from Conservation Overlay District Table I: Axe Handle Brook (Rickers and Howard Brooks), Health Brook, Hurd Brook, Willow Brook (Wardley Brook), Clark Brook, Baxter Lake, Rochester Reservoir, Hanson Pond (Squamagonic Pond), Little Long Pond, Champlin Pond, No Name pond south of Champlin Pond]

<sup>4</sup> CSPA – Comprehensive Shoreland Protection Act (RSA 483:B)

<sup>5</sup> Permitted to increase to 25% with no cutting in waterfront buffer, and up to 30% with a DES approved stormwater management plan

\* Buffers – no land disturbance or clearing of natural vegetation permitted

***Riparian Buffer Areas***

The Complex Systems Research Center at the University of New Hampshire conducted a *Stream Buffer Characterization Study* (2007)<sup>21</sup>, sponsored by the New Hampshire Estuaries Project, which mapped and evaluated the condition of riparian buffers for the major rivers and streams in Rochester. Riparian buffers are the undeveloped, vegetated lands along lakes, ponds, rivers and streams that connect river corridors, unfragmented lands, and wetlands. The results of this study are summarized in Table 32.

Based on the map produced by the *Stream Buffer Characterization Study*, riparian buffers in Rochester are relatively intact and unaltered in rural areas and somewhat modified or impaired in locations where there is intensive development, such as along the Salmon Falls and Cocheco Rivers within the central downtown area. The Rochester map can be viewed and downloaded from the Complex Systems Research Center website.

<sup>21</sup> Complex Systems Research Center at the University of New Hampshire, *Stream Buffer Characterization Study* (2007)



**Table 32: Buffer condition data from the New Hampshire Estuaries Project “Stream Buffer Characterization Study”**

Buffer Characterization	Decision Rule	% Area of 150-foot buffer	% Area of 300-foot buffer
Intact	<10% impacted	1.8	2.4
Mostly Intact	1-25% impacted	1.8	2.1
Somewhat Modified	25-50% impacted	1.3	4.1
Impaired	>50% impacted	0.5	2.0
<b>Total City Land Area (acres)</b>		<b>1,569</b>	<b>3,012</b>
<b>% Total City Land Area</b>		<b>5.5</b>	<b>10.6</b>

\* Note: The *Decision Rule* establishes categories based on the degree to which each buffer or buffer segment was impacted by human activity, specifically the percent of land area within the buffer mapped by land use type as either developed, transportation, or agriculture.

*Riparian Area and Buffer Function*

Buffers that are naturally vegetated - whether with grass, forest or scrub-shrub species - are most effective in providing wildlife habitat, removing pollutants, protecting resources from contamination, and preventing negative impacts resulting from human activity. The study *Introduction to Riparian Buffers*; Connecticut River Joint Commission for NH and VT<sup>22</sup>, offers guidelines for buffer widths by function provided as summarized in the table below.

**Table 33: Guidelines for buffer widths in providing specific functions and services**

Function/Service	Description	Width (feet)
<b>Bank Stabilization</b>	Riparian buffer vegetation helps to stabilize streambanks and reduce erosion by slowing the flow of runoff. Roots hold bank soil together, and stems protect banks by deflecting the cutting action of waves, ice, boat wakes, and runoff.	50
<b>Fisheries Habitat</b>	Forested riparian buffers benefit aquatic habitat by improving the quality of nearby waters through shading, filtering, and moderating stream flow. Shade in summer maintains cooler, more even temperatures, especially on small streams. Cooler water holds more oxygen and reduces stress on fish and other aquatic creatures. A few degrees difference in temperature can have a major effect on the survival of aquatic species. Woody debris feeds the aquatic food web. It also can create stepped pools, providing cover for fish and their food supply while reducing erosion by slowing flow.	75
<b>Nutrient Removal</b>	The riparian buffer traps pollutants that could otherwise wash into surface and groundwater. Phosphorus and nitrogen from fertilizer and animal waste can become pollutants if more is applied to the land than plants can use. Because excess phosphorus bonds to soil particles, 80–85% can be captured when sediment is filtered out of surface water runoff by passing through the buffer. Chemical and biological activity in the soil, particularly of streamside forests, can capture and transform nitrogen and other pollutants into less harmful forms. These buffers also act as a sink when nutrients and excess water are taken up by root systems and stored in the biomass of trees.	125

<sup>22</sup> Connecticut River Joint Commission. 2005. *Introduction to Riparian Buffers*. From: *Riparian Buffers for the Connecticut River Valley*, No.1. <http://www.crjc.org/riparianbuffers.htm>.

<b>Sediment Control</b>	Riparian buffers help catch and filter out sediment and debris from surface runoff. Depending upon the width and complexity of the buffer, 50–100% of the sediments and the nutrients attached to them can settle out and be absorbed as buffer plants slow sediment- laden runoff. Wider, forested buffers are even more effective than narrow, grassy buffers.	150
<b>Flood Control</b>	By slowing the velocity of runoff, the riparian buffer allows water to infiltrate the soil and recharge the groundwater supply. Groundwater will reach a stream or river at a much slower rate, and over a longer period of time, than if it had entered the river as surface runoff. This helps control flooding and maintain stream flow during the driest time of the year.	200
<b>Wildlife Habitat</b>	The distinctive habitat offered by riparian buffers is home many plant and animal species, including those rarely found outside this narrow band of land influenced by the river. Continuous stretches of riparian buffer also serve as wildlife travel corridors.	300

The proximity of discharge from stormwater management structures or from overland flow to surface water bodies, and vegetative condition of the riparian area, can have a significant effect on the pollutant loading from runoff to surface water bodies. Studies conducted in the northeast and by the Center for Watershed Protection (Maryland) have documented that by converting as little as ten percent of a watershed to impervious surfaces, stream water quality, stream channel structure, and species habitat begins to deteriorate. Above 25 percent impervious surface cover, water quality is seriously degraded. The 2005 report *The Effects of Urbanization on Stream Quality at Selected Sites in the Seacoast Region in New Hampshire, 2001-03*<sup>23</sup>, found that, at sites with greater than 8 to 14 percent impervious surface, the watershed generally showed changes in stream quality as measured by reductions in the combined water quality, habitat condition and biological condition score for these sites. The Center for Watershed Protection (Ellicott City, Maryland) reports similar findings of the correlation of percent impervious surface coverage with degradation of water quality and in-stream habitat.

### 10.3 Fishery

#### *Isinglass River*

The New Hampshire Fish and Game Department reports a diverse range of fish habitats in the Isinglass River. The free flowing nature, an extensive riparian buffer, high water quality (see below), and varied substrate types of the Isinglass River are the primary factors that account for the diverse habitats within the river. Although the Isinglass River is naturally a warm water fishery, the river is managed by the NH Fish & Game as a put-and-take coldwater fishery that provides habitat for approximately 20 resident warm and coldwater fish species. Naturally occurring game species include the Small and Largemouth Bass. Naturally occurring non-game fishes include common species such as Bluegill, Common Shiner, Fall Fish, Brown Bullhead, and the Common Sucker. An uncommon non-game species, known as the Blacknose Shiner, is found in the Isinglass River and has very limited distribution in New Hampshire. Introduced

<sup>23</sup> Deacon, Jeffrey, R., Soule, Sally A., and Smith, Thor E., *Effects of Urbanization on Stream Quality at Selected Sites in the Seacoast Region in New Hampshire, 2001-03*, U.S. Geological Survey Scientific Investigations Report 2005-5103.

game species include Brook, Brown, and Rainbow Trout. The river is stocked annually with these trout species. Much of this stocking occurs in the Town of Barrington between routes 126 and 202.

***Cocheco River***

The Cocheco fishery is a statewide resource. The NH Fish and Game Department manages and stocks trout in the Cocheco River without a closed fishing season from the Route 125 Bridge in Rochester downstream to the confluence with the Cocheco River. The Great Bay Chapter of Trout Unlimited developed a trout-restocking program for the Cocheco River and one of its major tributaries, the Isinglass River.

Overall, the Cocheco River has a diverse and healthy population of returning anadromous fish. The river is one of three most productive rivers for river herring from the monitored Great Bay tributaries. The following species have been identified in the Cocheco River fish ladder by NH Fish and Game: Alewife, Blueback Herring, American Shad, Sea Lamprey, American Eel, Atlantic Salmon, Brown Trout, Rainbow Trout, Eastern Brook Trout, Fallfish, White Sucker, Smallmouth Bass, Largemouth Bass, Striped Bass, Tiger Trout, Bluegill, and Creek Chub.<sup>24</sup>

**Table 34: Observed fish species in the Cocheco River**

Rainbow Trout	Atlantic Salmon	Bridled Shiner
Blueback Herring	Smelt	American Eel
Brook Trout	American Shad	Lamprey Eel
Common White Sucker	Yellow Perch	Eastern Chain Pickerel
Eastern Brook Trout	Small-Mouth Bass	Common Shiner
Alewife	Blueback Herring	Sea Lamprey
Brown Trout	Fallfish	White Sucker
Large-Mouth Bass	Striped Bass	

[Source: Cocheco River Watershed Environmental Quality Report (February 2006)]

In recent years the striped bass populations have increased throughout the Eastern seaboard and have been observed in Great Bay and tributaries including the Cocheco River according to the NH Fish & Game Department (NH F&G). River Herring (Blueback and Alewife), anadromous fishes, migrate up the Cocheco to spawn in fresh water via the fish ladder at Cocheco Falls in downtown Dover. Since 1989 there has been a general increase in the migration of this species as reported by the NH F&G. However, there have been years that have had low returns for a variety of reasons such as flood conditions or droughts affecting survivability. The Atlantic Salmon, once a very abundant species, is only found as a stocked species today. An Atlantic Salmon fry stocking program was initiated in 1988 in two coastal river systems (Cocheco and Lamprey Rivers) to produce a recreational fishery. Some years had no returns (1997 and 1998) while other years had only marginal returns (three returns in 1999). The program was terminated in 2003 due to not producing returns to fulfill the project goals. During the 1980’s NH F&G stocked the Cocheco, Lamprey and Exeter Rivers with American Shad. However, since 1988, when the stocking stopped in the Cocheco, there remains a residual run of American Shad.<sup>25</sup>

<sup>24</sup> Cocheco River Watershed Environmental Quality Report (February 2006), and personal communication of May 14, 2008 from Cheri Patterson, NHFGD

<sup>25</sup> 2001 City of Dover Master Plan, Natural Resources Chapter, Fish and Wildlife Resources Section

### *Salmon Falls River*

According to historical records, the Salmon Falls River sustained the most productive diadromous fish runs in the region, including an abundant Atlantic Salmon population, prior to the construction of dams. In 2002, a denil fishway was constructed at the Salmon Falls dam to facilitate diadromous fish passage. Today, a shad run exists on the Salmon Falls River; it is not yet clear whether shad are using the fishway as there is little monitoring data available. River herring have been observed using the fishway although there is no confirmation of which species. Also an American eel fish passage system allows passage over the dam. Because the hydroelectric dam facility at Rollinsford does not have a fishway, it serves as an upstream barrier to all species other than American eels. Restoration of fish passage at this site would provide potential fish access to about 10% of the total stream miles in this system. Today, intra and inter-basin transfers of river herring occur in the Lamprey, Cocheco, Winnicut, and Salmon Falls river systems. American shad, although this species is larger and able to swim and jump over larger barriers than river herring, has very specific spawning habitat requirements and only a trace of a natural spawning run persists in the Salmon Falls River.<sup>26</sup>

#### **10.4 Instream Flow Management**

In New Hampshire, instream flow protection under RSA 483 NH Rivers Management and Protection Program is required to be maintained along protected rivers, or segments of protected rivers, in a manner that will enhance or not diminish the enjoyment of outstanding river characteristics. Instream public uses are defined as including the flow-dependent components of navigation, recreation, fishing, conservation, maintenance and enhancement of aquatic life, fish and wildlife habitat, protection of water quality and public health, pollution abatement, aesthetic beauty, public water supply, and hydropower production.

In 2002, legislation was passed (Chapter 278, Laws of 2002 from House Bill 1449-A) that called for a pilot program for instream flow protection on two of the fifteen state designated rivers under the NH Rivers Management and Protection Program - the Lamprey River in the coastal watershed and the Souhegan River in the Merrimack watershed. With the advice and input of the statewide Rivers Management Advisory Committee (RMAC), Effective May 29, 2003, NHDES adopted Instream Flow Rules (Env-Ws 1900) for the Souhegan and Lamprey Rivers that describe the process for conducting a Protected Instream Flow study and developing a Water Management Plan to implement the study results. If the pilot program is successful, the rules would be amended before they could be applied to other state designated rivers. Detailed information about the main provisions of the Chapter 278 and components the Instream Flow Rules can be obtained from the NHDES website at <http://www.des.state.nh.us/Rivers/Instream/>.

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<sup>26</sup> New Hampshire Estuaries Project *Great Bay Estuary Restoration Compendium* (2006), Jay Odell and Pete Ingraham, The Nature Conservancy, Alyson Eberhardt and Dr. David Burdick, University of New Hampshire

In Rochester, instream flow rules may apply in the future to the Isinglass River, a designated river, and possibly to the Cocheco River, which was nominated for consideration into the designated rivers program in May 2008.

## **10.5 Dams**

The City owns and maintains City Dam on the Cocheco River in Rochester between North Main Street and Bridge Street. The City also maintains 4 other dams located outside the City which are part of the public drinking water supply system derived from the Berry River in Strafford. Refer to Section 10.5 Drinking Water Impoundments for additional information about these dams.

**Table 35: Dams and impoundments by surface water body**

<b>Name</b>	<b>River or Waterbody</b>	<b>Status</b>	<b>Material</b>	<b>Use</b>
Forest Meadow Pond	Forest Meadow Pond	Not built	Earth	R
Rochester Sewage Lagoon	NA	Active	Earth	L
Mill Pond	Cocheco	Active	Concrete	R
Gonic	Cocheco	Active	Concrete	R
Cocheco River	Cocheco	Breached	Timber/Stone	M
Hatfield	Cocheco	Active	Concrete	H
City Dam 1	Cocheco	Active	Earth	R
Farm Pond	Natural Swale	Active	Earth	C

[Source: NH Dam Listing provided by NHDES, 2007]

H = Hydropower, R = Recreation, C = Commercial, L = Lagoon, M = Mill

## **10.6 Floodplains**

Rochester has approximately 1,775 acres of floodplain as identified on the U.S. Federal Emergency Management Agency (FEMA) floodplain maps (2006). Rochester's Zoning Ordinance Chapter 42.20 Regulatory Floodway Zone includes the following requirements for protection of flood storage and property damage within the Regulatory Floodway:

- Prohibits any development or encroachment resulting in an increase in flood levels during the base flood discharge;
- New and replacement water and sewer systems proposed in flood prone areas will be designed to minimize or eliminate infiltration of flood waters and located to avoid impairment or contamination during periods of flooding; and
- Requires documentation of certification of flood-proofing and the as-built elevation of all new or substantially improved structures; all new construction and substantial improvements of residential and non-residential structures shall have the lowest floor and basement elevated at or above the 100-year flood level (non-residential structures and utility/sanitary facilities can alternatively be flood-proofed).

## **10.7 Drinking Water Sources**

### ***Public Drinking Water Supplies***

#### ***Rochester Water Treatment Facility***

The City of Rochester owns and operates a conventional tertiary water treatment plant that operates 24 hours per day, seven days per week. Water is treated through the processes of flash mix, coagulation, flocculation, sedimentation, sand filter filtration, carbon filter and disinfection. The facility serves approximately 8,000 connections and a population of 19,000 customers. Wastewater is processed through booster stations, 4 water storage tanks, and approximately 119 miles of piping. The water treatment plant is permitted by the state to process 5 million gallon per day (MGD) with a peak of 16 MGD. On average, the water treatment plant is operating approximately at seventy (70) percent capacity. Much of the peak flows are generated by periodic and seasonal increases in stormwater volumes. To maintain capacity and address these increased flows, the City has been working to remove infiltration and inflow from the sewer system through sewer separation and sewer main rehabilitation projects.

#### ***Drinking Water Source and Impoundments***

The Rochester Water Treatment facility draws water from the Rochester Reservoir, a man-made impoundment, which contains 790-acre feet of water. Water stored in the Rochester Reservoir in Farmington is drawn from the Berry River, which flows from Farmington into Strafford and has a watershed of 8.7 square miles. This supply is derived from one hundred percent surface water. The water supply to the reservoir includes Ox Bow, Whaleback and Tufts Ponds in Farmington. Water flows from these ponds to Round Pond and then to the Rochester Reservoir. After treatment, finished water is distributed via gravity system to the City of Rochester, East Rochester Village and parts of Gonic Village and South Lebanon, Maine.

The City owns and maintains 4 dams associated with the public drinking water supply: at the Rochester Reservoir in Rochester, Round Pond in Barrington, Tufts Pond in Farmington and the Berry River in Strafford adjacent to the water supply intake. Refer to Table 35 for a list of dams in Rochester.

**Table 36: Rochester Water Treatment Plant operational statistics, 2003-2007**

<b>Operational/Treatment Statistics</b>		<b>Delivery Statistics</b>	
Built In	1987	<b>Year</b>	<b>Production (MG)</b>
Design Flow	5.0 MGD	<b>2003</b>	763,641,000
Average Flow	2.2 MGD	<b>2004</b>	750,320,000
Max Day 2005	3.08 MGD	<b>2005</b>	760,310,000
Water Sources (100% surface water)	Round Pond, Berry River, Tufts Pond, Rochester Reservoir	<b>2006</b>	747,440,000
Service Connections and Population	8,000 connections 31,000 persons served	<b>2007</b>	786,610,000

MG = millions of gallons, MGD = millions of gallons per day [Source: City of Rochester, 2008]

*Watershed Transfer - City of Dover*

The City of Dover maintains the only registered water withdrawal (>20,000 gallons per day) on the Isinglass River. Dover withdraws an average of 830,000 gallons of water per day from the Isinglass River from a point just downstream of the Rochester Neck Road Bridge in the City of Rochester. The water is pumped to a recharge well in Dover (which recharges groundwater to the Cocheco) and serves as public water supply. [Source: Isinglass River A Report to the General Court, January 2002]

The NHDES report *Isinglass Annual Water Use Versus Stream Flow-2004*, reports that the City of Dover withdrew an average of 2.95 cubic feet per second from the Isinglass River for the months of January-June and October-December. The highest withdrawal rates were 3.342 cfs in the months of Jan-March and May. A lower withdrawal rate was 1.186 in October, with no withdrawals in the months of July-September.

*Water Quality Testing*

Drinking water from the Rochester Water Treatment Plant is treated to remove impurities as required by federal regulations (standards of the Clean Water Act) and good health practices. After initial filtration, chlorine is added to the water for disinfection, fluoride is added to promote strong teeth, and sodium bicarbonate is added to increase the alkalinity. The pH of the water is increased, and an inhibitor is added to reduce the corrosion of households plumbing. The Rochester Water Treatment Facility is required by state and federal law to test the drinking water supply for organic contaminants, inorganic contaminants, and microbiological contaminants.

**Table 37: Potential types and sources of contamination of drinking water sources**

<i>Organic Contaminants</i>	
Trihalomethanes (TTHM)	By-product of the chlorination process
Five Haloacetic Acids (HAA5)	By-product of the chlorination process
<i>Inorganic Contaminants</i>	
Fluoride	Produced by erosion of natural deposits; discharge from fertilizer application and aluminum factories; additive to promote oral health and to control microbes
Chlorine	
Nitrate	Runoff from fertilizer application; leaching from septic systems, tanks, sewage; erosion from natural deposits
Nitrite	
Copper*	Natural deposits and corrosion of household plumbing
<i>Microbiological Contaminants</i>	
Turbidity	Soil run off and stormwater
Total Organic Carbon	Naturally present in the environment; soil runoff and stormwater

[Source: City of Rochester Annual Water Quality Report 2008]

\* Copper is tested for once every three years. The State allows monitoring of some contaminants less than once per year because the concentrations of these contaminants do not tend to change frequently.

As an MS4 community, the City of Rochester must comply with the EPA Phase II National Pollutant Discharge Elimination System (NPDES) rules for water quality under the Safe Drinking Water Act. (Refer to the Water Quality Section below for a detailed description of the NPDES permit program.) NPDES State and federal requirements that must be met with respect

to the City’s surface water supply include: surface water treatment, filter backwash, lead and copper, water conservation, source protection, distribution, backflow, coliform and disinfection by-products.

*Potential Contamination Sources (PCSs)*

For source water protection, the City has identified properties containing Potential Contamination Sources (PCSs) in the Berry’s River water supply watershed. Those property owners are notified and furnished with educational information on an annual basis as required by the Best Management Practices Rule for Source Protection (NHDES, Drinking Water and Groundwater Bureau, Drinking water Source Protection Program).

**10.8 Surface Water Users**

*City of Dover - Watershed Transfer of Surface Waters*

The City of Dover maintains the only registered water withdrawal (>20,000 gallons per day) on the Isinglass River. Dover withdraws an average of 830,000 gallons of water per day from the Isinglass River from a point just downstream of the Rochester Neck Road Bridge in the City of Rochester. The water is pumped to a recharge well in Dover (which recharges groundwater to the Coheco) and serves as public water supply. [Source: Isinglass River: A Report to the General Court, January 2002]

The NHDES report *Isinglass Annual Water Use Versus Stream Flow-2004*, reports that the City of Dover withdrew an average of 2.95 cubic feet per second from the Isinglass River for the months of January-June and October-December. The highest withdrawal rates were 3.342 cfs in the months of Jan-March and May. The lowest withdrawal rate was 1.186 in October, with no withdrawals in the months of July-September.

*Industrial and Commercial Uses*

Tables 38 and 39 below report industrial and commercial businesses and hydroelectric facilities that withdraw and/or utilize water from the Coheco River.

