2015 REGIONAL MASTER PLAN

FOR THE ROCKINGHAM PLANNING COMMISSION REGION

ROCKINGHAM PLANNING COMMISSION

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Introduction

The Rockingham Planning Commission (RPC) is a regional planning commission established by its member municipalities under the enabling authority of New Hampshire RSA 36. Its planning region consists of 26 communities located in the southeastern corner of New Hampshire, including the Massachusetts border communities from Salem to Seabrook, the coastal communities from Seabrook to Portsmouth and the communities to the west of Epping, Fremont, Sandown, and Hampstead.

The RPC's purpose is threefold: to assist communities with their individual planning needs, to develop regional plans to guide and coordinate development in the region, and to help communities work together to address common problems.

The 2015 RPC Regional Master Plan is the expression of this second purpose. It has been prepared in accordance with RSA 36:47, the state statute which governs the development and adoption of such plans. The Plan is an advisory document with no mandate or regulatory effect. Its purpose is to provide useful and timely information, analysis and guidance to communities in the RPC region that they may use to help develop or update their individual master plans. It is also intended to ensure that those communities are aware of various issues and conditions in the broader region that may affect their future development, and to facilitate the coordination of planning and development in the region.

Regional Planning Commissions and the RPC

New Hampshire's Regional Planning Commissions were formally established by the NH Legislature state enabling law in 1969 though the enactment of RSA 36. That statute specifies that regional planning commissions are advisory bodies voluntarily formed by the member communities in their planning regions. The purpose of the RPC's is to provide technical planning assistance to communities in development of local plans, to foster regional cooperation among communities, and to carry out regional planning in areas such as transportation, land use, water resources, housing, economic development and emergency management. Specifically, the statue calls upon the regional planning commissions "*to prepare a coordinated plan for the development of a region taking into account present and future needs with a view toward facilitating the most appropriate use of land the facilitation of transportation and communication the proper and economic location of public utilities and services; the development of adequate recreational areas; the promotion of good civic design; and the wise and efficient expenditure of public funds.*" (RSA 36:45).

Rockingham Planning Commission

The Rockingham Planning Commission (RPC) was formally established from the merger in 1981 of two smaller regional planning commissions, the Southeast Region RPC and the Southern Rockingham RPC, which had each been formed in the mid 1970s. Like all regional planning commissions, the RPC is governed and controlled by a Board of Commissioners comprised exclusively of representatives appointed by each of the 26 member communities. Communities may either appoint or elect their representatives to their regional planning commission. RPC Commissioners, who are unpaid volunteers, are nominated by their community's Planning Board and appointed by their Board of Selectmen or City Council. They are accountable to the community they represent.

The 26 communities in the RPC region include: Atkinson, Brentwood, Danville, East Kingston, Epping, Exeter, Fremont, Greenland, Hampstead, Hampton, Hampton Falls, Kensington, Kingston, New Castle, Newfields, Newington, Newton, North Hampton, Plaistow, Portsmouth, Rye, Salem, Sandown, Seabrook, South Hampton, and Stratham.

The planning districts for regional planning commissions are established (and revised as needed) by the New Hampshire Office of Energy and Planning. Regional planning commissions are funded by member communities through local dues, and from grants and contracts from federal and state agencies. The Commission's member communities pay local dues voluntarily.[1]

About the Regional Master Plan

Purpose and Uses

The Regional Master Plan provides a useful technical reference with recommendations and planning policies that communities can use in their own planning. It serves as a guide from which communities in the region can examine ways to collaborate with each other in areas like infrastructure development, service agreements and resource protection. It is up to each community to decide whether and how to use the plan. Municipalities are encouraged to participate in the development and updates to the Regional Master Plan to ensure the plan reflects common interests, perspectives and priorities of the region.

Organization of the Document

The Regional Master Plan is organized in a similar manner as many local master plans and is designed to be consistent with the framework provided in RSA 36:47 and RSA 9-A It includes a Regional Overview section with describes the planning region, summarizes the current issues and challenges that are of concern, and establishes an overall vision and set of goals for the Plan. The remainder of the document is divided into topical chapters that cover key areas of interest including land use, transportation, housing, natural resources, historic resources, economic development, natural hazards, energy and climate change. Each chapter follows a standard organization as well, which includes an

RPC's Mission Statement

The Rockingham Planning Commission is a voluntary local public organization created and sustained by its member communities and their appointed representatives. Its purpose is to foster sound planning, wise use and careful stewardship of the region's natural and man-made resources. This is accomplished, first, by providing professional planning assistance and advice to member communities concerning local and regional planning and second, by actively promoting and facilitating cooperation and coordination among the communities. To fulfill the first aspect of this mission, the Commission will endeavor to maintain professional expertise and support in the following areas: municipal and regional land use planning, natural resources and conservation, regional transportation planning, coastal resources management, economic development and geographic information systems development. To fulfill the second aspect of the mission the Commission will reply upon the efforts of the appointment commissioners to facilitate

More About the RPC

The Rockingham Planning Commission (RPC) is one of nine regional planning commissions in New Hampshire established by RSA-36. The Commission's region consists of twenty-six communities within Rockingham County. The RPC is not affiliated with Rockingham County.

Operating as a non-profit local government organization, the Commission serves in an advisory role to local governments in order to promote coordinated planning, orderly growth, efficient land use, transportation access, and environmental protection.

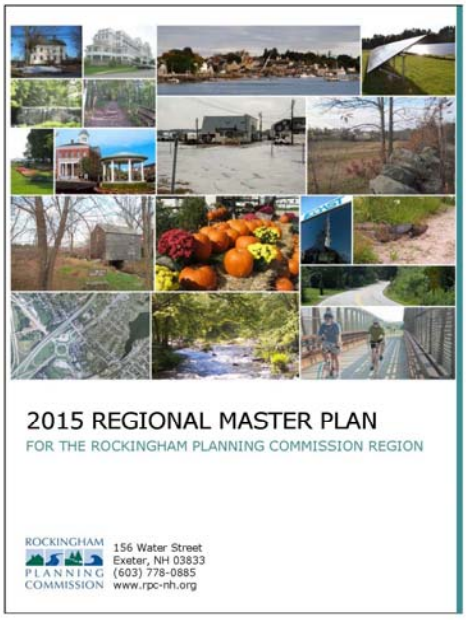
The Commission is a voluntary organization and although functioning as a political subdivision of the state, it has no regulatory or enforcement powers. Its primary function is to inform, advise and recommend action to be taken by local governments functioning within their own authority.

[1] Twenty five of the 26 communities in RPC's planning district are participating, dues-paying members of the RPC. Throughout the preparation of this plan, the Town of Salem was not a member and did not actively participate in Plan's development.

introduction, goals, existing conditions and trends, issues and challenges, recommendations and implementation, as maps and appendices.

The major sections of this plan include:

- Introduction
- Regional Vision and Goal
- Regional Overview
- Topic Chapters
  - Land Use
  - Transportation
  - Economic Development
  - Housing
  - Natural Resources
  - Natural Hazards
  - Historic Resources
  - Energy
  - Climate Change
- Scenario Planning
- Implementation Plan
- Appendices



Future Updates to the Plan

The specific New Hampshire statute governing the development of regional plans (RSA 36:47:III) implies that, while development plans prepared under the statute are not mandatory, where they exist they must be renewed every five years or sooner if desired. Revisions to local master plans are recommended only every five to ten years (RSA 674:3). The intention of the RPC is to maintain a 5-year update cycle, but to update the components of the plan sequentially, updating about approximately two chapters per year after the plan's adoption. Each update to the plan, whether wholly or in sections will be subject to the prescribed to public review and comment process.

Acknowledgements

Funding for the development of this plan was provided by the communities of the region as well as through the Sustainable Communities Initiative, a joint program of the US Department of Housing and Urban Development, US Department of Transportation and the US Environmental Protection Agency. The sustainable communities initiative supported a competitive grant from the nine New Hampshire regional planning commissions in 2012 to simultaneously update or develop new individual regional plans. This project, known as the Granite State Future, involved the collaboration of the nine RPCs together with state agencies including the Office of Energy and Planning, Department of Environmental Services, Department of Transportation, Department of Health and Human Services, Department of Agriculture, Housing Finance Authority, Department of Employment Security, and the University of New Hampshire. The purpose of this large collaboration was to share data and information about conditions, issues, trends and opportunities around the state, and, from the individual regional plans, identify goals policies that are common across the state.

The development of the 2015 RPC Regional Master Plan is the result by many hours of review, advice and counsel provided by the RPC Commissioners, the RPC Regional Master Plan Committee and interested citizens. This assistance took place during the course of many meetings and the review of draft documents; their dedication and input was essential to the development of this plan and their efforts are greatly appreciated.

Regional Vision and Goal

Vision for 2040

The vision for the Rockingham Planning Commission region in 2040 is the following:

The southeastern New Hampshire region enjoys a high quality of life represented by a strong regional economy, distinct community character, and outstanding natural and recreational resources. This has been achieved through careful planning, wise stewardship of natural resources, infrastructure investment, and increasing regional cooperation on shared issues. This vision is supported when:

1. Communities are working together to ensure that long-term economic, social and environmental factors are balanced in the planning and decision-making process.

2. Development and redevelopment are enhancing and strengthening community centers, preserving rural character, and maintaining traditional landscapes. This provides open space for agriculture, recreation and wildlife areas, and protection of natural resources, while providing residents with a variety of choices for places to live, work, and play.

3. Communities are allowing a variety of housing choices for residents of all income levels to strengthen our communities and economic vitality.

4. We are investing in the infrastructure systems that support our communities and businesses.

5. The region is promoting economic opportunities that result in more high quality jobs, stable property tax rates, enhanced educational opportunities, and improved services for residents and businesses.

6. We are striving to protect our natural environment so residents can benefit from its resources without diminishing its quality for other living creatures and future generations.

7. Our sense of community is being preserved by protecting and actively using the region's historical resources and cultural heritage.

8. Communities are acknowledging and planning for the effects of a changing climate. Anticipated changes include sea-level rise, increasing flood events, more erosion, periods of drought and other natural hazards.

9. Residents, businesses, and communities are adapting to the high cost of energy by implementing efficiency measures for building, increasing public transportation options, and developing local renewable energy resources.

10. Communities are respectful of property rights in their efforts to manage growth and development.

Regional Goal

Promote efficient use of land, resources and infrastructure in southeastern New Hampshire 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.

New Hampshire Livability Principles

Traditional Settlement Patterns and Development Design

Keep the traditional New Hampshire landscape intact by focusing development in town centers and village areas, while leaving open and rural areas for agriculture, recreation, and other suitable uses.

