NATURAL RESOURCES CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Natural Resources

Contents

Natural Resources

Introduction

The Rockingham Planning Commission (RPC) region enjoys the benefits of having clean water, open spaces, clean air, diverse wildlife habitats, and productive soils. Having good natural resources and services has allowed the region to support and accommodate the growth of residential, industrial and commercial development. As land uses change there is increased pressure on the region's natural resources and the services they provide. The ability to maintain and protect these resources and services is one of the largest challenges the region faces. However, how is accomplished this complex due to competing needs for the resources, balancing property rights, and the short and long term costs involved.

This chapter examines natural resources and services, along with several topics directly linked with those resources, including:

- Water Resources
- Land Use Issues
- Water Infrastructure
- Wildlife and Habitats
- Waste-Related Issues
- Air Resources
- Agriculture, Forestry, and Fisheries
- Recreation and Open Space
- Climate Change Impacts on Natural Resources

Water Infrastructure includes drinking water systems, private wells, wastewater and septic systems, dams, and stormwater infrastructure.

Historically, the RPC region developed around its natural resources, with communities developing near waterways for access to food, power production, and transportation routes. Agricultural fields typically clustered near the flat, nutrient-rich land near rivers, typically in the floodplains. Forestry activities occurred further away from town centers, resulting in land clearing; this provided for increased agricultural land for crop and livestock production to feed growing communities. As the region continued to develop, land use shifted from native forests and wetlands to predominantly agriculture and human settlement. This shift has continued to occur over the last 50 years.

Table NR 1 shows the shift in different land use types related to natural resources, agriculture and recreation in the RPC region since 1962. Of particular note is the reduction in the amount of forested land; some of which is attributable to better calculations from aerial photography, has dropped by approximately 15 percent. The RPC region has the lowest amount of forested land in the state. Additionally, the amount of land actively being used for agriculture has dropped by more than 50 percent. These land use changes demonstrate how the development in the region has shifted the resources available for wildlife, recreation, and agriculture. Actions communities in the region take now will dictate a large part of how much and in what condition the region's natural resources and services are in 2040.

Table NR1 - RPC Region Historical and Current Land Use *As Related to Natural Resources, Agriculture, or Recreation*					
Land Use Type (% of total RPC Region land area)	**1962**	**1974**	**1998**	**2005**	**2010**
Active Agricultural	10.5%	7.2%	4.4%	3.9%	3.9%
Farmsteads	0.3%	0.3%	0.1%	0.4%	0.4%
Forested	65.9%	63.8%	57.5%	40.3%	39.3%
Open Wetlands	3.9%	3.9%	3.8%	15.4%	15.4%
Other/Idle	4.1%	5.1%	3.8%	4.8%	4.7%
Playing fields / Recreation	No Data			1.4%	1.4%
Water	4.9%	5.0%	5.3%	5.3%	5.3%
Total RPC land area (acres)	**248,549.4**	**248,549.4**	**248,549.4**	**248,549.4**	**248,549.4**
Note: Years 1962, 1974 and 1998 were compiled with a slightly different methodology than 2005 and 2010. The Playing Fields are category only broken out in 2005 and 2010. Classification of wetlands was improved between 1998 and 2005. Due to lesser quality aerial photos many wetlands were classified as 'Forested' before 2005.					

Source: Land use data was derived from analysis of land use coverage based on aerial photos by GRANIT and Rockingham Planning Commission.

What the Region Said About Natural Resources

Local Master Plans

One of the most common in adopted local master plans in RPC region is the natural resources found in each community. Natural resources and environmental services issues and goals are often covered in a natural resource or environmental chapter of a local master plan, but are also found in water resources chapters, hazard mitigation chapters and land use chapters. Overall, protection of natural resources and environmental services is amongst the most important goals in all local master plans in the RPC region. The following are the ranking of how common a topic, not just environmental topics, was seen as a priority in the local master plans:

- Rank #1 – Natural resource and water resource protection.
- Rank #6 and #15 – Recreation resources
- Rank #7 and #12 – Preserving rural heritage and agriculture
- Rank #9 – Conservation and open space
- Rank #19 – Clean air

Statewide and Regional Surveys

Within the statewide and regional telephone and online survey, several questions concerning environmental issues were asked. Overall, environmental protection was considered a top priority by residents in the state and RPC region, and more specifically, a top priority for the use of public funds. Figure NR1 illustrates the prioritization residents have for natural resources and environmental services protection. Protection of water resources and open space are the overall top priorities.

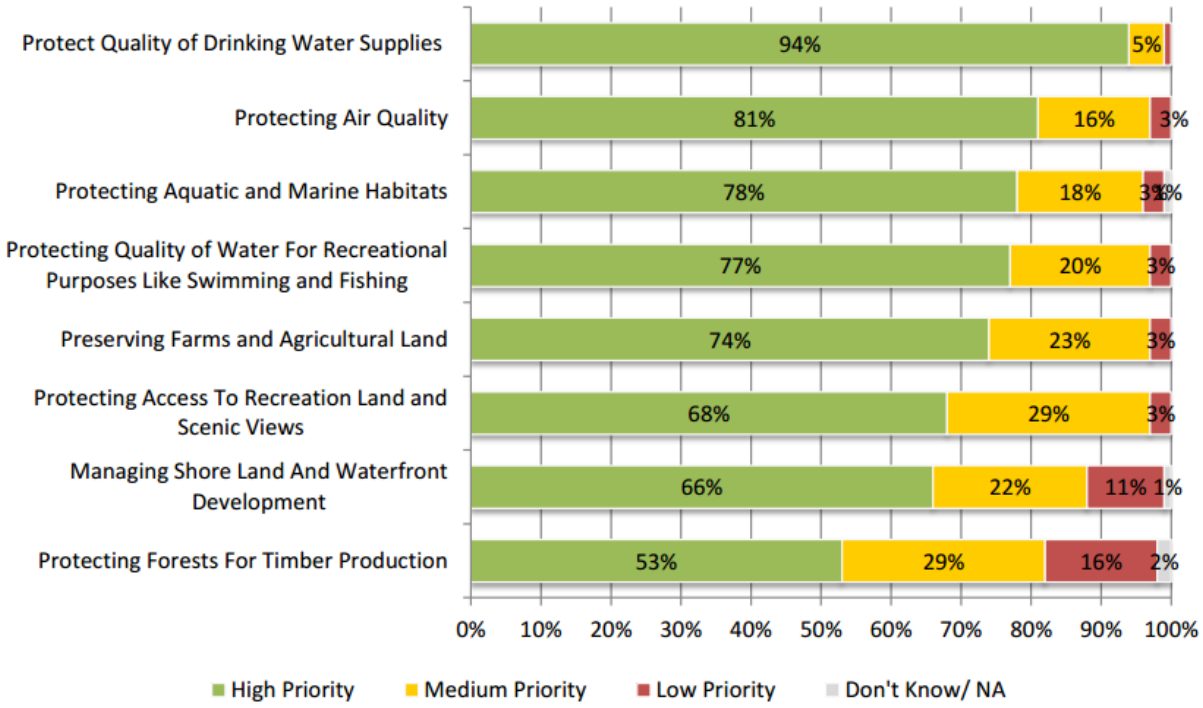

Figure NR1 - Statewide and Regional survey results about priority for protection for different environmental issues. Source: UNH Survey Center

Natural Resources Goals

Goal 1

Development and redevelopment practices minimize impacts on natural resources and improve those resources when possible.

Goal 2

Development and land use change impacts on water resources are minimized and improved when possible.

Goal 3

The region develops and redevelops in ways that allow waterways to flow as naturally as possible and precipitation to infiltrate into the ground.

Goal 4

Open spaces are preserved for agriculture, wildlife habitat, recreation, environmental services, and to maintain community character.

Environmental services are the benefits people obtain from the natural environment. These benefits can range from food and wood to water filtration and flood storage, and can include uses such as recreation and tourism.

Goal 5

Large, undisturbed blocks of land are protected and interconnected, particularly lands with sensitive habitats or lands of local importance.

Goal 6

The region promotes new and continued use of agricultural lands and resources.

Goal 7

Public and private drinking water supply sources are protected from overuse and pollution.

Goal 8

Water and wastewater system owners, including municipally-owned systems, collaborate with each other on management and system improvement projects.

Goal 9

The region is minimizing its contribution to air pollutants.

Goal 10

Waste generation is minimized and sites with past hazardous waste issues are restored to a usable condition.

Natural Resource Goals	**Regional Goal Promote the efficient use of land, resources and infrastructure that:**				
	Creates a high quality built environment while protecting important natural and cultural resources.	Promotes positive effects of development and minimizes adverse impacts.	Promotes economic opportunities and community vitality.	Enhances the coordination of planning between land use, transportation, housing and natural resources.	Considers and incorporates climate change into local and regional planning efforts
NR Goal 1	S	S	S	S	S
NR Goal 2	S	S	S	S	S
NR Goal 3	S	S	P	S	P
NR Goal 4	S	S	S	P	S
NR Goal 5	S	S	S	P	P
NR Goal 6	S	P	S	S	P
NR Goal 7	S	S	S	S	P
NR Goal 8	S	S	S	S	P
NR Goal 9	S	S	P	P	S
NR Goal 10	S	S	S	P	P

S = Goal supports the Regional Goal.
P = Goal partially supports the Regional Goal.
TBD = Goal applicability to support the Regional Goal is not yet known.
N/A = Goal does not apply to the Regional Goal.

Natural Resource Goals	NH Livability Principles					
	Traditional Settlement Patterns & Development Design	Housing Choices	Transportation Choices	Natural Resources Function & Quality	Community & Economic Vitality	Climate Change & Energy Efficiency
NR Goal 1	S	P	P	S	S	P
NR Goal 2	S	P	P	S	S	P
NR Goal 3	P	P	P	S	P	P
NR Goal 4	S	P	P	S	S	S
NR Goal 5	S	P	P	S	P	S
NR Goal 6	S	P	P	S	S	P
NR Goal 7	S	S	P	S	S	P
NR Goal 8	S	S	N/A	S	S	P
NR Goal 9	P	P	S	S	P	S
NR Goal 10	P	P	P	S	S	P

S = Goal supports the NH Livability Principle.
P = Goal partially supports the NH Livability Principle.
TBD = Goal applicability to support the NH Livability Principle is not yet known.
N/A = Goal does not apply to the NH Livability Principle

Existing Conditions

Water

The RPC region is rich in water resources. These resources include freshwater rivers and streams, lakes and ponds, wetlands, shoreland areas, and groundwater resources of stratified drift and bedrock aquifers. This region also contains New Hampshire's only oceanfront coastline and encompasses estuarine resources associated with the Great Bay and Hampton-Seabrook Estuaries. As the region has grown and land uses have changed there has been increasing impacts on all water resources. These land use changes have resulted in both positive and negative impacts on the health of the water resources RPC communities that rely on.

This region has:

- 785 miles of rivers and streams.
- 43 lakes and ponds over 10 acres in size.
- 18 miles of oceanfront
- 38,000 acres of wetlands
- 75+ miles of estuarine shoreline
- 229,974 acres of aquifers.

Water resources are managed and protected at all levels of government; however, the task of protecting local water resources relies heavily on individual, local and regional efforts. Water generally does not follow political boundaries, so successful protection efforts require cooperation and collaboration between many entities.

Water resources were considered in a separate chapter of the regional master plan and in many local master plans until recently. Local water quality management plans for watersheds, rivers, and drinking water sources within town boundaries are often considered as separate planning tools, but in many cases are legislatively enabled to be adopted as part of a community's master plan.

Surface Waters

The RPC region is located within two major watersheds, or drainage basins, the Merrimack River and Piscataqua-Salmon Falls watersheds. Within these two watersheds are several smaller watersheds, Figure NR2, including the Lamprey River, Exeter-Squamscott River, Coastal Drainage, Spickett River, and the Powwow River. The region hosts 785 miles of perennial rivers and streams, 43 lakes and ponds over 10 acres (totaling 3,189 acres), over 38,000 acres of wetlands, all of New Hampshire's 18 miles oceanfront, and over 75 miles of estuarine coastline within all of the Hampton-Seabrook Estuary and the RPC portion of the Great Bay Estuary.

A map of all surface waters in the RPC region can be found in Appendix C Map NR1 and a map of wetlands in Appendix C Map NR12.

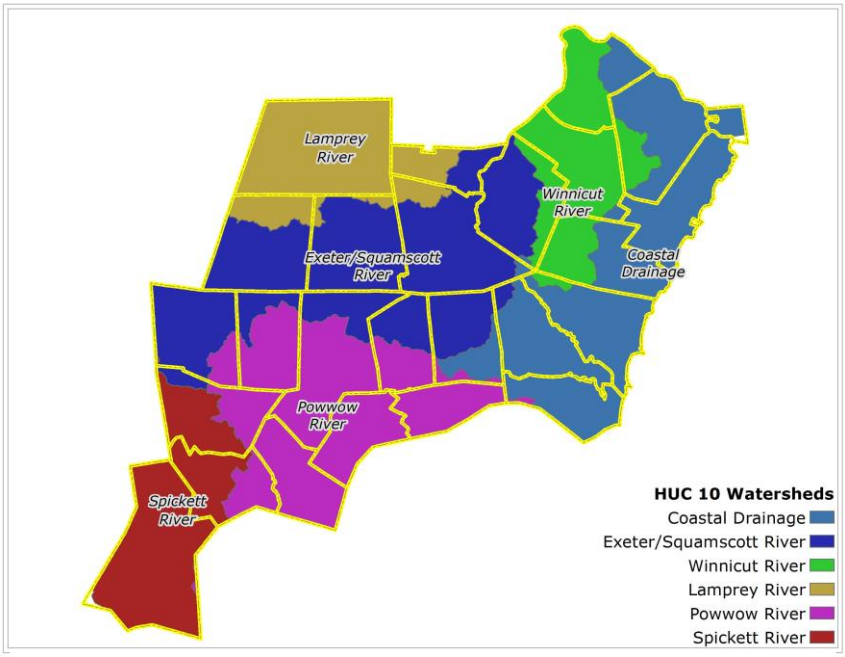

Figure NR2 -Watersheds in the RPC region. Source: NHGRANIT

Designated Rivers

The region hosts part of two river systems designated under the New Hampshire Rivers Management and Protection Program (RSA 483): the Exeter and Squamscott Rivers, and the Piscassic and Lamprey Rivers. These rivers were designated for their outstanding natural and cultural characteristics and value as community assets (NH Department of Environmental Services, 2008). This designation enables communities along the rivers to work together to develop a river management plan through a local advisory committee. Both the Exeter-

Squamscott River Local Advisory Committee and the Lamprey Rivers Advisory Committee are made up of members representing diverse interests, nominated by each riverfront community, and appointed by the NHDES Commissioner. The primary duties of the local advisory committees are to develop and implement their river management plans and to provide comment to NHDES on applications for certain state and federal permits that may impact the river. Municipalities may choose to incorporate the river management plan into their local master plans. River Management Plans are available via the websites listed below.

Additional information:
Lamprey Rivers Management Plan (2013)
http://www.lampreyriver.org/about-us-2013-management-plan-draft

Exeter-Squamscott River Management Plan (2012):
http://des.nh.gov/organization/divisions/water/wmb/rivers/documents/ext-squam-plan.pdf

Great Bay and Hampton-Seabrook Estuaries

Great Bay and Hampton-Seabrook Estuaries are the only two estuarine systems in New Hampshire and have contributed greatly to the natural, cultural and economic vitality of the region. Both estuaries are considered premiere systems for both protection and research in the country. In addition to the 18 miles of coastline in New Hampshire (all located within the RPC region), there is also over 220 miles of estuarine coastline, with over 75 miles occurring within the RPC region. Great Bay and the Hampton-Seabrook estuaries differ in their geology, hydrology, and historic uses, but today both are valued for their array of natural, commercial and recreational resources.

The Hampton-Seabrook estuary is the smaller of the two estuaries and is formed by sandbars that hug the estuary outlet. Sandy beaches and thousands of acres of saltmarsh areas dominate the estuaries natural landscape. The state's only remaining sand dunes are also located in and near the estuary.

Great Bay is the state's largest estuary and includes both Little Bay and the Piscataqua River. The majority of the estuary's watershed is located within New Hampshire, with the Lamprey River, Exeter-Squamscott River, and Winnicut River watersheds draining the portions of the RPC region within the estuary's watershed. Great Bay estuary is a unique estuary because of its location so far inland. It can take up to 20 days for all the water from Great Bay to migrate to the open ocean (NH Department of Environmental Services, 2008). This has implications on the sensitivity of Great Bay to nutrient loads, particularly nitrogen. The longer nutrients are present in the water, the greater the chances of them causing impacts such as algae blooms. For more details about nitrogen entering Great Bay see the text box on page 12.

Water Quality

The quality of surface waters has a direct impact on the environmental well-being, public health and economic opportunities of the region. Simply put, the region needs clean water to prosper.

The federal Clean Water Act requires all states to submit a report to the U.S. Environmental Protection Agency (EPA) every two years describing the quality of the state's surface waters for different types of uses such fishing, swimming and drinking. In New Hampshire, surface waters are evaluated to see if the water is clean and abundant enough to support fishing, swimming, boating, and aquatic organisms.

For a map of all impaired surface waters in the RPC region, see Appendix B MapNR2.

Currently, the RPC region lacks significant water quality data. Multiple entities, from drinking water suppliers and academic institutions to voluntary data collection programs sample many of the waterbodies in the region. NHDES in conjunction with the Volunteer Lakes and Rivers Assessment Programs and the UNH Lakes Lay Monitoring Program, along with other data collection efforts, conducts surface water quality assessments throughout the year in New Hampshire. Figure NR3 demonstrates the lack of water quality data. In the RPC region, only 45 percent of the lakes and 40 percent of the rivers have had any water quality data collection.