**Table 38: Permitted withdrawals from the Coheco River**

Withdrawal	Purpose	Location	Activity Status
<b>Rochester</b>			
City Concrete Company	Industrial	Chestnut Hill Road	Active Permit (facility inactive)
Frisbee Memorial Hospital	Institutional	11 Whitehall Road	Active
Pike Industries, Inc.	Mining	Rochester Neck Road	Active
Rochester WWTF	Sewage Treatment	Maple Street	Annual Irrigation
Woodsville/Rochester Hydroelectric	Power Hydroelectric	Main Street	Active

[Source: NHDES 2008]



**Table 39: Licensed hydroelectric facilities on the Cochecho River**

Hydroelectric Facility	Ownership	Location	FERC License #
Hatfield Dam	Woodsville Rochester Hydro Association	Rochester	5563
Gonic Saw Mill Dam	Breached	Gonic	N/A

[Source: NH Dam Listing provided by NHDES, 2007]

**Table 40: Impoundments on the Cochecho River**

Name of Dam	Location	Ownership	Status	Purpose	Drainage Area
Mill Pond Dam	Rochester	Mill River Trust	Active	R	80
Gonic Dam (breached)	Rochester	Gosport Properties LLC	Active	R	78
Cochecho River Dam	Rochester		Breached	M	0
City Dam 1	Rochester	City of Rochester	Active	R	64

R = Recreation M = Mill [Source: NH Dam Listing provided by NHDES, 2007]

### *Phase II: National Pollutant Discharge Elimination System (NPDES) Requirements*

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into Waters of the United States. (Note: Waters of the United States, as defined by the Clean Water Act, means navigable waters and their tributaries, interstate waters, oceans out to 200 miles, and intrastate waters used for recreation or as a source of fish or shellfish sold in interstate commerce, or for industrial purposes by industries engaged in interstate commerce.

Regulated point sources under the NPDES permit program are discrete conveyances such as pipes or man-made ditches. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. NPDES permits contain limits on what can be discharged, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or public health. The permit translates general requirements of the Clean Water Act into specific provisions tailored to the operations of each facility discharging pollutants.<sup>27</sup> In NH, the NPDES permit program is administered by the NHDES Pollutant Discharge Elimination System (NPDES) Federal Storm Water Program (Phase II).

As an MS4 community (urbanized areas as delineated by the U.S. Bureau of the Census), the City of Rochester must comply with the EPA Phase II National Pollutant Discharge Elimination System rules for discharges from the Rochester Wastewater Treatment Plant and municipal stormwater discharges to Waters of the United States. *Refer to Section 12.1 for more information about stormwater discharges and regulatory requirements.*

<sup>27</sup> EPA National Pollutant Discharge Elimination System (NPDES) website at <http://cfpub.epa.gov/npdes/>

**Table 41: Permitted municipal and commercial discharges to the Cocheco River**

<b>Point Source Discharge</b>	<b>Type</b>	<b>Location</b>
Rochester Wastewater Treatment Plant	Wastewater	Rochester
<b>Return to Environment</b>		
Brox Paving Materials Inc.	Mining	Rochester Neck Road
Lydall Rochester	Industrial	134 Chestnut Hill Road
Waste Management	Industrial (irrigation - dust control on roads)	Rochester Neck Road

[Source: NHDES 2008]

## **10.9 Water Quality Monitoring**

### ***Water Quality Monitoring Data***

#### ***Isinglass River***

The Isinglass River is designated a Class B water by the General Court. Based on monitoring data from 1990 to 2007, the Isinglass River fully supports the standards of this water quality goal. The significance of maintaining a high level of water quality in the Isinglass River is evidenced by the use of the river for recreational purposes, by the presence of a cold water fishery, its use as a public water supply for the City of Dover, and as a significant contributing factor to the water quality observed in the Cocheco River downstream of its confluence with the Isinglass. Current and historical water quality data has been analyzed and presented by NHDES in their annual “Isinglass River Watershed Water Quality Reports” available on the DES website at <http://www.des.nh.gov/wmb/VRAP/isinglass.html>.

The 2007 Isinglass Volunteer River Assessment Program (VRAP) completed its 6th consecutive year of volunteer water quality monitoring on the Isinglass. During the 2007 season (May – September) periodic water quality monitoring was performed on the Isinglass River and some of its tributaries. Sampling included: 1) air and water temperature, turbidity, pH, dissolved oxygen (in mg/l and % saturation) and specific conductance; 2) 5 rounds of sampling (conducted on a monthly basis) occurred at six locations on the Isinglass main stem and at 3 tributary locations (Nippo Brook, Mohawk River, Berry’s River); and 3) 3 rounds of *E. coli* and total phosphorous samples at 6 main stem sites. The 2007 monitoring program was conducted with the assistance of the Cocheco River Watershed Coalition, with a field metering kit donated by Waste Management, Inc., laboratory analysis conducted by NHDES and funded by the Cocheco River Watershed Coalition, as well as donations of time, materials and supplies from a dozen volunteers.

#### ***Cocheco River***

The Cocheco River Watershed Coalition has collected a great deal of data about water quality in the Cocheco River. The Cocheco River Watershed Coalition and many others are working to better understand the components of the river system in order to restore water quality. Water quality data is collected at ninety-three (93) monitoring stations on the Upper, Middle and Lower Cocheco mainstem and its tributaries including those of the Axe Handle Brook watershed, as well as at 8 lakes and ponds and the Rochester Reservoir. The following monitoring sites are

located in Rochester: 6 sites in the Axe Handle Brook watershed, 10 sites on the Middle Coheco mainstem, 6 sites near the confluence of the Isinglass and Coheco Rivers, and 4 sites on the Lower Coheco mainstem. The NHDES 2008 Section 305(b) Report found that several monitoring sites in Rochester report impairments for pH, dissolved oxygen, aluminum lead, copper, and *E. coli* for a remediation method would be needed to implemented to meet Total maximum Daily Load (TMDL) standards.

The Watershed Restoration and Implementation Plan for the Coheco River (June 2006) proposes various objectives and actions to meet these restoration goals and to restore water quality to the river.

### **10.10      Recommendations**

<b>ID</b>	<b>Action</b>
SW 1	Review existing ordinances and regulations for compliance with the Comprehensive Shoreland Protection Act, as adopted July 1, 2008. Revise ordinances and regulations as necessary. <i>Priority Ranking: Highest</i>
SW 2	Support water quality protection measures to ensure that surface waters meet state standards for their designated uses – aquatic life, drinking water, fish consumption, primary and secondary contact recreation and wildlife. <i>Priority Ranking: Highest</i>
SW 3	Encourage planting and restoration of riparian buffers on municipal and private properties. <i>Priority Ranking: Intermediate</i>
SW 4	Develop partnerships with local and regional watershed and river stewardship groups to improve and protect the quality of surface waters, i.e. through land conservation, water quality monitoring, implementing best management practices, forest preservation, etc. <i>Priority Ranking: Long Term</i>
SW 5	Conduct education and outreach to landowners and business owners in the community about the importance of buffers and riparian areas in protecting water quality. <i>Priority Ranking: Long Term</i>

## 11.0 GROUNDWATER RESOURCES

### Policy Statement

**Rochester has an obligation to protect the volume and quality of groundwater resources for use as a public and private drinking water sources to ensure adequate supply for the future.**

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### 11.1 Groundwater Resources

In New Hampshire, groundwater resources are often the most common source of water supply for a community, either through public or private wells. Development alters the hydrology of the land surface by the construction of buildings, roads and parking areas that can affect groundwater quantity. Covering the land surface with impervious material may divert water to such an extent not allow adequate recharge of groundwater aquifers. Groundwater quality is vulnerable to pollution from various land use activities. Pollutants can enter an aquifer from point sources of pollution – locations where sources of pollutants originate - such as nearby septic systems that are incorrectly placed on a site or maintained incorrectly. Aquifers are also at risk from underground storage tanks, household hazardous wastes when disposed of carelessly, from some commercial/industrial facilities, and from landfills and wastewater treatment plants when they are sited or managed improperly.<sup>28</sup>

#### *Public Drinking Water Supply*

##### *Large Groundwater Withdrawal Permit*

To meet current and future water supply demands, the City has investigated several new sources of public drinking water, consisting of the addition of two groundwater wells. The first well is located at the old City Concrete property on Chestnut Hill Road and the second well is at the Henderson Campground property near Farmington Road (NH Route 11). It is expected that these water sources will be in production to provide water to the City by the end of 2010.

The New Hampshire Department of Environmental Services has conditionally issued an approval of 1) one new large community production well (Well RCH-1C), and 2) a large groundwater withdrawal permit for two wells (RCH-1C and RCH-2A1). These two new large community overburden production wells are permitted for 864,000 gallons per day (or 600 gallons per minute). The permit was issued on April 4, 2008 and expires April 4, 2018. As stated in the permit notification letter from NHDES, the NHDES anticipates issuance of a permit for RCH-2A1 as a new large community production well upon demonstration by the City of ownership or control over the 400-foot sanitary protective area around the wellhead. Refer to Appendix F for a summary of NHDES approval and conditions of the permit.

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<sup>28</sup> NH Office of Energy and Planning Technical Bulletin 9, *Formulating A Water Resources Management & Protection Plan* (Winter 1992) at <http://www.nh.gov/oep/resourcelibrary/documents/technicalbulletin9.doc>

**Table 42: Source specifications for municipal drinking water supply, Well RCH-1**

Source Name	Well Status	Permitted Production Volume	Sanitary Protective Area Radius	Source Description
RCH-1C	New	864,000 gallons per day in any 24-hour period*	400 feet	Approx. 400 feet east of the Cocheco River east of Farmington Road

[Source: city of Rochester and NHDES Water Management Bureau]

\* This is the maximum volume of groundwater allowed to be withdrawn from this water supply production well in any 24-hour period.

*Conserved Lands – Henderson Property*

On August 2, 2005, the Rochester City Council approved purchase of the Henderson Property, in part, to protect the City’s new municipal drinking water supply well located on the property (groundwater well RCH-1C described previously). The Henderson Property consists of approximately 165.5 acres with 3,300 linear feet of water frontage along the east and west banks of Cocheco River, including 17.5 acres placed under a conservation easement. The Conservation Easement executed for the property describes the conservation purposes of this easement as:

- the protection of groundwater and surface water resources on and under the property;
- the perpetual protection of the quality and sustainable yield of groundwater and surface water resources to safeguard present and future drinking water supplies, including the stratified drift aquifer which underlies the property and the municipal drinking water supply whose Source Water Protection Area includes a portion of the property; and
- the safeguard of those conservation features of the property, which are dependent upon water quality and quantity.

*Private Drinking Water Wells*

According to the NH Department of Environmental Services One Stop Data Center, Rochester has 884 private wells registered with the state’s private water well database (reports only new wells drilled and registered from 1984 to the present). The City requires initial testing of new private drinking water wells for microbiological contaminants (*E. coli* and Coliform) but no further water quality testing is required.

**11.2 Groundwater Users**

The Wellhead Protection Areas for public drinking water sources comprise approximately 3,056 acres or 10.5 percent of the total City area.

**Table 43: Public drinking water sources and service statistics**

Type	Use	Population Served	# Service Connections
<b>Community</b>	Single-Family and Multi-Family Residential, Senior Housing	1,437	686
<b>Community*</b>	Rochester Water Department	20,000	7,000
<b>Non-Community Transient</b>	Motel/Hotel, Campground, Seasonal Residence	765	432

[Source: NHDES One Stop Database, 2008]

\* >1,500 persons served or derived from a surface water supply

### *Public Water Systems*

A Public Water Supply (PWS) is a system for the provision to the public of piped water for human consumption, and has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Non-transient non-community water supply, which is not a community water system, is a system, which serves the same 25 people, or more, over 6 months per year, such as schools, or private businesses that have their own drinking water supply. A Transient Community water supply is a system that serves less than 25 people for less than 6 months of the year, such as at restaurants, campgrounds, and other types of service-related businesses or facilities.<sup>29</sup>

## **11.3 Recommendations**

ID	Action
GW 1	Develop water conservation programs and raise public awareness about its importance. <i>Priority Ranking: Highest</i>
GW 2	Evaluate the effectiveness of existing local ordinances and regulations pertaining to the protection of ground water quality and quantity. <i>Priority Ranking: Highest</i>
GW 3	Provide information to owners of private drinking water wells about the health benefits of water quality testing. Encourage water quality testing on a periodic basis. <i>Priority Ranking: Intermediate</i>
GW 4	Support development of goals for the City to protect groundwater quality and quantity for future use as a public drinking water source. Evaluate whether existing regulatory measures meet these protection goals. <i>Priority Ranking: Intermediate</i>

<sup>29</sup> RSA 485:1-a Public Drinking Water Protection Program

## 12.0 POTENTIAL THREATS TO WATER RESOURCES

### Policy Statement

**Protect the quality of surface water and groundwater resources used for public drinking water, and surface water as habitat for aquatic and shoreland wildlife, and for recreational uses.**

Local studies have documented that the transport of sediments, pollutants, and nutrients, associated with stormwater runoff, is the largest contributor to non-point-source pollution in surface waters in the coastal watershed. This is due to the rapid growth in population and the developed landscape in many of the watershed communities. Local studies have estimated the increase in future demand on water resources based on this pattern of growth in the region.

The public appears to understand the value of water quality as a resource; however, public awareness of the effects of this growth on local economics and quality of life appears to be lacking.

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### **12.1 Point Source Pollution**

As defined under the Clean Water Act, point sources of pollution are ‘discernible, confined and discrete conveyances or discharges, such as from a pipe, ditch, channel, tunnel, conduit, fissure, or container, and including vessels or other floating craft from which pollutants can be discharged, and concentrated animal feeding operations.’

#### *Phase II: National Pollutant Discharge Elimination System (NPDES) Requirements*

As an MS4 community, the City of Rochester must comply with the EPA Phase II National Pollutant Discharge Elimination System rules and the requirements of the Stormwater General Permit. NPDES Permits are required under the Clean Water Act for any activity, which discharges pollutants through a point source into waters of the United States (refers to permanent tributaries to navigable waters, navigable waters, waters used for interstate commerce, and oceans out to 200 miles). The Permit translates general requirements of the Clean Water Act into specific provisions tailored to the operations of each permitted discharge activity.

Rochester’s EPA NPDES Permit (Number NHR041028) describes the City’s progress toward meeting these requirements of the Stormwater General Permit. Actions taken include: mapping and collection of GIS data for all stormwater outfalls citywide; engagement of a third party consulting engineer to comprehensively review all significant developments and report findings to the Planning Board; proactive monitoring by the City of stormwater management practices at construction sites; promotion of the Cocheco River as a valuable community resource, including Riverbank Cleanups; active participation in the Seacoast Stormwater Coalition, an organization of other MS4 communities in the seacoast region with the goal of leveraging resources and

sharing information relating to training and outreach about stormwater issues; conducting stormwater awareness training to highway, utility and Department of Public Works employees; implementing procedural changes throughout City government and departments to increase awareness of stormwater issues relating to construction, maintenance practices and management of public spaces; producing a stormwater video and brochure to increase public awareness of stormwater stewardship and management; conducting annual “Hazardous Waste” days for community collection of materials and waste; and adoption of a stormwater and erosion control ordinance (refer to description of the ordinance in Section 12.2 following).

## **12.2 Non-Point Source Pollution**

Non-point source pollution occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, mobilizes pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into the groundwater. These pollutants can include oil and sand from roadways, agricultural chemicals from farmland, sediments from construction sites, crop and forest lands, and eroding streambanks, and nutrients and toxic materials from urban and suburban areas. The effects of nonpoint source pollutants on specific waters vary and may not always be fully assessed. However, it is well documented in scientific literature that these pollutants have harmful effects on drinking water supplies, recreation, fisheries, and wildlife.

Reduction and prevention of nonpoint source pollution requires a collective effort on federal, state and local levels. Some activities are federal responsibilities, such as ensuring that federal lands are properly managed to reduce soil erosion and that water quality standards for Waters of the U.S. are protected. Some are state responsibilities, for example, developing legislation to govern mining and logging, and to protect groundwater and public drinking water supplies. Others are best handled locally, such as by zoning or erosion control and stormwater management ordinances. And each individual - homeowner, business owner, property owner, resource user, and visitor - can play an important role by practicing conservation and by making certain lifestyle adaptations.<sup>30</sup>

### ***Stormwater***

Stormwater is generated by precipitation, surface runoff and snow melt from land, pavements, building rooftops and other impervious surfaces. The introduction of pollutants can degrade water quality for public drinking water supplies and for aquatic habitat. Discharge points for stormwater runoff are infrastructure including detention basins, infiltration areas or basins, drainage ditches, and swales. Such diversion of runoff through artificial conveyances and infrastructure diverts water from the natural hydrologic flow systems. This can lead to alteration of the natural processes of infiltration and migration of surface water and groundwater that are critical for maintaining groundwater recharge, stream base flow and wetlands. Stormwater runoff is also discharged to surface water bodies through overland flow and infiltration to the groundwater table and discharge to streams, rivers, lakes and ponds, and wetlands.

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<sup>30</sup> New Hampshire Department of Environmental Services, Water Management Bureau



As shown in Table 44 below, impervious surface coverage for Rochester has increased steadily since 1990 to the present with an overall increase since 1990 of 1,570 acres or 63.5 percent.

**Table 44: Impervious surface cover and population for Rochester, 1990-2005**

Year	1990	2000	2005
<b>Impervious Surface Cover (acres)</b>	2,472	3,403	4,042
<b>% Total City Area</b>	8.5	11.7	13.9
<b>Population</b>	<b>1990-2000</b>		<b>2000-2005</b>
Percent Increase	37.7%		18.8%

[Source: *Impervious Surface Mapping in Coastal New Hampshire* (2006) by David Justice and Fay Rubin, Complex Systems Research Center at the University of New Hampshire

The current impervious surface cover of 18.8 percent is close to reaching a critical threshold for the protection of surface water quality. Studies conducted in the northeast have documented that by converting as little as ten percent of a watershed to impervious surfaces, stream water quality, stream channel structure, and species habitat begins to deteriorate. Above 25 percent impervious surface, water quality is seriously degraded. The 2005 report *The Effects of Urbanization on Stream Quality at Selected Sites in the Seacoast Region in New Hampshire, 2001-03*<sup>31</sup> found sites with between 8 and 14 percent impervious surface in the watershed generally showed changes in stream quality as measured by reductions in the combined water quality, habitat condition and biological condition score for these sites. The Center for Watershed Protection (Ellicott City, Maryland) reports similar findings of the correlation of percent impervious surface coverage with degradation of water quality and in-stream habitat.

#### *Erosion and Sedimentation*

The development process typically involves the removal of vegetation, the alteration of topography, and the covering of some previously vegetated surfaces with impervious surfaces. These changes to the landscape may result in the erosion of soil and the sedimentation of water bodies as soil travels to streams, rivers, and lakes in water runoff during storms at an increased velocity due to the lack of vegetative cover. The removal of vegetative cover and its roots system compromise the ability of vegetation to stabilize soil, reduce the velocity of runoff, shield the soil surface from rain, and maintain the soil's ability to absorb water. Specific erosion and sedimentation impacts related to the loss of vegetation, pollution of the water supply, and alteration of topography are:

1. Streambank erosion caused by an increase in the volume of stormwater runoff,
2. Alteration of existing drainage patterns,
3. Destabilization of steep slopes by removal of trees and other vegetation,
4. Reduced potential for groundwater recharge due to coverage by impervious surfaces or drainage control methods that convey stormwater off-site, and
5. Runoff of chemical and organic (nutrients) pollutants into surface waters or water supplies.

<sup>31</sup> Deacon, Jeffrey, R., Soule, Sally A., and Smith, Thor E., *Effects of Urbanization on Stream Quality at Selected Sites in the Seacoast Region in New Hampshire, 2001-03*, U.S. Geological Survey Scientific Investigations Report 2005-5103.

Structural and non-structural stormwater management methods used during construction are meant to mitigate for the increased amount of erosion and sedimentation that occurs as a result of grading and other land disturbance during construction, and are not designed to be permanently in place. When properly installed, these methods can be effective in preventing the erosion and sedimentation that may occur during construction, especially during storm events. These methods include: developing work zones and establishing phases of construction; developing the sequence of construction and methods to be used during phases; preparing a schedule for earth moving and building construction activities; requiring a narrative of daily activities. When these steps are completed, an erosion and sediment control plan can be created utilizing practices that will support the daily schedule of construction activities while preventing erosion and controlling sediment movement to surface waters.<sup>32</sup>

### *Managing Stormwater Through Low Impact Development (LID)*

Changes in land cover, resulting in replacement of natural vegetation with hardened surfaces, translates into an increase in stormwater runoff volume and rate, an increase in runoff and non-point source pollution, and a reduction in groundwater recharge. Low Impact Development (LID) is a process of developing land in a manner that mimics the natural hydrologic functions on the developed landscape. LID methods combine site design strategies and best management practices to achieve this primary goal. The goal of LID is to reduce the volume and flows of runoff from the developed site and to treat and recharge precipitation in a way that mimics the natural hydrology of the site and maintains high water quality.

Hydrology and Natural Resources. LID helps to manage the impacts that stormwater runoff has on wetlands, streams, lakes and coastal environments, and helps to recharge natural groundwater aquifers. Under natural conditions, rainfall and surface runoff infiltrates into the ground, recharges the groundwater aquifers and provides base flow to streams, rivers and wetlands. Development changes the natural water balance on a site by:

- ✓ increasing impervious area and reducing the amount of ground area capable of infiltration,
- ✓ converting naturally vegetated areas to impervious or manicured areas, and
- ✓ compacting natural soils.