Housing Choices

Ensure that everyone, no matter what their income level, has convenient and affordable choices in where they live. This includes a variety of housing options and ownership types that appeal to people at any stage of life and is convenient to where they work, shop, and play.

Transportation Choices

Provide a number of options that help people safely and efficiently get where they need to go, whether it is by walking, driving, biking, public transportation, carpooling, or taking a train or plane. Transportation networks should make it easy to get from one place to another, and should also allow the efficient movement of goods to support the economy (commercial freight, rail, and air transport).

Natural Resource Functions and Quality

Make sure that we protect New Hampshire's beautiful natural landscape, which is home to all of us as well as a wide range of wildlife species. This includes protecting and improving the water we drink, the air we breathe, the forests we love, and the farmland that sustains us.

Community and Economic Vitality

Continue to make New Hampshire a great place in which to do business, raise a family, recreate, visit, and retire. Our neighborhoods and communities offer opportunities for an excellent education, good health, cultural happenings, and social connections.

Climate Change and Energy Efficiency

Identify opportunities to save energy and costs and reduce risks to our communities, businesses and citizens. In recent decades, New Hampshire has seen an increase in extreme storms and flooding coupled with steadily rising fuel and energy prices. How can we reduce dependence on outside sources of energy, construct homes and buildings that are more efficient, and reduce impacts to our communities and infrastructure from extreme storms and flooding?

Regional Overview

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Regional Overview

Introduction

The Regional Overview serves as an executive summary of the Plan. As such it includes background information about the region, how it has changed over time, and description of significant trends and issues that are at work effecting its development. It also includes a summary of public opinion and input gathered during the development of the plan and finally, a review of the key recommendations and actions that are presented in the subsequent chapters.

A History of Growth and Change

Since the very earliest European settlement at Odiorne Point in 1623 to the present day, the story of this region is one of constant change. This change was driven by waves of European settlement, resource extraction, industrialization, migration and by general economic expansion, growth and development. These changes nearly always manifested themselves in great changes in land use and landscape.

From the late 1600s, and throughout the 1700s southeastern New Hampshire was one of the most heavily industrialized areas of the English colonies, driven initially by the extraction of its valuable white pine forest resources, and aided by inland access provided by the navigable Great Bay and its tidal tributaries. In the 1700s, a rich agricultural economy developed throughout the rest of the region, and at the same time the expansion of mercantile trade made New Hampshire's seacoast one of the most active commercial areas in New England.

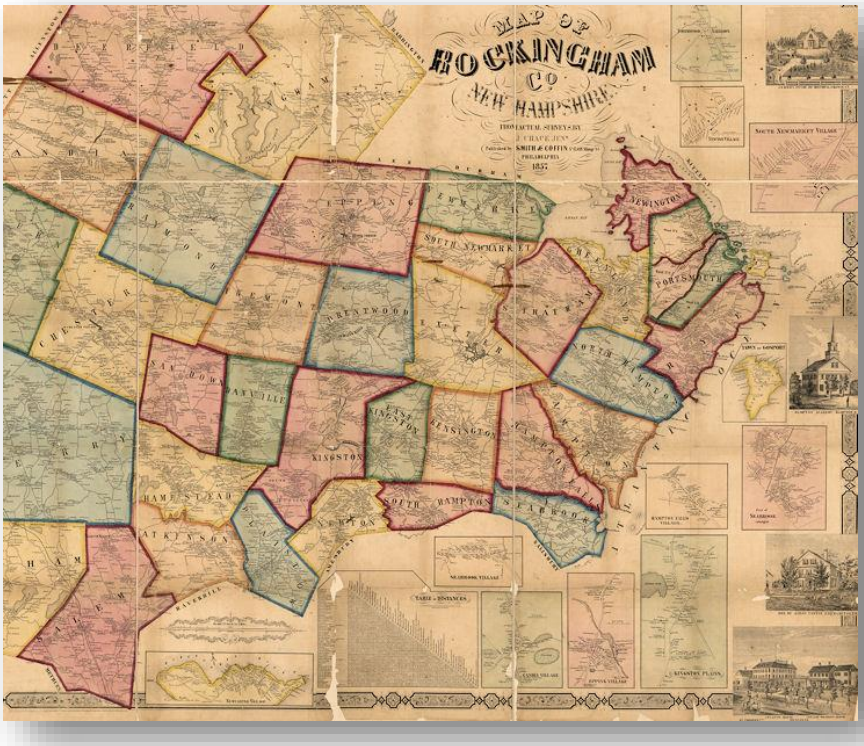


Figure RO1 - Map of Rockingham County circa 1857 Source: U.S. Library of Congress.

That early economic surge began to level off by the 1830s with the opening of the western frontier facilitated by the development of two new transportation technologies – a canal system, soon followed by the development of the railroad. As evidenced through census records, the opening of the West and decline in agriculture and trade resulted in long periods of relatively slow growth in the region, and even occasional decline, which was common in most of New England.

The region did not begin to grow in a sustained way again until after 1910, and then only moderately. ***(****Figure RO2*) After World War II, however, a period of explosive growth ensued lasting until nearly the end of the 20th century.

Many factors converged to cause high population growth and rapid land use change in the region. These included both general factors common throughout much of the country, such as the advent of the "baby boom", a growing ubiquity of cars and road systems, the decline of dairy and other agricultural land use, a

growing preference for suburban development patterns over urban centers, as well as other factors more specific to this region, like the availability of inexpensive undeveloped land, the development of two interstate highways and Pease Air Force base, expanding high tech employment in Massachusetts, the lack of income taxes compared to our bordering states and overall high quality of life. This period of rapid growth literally changed the landscape and put in place a pattern of growth and development which defines the region today. This pattern of growth in some places has continued our traditional town center settlements with surrounding rural lands but in many others has replaced it with a more uniform low density suburban style development along with highway oriented commercial development.

As with many places, the region is a composite of its history. It has the architectural and cultural heritage of its New England colonial roots mixed with that from the industrial age, the post-World War II 'auto-age' and the more recent new urban and mixed use development.

Recently, growth in the region, as with most of New Hampshire, has slowed to less than one percent per year and is forecast to remain that way through 2040. A number of factors are converging to cause this: the baby boom population is beginning to age out of the workforce, inmigration into the region is slowing, especially from other northeastern states, land is less available and more expensive, and high property taxes have diminished the New Hampshire tax advantage. While a renewal of economic growth could change this, the slower pace of growth has noticeably changed the focus of planning in many of the region's communities away from managing growth and toward planning for community development and redevelopment.

Regional Trends and Issues

Land Use

Changes in population growth and physical development after World War II have had profound effects on land use in the region. The historical view of population growth observed from decennial census data shows that through much of its early history, the region's population was relatively stable, experiencing some periods of mild expansion and contraction, but overall remaining essentially level. (The region's population in 1810 was about the same as 1910 – about 35,000 people.) The post war boom ended that stability. From 1950 to 2010 the population more than quadrupled, with additions to population and housing units averaging more than 2200 people and 1,000 units per year.

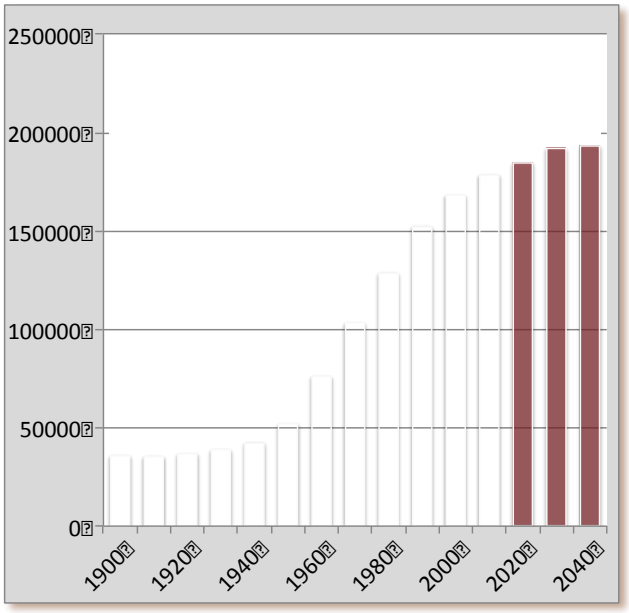


Figure RO2 Population growth and population projections in the RPC region. Source: U.S. Census Bureau and NHOEP.

The historical landscape and land use characteristics of the region were significantly altered as a result of this growth – not just because of the number of people and housing units added, but because of how they were accommodated. The land area of the region was mostly rural and agricultural at the beginning of this growth period. Only a few communities had densely developed town and city centers and the sewer and water facilities that support them. As the region grew most communities avoided sewer and water system development, both because of the cost and the desire to remain rural.

As the growth came communities responded by establishing a low density development pattern through large lot zoning or soil-based lot sizing that could sustain both on-site septic disposal and private wells for water supply without the necessity of sewer or water or built in fire suppression systems. One result of this approach (called by some a 'sewer avoidance strategy') was growth that did not require large expenditures for physical infrastructure, except for schools. Another was that buildout of these communities would be limited to a density of less than 1 house per acre on average, thus retaining a non-urban, if not exactly rural, character. Some of the consequences however, were that residential land uses, along with roads and traffic, grew rapidly

– even faster than the population – along with a separation of residential and commercial uses, a stunting of town center development and the development instead of large commercial developments along highways.

Rural to Urban Continuum

A rural to urban continuum is evident in the region's landscape and land use patterns. Residential development is distributed relatively widely across the region while commercial and industrial development is concentrated in urban centers and along major transportation corridors. The most dense population centers are found in Portsmouth, Exeter, Hampton, and Salem. With the exception of Salem, these were the earliest urban settlements in the region. They were its commercial and industrial centers and thus developed the infrastructure to support a concentration of residential, commercial and industrial development. Salem was an agricultural community but developed intensively in the 1960s and 1970s as a commercial and early high tech industrial center and attracted many early migrants from Massachusetts seeking a less urban setting and lower taxes. As shown in the map below, even to this day, much of the region retains a low average population density. Many of these communities struggle to maintain a rural quality of life in the face of lost agricultural land uses and low-density but widespread residential subdivisions. Retaining rural character remains a core objective in most of the local master plans.

Rural Areas

- Larger areas of undeveloped land.
- Residential lots are typically larger (~2 acres or greater)
- Most areas served by private wells and septic systems.
- Most trips require a car.
- Larger agricultural operations exist (hayfields, livestock and pasture lands).