This lack of data makes it impossible to know the actually condition of those lakes and rivers and any positive or negative trends in water quality on those waterbodies.

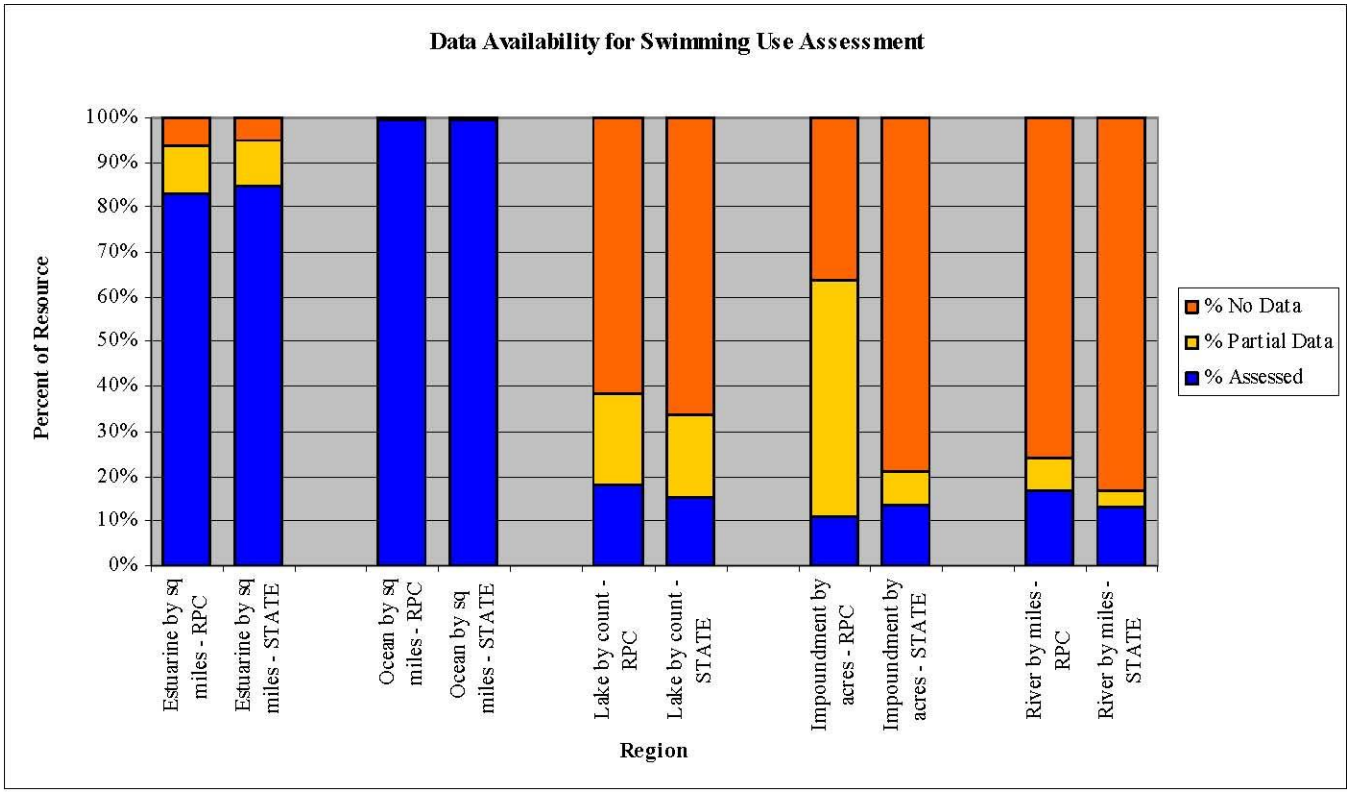

Figure NR3 - Data availability on waterbodies for water quality to meet state standards for swimming. Source: NHDES, 2013.

Nitrogen and Great Bay Estuary

In 2008, NHDES declared Great Bay Estuary, and portions of the rivers that drain into the bay, as being impaired and not meeting state water quality standards. The estuary is one of 28 "estuaries of national significance" established under the EPA National Estuary Program. The estuary is experiencing declining oxygen levels, algae blooms and declining eelgrass habitats due to in partto increase nutrients, specifically nitrogen, entering the watershed. The declining water quality can have direct impacts on the aquatic organisms that live in the bay; specifically affecting the region's fishing industry though the declining eelgrass habitat relied on by juvenile fish.

NHDES has estimated that 68 percent of the nitrogen originating in the bay originates from sources spread across the bay and that the remainder comes from municipal wastewater treatment facilities (N.H. Department of Environmental Services, 2014). The remaining sources include atmospheric deposition, septic systems, fertilizers (both agriculture and lawn), and animal waste. Several key findings of the NHDES 2014 Great Bay Nitrogen Non-Point Source Study include:

- 42% of nonpoint source nitrogen found in Great Bay comes from atmospheric deposits from air emission from vehicles and power generation from in New Hampshire and from other states.
- 29% of nonpoint source nitrogen entering Great Bay is from septic systems, mainly from those farther away from Great Bay.
- 70% of non-point source nitrogen entering Great Bay from fertilizers is from residential lawns, while only 23% is from agriculture fertilizer application.
- The following table illustrates the amount of nitrogen entering Great Bay from non-point sources from RPC communities located within the watershed. Generally, communities with higher contribution rates are closer to the bay, rely to varying degrees on septic systems, or have large areas of developed land.

RPC Community	**Nitrogen Contribution Rate to Great Bay Estuary** (lb/ac/yr)				
	.5-1.6	1.7-2.3	2.4-3	3.1-4	4.1-5.3
Brentwood			X		
Danville*			X		
East Kingston*			X		
Epping			X		
Exeter				X	
Fremont			X		
Greenland					X
Hampton					X
Hampton Falls			X		
Kensington*				X	
Kingston*			X		
Newfields		X			
Newington					X
North Hampton				X	
Portsmouth					X
Rye				X	
Sandown*				X	
Seabrook*					X
Stratham					X
*Only part of the municipality falls within the Great Bay Watershed.					

For additional information on Great Bay Estuary can be found via the following resources:

- Piscataqua Region Estuaries Partnership
  http://www.stateofourestuaries.org/
- NHDES Great Bay Estuary website
  http://des.nh.gov/organization/divisions/water/wmb/coastal/great-bay-estuary.htm

Stormwater

In New Hampshire, stormwater runoff is the single, largest source of water pollution (NH Department of Environmental Services, 2008). Stormwater runoff refers to rain and snowmelt that runs off impervious surfaces, such as buildings, roads, and parking lots, and over land that ends up in nearby streams, rivers, lakes, wetlands, or tidal waters. This runoff carries pollutants such as sediment, road salt, chemicals, fertilizers and other harmful substances that can degrade water quality if it is not treated. The primary method for treating stormwater is through Best Management Practices (BMPs). Examples of BMPs include:

- Maintaining buffer areas around surface waters that help to filter out some pollutants.
- Minimizing pollutants found on impervious surfaces by conducting proactive measures such as limiting road salt application, keeping hazardous materials inside and away from precipitation, and regularly sweeping roads and parking lots to remove trash and sediment.
- Minimizing impervious surfaces through the use of pervious materials to increase infiltration into the ground.
- Constructing stormwater control structures that help filter pollutants and slow down how quickly it reaches surface waters.

Source of Pollution for Surface Waters Not Meeting State Water Quality Standards	Stormwater	Intermingling of Stormwater and Other Pollutants	Other Pollutants
State	76.7%	16.7%	6.5%
RPC Region	47.9%	42.2%	9.9%

Table NR2 - Water pollution caused by stormwater in the RPC region and the state. Source: NHDES.

In the RPC, 47.9 percent of the waterbodies with documented water quality problems are related to the pollutants commonly found in stormwater. An additional 42.2 percent of waterbodies have problems related to an intermingling of stormwater and other types of pollutants sources.

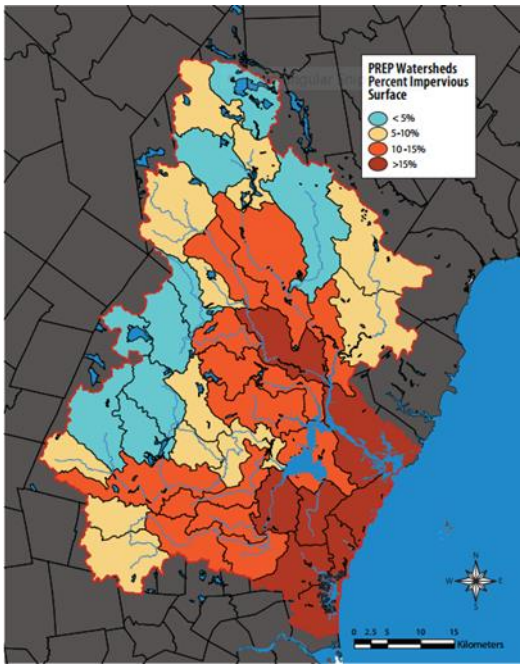

Figure NR4 - Percent of impervious surface coverage by watershed in the Piscataqua-Salmon Falls Watershed. Source: PREP, 2012.

Groundwater

Maintaining the quantity and quality of groundwater has a significant impact on land use. Groundwater is found in both bedrock and stratified-drift geologic formations. Large areas or volumes of groundwater are frequently referred to as aquifers and often result in restricted land uses.

Most RPC municipalities rely on individual wells and septic systems. Often these are for single-family houses but may include common infrastructure for apartments, condominiums, or town houses. Many of these same communities have adopted some form of lot-sizing and septic system design by soil type. Soil types are closely related to the underlying quantities and depth of the groundwater to the land surface. Septic designs dealing with acceptable locations for septic systems are based on the Seasonal High Water Table (SHWT) which is defined as the highest elevation reached by the groundwater.

Most RPC municipalities have aquifer protection ordinances which may also influence the minimum buildable lot size and usually further restrict the list of permitted uses for the lot. To help maintain the water quantity in aquifers, many municipalities have regulations requiring that a certain percent of water run-off from the impervious surfaces of a lot be captured and recharged into the groundwater. Typically part of the lot-sizing by soil types also include

set back requirements and/or buffers between lot lines and wells, lot lines and septic systems, and wells and septic systems. Some of the regulations are also state regulations as well as local regulations.

When water is extracted through a well, the largest quantities of water are extracted at the location of the well pump. The further from the pump, the less water is withdrawn from the well. A picture of this would look like a cone where the well is at the tip of the cone and the top of cone is the land surface. This arrangement is often referred to as the "cone of influence". The larger the well, that is the more water that is extracted, the larger the cone of influence. Many communities, especially those that have wells to either act as a municipal water supply or those that supply water to larger neighborhoods have adopted wellhead protection ordinances. The gist of these ordinances is to restrict the uses that may occur in the wellhead protection areas (cones of influence). They may also have some conditions regarding the size of the lot where the well is located.

In 2008, U.S. Geological Survey (USGS) released the *Seacoast New Hampshire Groundwater Availability Study*, an assessment to determine the long-term availability of groundwater in a region where groundwater is the primary source of drinking water. Due to increasing population and increasing water consumption, USGS has estimated that demand in the region will grow by 40 million gallons per day by 2025. As of 2008, the average per person water use in the region is 75 gallons per day, increasing to 92 gallons per day during the summer (the increase is primarily due to outdoor watering). The overall finding, is that there are sufficient groundwater supplies to meet this growing demand. However, the land use and other policy decisions made at the state and municipal level could alter this scenario.

For a map of groundwater resources in the RPC region see Appendix C Map NR3.

Water Infrastructure

Drinking Water Sources and Infrastructure

New Hampshire has abundant supplies of clean drinking water available. However, as development increases and land use changes there is increase demand for water and potential for contaminating drinking water sources (both surface and groundwater). Public water supplies are highly regulated to protect public health, however, the sources of this water can become polluted or dry up.

There are a total of 311 public water supply sources in the RPC region, 115 of which are community water systems. According to NHDES Drinking Water and Groundwater Bureau, 69 percent of residents in the region received their drinking water from community water supplies that are tested regularly to ensure water meets the state's drinking water quality standards. The vast majority of water from these community water supplies comes from groundwater; only the Exeter and Salem municipal water systems utilize surface waters as a water supply source.

Of the remaining portion of residents, 31 percent, rely on private domestic wells for their drinking water. Both private and public wells can have naturally occurring contaminants, such as radon and arsenic, or contaminants from human activities, such as MtBE, a gasoline additive now banned in New Hampshire. However, unlike public water supplies, private wells are not required to be tested in New Hampshire. A few communities have ordinances that require the testing of new wells, or at the time of a real estate transfer, but many residents do not regular test their well's water quality. Statewide, 20 percent of private wells are estimated to contain arsenic above safe levels and 40 percent are estimated to have radon levels above safe levels (NH Department of Environmental Services, 2008). NHDES recommends private wells be tested every year for bacteria and every three years for both natural and human-related contaminants.

See Appendix C Map NR4 for a map showing the locations of municipal and community water supply sources and well-head protection areas. [Note: Community water supplies include wells that serve specific populations on a regular basis such as businesses, restaurants, schools and hospitals.]

Wastewater Infrastructure and Septic Systems

Wastewater treatment, be it in the form of a municipal sewer system or individual septic systems, are designed to collect and treat waste water produced from residential, commercial or industrial uses. The majority of New

Hampshire's wastewater treatment plans were built over 30 years ago to help address public health issues and to combat water pollution (Table NR3). Generally, most wastewater treatment systems, including both sewer and septic systems, are designed to last 20 to 30 years. The maintenance cost of municipal sewer systems is becoming increasingly high due to aging infrastructure and increasing concerns over water pollution, particularly nitrogen pollution entering Great Bay in the RPC region.

Table NR3 shows details regarding the eight wastewater treatment facilities in the RPC region.

FACILITY	Town/City	Average Daily Design Flow, MGD	Long Term Average WWTF Flow, MGD	WWTF Flow Capacity Used, %	Original Construction Year	Population Served by WWTF	Towns Served by WWTF	Preliminary Treatment	Secondary Treatment	Advanced Treatment	Receiving Water (for surface water discharges)
EPPING WASTEWATER	Epping	0.500	0.280	56.00%	1970	1,500	Epping	Yes	Yes	Yes	Lamprey River
EXETER WASTEWATER	Exeter	3.000	1.600	53.33%	1990	9,313	Exeter, Hampton, Stratham	No	Yes	No	Squamscott River
HAMPTON WASTEWATER	Hampton	4.700	2.800	59.57%	1976	26,200	Hampton, Rye	Yes	Yes	Yes	Tide Mill Creek
NEWFIELDS WASTEWATER	Newfields	0.117	0.094	80.34%	1982	520	Newfields	Yes	Yes	No	Squamscott River
NEWINGTON WASTEWATER	Newington	0.290	0.130	44.83%	1980	Unknown	Newington	Yes	Yes	No	Piscataqua River
PEASE INTL.TRD PORT WASTEWATER	Portsmouth	1.200	0.770	64.17%	1954	Unknown	Pease Tradeport	Yes	Yes	No	Piscataqua River
PORTSMOUTH WASTEWATER	Portsmouth	4.800	5.400	112.50 %	1964	Unknown	Portsmouth, Newcastle, Greenland, Rye	Yes	None	No	Piscataqua River
ROCKINGHAM CTY HM WASTEWATER	Brentwood	0.084		0.00%	Unknown	Unknown	County Complex	Yes	Yes	No	Ice Pond Brook
SEABROOK WASTEWATER	Seabrook	1.800	0.670	37.22%	1994	9,000	Seabrook	Yes	Yes	No	Atlantic Ocean

The estimated cost of wastewater infrastructure needs for the RPC region is $252.4 million and a total of $1.7 billion is needed statewide (New Hampshire Department of Enviornmental Services, 2012). Wastewater infrastructure needs include four different areas: treatment, replacement and rehabilitation of existing sewer systems, new sewers, and correcting combined sewer overflow systems. For a map of areas serviced by public wastewater systems, see Appendix C Map NR5.

All areas without public wastewater systems (sewer systems) are generally serviced by individual septic systems or small-scale community septic systems. In the RPC region, the majority of communities are not served by sewer systems. In many cases, the cost of installing a wastewater system or expanding an existing system is cost prohibitive. Having a centralized wastewater system can help to reduce water pollution as the amount and source of the pollution is more easily monitored and addressed. (As illustrated in Table NR3, many of the wastewater treatment systems are currently are not at maximum capacity and were originally designed to allow for expansion of area or volume served.) However, individual septic systems dispersing water pollution over a

greater area (which may be a positive or negative situation) and allow for greater water recharge in the location where the original water withdrawal occurred.

Stormwater Infrastructure

As stated previously, stormwater and stormwater intermingled with other pollutants, is the leading cause of water pollution in the state and in the RPC region. The infrastructure that helps to move stormwater off roads, buildings and parking lots was traditionally constructed to move the water from these locations as quickly as possible and to direct them into waterways. This allows for little, if any, removal of pollutants or chance for water infiltration into the ground, and can increase the potential for erosion and flooding issues.

Stormwater infrastructure is often considered forgotten infrastructure, as the cost to construct or maintain it is often incorporated into the construction and maintenance of roadways and parking lots. As mentioned in the Stormwater Section on page 13, almost 90 percent of the water pollution in the RPC region is attributable to stormwater, and thus retrofitting or maintain stormwater infrastructure is critical in combating water pollution. This maintenance and retrofitting will likely be expensive; NHDES has estimated the RPC region's total stormwater infrastructure costs to be almost $37 million dollars. Similarly, most RPC communities are already, or will soon be, subject to the federal MS4 Stormwater Permit (detailed in the next section) that addresses stormwater pollution in part by changing requirements for stormwater infrastructure. Table NR4 illustrates some of the NHDES estimated capital and noncapital costs communities in the RPC region, some attributable to the federal MS4 Stormwater Permit.