Development also traditionally connects impervious areas to create efficient pathways to convey and divert runoff where it often has a single discharge point to surface waters. This creates the following hydrologic changes:

- ✓ larger volumes of runoff than under natural conditions,
- ✓ less recharge to groundwater and flow to surface waters and wetlands, and
- ✓ higher peak flow rates than under natural conditions.<sup>33</sup>

Better Site Design. An important concept related to Low Impact Development is the concept of “Better Site Design”. Better site design is a set of related tools that help to reduce the environmental footprint of a development on the site, and help to reduce the need for stormwater

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<sup>32</sup> NH Department of Environmental Services, Regional Environmental Protection Program (REPP) “Innovative Land Use Planning Techniques Guide” Chapter 2: Environmental Characteristics Zoning – Erosion and Sediment Control (2007)

<sup>33</sup> *LID Manual for Maine Communities: Approaches for implementation of Low Impact Development Practices At The Local Level* (September 21, 2007), Prepared for the State of Maine Coastal Program by Horsley Whitten Group, Newburyport MA.

management techniques. Better site design includes techniques such as maintaining natural vegetated areas and reducing manicured lawn areas, maintaining or planting native vegetation that is more hearty and requires less irrigation and fertilizer than non-native species, reducing pavement size by reducing driveway and roadway lengths and widths, reducing unnecessary sidewalks, building up rather than out to reduce building footprint, and avoiding natural resource areas such as wetlands, springs, wellhead areas, or special habitat areas.<sup>34</sup>

**Minimization of Impervious Surfaces.** Impervious surfaces are defined as materials that prevent or significantly retard the infiltration of water into underlying soil or earth materials. Conventional development can create large areas of impervious surfaces in the form of rooftops, driveways, parking areas, walkways, patios and roadways, and often results in significant reduction in forest or other natural vegetated land cover to accommodate the development and the construction process. Low Impact Development (LID) differs from conventional development because it focuses primarily on site design with the goal of maintaining the natural water balance. This is done by retaining as much of the natural vegetative cover on a site as possible and siting buildings, driveways and parking areas in a way that avoids and minimizes impacts to wetlands, surface water, source water protection and recharge areas, and other important hydrologic features. Once the basic site design is created, LID practices can be integrated into the design to further improve stormwater management to reduce the pollutant load carried in the stormwater, reduce erosion, reduce peak flows, reduce runoff volumes and increase infiltration on the site to maintain hydrologic function and a more natural hydrologic system.<sup>35</sup>

### ***Rochester Stormwater and Erosion Control Ordinance***

As part of their strategy to meet the Phase II requirements, the City developed a stormwater and erosion control ordinance, which was adopted by the City Council at the May 6, 2008 meeting. The purpose of the ordinance is to “provide for the health, safety, and general welfare of the citizens of the City of Rochester through the regulation of discharges into the City’s Stormwater Drainage System, waterbodies, streams, and wetlands in a manner compliant with the requirements of State and Federal law, including the provisions of the Federal Stormwater Management Legislation for Municipal Separate Storm Sewer Systems (MS4s), as amended.” The objective of the ordinance is to:

- (a) Prohibit non-permitted discharges into the municipal stormwater drainage system;
- (b) Set forth the legal authority and procedures to carry out all inspection, monitoring, and enforcement activities necessary to ensure compliance with this Ordinance and applicable State and Federal law;
- (c) Establish, for new construction, design and construction standards for stormwater drainage systems that will result in the construction of systems that will be compliant with the ordinance and State and Federal laws and to have such standards incorporated into the existing standards and review processes governing new construction in site plan and subdivision review, as well as building permits that implicate the requisite disturbance of the site.

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<sup>34</sup> *LID Manual for Maine Communities: Approaches for implementation of Low Impact Development Practices At The Local Level* (September 21, 2007), Prepared for the State of Maine Coastal Program by Horsley Whitten Group, Newburyport MA.

<sup>35</sup> Ibid

The ordinance requirements include:

- Any activity that disturbs or impacts greater than 5,000 cumulative square feet of land must obtain an approved Stormwater Management Plan (SWMP) from the Department of Public Works Director (excludes normal agricultural maintenance and improvement of land, maintenance of lands associated with a single-family dwelling, construction of fences and utilities, emergency repairs to a stormwater management facility)
- Applications for site plan review and subdivision review must include a Construction Stormwater Management and Erosion Control Plan when: cumulative disturbed area exceeds 20,000 square feet or greater than one acre for road construction; subdivision of more than three building lots; phasing of greater than three lots per year of an existing or proposed subdivision; construction of utilities requiring contiguous land disturbance of greater than 20,000 square feet.
- Critical Areas are lands: within 35 feet of the ordinance high water mark of a permanent or intermittent vernal pool, stream, bog, water body; within 35 feet of poorly and very poorly drained soils and floodplain; disturbed areas exceeding 2,000 square feet in highly erodible soils; and disturbed areas containing slope lengths exceeding 25 feet on slopes greater than 15 percent. Adjacent to Critical Areas any new project requiring an approved SWMP will require permanent water quality control measures.
- Permanent Stormwater Management Technical Design Criteria include: existing and proposed methods of handling stormwater runoff must result in no increase in the rate or volume of runoff that leaves the boundaries of the site; engineering calculations used to determine drainage requirements must be based upon 25-year storm frequency, 24-hour duration; all closed drainage systems, culverts, major ditches, swales, and detention facilities must be sized for the 25-year storm frequency; all drainage pipes larger than 48 inches must be designed to accommodate a 50-year storm frequency event; and all structural measures such as detention/retention facilities must be reviewed for 50-year storm impacts.
- A Maintenance and Inspection Plan may be required as part of an approved SWMP.

#### *Potential Nonpoint Sources of Pollution*

Other potential sources of non-point source pollution include: subsurface waste disposal systems, road salt and maintenance, underground and aboveground storage tanks, agriculture, forestry, silviculture, and resource extraction. There is no comprehensive inventory or estimate of pollutant contribution from these types of potential nonpoint sources of pollution in the Isinglass watershed. Agriculture, forestry, silviculture, and resource extraction are regulated by federal and state laws and require implementation of best management practices to protect water quality on active sites. New and replacement subsurface waste disposal systems are permitted by the state; however, malfunctioning and failing septic systems can go undetected as there are no routine inspection procedures in most communities.

Other potential sources of non-point source pollution of local and neighborhood concern include disposal of yard waste, pet waste management, trash accumulation and disposal. These activities can cumulatively contribute to pollutants in surface waters and wetlands. Effective methods to reduce these potential contributions may focus on education and outreach to landowners and in cooperation with local civic groups, neighborhood and volunteer organizations, and schools.

### 12.3 Recommendations

<b>ID</b>	<b>Action</b>
TH 1	Develop a City policy for large groundwater withdrawals to address the potential effects on future public drinking water supplies. <i>Priority Ranking: Highest</i>
TH 2	Encourage use of alternative materials that reduce impervious surfaces for construction of driveways, walkways, roads, parking areas and recreational trails. <i>Priority Ranking: Intermediate</i>
TH 3	Require pre- and post-development run-off assessments and evaluate potential limitations on both the "post" rate and total quantity into ordinances and regulations. <i>Priority Ranking: Intermediate</i>
TH 4	Develop a database of lands protected as part of Subdivision and Site Plan approvals. Require the submission of GIS information for protected lands and open space as part of these applications. <i>Priority Ranking: Long Term</i>
TH 5	Conduct education and outreach to landowners, businesses and residents about reduction and proper disposal of yard waste, pet waste and trash, especially in riparian areas to protect water quality. <i>Priority Ranking: Long Term</i>

## 13.0 SCENIC RESOURCES

### Policy Statements

#### **Rochester shall endeavor to preserve scenic landscape features of local significance.**

The landscape of an area defines its cultural, natural, and historical heritage and provides the members of a community with a sense of identity. Rochester's identity is marked by the views of and from roadways, streams and rivers, and open spaces. In addition, the historical context of river industry, agricultural uses and the urban landscape even today serves to define the community.

Key scenic attributes include views of and from: hills and hillsides; rivers, streams, lakes, ponds and wetlands; agricultural lands; forests, woodlands, urban tree-scapes, meadows; native vegetation, foliage and wildflowers; and other natural resource features of historical and cultural importance.

#### **Support development of planning initiatives and programs that protect the scenic viewsheds of Rochester.**

Rochester has a rich diversity of scenic views and vistas, most of which are protected only by the willingness and desires of the landowners. No comprehensive inventory and analysis exists of Rochester's scenic views and vistas.

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### **13.1 Scenic Views**

Rochester has many scenic views from its state highways and locally designated scenic roads. Several prominent and notable views include (refer to the photographs of these views on the following page):

#### *Gagne Farm*

- Open fields, stone walls and a broad view into the lowlands of the Coheco floodplain, northbound on the left toward Rochester on Route 108 before Frisbee Memorial Hospital

#### *Ten Rod Road*

- Open meadows, dense forests and historic farmsteads west toward Farmington

#### *Salmons Falls Road*

- Open meadows, hay fields, active farms and broad scenic vistas crossing the Salmon Falls River into Maine

#### *Meadersboro Road*

- Open meadows, hay fields, active farms and broad scenic vistas across the highlands north of the City



**Figure 17: Scenic views of Rochester**

Gagne Farm from Route 108 north (top left)

View toward Maine from Salmon Falls Road (top right)

Field and farmhouse on Ten Rod Road (lower left)

### *Cocheco River*

The Cocheco River through Rochester offers many spectacular scenic views from both land and from the river. Following are brief descriptions of some easily accessible views of the river.

From Little Falls Bridge to the North Main Street Bridge, a surprisingly green river corridor slips right into the urban center of Rochester. On the east bank, Hanson Pines Park with its large stand of white pines is a haven within the City. The arched bridge at North Main Street is a focal point in the urban downtown. The City Dam and Hatfield Dam just downstream at Wyandotte Falls are popular viewing points. Just downstream of the Wyandotte Mill RHA Housing is a little known view down around a bend in the river and up at a white church steeple, one block from the center of urban downtown Rochester. The corridor from the Rochester Fairgrounds to Route 125 provides scenic canoeing. Snow's Intervale by the Allen School is a city-owned park in the forested floodplain with quiet paths for walking. Pickering Ponds are functional wetlands that once were aeration ponds for the WWTF. Trails around the levees that parallel the river offer views for birding as well as good walking.

**Figure 18: Cocheco River at Gonic Mills, Pickering Road (left) and Salmon Falls River at Route 202 Bridge in East Rochester (right)**



### *Salmon Falls River*

The Salmon Falls River, a tributary to the Piscataqua River, forms the border between Rochester and Maine. From the source waters at Great East Lake in the Town of Wakefield, the river flows south-southeast for approximately 38 miles to the Piscataqua River. The river provides hydroelectric power in north Rochester and is popular local fishing spot. The Salmon Falls River is a public drinking water source to downstream communities including Somersworth (serving some 12,000 residents), and its water quality strongly influences the water quality for public wells downriver serving 33,000 residents in Portsmouth.

The Salmon Falls watershed includes diverse habitat including peatland, marsh, riverine, field and uncommon enriched soil plant communities. Within 15 miles from the center of Rochester, large undeveloped tracts are part of two larger 2,300 and 3,800-acre forest blocks identified in The Land Conservation Plan for New Hampshire's Coastal Watersheds.



## 13.2 Recommendations

<b>ID</b>	<b>Action</b>
SR 1	Inventory, identify, and prioritize the scenic viewsheds of Rochester for possible future land protection. <i>Priority Ranking: Intermediate</i>
SR 2	Identify existing ordinances and regulations that include requirements or guidelines for protection of scenic viewsheds. <i>Priority Ranking: Intermediate</i>
SR 3	Support enforcement of the requirements of the Scenic Road Overlay District, when adopted. <i>Priority Ranking: Long Term</i>
SR 4	Strengthen existing ordinances and regulations to provide greater protection of scenic viewsheds. <i>Priority Ranking: Long Term</i>
SR 5	Develop partnerships with local and regional watershed and river stewardship groups to protect the scenic qualities of rivers and tributaries. <i>Priority Ranking: Long Term</i>

## 14.0 RESOURCE CONSERVATION AND PROTECTION

### Policy Statement

**Coordinate effort among the City, State, and Federal agencies as well as non-profit conservation groups to initiate the conservation of lands in Rochester to meet multiple objectives including protection of forests, wildlife habitat, water resources and farmlands.**

A coordinated effort should be undertaken to conserve areas identified by the Master Plan as having significant importance and values to the community. Highest priority should be given to those areas most likely to be developed in the near future.

The Conservation Commission should be an active partner with The Nature Conservancy and the Society for the Protection of New Hampshire's Forests, and regional land trusts to apply a science based studies to develop specific recommendations for land conservation, and directed toward areas identified as having significant importance and values to the community.

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### **14.1 Current Use Property Assessment**

Current Use is a method of taxation established by NH RSA 79-A, which states in its purpose: "It is hereby declared to be in the public interest to encourage the preservation of open space, thus providing a healthful and attractive outdoor environment for work and recreation of the state's citizens, maintaining the character of the state's landscape, and conserving the land, water, forest, agricultural and wildlife resources. It is further declared to be in the public interest to prevent the loss of open space due to property taxation at values incompatible with open space usage. Open space land imposes few if any costs on local government and is therefore an economic benefit to its citizens. The means for encouraging preservation of open space authorized by this chapter is the assessment of land value for property taxation on the basis of current use. It is the intent of this chapter to encourage but not to require management practices on open space lands under current use assessment."

Current Use is designed to help landowners reduce their taxes by assessing the land at its present use rather than its potential use, which also benefits the community by keeping lands as open space (i.e., forests, meadows, pastureland, and agriculture). Approximately 39.5% of land in Rochester is currently enrolled in the Current Use Program. The Rochester City Council apportions a percentage (determined annually) of the current use tax collected to the Conservation Commission. These funds are commonly used for conservation and protection of lands through fee simple acquisition, placement of easements on private lands, and outreach and education including distribution of brochures and estate planning workshops.

**Table 45: Statistics of lands in Current Use**

Year	Acres In Current Use	% Total Acres Current Use	# of C.U. Property Owners	# of C.U. Parcels
2000	11,434.6	39.5	--	--
2001	Not Reported			
2002	11,661	41	269	386
2003	11,631	41	265	387
2004	11,504	40	258	415
2005	11,194	39	262	385
2006	10,944	38	245	371
2007	10,880	40	248	392

[Source: NH Department of Revenue (2007) at [http://www.nh.gov/revenue/munc\\_prop](http://www.nh.gov/revenue/munc_prop)]

It is important to understand that Current Use is not a method for permanent protection of open space land. Land placed in Current Use can be removed from the program by the landowner when a change in land use occurs, at which time a penalty called the Land Use Change Tax is assessed. Many communities use this tax revenue to fund purchase of easements and fee simple acquisition of lands for preservation of open space and significant habitat and resources. Detailed information about Current Use is in the *Current Use Criteria Booklet* available from the Department of Revenue Administration online at [www.state.nh.us/revenue](http://www.state.nh.us/revenue).

## **14.2 Land Conservation and Preservation**

Land conservation is one of the most effective tools for preserving permanently vital natural resources, wildlife and habitat, and lands of historical and cultural importance. However, land acquisition and the purchase of easements can be costly particularly as the price of land increases and the supply of developable lands become scarce.

Conserved and protected public land and privately owned lands comprise 718.1 acres or 2.5 percent of the total area of Rochester. Following is a summary of conserved and protected public land and privately owned lands in Rochester.

**Table 46: Protected publicly owned and privately owned lands in Rochester**

ID#*	Property/Parcel Name	Protection Type	Protection Level	Acres
1	Baxter Lake Boat Access	Fee Ownership	Unprotected Public Open Space	2.6
2	Bel-Gro Associates	Conservation Easement	Permanently Protected	11.0
3	Chamberlain School City Forest	Fee Ownership	Unofficially Protected	10.8
4	City Forest	Fee Ownership	Permanently Protected	16.4
5	City Well Parcel	Fee Ownership	Water Supply	<0.1

			Lands	
6	East Rochester School City Forest	Fee Ownership	Unofficially Conserved	21.1
7	Gabriel	Conservation Easement	Permanently Protected	23.4
8	Gagne Easements	Conservation Easement	Level Unknown	53.9
9	Gonic School City Forest	Fee Ownership	Unofficially Conserved	10.5
10	Hanson Pines	Fee Ownership	Permanently Protected	30.4
11	Heath Bog (portion of)	Fee Ownership	Permanently Protected	49.3
12	Isinglass Acres	Conservation Easement	Permanently Protected	3.1
13	Locke Falls	Deed Restriction	Permanently Protected	--
14	Meader Pond (Baxter Lake) Access	Fee Ownership	Developed Public Land	2.8
15	Municipal Lot	Fee Ownership	Permanently Protected	35.5
16	Rochester Reservoir Parcel	Fee Ownership	Permanently Protected	39.4
17	Rochester Reservoir-Barrington Land	Fee Ownership	Permanently Protected	--
18	Rochester Water Department	Fee Ownership	Water Supply Lands	105.2
19	Spaulding Turnpike Parcel	Fee Ownership	Permanently Protected	25.7
20	Squamanagonic	Fee Ownership	Permanently Protected	45.0
21	Strafford Road Parcel	Fee Ownership	Permanently Protected	4.2
	<b>Total</b>			<b>490.2</b>

[Source: NH GRANIT 2007]

\* Refer to Figure 1- Base Map for the ID # and location for each parcel.

### ***Conserved Lands – Henderson Property***

On August 2, 2005, the Rochester City Council approved purchase of the Henderson Property, in part, to protect the City's new municipal drinking water supply well located on the property and to preserve the property for conservation purposes (refer to Chapter 11, Section 11-1 for information about groundwater protection). The Henderson Property consists of approximately 165.5 acres with 3,300 linear feet of water frontage along the east and west banks of Cocheco

River. The Conservation Easement executed for this property described the intended conservation purposes as follows:

- To preserve and protect in perpetuity the natural vegetation, soils, hydrology, natural habitat and the scenic and aesthetic character so that the property retains in its natural qualities and functions;
- To protect and conserve open spaces, particularly the conservation of the productive farm and/or forest land and the wildlife habitat along the Cochecho River;
- To maintain scenic enjoyment of the general public;
- To safeguard those conservation features which are dependent upon water quality and quantity; and
- To prevent any future development, construction, or use that would significantly impair or interfere with the conservation values of the property.

The Conservation Easement also describes the following use limitations imposed whereby the property shall:

- Be maintained in perpetuity in an undeveloped and natural condition;
- Not be subdivided, not any the individual tracts shall be conveyed separately;
- Permit no structure or improvement; except for ancillary structures (such as a road, dam fence, bridge, culvert, barn, maple sugar house, or shed);
- Permit no removal, filling or other disturbances of soil surface or changes in topography, surface or subsurface water systems, wetlands or natural habitat.

## *Partners in Land Conservation*

### *Strafford Rivers Conservancy*

The Strafford Rivers Conservancy, P.O. Box 623, Dover, NH 03821-0623  
(603) 516-0772 [www.strafforddriversconservancy.org](http://www.strafforddriversconservancy.org)

The Strafford Rivers Conservancy (SRC) is a non-profit regional land trust whose purpose is to protect the natural resources, beauty, and character of lands in Strafford County. The SRC achieves its mission through the promotion of conservation easements, education, and the acquisition and stewardship of land. The Strafford Rivers Conservancy works closely with all sectors of the community including public agencies, private landowners, businesses and other non-profit organizations, and provides assistance to private landowners and others who are interested in land conservation. The SRC holds many easements, which must be monitored, inspected, and enforced, including the following: primary easement holder on 20 easements totaling 877 acres; backup easement holder on 18 easements totaling 858 acres; owns 47 acres; manages a total of 39 properties and 1782 acres. The SRC educates landowners on the procedures for protecting their land through conservation easements or outright gifts of land, and provides guidance throughout the process. In addition, the Conservancy works with developers to create development plans that are both environmentally sensitive and economically viable.

### *Strafford County Conservation District*

Since 1946, the New Hampshire Association of Conservation Districts (NHACD) has provided statewide coordination, representation, and leadership for Conservation Districts to conserve, protect, and promote responsible use of New Hampshire's natural resources. Formed to assist and support the Districts in carrying out their long-term programs and objectives, the NHACD Board of Directors is comprised of members from all ten counties. It facilitates the necessity and celebrates the success of local leaderships within the Districts and Association to achieve the common goal of sound soil and water conservation. The New Hampshire Association of Conservation Districts works collaboratively with County Districts, federal, state, and local agencies, nonprofits, and other conservationists as a volunteer, tax-exempt, nonprofit organization. The Strafford County Conservation District provides both collaborative and support services, technical assistance, and local initiatives and programs to its communities, including:

- Promote understanding and acceptance of soil and water conservation in elementary, secondary, and post-secondary school curricula
- Inform state and federal legislators of the objectives and needs of Conservation Districts and necessary legislation
- Develop guidelines for assistance and priorities to the many and diverse cooperators and others requesting support
- Promote and conduct the annual [Envirothon](#) competition for New Hampshire high-school students
- Monitor and advocate for legislation that supports conservation principles
- Design and conduct practical education workshops on topics such as flood mitigation and nonpoint source pollution prevention
- Identify and design grant programs to support Conservation District initiatives

- Host semi-annual meetings to provide a forum for and facilitate collaboration among other conservation groups
- Represent the New Hampshire at the national level through participation in the National Association of Conservation Districts meetings and initiatives
- Manages the New Hampshire Resource Conservation Corps, AmeriCorps Program supporting statewide conservation

*New Hampshire Land and Community Heritage Investment Program (LCHIP)*

The New Hampshire Land and Community Heritage Investment Program (LCHIP) is an independent start authority that makes matching grants to communities and non-profit organizations to conserve and preserve New Hampshire’s most important natural, cultural, and historic resources. The LCHIP seeks to achieve these goals both with its own resources and by setting an example and educating and supporting the land conservation efforts of others.<sup>36</sup> In recent years, LCHIP funding has supported land conservation efforts by the City, including placement of the conservation easement on the Gagne Farm.

**Table 47: Conservation easements held in Rochester by the Strafford Rivers Conservancy**

<b>SRC – Primary Grantee</b>					
<b>Property Name</b>	<b>Grantor(s)</b>	<b>Location</b>	<b>Acres</b>	<b>Date Acquired</b>	<b>Executory Grantee</b>
England Road	WMNH	England Road	32.8	4/12/2007	SCCD
Gagne	George Gagne	Salmon Falls Road	87.0	2/28/1998	SCCD
Henderson	City of Rochester	Farmington Road	18.45	10/1/2005	None
Vanderzanden	Andre & Edwinna Vanderzanden	Salmon Falls – Haven Hill Roads	75.0	12/29/1999	SCCD
<b>Total</b>			213.25		
<b>SRC – Executory Grantee</b>					
Towne	Matthew David Towne & Karen Lee Towne	Estes Road	14.6	12/13/2007	SCCD
<b>Total</b>			<b>277.85</b>		

WMNH = Waste Management of New Hampshire

SCCD = Strafford County Conservation District

***Agricultural Preservation***

Agriculture is an important element in open-space land use in Rochester. Preservation of agricultural lands is an effective means of preserving open space and natural resources due to the very nature of farmland use and management, and the large size of these undeveloped parcels. Managed forests, fields, orchards, and meadows provide important wildlife habitat and row crops are sources of food and cover. Refer to Section 4.4 Agriculture for information about active farms in Rochester.