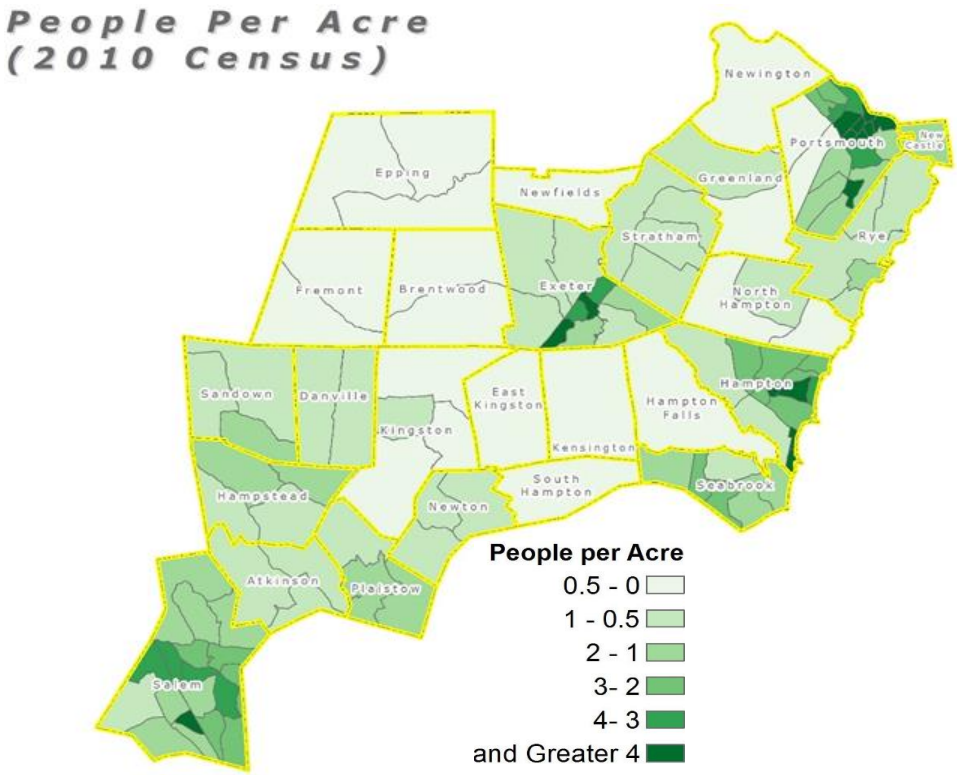
Suburban Areas

- Smaller blocks of undeveloped land.
- Residential lots are typically smaller (~2 acres or smaller).
- Mixture of private wells, septic systems, and municipal water and sewer service.
- Minimal public transit and limited sidewalks.
- Smaller agricultural operations exist (vegetables, plants/flowers, niche products).

Urban Areas

- Most undeveloped lands are liminted to public parks and conservation land.
- Residential lots are typically less than 0.5 acres.
- Most areas are served by municipal water and sewer service.
- Public transit and bicycle and pedestrial accomindations are more widely available.
- Farmers' markets and small, backyard gardens exist.

Figure RO3 Map of persons per acre in the region.



Land Use Change

Table RO1 reports land use statistics for 1962, 1974, 1998, 2005 and 2010. These data are derived by the classification of land use from aerial photographs which are available for these years. Several trends are apparent in this 48 year history of land use in the region.

- Residential development increased 163 percent from 1962 to 1998 but only 18 percent from 1998 to 2010, reflecting a slowing of population growth and residential construction.
- Active agricultural land decreased by 62 percent from 1962 to 2010, small farmsteads increased by 30 percent in the same time period. This is consistent with the more recent trend in the increase in the number of agriculture establishments especially since 2000. In 1962 the ratio of agriculture to residential acres was 1.5-to-1; in 2010 it was 0.18-to-1 – a six fold decrease.
- Industrial and commercial development increased by 91 percent from 1962 to 1998 and decreased slightly by four percent from 1998 to 2010. The decrease is due a change in classification of land use types.
- Transportation uses increased by 64 percent from 1962 to 1998 and 35 percent from 1998 to 2010, reflecting primarily new road construction.
- Total developed land grew from 11 percent to 30 percent between 1962 and 2010; net land conversion from undeveloped to developed categories was 48,000 acres or about 20 percent of the region's land area.
- Nearly 7 out of 10 acres in the region remains as undeveloped land (forest, agriculture, wetland, and open land), however the undeveloped lands are much more fragmented. In 1962 the average size of undeveloped blocks was 182 acres; in 2010 it was only 69 acres.
- The number of developed acres used rose from 0.35 to 0.42 acres per person, indicating a less efficient use of land.

Table RO1
Historical Land Use - RPC Region
(reported in acres)

Land Use Type	1962	1974	1998	2005	2010
Active Agricultural	26,051.9	17,802.6	10,882.1	9,777.0	9,799.5
Auxiliary Transportation	--	--	--	1,272.5	1,445.7
Farmsteads	839.8	689.3	138.8	1,062.0	1,088.8
Forested	163,716.5	158,618.3	142,922.7	100,198.3	97,739.2
Industrial/Commercial	4,992.8	7,184.5	9,564.4	8,704.0	9,171.1
Mixed Urban	1,019.5	1,608.5	3,455.1	692.0	729.1
Open Wetlands	9,603.3	9,782.5	9,524.0	38,373.9	38,354.3
Other/Idle	10,234.4	12,618.7	9,367.2	12,020.3	11,733.5
Playing fields & Outdoor Rec.	--	--	--	3,460.4	3,596.9
Railroad	--	--	--	134.2	134.2
Residential	16,789.2	23,954.0	44,258.1	50,575.6	52,084.9
Transportation	3,222.3	3,818.8	5,292.7	6,750.3	7,134.0
Utilities	--	--	--	2,339.3	2,342.9
Water	12,079.6	12,472.4	13,144.4	13,189.5	13,195.5
Grand Total	**248,549.4**	**248,549.4**	**248,549.4**	**248,549.4**	**248,549.4**

** Note: Years 1962, 1974 and 1998 were mapped from lower resolution aerial photography than subsequent years and used a simpler classification of land uses and therefore are not fully comparable. Auxiliary Transportation, Playing Fields and Utilities are categories only broken out in 2005 and 2010. Due to the lower resolution aerial photos, many wetlands were classified as 'Forested' before 2005. The more accurate classification caused the very large increase in reported wetland acres between 2005 and prior.

Conservation and Open Space Land

The significant land use change and growth seen in the RPC region in the last four decades has put increasing pressure on remaining natural and open spaces. Much of the open space in the region is vulnerable to being developed because of its high value for developed uses, particularly agricultural lands. Among RPC comminutes, several of the highest priorities identified in local master plans include protecting natural resources for water quality protection, recreation, open space, conservation and wildlife protection. This is a long standing priority in the region. Significant local and state conservation efforts began as far back as the 1970s and 1980s with agricultural preservation easements, followed later with conservation and preservation efforts fostered by the the Land and Community Heritage Program. Many of the communities in the region have put land conservation goals into action by using local dedicated funds and conservation grants for the purpose of open space protection, resulting in many hundreds of acres of permanently conserved open space and conservation land. In addition the region is fortunate to have a long and successful history of private land conservation, often facilitated by efforts of local conservation commissions and private conservation organizations such as the Southeast Land Trust (SELT). The SELT has protected more than 7,500 acres on 115 sites and 18 reservations throughout the Seacoast and Rockingham County. Other successes in land conservation have occurred around the Great Bay throughout the 1990s and 2000s led by organizations like the Great Bay Resource Protection Partnership which has conserved over 6000 acres and protected 25 miles of shoreline along the Great Bay. Equally important is the approach: science-based determination of land protection priorities based on resource conservation needs matched with federal, state and private funding opportunities.

Table RO2
CONSERVATION & PUBLIC LAND**

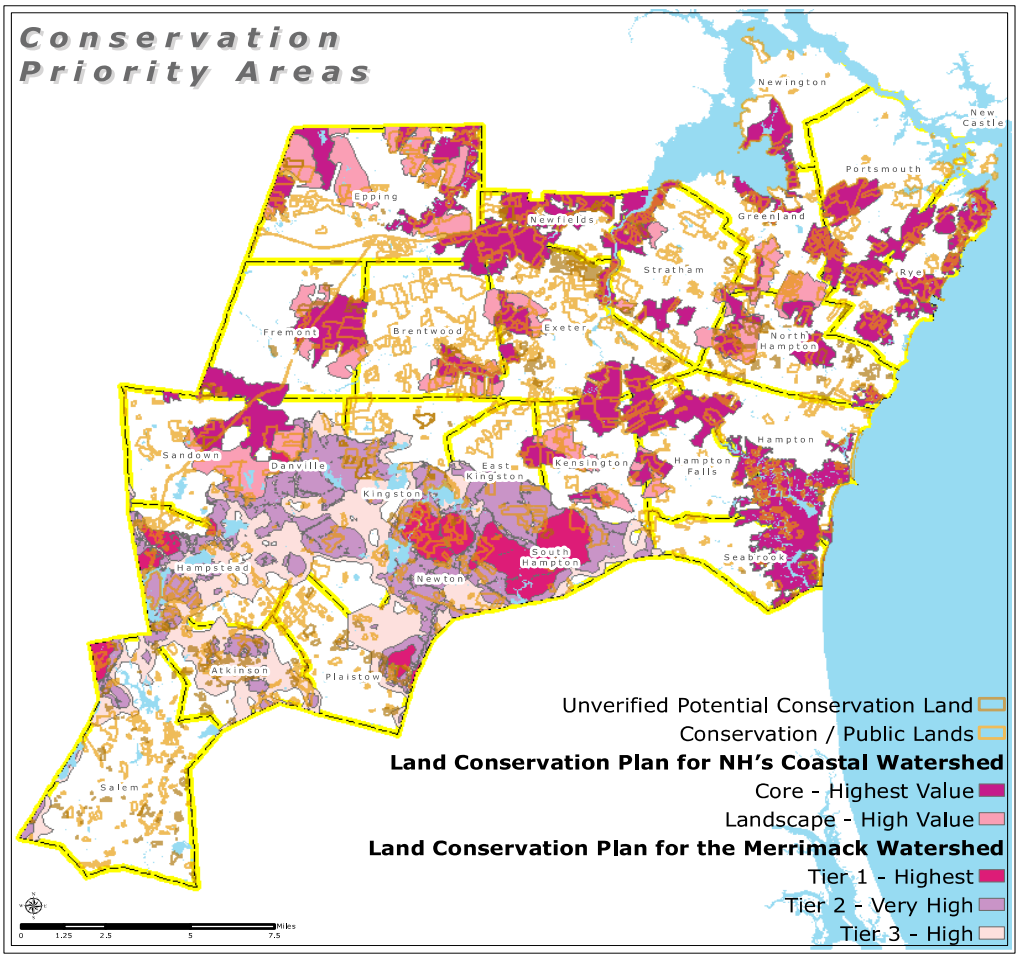
Municipality	Land Acres	%
Atkinson	1,444	20.2
Brentwood	2,956	27.6
Danville	681	9.1
East Kingston	999	15.6
Epping	3,362	20.2
Exeter	4,257	34
Fremont	1,007	9.2
Greenland	1,439	21.6
Hampstead	1,599	18.8
Hampton	910	11
Hampt. Falls	1,168	15
Kensington	1,780	23.3
Kingston	2,602	20.7
New Castle	111	20.9
Newfields	1,282	28.2
Newington	1,343	25.6
Newton	788	12.4
No. Hampton	1,769	19.9
Plaistow	940	13.8
Portsmouth	1,435	14.3
Rye	1,681	20.8
Salem	1,473	9.3
Sandown	1,065	11.9
Seabrook	531	9.3
So. Hampton	392	7.8
Stratham	1,758	18.2
RPC Region	**38,771**	**17.7**

* Note: Includes public lands used as natural areas (such as town forests), but not permanently protected by easement.