Table NR4 – Stormwater Infrastructure Estimates (Source: NHDES 2012 Clean Water Needs Survey

Town	Clean Water Needs Survey	Additional State Needs			Grand Total Estimated Stormwater Costs
	Capital Cost	Non-Capital Costs	Capital Costs	Additional State Need Total	
Atkinson	$170,576.14	$ 46,566	$ 120,036	$ 166,602	**$ 337,178**
Brentwood	$70,890.00	$ -	$ -	$ -	**$ 70,890**
Danville	$219,841.00	$ -	$ 144,900	$ 144,900	**$ 364,741**
E. Kingston	$250,060.52	$ 6,325	$ 54,009	$ 60,334	**$ 310,395**
Epping	$1,394,955.24	$ 5,549	$ 141,907	$ 147,457	**$ 1,542,412**
Exeter	$983,904.00	$ 1,786	$ 58,291	$ 60,077	**$ 1,043,981**
Fremont	$922,977.40	$ 3,672	$ 93,894	$ 97,565	**$ 1,020,543**
Greenland	$464,027.00	$ 28,486	$ 40,791	$ 69,277	**$ 533,304**
Hampstead	$204,567.72	$ 55,845	$ 143,956	$ 199,801	**$ 404,369**
Hampton	$1,193,407.00	$ -	$ 580,380	$ 580,380	**$ 1,773,787**
Hampton Falls	$662,480.67	$ 2,635	$ 67,393	$ 70,029	**$ 732,510**
Kensington	$302,203.17	$ 7,644	$ 65,271	$ 72,915	**$ 375,119**
Kingston	$302,889.45	$ 82,686	$ 213,146	$ 295,832	**$ 598,722**
New Castle	$12,425.58	$ 3,392	$ 8,744	$ 12,136	**$ 24,562**
Newfields	$379,486.20	$ 1,510	$ 38,605	$ 40,114	**$ 419,601**
Newington	$440,768.68	$ 1,753	$ 44,839	$ 46,592	**$ 487,361**
Newton	$150,067.75	$ 40,967	$ 105,604	$ 146,571	**$ 296,639**
North Hampton	$0.00	$ 47,338	$ 48,521	$ 95,859	**$ 95,859**
Plaistow	$158,887.00	$ -	$ 300,000	$ 300,000	**$ 458,887**
Portsmouth	$10,064,352.00	$ 67,239	$ 8,204,845	$8,272,084	**$ 18,336,436**
Rye	$338,241.00	$ 158,626	$ 69,650	$ 228,276	**$ 566,517**
Salem	$405,205.00	$ 1,168,750	$ 3,675,000	$4,843,750	**$ 5,248,955**
Sandown	$13,214.00	$ -	$ -	$ -	**$ 13,214**
Seabrook	$62,380.00	$ 30,000	$ 359,000	$ 389,000	**$ 451,380**
So Hampton	$199,543.23	$ 5,047	$ 43,098	$ 48,146	**$ 247,689**
Stratham	$808,990.96	$ 3,218	$ 82,298	$ 85,516	**$ 894,507**
Percent of Total Stormwater Needs	55.05%	5%	40%	45%	100%

Total Stormwater Needs	**$20,176,340.70**	**$ 1,769,036**	**$ 14,704,180**	**$ 16,473,216**	**$ 36,649,556**

MS4 Stormwater Permit

The federal MS4 Stormwater Permit for municipalities is formally known as the General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4). This federal permit is intended to address and reduce stormwater pollution originating from municipally-owned facilities and land, including local roads. This reduction in stormwater pollution reaching surface waters is accomplished by:

- Requiring municipalities to identify sources of stormwater.
- Monitoring and retrofitting existing stormwater sources to reduce pollution.
- Eliminating new sources of stormwater.
- Conducting public outreach about how to reduce stormwater pollution.

Municipalities required to obtain this permit have been identified as having a central place (or places), and adjacent densely settled surrounding territory, that together have a minimum residential population of 50,000 people and a minimum average density of 1,000 people/square mile (currently defined by 2000 Census). In 2003, EPA released the first MS4 Stormwater Permit and 20 of the municipalities within the RPC region were required to obtain this permit under the previous definition. However, many municipalities received waivers from the permit due to the small amount of area within their municipalities that fell within the previous definition.

In 2013, EPA released new draft permit requirements and due to changes in population from the 2010 Census, all RPC communities except Kensington are now required to obtain this permit once the permit is finalized (expected in late 2014 or 2015). As of fall of 2014, the following RPC communities have received preliminary waivers from the 2013 permit: Brentwood, East Kingston, Epping, Fremont, Hampton Falls, Newfields, Newington and South Hampton.

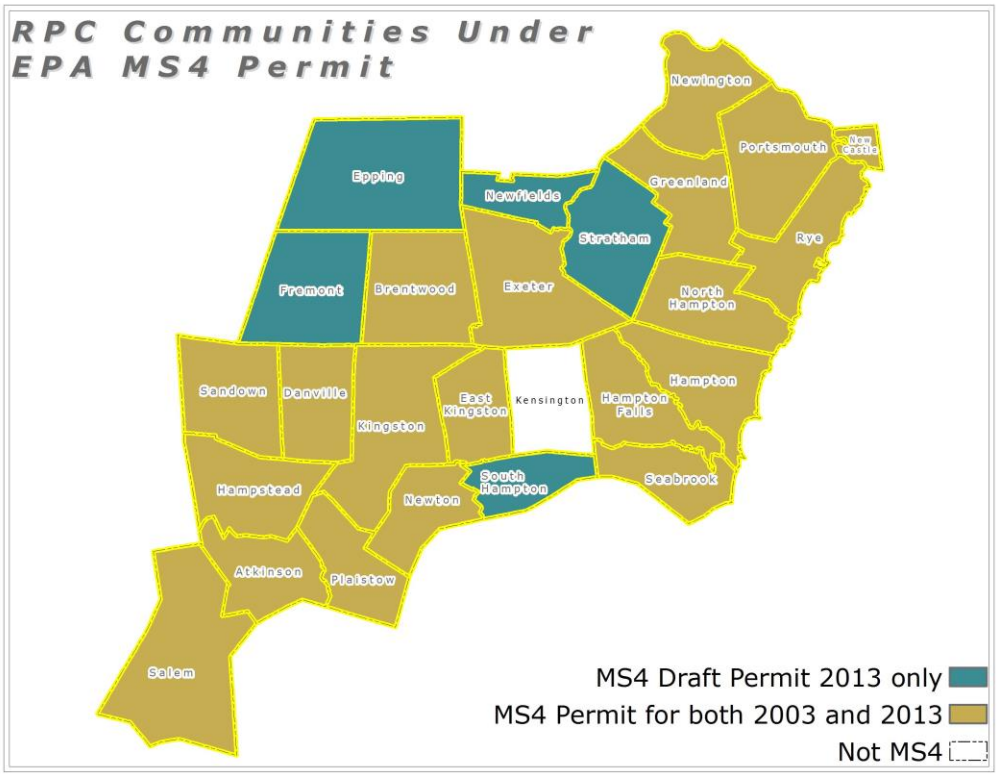

Figure NR5 – RPC Communities subject to the 2003 or draft 2013 MS4 Stormwater Permit. Source: EPA

Figure NR5 indicates which RPC communities were required to obtain a permit in 2003 and which communities will be required to obtain a permit once the 2013 permit is finalized. This map does not indicate communities receiving permit waivers in 2003 or 2013. Waivers from the permit are reviewed regularly and may be revoked by EPA if there is a dramatic shift in population in a particular municipality.

Additional information regarding the MS4 Stormwater Permit and the status of the 2013 draft permit can be found via EPA's website at: http://www.epa.gov/region1/npdes/stormwater/MS4_2013_NH.html.

Dams

Dams, and the impoundments behind them, are an important feature in shaping the region's communities and landscape. Historically, dams in the region were used for power and manufacturing, water supplies, and flood protection. Today, dams in the region still provide water to a few communities, but also serve as recreation resources, provide wildlife habitat and are tied to a community's sense of character. Despite their benefits, dams also can pose hazards to people and structures if they fail, adversely affect water quality, and prevent fish and other aquatic species from moving up or downstream.

There are 170 active dams in the RPC region and most are privately owned (see Figure NR6). The risk of dams continues to increase as development grows downstream. The risk is that there is a greater potential for loss of life or property damage if a dam were to fail. Dams that pose the greatest risk of such losses are considered "high hazard" dams by the New Hampshire Department of Environmental Services. Two dams in the RPC region are "high hazard" dams: Wheeler Dam on the Spickett River in Salem and the Exeter Reservoir Dam on Dearborn Brook in Exeter. Both dams are owned by the municipality in which they reside.

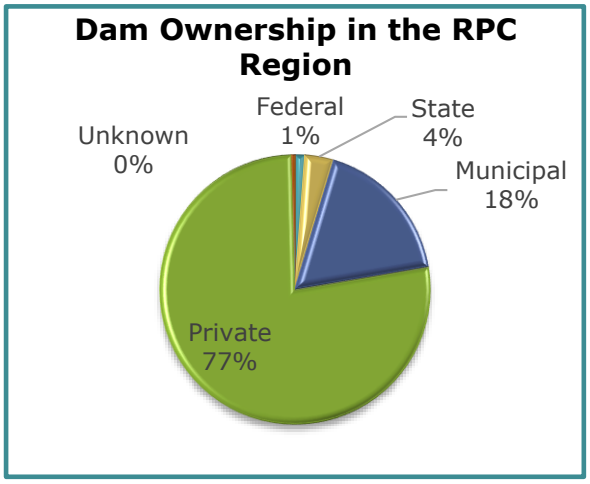

Figure NR6 - Dam ownership in the Rockingham Planning Commission region. Source: N.H. Department of Environmental Services Dam Bureau.

For a map of dams located in the RPC region see Appendix C Map NR6.

Land

Topography

Rockingham County is part of the major land resource area known as the New England and Eastern New York Upland, Southern Part. Elevations in the region range from sea level to about 1,350 feet above sea level, including lands from the coastline of New Hampshire and extending inland to the Merrimack River Valley. Figure NR7 depicts the hillshade of the RPC region.

The present day topography of the region is generally a result of the underlying bedrock, the effects of glaciation, and the weathering conditions that have occurred since the most recent glacier. Erosion and deposition caused by the most recent period of glacial advance, and the formations created by this advance are the greatest factors in determining today's topography.

The entire New Hampshire coastal area is a flat or gently rolling plain of very low relief with a poorly defined divide separating this drainage area from adjoining river basins. A group of drumlins, approximately 200-300 feet high form the western divide. Drumlins are small hills with smooth, rounded surfaces, consisting almost entirely of till deposited by the glacier. The drumlins are found in South Hampton, Kensington, and Stratham. Drumlins are the most significant topographical features in the region: 1) they are pronounced, well defined formations whose elevation is generally 200 feet higher than the adjacent coastal basin; and 2) they separate the low coastal region from the inland area to the west and north and provide a transition to the more complex inland topography.

To the west of the drumlin divide, the sandy plains in Epping, Brentwood, and Kingston are all underlain by outwash and shore deposits which support a relatively flat topography. The erosive forces of streams and rivers have also contributed to today's topography. Alluvial material deposited by streams since glacial time is found in parts of the many floodplains of the seacoast region. It is distributed along the major stream valleys in discontinuous patches.

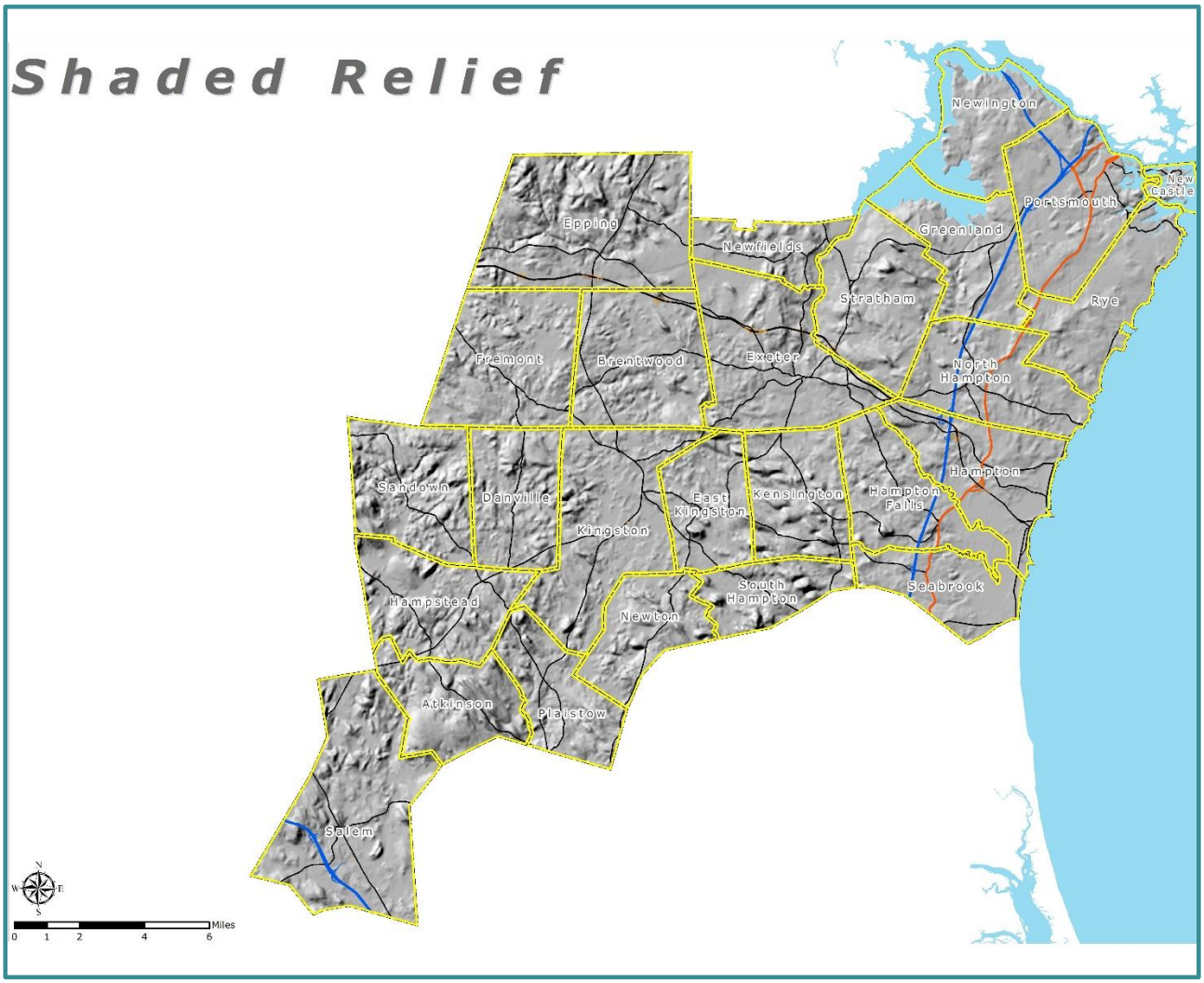

Figure NR7 – Topgraphic hillshare relief of the RPC region: Source: NHGRANIT.

Conservation Land

The significant land use change and growth seen in the RPC region has put increasing pressure on remaining natural spaces. The highest priorities identified in local master plans in the RPC region, include protecting natural resources for water quality protection, recreation, open space and wildlife.(See Community Input section for additional detail.) Table NR5 depicts the amount of land currently protected in each RPC community.

A primary way of protecting spaces and resources for these purposes is protecting land from future development through easements, deed restrictions, or purchase. However, these methods can be costly. Other options to protect land is through land use regulations, voluntary protections, and land management planning. The later protection methods are generally lower in cost, but may not always fully protect land. Funds available for permanently protecting land from development can be scares. Generally, those lands that can help to protect several resources, including wildlife resources, habitat, prime agricultural soils, important water resources or recreational areas are most likely to receive such funding.

For a map of lands currently under conservation easements or publicly-owned lands, see Appendix C Map NR7.

Municipality	% of Municipality with Protected Land	Total Municipality Area (Acres)	Total Protected Land Area in Municipality (Acres)
Atkinson	10.7	7,258.49	777.99
Brentwood	25.8	10,863.04	2,803.18
Danville	8.8	7,569.43	666.78
East Kingston	15.2	6,380.76	972.30
Epping	18.7	16,775.68	3,133.25
Exeter	28.9	12,812.93	3,708.42
Fremont	5.4	11,142.41	598.56
Greenland	16.9	8,523.86	1,442.00
Hampstead	17.7	9,014.15	1,598.90
Hampton	8.7	9,072.77	791.42
Hampton Falls	14.1	8,078.00	1,137.52
Kensington	23.1	7,667.80	1,769.38
Kingston	16.1	13,450.26	2,166.06
New Castle	8.2	1,347.62	110.63
Newfields	27.2	4,646.73	1,262.82
Newington	17.0	7,916.76	1,345.06
Newton	12.4	6,364.93	787.74
North Hampton	13.4	8,922.85	1,195.80
Plaistow	7.6	6,789.62	514.16
Portsmouth	13.2	10,763.40	1,424.81
Rye	19.7	8,405.86	1,653.97
Salem	7.1	16,569.38	1,169.38
Sandown	8.9	9,231.81	818.71
Seabrook	8.1	6,161.30	496.22
South Hampton	5.9	5,146.60	305.62
Stratham	16.1	9,901.59	1,593.93
RPC Region	**14.8**	**230,778.03**	**34,244.58**

Table NR5 - *Conservation Lands figures are from the NH GRANIT database. This database includes parcels of land of two or more acres that are mostly undeveloped and are protected from future development. The data was developed from the records of the Society for the Protection of NH Forests (SPNHF), many of the state agencies, and original research from deeds and tax maps. The last update was completed in April of 2012. This data likely represents an underrepresentation of the actual total amount of land with easements, deed restrictions or other development protections.*

To assist in helping protect the most critical lands permanently two conservation plans, based on watershed boundaries, have been developed that prioritize areas most in need of protection. Both plans, listed in the text box below, cover the RPC region and have served as important resources in helping communities prioritize areas in need of protection. A regional map indicating prioritized areas is available in Appendix C Map NR8.