Communities that encourage agricultural and forest-based business activities benefit by preserving rural character, scenic landscapes, natural resources and open space. Like other small business operators, farms need to be profitable in order to support the livelihood of the land

<sup>36</sup> *New Hampshire Land and Community Heritage Investment Program (LCHIP) website at <http://www.lchip.org/>*

owner, and to keep farmlands undeveloped. When farmers go out of business, or sell their farm to move to an area with less development pressure, the whole community is affected by the potential conversion of the land.<sup>37</sup>

#### Federal Assistance

The Farm and Ranch Land Protection Program (FRPP), administered by the U.S. Department of Agriculture (USDA), Natural Resource Conservation Service, provides matching funds to help purchase development rights to keep productive farm and ranchland in agricultural uses. Working through existing programs, USDA partners with State, tribal or local governments and non-governmental organizations to acquire conservation easements or other interests in land from landowners. USDA provides up to 50 percent of the fair market easement value of the conservation easement. To qualify for funding through USDA, farmland must demonstrate the following: part of a pending offer from a State or local farmland protection program; privately owned; have a conservation plan; large enough to sustain agricultural production; have access to markets for what the land produces; have adequate infrastructure and agricultural support services; and have surrounding parcels of land that can support long-term agricultural production.<sup>38</sup>

#### *Gagne Farm*

The Gagne Farm, located on Rochester Hill Road near Lowell Street, is protected by a 64-acre easement with several acres of reserved rights. The 30+ acres of active agricultural lands of this farm are prime farmland soils, which are used to grow high-grade hay. The property has spectacular views that extend to the highland surrounding the western portion of the City and across a series of open fields separated by stoned walls. The protected lands are open to the general public for walking, hunting and winter activities. The farm is located in an area of the City is rapidly becoming more urbanized. Recent changes to the landscape include road improvement projects, infill development and redevelopment of older businesses, conversion of properties to commercial businesses, and expansion of the Frisbee Memorial Hospital and associated facilities.

#### *Towne Property*

The Towne Property, located on Estes Road, comprises 15.6 acres. The property contains a small pond, several streams, wetlands, and gently rolling topography. Most of the property is forested. Two existing logging roads will remain open for public access. The conservation easement executed for this property will provide: protection from further development, preservation of natural resources, and public access to open space.

#### ***Habitat Protection***

The rapid increase in human population and rate of development in New Hampshire is placing significant stress on our native wildlife populations. The development of land and related activities impact both the quantity and quality of wildlife habitat. As described in Section 6.0 Areas of Ecological Significance, Rochester contains several ecologically significant areas,

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<sup>37</sup> NH Office of State Planning Revised Technical Bulletin 6, *Preserving Rural Character: The Agricultural Connection* (Winter 2000)

<sup>38</sup> U.S. Department of Agriculture, Natural Resource Conservation Service website at <http://www.nrcs.usda.gov/programs/frpp/>



which provide habitat for both rare and common species of wildlife. Important wildlife habitats and corridors can be protected through site design and development practices as part of the local development approval process. In addition, ordinances and regulations can help achieve this goal by focusing preliminary reviews on identifying natural resources, followed by implementation of conservation practices and site design to minimize the impact of development and human activity on wildlife and other resources.

The loss of habitat through the conversion of land from its natural state to a developed landscape represents the single greatest impact of increased human activity on native wildlife. Development can eliminate or significantly change many important habitat features found in a natural area, thus reducing or eliminating the habitat value of that area. The impact of human activity on wildlife extends beyond the actual area of development. For this reason, the preservation of wildlife corridors is particularly important. Wildlife corridors are areas with very-low development density that connect large unfragmented lands that provide wildlife with habitat, food, and cover, as well as for migration and reproduction. (Note: Refer to Section 6.3 for a more detailed discussion of the affects of fragmentation of large forested blocks and wildlife habitats.) Impacts of human activity on wildlife include permanent disturbances such as roads, utility lines, cleared areas for lawns and landscaping, and structures. For example, roads can: disrupt or prevent passage across the disturbed area; provide an entrance for exotic species or predators; increase mortality; and increase unnatural disturbances from sources such as pollution and fire.<sup>39</sup>

Important wildlife habitats and corridors can be protected with conservation measures but first they must be identified. GIS mapping, using overlays of environmental data, is a methodology commonly used to identify wildlife corridors and significant habitats. Data to project on such a map includes: habitat for federal and state listed rare and endangered species, unfragmented lands (forests, meadows, water features), riparian and shoreland areas, priority wetlands and surrounding uplands, agricultural land, locally unique or critical habitats, undeveloped lands that connect vital habitats.

### 14.3 Recommendations

ID	Action
RC 1	Continue the practice of preserving forests and woodlands as criteria for prioritization of land conservation planning and acquisition of conservation lands. <i>Priority Ranking: Highest</i>
RC 2	Encourage land use boards to engage the Conservation Commission early in the application and development review process to gain recommendations on natural resource conservation and protection. <i>Priority Ranking: Highest</i>
RC 3	Partner with regional land trusts and watershed groups to identify shared goals and priorities for natural resource protection and land conservation. <i>Priority Ranking: Highest</i>

<sup>39</sup> NH Department of Environmental Services, Environmental Fact Sheet ID-4 *Habitat-Sensitive Site Design and Development Practices to Minimize the Impact of Development on Wildlife* (2004)

- RC 4 Develop an inventory of all City owned lands, including acreage, assessed value and resource inventory for each parcel.  
*Priority Ranking: Highest*
- RC 5 Develop a comprehensive management plan and natural resource protection strategies for City owned lands.  
*Priority Ranking: Intermediate*
- RC 6 Establish a stewardship program to monitor all of the existing and future conservation and scenic easements held by the City. Stewardship requirements should be evaluated by the Conservation Commission for each easement under consideration.  
*Priority Ranking: Long Term*
- RC 7 Use the database of protected lands and open space provided with new development projects to provide for and inform resource and conservation protection decisions.  
*Priority Ranking: Long Term*

## 15.0 PUBLIC AND RECREATIONAL RESOURCES

### **Policy Statement**

**Coordinate effort among the City, State, and Federal agencies as well as non-profit conservation groups to initiate the conservation of lands in Rochester to meet multiple objectives including protection of forests, wildlife habitat, water resources and farmlands.**

A coordinated effort should be undertaken to conserve areas identified by the Master Plan as having significant importance and values to the community. Highest priority should be given to those areas most likely to be developed in the near future.

The Conservation Commission should be an active partner with The Nature Conservancy and the Society for the Protection of New Hampshire's Forests, and regional land trusts to apply a science based studies to develop specific recommendations for land conservation, and directed toward areas identified as having significant importance and values to the community.

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### **15.1 Open Space**

Open space includes many types of undeveloped lands including forests, wetlands, riparian areas, wildlife corridors, meadows and agricultural lands. New Hampshire is losing nearly 13,000 acres of open space to development each year. Based on estimates from the state's Forest Resources Plan, approximately 189,600 acres of forests (3 percent of the state's total area) were developed between 1982 and 1997.<sup>40</sup>

The most effective way to protect open space, and the natural resources contained within them, is through permanent public or private land conservation. This can occur through voluntary transactions between a landowner and a town, agency or land trust by acquisition of lands or donation of easements whereby the landowner sells the development rights but maintains ownership. Open space conservation also occurs through regulatory measures such as the designation of open space in the subdivision of land and other development approvals. Other ways that open space can be conserved is through zoning regulations that prohibit development in sensitive areas such as shorelands and buffers to surface waters and wetlands, and through education and voluntary efforts of landowners to preserve portions of their property in a natural state.

As shown in [Figure 8- Forest Types and Contiguous Forest Blocks Map](#), Rochester has a surprisingly extensive network of open space and undeveloped lands, comprising 15.4 percent of the total land area of the City. However, evaluation and local action are necessary to maintain these open spaces for the health of the land, and for the enjoyment of residents of and visitors to

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<sup>40</sup> NH Living Legacy, University of New Hampshire Cooperative Extension

Rochester. Development of an Open Space Plan could help guide the protection and management of Rochester's significant open spaces and the natural resources contained within them. The City must recognize and embrace the importance of open space and natural resource conservation in maintaining the character of the community as it grows in the future. This Plan may additionally provide the rationale for adopting regulatory changes that could enhance voluntary measures to conserve open space and natural resources.

Refer to Section 6.3 and Table 13 for additional information regarding unfragmented lands and contiguous forest blocks.

## **15.2 Natural and Scenic Recreation Areas**

Following are descriptions of natural and scenic recreation areas popular for hiking, biking, walking, and wildlife viewing.<sup>41</sup>

### *River Walk in Downtown - Rochester*

The river walkway behind the offices of Foster's Daily Democrat on River Street and Bridge Street in downtown Rochester is a wonderful place to walk, picnic, watch for fish and wildlife and learn about the history of Rochester. Many of the historic homes on River Street back onto the river. From Bridge Street to the Wyandotte Falls buildings, the falls are prominent and past the end of the buildings view the river downstream as it flows past the site of the historic box mill toward the fairgrounds. From the walkway the arches of the North Main Street Bridge are visible. The upper dam and the dam downstream of Bridge Street at Wyandotte Falls are relics of the manufacturing mills once powered by the river.

### *Axe Handle Brook*

A pocket park is located in Rochester on Axe Handle Brook (off Route 125 on Wadleigh Road, shared driveway with the Anchorage Inn). An historic marker, gravestones, a stone wall and a picnic table are set in mature woods along this tributary to the Cochemo River.

### *Henderson Farm*

The Henderson Farm property was recently acquired by the City of Rochester primarily for siting of 2 new wells for use as municipal water sources. Additionally, the City intends to use the former campground in the Cochemo River floodplain as a recreation site.

### *Pickering Ponds*

South of the intersection of Tebbetts Road and Pickering Road, Pickering Ponds in Gonic has two miles of trails that follow the dikes around two settling ponds and loop down along the river. The dikes are a vantage point for wildlife viewing in and around the ponds and river. Wildflowers and other wildlife are abundant in this mix of habitat areas. This is a favorite birding spot for sighting gulls, waterfowl, shorebirds, songbirds and raptors. In the winter, this area is excellent for cross-country skiing. There is no permanent signage at this location, but a path leads to the entrance through a gate and several granite benches are placed along the trail.

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<sup>41</sup> *Access Guide to the Cochemo River* (2003) by the Strafford County UNH Cooperative Extension and the Cochemo River Watershed Coalition

### *Mount Isinglass Recreation Area*

Located at the Turnkey Recycling & Environmental Enterprises, 90 Rochester Neck Road, the Mount Isinglass Hiking Area is a system of walking and biking trails through Rochester and Barrington. The trails wander alongside the Isinglass River with views of a small waterfall and through woodland areas, offering many opportunities for wildlife viewing. Fishing is also popular in the Isinglass River including fly-fishing and trout fishing in the fall. In winter the trails are groomed for cross-country skiing and the hike is very scenic.

### *Champlin Woods*

Located off Route 108, Champlin woods offers extensive walking trails and excellent opportunities for wildlife viewing. A pond previously existed on this site but has been breached in recent years and has now become a wetland area.

### *Gagne Farm*

The Gagne Farm is located between Route 108 and Rochester Hill road south of the downtown area. Walking trails are open for public use only at the access entrance located on Lowell Street. The property has no access directly from Route 108. For reasons of public safety, public access to other conservation lands on this site are prohibited during active agricultural use such as haying and other production or management activities.

## **15.3 Water Recreation and Fishing**

Following are popular boating, canoeing and kayaking locations on the Cocheco River.<sup>42</sup>

### *Little Falls Bridge Road Bridge*

The public right of way along Little Falls Road in Rochester serves as a takeout for canoeing the upstream reach of the river beginning at the Cocheco Road Bridge in Farmington. This location also serves as the put-in for paddling upstream toward Farmington or downstream into Rochester. About 200 yards downstream from this access is Little Falls, which may require a short portage. From Little Falls it is an easy paddle downstream to Hanson Pines Park through the rural riparian backyards of Rochester.

### *Hanson Pines Park*

Also called Dominicus Hanson Park, this natural area reaches a half-mile along the banks of the river in the heart of Rochester fringed by tall pines in this managed, mature forest. Long ago this section of the river was channeled and dammed for the mills downstream. Recreational features include footpaths, picnic tables and benches throughout the park. A footbridge crossing the river to Dewey Street makes a fine vantage point for wildlife and scenic viewing. Alongside the bridge is a convenient location to put in a canoe or end a canoe trip upstream from Farmington or Little Falls.

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<sup>42</sup> *Access Guide to the Cocheco River* (2003) by Strafford County UNH Cooperative Extension and the Cocheco River Watershed Coalition

### *Ironwood Park*

Ironwood Park is a small wooded picnic area at the end of England Road on the north bank of the river, provides a good launch for a canoe or kayak. From this point, the river offers a scenic paddle to the confluence of the Cocheco and Isinglass Rivers, and then on down the Cocheco River.

**Table 48: Public access locations to the Cocheco River and Isinglass River**

<b>Cocheco River</b>			
<b>Location</b>	<b>Type of Access</b>	<b>Facilities</b>	<b>Ownership</b>
Little Falls Bridge Rd	Canoe/Kayak Launch	None	Public Right of Way
Hanson Pines Park – Dewey St	Trails, Picnic Areas, Canoe/Kayak Launch	None	Rochester
Axe Handle Brook	<b>Pocket Park, Picnic Area</b>	None	Rochester
Ironwood Park	Canoe/Kayak Launch	None	Gonic
Pickering Ponds	Trails, Benches	None	Gonic
<b>Isinglass River</b>			
Waste Management, Inc.	Canoe site, picnic tables, riverside trail system	None	Waste Management, Inc.

[Source: *Access Guide to the Cocheco River* (2003) by the Strafford County UNH Cooperative Extension and the Cocheco River Watershed Coalition]

Note: The City is working to establish two additional public recreation access sites at the Henderson Property and a 16-acre City owned property off Chestnut Hill Road.

### *Fishing*

The Salmon Falls and Cocheco River offer many opportunities for fishing in Rochester. Refer to Section 10.2 for a description of fisheries resources and Table 48 above for fishing access to the Cocheco River.

## **15.4 Recommendations**

<b>ID</b>	<b>Action</b>
PR 1	Support water quality protection measures to ensure that surface waters meet state standards for their designated uses that support recreation including aquatic life, fish consumption, primary and secondary contact recreation, and wildlife. <i>Priority Ranking: Highest</i>
PR 2	Support establishment of recreational trails for public use on public lands. <i>Priority Ranking: Intermediate</i>
PR 3	Establish an Open Space committee to comprehensively evaluate existing and future opportunities to conserve open space and address management of open space for public enjoyment and use. <i>Priority Ranking: Intermediate</i>
PR 4	Develop a brochure and map describing public access locations to land and water recreational sites in Rochester. <i>Priority Ranking: Intermediate</i>

## 16.0 REGIONAL AND WATERSHED PLANNING

### Policy Statement

**In partnership with local, regional, state, and Federal agencies as well as non-profit conservation groups, evaluate strategies to address sustainability of water, land and air.**

Our natural resource base is part of larger ecological systems that have an undefined level of sustainability. The projection of future demand, use and capacity is based on the availability of critical, limiting resources – such as food, water, space - and is fundamental to an ecological view of the world.

**Support adoption of a regional drinking water resource protection strategy by all communities that share these resources.**

Drinking water resource protection is currently done on a community by community basis, while the resource transcends political boundaries.

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### **16.1 Overview**

The purpose of the Regional and Watershed Planning Section is to consider natural resources in a broader perspective and to identify shared resources –resources that transcend municipal boundaries. These resources include air, water, land, wildlife, habitats, forests, and open space. The goal is to recognize opportunities for developing partnerships to address natural resource issues in a holistic manner, including watershed planning, land conservation, land use planning, regulation and public participation.

The regional perspective can be defined as: the communities immediately bordering Rochester, the eighteen member communities of the Strafford Regional Planning Commission, and all communities that interact with Rochester to provide employment, goods and services, housing and workforce.

The watershed perspective can be defined as successively larger catchment areas that ultimately cross the New Hampshire and Maine border, beginning with the subwatersheds of individual streams and rivers in Rochester, the drainage systems of major rivers, namely the Isinglass, Cocheco and Salmon Falls Rivers; the greater watershed of the Piscataqua River; and the Coastal Watersheds of the Great Bay Estuary.

On the regional and watershed level, Rochester's priority natural resource objectives are to:

- ✓ Sustain the natural resource base for future economic, health, and social well-being
- ✓ Preserve the functions and services provided by the natural resource base
- ✓ Protect the quality and volume of public and private drinking water sources

- ✓ Collaborate planning and management actions for shared resources
- ✓ Protect and enhance the region's environmental and biological diversity
- ✓ Access to and dissemination of information, data and other technical resources that benefit regional and watershed level initiatives
- ✓ Link natural resource protection and land use to promote an integrated framework to guide growth and development

Following are descriptions of several state, regional and watershed-based groups and agencies, their goals and technical resources, and recent activities that promote regional and watershed cooperative action. *It is evident that these diverse groups share several common themes in their work including a desire to improve water quality, restore wildlife and habitat, and sustain New Hampshire's natural resource base for future use and enjoyment.*

## **16.2 Cocheco River Watershed Coalition (CRWC)**

The Cocheco River Watershed Coalition (CRWC) - a non-profit advocacy group - was founded in 1998 to maintain a healthy watershed by identifying and protecting important natural resources, by forming a water quality monitoring network, and by educating and engaging citizens in these efforts. The Coalition has completed several comprehensive studies of the watershed including: *Cocheco River Watershed Environmental Quality Report*, February 2005 (prepared for Cocheco River Watershed Coalition, Dover, NH by Thomas R. Fargo and Danna B. Truslow, D.B. Truslow Associates, Rye, NH), *Watershed Restoration and Implementation Plan for the Cocheco River*, June 2006 (prepared for Cocheco River Watershed Coalition, Dover, NH by Danna B. Truslow, D.B. Truslow Associates, Rye, NH).

The *Watershed Restoration and Implementation Plan for the Cocheco River* recommends a working partnership of communities in the watershed to achieve the following primary goals of the Plan:

- ✓ Improve public perception and understanding about the value of the river and increase stewardship for and responsibility to the river
- ✓ Restore water quality for greater recreational opportunities (swimming, boating, fishing), particularly upstream waters that discharge to the tidal portion of the river and the Great Bay estuary
- ✓ Restore wildlife and habitat by improving the condition of riparian areas, channel stability, and instream conditions
- ✓ Protect infrastructure and water quality by supporting low impact development, reduction in impervious surface cover, and reduction in sediment and other pollutants in runoff

On May 29, 2008, the CRWC submitted a nomination for designation of the Cocheco River to the New Hampshire Department of Environmental Services, Rivers Management and Protection Program and for review and consideration by the NH River's Management Advisory Committee and the NH General Court. For additional information, contact Lorie Chase at Cocheco River Watershed Coalition, 268 County Farm Road, Dover, NH 03820 and email at [lorie.chase@unh.edu](mailto:lorie.chase@unh.edu).



### **16.3 Isinglass River Local Advisory Committee (IRLAC)**

Formed in 2000, the Isinglass River Protection Project (IRPP) was comprised of a handful of local citizens who organized a strong network of support through educational outreach programs, petitions and public meetings. The IRPP lead efforts to designate the Isinglass River under the NH Rivers Management and Protection Program. Designation was achieved in 2002. The nomination showcased the river's values and importance to the local communities as an important environmental, historical and recreational resource. Many of the IRPP's members eventually became members of the Isinglass River Local Advisory Committee (IRLAC), which actively supports protection of the river and its watershed by reviewing development projects, conducting educational and outreach activities and public meetings and events in each of the three river corridor communities – the Towns of Strafford and Barrington and the City of Rochester.

The IRLAC is in the process of completing the Isinglass River Management Plan. This Plan recommends specific actions to protect the river corridor and the watershed, and advocates for participation of all watershed communities to implement Plan goals. The completed River Management Plan will be completed by July 2008 and available for viewing and download from the Strafford Regional Planning Commission website at [www.strafford.org](http://www.strafford.org).

### **16.4 Strafford Rivers Conservancy**

The Strafford Rivers Conservancy (SRC) is a non-profit regional land trust whose purpose is to protect the natural resources, beauty, and character of lands in Strafford County. The SRC achieves its mission through the promotion of conservation easements, education, and the acquisition and stewardship of land. Refer to Section 14.2 for detailed information about the lands held in conservation by SRC in Rochester.

### **16.5 Federal and State Agencies and Programs**

Federal and state agencies and programs can provide technical assistance, funding and partnership opportunities to advance implementation of the recommendations of this Chapter. While some state programs focus on issues of statewide importance, other state and federal agencies focus specifically on certain resources, such as forests, land use or wildlife habitat, or a geographic area of concern, such as the Coastal Watersheds of the Great Bay estuary. It will be important when implementing specific recommendations of this Chapter to identify partners that can provide expertise and assistance relevant to the tasks, products and issues to be achieved.

#### ***New Hampshire Estuaries Project (NHEP)***

The New Hampshire Estuaries Project (NHEP) is part of the U.S. Environmental Protection Agency's (EPA's) National Estuary Program, which is a collaborative local/ state/federal program established under the Clean Water Act with the goal of promoting the protection and enhancement of nationally significant estuarine resources. The mission of the NHEP is to protect, enhance, and monitor the environmental quality of the state's estuaries. Approved in 2001 and updated in 2005, the NHEP Comprehensive Conservation and Management Plan is an

approach to protect and enhance the state's estuaries. The plan describes actions to be undertaken throughout New Hampshire's coastal watershed to achieve and sustain healthy estuarine systems. The Management Plan identifies priority actions in five areas: 1) Water Quality, 2) Land Use, Development, and Habitat Protection, 3) Shellfish Resources, 4) Habitat Restoration, and 5) Public Outreach and Education. The NHEP study area covers the entire coastal watershed of New Hampshire, including all the freshwater tributaries that flow into the estuaries in the state.