At present approximately 18 percent of land in the RPC region is permanently protected and ranges greatly from community to community (Table RO2). 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, it provides a useful target for the region in order to help preserve the resources and quality of life enjoyed by its residents.

Two regional-scale land conservation plans exist for southeast New Hampshire that can help to prioritize future voluntary land conservation efforts. The Land Conservation Plan for New Hampshire's Coastal Watershed (2005) and The Lower Merrimack Conservation Plan (2014) were both collaborative efforts, spearheaded by the Nature Conservancy of New Hampshire and the Forest Society for the Protection of NH Forests, which identify land conservation priorities based upon a science-based determination of resource conservation values (see Figure RO4 Conservation Priority Area Map). They are valuable conservation tools for conservation commissions and land trusts which can supplement local conservation planning efforts and help secure federal, state or private funding opportunities to match local funds. More detail on these plans is contained in the Natural Resources Chapter of this Plan.

Figure RO4. Conservation Priority Areas identified in the Land Conservation Plan for New Hampshire's Coastal Watershed (2005).



Impervious Surfaces and Water Quality Decline

Since 1990, the percent of impervious surface cover in the Coastal Watershed, which largely covers the RPC region, has nearly doubled from 4 percent to 10 percent (PREP, 2013). At around 10 percent total impervious surface coverage in a watershed water quality generally begins to decline. Stormwater runoff from impervious surfaces, lawns and agricultural lands are the main cause of this water quality decline, and specifically causes over 90 percent of the water quality problems in the RPC region (NHDES, 2012). The increase in impervious surface cover and stormwater runoff in the region has occurred in a slow, incremental fashion as the region has developed. As more development occurs, the impacts associated with impervious surfaces and stormwater runoff will continue to cause water quality decline in the region unless proactive steps are taken by

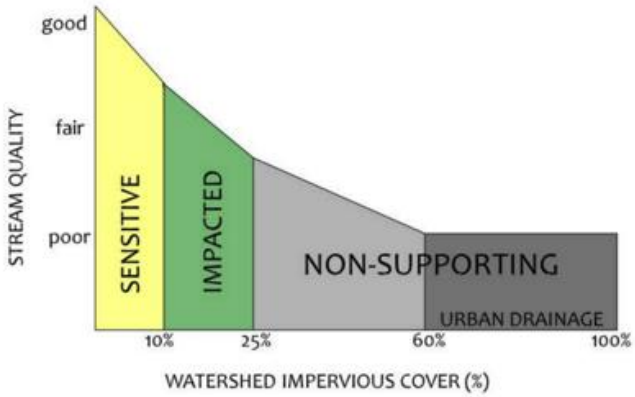


Figure RO5 - As impervious surface coverage in a watershed increases the water quality begins to decline. Source: NHDES, 2013.

individuals, municipalities, and the region.

As the acreage of developed land has increased, so has the area of impervious surface (the land surface covered with buildings, driveways, pavement and other surface that are impervious to the infiltration of rain or runoff). The growth of impervious surface coverage in the RPC region has outpaced the population growth from 1990 through 2010. During that period, the impervious surface coverage has almost doubled, while the population has only grown by approximately 20 percent.

	1990	2000	20100
Population	115,536	128,140	137,392
Acres of Impervious Surface	29,541	40,415	50,438
Acres of Impervious Surface per person	0.26	0.32	0.37

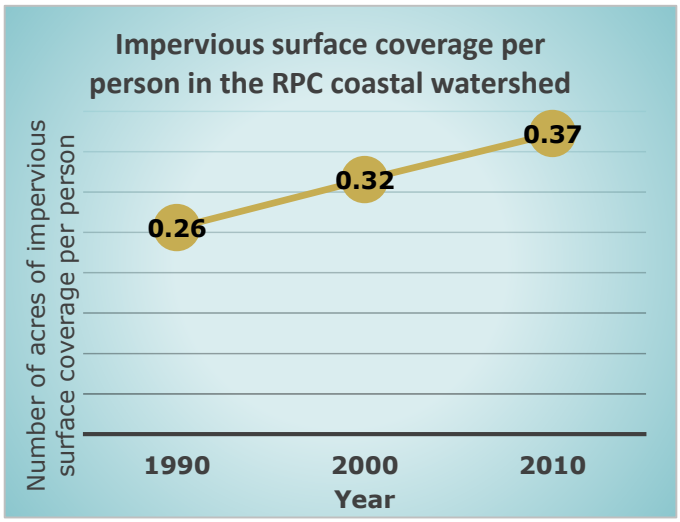


Figure RO6 - The data shown in the graph to the right and table above represents only the population and impervious surface coverage for those communities located within the Coastal Watershed Source: NHGRANIT, U.S. Census Bureau

For the RPC region, the increase in impervious coverage, and thus the decline in water quality, has had specific impacts and many of which are causing long-term impacts to the region. One example of this is the 2008 NHDES designation of the Great Bay Estuary as an "impaired" waterbody that does not meet state water quality standards. An additional cause of this "impaired" status is attributable to nutrients from wastewater treatment facilities and septic systems. The Great Bay Estuary declaration is motivated by concerns about public and environmental health, and has invoked stricter regulations and higher costs for wastewater treatment. While all of these issues must be dealt with, there are innovative approaches to growth that communities and developers can take to both mitigate the cumulative impact of increase impervious coverage and to help them develop in such a way that does not add to the problem.

Agriculture and Farming

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 agricultural production. The RPC region has over 70,000 acres of soils defined by the Natural Resource Conservation Service (NRCS) as prime or important farmland soils. These prime or important farmlands are described as land that contains the best combination of physical and chemical characteristics to produce agricultural products. (See Natural Resources Chapter for additional detail and Appendix J for a map of farmland soils.)

Within the RPC region, several communities contain high amounts of all three categories of important agricultural soils, including Atkinson, Brentwood, Kensington, East Kingston, Epping, Greenland, and Stratham. Due to the nature of farmland soils, generally being fairly well drained soils and their proximity to waterways, the areas are highly desirable as building sites, particularly for sites requiring septic systems. The ability to recognize the importance of farmland soils and ensure their availability for use into the future is a key component of

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

maintaining productive agriculture in the region and maintaining this irreplaceable resource for future needs.

After decades of decline, agriculture in Rockingham County is now growing as a use of land and in economic importance. The latest U.S. Census of Agriculture shows farming as a major component of our state's economy. In 2012, our farmers sold nearly $200 million worth of agricultural products. While the number of farms around the country dropped by four percent since the last census, our farm numbers grew five percent since 2007. Our farmland acreage also grew by four percent since the 2007 Census of Agriculture. Farming is also more diverse than in the past, producing different crops, livestock, and specialty products. Agriculture has a major influence on the county's character and quality of life, and has a significant impact on the economy, employment, and tax revenue. The top products are nursery and greenhouse crops, fruits and berries, hay and silage, vegetables, dairy, and livestock. (University of New Hampshire-Cooperative Extension)

The 2012 and 2007 Agricultural Census report includes some remarkable and surprising 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 in the top two percent (38th of 3,130 counties) in the United States in the value of direct market sales ($3,685,000). The total market value of agriculture products sold in Rockingham County annually is $26,035,000.
- There are 594 farms in the county (a 32 percent increase from 2002) and more than half the farms are small farms run by family operators. (2007 USDA Census of Agriculture)
- Only 17 percent of important agricultural soils in the RPC region are within conservation land or protected by agricultural easement.
- The amount of land in the RPC region dedicated to agriculture, including forestry, is now increasing instead of declining. Agricultural acreage in Rockingham County in 2007 was 33,570, a six percent increase from 31,656 in 2002.

This data highlights the important statewide (and nationwide) trend of residents discovering the value of the working landscape of farms, forests and fisheries and their importance in expanding the local food system and the renewed economic development opportunities they represent. Communities interested in supporting a local food system will need to be proactive in helping to support agricultural operation and land uses.

Future Buildout Scenarios

A Regional Buildout Analysis was undertaken as part of the development of this Plan to determine the approximate maximum amount of future development that would be possible under current zoning and land use regulations. The buildout analysis takes into account land use and zoning constraints, lot and building dimensional requirements, and environmental protection overlays such as wetlands and stream buffers. These factors are combined in various ways to test different development outcomes. By modifying factors such as setbacks, densities, and building restrictions buildout results can change significantly. Comparing results allows local planning officials to 'test' the effects and consequences of various land use and zoning policies before proposing them in their community. Buildout results for individual communities are included in the Scenario Planning Chapter. It should

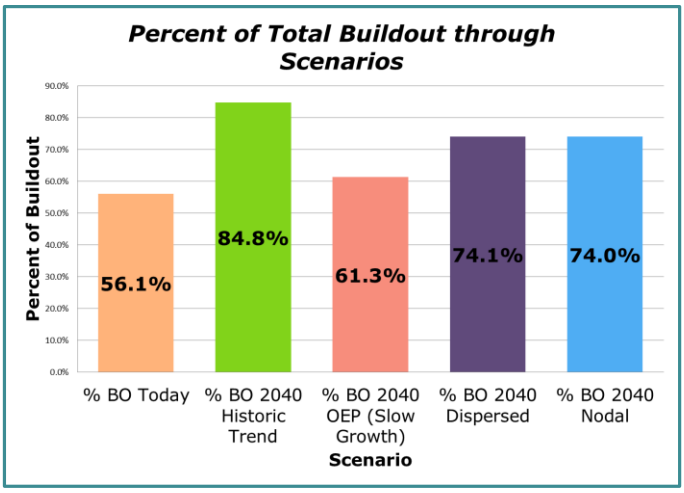


Figure RO7 - The graph abovedepicts percent of total buildout based on four types of growth and development scenarios: historic trend, slow growth, dispersed growth (sprawl) and nodal growth (compact development).

be noted that far more vacant land zoned for industrial and commercial development exists than could be supported given the limits to residential development. The residential buildout limit therefore acts as a constraint on the commercial and industrial buildout.