Additional Resource:

- **Land Conservation Plan for New Hampshire's Coastal Watersheds (2005)** – http://www.rpc-nh.org/coastal-conservation.htm
- **Merrimack River Valley Land Conservation Plan (2013)–** http://www.forestsociety.org/landconservation/merrimack-watershed.asp

Impervious Surfaces

Impervious or impermeable surfaces are areas covered by material that impedes the infiltration of water into the soil. Examples of impervious surfaces are paved roads, parking lots, buildings, concrete, pavement, and severely compacted soils (PREP). Pollutants in runoff often include suspended carcinogens known as polycyclic aromatic hydrocarbons, which can leach from asphalt, coal tar-based sealants, oil and gasoline. Other pollutants commonly found in runoff include pesticides, nitrates, phosphates, heavy metals, sediment and salt for de-icing roads.

The majority of municipalities in the region have below ten percent total impervious surface cover, a threshold that often signals declining water quality and health of aquatic organisms when exceeded. Several of the more urbanized municipalities are approaching 20 percent impervious surface cover, with the exception of Portsmouth at 26.4 percent.

For a map of impervious surface coverage in the RPC region and percentage by community, see Appendix C Map NR9.

Table NR6 – Impervious coverage of RPC Communities.

Town	Impervious (Acres)	Land Area (Acres)	Percent Impervious
Atkinson	611.7	7,133.3	8.6%
Brentwood	607.4	10,726.1	5.7%
Danville	377.8	7,500.4	5.0%
East Kingston	258.9	6,398.9	4.0%
Epping	872.0	16,650.3	5.2%
Exeter	1,157.2	12,517.4	9.2%
Fremont	396.6	10,948.2	3.6%
Greenland	553.1	6,669.6	8.3%
Hampstead	801.8	8,513.8	9.4%
Hampton	1,314.0	8,257.7	15.9%
Hampton Falls	374.3	7,802.2	4.8%
Kensington	269.5	7,643.3	3.5%
Kingston	729.2	12,577.9	5.8%
New Castle	90.9	528.1	17.2%
Newfields	200.0	4,541.0	4.4%
Newington	847.6	5,242.5	16.2%
Newton	390.6	6,341.1	6.2%
North Hampton	1,366.2	8,904.9	15.3%
Plaistow	775.8	6,802.6	11.4%
Portsmouth	2,636.7	10,006.2	26.4%
Rye	601.6	8,073.5	7.5%
Salem	2,583.3	15,821.1	16.3%
Sandown	447.8	8,928.2	5.0%
Seabrook	1,046.3	5,693.7	18.4%
South Hampton	136.0	5,047.1	2.7%
Stratham	828.0	9,664.7	8.6%
RPC Total	**20,274.6**	**218,933.8**	**9.3%**

Agricultural Soils

A common value in many RPC communities is the preservation of rural character and agricultural heritage. A key component in preserving agricultural production is maintaining or protecting soils that allow for the successful agricultural opportunities. The RPC region has over 70,000 acres of soils defined by the Natural Resource Conservation Service (NRCS) as prime or important farmland soils. (See Appendix C Map NR10 for a map of agricultural soils in the RPC region.) These prime or important farmlands are described as land that contains the best combination of physical and chemical characteristics to produce agricultural products. NRCS describes the various levels of farmland soils as follows:

- 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, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water). The soils are of the highest quality and can economically produce sustained high yields of crops when treated and managed according to acceptable farming methods.

- Farmland of Statewide Importance - This is land, in addition to prime and unique farmland, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are to be determined by the appropriate state agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

- Farmland of Local Importance - In some local areas, there is concern for certain additional farmlands for the production of food, feed, fiber, forage, and oilseed crops, even though these lands are not identified as having national or statewide importance. Where appropriate, these lands are to be identified by the local agency or agencies concerned. In places, additional farmlands of local importance may include tracts of land that have been designated for agriculture by local ordinance.

Within the RPC region, several communities contain high amounts of all three categories of important agricultural soils, including Atkinson, Brentwood Kensington, Greenland, and Stratham. The only community with very little important agricultural soils is New Castle; this is primarily because of its size and geology. Due to the nature of farmland soils, being fairly well drained soils and their proximity to waterways, those areas are highly desirable as building sites, particularly for sites requiring septic systems. The ability to recognize the importance of farmland soils and assure their availability for use in the future is a key component of maintaining productive agriculture in the region.

Currently, only 17 percent of important agricultural soils in the RPC region are within conservation land or under agricultural easements.

Floodplains

Floodplains

The RPC region has 3,416 acres of land within the 100-year floodplain, including 3,162 acres of riverine floodplain and 254 acres within coastal areas. 5517 acres of upland are located between the 100-year floodplain (Zone X) and 500-year floodplain, and 128 acres are within the 500 year floodplain (Zone X500).

Flood Hazard Areas

The primary flood hazard areas are within the extent 100-year and 500-year floodplain and areas affected by wave action in immediate coastal areas, as identified on the Digital Flood Insurance Rate Map (DFIRM). Many homes and businesses are located in flood prone areas. Development in flood prone areas is problematic as it risks damage to life and property, reduces flood storage capacity of the floodplain, thus intensifying flood conditions elsewhere, and contributes to water quality problems. These problems can be controlled or alleviated through the adoption of floodplain regulations as part of the National Flood Insurance Program. For more detail regarding flood hazards and the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program see the Natural Hazards chapter.

For a map of flood hazard areas, including 2014 preliminary areas, see Appendix C Map NR11.

Flooding and Fluvial Erosion Hazard Areas

In New Hampshire, most of the damage associated with flooding is caused by erosion, not by inundation from floodwaters (NH Department of Environmental Services, 2008). Rivers and streams naturally change course overtime. However, during extreme rain and snowmelt events the water can cause an increase in the speed of erosion and sedimentation. Certain areas, called fluvial erosion hazard areas, along rivers and streams are more prone to erosion than others based on their soil type and geology. Identifying these areas, along with infrastructure that may affected or be impacted by flooding, can help reduce damage to the natural and built environment. In 2009, the N.H. Legislature passed RSA 674:21 to allow municipalities to adopt fluvial erosion hazard zoning to address this issue.

Fluvial geomorphology is the study of the interaction of water and the landscape through which it flows. Rivers and streams are dynamic systems that balance water flow and sediment transport. This dynamic condition is referred to as the equilibrium condition, where the discharge and the processes of erosion and sedimentation can maintain a stable river system.

The purpose of adopting fluvial erosion hazard (FEH) zoning is to limit development in fluvial erosion hazard areas for the purpose of protecting public and private property, and public safety and welfare. Informed by geomorphic channel assessment and management practices endorsed by the New Hampshire Department of Environmental Services (DES) and New Hampshire Geological Survey (NHGS), fluvial erosion hazard zoning recommends implementation of development requirements and standards that recognize a stream's natural evolution and range of stable conditions.

Ultimately, the most effective way to prevent hazards associated with fluvial erosion is avoidance: limiting future human presence and investments in river corridors. The objective of this type of zoning is to guide and encourage measures and improvements that provide increased property and infrastructure protection, and maintain or restore the hydrologic and geomorphic functions and economic values of river systems. The functions and values of healthy river systems include: flood mitigation, water supply, water quality, sediment storage and transport, aquatic habitat, recreation, transportation, and aesthetic qualities. In the RPC region, NHGS has conducted geomorphic assessments that determine the fluvial erosion hazard areas on sections of the Lamprey River, Piscassic River, and Exeter River. As of 2014, no RPC community has adopted fluvial erosion hazard zoning.

RPC Regional Stream Crossing Assessment

There are approximately 1216 stream crossing (locations where roads cross over streams and rivers) in the RPC regions. Stream crossings can be either bridges or culverts, and can limit the habitats of aquatic species by preventing them from moving up and downstream. In 2013, RPC began conducting a regional stream crossing assessment to provide state agencies and municipalities with information to identify critical and hazardous crossings. The main objective of the project is to identify stream crossings that may fail, particularly during storm events. These failures occur because the crossing does not allow for adequate passage of water, sediment, or debris due to design, stream erosion, crossing deterioration, or changes to the streambed. Failures can cause infrastructure and property damage, cut off evacuation routes, and negatively affect waterways. A secondary benefit of the project is that it can identify if a crossing is a barrier to aquatic organisms, fish and other wildlife movement; this is often not considered during construction of a crossing, even relatively new crossings. Knowing the condition of stream crossings can help guide municipalities prioritize those crossings most in need of retrofit or replacement. Results from this assessment can be incorporated into municipal and regional hazard mitigation plans, vulnerability assessments, and site-specific restoration and mitigation projects.

The RPC is utilizing the New Hampshire Stream Crossing Assessment Protocol, developed by New Hampshire Geological Survey (NHGS), which now encompasses additional information for NHDOT, to evaluate the region’s stream crossings. As of the end of 2014, over half of the RPC communities have had stream crossing data collected.

Wildlife and Habitats

In the RPC region there is a tremendous variety of wildlife and habitat types due to its unique position along the coast and the various types of wetlands, forests, grasslands and freshwater resources found within the region's boarders. The New Hampshire Fish and Game Department's *Wildlife Action Plan,* updated in 2010, has identified the various types of habitats found within the RPC region.

Habitat Types and Fragmentation

Preserving large areas of forests and open space are critical for sustaining wildlife. Development of the natural landscape results in the loss of habitat and habitat fragmentation. 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.

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

- Providing 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.
- Providing habitat for mammals that have large home ranges and prefer to avoid human contact such as otters, bears, and moose.
- Enabling owners of large parcels of forestland to conduct timber harvests that are economically viable;
- Minimizing conflicts that can arise when managed forests and farms are surrounded and interspersed with development.
- Offering 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. Tables NR7 and NR8 list various rare and engaged wildlife in the RPC region and the habitats found within the region.

Table NR7 - Rare and Endangered Wildlife in RPC Region
New Hampshire Natural Heritage Bureau Data

Scientific Name	Common Name	Scientific Name	Common Name
Rana pipiens	Northern Leopard Frog	*Vermivora chrysoptera*	Golden-winged Warbler
Gavia immer	Common Loon	*Pooecetes gramineus*	Vesper Sparrow
Podilymbus podiceps	Pied-billed Grebe	*Ammodramus savannarum*	Grasshopper Sparrow
Ixobrychus exilis	Least Bittern	*Ammodramus henslowii*	Henslow's Sparrow
Ardea herodias	Great Blue Heron (Rookery)	*Ammodramus caudacutus*	Saltmarsh Sharp-tailed Sparrow
Pandion haliaetus	Osprey	*Ammodramus maritimus*	Seaside Sparrow
Haliaeetus leucocephalus	Bald Eagle	*Ammodramus nelsoni*	Nelson's Sharp-tailed Sparrow
Accipiter gentilis	Goshawk	*Esox americanus americanus*	Redfin Pickerel
Falco peregrinus anatum	Peregrine Falcon	*Notropis bifrenatus*	Bridled Shiner
Porzana carolina	Sora	*Enneacanthus obesus*	Banded Sunfish
Gallinula chloropus	Common Moorhen	*Etheostoma fusiforme*	Swamp Darter

Charadrius melodus	Piping Plover	*Clemmys guttata*	Spotted Turtle
Catoptrophorus semipalmatus	Willet	*Glyptemys insculpta*	Wood Turtle
Bartramia longicauda	Upland Sandpiper	*Emydoidea blandingii*	Blanding's Turtle
Sterna hirundo	Common Tern	*Terrapene carolina*	Eastern Box Turtle
Sterna paradisaea	Arctic Tern	*Coluber constrictor constrictor*	Northern Black Racer
Eremophila alpestris	Horned Lark	*Opheodrys vernalis*	Smooth Green Snake
Progne subis	Purple Martin		

Table NR8 - Natural Communities and Unique Ecological Systems in RPC Region		
Natural Community	Oyster bed	Tall graminoid emergent marsh
	Low salt marsh	Circumneutral seepage swamp
	High salt marsh	Seasonally flooded Atlantic white cedar swamp
	Brackish marsh	Red maple - Sphagnum basin swamp
	Coastal salt pond marsh	Black gum - red maple basin swamp
	Low brackish tidal riverbank marsh	Swamp white oak basin swamp
	High brackish tidal riverbank marsh	Red maple - black ash - swamp saxifrage swamp
	Coastal shoreline strand/swale	Atlantic white cedar - yellow birch - pepperbush swamp
	Saline/brackish intertidal flat	Mesic Appalachian oak - hickory forest
	Saline/brackish subtidal channel/bay bottom	Coastal rocky headland
	Eelgrass bed	Semi-rich Appalachian oak - sugar maple forest
	Tidal creek bottom	Rich Appalachian oak rocky woods
	Herbaceous low riverbank	Dry Appalachian oak - hickory forest
	Alder - dogwood - arrowwood alluvial thicket	Bayberry - beach plum maritime shrubland
	Red maple floodplain forest	Maritime wooded dune
	Hemlock - cinnamon fern forest	Beach grass grassland
	Atlantic white cedar - leather-leaf swamp	Swamp white oak floodplain forest
	Coastal interdunal marsh/swale	Hudsonia maritime shrubland
	Red maple - sensitive fern swamp	
	Herbaceous seepage marsh	
	Buttonbush basin swamp	
Ecological System	Kettle hole bog system	Medium level fen system
	Poor level fen/bog system	Temperate minor river floodplain system

Forests

Forests provide important ecological functions and environmental services as well as economic and social benefits such as recreation areas and traditional lifestyles and culture in New Hampshire connected to logging, forestry, and forest area recreation. Currently, only 39 percent of the RPC region is forested, amongst the lowest coverage in the state. As indicated in Table NR8, many of the natural communities present in the RPC region are types of forest environments. Proximity to major transportation corridors appears to play a role in loss of forests, as the 13 municipalities that have less than 50 percent of total land as forests fall along major transportation corridors.

In order to sustain the values provided by the region's forested lands, the following strategies are recommended by the governmental and non-profit agencies that monitor and protect our public forested lands. In addition to the efforts of governmental and non-profit entities, private landowners behavior must also be considered, as individual landowners or private companies hold a significant amount of forested lands.

Waste

Solid Waste

The New Hampshire Department of Environmental Services (DES) describes solid waste as any abandoned or discarded material that has been placed in the waste stream, including household trash, construction and demolition debris, furniture, appliances, tires, and recyclables, such as paper, cans, glass and plastic containers. Wastes that are not solid waste include hazardous waste, biosolids and septage. Proper management of solid waste and the facilities that collect, process and dispose of solid waste is one of New Hampshire's primary health and environmental priorities. DES oversees the management of solid waste through a combination of permitting, training and compliance programs.

In 1981, the New Hampshire Legislature adopted RSA 149-M, authorizing DES to regulate the management of solid waste through a permit system. This law provides the basis for environmentally responsible municipal solid waste management. The Legislature amended RSA 149-M in 1996 to establish a goal for the state to manage 40 percent of its solid waste by recycling and a hierarchy of preferential facility types. (Table NR8).

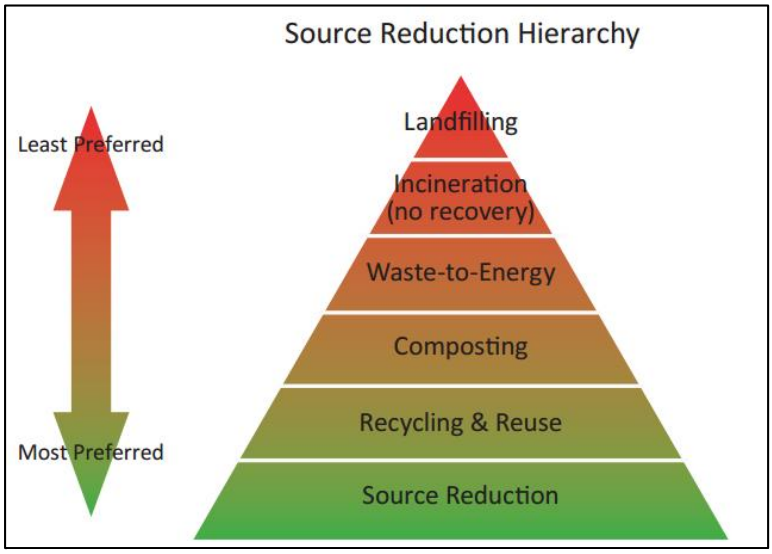

Figure NR8 - Hierarchy of preferred solid waste management options in New Hampshire established RSA 149-M. Source: NHDES Best Management Practices for N.H. Solid Waste Facilities, 2014.