Rochester is located entirely within the Cocheco River subwatershed of the larger coastal New Hampshire and Maine watersheds. The coastal watershed and estuary provide critical habitat to a variety of diadromous fishes, waterfowl, shorebirds, osprey and eagles, as well as terrestrial and freshwater aquatic species.<sup>43</sup>

The NHEP's *Great Bay Estuary Restoration Compendium* (2006) provides a comprehensive framework for addressing the numerous stressors in the coastal watersheds that cause degradation of its resources. The NHEP's evaluation of historic and current condition of Great Bay found that although the estuary is relatively intact and resilient in many ways, the system has been significantly altered and degraded since the industrial age of the 1800's. Human population growth and development throughout the watershed have created ecosystem stresses including habitat loss, and increasing levels and types of point and nonpoint sources of pollution. Human activities have altered many of the ecological processes that are necessary for the long term viability of estuarine habitats and all the species that depend on them. If continued unabated at previous levels, these alterations can produce ecosystems that are undesirable because they do not produce the kinds of natural resources, aesthetic resources, and ecological services desired to sustain human communities in the watershed and region.

For these reasons, it is the responsibility of all communities in the watershed to address the threats that degrade and reduce the biodiversity of the estuary ecosystem. In recent decades, there is a growing recognition that humans are a permanent and integral part of the ecological landscape. However, NHEP believes that ecosystems cannot be protected without implementation of multiple tools including land protection, control of point discharges and nonpoint sources of pollution, and adoption of best practices to minimize even small scale impacts from development and natural resource use throughout the watershed. New concepts such as smart growth and new technologies to manage stormwater runoff focus on mitigating the negative effects of human activities on natural systems by maintaining water quality and preventing habitat loss.<sup>44</sup>

Following is a summary of findings from the NHEP's *Environmental Indicator Report: Land Use and Development* (2006) focused on land development and population growth statistics from 1990 to 2005 specific to Rochester.

### *Impervious Surface*

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<sup>43</sup> New Hampshire Estuaries Project *Great Bay Estuary Restoration Compendium* (2006), Jay Odell and Pete Ingraham, The Nature Conservancy, Alyson Eberhardt and Dr. David Burdick, University of New Hampshire

<sup>44</sup> Ibid

The original goal of the NHEP Management Plan was to keep impervious surface cover in the coastal watershed at less than 10 percent. Based on the results below, this goal will probably not be met since expansion of impervious cover is unlikely to decline over time. To address these anticipated increases, measures can be taken to mitigate the negative effects by slowing the rate of increase from the 1990 to 2005 levels, developing stormwater management regulations to manage and treat runoff from impervious surfaces, and encouraging use of alternative technologies and materials to prevent addition of impervious cover.

**Table 49: Statistics of impervious surface cover in the coastal watershed from 1990 to 2005**

<b>Finding</b>	<b>1990</b>	<b>2000</b>	<b>2005</b>
Total Area of impervious cover	24,349 acres	35,503 acres	41,784 acres
% Watershed land area of impervious cover	4.7%	6.8%	8.0%
# Subwatersheds >10% impervious cover	2	6	10
# Communities >10% impervious cover	7	11	14
<b>Increase</b>	<b>1990-2000</b>		<b>2000-2005</b>
Acres impervious cover added in period	11,154		6,282
Acres of impervious cover added per year	1,115		1,256

[Source: New Hampshire Estuaries Project *Great Bay Estuary Restoration Compendium* (2006)]

Refer to Table 44 for statistics on Rochester’s impervious cover and population from 1990 to 2005.

### ***New Hampshire Coastal Program***

In 1972, the U.S. Congress passed the Coastal Zone Management Act (CZMA) in recognition of the importance of the nation's coastal resources. The NH Coastal Program (NHCP) gained federal approval in 1982 and is administered by the NH Department of Environmental Services. Seventeen communities in the coastal zone and twenty communities in the coastal watershed (total of 42 communities) share in the work of the NH Coastal Program. Rochester is located within NH’s Coastal Watershed.

The New Hampshire Coastal Program's mission is to balance the preservation of natural resources of the coast with the social and economic needs of this and succeeding generations. To accomplish this mission, the Coastal Program focuses on five primary goals to: prevent and abate coastal pollution; provide for public access to coastal lands and waters; foster community stewardship and awareness of coastal resources; protect and restore coastal natural resources; and encourage a viable economy with adequate infrastructure.

NHCP's Strategic Plan defines the agencies coastal management objectives for the next two to three years, focusing on areas with the most demonstrated need that protect coastal resources.

Priority Areas of the Strategic Plan include:

**Goal 2: Improve science-to-management in local communities.**

**A. Increase community planning to protect water resources:**

- Partner with other NHDES programs and organizations to help communities designate **Prime Wetlands**. If possible, set aside small amount of funding for one community to use on an annual basis.

- Work intensively with a community that’s **updating the water resources section of its master plan**, to make sure that all the water-related information is included in the planning and decision-making process (groundwater, buffers, restoration, etc.).
  - Continue to connect local decision makers with **information needed to protect water resources, like new planning tools and resources**.
- B. Support organizations and entities that assist communities with planning and data collection, compilation and interpretation.
- Provide funding to organizations and entities that **assist communities with planning, data collection, compilation and interpretation**.

Goal 3: Protect and restore natural habitats in the coastal watershed.

- A. Participate in developing, revising, and implementing state policies that protect coastal resources.
- Participate in the development of **reworking wetlands, river, or habitat wetland-related rules**.

The goals of the NHCP’s Strategic Plan clearly support many of the recommendations contained in this Natural Resources Chapter, making this agency an informed and potentially viable partner in providing technical assistance and funding to implement them. NHCP funding sources include: Competitive Grant Program, Coastal and Estuarine Land Conservation Program, and program funding through the Regional Planning Commission (the source of funding for development of this Chapter).

***NH Department of Environmental Services (NHDES)***

The various programs of the NHDES provide technical assistance and funding opportunities for nearly every sector of natural resource protection and management from drinking water supply protection to non-point source pollution abatement to land conservation. However, it is necessary to become familiar with each program and the resources that are available to determine appropriate partnerships and achieve results in implementing the recommendations of this Chapter. It may be helpful to organize a working group or subcommittee of elected officials and board and commission members to take on this task and to develop the necessary contacts and partnerships to move forward.

***University of New Hampshire Cooperative Extension***

The mission of the University of New Hampshire Cooperative Extension is to “provide New Hampshire citizens with research-based education and information, enhancing their ability to make informed decisions that strengthen youth, families and communities, sustain natural resources, and improve the economy.” Cooperative Extension derives its name from its partnership structure, which combines federal, state and county funding. This "cooperative" effort ensures all people have local access to their state university and the knowledge and resources available to address needs and problems. The principal partner is the University of New Hampshire. As a state land-grant university it is charged by Congress to conduct resident instruction, research, and outreach to people beyond the classroom.<sup>45</sup>

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<sup>45</sup> From the University of New Hampshire Cooperative Extension website at <http://extension.unh.edu/>

The University of New Hampshire Cooperative Extension is a state partner that offers communities many valuable resources and programming, which include technical guidance materials, assistance with natural resource and wildlife management issues, and landowner and public education initiatives.

## 16.6 Recommendations

ID	Action
RW 1	Develop a long term strategy to balance growth with protection and sustainability of surface water and groundwater resources. <i>Priority Ranking: Highest</i>
RW 2	Identify natural resources, wildlife corridors, natural communities, and conservation lands that extend beyond the municipal boundary of Rochester into adjacent communities. <i>Priority Ranking: Highest</i>
RW 3	Establish partnerships with adjacent communities, watershed groups, and natural resource advocacy groups, and other stakeholders to identify shared goals for protection and sustainability of natural resources in the region and local watersheds. <i>Priority Ranking: Long Term</i>
RW 4	Initiate a regional drinking water resource protection strategy that is adopted by all communities that share these resources. <i>Priority Ranking: Long Term</i>

## 17.0 IMPLEMENTATION PLAN

### 17.1 Priority Recommendations

#### *Overview and Framework*

The Natural Resources Chapter includes a set of Recommendations ranging from analyses and studies, coordination with local and regional groups, formation of committees, ordinance and regulation development, outreach and education, and other management actions necessary to accomplish the recommended actions. The tables that follow organize the Chapter Recommendations as Highest Priority, Intermediate Priority, and Long Term Priority Actions, identifies funding requirements, and assigns implementation to a responsible party.

Recommendations are specific actions, which can be implemented in order to meet the specific objective. Potential lead contact, organization, and partners describe the persons or groups who are likely to take the lead or be involved in implementing a specific strategy. Identifying all options for funding will be a primary responsibility of those taking a lead in implementing a specific strategy.

#### *Priority Actions*

The Chapter recommendations are identified as Highest, Intermediate, and Long Term Priority Actions. Highest Priority actions are estimated for completion within the next year; Intermediate Priority Actions are within three years; and Long Term Priority Actions within five years or ongoing. These time frames have been provided as general guidelines and are based on several variables including but not limited to time commitment from lead contacts, volunteers and available resources and funding. While initiation of a strategy may include short-term action, completion will depend on many factors.

To measure success and evaluate if steps are being taken to reach desired management priorities and goals, an annual audit of the Priority Actions should be conducted by the Conservation Commission and/or the lead contact, organization, and partners assigned to complete a strategy or action item is suggested. Benchmarks will need to be established by the person(s), organizations and partnerships that will be responsible for implementing each strategy based on dedicated resources, funding availability, timeframe of grants, availability of volunteers, and other commitments from partnerships.

### 17.2 Management Approaches

Management approaches for the Implementation Actions and Implementation Plan are categorized as follows:

- √ Public Education, Outreach and Training
- √ Local Land Use Regulations and Ordinances
- √ State and Local Enforcement of Regulations
- √ Collection and Use of Data
- √ Regional and Watershed Coordination
- √ Local, Regional and State Collaboration

**17.3 Priority Actions: Highest, Intermediate, and Long Term**

**PRIORITY ACTIONS: HIGHEST**

<b>ID</b>	<b>Action</b>	<b>Management Approach</b>	<b>Lead Action</b>
<b>1.0 INTRODUCTION</b>			
<b>GR1</b>	Develop an outreach strategy to inform the public about the utility and importance of the Natural Resource Chapter.	Public Education, Outreach, Training	City
<b>GR2</b>	Develop an education and outreach plan focused on encouraging implementation of specific recommendations of the Natural Resources Chapter by students as part of the school curriculum, civic organizations, landowners and business owners.	Public Education, Outreach, Training	City
<b>4.0 SOILS</b>			
<b>SL1</b>	Encourage revisions to ordinances and regulations to provide for preservation of land that contains the Farmland soil type. (For example, consider changes to the cluster development zoning regulations [Section 42.24] to encourage preservation of farmland soils.)	Local Regulations & Ordinances	Planning Board
<b>5.0 FORESTS AND URBAN TREES</b>			
<b>FR1</b>	Require to the extent possible the retention and planting of trees within the urban core areas as part of the design of development projects.	Collection and Use of Data	Evaluation/ Study
<b>6.0 AREAS OF ECOLOGICAL SIGNIFICANCE</b>			
<b>EC1</b>	Identify important wildlife corridors, natural communities, and habitat for rare, threatened and endangered species, including connections between terrestrial and aquatic habitat, seasonal habitat, breeding areas, foraging habitat, and migratory corridors.	Collection and Use of Data	Evaluation/ Study
<b>EC2</b>	Submission of an inventory of important wildlife corridors, natural communities, rare / threatened /endangered species may be required for any subdivision and site plan review applications.	Local Regulations & Ordinances	Planning Board
<b>7.0 WILDLIFE AND INVASIVE SPECIES</b>			
<b>WI1</b>	Support state regulations and guidelines for proper prevention, removal and disposal of invasive species.	State and Local Enforcement	City
<b>WI2</b>	Locate and develop remediation plans to remove significant populations of invasive species. Species of particular interest include Phragmites, Purple Loosestrife, Burning Bush, Bittersweet, Buckthorn, Japanese Barberry and Japanese Knotweed.	Collection and Use of Data	City
<b>WI3</b>	Educate landowners and business owners about the benefits of native plants and the negative impacts of invasive species on native ecosystems.	Public Education, Outreach, Training	City
<b>WI4</b>	Educate landowners about how to manage or eliminate invasive species and encourage voluntary removal of invasive species.	Public Education, Outreach, Training	City

<b>WI5</b>	Evaluate City management and maintenance practices to eliminate sources and distribution of invasive species contained in road sand and fill, and during municipal construction projects.	Collection and Use of Data	City
<b>WI6</b>	Seek partnerships to assist in evaluating the extent and presence of invasive species in the City and to develop management options.	Regional/Watershed Coordination	City
<b>WI7</b>	Provide information to homeowners, neighborhood groups, landscapers and developers about the benefits of using native plants in landscaping.	Public Education, Outreach, Training	City
<b>WI8</b>	Encourage the use of native plants and trees in landscaping plans as part of subdivision and site plan review approvals.	Public Education, Outreach, Training	City
<b>8.0 WETLANDS</b>			
<b>WT1</b>	Expand upon the previous freshwater wetland study to include wetlands of 2-5 acres in size for consideration for prime designation.	Collection and Use of Data	Conservation Commission
<b>WT2</b>	Use the results of the freshwater wetland study to develop a formal submittal to the NHDES for prime wetlands designation.	Collection and Use of Data	Conservation Commission
<b>WT3</b>	Protect remaining undeveloped portions of Heath Bog, a designated Conservation Focus Area in <i>The Land Conservation Plan for New Hampshire's Coastal Watersheds</i> . Include Heath Bog in future recommendations for designation of prime wetlands.	Planning, Policy Management	Conservation Commission
<b>WT4</b>	Encourage pre-construction inspections by City staff to ensure that protective fencing or markers are installed at the edge of the wetland buffers prior to construction.	Local Regulations & Ordinances	City
<b>WT5</b>	Since the adoption of Chapter 50 of the City's general ordinances, Stormwater Management and Erosion Control, information about the affects of stormwater management on the hydrology of wetlands should be requested as part of Subdivision and Site Plan Review applications (i.e. affects of clearing large tracts of adjacent forests on changes in the groundwater table; diversion of water from soil infiltration and groundwater recharge).	Local Regulations & Ordinances	Planning Board
<b>9.0 AQUIFERS</b>			
<b>AQ1</b>	Retain the existing aquifer recharge volumes and recharge functions on all development sites.	Local Regulations & Ordinances	Planning Board
<b>AQ2</b>	Encourage reductions in impervious surface cover in aquifer recharge areas, both on residential and non-residential properties.	Local Regulations & Ordinances	Planning Board
<b>10.0 SURFACE WATER RESOURCES</b>			
<b>SW1</b>	Review existing ordinances and regulations for compliance with the Comprehensive Shoreland Protection Act, as adopted July 1, 2008. Revise ordinances and regulations as necessary.	Local Regulations & Ordinances	Planning Board
<b>SW2</b>	Support water quality protection measures to ensure that surface waters meet state standards for their designated uses – aquatic life, drinking water, fish consumption, primary and secondary contact recreation and wildlife.	Local Regulations & Ordinances	Planning Board



<b>11.0 GROUNDWATER RESOURCES</b>			
<b>GW 1</b>	Develop water conservation programs and raise public awareness about its importance.	Public Education, Outreach, Training	City
<b>GW2</b>	Identify existing ordinances and regulations pertaining to groundwater quality and quantity.	Local Regulations & Ordinances	Planning Board
<b>12.0 POTENTIAL THREATS TO WATER RESOURCES</b>			
<b>TH1</b>	Develop a City policy for large groundwater withdrawals to address the potential effects on future public drinking water supplies.	Planning, Policy Management	City
<b>13.0 SCENIC RESOURCES</b>			
	<b>No actions identified</b>		
<b>14.0 RESOURCE CONSERVATION AND PROTECTION</b>			
<b>RC1</b>	Continue the practice of preserving forests and woodlands as criteria for prioritization of land conservation planning and acquisition of conservation lands.	Planning, Policy Management	Conservation Commission
<b>RC2</b>	Encourage land use boards to engage the Conservation Commission early in the application and development review process to gain recommendations on natural resource conservation and protection.	Local Regulations & Ordinances	Conservation Commission
<b>RC3</b>	Partner with regional land trusts and watershed groups to identify shared goals and priorities for natural resource protection and land conservation.	Regional/Watershed Coordination	City
<b>RC4</b>	Develop an inventory of all City owned lands, including acreage, assessed value and resource inventory for each parcel.	Collection and Use of Data	City
<b>15.0 PUBLIC AND RECREATIONAL RESOURCES</b>			
<b>PR1</b>	Support water quality protection measures to ensure that surface waters meet state standards for their designated uses that support recreation including aquatic life, fish consumption, primary and secondary contact recreation, and wildlife.	State and Local Enforcement	City
<b>16.0 REGIONAL AND WATERSHED PLANNING</b>			
<b>RW1</b>	Develop a long term strategy to balance growth with protection and sustainability of surface water and groundwater resources.	Planning, Policy Management	City
<b>RW2</b>	Identify natural resources, wildlife corridors, natural communities, and conservation lands that extend beyond the municipal boundary of Rochester into adjacent communities.	Collection and Use of Data	Evaluation/ Study

**PRIORITY ACTIONS: INTERMEDIATE**

<b>ID</b>	<b>Action</b>	<b>Management Approach</b>	<b>Responsible Party</b>
<b>1.0 INTRODUCTION</b>			
	No action identified		

<b>3.0 TOPOGRAPHY</b>			
<b>TP 1</b>	Develop specific standards to minimize or eliminate disturbance to steep slopes that are contiguous with or drain to state and locally regulated buffers to protect water quality of surface waters and wetlands.	Local Regulations & Ordinances	Planning Board
<b>4.0 SOILS</b>			
<b>SL 2</b>	Continue the practice of preserving farmland soils as criteria for prioritization of land conservation planning and acquisition of conservation lands.	Planning, Policy Management	Conservation Commission
<b>5.0 FORESTS AND URBAN TREES</b>			
<b>FR 2</b>	Develop guidelines to identify valuable forests and encourage preservation as part of the design process for development sites.	Local Regulations & Ordinances	Planning Board
<b>FR 3</b>	Develop guidance to retain vegetated areas along local streets and roads outside the urban core areas.	Local Regulations & Ordinances	City
<b>FR 4</b>	Review current protocol that requires pre-construction inspections by City staff prior to construction or land preparation and disturbance to ensure that protective fencing or markers are installed around trees to be preserved on a site.	Local Regulations & Ordinances	Planning Board
<b>FR 5</b>	Review and revise ordinances and regulations to identify methods to include preservation of large contiguous forested blocks.	Local Regulations & Ordinances	City
<b>6.0 AREAS OF ECOLOGICAL SIGNIFICANCE</b>			
<b>EC3</b>	Protect large unfragmented blocks, wildlife corridors, natural communities, and rare, threatened and endangered species as part of land conservation and open space planning.	Planning, Policy Management	Conservation Commission
<b>EC4</b>	Encourage the City to protect significant wildlife habitat by: adopting development regulations, developing management guidelines for land owners, and providing land owner education about protection and conservation.	Local Regulations & Ordinances	City
<b>7.0 WILDLIFE AND INVASIVE SPECIES</b>			
<b>WI9</b>	Develop wildlife management policies to protect migratory wildlife (such as signage at common crossing locations).	Planning, Policy Management	Conservation Commission
<b>WI10</b>	Obtain wildlife videos to air on the Government Channel and public access television.	Public Education, Outreach, Training	City
<b>WI11</b>	Encourage development of a management plan for the City to control invasive species in the maintenance area surrounding municipal stormwater management structures (basins, swales, access ways) and within wetland buffers if nearby these structures.	Planning, Policy Management	City
<b>8.0 WETLANDS</b>			
<b>WT6</b>	Research habitat-friendly designs for culverts and other structures for the safe passage of wildlife at stream and wetland road crossings.	Collection and Use of Data	Conservation Commission
<b>WT7</b>	Obtain information about the effectiveness of detention basins versus infiltration basins in maintaining wetland hydrology.	Collection and Use of Data	Evaluation/ Study

<b>9.0 AQUIFERS</b>			
<b>AQ3</b>	Revise ordinances and regulations to include preservation of aquifer recharge areas.	Local Regulations & Ordinances	Planning Board
<b>10.0 SURFACE WATER RESOURCES</b>			
<b>SW3</b>	Encourage planting and restoration of riparian buffers on municipal and private properties.	Public Education, Outreach, Training	City
<b>11.0 GROUNDWATER RESOURCES</b>			
<b>GW 3</b>	Provide information to owners of private drinking water wells about the health benefits of water quality testing. Encourage water quality testing on a periodic basis.	Planning, Policy Management	City
<b>GW 4</b>	Support development of goals for the City to protect groundwater quality and quantity for future use as a public drinking water source. Evaluate whether existing regulatory measures meet these protection goals.		
<b>12.0 POTENTIAL THREATS TO WATER RESOURCES</b>			
<b>TH2</b>	Encourage use of alternative materials that reduce impervious surfaces for construction of driveways, walkways, roads, parking areas and recreational trails.	Public Education, Outreach, Training	Planning Board
<b>TH3</b>	Consider incorporating in ordinances and regulations requirements for the assessment of hydrologic functions in the pre-developed condition and provisions to retain those functions in the post-developed condition.	Local Regulations & Ordinances	Planning Board
<b>TH4</b>	Evaluate the potential municipal services and infrastructure costs associated with development and construction (i.e. roads, stormwater, other infrastructure) as permitted by the existing Floodplain Ordinance.	Collection and Use of Data	City
<b>13.0 SCENIC RESOURCES</b>			
<b>SR1</b>	Inventory, identify, and prioritize the scenic viewsheds of Rochester for possible future land protection.	Collection and Use of Data	City
<b>SR2</b>	Identify existing ordinances and regulations that include requirements or guidelines for protection of scenic viewsheds.	Local Regulations & Ordinances	Planning Board
<b>14.0 RESOURCE CONSERVATION AND PROTECTION</b>			
<b>RC 5</b>	Develop a comprehensive management plan and natural resource protection strategies for City owned lands.	Planning, Policy Management	City
<b>15.0 PUBLIC AND RECREATIONAL RESOURCES</b>			
<b>PR2</b>	Support establishment of recreational trails for public use on public lands.	Planning, Policy Management	City
<b>PR3</b>	Establish and Open Space committee to comprehensively evaluate existing and future opportunities to conserve open space and address management of open space for public enjoyment and use.	Planning, Policy Management	City