The year 2040 was used as the projection limit for buildout. Two growth scenarios were tested: one based on the historic growth trend for the region, a second based on the 2014 OEP/RPC population projections (Figure RO8).

The 2014 Regional Buildout Analysis also includes a full regional buildout result not associated with any point in time. This is the theoretical maximum level of development aggregated across the region that could occur under current zoning and land development regulations in force at the municipal level:

- 77 percent increase in the number of dwelling units
- 106 percent increase in developed lands
- 47 percent increase in number of dwelling units per acre
- A range of 61 percent to 74 percent buildout at 2040 under slow, dispersed and nodal growth scenarios

Indicator	Existing Conditions	Percent of full Buildout	Conditions at full Buildout	Change from Existing Conditions
Dwelling Units	65,528	56%	116,824	51,296 additional units
Developed Acres	74,130 acres developed	48% (of developable land)	152,837	78,707 acres of additional development
Residential Density	0.48 dwelling units per acre	N/A	0.71 dwelling units per acre	48% increase

Table RO3 - Results of the RPC Regional Buildout Analysis.

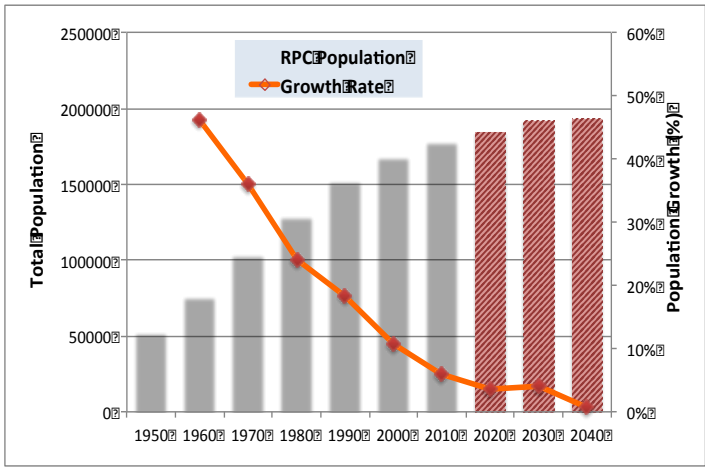
Buildout results are available at a town by town level in additional to the regional aggregate. These results and a more complete explanation of the buildout process and assumption are available in the Scenario Planning Chapter of the Plan.

Demographics

Historical and Projected Population Growth

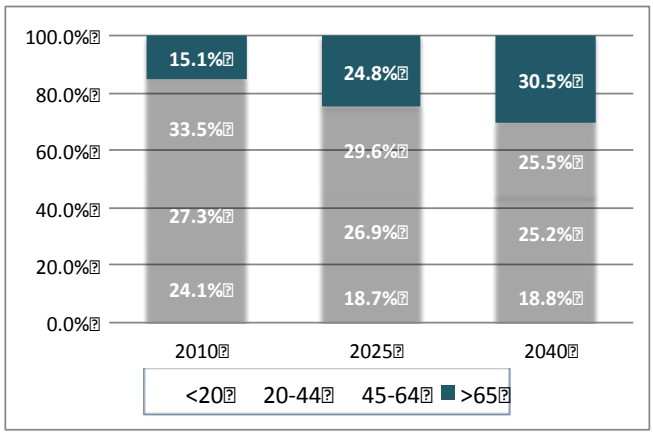
Demographic conditions and trends significantly influence the trajectory of the region's future development, land use, housing, infrastructure needs, and virtually all aspects of planning. As noted earlier in this chapter, for most of the past 50 years, the RPC has been strongly influenced by rapid population growth. At times during the 1970s and 1980s several towns in the region grew at a faster pace than any in the state. The number of people added between 1950 and 1990 averaged nearly three percent per year or about 2,500 per year. Between 2000 and 2010, that rate fell by 60 percent to about 1000 persons per year across the region (Figures RO8 and RO9) and now has been less than one percent per year.

Figure RO8 - Population, Growth Rate and Projections from 1950-2040



Age Demographics

Figure RO9 -
Age Cohorts in the Region from 2010-2040



Looking forward, based on the age demographics of the region's population, it is likely that we have entered a prolonged period of relatively slow growth unless other factors intervene. The New Hampshire RPCs together with the N.H. Office of Energy and Planning (NHOEP) collaborated in 2013 to produce updated population projections for the state. The new projections show relatively slow growth in the region's population from 2010 to 2040 and zero growth from 2030-2040. This projection is driven primarily by the effect of the large baby-boom cohort beginning to age out of the population after 2030. It assumes that migration, the net number of people moving into the region, will remain on average as it was from 2000 to 2010 so even with in-migration occurring, population growth will flatten as a natural consequence of the age structure. Assuming that recent trends hold true, between 2010 and 2040 it is anticipated that the population of citizens aged 65 and older will more than double from 26,500 to 57,200 people. At the same time, the number of residents under the age of 20 is expected to decline by about 13 percent from just over 42,000 to 36,400. This has wide implications for the region in terms of impacts to employment and the labor force, access to health care, education, elderly transportation needs, and housing among other areas. Significant planning and preparation will be needed to prepare for this growth in the elderly population.

Labor Force

Unless the in-migration rate seen over the past decade increases, the regional labor force is expected to become slightly smaller over the next 30 years and to change in demographic composition as well. Overall, the size of the labor force in the region is projected to decline by approximately seven percent between 2010 and 2040. This is due to a combination of national trends such as the aging of the baby boom generation and local demographics. According to Bureau of Labor Statistics projections, young workers (16-24) participation in the labor force has declined over 20 years from 66 percent in 1992 to 55 percent in 2012 and is expected to fall further by 2022. At the same time, participation by individuals 65 and older has *increased* from 11.5 percent in 1992 to 18.5 percent in 2012 and is expected to increase to 23 percent by 2022. This growth in senior workers is substantial but may not be enough to offset the decline in younger workers, possibly leading to a smaller labor force in the region – the first time that has happened since the 1940s.

Population Diversity

Table RO-3 identifies the number of racial and ethnic minority residents for each municipality in the RPC region, as well as minority residents as a percentage of overall population. Region-wide minorities make up approximately 6.6 percent of the population, a very low percentage by national standards and lower than the statewide average of 8.9 percent. This average is exceeded in two communities: Portsmouth (11.2 percent), and Salem (12.0 percent). Statewide, members of racial and ethnic minority groups make up 8.9 percent of the population. This is a significant increase since the 2000 census, when racial and ethnic minorities made up only 5.6 percent of the population statewide, and 3.5 percent of the population in the MPO region. Both the region's and state's population diversity is expected to slowly increase with time, but remain behind surrounding state's and regions.

Table RO4 - Racial and Ethnic Minority Population in the RPC Region – 2010

Area	Total Pop	Black	Amer. Indian	Asian & Pacific Islander	2+ Races	Hispanic or Latino	Minority Total	Minority Percent
Atkinson	6,751	34	3	65	50	96	**264**	**3.9%**
Brentwood	4,486	30	6	50	59	67	**233**	**5.2%**
Danville	4,387	28	8	15	83	68	**214**	**4.9%**
East Kingston	2,357	3	1	17	21	22	**71**	**3.0%**
Epping	6,411	22	13	84	105	100	**343**	**5.4%**
Exeter	14,306	79	15	289	234	240	**887**	**6.2%**
Fremont	4,283	9	6	11	66	54	**159**	**3.7%**
Greenland	3,549	22	3	66	45	31	**177**	**5.0%**
Hampstead	8,523	23	7	71	87	84	**287**	**3.4%**
Hampton	15,430	89	32	199	205	264	**867**	**5.6%**
Hampton Falls	2,236	9	1	17	17	14	**63**	**2.8%**
Kensington	2,124	7	4	24	14	24	**77**	**3.6%**
Kingston	6,025	20	16	34	90	85	**264**	**4.4%**
New Castle	968	1	1	8	8	5	**23**	**2.4%**
Newfields	1,680	6	2	17	10	22	**64**	**3.8%**
Newington	753	4	1	10	9	8	**36**	**4.8%**
Newton	4,603	14	11	19	41	67	**167**	**3.6%**
North Hampton	4,301	19	8	56	38	41	**167**	**3.9%**
Plaistow	7,609	42	13	45	47	175	**358**	**4.7%**
Portsmouth	20,779	359	46	725	479	573	**2,335**	**11.2%**
Rye	5,298	16	1	50	41	58	**177**	**3.3%**
Salem	28,776	259	42	942	410	1,270	**3,454**	**12.0%**
Sandown	5,986	18	7	19	61	94	**232**	**3.9%**
Seabrook	8,693	46	10	92	119	126	**446**	**5.1%**
South Hampton	814	8	0	4	13	13	**41**	**5.0%**
Stratham	7,255	11	7	143	90	95	**356**	**4.9%**
RPC Region	**178,383**	**1,178**	**264**	**3,072**	**2,442**	**3,696**	**11,762**	**6.6%**
Rockingham Cty	**295,223**	**1,996**	**486**	**5,043**	**4,054**	**6,142**	**19,399**	**6.6%**
State of N.H.	**1,316,470**	**15,035**	**3,150**	**28,791**	**21,382**	**36,704**	**117,124**	**8.9%**

Source: 2010 U.S. Census

Populations in Poverty

According to the U.S. Census Bureau, for 2011 the poverty threshold in the RPC region was approximately $23,000 for a family of four. RO Figure-12 uses the American Community Survey 2011 5-year data compilation to show the number and percent of households in poverty by municipality in the Rockingham Planning Commission region. The mean percentage of households in poverty for the MPO region was 4.8 percent. The table also identifies eight communities where the percentage of households in poverty exceeds this regional mean: East Kingston (5.4 percent), Exeter (5.7 percent), Greenland (6.0 percent), Hampton (8.6 percent), Newton (5.8 percent), Portsmouth (9.0 percent), Sandown (7.8 percent), and Seabrook (6.5

percent). Statewide, approximately eight percent of the population falls below the federal poverty line, while nationally for 2011 an estimated 15 percent of the population lived in poverty.

This represents some change from the 2000 Census data, which showed five percent of residents in the region living in poverty. Several towns with above average populations in poverty in 2011 were below average in 2000. These include East Kingston, Greenland and Sandown. This may reflect demographic shift or may to some degree reflect sampling anomalies in these small towns. Hampton traditionally shows a high population in poverty due to short term winter rental residents in the beach district, while Portsmouth as the only city in the area, and a community with lots of students and retail workers, also traditionally shows above average poverty levels.