According to DES, about 1.5 million tons of solid waste is generated in New Hampshire each year. Approximately five percent is exported to other states; 35 percent is recycled or composted; 27 percent is incinerated at waste-to-energy facilities; and 33 percent is disposed of in lined landfills. The rate of recycling and composting in the state has risen from six percent in 1990 to 35 percent in 2013, but still falls short of the statutory goal of 40 percent. DES estimates 80 percent of solid waste is recyclable. Management and disposal of solid waste is costly, as examination of municipal budgets in the region will highlight. DES estimates the cost of per household to be $270 per year.

In the RPC region, most municipalities operate a transfer station for the collection of solid waste from residents. The waste collected at these facilities is transferred to a variety of disposal and recycling facilities in the region, including a landfill operated by Waste Management in Rochester, N.H., waste incinerators located in and out of state, and waste recycling businesses and end users. Many communities in the region provide curbside collection of waste and recyclables for residents and businesses.

Only 35% of solid waste is recycled in New Hampshire.

The costs associated with the collection and disposal of waste continue to rise yet it is not known why recycling rates have not continued to increase. Although the prices for recycled materials fell from record highs in recent years, municipalities can still receive revenue from the sale of collected recyclables and reduce the amount paid to dispose of non-recycled waste.

Hazardous Waste

The State of New Hampshire Hazardous Waste Rules, Env-HW 103.62, defines hazardous waste as any solid, semi-solid, liquid or contained gaseous waste, or any combination of these wastes which may cause or contribute to an increase in irreversible or incapacitating illness; waste which poses a present or potential threat to human health or the environment if improperly managed; and/or, waste which has been identified as a hazardous waste by the DES Waste Management Division. Industrial and commercial operations that generate more than 220 pounds of hazardous waste in one month must have a state certified staff person on site to ensure proper handling and disposal of hazardous waste. DES provides education and certification in order to comply with this requirement.

For a map of locations of known or potential hazardous waste sites, see Appendix C Map NR14.

Households in the RPC region are also generators of hazardous waste. This type of waste is defined as household hazardous waste and is typically managed through annual or semi-annual collections organized by municipalities and the RPC. Examples of household hazardous waste include oil-based paint, automotive waste such oil and antifreeze, pesticides, batteries, mercury containing devices, and fluorescent bulbs.

In the RPC region, the RPC organizes and manages a household hazardous waste collection program for the towns of Exeter, Stratham, Newfields, Epping and Seabrook. There are several other collections held in the region, organized by municipalities.

Table NR9
RPC Communities Offering Household Hazardous Waste Collection

Municipality	Collection Location	Collection Frequency	Collection Organizer
Atkinson	Danville DPW	Annually in October	Town of Atkinson
Brentwood	Hampton Highway Garage	Spring and Fall	Town of Hampton
Danville	Danville DPW	Annually in October	Town of Danville
East Kingston	Exeter DPW	Annually in October	RPC
Epping	Exeter DPW	Annually in October	RPC
Exeter	Exeter DPW	Annually in October	RPC
Fremont	Hampton Highway Garage	Spring and Fall	Town of Hampton
Greenland	Portsmouth DPW	May and October	City of Portsmouth
Hampstead	Danville DPW	Annually in October	Town of Hampstead
Hampton	Hampton Highway Garage	Spring and Fall	Town of Hampton
Hampton Falls	Hampton Highway Garage	Spring and Fall	Town of Hampton
Kensington	Hampton Highway Garage	Spring and Fall	Town of Hampton
Kingston	Atkinson DPW	Annually in October	Town of Atkinson
Newfields	Exeter DPW	Annually in October	RPC
Newington	Portsmouth DPW	May and October	City of Portsmouth
North Hampton	Hampton Highway Garage	Spring and Fall	Town of Hampton
Plaistow	Danville DPW	Annually in October	Town of Atkinson
Portsmouth	Portsmouth DPW	May and October	City of Portsmouth
Rye	Portsmouth DPW	May and October	City of Portsmouth

Sandown	Hampton Highway Garage	Spring and Fall	Town of Hampton
Seabrook	Exeter DPW	Annually in October	RPC
Salem	Salem DPW	Annually in October	Town of Salem
South Hampton	Hampton Highway Garage	Spring and Fall	Town of Hampton
Stratham	Exeter DPW	Annually in October	RPC

Superfund Sites

The federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) environmental law of 1980 authorized the EPA to create a list of polluted locations requiring a long-term response to clean up hazardous material contamination. These locations are known as Superfund sites, and are placed on the EPA's National Priorities List. According to EPA, there are 20 superfund sites in New Hampshire on the National Priorities List.

Table NR10

Superfund Site Location	Superfund Site Name	EPA ID
Portsmouth and Newington	Pease Air Force Base	NH 7570024847
Plaistow	Beede Waste Oil	NHD018958140
North Hampton	Coakley Landfill	NHd064424152
Epping	Keefe Environmental Services	
Kingston	Ottati & Goss/Kingston Steel Drum	NHD990717647

There are five Superfund sites in the RPC region. Information on contamination at each site and management of the site may be found by entering the EPA ID into the EPA Superfund Site Information database at http://cumulis.epa.gov/supercpad/cursites/srchsites.cfm

Brownfields

The U.S. EPA's Brownfields Program provides competitive grants to states, municipalities, tribal authorities, and regional planning and economic development organizations to support the identification, assessment, clean-up, and redevelopment of properties that may be stigmatized by pollution or the perception of contamination. Such properties can include closed gas stations and auto body repair shops, large manufacturing mills, and commercial or industrial sites. These sites exist throughout the region and represent enormous economic development potential. Cleaning up and reinvesting in these properties increases local tax bases, facilitates job growth, utilizes existing infrastructure and alleviates development pressure on undeveloped land in the region.

Brownfields Assessment Programs

The RPC established a regional Brownfields Assessment Program with $400,000 in grant funds awarded by EPA in 2007. The RPC has received two other grant awards from EPA since that time to maintain and manage the Program. The RPC has used the funds to hire a qualified environmental consultant, complete an inventory of over 240 Brownfields sites in the region, and work with municipalities and property owners to complete environmental site assessments on 14 sites. Several of the sites assessed by RPC with grant funds have been cleaned-up and redeveloped.

Brownfields Clean-up Program

In May 2010, the EPA awarded the Regional Economic Development Center of Southern New Hampshire (REDC) $1M to establish a Revolving Loan Fund (RLF). The RLF is being used to capitalize a revolving loan fund from which the REDC will provide low interest loans and sub-grants to conduct clean-up activities on selected Brownfields sites in the region. The RLF funds are available for anyone anticipating cleaning up a contaminated property for redevelopment, as long as the applicant is not responsible for the contamination. Low interest loans, typically three percent, are available for expanding businesses, developers, non-profit organizations and municipalities. Sub-grants can be awarded to municipalities and non-profit organizations only. Eligible clean-up activities include the installation of fences and drainage systems, capping, excavation and removal of contaminated soils, and removal of drums, tanks and other sources of hazardous materials. The REDC is

targeting sub-grant RLF funds towards projects that facilitate the creation of green space, benefits low income communities, and facilitate the use of existing infrastructure.

Open Space and Recreation

Traditionally, open space is defined as land which has not been developed or altered from its natural state. More broadly, open space includes farms, playing fields and recreational facilities, reclaimed lands, and stormwater retention areas. Open space can provide many benefits to communities, including: scenic beauty, wildlife habitat, aquifer protection, buffers between developed areas, flood control, recreational opportunities, forestry, and agriculture uses.

Having open space the quality of life and character of a community, enhances property values overall, and requires less in municipal services (i.e. roads, sewers, schools, emergency services) than residential or commercial uses. The preservation of open space should be viewed as an asset to the town, an investment in the future sustainability of land and resources, and a balance to the demands of growth.

As growth continues in the region, development is working its way into difficult areas, those with marginal soils, adjacent to wetlands and aquifers, and with other environmental constraints. It was often believed that these lands would remain open space because of the expense and difficulty to develop the. However, these marginal lands are now being developed, particularly in areas where water and services have been extended.

Historically, open space has been lost primarily through the development of farmlands and tidal wetlands. Today, with improved state and local regulation and land acquisition by the town, state agencies and private environmental organizations. Over 38,000 acres (18 percent of the total land area) of land in the RPC region is dedicated open space and conservation land.

Maintaining open space open spaces for recreational purposes is often a top priority for communities in the RPC region (See the What the Region Had to Say section of this chapter for more detail.) The 2013 *New Hampshire Statewide Comprehensive Outdoor Recreation Plan* (SCORP) identifies existing outdoor recreation opportunities and addresses areas where outdoor recreation can help or harm natural resources. Additionally, SCORP addresses many of the economic benefits

Within the region, the majority of open space that can be utilized for outdoor recreation is primarily natural areas at just over 45 percent (New Hampshire Department of Resources and Economics, 2013). The remaining open recreational space are a mixture of playing fields, campgrounds, golf facilities, water access sites, and sites with specialized activities.

For a map of outdoor recreational spaces in the region, see Appendix C Map NR15.

Public Spaces and Public Access

The RPC region contains the state's entire amount of ocean frontage along the Atlantic Ocean. The region's 18 miles of coastline are the focus of water-based recreation with state, local, and private facilities combining to provide a wide range of opportunities for boating, fishing, swimming, and general scenic enjoyment. In general, easy access to the shoreline from southern New England and Canada has resulted in a heavy influx of seasonal residents in the RPC's coastal communities. Although population figures are not developed on a seasonal basis, it has been estimated that coastal populations double during the summer months. The seasonal residents and tourists are vital to the seacoast community's local economy during the summer season.

The numerous state and local beach areas within the RPC region are a large part of the attraction for visitors to the seacoast. The most significant beach areas include:

- Rye Harbor State Park (63 acres in size)
- Jenness State Beach in Rye, (2 acres)
- Sawyer's Beach in Rye, (3 acres)
- Wallis Sands State Park in Rye, (18 acres)
- Odiorne State Park in Rye, (137 acres)
- North Hampton State Beach, (5 acres)
- Hampton Beach State Park, (50 acres)

Recreational boating along the coastline occurs primarily out of the Rye and Hampton harbor areas, and boating constitutes the major use of these waters. Boating is also popular within the Great Bay and Little Bay areas, where the demand for additional mooring sites is far greater than the current supply (NHDES, 2010). Today, over 78 percent of the state's coastal sand beaches are preserved for public use in state parks (NH Department of Environmental Services, 2008).

For a map of all official public water access sites in the RPC region see Appendix C Map 16. Many informal public water access sites also exit, particularly for fishing and canoe/kayak launches, within the right-of-ways of local and state roads.

Table NR11

Primary Recreational Use	Acres within RPC Region
Natural Area	6,408.6
Field Sports	1,357.3
Campground	1,347.0
9 or 18 Hole Golf	1,210.0
Golf	1,047.5
Park	775.5
Hunting Area	596.2
Trail Area	455.9
Race Track	264.0
Fishing	197.0
Water Sports Area	112.1
Winter Sports Area	111.2
Special Event Facility	61.0
Recreation Resort	50.0
Historic Site	34.8
Youth Camp	20.0
Other	17.3
Golf Driving Range	16.0
Picnic Area	15.3
Fishing, Access Point	8.4
General Playground	5.0
Excursions	4.0
Mini Golf Course	1.0
Museum	1.0
Water Slide	1.0

Table NR12
Economic Contribution of Fresh Water Recreation to the Seacoast Region

	Total Sales	Household Income	Jobs
Fishing	$2,032,663	$727,664	33
Boating	$1,190,546	$421,235	19
Swimming	$11,529,283	$4,079,712	183
TOTAL	**$14,752,492**	**$5,228,591**	**235**

Recreation and Economics

Having a variety of recreational activities available promotes economic opportunities within a community and region. It has been estimated that in the Seacoast Region, including all of the RPC region, that freshwater recreation activities (fishing, boating and swimming) bring in a total of almost 15 million dollars in sales to the region annually, contribute over five million dollars derived from household income, and account for 235 jobs (Nordstrom, 2007).

Agriculture

Farming, forestry and fishing are integral to the history of the RPC region and continue today as valued and critically important activities. Farming and forestry were once predominant land uses across New Hampshire, but the region's population growth has led to residential and commercial development encroaching on activities that can often be regarded as incompatible with housing subdivisions and retail centers. Common practices of

the working landscape, such as fertilizing fields and timber harvesting, may be seen as detrimental to property values when conducted near residential developments.

A number of communities, however, are reviewing land use policies to identify ways in which to support backyard and larger-scale farming. Master Plan updates include inventories of local agricultural activity, zoning regulations are being amended to permit increased farming at various scales, and site plan and subdivision regulations are addressing seasonal farm stands, farm signs, and community gardens. How and where food is produced is changing rapidly, altering our perception of what was once considered a soil-based resource. Roof-top gardens in Portsmouth provide fresh ingredients to restaurants. Plastic "hoop houses" and greenhouse tunnels are being erected, expanding not only the regional growing season, but the definition of what a farm may look like.

New Hampshire is the third highest ranked state for supporting local food production, behind Vermont and Maine (Strolling of the Hiefers, 2014).

These changes are being driven by a strong interest in purchasing locally grown food and other agricultural products, including horticulture and landscape plants, and vineyards. This interest can be seen in all areas of the food system, from increased demand for local foods in grocery stores, farmers' markets and restaurants to the establishment of local Agricultural Commissions by municipal governments. New Hampshire residents are asking for food that has been produced locally for a wide variety of reasons including health and wellness, support for local farmers, and increasing the amount of food produced in the state to stabilize supply.

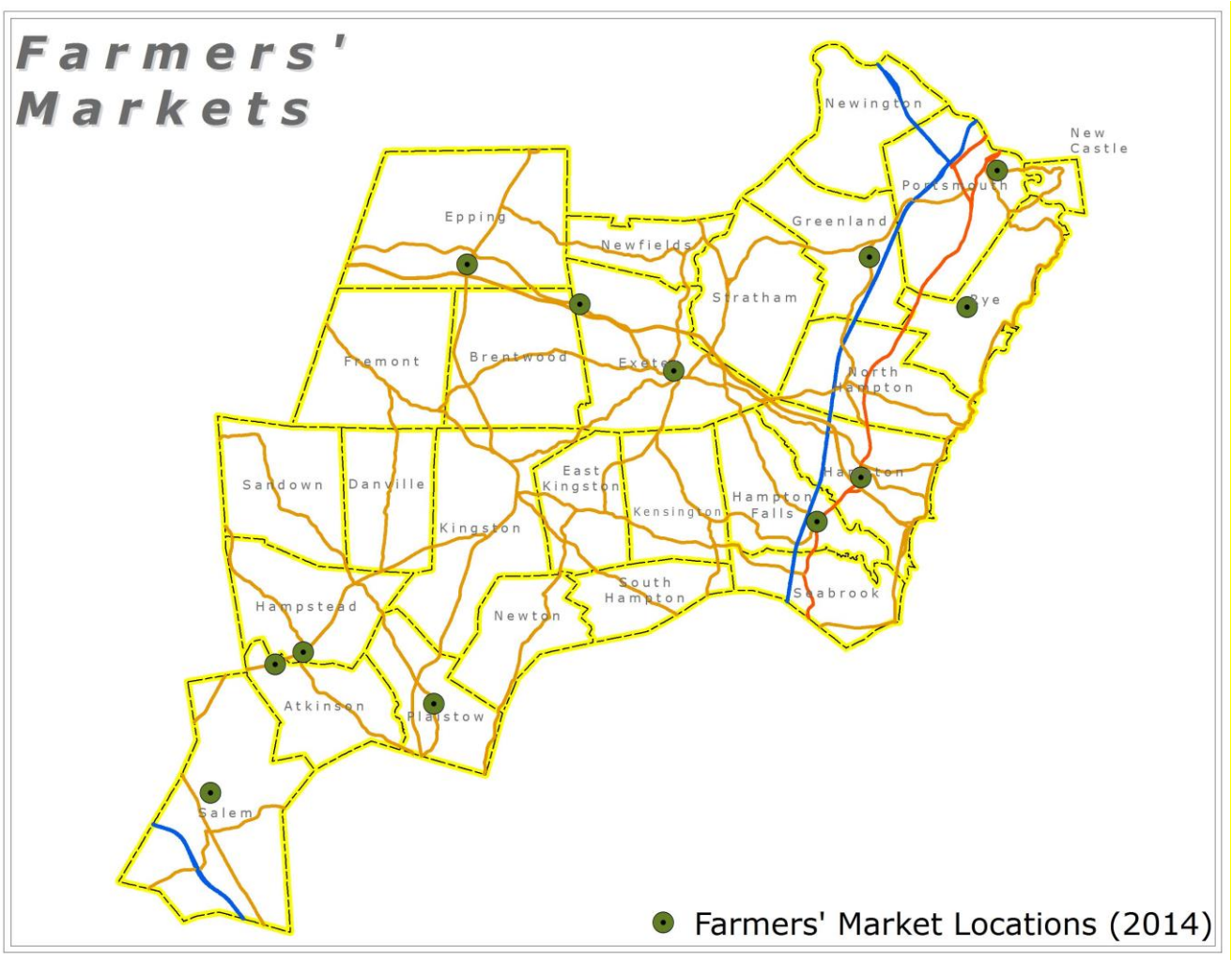

Figure NR9 – Locations of Farmers' Markets in the region.

Food security is also a topic of interest. The ice storms of 2008 and 2010 revealed that at any given time New Hampshire has only a three day supply of food on hand. UNH Cooperative Extension estimates that only three to four percent of food consumed in New Hampshire comes from local sources. Climate change has already begun to impact food production nationally and internationally, emphasizing the need for the state and the region to identify opportunities and challenges facing agricultural producers and woodland owners in New Hampshire. In response, the U.S. Department of Agriculture has created seven regional research centers to study the impacts of climate change on food and forest production. The University of New Hampshire campus in Durham was selected as the home for the Northeast Regional Hub for Risk Adaptation and Mitigation to Climate Change. The Hub will provide climate science and land management tools to make farmland and forests in the region healthier and more resilient.