<b>PR4</b>	Develop a brochure and map describing public access locations to land and water recreational sites in Rochester.	Public Education, Outreach, Training	City
<b>16.0</b>	<b>REGIONAL AND WATERSHED PLANNING</b>		
	No actions identified		

### PRIORITY ACTIONS: LONG TERM

<b>ID</b>	<b>Action</b>	<b>Management Approach</b>	<b>Responsible Party</b>
<b>1.0</b>	<b>INTRODUCTION</b>		
	No action identified		
<b>3.0</b>	<b>TOPOGRAPHY</b>		
<b>TP2</b>	Support enforcement and implementation of erosion and sedimentation control and stormwater best management practices for development on steep slopes to protect the quality of surface waters and wetlands.	State and Local Enforcement	Planning Board
<b>4.0</b>	<b>SOILS</b>		
	No action identified		
<b>5.0</b>	<b>FORESTS AND URBAN TREES</b>		
<b>FR 6</b>	Inventory City trees and develop a management strategy.	Collection and Use of Data	Conservation Commission
<b>FR 7</b>	Develop an Urban Forestry Plan and Program for the City.	Planning, Policy Management	City
<b>FR 8</b>	Develop a list of tree species most beneficial to the improvement of environmental and aesthetic conditions, and for efficient maintenance and management.	Collection and Use of Data	City
<b>FR 9</b>	Establish a City Tree Committee to advise elected officials and land use boards about retention of existing forest cover, and the maintenance and planting of City trees.	Public Education, Outreach, Training	Conservation Commission
<b>FR 10</b>	Develop an inventory and management plan of forested lands owned by the City.	Collection and Use of Data	Evaluation/ Study
<b>FR 11</b>	Develop educational materials for distribution to developers and contractors about best care practices for trees during construction, including installation of fencing or markers around trees to be preserved to delineate protective areas (i.e. canopy drip line).	Public Education, Outreach, Training	Conservation Commission
<b>FR 12</b>	Research the existing and historical extent of native ecosystems in the City.		
<b>6.0</b>	<b>AREAS OF ECOLOGICAL SIGNIFICANCE</b>		
<b>EC5</b>	Develop an outreach and signage campaign to identify important wildlife corridors.	Public Education, Outreach, Training	City
<b>EC6</b>	Evaluate the current status of natural resources and biodiversity in Rochester.	Collection and Use	Evaluation/

		of Data	Study
<b>7.0</b>	<b>WILDLIFE AND INVASIVE SPECIES</b>		
<b>WI12</b>	Whenever beneficial and possible as a condition of approval, encourage removal of invasive species as part of all development projects.	Local Regulations & Ordinances	Planning Board
<b>WI13</b>	Develop a workshop and field trip about locally significant wildlife for education and outreach to the public, elected officials and land use boards. Coordinate with wildlife and other groups to provide this training.	Public Education, Outreach, Training	City
<b>8.0</b>	<b>WETLANDS</b>		
<b>WT8</b>	Develop a GIS database of vernal pool locations and ecology. Require GIS data to be submitted for vernal pools with all applications for Subdivision and Site Plan Review.	Collection and Use of Data	City
<b>WT9</b>	Inventory vernal pools on City owned lands.	Collection and Use of Data	City
<b>9.0</b>	<b>AQUIFERS</b>		
<b>AQ4</b>	Provide options in regulations for implementation of low impact development techniques to provide aquifer recharge on all development sites through stormwater management.	Local Regulations & Ordinances	Planning Board
<b>10.0</b>	<b>SURFACE WATER RESOURCES</b>		
<b>SW4</b>	Develop partnerships with local and regional watershed and river stewardship groups to improve and protect the quality of surface waters, i.e. through land conservation, water quality monitoring, implementing best management practices, forest preservation, etc.	Regional/Watershed Coordination	City
<b>SW5</b>	Conduct education and outreach to landowners and business owners in the community about the importance of buffers and riparian areas in protecting water quality.	Public Education, Outreach, Training	City
<b>11.0</b>	<b>GROUNDWATER RESOURCES</b>		
	No actions identified		
<b>12.0</b>	<b>POTENTIAL THREATS TO WATER RESOURCES</b>		
<b>TH5</b>	Develop a database of lands protected as part of Subdivision and Site Plan approvals. Require the submission of GIS information for protected lands and open space as part of these applications.	Public Education, Outreach, Training	City
<b>TH 6</b>	Conduct education and outreach to landowners, businesses and residents about reduction and proper disposal of yard waste, pet waste and trash, especially in riparian areas to protect water quality.	Collection and Use of Data	City
<b>13.0</b>	<b>SCENIC RESOURCES</b>		
<b>SR3</b>	Support enforcement of the requirements of the Scenic Road Overlay District, when adopted.	State and Local Enforcement	City
<b>SR4</b>	Strengthen existing ordinances and regulations to provide greater protection of scenic viewsheds.	Local Regulations & Ordinances	Planning Board
<b>SR5</b>	Develop partnerships with local and regional watershed and river stewardship groups to protect the scenic qualities of rivers and tributaries.	Regional/Watershed Coordination	City

<b>14.0 RESOURCE CONSERVATION AND PROTECTION</b>			
<b>RC6</b>	Establish a stewardship program to monitor all of the existing and future conservation and scenic easements held by the City. Stewardship requirements should be evaluated by the Conservation Commission for each easement under consideration by the Commission.	Planning, Policy Management	Conservation Commission
<b>RC7</b>	Use the database of protected lands and open space provided with new development projects to inform resource and conservation protection decisions.	Collection and Use of Data	Conservation Commission
<b>15.0 PUBLIC AND RECREATIONAL RESOURCES</b>			
	No actions identified	Planning, Policy Management	City
<b>16.0 REGIONAL AND WATERSHED PLANNING</b>			
<b>RW3</b>	Establish partnerships with adjacent communities, watershed groups, and natural resource advocacy groups, and other stakeholders to identify shared goals for protection and sustainability of natural resources in the region and local watersheds.	Regional/Watershed Coordination	City
<b>RW4</b>	Initiate a regional drinking water resource protection strategy that is adopted by all communities that share these resources.	Planning, Policy Management	City

## **19.0 APPENDICES**

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- APPENDIX A: Summary of Recommendations by Section of the Natural Resources Chapter
- APPENDIX B: Conservation Focus Area data sheets from the Land Conservation Plan for New Hampshire's Coastal Watersheds.
- APPENDIX C: Inventory of Birds Observed in Rochester
- APPENDIX D: Species Commonly Found to Vernal Pools in New Hampshire
- APPENDIX E: Fact Sheet Summary of CSPA Changes Effective April 1, 2008.
- APPENDIX F: Summary of Requirements of the City of Rochester Large Groundwater Withdrawal Permit No. LGWP-2008-0001
- APPENDIX G: General information about potential sources of nonpoint and point sources of pollution

**APPENDIX A**  
**Summary of Recommendations by Section of the Natural Resources Chapter**

**1.0 INTRODUCTION**

<b>ID</b>	<b>Action</b>
GR 1	Develop an outreach strategy to inform the public about the utility and importance of the Natural Resource Chapter. <i>Priority Ranking: Highest</i>
GR 2	Develop an education and outreach plan focused on encouraging implementation of specific recommendations of the Natural Resources Chapter by students as part of the school curriculum, civic organizations, landowners and business owners. <i>Priority Ranking: Highest</i>

**2.0 OVERVIEW**

**\*\* Sections 2.0 does not include recommendations.**

**3.0 TOPOGRAPHY**

<b>ID</b>	<b>Action</b>
TP 1	Develop specific standards to minimize or eliminate disturbance to steep slopes that are contiguous with or drain to state and locally regulated buffers to protect water quality of surface waters and wetlands. <i>Priority Ranking: Intermediate</i>
TP 2	Support enforcement and implementation of erosion and sedimentation control and stormwater best management practices for development on steep slopes to protect the quality of surface waters and wetlands. <i>Priority Ranking: Long Term</i>

**4.0 SOILS**

<b>ID</b>	<b>Action</b>
SL 1	Encourage revisions to ordinances and regulations to provide for preservation of land that contains the Farmland soil type. (For example, consider changes to the cluster development zoning regulations [Section 42.24] to encourage preservation of farmland soils.) <i>Priority Ranking: Highest</i>
SL 2	Continue the practice of preserving farmland soils as criteria for prioritization of land conservation planning and acquisition of conservation lands. <i>Priority Ranking: Intermediate</i>



## 5.0 FORESTS AND URBAN TREES

<b>ID</b>	<b>Action</b>
FR 1	Require to the extent possible the retention and planting of trees within the urban core areas as part of the design of development projects. <i>Priority Ranking: Highest</i>
FR 2	Develop guidelines to identify valuable forests and encourage preservation as part of the design process for development sites. <i>Priority Ranking: Intermediate</i>
FR 3	Develop guidance to retain vegetated areas along local streets and roads outside the urban core areas. <i>Priority Ranking: Intermediate</i>
FR 4	Review current protocol that requires pre-construction inspections by City staff prior to construction or land preparation and disturbance to ensure that protective fencing or markers are installed around trees to be preserved on a site. <i>Priority Ranking: Intermediate</i>
FR 5	Review and revise ordinances and regulations to identify methods to include preservation of large contiguous forested blocks. <i>Priority Ranking: Intermediate</i>
FR 6	Inventory City trees and develop a management strategy. <i>Priority Ranking: Long Term</i>
FR 7	Develop an Urban Forestry Plan and Program for the City. <i>Priority Ranking: Long Term</i>
FR 8	Develop a list of tree species most beneficial to the improvement of environmental and aesthetic conditions, and for efficient maintenance and management. <i>Priority Ranking: Long Term</i>
FR 9	Establish a City Tree Committee to advise elected officials and land use boards about retention of existing forest cover, and the maintenance and planting of City trees. <i>Priority Ranking: Long Term</i>
FR 10	Develop an inventory and management plan of forested lands owned by the City. <i>Priority Ranking: Long Term</i>
FR 11	Develop educational materials for distribution to developers and contractors about best care practices for trees during construction, including installation of fencing or markers around trees to be preserved to delineate protective areas (i.e. canopy drip line). <i>Priority Ranking: Long Term</i>
FR 12	Research the existing and historical extent of native ecosystems in the City. <i>Priority Ranking: Long Term</i>

## 6.0 AREAS OF ECOLOGICAL SIGNIFICANCE

<b>ID</b>	<b>Action</b>
EC 1	Identify important wildlife corridors, natural communities, and habitat for rare, threatened and endangered species, including connections between terrestrial and aquatic habitat, seasonal habitat, breeding areas, foraging habitat, and migratory corridors. <i>Priority Ranking: Highest</i>

EC 2	Submission of an inventory of important wildlife corridors, natural communities, rare / threatened /endangered species may be required for any subdivision and site plan review applications. <i>Priority Ranking: Highest</i>
EC 3	Protect large unfragmented blocks, wildlife corridors, natural communities, and rare, threatened and endangered species as part of land conservation and open space planning. <i>Priority Ranking: Intermediate</i>
EC 4	Encourage the City to protect significant wildlife habitat by: adopting development regulations, developing management guidelines for land owners, and providing land owner education about protection and conservation. <i>Priority Ranking: Intermediate</i>
EC 5	Develop an outreach and signage campaign to identify important wildlife corridors. <i>Priority Ranking: Long Term</i>

## **7.0 WILDLIFE AND INVASIVE SPECIES**

<b>ID</b>	<b>Action</b>
WI 1	Support state regulations and guidelines for proper prevention, removal and disposal of invasive species. <i>Priority Ranking: Highest</i>
WI 2	Locate and develop remediation plans to remove significant populations of invasive species. Species of particular interest include Phragmites, Purple Loosestrife, Burning Bush, Bittersweet, Buckthorn, Japanese Barberry and Japanese Knotweed. <i>Priority Ranking: Highest</i>
WI 3	Educate landowners and business owners about the benefits of native plants and the negative impacts of invasive species on native ecosystems. <i>Priority Ranking: Highest</i>
WI 4	Educate landowners about how to manage or eliminate invasive species and encourage voluntary removal of invasive species. <i>Priority Ranking: Highest</i>
WI 5	Evaluate City management and maintenance practices to eliminate sources and distribution of invasive species contained in road sand and fill, and during municipal construction projects. <i>Priority Ranking: Highest</i>
WI 6	Seek partnerships to assist in evaluating the extent and presence of invasive species in the City and to develop management options. <i>Priority Ranking: Highest</i>
WI 7	Provide information to homeowners, neighborhood groups, landscapers and developers about the benefits of using native plants in landscaping. <i>Priority Ranking: Highest</i>
WI 8	Encourage the use of native plants and trees in landscaping plans as part of subdivision and site plan review approvals. <i>Priority Ranking: Highest</i>
WI 9	Develop wildlife management policies to protect migratory wildlife (such as signage at common crossing locations). <i>Priority Ranking: Intermediate</i>
WI 10	Obtain wildlife videos to air on the Government Channel and public access television. <i>Priority Ranking: Intermediate</i>

WI 11	Encourage development of a management plan for the City to control invasive species in the maintenance area surrounding municipal stormwater management structures (basins, swales, access ways) and within wetland buffers if nearby these structures. <i>Priority Ranking: Intermediate</i>
WI 12	Whenever beneficial and possible as a condition of approval, encourage removal of invasive species as part of all development projects. <i>Priority Ranking: Long Term</i>
WI 13	Develop a workshop and field trip about locally significant wildlife for education and outreach to the public, elected officials and land use boards. Coordinate with wildlife and other groups to provide this training. <i>Priority Ranking: Long Term</i>

## **8.0 WETLANDS**

<b>ID</b>	<b>Action</b>
WT 1	Expand upon the previous freshwater wetland study to include wetlands of 2-5 acres in size for consideration for prime designation. <i>Priority Ranking: Highest</i>
WT 2	Use the results of the freshwater wetland study to develop a formal submittal to the NHDES for prime wetlands designation. <i>Priority Ranking: Highest</i>
WT 3	Protect remaining undeveloped portions of Heath Bog, a designated Conservation Focus Area in <i>The Land Conservation Plan for New Hampshire's Coastal Watersheds</i> . Include Heath Bog in future recommendations for designation of prime wetlands. <i>Priority Ranking: Highest</i>
WT 4	Encourage pre-construction inspections by City staff to ensure that protective fencing or markers are installed at the edge of the wetland buffers prior to construction. <i>Priority Ranking: Highest</i>
WT 5	Since the adoption of Chapter 50 of the City's general ordinances, Stormwater Management and Erosion Control, information about the affects of stormwater management on the hydrology of wetlands should be requested as part of Subdivision and Site Plan Review applications (i.e. affects of clearing large tracts of adjacent forests on changes in the groundwater table; diversion of water from soil infiltration and groundwater recharge). <i>Priority Ranking: Highest</i>
WT 6	Research habitat-friendly designs for culverts and other structures for the safe passage of wildlife at stream and wetland road crossings. <i>Priority Ranking: Intermediate</i>
WT 7	Obtain information about the effectiveness of detention basins versus infiltration basins in maintaining wetland hydrology. <i>Priority Ranking: Intermediate</i>
WT 8	Develop a GIS database of vernal pool locations and ecology. Require GIS data to be submitted for vernal pools with all applications for Subdivision and Site Plan Review. <i>Priority Ranking: Long Term</i>
WT 9	Inventory vernal pools on City owned lands. <i>Priority Ranking: Long Term</i>

## **9.0 AQUIFERS**

<b>ID</b>	<b>Action</b>
AQ 1	Retain the existing aquifer recharge volumes and recharge functions on all development sites. <i>Priority Ranking: Highest</i>
AQ 2	Encourage reductions in impervious surface cover in aquifer recharge areas, both on residential and non-residential properties. <i>Priority Ranking: Highest</i>
AQ 3	Revise ordinances and regulations to include preservation of aquifer recharge areas. <i>Priority Ranking: Intermediate</i>
AQ 4	Provide options in regulations for implementation of low impact development techniques to provide aquifer recharge on all development sites through stormwater management. <i>Priority Ranking: Long Term</i>

## **10.0 SURFACE WATER RESOURCES**

<b>ID</b>	<b>Action</b>
SW 1	Review existing ordinances and regulations for compliance with the Comprehensive Shoreland Protection Act, as adopted July 1, 2008. Revise ordinances and regulations as necessary. <i>Priority Ranking: Highest</i>
SW 2	Support water quality protection measures to ensure that surface waters meet state standards for their designated uses – aquatic life, drinking water, fish consumption, primary and secondary contact recreation and wildlife. <i>Priority Ranking: Highest</i>
SW 3	Encourage planting and restoration of riparian buffers on municipal and private properties. <i>Priority Ranking: Intermediate</i>
SW 4	Develop partnerships with local and regional watershed and river stewardship groups to improve and protect the quality of surface waters, i.e. through land conservation, water quality monitoring, implementing best management practices, forest preservation, etc. <i>Priority Ranking: Long Term</i>
SW 5	Conduct education and outreach to landowners and business owners in the community about the importance of buffers and riparian areas in protecting water quality. <i>Priority Ranking: Long Term</i>

## **11.0 GROUNDWATER RESOURCES**

<b>ID</b>	<b>Action</b>
GW 1	Develop water conservation programs and raise public awareness about its importance. <i>Priority Ranking: Highest</i>
GW 2	Identify existing ordinances and regulations pertaining to groundwater quality and quantity.

	<i>Priority Ranking: Highest</i>
GW 3	Provide information to owners of private drinking water wells about the health benefits of water quality testing. Encourage water quality testing on a periodic basis. <i>Priority Ranking: Intermediate</i>
GW 3	Support development of goals for the City to protect groundwater quality and quantity for future use as a public drinking water source. Evaluate whether existing regulatory measures meet these protection goals. <i>Priority Ranking: Intermediate</i>

## **12.0 POTENTIAL THREATS TO WATER RESOURCES**

<b>ID</b>	<b>Action</b>
TH 1	Develop a City policy for large groundwater withdrawals to address the potential effects on future public drinking water supplies. <i>Priority Ranking: Highest</i>
TH 2	Encourage use of alternative materials that reduce impervious surfaces for construction of driveways, walkways, roads, parking areas and recreational trails. <i>Priority Ranking: Intermediate</i>
TH 3	Consider incorporating in ordinances and regulations requirements for the assessment of hydrologic functions in the pre-developed condition and provisions to retain those functions in the post-developed condition. <i>Priority Ranking: Intermediate</i>
TH 4	Evaluate the potential municipal services and infrastructure costs associated with development and construction (i.e. roads, stormwater, other infrastructure) as permitted by the existing Floodplain Ordinance. <i>Priority Ranking: Intermediate</i>
TH 5	Develop a database of lands protected as part of Subdivision and Site Plan approvals. Require the submission of GIS information for protected lands and open space as part of these applications. <i>Priority Ranking: Long Term</i>
TH 6	Conduct education and outreach to landowners, businesses and residents about reduction and proper disposal of yard waste, pet waste and trash, especially in riparian areas to protect water quality. <i>Priority Ranking: Long Term</i>

## **13.0 SCENIC RESOURCES**

<b>ID</b>	<b>Action</b>
SR 1	Inventory, identify, and prioritize the scenic viewsheds of Rochester for possible future land protection. <i>Priority Ranking: Intermediate</i>
SR 2	Identify existing ordinances and regulations that include requirements or guidelines for protection of scenic viewsheds. <u>Priority Ranking: Intermediate</u>
SR 3	Support enforcement of the requirements of the Scenic Road Overlay District, when adopted. <i>Priority Ranking: Long Term</i>

- SR 4 Strengthen existing ordinances and regulations to provide greater protection of scenic viewsheds.  
*Priority Ranking: Long Term*
- SR 5 Develop partnerships with local and regional watershed and river stewardship groups to protect the scenic qualities of rivers and tributaries.  
*Priority Ranking: Long Term*

**14.0 RESOURCE CONSERVATION AND PROTECTION**

<b>ID</b>	<b>Action</b>
RC 1	Continue the practice of preserving forests and woodlands as criteria for prioritization of land conservation planning and acquisition of conservation lands. <i>Priority Ranking: Highest</i>
RC 2	Encourage land use boards to engage the Conservation Commission early in the application and development review process to gain recommendations on natural resource conservation and protection. <i>Priority Ranking: Highest</i>
RC 3	Partner with regional land trusts and watershed groups to identify shared goals and priorities for natural resource protection and land conservation. <i>Priority Ranking: Highest</i>
RC 4	Develop an inventory of all City owned lands, including acreage, assessed value and resource inventory for each parcel. <i>Priority Ranking: Highest</i>
RC 5	Develop a comprehensive management plan and natural resource protection strategies for City owned lands. <i>Priority Ranking: Intermediate</i>
RC 6	Establish a stewardship program to monitor all of the existing and future conservation and scenic easements held by the City. Stewardship requirements should be evaluated by the Conservation Commission for each easement under consideration by the Commission. <i>Priority Ranking: Long Term</i>
RC 7	Use the database of protected lands and open space provided with new development projects to provide for and inform resource and conservation protection decisions. <i>Priority Ranking: Long Term</i>

**15.0 PUBLIC AND RECREATIONAL RESOURCES**

<b>ID</b>	<b>Action</b>
PR 1	Support water quality protection measures to ensure that surface waters meet state standards for their designated uses that support recreation including aquatic life, fish consumption, primary and secondary contact recreation, and wildlife. <i>Priority Ranking: Highest</i>
PR 2	Support establishment of recreational trails for public use on public lands. <i>Priority Ranking: Intermediate</i>
PR 3	Establish and Open Space committee to comprehensively evaluate existing and future opportunities to conserve open space and address management of open space for public

	enjoyment and use. <i>Priority Ranking: Intermediate</i>
PR 4	Develop a brochure and map describing public access locations to land and water recreational sites in Rochester. <i>Priority Ranking: Intermediate</i>