Table RO5 - Population in Poverty – 2011

Geography	Total Population	Population in Poverty	% of Population in Poverty
Atkinson	6,739	241	3.6%
Brentwood	3,857	83	2.2%
Danville	4,379	87	2.0%
East Kingston	2,358	127	5.4%
Epping	6,313	297	4.7%
Exeter	14,135	800	5.7%
Fremont	4,193	202	4.8%
Greenland	3,516	211	6.0%
Hampstead	8,547	395	4.6%
Hampton	15,179	1,307	8.6%
Hampton Falls	2,247	54	2.4%
Kensington	2,035	13	0.6%
Kingston	6,016	107	1.8%
New Castle	858	23	2.7%
Newfields	1,862	10	0.5%
Newington	699	26	3.7%
Newton	4,596	265	5.8%
North Hampton	4,276	52	1.2%
Plaistow	7,642	366	4.8%
Portsmouth	20,343	1,834	9.0%
Rye	5,279	169	3.2%
Salem	28,775	1,169	4.1%
Sandown	5,935	462	7.8%
Seabrook	8,630	565	6.5%
South Hampton	715	22	3.1%
Stratham	7,208	60	0.8%
RPC Region	**176,332**	**8,947**	**5.1%**
Rockingham County	**292,589**	**14,237**	**4.9%**
New Hampshire	**1,275,969**	**101,634**	**8.0%**

Source: ACS 2011 5-year data compilation based on 5 year moving average sample.

Housing Trends

Cost of Ownership

Housing availability, diversity and affordability are important factors in creating and maintaining a favorable environment for creative, diverse, vibrant communities and healthy economic development. The quality of the housing stock in the region, as measured by common census statistics like age of units, number of bedrooms,

utility status, etc., is generally good. Another positive metric for the state and region is the high homeownership rate, which correlates with overall prosperity. New Hampshire ranked second nationwide in homeownership with 71 percent occupied housing units being owned versus rented (ACS 2012, 3 Year Average). In Rockingham County, 77 percent are owned, the highest of all areas in the state except Carroll County. On the other hand, the RPC region has comparatively high housing costs which can translate into higher living costs for the region's workforce, and in turn, high labor costs for the region's employers if higher wages are needed to attract the workforce their business demands.

Statewide, the percentage of households where costs for housing exceed 30% of income is similar to the other New England states. Contrary to expectations, the rate of overpayment in Rockingham County and the Seacoast region is only modestly higher due to higher household incomes in the region.

Supply of Workforce Housing

Beginning in the 1970s and continuing to today, the region has had a relatively constrained supply of workforce-affordable housing, both owned and rental. At least two factors have and continue to contribute to this. First, the proximity to the Boston housing market and high housing costs in neighboring communities in Massachusetts tends to inflate the cost of housing here, whereas wages are not as strongly affected. Second, there is an undersupply in multifamily housing which is an important source of both rental and other affordable housing units in the region. Two additional factors contribute to this lack of multifamily housing: lack of municipal sewer and water services which permits development density conducive to multifamily development, and zoning provisions that discourage or make it infeasible. The Workforce Housing statute (RSA 674:58-674:61) requires municipalities to provide reasonable and realistic opportunities for the development of workforce-affordable housing by removing unnecessary barriers in zoning and land use regulations. Nevertheless legacy zoning provisions, combined with density limitations from lack of sewer, make such housing economically unattractive to developers in many parts of the region.

Lack of Affordable and Multi-Family Units

As of the 2010 Census, about two-thirds of the housing units in the region were single-family units, but for many small communities that number is over 80 percent. Zoning restrictions in many communities make it more difficult to construct affordable multi-family housing, but these restrictions are often in place because of the lack of municipal sewer and water infrastructure in the majority of the towns in the region. Only ten of the 26 RPC communities have municipal sewer systems, and in most of those, the sewer district covers only a small portion of the town. Even where allowed by zoning, that lack of infrastructure increases the relative cost of multifamily construction in rural areas and becomes less attractive to builders. Another factor in the comparatively small supply of multifamily housing presently available in the region is the relative weakness in the housing construction sector which began with the recession in the early to mid 1990s which affected the multi-family sector more than the single family sector.

Multifamily construction was virtually non-existent in the mid- to late 1990s and slowed dramatically again after 2005. The net effect is a lagging housing stock for multifamily units. Since average prices and rents for multifamily housing are lower than single family housing, the affect is to reduce the available stock of workforce affordable housing. Since the recession, rental prices for multi-family units have remained strong and increased demand for this type of construction.

Transportation

The region is served by a well-developed roadway network, a small and geographically limited public transportation system, and a large variety of domestic and international freight transportation carriers. All modes of transport and goods movement are available within or near to the region including the Port of New Hampshire, Pan Am Railways main line (the former Eastern Line of the Boston and Maine Railroad) and the Pease and Manchester airports. Rail freight access has significantly declined over the past 50 year, while motor carrier freight access has dramatically increased.

State and Local Roadway Network

The region has a network of 1,846 miles of well-developed state and local roadways. Local and private roads represent 82 percent of the total road miles among all classes.

Table RO6 - Road Miles by Functional Class

Rural Roadways	Miles	Urban Roadways	Miles
Principal Arterials	1.8	Principal Arterials – Interstate	61.9
Minor Arterials	0.6	Principal Arterials – Other Freeways and Expressways	67.6
Major Collector	22.3	Principal Arterials –Other	54.6
Minor Collector	27.0	Minor Arterial	88.2
Local Road	240.3	Collector	150.3
Private Roads	245.9	Local Road	885.5
Sub-total	**537.9**	**Sub-total**	**1,308.1**
Total Road Miles = 1,846.2 miles			

Detailed descriptions of roadway functional classes, road miles by town, and roadway network distribution are provided in the main body of the Transportation Chapter and Appendix A and Map TR1.

Freight

The movement of goods by freight is summarized below by total value and percent mode. The largest percentage of total freight is moved by transport truck. Details of freight movement including volume are provided in Appendix C of the Transportation Chapter.

Table RO7 - Freight Movement by value and % mode for 2011.

Total Exports (Millions of Dollars)	$95,520.52
Total Imports (Millions of Dollars)	$66,340.11
Total Goods Movement by Value (Millions of Dollars)	$161,860.63
Percentage of Total Goods Movement by Mode	
Air (include truck-air)	2.78%
Multiple modes & mail	20.52%
Other and unknown	1.96%
Pipeline	1.57%
Rail	0.69%
Truck	69.95%
Water	2.54%

[Source: Freight Analysis Framework. With the exception of the data for the Port of New Hampshire, all information available is for the state as a whole and not specific to the region.]

Shipping

The region is host to the Port of New Hampshire in Portsmouth, an active port handling over 8.8 million tons of cargo each year and expected to nearly double that by 2040 (USDOT). The Division of Ports and Harbors (DPH) Market Street Marine Terminal, located on the Piscataqua River, is the only public access, general cargo terminal on the River. In addition, Portsmouth is within 50 miles of the Port of Boston, one of America's major

port facilities, and has convenient access by highway and rail to other major and regional ports including New York, Portland, and Montreal.

Table RO8 - Estimated Goods Movement through the Port of New Hampshire (1000s of tons)

	2011	2015	2020	2025	2030	2035	2040
Imports	8,377.68	9,330.36	10,436.82	11,461.28	12,263.23	13,198.45	14,255.60
Exports	474.48	622.28	814.18	1,041.30	1,270.01	1,491.81	1,746.02
Total	8,852.16	9,952.64	11,250.99	12,502.58	13,533.23	14,690.26	16,001.61

[Source: Freight Analysis Framework]

Rail

The area is served by the main line of Pan Am Railways, a major U.S. regional railroad, which was historically known as the Boston and Maine Railroad (B&M) Main Line West running between Boston and Portland, and in the RPC region traversing the towns of Atkinson, Plaistow, Newton, Kingston, East Kingston, Exeter, and Newfields. The mainline is currently categorized as a Class 4 track which allows passenger rail speeds up to 80 MPH and freight rail. Branch line freight services are currently available between the main line and Portsmouth and over the Sarah Long Bridge into Maine on a Class 1 track. Intermodal (rail-truck) facilities operated both by Pan Am and Conrail in the Boston area and by the St. Lawrence and Atlantic Railway in Auburn, Maine are within easy reach of the Seacoast region. Through these connections, shippers have access by rail to points throughout North America and, using Rail Land Bridge services, throughout the world.

Air Freight

The region is served by direct airfreight service at Pease International Tradeport. The Fixed Base Operator at Pease Airport provides cargo handling by truck and air. The facility can accommodate the largest cargo planes and has 45,000 square feet of warehouse facilities in close proximity to rail, deep water port and I-95. Boston's Logan Airport and the Manchester-Boston Regional Airport are located less than 50 miles away, adding access to a wide variety of air cargo services serving markets throughout North America and the world.

Public Transportation

Public transportation plays an important and growing role in addressing the mobility, traffic congestion, and air quality issues facing the RPC region. The number of communities in the region served by transit has increased in the past ten years, from five to seven; and ridership on all forms of transit has seen dramatic growth in response to rising fuel prices and growing transit dependent populations. Still, fewer than a third of the 26 communities in the region are served by public transportation, and significant challenges exist to expanding services, including funding availability, and low density development patterns making fixed route service inefficient in many towns. Regional transit routes are shown on Map 1 in the Transportation Chapter.

Other public transportation services and facilities in the region include (see Transportation Chapter for detailed descriptions of each service):

- Cooperative Alliance for Seacoast Transportation (COAST);
- The Greater Derry-Salem Cooperative Alliance for Regional Transportation (CART);
- Intercity bus service in the I-95, I-93, NH Route 125 and NH Route 101 corridors;
- Amtrak’s Downeaster service between Boston, Portland and Brunswick Maine; and
- Seven Park & Ride facilities operated by the N.H. Department of Transportation (NHDOT).

State of Infrastructure

Water Infrastructure Needs

Wastewater Treatment Facilities

There are eight wastewater treatment facilities in the RPC region that primarily cover the more populated areas of the region, particularly in the coastal and eastern parts of the region. Many of these facilities were built between 30 and 50 years ago. While the capacity of most of the facilities (the exception being Portsmouth's facility on Pierce Island) have enough capacity to service residents, many of them do not meet current water treatment standards and are in need of major upgrades. 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 Environmental Services, 2012). These wastewater infrastructure needs include four different areas: treatment, replacement and rehabilitation of existing sewer systems, new sewers, and correcting combined sewer overflow systems.