According to the preliminary 2012 Census of Agriculture data, the number of farms in the state increased five percent from the 2007 Census, to a total of 4,391 farms. The number of farms in Rockingham County also increased, from 445 to 594. The complete 2012 data set will not be released by the National Agricultural Statistics Service until May, but the preliminary 2012 report and the 2007 Census provide the following information:

- New Hampshire ranks first in the nation in direct sales of farm and forest products to consumers; 23 percent of New Hampshire farms sell directly to consumers versus six percent of farms nationally.
- Rockingham County ranks 38 out of 3,130 counties in the United States in the value of direct market sales ($3,685,000).
- New Hampshire ranks third in the nation in the percentage of total market value of agricultural sales from direct sales to consumers.
- The amount of land in the RPC region dedicated to agriculture, including forestry, continues to increase. Agricultural acreage in Rockingham County in 2007 was 33,570, up from 31,656 in 2002.

This data highlights the persistent trend of New Hampshire residents discovering the value of the working landscape of farms, forests and fisheries. A 2010 report by the University of New Hampshire's Food Solutions New England entitled, "Home Grown: The Economic Impact of Local Food Systems in New Hampshire", discusses the economic development opportunities presented by expanding the local food system. These opportunities include increasing the amount of food manufactured in the state, and increasing the profitability of New Hampshire's small and fragmented farm system. Specific examples of the many opportunities to expand the local food system include increased aquaculture, meat and dairy production, and specialty food products.

Key Issues and Challenges

Increases in Impervious Surfaces

The increase of impervious surfaces through land development affects water resources in several ways. Impervious surfaces combined with urban drainage systems - such as curbs and gutters and storm drain pipes - can alter the natural hydrology in a watershed by increasing the volume of stormwater, reducing groundwater recharge, and diverting water from surface water bodies. Impervious surfaces can also result in contamination of drinking water resources, loss of aquatic habitat, loss of biological diversity, and an overall decrease in water quality due to the accelerated delivery of pollutants into rivers, lakes, and estuaries (Piscataqua Region Estuaries PArtnership, 2013).

Since 1990, the Coastal Watershed, including portions of Maine has increased the impervious surface coverage from under 4% to nearly doubling to 10% impervious surface coverage in 2010. The population over the same time period has increase by only 19% (Piscataqua Region Estuaries Partnership, 2013)

A specific goal within the Piscataqua Region Estuaries Partnership *2013 State of our Estuaries Report* is to not increase the number of towns within a greater than 10 percent impervious surface coverage and to see not increase in the number of towns with less than 5 percent impervious surface coverage.

Maintaining Hydrologic Connectivity (Floodplains, Fluvial Erosion, Groundwater Infiltration)

The water flows and location of rivers and stream are naturally very dynamic; however, human activity can significantly alter these changes. Stream flow can lowered by people by removing water for drinking or commercial uses, or by holding water back in dam impoundments that reduce flows further downstream. Stream flows can be increase by water releases by dams, wastewater discharges, and, most significantly, by increased development within a watershed. Increased development and impervious surface coverage can increase the rate that rainfall and snowmelt reach surface waters in the form of stormwater and decrease the amount of water that infiltrates into the ground replenishing aquifers.

Figure NR10 - An undersized culvert in North Hampton shows evidence of being too small causing erosion on the stream bottom and banks. Photo: RPC staff.

When roads cross streams and rivers the structures that allow the water pass under the road can often cause problems by changing the shape and structure of the stream, degrading aquatic habitat, disrupting water flows, and by restricting the movement of fish and other wildlife (NH Department of Environmental Services, 2008).

Cost of Maintaining Water Infrastructure

One of the costliest investments many communities in the RPC region will need to make in the next twenty-five years are related to water infrastructure. Estimated cost of wastewater infrastructure needs for the RPC region is $252.4 million and a total of $1.7 billion is needed statewide (New Hampshire Department of Environmental Services, 2012). Wastewater infrastructure needs include four different areas: treatment, replacement and rehabilitation of existing sewer systems, new sewers, and correcting combine sewer overflow systems. These figures do not include the costs of replacing or maintaining individual or community septic systems.

Water pollution from stormwater runoff accounts for over 90 percent of the cause of surface waters not meeting state water quality standards in the RPC region. Much of this stormwater comes from runoff from impervious surfaces (roads, parking lots, and rooftops). The impervious surface acreage in the region as nearly doubled since 1990. The estimated cost to upgrade stormwater infrastructure to help treat some of the water pollution coming from stormwater runoff is almost $37 million dollars. Finally, municipalities face challenges in implementing standards for the draft 2013 MS4 Stormwater Permit including costs of complying

with new data, monitoring and regulatory standards, and opportunities for cost savings (e.g. through municipal cooperation).

Loss of Open Spaces

Development pressure has reduced the amount of open space in the region. This elimination or reduction in size of open space can change the traditional forest and agricultural landscape of a community, eliminate wildlife habitat, reduce environmental services (such as filtering water and providing flood storage), and impact recreational opportunities. While open space has been reduced, there has been an increase in the amount of land being permanently protected for agriculture, recreation and habitat protection through agricultural and conservation easements. The significant land use change and growth seen in the RPC region in the last few decades has put increasing pressure on remaining natural and open spaces.

Amongst RPC comminutes, several of the highest priorities identified in local master plans include protecting natural resources for water quality protection, recreation, open space, and wildlife. Currently, only 14.8 percent of land in the RPC region is permanently protected and ranges greatly from community to community. Much of the open space in the region is vulnerable to being developed; eliminating some of the scenic vistas, recreational opportunities, and traditional character of many communities. This vulnerability is particularly true of traditional agricultural lands, which are often in locations ideal for development.

An often cited goal by the Society for the Protection of New Hampshire Forests is for every community in the state to have at least 25 percent of its land permanently protected from development. This goal aims to protect open spaces, recreational opportunities, agricultural lands, wildlife habitats, and environmental services. While protecting 25 percent of the land may not be attainable for all communities in the RPC region, it provides a useful goal for the region in order to help preserve the resources and quality of life enjoyed by the region's residents. The following are some of the tools communities can use to help prioritize the most important lands to protect in a given municipality and to interconnect those areas:

- Land Conservation Plan for New Hampshire's Coastal Watershed
- A Land Conservation Plan for the Merrimack Watershed of NH and MA
- New Hampshire Wildlife Action Plan
- New Hampshire Designated River Management Plans (Lamprey and Exeter-Squamscott Rivers)
- Source Water Protection Plans

For a map of existing conservation lands in the RPC regions, see Appendix C Map NR7.

Adapting to Climate Change

As the climate warms, precipitation patters change, and sea levels rise, natural resources and environmental services will be impacted in many ways, some positive and some negative. In many cases, proactive planning can help to minimize the impacts of climate change on the region, in other ways the region will need to adapt to deal with those impacts. Table NR13 highlights some of the impacts climate change may have on natural resources and environmental services.

Table NR13 – Potential Impacts of Climate Change to Natural Resources	
Natural Resource or Environmental Services	**Description of Potential Impacts**
Water Resources	• Increased extreme precipitation events, but less consistent rainfall patters will change the availability of water throughout the year for human use and environmental needs. • Increased periods of drought may cause increase reliance on groundwater resources. • Increased areas impacted by flood waters causing damage to existing habitats, buildings and infrastructure.
Wildlife and Habitats	• Changes in stream flows can negatively affect aquatic species, specifically species recreational and commercial fish species. • Sea-level rise may cause declines in coastal wetlands and/or cause an inland migration of those wetlands. • Potential expansion of species or habitats currently near the northern or cooler edge of their habitat range. • Potential decline of species or habitats currently near the southern or warmer edge of their habitat range. • Increased occurrences of invasive species and diseases due to a more temperate climate.
Agriculture	• Altered precipitation patters and temperature fluctuations will alter historic growing seasons. • Extended growing seasons may allow for a greater variety of agricultural crops to be cultivated. • Maple-syrup production may decline in the region due to shifts in springtime temperatures. • Warmer ocean temperatures may alter commercial fisheries.
Recreation	• Decreased snow cover may decrease wintertime recreational activities. • Extended warm season may allow for greater economic opportunities associated with recreational tourism.
Water Infrastructure	• Increased flood hazard areas may require moving existing water and wastewater infrastructure facilities. • Existing stormwater infrastructure may increasingly fail if not appropriately sized to accommodate increase stormwater flows. • Dams and downstream communities may be increasingly vulnerable to dam failures due to increase stream flows.
Air Quality	• Increased concentrations of air emissions may increase negative public health effects associated with air pollution. • Warmer winter temperatures may decrease winter energy demands, thereby reducing air emissions. Alternatively, hotter summer temperatures may increase energy demands for cooling.

Support for Local Food Production

Farmland and forestland in the region define the rural character favored by many residents. The statement, "preserving rural character" appears in most local Master Plans in the region. NH RSA 672:1, III-b states, "Agricultural activities are a beneficial and worthwhile feature of the New Hampshire landscape and shall not be unreasonably limited by use of municipal planning and zoning powers or by unreasonable interpretation of such powers."

Since 1960, the length of the growing season in southern New Hampshire has increased by fifteen to fifty-two days. (Wake, et al., 2014)

Food production and long-term food security depend on the availability of agricultural land and land use policies that support the dynamic and fast-paced changes occurring in farming today. Locally sourced forest products depend on the availability of forest land, and locally sourced fish depend upon a functioning local fishery.

Despite the importance of all these resources – farmland, forestland, and fisheries – plans and regulations often lack the support these activities need in order to prosper. Conservation of agricultural and forestland is critical to the future of farming and forestry, as is analysis of local land use regulations to identify changes that can be made to enable local food and forest production.

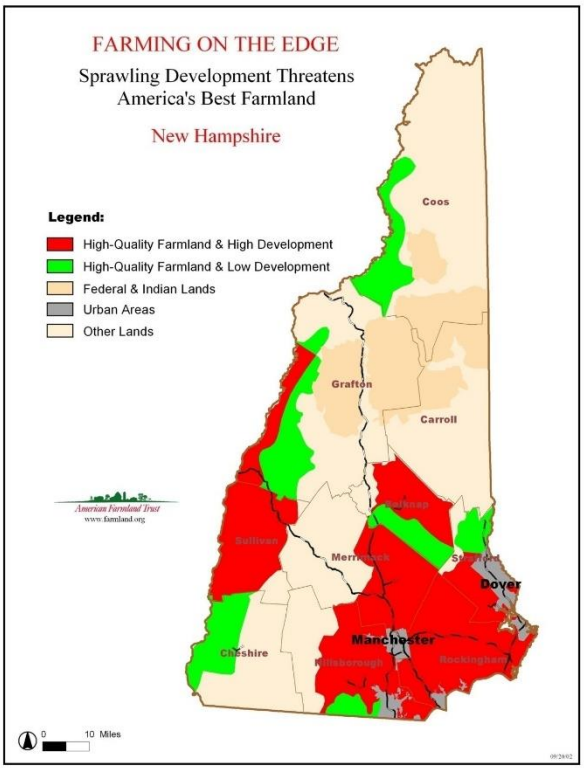

Figure NR11 - The RPC region's high-quality agricultural land is under increasing pressure from development, and is amongst the most threatened in the state. Source: American Farmland Trust, Farming on the Edge: New Hampshire *(2007).*

Natural Resources Recommendations

Recommendation 1

Decrease the amount of stormwater runoff by limiting impervious surfaces allowed with new development, requiring onsite treatment of stormwater runoff, and retrofitting existing development.

Actions

- Municipalities adopt the Southeast Watershed Alliance model stormwater regulations.
- Municipalities collaborate with each other and outside organizations to conduct stormwater reduction outreach campaigns.
- RPC provides technical assistance to communities regarding compliance with the federal MS4 Stormwater Permit.

Recommendation 2

Minimize potential sources of surface water and groundwater pollution by limiting development within drinking water source protection areas, increasing natural buffers around surface waters, and increasing protection of wetlands areas to help filter pollutants.

Actions

- Municipalities seek to permanently protect areas that serve as drinking water supply sources.
- RPC provides technical assistance to communities and water system owners on techniques for protecting drinking water sources.
- Municipalities reclassify groundwater supplies, as allowed under RSA 485-C, to restrict certain types of development near water sources or to adopt a local groundwater management plan.
- Municipalities seek to increase natural buffers around water resources to help filter potential water pollutant.
- Decrease the amount of impervious surfaces near surface waters and groundwater recharge areas through local zoning regulations. (For more detail see Recommendation 1 Action Items.)

Recommendation 3

All municipal water infrastructure operations, including drinking water, wastewater, stormwater and dam infrastructure, evaluate cost-saving potential of coordinating and collaborating with other systems on management and system improvements.

Actions

- Municipalities develop asset management plans regarding water and wastewater infrastructure systems to account for long-term costs of equipment and system maintenance. Part of these asset management plans should incorporate energy efficiency upgrades, planning for emergency or permanent interconnection with other systems, and feasibility of sharing system management costs with other systems.
- Public water systems implement water conservation programs to reduce treatment costs and unnecessary wear and tear on the overall system.
- Municipalities establish stormwater utility districts to serve as a funding source to implement MS4 Stormwater Permit requirements and to decrease stormwater pollution.
- RPC provides technical assistance to help municipalities and water system owners to collaborate on sharing services or implement outreach campaigns to reduce system costs.

Recommendation 4

Encourage communities to protect existing agricultural operations and promote new agricultural uses of land by adopting zoning and site plan regulations that minimize restrictions on agriculture.

Actions

- Creation of a regional agricultural heritage preservation plan that incorporates strategies to protect existing agricultural, forestry, and fishing operations.
- Encourage municipalities to adopt regulations to protect prime agricultural soils.
- Encourage municipalities to amend or adopt conservation subdivision regulations that promote preservation of agricultural land.
- Establishment of local agricultural commissions where they do not currently exist.

Recommendation 5

Encourage communities to adopt open space plans and zoning regulations that protect those areas identified as locally or regionally important for wildlife, recreation, agriculture, and scenic quality. Whenever possible, areas that are important for multiple factors should be prioritized.

Actions

- Municipalities adopt open space plans that include recommendations for protection of high priority areas identified in conservation and open space plans, including:
    - Land Conservation Plan for New Hampshire's Coastal Watersheds
    - Merrimack River Valley Land Conservation Plan Coastal Conservation Priority Plan
    - Lamprey River and Exeter-Squamscott River Management Plans
- Municipalities without cluster or open space subdivisions adopt such regulations to help protect open

Recommendation 6

Communities should evaluate current land use and zoning ordinances to determine how current and potential future development may negatively affect the ability of surface waters to flow across the landscape or for precipitation to infiltrate the ground.

Actions

- Establish standards for the amount of allowed impervious surface coverage allowed on individual sites.
- Increase the capacity requirement for all culverts to accommodate increased runoff from storm events.

Recommendation 7

Municipalities manage solid waste generated in the region as a sustainable material in order to find cost savings and conserve natural resources.

Actions

- Municipalities not already doing so adopt "pay as you throw" waste disposal in combination with free recycling.
- Establish one or more permanent household hazardous waste collection centers in the region.

Recommendation 8

Communities should incorporate the impacts a changing climate will have on natural resources and environmental services into all planning activities, including zoning, infrastructure investments, emergency planning, and economic development.

Actions

- Evaluate and retrofit existing stream crossings to accommodate increase flows from storm events.
- Incorporate impacts to roads and water/wastewater infrastructure into emergency management plans.
- Prioritize areas for protection that are identified as being susceptible to the impacts of climate change and sea-level rise.

- Provide more outreach to communities and individual landowner regarding how climate change may impact a particular community or area, and provide technical assistance for how to adapt to those impacts.

Natural Resource Goals and Recommendations Matrix

	NR Goal 1	NR Goal 2	NR Goal 3	NR Goal 4	NR Goal 5	NR Goal 6	NR Goal 7	NR Goal 8	NR Goal 9	NR Goal 10
Recommendation 1	S	S	S	S	S	N/A	P	N/A	N/A	S
Recommendation 2	S	S	P	S	S	P	P	N/A	N/A	S
Recommendation 3	P	S	P	P	S	S	P	N/A	N/A	S
Recommendation 4	P	P	S	S	P	P	S	P	S	S
Recommendation 5	S	S	S	S	P	P	P	P	P	S
Recommendation 6	S	S	S	S	S	P	P	P	P	S
Recommendation 7	N/A	N/A	N/A	P	S	P	N/A	S	S	N/A
Recommendation 8	S	S	S	S	S	P	P	S	P	P

S = Recommendation supports the Chapter Goal.
P = Recommendation partially supports the Chapter Goal.
N/A = Recommendation does not apply to a Chapter Goal
TBD = Unknown if recommendation will support the Chapter Goal due to lack of information or unknown future conditions.