## **16.0 REGIONAL AND WATERSHED PLANNING**

<b>ID</b>	<b>Action</b>
RW 1	Develop a long term strategy to balance growth with protection and sustainability of surface water and groundwater resources. <i>Priority Ranking: Highest</i>
RW 2	Identify natural resources, wildlife corridors, natural communities, and conservation lands that extend beyond the municipal boundary of Rochester into adjacent communities. <i>Priority Ranking: Highest</i>
RW 3	Establish partnerships with adjacent communities, watershed groups, and natural resource advocacy groups, and other stakeholders to identify shared goals for protection and sustainability of natural resources in the region and local watersheds. <i>Priority Ranking: Long Term</i>
RW 4	Initiate a regional drinking water resource protection strategy that is adopted by all communities that share these resources. <i>Priority Ranking: Long Term</i>

## **APPENDIX B**

**Conservation Focus Area data sheets from the Land Conservation Plan for New Hampshire's Coastal Watersheds.**

**Conservation Focus Areas in Rochester:**

**Rochester Heath Bog**

**Rochester Neck**

**Preston Pond**

**Blue Hills**



**The Land Conservation Plan for New Hampshire's Coastal Watersheds:  
Conservation Focus Area Description**

<b>Name:</b>	Rochester Heath Bog	
<b>Location</b>		
<b>Town(s)</b>	Rochester	
<b>Watershed (HUC 10)</b>	Cocheco River, Salmon Falls River	
	<b>CORE AREA</b>	<b>SUPPORTING NATURAL LANDSCAPE</b>
<b>Size</b>	1,020 acres	N/A
<b>Significant Ecological Resources</b>		
<b>Forest Ecosystem</b>		
Unfragmented forest block	none	
Aggregated forest blocks	none	
<b>Freshwater Systems</b>		
High quality stream watersheds	none	
Important stream reaches	none	
Presence/absence of dams (within high quality watersheds)	none	
River & stream miles	1.6 miles of 1st order, 2.9 miles of 2nd order, 0.2 miles of 3rd order	
<b>Coastal &amp; Estuarine Resources</b>		
Coastal and estuarine shoreline	not a coastal / estuarine area	
Tidal rivers & streams		
Coastal forest blocks		
Tidal wetlands		
<b>Important Plant &amp; Wildlife Habitat</b>		
Plants of conservation concern	Calamagrostis cinnoides (Nuttall's Reedgrass, endangered, G5, S1) Carex bullata (Inflated Sedge, endangered, G5, S1) Carex polymorpha (Many Forms Sedge, endangered, G3, S1) Scirpus longii (Long's Bulrush, endangered, G2, S1)	
Animals of conservation concern	none known	
Significant wildlife habitats	floodplain forest, grassland, marsh, peatland	
Exemplary natural communities and systems	Poor level fen/bog system (S3)	
<b>Other Resource Features &amp; Public Values</b>		
<b>Water Supply</b>		
High yield aquifer (maximum transmissivity >1,000 R2 / day)	795.0 acres	
Surface water intakes	none	
Wells	none	
Wellhead protection areas	Silver Bell Mobile Home Park (47.6 acres)	
Favorable gravel well sites	175.8 acres	
<b>Agricultural Lands</b>		
Prime or statewide importance farm soils	4.2 acres of farmland of statewide importance	
<b>Landscape Connectivity</b>	Low connectivity value between conservation lands, and forest blocks	
<b>Other Documented</b>		
<b>Current Conservation Status</b>		
Permanently Protected, Managed as natural area or ecological reserve (GAP 1 & 2)	-	

**The Land Conservation Plan for New Hampshire's Coastal Watersheds:  
Conservation Focus Area Description**

	<i>Permanently Protected, Managed primarily as working forest (GAP 3)</i>	-	
	<i>Not permanently protected, but in public or institutional ownership (GAP 3a)</i>	49 acres	
	<i>Managed primarily (more than 50% by area) for extractive uses (GAP 4)</i>	-	
	<i>Total conserved</i>	49 acres	
<b>Relationship to other Plans</b>			
	<i>Area identified in other planning initiatives</i>	Rochester master plan has no specific open space or natural resource protection recommendations. City does have conservation overlay district (2003) which largely addresses wetland and surface water quality.	
		Profiles strongly with SRC conservation criteria.	

**The Land Conservation Plan for New Hampshire's Coastal Watersheds:  
Conservation Focus Area Description**

<b>Name:</b>	Rochester Neck	
<b>Location</b>		
<b>Town(s)</b>	Barrington, Dover, Rochester	
<b>Watershed (HUC 10)</b>	Cocheco River	
	<b>CORE AREA</b>	<b>SUPPORTING NATURAL LANDSCAPE</b>
<b>Size</b>	1,610 acres	N/A
<b>Significant Ecological Resources</b>		
<b>Forest Ecosystem</b>		
<i>Unfragmented forest block</i>	one 823 acre block, a portion (~20%) of a 830 acre block, and a portion (~30%) of a 1,020 acre block identified as a Tier 2 priority in the 2005 Wildlife Action Plan	
<i>Aggregated forest blocks</i>	located within a 8,600 acre block	
<b>Freshwater Systems</b>		
<i>High quality stream watersheds</i>	none	
<i>Important stream reaches</i>	none	
<i>Presence/absence of dams (within high quality watersheds)</i>	none	
<i>River &amp; stream miles</i>	1.2 miles of 1st order, 0.6 miles of 2nd order, 3.3 miles of 3rd order, 6 miles of 4th order, 1.4 miles of 5th order	
<b>Coastal &amp; Estuarine Resources</b>		
<i>Coastal and estuarine shoreline</i>	not a coastal / estuarine area	
<i>Tidal rivers &amp; streams</i>		
<i>Coastal forest blocks</i>		
<i>Tidal wetlands</i>		
<b>Important Plant &amp; Wildlife Habitat</b>		
<i>Plants of conservation concern</i>	none known	
<i>Animals of conservation concern</i>	Bartramia longicauda (Upland Sandpiper, endangered, G5, S1) Gallinula chloropus (Common Moorhen, G5, S2) Podilymbus podiceps (Pied-billed Grebe, endangered, G5, S1)	
<i>Significant wildlife habitats</i>	floodplain forest, grassland, marsh, peatland	
<i>Exemplary natural communities and systems</i>	Red maple floodplain forest (S2)	
<b>Other Resource Features &amp; Public Values</b>		
<b>Water Supply</b>		
<i>High yield aquifer (maximum transmissivity &gt;1,000 ft<sup>2</sup> / day)</i>	1,329.8 acres	
<i>Surface water intakes</i>	none	
<i>Wells</i>	none	
<i>Wellhead protection areas</i>	City of Dover Water Dept (288.5 acres) Green Hills Mobile Home Park (6.5 acres)	
<i>Favorable gravel well sites</i>	575.6 acres	
<b>Agricultural Lands</b>		
<i>Prime or statewide importance farm soils</i>	632.3 acres of prime farmland and 61.7 acres of farmland of statewide importance	
<b>Landscape Connectivity</b>	Low connectivity value between conservation lands, and forest blocks High potential connectivity along watercourse.	
<b>Other Documented</b>		

**The Land Conservation Plan for New Hampshire's Coastal Watersheds:  
Conservation Focus Area Description**

<b>Current Conservation Status</b>		
<i>Permanently Protected, Managed as natural area or ecological reserve (GAP 1 &amp; 2)</i>	2 acres	
<i>Permanently Protected, Managed primarily as working forest (GAP 3)</i>	102 acres	
<i>Not permanently protected, but in public or institutional ownership (GAP 3a)</i>	-	
<i>Managed primarily (more than 50% by area) for extractive uses (GAP 4)</i>	-	
<i>Total conserved</i>	104 acres	
<b>Relationship to other Plans</b>		
<i>Area identified in other planning initiatives</i>	Rochester master plan has no specific open space or natural resource protection recommendations. City does have conservation overlay district (2003) which largely addresses wetland and surface water quality.	
	Dover master plan addresses many water quality and aquatic systems conservation priorities generally, and the Cocheco River is mentioned as a conservation priority area; however, the confluence with the Isinglass River is not mentioned.	
	Profiles strongly with SRC conservation criteria.	
	Focus area of the Cocheco River Watershed Coalition	

**The Land Conservation Plan for New Hampshire's Coastal Watersheds:  
Conservation Focus Area Description**

<b>Name:</b>	Preston Pond	
<b>Location</b>		
<i>Town(s)</i>	Barrington, Rochester	
<i>Watershed (HUC 10)</i>	Cochecho River	
	<b>CORE AREA</b>	<b>SUPPORTING NATURAL LANDSCAPE</b>
<b>Size</b>	340 acres	470 acres
<b>Significant Ecological Resources</b>		
<b>Forest Ecosystem</b>		
<i>Unfragmented forest block</i>	a portion (~25%) of a 1,800 acre block identified as a Tier 2 priority in the 2005 Wildlife Action Plan	a portion (~50%) of a 1,800 acre block identified as a Tier 2 priority in the 2005 Wildlife Action Plan
<i>Aggregated forest blocks</i>	located within a 14,700 acre block	
<b>Freshwater Systems</b>		
<i>High quality stream watersheds</i>	one Tier 4 (180 acres)	none
<i>Important stream reaches</i>	none	none
<i>Presence/absence of dams (within high quality watersheds)</i>	1 dam within high quality stream watersheds	none
<i>River &amp; stream miles</i>	0.8 miles of 1st order	none
<b>Coastal &amp; Estuarine Resources</b>		
<i>Coastal and estuarine shoreline</i>	not a coastal / estuarine area	not a coastal / estuarine landscape
<i>Tidal rivers &amp; streams</i>		
<i>Coastal forest blocks</i>		
<i>Tidal wetlands</i>		
<b>Important Plant &amp; Wildlife Habitat</b>		
<i>Plants of conservation concern</i>	none known	none known
<i>Animals of conservation concern</i>	none known	Emydoidea blandingii (Blanding's Turtle, G4, S3)
<i>Significant wildlife habitats</i>	grassland, marsh, peatland, ridge / talus	grassland, marsh, ridge / talus
<i>Exemplary natural communities and systems</i>	Red oak - ironwood - Pennsylvania sedge woodland (S2)	none known
<b>Other Resource Features &amp; Public Values</b>		
<b>Water Supply</b>		
<i>High yield aquifer (maximum transmissivity &gt;1,000 ft<sup>2</sup> / day)</i>	none	none
<i>Surface water intakes</i>	none	none
<i>Wells</i>	none	Inn At Secretariat Estates (2 community wells)
<i>Wellhead protection areas</i>	Inn At Secretariat Estates (77.6 acres)	Inn At Secretariat Estates (163.1 acres)
<i>Favorable gravel well sites</i>	none	none
<b>Agricultural Lands</b>		
<i>Prime or statewide importance farm soils</i>	6.6 acres of prime farmland and 9.4 acres of farmland of statewide importance	60.9 acres of prime farmland and 11.5 acres of farmland of statewide importance
<b>Landscape Connectivity</b>	Low connectivity value between conservation lands, and forest blocks	Low connectivity value between conservation lands, and forest blocks
<b>Other Documented</b>		
<b>Current Conservation Status</b>		
<i>Permanently Protected, Managed as natural area or ecological reserve (GAP 1 &amp; 2)</i>	-	-
<i>Permanently Protected, Managed primarily as working forest (GAP 3)</i>	-	-

**The Land Conservation Plan for New Hampshire's Coastal Watersheds:  
Conservation Focus Area Description**

	<i>Not permanently protected, but in public or institutional ownership (GAP 3a)</i>	-	31 acres
	<i>Managed primarily (more than 50% by area) for extractive uses (GAP 4)</i>	-	-
	<i>Total conserved</i>	-	31 acres
<b>Relationship to other Plans</b>			
	<i>Area identified in other planning initiatives</i>	Profiles strongly with SRC conservation criteria.	

**The Land Conservation Plan for New Hampshire's Coastal Watersheds:  
Conservation Focus Area Description**

<b>Name:</b>	Blue Hills	
<b>Location</b>		
<b>Town(s)</b>	Farmington, Northwood, Rochester, Strafford	
<b>Watershed (HUC 10)</b>	Cocheco and Suncook Rivers	
	<b>CORE AREA</b>	<b>SUPPORTING NATURAL LANDSCAPE</b>
<b>Size</b>	16,900 acres	19,560 acres
<b>Significant Ecological Resources</b>		
<b>Forest Ecosystem</b>		
<i>Unfragmented forest block</i>	Encompasses multiple blocks (wholly or in part) identified as Tier 1 and 2 priority in the 2005 Wildlife Action Plan: 1,080 acres (Tier 2), 2,040 acres (Tier 2), 2,420 acres (Tier 2, ~30%), 5,080 acres (Tier 1, ~60%), 17,270 acres (Tier 1, ~50%)	1,080 (Tier 2), 2,040 (Tier 2), 2,420 (Tier 2), 3,460 (Tier 2), 5,080 (Tier 1), 17,270 (Tier 1)
<i>Aggregated forest blocks</i>	located within a 87,500 acre block	
<b>Freshwater Systems</b>		
<i>High quality stream watersheds</i>	includes 220.72 acres of Tier 1, 3233.29 acres of Tier 2, 2421.26 acres of Tier 3, and 5253.25 acres of Tier 4 HQWS	Contains 8.98 acres of Tier 2, 235.48 acres of Tier 3, and 313.43 acres of Tier 4 HQWS.
<i>Important stream reaches</i>	none	includes .37 Miles of stream that includes good diversity of fish including, but not limited to, American Eel, Bridle Shiner, and Banded Sunfish
<i>Presence/absence of dams (within high quality watersheds)</i>	3 dams within high quality stream watersheds	
<i>River &amp; stream miles</i>	includes 32.1 miles of 1st order, 10.12 miles of 2nd Order, 2.02 miles of 3rd order streams.	includes 11.22 miles of 1st order, 2.07 miles of 2nd Order, .64 miles of 3rd order
<b>Coastal &amp; Estuarine Resources</b>		
<i>Coastal and estuarine shoreline</i>	not a coastal / estuarine area	not a coastal / estuarine landscape
<i>Tidal rivers &amp; streams</i>		
<i>Coastal forest blocks</i>		
<i>Tidal wetlands</i>		
<b>Important Plant &amp; Wildlife Habitat</b>		
<i>Plants of conservation concern</i>	Isotria medeoloides (Small Whorled Pogonia, threatened, G2, S2)	none known
<i>Animals of conservation concern</i>	Emydoidea blandingii (Blanding's Turtle, G4, S3)	Emydoidea blandingii (Blanding's Turtle, G4, S3)
	Glyptemys insculpta (Wood Turtle, G4, S3)	Glyptemys insculpta (Wood Turtle, G4, S3)
<i>Significant wildlife habitats</i>	grassland, marsh, peatland	grassland, marsh, peatland
<i>Exemplary natural communities and systems</i>	none known	none known
<b>Other Resource Features &amp; Public Values</b>		
<b>Water Supply</b>		
<i>High yield aquifer (maximum transmissivity &gt;1,000 ft<sup>2</sup> / day)</i>	48.4 acres	394.9 acres
<i>Surface water intakes</i>	none	none
<i>Wells</i>	none	Camp Foss (1 non-community well) Coe Brown Athletic Field (1 non-community well) Collins And Aikman (3 non-community wells) NH National Guard (3 non-community wells) Strafford Elementary School (1 non-community well)
<i>Wellhead protection areas</i>	Farmington Water Dept (732 acres) Strafford Elementary School (58.1 acres)	Coe Brown Academy (38.1 acres) Coe Brown Smith Hall (45.3 acres) Collins And Aikman (120.5 acres) Farmington Water Dept (726.1 acres) Strafford Elementary School (58.4 acres)
<i>Favorable gravel well sites</i>	2.3 acres	155.2 acres

**The Land Conservation Plan for New Hampshire's Coastal Watersheds:  
Conservation Focus Area Description**

<b>Agricultural Lands</b>		
<i>Prime or statewide importance farm soils</i>	464.4 acres of prime farmland and 207.5 acres of farmland of statewide importance	739.1 acres of prime farmland and 332.8 acres of farmland of statewide importance
<b>Landscape Connectivity</b>		
	Moderate to high connectivity value between conservation lands and forest blocks	Moderate to high connectivity value between conservation lands, and forest blocks
<b>Other Documented</b>		
<b>Current Conservation Status</b>		
<i>Permanently Protected, Managed as natural area or ecological reserve (GAP 1 &amp; 2)</i>	-	-
<i>Permanently Protected, Managed primarily as working forest (GAP 3)</i>	1,645 acres	2,514 acres
<i>Not permanently protected, but in public or institutional ownership (GAP 3a)</i>	267 acres	1,424 acres
<i>Managed primarily (more than 50% by area) for extractive uses (GAP 4)</i>	-	-
<i>Total conserved</i>	1,912 acres	3,938 acres
<b>Relationship to other Plans</b>		
<i>Area identified in other planning initiatives</i>	Identified in Strafford and Farmington master plans as having general conservation priorities because of landscape features located in the CFA including, but not limited to, agricultural lands, unfragmented lands, etc.	Long-time land protection focus area for the Lovejoy Foundation and the New England Forestry Foundation. High scoring in SPNHF SENH study Important linkages identified in BearPaw Regional Greenway Plan.
	Farmington master plan specifically mentions large forest blocks shared with other towns.	
	Land protection focus area for the Lovejoy Foundation and the New England Forestry Foundation. High scoring in SPNHF SENH study. Important linkages identified in Bear Paw Regional Greenway Plan.	
	Very high-scoring landscape-scale complex in the BPRG strategic conservation priorities mission mapping.	Very high-scoring landscape-scale complex in the BPRG strategic conservation priorities mission mapping.



## APPENDIX C

### Inventory of Birds Observed in Rochester

This record was developed over the last 20 years at Old Ox Road, Pickering Ponds Trails at Rochester Wastewater Treatment Plant, Ten Rod Road, Fowler Farm, Salmon Falls Road, and Pickering Road in Rochester.

Alder Flycatcher	Cliff Swallow	Iceland Gull	Ring-billed Gull
American Bittern	Common Eider	Indigo Bunting	Ring-necked Duck
American Black Duck	Common Goldeneye	Killdeer	Ring-necked Pheasant
American Coot	Common Grackle	King Eider	Rock Pigeon
American Crow	Common Loon	Lapland Longspur	Rose-breasted Grosbeak
American Golden Plover	Common Merganser	Laughing Gull	Rough-legged Hawk
American Goldfinch	Common Moorhen	Least Flycatcher	Ruby-crowned Kinglet
American Kestrel	Common Night-hawk	Least Sandpiper	Ruby-throated Hummingbird
American Pipit	Common Raven	Lesser Black-backed Gull	Ruddy Duck
American Redstart	Common Redpoll	Lesser Scaup	Ruddy Turnstone
American Robin	Common Yellowthroat	Lesser Yellowlegs	Ruffed Grouse
American Tree Sparrow	Cooper's Hawk	Lincoln's Sparrow	Rusty Blackbird
American Wigeon	Dark-eyed Junco	Little Blue Heron	Sandhill Crane
American Woodcock	Dickcissel	Long-billed Dowitcher	
Baird's Sandpiper	Double-crested Cormorant	Louisiana Waterthrush	Savannah Sparrow
Bald Eagle	Downy Woodpecker	Magnolia Warbler	Scarlet Tanager
Baltimore Oriole	Dunlin	Mallard	Semipalmated Plover
Bank Swallow	Eared Grebe	Merlin	Semipalmated Sandpiper
Barn Swallow	Eastern Bluebird	Mourning Dove	Sharp-shinned Hawk
Barred Owl	Eastern Kingbird	Mourning Warbler	Short-billed Dowitcher
Barrow's Goldeneye	Eastern Meadowlark	Mute Swan	Slaty-backed Gull
Bay-breasted Warbler	Eastern Phoebe	Nashville Warbler	Snow Bunting
	Eastern Towhee	Northern Bobwhite	Snow Goose
Belted Kingfisher	Eastern Wood-pewee	Northern Cardinal	Snowy Egret
Black-and-white Warbler	European Starling	Northern Flicker	Snowy Owl
Black-bellied Plover	Evening Grosbeak	Northern Goshawk	Solitary Sandpiper
Black-billed Cuckoo	Field Sparrow	Northern Harrier	Song Sparrow
Blackburnian Warbler	Fox Sparrow	Northern Mockingbird	Sora
Black-capped Chickadee	Franklin's Gull	Northern Parula	Spotted Sandpiper
Black-crowned Night-heron	Gadwall	Northern Pintail	Stilt Sandpiper
Black-headed Gull	Glaucous Gull	Northern Rough-winged Swallow	Swainson's Thrush

Black-headed Kittiwake	Glossy Ibis	Northern Saw-whet Owl	Swamp Sparrow
Blackpoll Warbler	Golden Eagle	Northern Shoveler	Tennessee Warbler
Black-throated Blue Warbler	Golden-crowned Kinglet	Northern Shrike	Thayer's Gull
Black-throated Green Warbler	Golden-winged Warbler	Northern Waterthrush	Tree Swallow
Blue Jay	Grasshopper Sparrow	Olive-sided Flycatcher	Tufted Titmouse
Blue-Gray Gnatcatcher	Gray Catbird	Orchard Oriole	Turkey Vulture
Blue-headed Vireo	Gray-cheeked Thrush	Osprey	Veery
Blue-winged Teal	Great Black-backed Gull	Ovenbird	Vesper Sparrow
Blue-winged Warbler	Great Blue Heron	Palm Warbler	Virginia Rail
Bobolink	Great Cormorant	Pectoral Sandpiper	Warbling Vireo
Bohemian Waxwing	Great Crested Flycatcher	Peregrine Falcon	Western Sandpiper
Bonaparte's Gull	Great Egret	Philadelphia Vireo	Whip-poor-will
Brant	Great Gray Owl	Pied-billed Grebe	White-breasted Nuthatch
Broad-winged Hawk	Great Horned Owl	Pileated Woodpecker	White-crowned Sparrow
Brown Creeper	Greater Scaup	Pine Grosbeak	White-rumped Sandpiper
Brown Thrasher	Greater Yellowlegs	Pine Siskin	White-throated Sparrow
Brown-headed Cowbird	Green Heron	Pine Warbler	White-winged Crossbill
Buff-breasted Sandpiper	Green-winged Teal	Prairie Warbler	Wild Turkey
Bufflehead	Hairy Woodpecker	Purple Finch	Willow Flycatcher
Canada Goose	Hermit Thrush	Purple Martin	Wilson's Snipe
Canada Warbler	Herring Gull	Red Phalarope	Wilson's Warbler
Canvasback	Hoary Redpoll	Red-bellied woodpecker	Winter Wren
Carolina Wren	Hooded Merganser	Red-breasted Nuthatch	Wood Duck
Cattle Egret	Horned Lark	Red-eyed Vireo	Wood Thrush
Cedar Waxwing	House Finch	Red-headed Woodpecker	Yellow Warbler
Chestnut-sided Warbler	House Sparrow	Red-shouldered Hawk	Yellow-bellied Flycatcher
Chimney Swift	House Wren	Red-tailed Hawk	Yellow-bellied Sapsucker
Chipping Sparrow		Red-throated Loon	Yellow-billed Cuckoo
Clay-colored Sparrow		Red-winged Blackbird	Yellow-rumped Warbler
			Yellow-throated Vireo