Water Pollution and Stormwater

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). Municipalities face challenges in implementing standards for the draft 2013 EPA Municipal Separate Storm Sewer Systems (MS4) permit including costs of complying with new data, monitoring and regulatory standards, and opportunities for cost savings (e.g. through municipal cooperation). The impervious surface acreage in the region has nearly doubled since 1990 as a result of a period of rapid growth creating additional challenges to meeting the new EPA MS4 permit requirements. The estimated cost for the region to upgrade existing stormwater infrastructure, including upgrades associated with the MS4 Permit is over $36.6 million dollars

Transportation Infrastructure Needs

State and Regional Plans

There are three project planning and programming documents that guide the implementation of transportation projects in the RPC region; The Long Range Transportation Plan (LRTP), the State Ten Year Plan, and the Transportation Improvement Program (TIP). Together these plans identify needs and priorities for transportation infrastructure improvement in the region.

- The LRTP is a 20-plus year document that identifies anticipated transportation improvement needs in the region. This document is required to be fiscally constrained and contains approximately $360 million in long term transportation improvement needs.
- The State Ten Year Plan is a statewide listing of priority projects for construction over the next decade. This document is updated every two years by NHDOT with approvals from the Governor's Council, the Legislature, and the Governor and includes short and medium term project needs. This document contains approximately $1.6 billion in funding statewide, and about $571 million in projects for the region between 2015 and 2024. A large portion of this funding is tied into three large multi-regional projects: the I-93 expansion from Salem to Manchester, the Newington-Dover Spaulding Turnpike expansion, and the replacement of the Sarah Mildred Long (SML) Bridge between Portsmouth and Kittery, Maine.
- The TIP covers a four-year timeframe and only includes federally funded or other regionally significant projects that will be built in the short term. There is a statewide version (known as the STIP) and a regional version that only includes projects that impact the region directly. The TIP currently includes approximately $958 million in projects statewide and about $420 million dollars in the region, largely into the three big projects of I-93, Newington-Dover, and SML Bridge.

Road Maintenance Costs

Operation and maintenance of transportation infrastructure continues to be a growing need in the region as the costs of construction continue to escalate. Estimates from the New Hampshire Department of Transportation indicated that operating and maintaining the state highways costs approximately $12,000 per mile and estimates from local highway budgets indicate that a similar cost is associated with maintaining and

operating local roadways as well. Funding provided for this purpose has remained inadequate however, and this has begun to cause a backlog in maintenance needs that are being pushed off to future years at a higher cost.

Energy Infrastructure Needs

Increasing Dependence on Natural Gas

As reported in the 2013 Comprehensive Economic Development Strategy (REDC, 2013) New Hampshire has rapidly increased its reliance on natural gas as fuel for generating electricity. As shown in Figure RO10 at right, natural gas now comprises 52 percent of the state's current energy mix for electric generation compared with 16 percent in 2000. This is creating a short term supply constraint, especially during the winter months when competing demand for gas for heating peaks. This is resulting in large seasonal increases in electric rates for many utilities. Several proposals to expand gas transmission capacity into New England are being considered, including a joint proposal by the New England State Governors. The status of these is uncertain, however, until transmission capacity is addressed seasonally constrained gas supplies will lead to price instability.

Some municipalities are interested in expanding local natural gas distribution lines as a means to bring more energy options to serve residential, commercial and industrial uses. Hampton successfully negotiated expansion of the local natural gas pipeline to serve a high density residential area (refer to the Energy Chapter for a detailed description of this effort).

The state's growing dependency on a single energy fuel source increases our exposure to uncertainties in supply, transportation and infrastructure interruptions, and market price fluctuations during times of high demand. As recommended in the 2014 State Energy Strategy, the state's energy future lies in diversifying its energy portfolio to include both expanded transmission capacity and expanded use of renewable energy sources such as wind, solar, biomass, geothermal and hydroelectricity.

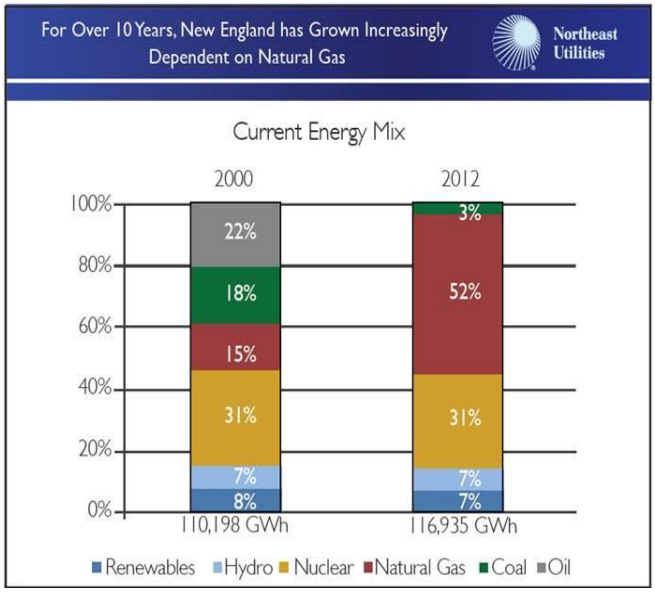


Figure RO10 – Current New England energy mix. Source: PSNH

Need for Electrical Grid Modernization

The N.H. State Energy Strategy (2014) describes a vision for electric grid modernization that could provide multiple benefits to New Hampshire consumers and meet several strategies outlined in the Plan. Grid modernization would provide the platform upon which to effectively manage energy sources, demand, supply and efficiency statewide. Grid modernization refers to ensuring that the electric grid is more resilient and flexible, has adequate storage capacity, able to integrate intermittent energy sources (such as energy produced through net metering), and able to provide real-time information to help customers manage their energy use. The potential benefits of grid modernization can include: better outage response and increased reliability; customer engagement in reducing peak demand; improved integration of distributed generation, renewable resources and storage; improved efficiencies for distribution utilities; integration of electric vehicles; and cost savings for all customers.

Natural Hazards and Climate Change

Changes in New Hampshire's climate are well documented in local records of sea level, growing seasons, range of flora and fauna, precipitation and temperature. New Hampshire and its municipalities have many opportunities and time to prepare and adapt to a changing climate and minimize impacts from natural hazards related to weather events and natural earth processes. Climate change can increase the severity of existing

and future hazards such as coastal storms, flooding, strong winds, extreme precipitation, extreme temperatures and drought, and alter the frequency and occurrence of weather related events. To prepare for and adapt to future conditions, state, regional and local efforts will require understanding of ongoing climate projections and assessments, applying technology and data to solve problems, and learning from other states and communities that have successfully implemented effective strategies and solutions. RPC communities have the additional vulnerability from projected rise in sea level, which will require a significant level of planning, preparation and adaptation in the decades to come.

Current Conditions

Changes in climate are well documented in historical records. Trends indicate acceleration of certain conditions particularly in the last 100 years.

Sea Level Rise and Coastal Flooding

For the period 1926 to 2001, sea level rose nearly half a foot (5.3 inches), at a rate of about 0.693 inches per decade. This change in sea level has noticeably influenced permanent inundation of uplands surrounding tidal wetlands and exacerbated flooding during seasonal high tides and storm events.

Precipitation

Since the 1990s the magnitude and frequency of extreme precipitation events have increased compared with historical trends since 1950. In most areas of the region, the amount of rainfall associated with the 100-year, or one percent chance storm event has increased by two to three inches.

Costs of Disasters

The frequency and related costs of declared disasters and emergency declarations have increased since the late 1990s. This increase is in part due to the increase in extreme weather events but also continued investment and growth in high risk areas such as riverine and coastal floodplains.

Environment/Natural Resources

Records indicate shifts in forest and wetland species composition, ranges of flora and fauna, decline in marine shellfish and fish populations, and availability of water resources in certain years.

Health Impacts

According to the Centers for Disease Control and Prevention, New Hampshire and specifically Rockingham County have one of the highest occurrences of Lyme Disease in the country and among the New England states.

Future Projected Conditions

Sea Level Rise

The range that best covers plausible sea level rise increases to 2050 and 2100 are those prepared for the U.S. Third National Climate Assessment (2013) and include the "Highest", "Intermediate High" and "Intermediate Low" sea level rise scenarios based on varying greenhouse gas emissions and other climate responses. However, given current trends in worldwide growth and consumption of fossil based fuels, the Intermediate Low sea level rise scenario is an unlikely future condition.

Time Period*	Intermediate Low	Intermediate High"	Highest"
2050	0.6 ft.	1.3 ft.	2.0 ft.
2100	1.6 ft.	3.9 ft.	6.60 ft.

*using mean sea level in 1992 as a reference (Parris et al., 2012)

Table RO9 - Source: Science and Technical Advisory Committee Report, NH Coastal Risks and hazards Commission, (Kirshen, Wake, Huber, Knuuti, & Stampone, 2014) based on sea-level rise scenarios provided by the National Climate Assessment.

Storm Surge

Given the uncertainties associated with changes in storm surge severity in the future, experts recommend that projects continue to use the present frequency distributions for 100-year and 500-year storms (as depicted in the 2014 FEMA Flood Insurance Rate Maps for Rockingham and Strafford Counties. (Kirshen, Wake, Huber, Knuuti, & Stampone, 2014)

Precipitation

Projected increases in annual precipitation are uncertain but could be as high as 20 percent in the period 2071-2099 compared to 1970-1999, with most of the increases in winter and spring with less increase in the fall and perhaps none in the summer. While unable at present to assign with confidence future changes in extreme precipitation events, experts recommend at a minimum that all related infrastructure be designed with storm volumes based on the current Northeast Regional Climate Data Center (Cornell) precipitation atlas to represent current conditions. Infrastructure is recommended to be designed to manage a 20 percent increase in extreme precipitation events after 2050 and that a review of these projections be continued. (Kirshen, Wake, Huber, Knuuti, & Stampone, 2014)

Energy

New Hampshire sources nearly 90 percent of its energy from out of state as it has no in-state sources of fossil fuels or nuclear material. Petroleum and nuclear power alone comprise 55 percent of the state's total energy portfolio. Of the energy produced in New Hampshire, 79 percent is derived from nuclear power and natural gas, with lesser use of renewable sources, hydroelectric, coal and petroleum sources. Total energy production in the state is derived from 89 percent non-renewable and 11 percent renewable sources.

New Hampshire consumes the most amount of energy in support of four primary uses: transportation, residential development, commercial development and industrial development. Residential and commercial development combined account for 52.5 percent of energy consumption in the state

New Hampshire Climate Action Plan

The N.H. Climate Action Plan recommends that New Hampshire strive to achieve a long-term reduction in greenhouse gas emissions of 80 percent below 1990 levels by 2050. The recommended strategies are organized into the following overarching plan goals:

1. Maximize energy efficiency in buildings.
2. Increase renewable and low CO^2-emitting sources of energy in a long-term sustainable manner.
3. Support regional and national actions to reduce greenhouse gas emissions.
4. Reduce vehicle emissions through state actions.
5. Encourage appropriate land use patterns that reduce vehicle-miles traveled. Reduce vehicle-miles traveled through an integrated multi-modal transportation system.
6. Protect natural resources (land, water and wildlife) to maintain the amount of carbon fixed or sequestered.
7. Lead by example in government operations.
8. Plan for how to address existing and potential climate change impacts.
9. Develop an integrated education, outreach and workforce training program.