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Appendix A – Public Water Supplies

	Public Water System (PWS) Type*							
Town	**Community Water System (CWS)**	**Transient, Non-Community System**	**Non-Community, Non-Transient System**	**Total PWS**	**Population Served by Community Water Systems****	**2010 Census Population *****	**% of population served by CWS**	**Notes**
Atkinson	6	5	1	12	3155	6,751	46.7	
Brentwood	2	5	6	13	1275	4,486	28.4	
Danville	5	1	1	7	1188	4,387	27.1	
East Kingston	4	1	3	8	338	2,357	14.3	
Epping	7	8	0	15	1810	6,411	28.2	
Exeter	8	6	3	17	12697	14,306	88.8	
Fremont	3	4	3	10	140	4,283	3.3	
Greenland	0	0	3	3	0	3,549	-	Water services are provided in part by Portsmouth Water System and in part by private domestic wells.
Hampstead	3	9	8	20	2833	8,523	33.2	
Hampton	4	0	1	5	23352	14,976	155.9	Water is primarily supplied from Aquiarion Water Company and water is supplied to other communities.
Hampton Falls	0	5	5	10	0	2,236	-	Water is primarily supplied from private domestic wells.
Kensington	0	2	3	5	0	2,124	-	Water is primarily supplied from private domestic wells.
Kingston	5	6	0	11	398	6,025	6.6	
New Castle	0	0	0	0	0	968	-	Water services primarily provided by Portsmouth Water System
Newfields	1	0	4	5	500	1,680	29.8	

Town	Community Water System (CWS)	Transient, Non-Community System	Non-Community, Non-Transient System	Total PWS	Population Served by Community Water Systems**	2010 Census Population ***	% of population served by CWS	Notes
Newton	4	4	9	17	345	4,603	7.5	
North Hampton	1	0	1	2	177	4,301	4.1	Water is primarily supplied from Aquiarion Water Company
Plaistow	22	16	22	60	1941	7,609	25.5	
Portsmouth	1	1	0	2	33000	21,233	155.4	Water services primarily provided by Portsmouth Water Works and water is supplied to other communities.
Rye	1	0	1	2	4100	5,298	77.4	
Salem	9	4	8	21	19046	28,776	66.2	
Sandown	9	4	5	18	754	5,986	12.6	
Seabrook	1	0	0	1	14000	8,693	161.0	Water services primarily provided by Seabrook Water Department and water is supplied to other communities.
South Hampton	0	1	3	4	0	814	-	Water is primarily supplied from private domestic wells.
Stratham	19	15	9	43	2467	7,255	34.0	
TOTAL	**115**	**97**	**99**	**311**	**123516**	**178,383**	**69.2**	

* Public Water Supply Definitions: ***Community Water System*** is a public water system which has a potential to serve at least 15 residential service connections on a year-round basis or serves at least 25 residents on a year-round basis. Most municipal and private water systems qualify as community water systems. ***Transient, Non-Community System*** is a public water system that is not a community water system and serves at least 25 persons at least 60 days out of the year, yet by its characteristics, does not meet the definition of a non-transient, non-community water system. Restaurants and parks can qualify as transient, non-community water systems. ***Non-Transient, Non-Community Systems*** is a public water system that is not a community water system and regularly serves at least 25 of the same persons at least six months out of the year. Schools, camps and large businesses can qualify as non-transient, non-community water systems.

** Source: New Hampshire Department of Environmental Services Drinking Water and Groundwater Bureau

*** United States Census Bureau

Appendix B – Dams

Town	Dam Name	Waterbody Name	Dam Construction Type*	Ownership*	Area Impounded (Acres)	Dam Height (Feet)	Dam Drainage Area (Sq. Miles)	Dam Status	Dam Hazard Classification*
ATKINSON	HOG HILL BROOK	TR SPICKET RIVER	T,S	P	0.00	5.00	3.38	RUINS	
	HOG HILL BROOK	TR SPICKET RIVER	E	P	3.14	11.00	3.44	ACTIVE	A
	HOG HILL BROOK	TR LITTLE RIVER	S,E	P	0.00	8.00	0.00	RUINS	
	FIRE POND	RUNOFF	E	P	1.00	6.00	0.20	ACTIVE	AA
	FIRE PROTECTION POND	UNNAMED RUNOFF	E	P	0.66	1.50	0.02	EXEMPT	
	FIRE PROTECTION POND	UNNAMED RUNOFF	E	M	0.44	2.00	0.13	EXEMPT	
	BRADGATE DET POND	RUNOFF	E	P	0.10	8.00	8.00	NOT BUILT	
	SECKNEDORF POND B	RUNOFF	E	P	0.10	10.50	0.01	ACTIVE	AA
	WILDLIFE POND	TR LITTLE RIVER	E	P	0.28	12.00	0.46	ACTIVE	AA
	WILDLIFE POND	TR LITTLE RIVER	C	P	0.75	10.00	0.35	ACTIVE	AA
	SECKENDORF POND A	RUNOFF	E	P	0.20	8.50	0.03	ACTIVE	AA
	MORSE POND DAM	NATURAL SWALE	S,E	M	0.33	2.00	0.00	EXEMPT	
	PRIVATE SWIMMING POOL	TR SPICKET RIVER	C	P	0.50	7.00	2.00	ACTIVE	AA
	PICONE DAM	NA	E	P	0.40	9.00	200.00	ACTIVE	AA
	ATKINSON CC SEWAGE LAGOON	NA	E	P	1.00	21.00	0.00	NOT BUILT	
BRENTWOOD	ROCKINGHAM CNTY WASTEWTR LAGOON	NA	E	M	5.24	13.00	0.00	ACTIVE	B
	DUDLEY BROOK	DUDLEY BROOK	S,E	M	3.00	4.00	0.00	ACTIVE	AA
	TRREE PONDS	DUDLEY BROOK	E	P	3.90	14.00	0.00	ACTIVE	AA
	ICE POND DAM	DUDLEY BROOK	C	M	5.00	8.35	0.98	ACTIVE	A
	FARM POND	DUDLEY BROOK	E	P	0.86	0.00	0.00	ACTIVE	AA
	GRAVEL PIT DAM	UNNAMED STREAM	E	P	9.00	2.50	0.00	ACTIVE	AA
	LABONTE DETENTION POND	TRIB. OF PISCASSIC RIVER	E	P	0.15	9.50	0.01	PENDING	AA
	LAMBERT FIRE POND	NA	E	P	0.30	12.00	0.01	ACTIVE	AA
	LYFORD DAM	DUDLEY BROOK	S,E	P	0.00	0.00	4.50	RUINS	

	EXETER RIVER CRIB DAM	EXETER RIVER	T,S	P	0.00	12.00	65.00	RUINS	
	JOHANON DAM	EXETER RIVER	S,E	P	0.00	10.00	62.80	RUINS	
	CRAWLEY FALLS DAM	EXETER RIVER	T,S	P	0.00	9.00	62.00	RUINS	
	ROWE DAM	EXETER RIVER	T,S	P	0.00	8.00	62.10	RUINS	
	MEARS WOOD HEEL COMPANY DAM	EXETER RIVER	T,S	P	0.00	6.00	60.30	RUINS	
	PICKPOCKET DAM	EXETER RIVER	C	M	20.00	15.00	86.00	ACTIVE	A
	EXETER RIVER	EXETER RIVER	C	P	24.00	15.00	7.00	ACTIVE	A
DANVILLE	COLBY POND DAM	UNNAMED STREAM	E	P	3.80	0.00	0.19	NOT BUILT	
	CUB POND DAM	COLBY BROOK	S,E	P	0.50	4.00	1.40	RUINS	
	LITTLE CUB POND	COLBY BROOK	E	M	10.00	10.00	1.43	ACTIVE	A
	MAYO DAM	COLBY BROOK	U	P	0.00	0.00	0.00	INACTIVE	
	DIAMOND POND	COLBY BROOK	C	P	8.00	12.00	1.75	ACTIVE	AA
	COLBY BROOK	COLBY BROOK	E	P	0.10	4.00	2.40	ACTIVE	AA
EAST KINGSTON	FLYNN FAMILY TRUST BASIN 2	RUNOFF	E	M	0.60	14.00	0.13	EXEMPT	
	FLYNN FAMILY TRUST BASIN 1	RUNOFF	E	M	0.20	12.00	0.03	ACTIVE	A
	BLUNT POND	BRICKYARD BROOK	E	P	1.75	18.00	113.00	ACTIVE	AA
	YORK FARM POND DAM	TR GREAT BROOK	E	M	2.50	11.60	4.00	BREACHED	
	POWWOW POND(TRICKLING FALL RV)	POWWOW RIVER	E	S	325.00	12.00	30.60	ACTIVE	A
	COTTULI DAM	POW WOW RIVER	E	M	0.30	5.00	0.00	ACTIVE	AA
	FURNALD POND	NATURAL SWALE	E	P	0.30	3.00	0.01	EXEMPT	
	WHIPPOORWILL FARM POND	UNNAMED BROOK	C	P	0.80	4.00	0.01	ACTIVE	AA
EPPING	THOMAS RECREATION POND	ROLLINS BROOK	E	P	0.75	3.00	0.02	INACTIVE	
	FARM POND	NATURAL SWALE	E	P	1.00	8.00	0.00	ACTIVE	AA
	FARM POND	NATURAL SWALE	E	P	0.22	6.00	0.00	ACTIVE	AA
	BYTNE DAM	UNNAMED STREAM	E	P	0.55	5.00	0.00	ACTIVE	AA
	GCF REALTY TRUST POND	UNNAMED STREAM	U	P	4.00	10.50	0.33	ACTIVE	AA
	GCF REALTY TRUST DET POND	RUNOFF	U	P	0.50	10.50	0.33	ACTIVE	AA

	HOAR POND	HOAR POND	E	S	26.00	5.80	0.43	ACTIVE	A
	RECREATION POND	TR LAMPREY RIVER	E	P	0.25	7.00	0.00	INACTIVE	
	BUNKER POND	LAMPREY RIVER	E	S	29.00	15.00	76.80	REMOVED	A
	LAMPREY RIVER TOWN DAM	LAMPREY RIVER	U	M	0.00	6.00	109.00	RUINS	
	PICARD DETENTION POND	RUNOFF	E	P	0.01	2.00	0.51	EXEMPT	
EXETER	SHARP POND DAM	NA	E	P	0.20	3.00	9.00	EXEMPT	
	FARM POND	NATURAL SWALE	E	P	0.47	13.00	0.00	ACTIVE	AA
	COURMA LTD DAM	BLOODY BROOK	C	P	2.00	5.00	0.00	ACTIVE	AA
	SEWAGE LAGOON	NA	E	M	8.53	12.00	0.00	ACTIVE	B
	GARRISON GLEN DETENTION POND	NA	U	P	0.25	4.80	0.01	ACTIVE	AA
	EXETER INDUSTRIAL DET POND 2	RUNOFF	E	P	0.15	6.00	0.01	ACTIVE	AA
	EXETER INDUSTRIAL DET POND 1	RUNOFF	E	P	0.06	6.00	0.00	ACTIVE	AA
	FARM POND	NORRIS BROOK	E	P	0.63	8.00	0.02	ACTIVE	AA
	EXETER RESERVOIR DAM	DEARBORN BROOK	C	M	26.00	15.00	1.80	ACTIVE	C
	SEWAGE LAGOON-HOLDING POND	NA	E	M	7.00	10.00	0.00	ACTIVE	B
	WATER SUPPLY	WHEELWRIGHT CREEK	E	P	0.38	11.00	0.01	ACTIVE	AA
	COLCORD POND	LITTLE RIVER	E	M	8.00	7.00	11.85	ACTIVE	AA
	EXETER RIVER DAM I	EXETER RIVER	C	M	36.00	15.00	102.70	ACTIVE	A
	SHEVENELL WILDLIFE POND DAM	TR ASH BROOK	E	P	0.50	5.50	0.08	NOT BUILT	
	APOLLO COMP DET POND	RUNOFF	E	P	1.60	6.10	0.01	ACTIVE	AA
	DETENTION POND	NA	E	P	0.37	5.80	0.02	ACTIVE	AA
	DETENTION POND	NA	E	P	0.60	3.50	0.01	ACTIVE	AA
	EXETER FALLS ESTATES DET POND	RUNOFF	E	P	0.87	6.50	0.13	ACTIVE	AA
	EXETER RIVER DAM	EXETER RIVER	U	M	0.00	0.00	72.80	RUINS	
	STONE RECREATION POND	UNNAMED STREAM	E	P	1.68	9.80	0.01	ACTIVE	AA
FREMONT	COLE DAM	PISCASSIC RIVER	S,E	P	0.00	9.00	2.00	BREACHED	
	PISCASSIC BROOK	PISCASSIC RIVER	E	P	0.30	5.00	0.00	ACTIVE	AA

	POPLIN WOODS DAM	NA	E	P	0.30	8.50	0.02	NOT BUILT	
	EXETER RIVER	EXETER RIVER	T,S	P	1.50	7.00	56.80	ACTIVE	AA
	EXETER RIVER	EXETER RIVER	C	P	5.00	12.00	52.00	ACTIVE	A
	EVERGREEN ESTATES DET. POND	NA	E	P	0.50	5.00	0.01	ACTIVE	AA
	EXETER RIVER	EXETER RIVER	S,E	P	1.00	2.00	0.00	ACTIVE	AA
	TIBBETTS RECREATION POND	EXETER RIVER	E	P	0.50	3.00	0.00	ACTIVE	AA
	HOOKE DAM	BRANCH EXETER RIVER	U	P	0.00	0.00	5.95	RUINS	
GREENLAND	COUNTRY CLUB POND	UNNAMED STREAM	E	P	0.10	5.00	0.00	ACTIVE	AA
	PACKER BROOK POND	PACKERS BROOK	C	P	0.80	8.00	2.10	ACTIVE	AA
	MCKAY SKATING POND DAM	NA	S,E	P	0.18	1.00	0.18	EXEMPT	
	ALLEN FARM SUBDIVISION PD 2	NA	E	P	0.88	4.40	0.04	ACTIVE	AA
	ALLEN FARM SUBDIVISION PD 1	NA	E	P	0.23	2.20	0.02	INACTIVE	
	WINNICUT RIVER DAM	WINNICUT RIVER	C	S	20.00	14.00	13.25	REMOVED	A
	HARTMANN DETENTION POND I	RUNOFF	E	P	0.07	3.25	0.00	ACTIVE	AA
	HARTMANN DETENTION POND 2	RUNOFF	E	P	0.05	2.00	0.00	ACTIVE	AA
HAMPSTEAD	FIRE POND	TR WASH POND	E	P	5.00	6.00	0.00	ACTIVE	AA
	HOWARD DET POND	RUNOFF	E	P	0.15	6.50	2.50	ACTIVE	AA
	COOMBS SUBDIVISION DET POND	RUNOFF	E	P	0.30	9.00	0.20	ACTIVE	AA
	CRANBERRY MEADOWS DET POND #5	RUNOFF	E	P	0.60	12.00	0.10	ACTIVE	AA
	CRANBERRY MEADOWS DET POND #4	RUNOFF	E	P	0.35	6.00	0.01	ACTIVE	AA
	WASH POND AKA SUNSET LAKE	TR ISLAND POND	C	M	170.00	4.00	1.75	ACTIVE	AA
	WASH POND LOWER DAM	TR ISLAND POND	C	M	1.50	5.00	1.50	ACTIVE	AA
	MILL BROOK DAM	KELLY BROOK	E	P	2.50	9.00	0.00	ACTIVE	AA
	JOHNSON POND DAM	JOHNSON POND	S,E	P	0.00	0.00	1.92	BREACHED	
HAMPTON	CAR BARN POND	OLD RIVER	E	P	3.70	11.00	1.80	ACTIVE	AA
	DETENTION POND #II	RUNOFF	E	P	1.20	3.50	0.26	ACTIVE	AA

	DETENTION POND #I DAM	RUNOFF	E	P	0.50	3.00	0.01	EXEMPT	
	SIGNAL COMPANY DAM	UNNAMED STREAM	E	P	3.00	7.00	0.00	ACTIVE	AA
	FIRE POND	TR DRAKES RIVER	E	P	2.40	14.00	0.00	ACTIVE	AA
	COFFIN POND DAM	DRAKES RIVER	C	M	1.00	7.20	0.62	ACTIVE	A
	TOWLE FARM DAM	TR DRAKES RIVER	E	P	1.00	5.50	0.00	ACTIVE	AA
	OLD MILL POND DAM	NILUS BROOK	S,E	M	5.50	8.00	3.00	BREACHED	
	TR DRAKES BROOK	TR DRAKES BROOK	E	P	0.75	4.00	0.00	ACTIVE	AA
	DRAKES RIVER DAM	DRAKES RIVER	C	M	0.00	3.00	0.00	REMOVED	
	FIRE POND	TR TIDE MILL CREEK	E	P	0.20	3.00	0.01	ACTIVE	AA
HAMPTON FALLS	TAYLOR RIVER POND	TAYLOR RIVER	S,E	P	6.30	14.00	9.75	ACTIVE	A
	FARM POND	TR TAYLOR RIVER	E	P	0.75	6.00	0.00	ACTIVE	AA
	TAYLOR RIVER DAM	TAYLOR RIVER	E	M	37.00	7.00	1.30	NOT BUILT	
	TAYLOR RIVER POND DAM	TAYLOR RIVER	C	S	30.00	21.00	12.50	ACTIVE	A
	TAYLOR RIVER POND DIKE	TAYLOR RIVER	E	S	10.00	9.00	12.00	ACTIVE	AA
	APPLECREST FARMS DAM	UNNAMED SWALE	U	P	0.30	5.00	0.00	INACTIVE	
	MARELLI DAM	NATURAL SWALE	E	P	0.10	3.70	0.00	ACTIVE	AA
	KENNEY BROOK	KENNEY BROOK	E	M	1.00	8.00	0.00	ACTIVE	AA
	FITZGERALD DETENTION POND	RUNOFF	E	P	0.08	5.00	0.01	ACTIVE	AA
	BIG DODGE POND	HAMPTON FALLS RIVER	E	M	11.00	12.00	6.90	ACTIVE	A
	HAMPTON FALLS RIVER III	HAMPTON FALLS RIVER	S,E	P	2.60	6.50	6.30	ACTIVE	AA
	HAMPTON FALLS RIVER II	HAMPTON FALLS RIVER	S,E	P	2.00	13.00	6.70	ACTIVE	A
	HAMPTON FALLS RIVER I	HAMPTON FALLS RIVER	S,E	P	0.33	14.00	6.50	ACTIVE	AA
	WEARES MILL DAM	HAMPTON FALLS RIVER	E	P	0.00	3.00	3.50	EXEMPT	
KENSINGTON	CARPENTER DAM	UNNAMED STREAM	E	P	1.00	7.20	0.00	ACTIVE	AA
	PHILBRICK POND	BRANCH GREAT BROOK	E	P	2.00	9.00	0.90	ACTIVE	AA
	BRANCH GREAT BROOK DAM	BRANCH GREAT BROOK	S,E	P	0.00	0.00	0.18	RUINS	
	WINKLEY BROOK DAM	WINDLEY BROOK	S,E	P	0.00	0.00	1.55	RUINS	
	WILDLIFE POND	UNNAMED STREAM	E	P	0.40	11.00	0.00	ACTIVE	AA