***Note: This inventory will be updated periodically as new information becomes available. Refer to the City's website for these updates.***

## APPENDIX D

### Species Commonly Found to Vernal Pools in New Hampshire

Species	Description
<i>Amphibians</i>	
Wood Frog	Terrestrial except during the breeding season; live in woodlands, where they forage for food among leaves and debris on the forest floor; hibernate in winter under rocks, moss, leaf litter, or in rotting logs and stumps; often the first amphibians to emerge in spring, at which time large numbers of males and females migrate to breeding sites during the first warm rains (from late March to late April); breeding completed within a couple of weeks, after which adults return to the woods; eggs hatch into tiny tadpoles in about three weeks, depending on water temperature; tadpoles grow and eventually metamorphose into juveniles after an average of 67 days; juveniles gather in large groups along the shore of the pool before dispersing into surrounding woodlands.
Spring Peeper	May use vernal pools for breeding, in addition to any pond, ditch, or other small water body, may breed in early spring.
Green Frog or Bullfrog	May seek out vernal pools to feed on eggs and tadpoles in late summer; do not breed in temporary water bodies, as their tadpoles need to stay in the water for over a year before they reach metamorphosis; tadpoles do not metamorphose into terrestrial forms until they are three years old.
Spotted, Jefferson and Blue-spotted Salamander	Various species breed in vernal pools; Spotted, Jefferson's, and Blue-spotted Salamanders arrive between mid-March and late April; known as "mole" salamanders because of their subterranean lifestyles, spend most of their lives in underground rodent burrows and tunnels and crevices under rocks and other debris; adults emerge from underground and migrate to vernal pools during the first warm, rainy evenings of spring; although breeding season may last a few weeks, males and females in any given pool complete courtship, mating, and egg-laying in just a few days; females attach their eggs to branches, logs, and other underwater structures, after which they leave the pools and go back underground for the rest of the year; mole salamander egg masses look clear or opaque and are made up of many eggs, each with a tiny dark embryo, which hatch in three to five weeks, depending on water temperature, larvae metamorphose by late summer, and leave the pools to live underground in surrounding uplands.
Marbled Salamander	Extremely rare in New Hampshire, having been found in only a few places in the southern part of the state; lives underground most of the year, but adults breed in the fall, selecting dry autumnal pools to breed and lay eggs; males leave dry pools soon after breeding, while females stay behind to guard and incubate the eggs, when rains fill the breeding pools, females leave; eggs hatch into aquatic larvae, which will remain in the pool until they metamorphose in late fall or early spring.

Eastern Spotted Newt and Four-toed Salamander	Newts typically live in permanent water, such as ponds and lakes; larvae metamorphose into terrestrial juveniles known as "red efts," which travel on land for two to seven years before returning to water to breed; some may select a vernal pool in which to transform into their aquatic adult phase; four-toed salamanders do not lay their eggs in pools, but attach them to rocks, logs, or moss clumps directly over the water; hatching larvae fall from the egg mass directly into the pool.
<i>Invertebrates</i>	
Fairy Shrimp	Small crustaceans that look like tiny shrimp and the only species that are unique to these habitats in our area; measuring anywhere from 1/2 to 1 inch long, they swim along just below the water's surface; lay their eggs in the soil and leaf litter on the bottom of the pool as the pools dry up; adults die off when the pools dry completely, and remaining eggs are dormant until the pools fill again the following spring.
<i>Reptiles</i>	
Spotted, Blanding's and Wood Turtles	May use pools during the breeding season of wood frogs and mole salamanders; species wander extensively on land searching for food during the spring, summer, and fall; seek out vernal pools in early spring to prey on amphibian and invertebrate eggs and larvae; relatively deep vernal pools may serve as over-wintering sites for some Blanding's and spotted turtles.

## APPENDIX E

### Fact Sheet Summary of CSPA Changes Effective April 1, 2008.



#### RSA 483-B Comprehensive Shoreland Protection Act Standards

\*Subject to additional clarifications after rule making

Effective April 1, 2008, A STATE SHORELAND PERMIT is required for any construction, excavation or filling activities. Forest management not associated with shoreland development or land conversion and conducted in compliance with RSA 227-J:9 or under the direction of a water supplier for the purpose of managing a water supply watershed, and agriculture conducted in accordance with best management practices as required by RSA 483-B, III are exempted from the provisions of the Chapter. Projects that receive a permit under RSA 482-A, e.g., beaches, do not require a shoreland permit.

#### 250 Ft. from Reference Line—THE PROTECTED SHORELAND:

- **Impervious Surface Area Limitations.** Impervious surface area is limited to 20%. This may be increased to:
  - 25% with 50 points of tree coverage in each 50 foot x 50 foot grid segment in the waterfront buffer (WB), and a no cut deed restriction in the waterfront buffer.
  - 30% with 50 points of tree coverage in each 50 foot x 50 foot grid segment in the waterfront buffer, a no cut deed restriction in the waterfront buffer, and a DES approved stormwater management plan.

#### Other Restrictions:

- No establishment/expansion of salt storage yards, auto junk yards, solid waste and hazardous waste facilities.
- All new lots, including those in excess of 5 acres are subject to subdivision approval by DES.
- Setback requirements for all new septic systems are determined by soil characteristics.
  - 75 feet for rivers and areas where there is no restrictive layer within 18 inches and where the soil down gradient is not porous sand and gravel (perc>2 min.).
  - 100 feet for soils with a restrictive layer within 18 inches of the natural soil surface.
  - 125 feet where the soil down gradient of the leachfield is porous sand and gravel (perc>2min.).
- Minimum lot size in areas dependent on septic systems determined by soil type.
- Alteration of Terrain Permit standards reduced from 100,000 square feet to 50,000 square feet.
- The number of dwelling units per lot shall not exceed 1 unit per 150 feet of shoreland frontage.

#### 150 ft. from Reference Line—NATURAL WOODLAND BUFFER RESTRICTIONS:

- Within the area between 50 feet and 150 feet from the reference line; 50% of the area not covered by impervious surfaces shall be maintained in an undisturbed state.

#### 50 ft. from Reference Line—WATERFRONT BUFFER and PRIMARY BUILDING SETBACK:

- All primary and accessory structures must be set back at least 50 feet from the reference line. Towns may maintain or enact their own setback only if it is greater than 50 feet.
- Within 50 feet, a waterfront buffer must be maintained. Within the waterfront buffer, tree coverage is managed with a 50-foot x 50 foot grid and points system. Tree coverage must total 50 points in each grid. Trees and saplings may be cut as long as the sum of the scores for the remaining trees and saplings in the grid segment is at least 50 points.
- No natural ground cover shall be removed except for a footpath to the water that does not exceed 6 feet in width and does not concentrate stormwater or contribute to erosion.
- Natural ground cover, including the duff layer, shall remain intact. No cutting or removal of vegetation below 3 feet in height (excluding lawns) except for the allowable footpath.
- Within 50 feet, stumps, roots, and rocks must remain intact in and on the ground.
- Chemical applications (including but not limited to pesticides and herbicides) are prohibited. Low phosphorus, slow release nitrogen fertilizer may be used for the area that is beyond 25' from the reference line. No fertilizer, except limestone, shall be used between the reference line and 25 feet.

**REFERENCE LINE:** For *coastal waters* it is the highest observable tide line; for *rivers* it is the ordinary high water mark; for *natural fresh waterbodies* it is the natural mean high water level; and for *artificially impounded fresh waterbodies* it is the elevation at the spillway crest or the elevation of the state's flowage.

**NON-CONFORMING STRUCTURES** Are structures that, either individually or when viewed in combination with other structures on the property, do not conform to the provisions of the CSPA, including but not limited to the impervious surface limits of RSA 483-B:9V(g). They may be repaired, renovated, or replaced in kind using modern technologies, provided the result is a functionally equivalent use. Such repair or replacement may alter the interior design or existing foundation, but shall result in no expansion of the existing footprint except as authorized by the department pursuant to paragraph II of RSA 483-B.

A **SITE ASSESSMENT** is required prior to executing a purchase and sale agreement for any "developed waterfront property" using a septic disposal system and which is contiguous to or within 200 feet of a great pond (a public water of more than 10 acres) as defined in RSA 4:40-a and upon which stands a structure suitable for either seasonal or year-round human occupancy.

For more information, please visit the DES Shoreland Website at [www.des.nh.gov/cspa](http://www.des.nh.gov/cspa)



## APPENDIX F

### Summary of Requirements of the City of Rochester Large Groundwater Withdrawal Permit No. LGWP-2008-0001

[From a letter to John Brooks, City of Rochester, Department of Public Works from Christine Bowman, NHDES, Drinking Water and Groundwater Bureau, dated April 4, 2008 regarding Large Well Siting Approval/Large Groundwater Withdrawal Permit LGWP-2008-0001]

Following is a summary of the primary requirements and recommendations associated with the NHDES approval of RCH-1C for use as a large production well for a community water system. These requirements must be complied with as a condition of approval of the well.

1. Rochester must maintain a wellhead protection program for the RCH-1C Wellhead Protection Area (WHPA) consisting of: 1) updating inventories of contamination sources and potential contamination sources at intervals no greater than three years from the date of approval; 2) competing written notification requirements to each owner of contamination sources or potential contamination sources once every three years from the date of approval; 3) within once year of approval, conduct site visits to survey all potential contamination sources located within the WHPA to determine compliance with best management practices for preventing groundwater contamination at least once ever three years.
2. NHDES recommends elevation of the well casing to extend at least two feet above the 100-year floodplain elevation (235 feet above sea level).
3. Rochester must implement and adhere to the conditions of the Large Groundwater Withdrawal Permit (No. LGWP-2008-0001).
4. Chemical Monitoring Program – Results of the water quality sampling program show that the water derived from RCH-1C is slightly acidic and has pH in the range of 6.0-6.4, which is less than the lower limit of the SMCL range (Secondary Maximum Contaminant Level is 6.5 to 8.5). NHDES recommends the City consider installation of chemical treatment to adjust the Ph of the water, or other acceptable erosion control treatment. Results of the water quality sampling program also indicate that the concentration of radon is elevated in water derived from well RCH-1C. Although there is currently no state or federally enforced drinking water standard for radon, NHDES suggests that the City consider options for reducing or removing radon from the water supply. The City must also notify NHDES when well RCH-1C becomes active.
5. Emergency Plan – Rochester shall update its emergency plan for the water system prior to the source coming online or at such time that the configuration and construction of the water system's primary components are known. This plan shall continue to be updated and submitted to NHDES once every six years and shall be reviewed annually by the system and updated as necessary.
6. Water level monitoring data (a condition of and as described in the Permit) shall be submitted annually to NHDES in an electronic format.

Summary of Conditions of Permit No. LGWP-2008-0001 to withdraw groundwater from wells RCH-1C and RCH-2A1. *Note: This is not a complete list of permit conditions.*

1. Metering Requirements: Withdrawals from all sources must be metered at all times.

2. Monitoring and Reporting Requirements:
  - Protecting Low Flows in the Cocheco River: The permittee shall implement a low-flow pumping restriction program to protect low flows in the Cocheco River whereby withdrawals are limited to times when flow in the Cocheco River exceeds a minimum flow threshold of 23 cubic feet per second (cfs) measured at the USGS Stream Gage – Cocheco River Near Rochester, NH. Stream flow monitoring shall commence when a withdrawal is initiated and shall continue indefinitely as a condition of the permit when the wells are in use. Records shall be maintained of the daily stream flow measurements, operation schedules and total daily withdrawal volumes.
  - Water Level Monitoring: The permittee shall complete the following water level monitoring and reporting program for the RCH-2A1 well: Off-site Private Dug Well, and On-Site Overburden Monitoring Wells.
  - Wetland Monitoring: The permittee shall implement a wetland monitoring program. Monitoring shall occur at the proposed on-site wetland monitoring station (in the wetland east of RCH-1C) and the proposed control site (south of the Cocheco River out side the zone of contribution of well RCH-1C). The wetland monitoring program shall commence once year prior to initiating a withdrawal from RCH-1C and continue indefinitely as a condition of the permit. All work shall be conducted under the direct oversight of a New Hampshire Certified Wetland Scientist. All monitoring data shall be submitted to NHDES annually by January 31<sup>st</sup> of each year. The annual monitoring report shall note any relevant observations that may affect the stream flow measurements, water level measurements, or wetland plot observations and include all field notes documenting the monitoring activities for the preceding year.
3. Mitigation Requirements:
  - Prior to initiating the large groundwater withdrawal, the permittee shall notify any lot owner with a private or public well within the area identified as “estimated 180-Day Zone of Influence Around Each Production Well”. The permittee shall explain to lot owners that their well may be influenced by the withdrawal at these wells. The permittee shall provide to these owners contact information for both the permittee and NHDES in the event they believe they may be adversely impacted by the withdrawal.
  - The permittee shall notify NHDES of any adverse impact within 12 hours of receiving such information. The permittee shall provide potable water for drinking and cooking purposes to a well owner that NHDES has determined to be adversely impacted. A permanent alternative water supply that produces water quality that complies with Federal and State drinking water quality requirements and quantity of water shall be provided to an adversely impacted water user within 30 days of NHDES determining that a water user had been adversely impacted. Contracts with companies capable of providing water and well services must be developed and maintained prior to and after initiating the withdrawal such that in the event that impacts are noted at private wells, mitigation steps can be undertaken expeditiously.
4. The permittee shall apply for renewal of the permit at least 365 days prior to its expiration date.



## APPENDIX G

### **General information about potential sources of nonpoint and point sources of pollution.**

#### **Nonpoint Sources Pollution**

##### ***Household and Personal Care Products***

The following information is from NHDES Fact Sheet WMD-SW-33 (available at <http://www.des.state.nh.us/factsheets/sw/sw-33.htm>).

Any product consumed or applied by an individual for personal health or cosmetic reasons can be defined as a pharmaceutical or personal care product. These products include prescription and over-the-counter therapeutic drugs, fragrances, cosmetics, sunscreen agents, diagnostic agents, contact lens solutions, nutraceuticals, biopharmaceuticals, and many others. All of these products applied externally or ingested have the potential to be excreted or washed into sewage systems and discharged to the aquatic and terrestrial environments. Some medications and personal care products contain hazardous chemicals or even heavy metals, such as mercury (which is used as a preservative). In New Hampshire, there has been increasing attention on mercury as a serious pollutant due to its toxic, persistent and accumulative properties in fish.

The proper disposal of pharmaceuticals and personal care products is an emerging issue in the environmental arena. When aquatic and amphibian species are exposed to small amounts of pharmaceutical and personal care products, it can result in decreased reproduction, delayed development and even additional appendages in some species. In 2002, 80 percent of streams sampled (139 rivers in 30 states) by the U.S. Geological Survey showed evidence of drugs, hormones, steroids and personal care products such as soaps and perfumes. The risks posed to aquatic organisms by continual life-long exposure and to humans by long-term consumption of minute quantities are essentially unknown.

#### **Point Sources of Pollution**

##### ***Underground Storage Tanks***

The NHDES operates an Underground Storage Tank (UST) Program and established rules for registration and permitting in November 1985, as well as standards for design, installation, operation, maintenance, and monitoring of UST facilities. The purpose of the Underground Storage Tank (UST) Program is to prevent and minimize contamination of the land and waters of the state due to the storage and handling of motor fuels, heating oils, lubricating oils, other petroleum and petroleum contaminated liquids, and hazardous substances. The UST Program rules apply to:

- ✓ all underground storage tank systems that store motor fuels or a regulated substance other than heating oil having a total storage capacity of more than 110 gallons, and
- ✓ non-residential tank systems having an on-premise use heating oil storage capacity of more than 1,100 gallons.

The owner of an underground storage facility must register the facility with DES by providing the information required in UST facility rules. The owner of a UST facility must provide an application and plans to DES before commencing construction, installation of a new or replacement system, or a substantial modification of an existing underground storage system.

The plans must be prepared and stamped by a registered professional engineer, licensed to practice in the state of New Hampshire. DES must be notified within 30 days prior to any scheduled system closure. An assessment must be completed and results sent to DES to determine if any contamination is present.

### ***MTBE (methylterbutyl ether)***

As part of a 2005-2006 study of 800 wells, researchers from the USGS and NHDES, it was found that the gasoline additive MTBE is widespread in New Hampshire's ground water, particularly in four counties – Rockingham, Strafford, Hillsborough and Merrimack. The study found that groundwater from these counties was more likely to contain MTBE than were samples from the rest of the state. This may be due in part to the 1995 mandate that cleaner-burning reformulated gasoline be used these four counties. Across the state, the MTBE concentrations were significantly below the state drinking water limit and the federal drinking water advisory. No data exist on the human health effects of ingesting MTBE in drinking water and no federal regulatory standards have been set for MTBE, but an advisory (of 20-40 parts per billion) has been issued by the EPA. Many of New Hampshire's public and private water supplies are derived from wells drilled into surficial and bedrock aquifers, where ground water can travel slowly, increasing exposure time to radon-bearing minerals and rock formations. This, in addition to factors like NH's unique geologic formations and fractured-rock aquifers, makes it uncertain how long MTBE will persist in the state's ground water.<sup>46</sup>

### ***Septic Systems***

#### ***Definition of a Failed Septic (Subsurface Disposal) System***

New Hampshire Revised Statutes Annotated (RSA) 485-A:2 defines failure as "the condition produced when a subsurface sewage or waste disposal system does not properly contain or treat sewage or causes or threatens to cause the discharge of sewage on the ground surface or into adjacent surface or groundwater." Tips for Maintaining a Septic System include:

- Know the location of your septic tank and leaching area. Keep deep-rooted trees and shrubs from growing on your leaching area. Keep heavy vehicles from driving or parking on your leaching area.
- Inspect your tank yearly and have the tank pumped as needed and at least every three years. Don't wait until there is a problem. Avoid flushing bulky items such as disposal diapers.
- Do not flush toxic materials such as paint thinner, pesticides, or chlorine into your system as they may kill the bacteria in the tank. These bacteria are essential to a properly operating septic system.
- Be conservative with your water use, use water-reducing fixtures wherever possible, and repair leaking fixtures.

[Source: NHDES Environmental Fact Sheet Series (SSB1, SSB2)]

### ***Sand and Gravel Extraction***

Section 42.11 Earth Removal of the Rochester Zoning Ordinance states that there shall be no excavation or removal of earth, loam, topsoil, gravel, clay, or stone except in conformance with the provisions of RSA 155-E as amended or as may be hereafter amended (and incorporated by

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<sup>46</sup> Gasoline Additive MTBE Widespread in New Hampshire's Ground Water (January 2, 2008), USGS News Release) from <http://nh.water.usgs.gov/WhatsNew/newsreleases/mtbe010208.htm>

reference). Such excavation shall require a special exception by the Board of Adjustment as specified in Section 42.23(a)(16) of this ordinance. RSA 155-E defines excavation as a land area, which is used, or has been used, for the commercial taking of earth, and the excavation site means any area of contiguous land in common ownership upon which excavation takes place.

RSA 155-E states and/or requires the following:

- Exceptions to the permitting requirement include existing excavations and stationary manufacturing plants for excavation which lawfully existed as of August 24, 1979, from which earth material of sufficient weight or volume to be commercially useful has been removed during the 2-year period before August 24, 1979. Such excavations are exempt from the provisions of local zoning or similar ordinances, but may not be expanded without a permit.
- Highway excavations shall not require a permit if performed exclusively for the lawful construction, reconstruction, or maintenance of a class I, II, III, IV or V highway by a unit of government having jurisdiction for the highway or their agent.
- No permit is required for excavation that is: 1) exclusively incidental to the construction or alteration of a building or structure or the construction or alteration of a parking lot or way including a driveway, 2) incidental to agricultural or silvicultural activities; and 3) from a granite quarry for the purpose of producing stone for construction purposes.
- Prohibited activities include excavation: within 50 feet of the boundary of a disapproving abutter or within 10 feet of the boundary of an approving abutter; that would cause a diminution in area property value or unreasonably change the character of the neighborhood; is unduly hazardous or injurious to the public welfare; or would substantially damage a known aquifer designated by the United States Geological Survey.

RSA 155-E requires the following minimum operational standards relating to protection of resources:

- No excavation within 75 feet of a great pond, navigable river, or other standing body of water of 10 acres or greater or within 25 feet of a stream, river or brook which normally flows throughout the year, or naturally occurring standing body of water less than 10 acres, prime wetland (as designated in RSA 482-A:15(I) or wetland greater than 5 acres in area as defined by the department of environmental services.
- Drainage shall be maintained to prevent the accumulation of free-standing water for prolonged periods. Excavation practices, which result in continued siltation of surface waters or degradation of water quality of public or private water supplies, are prohibited.
- No fuels, lubricants, or other toxic or polluting materials shall be stored on-site unless in compliance with state laws or rules pertaining to such materials. RSA 155-E requires the following minimum reclamation standards relating to protection of resources:
- Excavated areas or stripped of vegetation shall be covered by soil capable of sustaining vegetation, and shall be planted with seedlings or grass suitable to prevent erosion.

- All slopes, except for exposed ledge, shall be graded to natural repose for the type of soil of which they are composed. Standing bodies of water created in the excavation project must be eliminated.
- The topography of the land shall be left so that water draining from the site leaves the property at the original, natural drainage points and in the natural proportions of flow.