	WINKLEY BROOK DAM	WINKLEY BROOK	E	P	0.00	7.00	0.00	RUINS	
	FARM POND	NATURAL SWALE	E	P	0.15	8.00	0.00	ACTIVE	AA
	WILDLIFE POND DAM	UNNAMED STREAM	E	P	0.21	3.00	0.04	EXEMPT	
	DOW POND	RUNOFF	E	P	0.60	11.50	0.03	ACTIVE	AA
	FIRE POND	UNNAMED STREAM	E	P	0.25	0.00	0.00	INACTIVE	
	DINGMAN DAM	UNNAMED STREAM	E	P	1.70	10.00	0.00	ACTIVE	AA
KINGSTON	LITTLE RIVER DAM	LITTLE RIVER	E	P	0.00	7.00	2.00	BREACHED	
	LITTLE RIVER	LITTLE RIVER	E	P	0.00	8.00	3.60	ACTIVE	AA
	LITTLE RIVER DAM	LITTLE RIVER	S,E	P	0.00	8.50	3.40	RUINS	
	LITTLE RIVER	LITTLE RIVER	C	P	1.00	10.00	6.60	ACTIVE	AA
	FISH POND DAM	UNNAMED STREAM	E	P	0.30	3.90	0.06	EXEMPT	
	BROKELBANK DAM	LITTLE RIVER	E	P	0.10	1.00	0.25	INACTIVE	
	CARRIAGE TOWN POND	RUNOFF	E	P	0.05	5.50	5.00	ACTIVE	AA
	LITTLE RIVER DAM	LITTLE RIVER	E	P	0.00	8.00	0.00	RUINS	
	LONG POND DAM	LONG POND BROOK	E	P	100.00	6.00	4.45	ACTIVE	A
	LONG POND BROOK DAM	LONG POND BROOK	E	P	0.00	7.50	8.00	RUINS	
	CHENEY MILL DAM	LONG POND BROOK	C	P	2.00	11.00	5.40	ACTIVE	A
	GREAT POND	POWWOW RIVER	C	S	204.00	5.00	8.40	ACTIVE	AA
	COLBY BROOK DAM	COLBY BROOK	E	P	0.00	5.00	10.40	RUINS	
	COLBY BROOK AKA BAYBERRY POND	COLBY BROOK	C	P	16.80	7.00	9.35	ACTIVE	A
NEWFIELDS	SEWAGE LAGOON	NA	E	M	1.60	19.00	0.00	ACTIVE	B
	PISCASSIC ICE POND DAM	PISCASSIC RIVER	C	P	10.30	6.00	0.01	ACTIVE	A
	PARTING BROOK DAM	PARTING BROOK	E	P	0.00	4.00	0.00	ACTIVE	AA
	PARTING BROOK DAM	PARTING BROOK	S,E	P	0.00	12.00	1.30	RUINS	
NEWINGTON	FIRE POND	SPINNY CREEK	E	P	2.00	10.00	0.00	ACTIVE	AA
	KNIGHT BROOK	KNIGHT BROOK	C	M	1.50	10.00	0.00	ACTIVE	AA
	HOLDING POND	PISCATAQUA RIVER	E	P	0.03	12.00	0.00	ACTIVE	AA
	LOWER DUNWOODY DAM	UNNAMED BROOK	E	P	1.50	4.50	0.00	ACTIVE	AA

	UPPER DUNWOODY DAM	UNNAMED BROOK	C,E	P	0.40	8.00	0.25	RUINS	
	FERLAND RECREATION POND	UNNAMED STREAM	E	P	1.00	11.00	0.00	ACTIVE	AA
	WILDLIFE POND DAM	NATURAL SWALE	E	P	0.18	0.00	0.00	ACTIVE	AA
	UPPER PEVERLY BROOK POND DAM	PEVERLY BROOK	E	F	12.00	18.00	0.48	ACTIVE	A
	LOWER PEVERLY BROOK DAM	PEVERLY BROOK	E	F	7.00	18.00	0.65	ACTIVE	A
	STUBBS POND DAM	STUBBS POND	E	F	45.00	8.70	1.37	ACTIVE	A
	FARM POND DAM	NATURAL SWALE	E	P	0.31	8.00	0.00	ACTIVE	AA
	KENNARD DAM	UNNAMED STREAM	C	M	1.75	7.50	0.00	ACTIVE	AA
NEWTON	COUNTRY POND DAM	COUNTRY POND	C	P	255.00	6.25	14.00	EXEMPT	
	ICE POND DAM	UNNAMED BROOK	E	P	1.00	10.00	0.00	ACTIVE	AA
	LEACH FIRE POND DAM	UNNAMED STREAM	E	P	0.32	1.50	0.02	NOT BUILT	
	FIRE POND DAM	UNNAMED STREAM	E	M	0.00	0.00	0.00	ACTIVE	AA
	FIRE POND DAM	NATURAL SWALE	E	M	0.25	5.00	0.00	ACTIVE	AA
NORTH HAMPTON	DETENTION POND DAM	RUNOFF	E	P	0.90	4.00	0.04	NOT BUILT	
	WOLLMAN POND DAM	TR WINNICUT RIVER	E	P	0.30	2.00	0.01	EXEMPT	
	WINNICUT RIVER DAM	WINNICUT RIVER	E	M	0.00	3.00	5.42	RUINS	
	COUNTRY CLUB ESTATES DAM	UNNAMED STREAM	E	P	0.50	1.00	0.00	ACTIVE	AA
	MILL POND DAM	LITTLE RIVER	E	P	9.00	15.00	3.19	ACTIVE	A
	LITTLE RIVER DAM	LITTLE RIVER	E	P	0.26	9.00	3.29	ACTIVE	AA
	STEVENS RECREATION POND DAM	LITTLE RIVER	E	P	0.08	4.00	0.00	ACTIVE	AA
PLAISTOW	KELLEY BROOK DAM	KELLEY BROOK	E	P	0.00	0.00	0.00	RUINS	
	LITTLE RIVER DAM	LITTLE RIVER	U	P	0.00	10.00	11.51	RUINS	
	SWEET HILL ESTATES POND DAM	RUNOFF	E	P	1.00	8.00	120.00	NOT BUILT	
	SEAVER BROOK DAM	SEAVER BROOK	C	M	0.25	4.00	0.00	ACTIVE	AA
	GREENFIELD HILLS DAM	UNNAMED STREAM	U	P	0.00	0.00	0.00	INACTIVE	
	PLAISTOW FISH & GAME DAM	SEAVER BROOK	C	P	0.30	0.00	0.00	ACTIVE	AA
	LITTLE RIVER DAM	LITTLE RIVER	T,S	P	0.00	10.00	13.89	RUINS	

	BURNETT DAM IN MASS	UNNAMED STREAM	T	P	0.00	8.00	0.00	EXEMPT	
	FIRE POND DAM	NATURAL SWALE	E	P	0.50	3.00	0.00	ACTIVE	AA
	DEMOULAS DETENTION POND DAM	RUNOFF	C	P	0.10	7.20	0.60	ACTIVE	AA
	CEDARBROOK PLAZA DAM	RUNOFF	E	P	0.10	7.00	0.01	ACTIVE	AA
PORTSMOUTH	THE HOME CENTER DET POND	RUNOFF	E	P	0.21	6.50	0.01	ACTIVE	AA
	DEVELOPMENT EAST DAM	RUNOFF	U	P	0.00	0.00	0.00	NOT BUILT	
	HODGSON BROOK DAM	HODGDON BROOK	C	P	0.00	6.00	0.10	RUINS	
	NORTH MILL POND DAM	OUTLET NORTH MILL POND	C	M	50.00	11.00	4.00	NOT BUILT	
	SOUTH MILL POND DAM	TR ATLANTIC OCEAN	E	M	14.50	14.00	0.77	ACTIVE	A
	HODGSON BROOK DAM	HODGDON BROOK	C,S	P	0.00	6.00	3.20	REMOVED	
	BRANCH HODGSON BROOK	BRANCH HODGDON BROOK	U	P	0.00	0.00	0.60	NOT BUILT	
	HOSPITAL CORPORATION DAM	UNNAMED STREAM	E	P	9.00	5.00	31.00	ACTIVE	AA
	SAGAMORE CREEK DAM	SAGAMORE CREEK	C	P	1.00	8.00	0.14	ACTIVE	AA
	HOLDING POND DAM	NATURAL SWALE	E	P	0.25	2.00	0.02	INACTIVE	
	PARK POND DAM	NATURAL SWALE	U	P	4.70	3.00	0.02	NOT BUILT	
RYE	HUNTERS RUN DETEN POND B	RUNOFF	E	P	0.23	1.70	0.00	INACTIVE	
	HUNTERS RUN DETEN POND A	RUNOFF	E	P	0.06	3.00	0.00	INACTIVE	
	LOCKE POND DAM	LOCKE POND	E	P	3.00	6.00	2.25	ACTIVE	AA
	EEL POND	BAILEY BROOK	C	S	30.00	6.20	2.40	ACTIVE	A
	BURKE POND DAM	BAILEY BROOK	C	P	3.00	4.00	2.50	ACTIVE	AA
SALEM	TAYLOR RESERVOIR	SPICKETT RIVER	C	M	12.00	21.00	19.00	ACTIVE	B
	SPICKETT RIVER	SPICKETT RIVER	E	M	0.00	12.00	0.00	INACTIVE	
	GORDON HILL ESTATES DAM	RUNOFF	E	P	0.16	8.00	0.02	ACTIVE	AA

	EVERGREEN, WHEELER DAM EAST DIKE	SPICKETT RIVER	C	M	320.00	31.00	20.81	ACTIVE	B
	ARLINGTON MILLS RES	SPICKETT RIVER	C	M	320.00	54.00	20.81	ACTIVE	C
	SHADOW LAKE DAM	HITTY TITTY BROOK	C	M	35.00	5.50	0.89	ACTIVE	AA
	ARLINGTON MILLS RES WEST DIKE	SPICKETT RIVER	E	M	320.00	10.00	20.81	ACTIVE	A
	SPICKETT RIVER IV DAM	SPICKETT RIVER	E	P	0.50	8.00	36.80	ACTIVE	AA
	HITTY TITITY BROOK	HITTY TITTY BROOK	E	P	0.00	12.00	0.00	INACTIVE	
	MILLVILLE LAKE	HITTY TITTY BROOK	C	M	54.00	20.00	10.18	ACTIVE	B
	CANOBIE LAKE DAM	CANOBIE LAKE	E	M	350.00	8.00	2.25	ACTIVE	A
	POLICY BROOK	POLICY BROOK	E	P	0.00	7.00	0.00	INACTIVE	
	SPICKET HILL REALTY DET POND	NA	E	U	5.50	7.00	0.01	PENDING	AA
	POLICY BROOK DAM	POLICY BROOK	E	P	1.50	11.00	2.38	ACTIVE	AA
	EQUITY POND	NATURAL SWALE	E	P	0.10	18.00	0.05	INACTIVE	
	DETENTION POND DAM	RUNOFF	E	P	1.00	4.00	0.00	ACTIVE	AA
	DETENTION POND DAM	RUNOFF	E	P	1.50	4.00	0.11	ACTIVE	AA
	DETENTION POND	RUNOFF	E	P	0.10	4.20	0.00	INACTIVE	
	CAMPBELLS GOLF COURSE 12A POND	RUNOFF	E	P	1.18	5.00	0.01	ACTIVE	A
	STILLWATER CLOSE DAM	OUTLET OF STILLWATER POND	S,E	P	7.00	6.50	0.63	ACTIVE	AA
SANDOWN	ATKENS DAM	NATURAL SWALE	E	P	1.00	4.00	0.00	ACTIVE	AA
	CELESTE FARM POND DAM	NATURAL SWALE	E	P	1.00	7.00	0.00	ACTIVE	AA
	EXETER RIVER IV	EXETER RIVER	S,E	P	0.00	12.00	0.00	INACTIVE	
	DENSON POND DAM	EXETER RIVER	E	P	5.00	10.00	13.40	ACTIVE	AA
	DROWNES POND	NATURAL SWALE	E	P	0.10	3.00	0.00	INACTIVE	
	EXETER RIVER II	EXETER RIVER	S,E	P	0.00	10.00	0.00	INACTIVE	
	EXETER RIVER I	EXETER RIVER	E	P	0.00	5.00	0.00	INACTIVE	
	PRIVATE POND DAM	BRANCH EXETER RIVER	E	P	0.11	5.00	0.00	ACTIVE	AA
	FIRE HOLE POND DAM	NATURAL SWALE	E	P	4.00	3.00	0.00	ACTIVE	AA

	SHOWELL POND	OUTLET SHOWELL POND	S,E	P	0.00	11.00	0.00	INACTIVE	
	BARTLETT BROOK	BARTLETT BROOK	U	P	0.00	0.00	0.00	INACTIVE	
	ANGLE POND DAM	BARTLETT BROOK	C	S	150.00	4.70	1.45	ACTIVE	A
SEABROOK	MC WASHBY POND	FARM BROOK	E	P	0.00	5.00	0.00	INACTIVE	
	SECORD POND DAM	BRANCH CANES BROOK	E	M	2.50	10.00	0.70	ACTIVE	A
	CANES BROOK AT LAKESHORE DR	TR CANES BROOK	E	M	1.00	7.00	0.36	ACTIVE	A
	CANES BROOK	CAINS BROOK	C	M	3.50	2.50	1.83	ACTIVE	A
	CANES BROOK	BRANCH CANES BROOK	S,E	P	0.33	11.50	0.00	INACTIVE	
	CANES MILL POND	CANES BROOK	C	P	4.50	8.00	2.06	ACTIVE	A
SOUTH HAMPTON	WORTHEN DET POND #1 DAM	BACK RIVER	E	P	0.14	6.80	0.01	ACTIVE	AA
	WORTHEN DET POND #2 DAM	BACK RIVER	E	P	0.15	6.80	0.01	ACTIVE	AA
STRATHAM	WILD LIFE POND	UNNAMED STREAM	E	P	1.18	4.00	0.03	ACTIVE	AA
	USA DETENTION POND DAM	RUNOFF	E	P	1.30	4.20	0.01	ACTIVE	AA
	DEVELCO POND	RUNOFF	E	P	2.50	4.50	0.01	ACTIVE	AA
	FARM POND	SPRINGS	E	P	0.25	6.00	0.00	ACTIVE	AA
	MILL BROOK POND	MILL BROOK	C	P	2.00	6.00	0.01	ACTIVE	AA
	FIRE POND	SPRINGS	E	P	0.50	6.00	0.05	ACTIVE	AA
	WINDING BROOK CONDO DET POND	RUNOFF	E	P	4.00	8.00	0.03	ACTIVE	AA
	WILDLIFE POND	UNNAMED BROOK	E	P	0.25	10.00	0.00	ACTIVE	AA
	SANDERSON DAM	TR MILL BROOK	E	P	0.10	4.00	0.00	ACTIVE	AA
	FARM POND	UNNAMED BROOK	E	P	3.00	8.00	0.00	ACTIVE	AA
	WINNICUT MILLS POND DAM	WINNICUT RIVER	E	P	0.15	9.00	7.50	ACTIVE	AA
	MONTROSE CONDO POND I	RUNOFF	E	P	0.00	0.00	0.00	INACTIVE	
	MONTROSE CONDO POND II	RUNOFF	E	P	0.60	5.00	0.03	ACTIVE	AA

***Table Key**

Dam Construction Type: E= earthen, C=concrete, M=masonary, S=stone, and T=timber/wood. Where mutiple types of construction were employed the caluse are comma delimited (e.g., T,S).

Ownership: F=federal, S=state, M=municipal, P=private, and U=unknown.

Dam Hazard Classification: AA=low hazard potential, A=low hazard potential, B=significant hazard potential, C=high hazard potential, and <blank>= a dam which is in ruins or has been breached.

Appendix C - Maps

Map NR1 Surface Water

Map NR2 Impaired Surface Waters (2012 303(d) List)

Map NR3 Groundwater Resources (Stratified Drift Aquifers)

Map NR4 Public Water Supply Systems

Map NR5 Public Wastewater Infrastructure

Map NR6 Dams

Map NR7 Conservation and Other Public Lands

Map NR8 Conservation Priority Areas

Map NR9 Impervious Surface Coverage (2010)

Map NR10 Agricultural Soils

Map NR11 Flood Hazard Areas (FEMA Flood Hazard areas Preliminary (2013) and Adopted)

Map NR12 National Wetlands Inventory

Map NR13 High Priority Wildlife Habitat Areas (NH Fish and Game Wildlife Action Plan)

Map NR14 Solid and Hazardous Waste Locations

Map NR15 Recreational Areas and Water Access

Map NR16 Official Public Water Access Sites