2014 State Energy Strategy

The 2014 State Energy Strategy identifies as part of the Energy Vision for N.H. key drivers (high impact, high influence) that will define New Hampshire's energy future – energy efficiency, renewable power generation, fuel choice and availability, transportation options, and grid modernization. Figure RO11 summarizes critical actions to advance these key drivers and achieve the Strategies' vision. These actions will require collaboration among federal. State, regional, local and private partners and across all sectors of energy production and consumption.

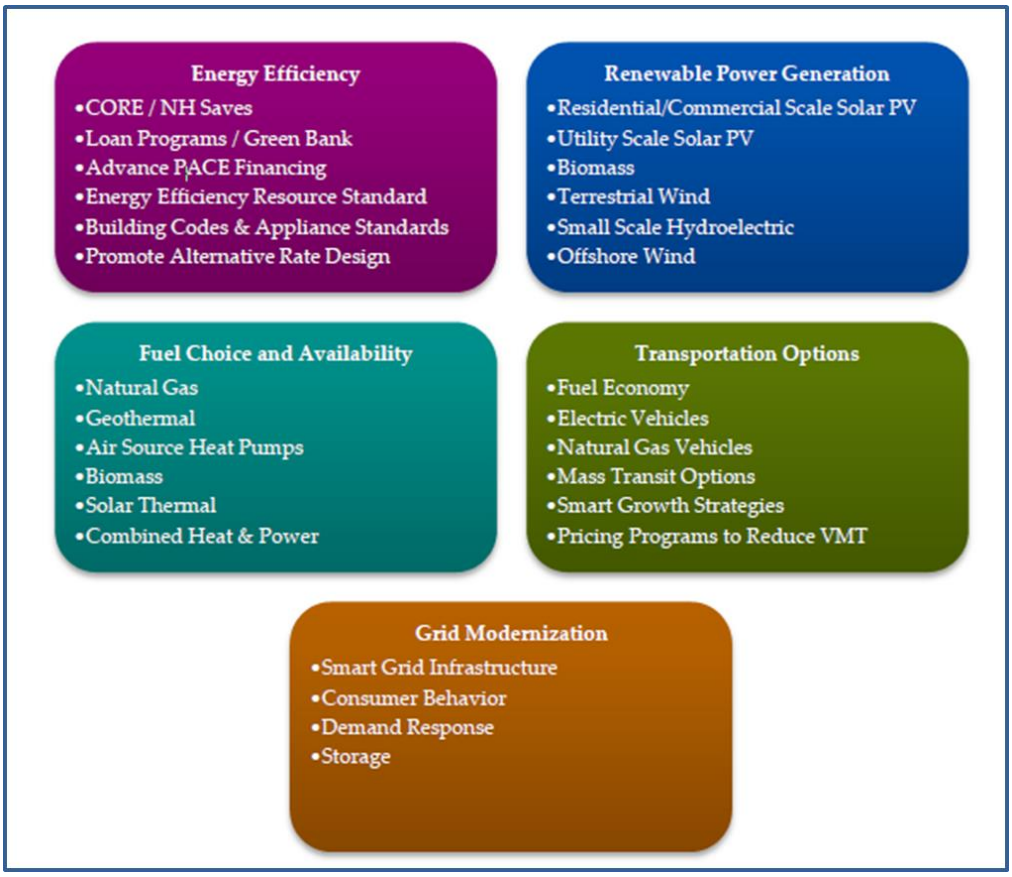


Figure RO11 – Key drivers of New Hampshire's energy future. Source: 2014 State Energy Strategy, NHOEP

Assets and Resources

Quality of life and quality of place

The assets of the region are largely derived from abundant resources, strategic location and diverse choices in living, working and recreating. These features combine to create what is widely perceived as the region's greatest asset: its high quality of life. This is reinforced by the many amenities the region offers – including a rich mix of historic, cultural and natural assets, and a location that is accessible to and from attractions like Boston, the ocean and the White Mountains. This overall desirability as a place has been an important reason for its success and points to the important role of planning in helping to maintain that quality of place.

Assets and Resources

The RPC region is one of abundant natural resources, cultural and historical assets, scenic beauty and economic opportunity. Listed below are the assets and resources that contribute to the region's quality of life and place.

Table RO10 – The RPC Region's Key Resources and Assets

Resources and Assets	Supports
Clean and Abundant Freshwater Resources: Aquifers and surface waters for drinking water supply, recreation, aquatic habitat and productivity	Recreation, Tourism, Harvesting/Production, Wildlife, Economic Development
Well-developed Highway Network: I-95, I-93, US Route 1, NH 101, and NH 125	Access To People, Goods, Services, Employment Centers
Diverse Transit System: Downeaster, COAST, Pease, park/ride facilities (although geographically limited)	Transportation Choices, Mobility
Deep Water Port Export and import of fuels, goods and materials	Economic Development
Harbors and Working Waterfront: Boating,fisheries/shellfish and goods/services	Recreation and Tourism, Economic Development
Great Bay and Coastal Areas: Diverse and abundant natural resources, wildlife habitat and scenic beauty	Recreation and Tourism Economic Productivity
Land Development and Use: Villages, developable land stock, and natural resources	Earth Materials, Water Resources, Recreation, Wildlife Habitat
Cultural and Historical Resources: First European settlements, village settlement patterns, historic buildings, production mills	Iconic Cultural and Historical Resources
Pease International Tradeport: Redevelopment of former naval base into a business park and airport	Economic Development, Employment Center, Transportation Hub
Educational Institutions: Great Bay Community College and University of New Hampshire	Highly Educated Population and Workforce
Proximity to Metropolitan Centers: Greater Boston and Portland, connected via I-95 corridor and passenger rail (Downeaster)	Employment, Goods, Services, Recreation and Tourism
Diverse and Historical Housing Stock: Urban and rural, particularly mill buildings and large historic homes	Adaptive Reuse and Redevelopment of Brownfields
Open Space and Conserved Land: Municipal, state and federal governments, and federal and local non-profit organizations	Recreation, Forests, Wildlife Habitat And Ecosystem Functions
Recreation and Tourism Base: Beaches, coastline, all-season recreation, wildlife and ecology	Local and Regional Economy
Agriculture and Food Production: Traditional crops and more recently craft and specialty products	Recreation and Tourism Food Security and Local Business
Local Volunteers In NH, 28.4 percent of residents volunteer a total of $738.4 million in contributed services	Local/Municipal Capacity, Community Character, Enhanced Services
Diverse Workforce: Skilled technicians, skilled trades and craftsmen, educators and service workers	Economic Development, Business of (all types) Including Independent

What the Region Said

The content of the regional master plan is informed by a significant amount of public input that was gathered during its development. This input was drawn from four main sources:

1. Contents of the individual local master plans from communities in the region (as available through 2013).
2. Opinions expressed by attendees at the regional visioning workshops held in 2013.
3. Results from the statewide and regional opinion telephone survey conducted by the UNH Survey Center (Spring 2013) and an online version of the telephone survey conducted by the RPC.
4. Comments and opinions expressed by RPC Commissions as they reviewed components of the draft Plan.

The full reports of all outreach results are available online at: http://rpc-nh.org/gsf/get-involved/outreach.

Local Master Plans

A comprehensive review of current local master plans was undertaken by the RPC staff at an early stage of the plan's development, focusing specifically on goals, objectives and recommendations. The following table is a ranked summary of topics that were most frequently cited as areas of interest or concern in these local master plans:

Table RO11 – Priority Issues Most Cited In Local Master Plans

1	Natural and Water Resource Protection	**11**	Bike and Pedestrian Facilities (lack of)
2	Transportation (access and condition)	**12**	Agriculture, Forests, Farmlands Protection and Preservation (loss of farms and agricultural assets)
3	Land use (loss of open space)	**13**	Sense of Community, Active Involvement, Volunteerism
4	Housing (condition, access, affordability)	**14**	Historic Preservation (loss of assets; community character)
5	Community Facilities (condition, adequacy, increased demand)	**15**	Access to Recreational Areas
6	Recreation and Trails (access, expansion)	**16**	Downtown (define, enhance, preserve)
7	Preserving Rural, Architectural, and Cultural Heritage	**17**	Rural Atmosphere Near Amenities and Services
8	Economic Development (tax base, jobs)	**18**	Planning For Growth
9	Conservation and Open Space (loss of open space; environmental quality)	**19**	Clean Air and Water, Open Spaces
10	Infrastructure (condition, adequacy, need for investment)	**20**	Energy (conservation and source diversity)

Public Input from Regional Workshop

September and October 2013

Six regional visioning workshops, called "community conversations", were held around the region in 2013 soliciting input about key concerns and issues on several topics, including natural resources, transportation and housing, economic development, climate change, energy, and land use. The discussion format followed the "SWOT" format: a brainstorming session that moved sequentially to discussion of the region's strengths, weaknesses, opportunities and threats. The key themes that arose

Figure RO12 - Portsmouth Community Conversation hosted at the Portsmouth Library in October 2013.

from these discussions are more fully explored as they pertain to each topic chapter in the Regional Master Plan.

A number of key themes, which cut across multiple topics, were raised repeatedly in different workshops. The most frequently cited perceptions of key strengths and opportunities focused on the following:

- A high quality of life.
- The region's diverse natural resources, recreational opportunities and growing support for local agriculture
- The diverse historical and cultural resources.
- Availability of clean water, energy sources, and transit network.
- Access and proximity to Boston, Portland and Manchester/Concord.
- The schools and educational opportunities in region are strong.
- The highway network is good and generally well maintained
- A highly educated and motivated workforce.

The common perceptions of weaknesses and threats to the region centered on the following:

- Lack of infrastructure in parts of the region (sewer, water, natural gas, broadband internet access, transit)
- Inadequate investment, maintenance and upgrading of existing infrastructure, especially sewer, water systems.
- Further loss of open space from additional development and the impact recreation, regional character and natural resources.
- The scarcity of workforce-affordable housing, high relative cost of energy.
- The lack of inter-municipal cooperation in approaching regional scale problems and needs.
- The cost stricter environmental regulations will impose on communities.
- Challenges of helping senior residents stay in their homes and communities, and keeping and attracting young families.
- Too much development of 'big box' retail establishments.
- Concern over sustainability of groundwater as a principle public water supply
- Vulnerability to increased flooding

University of New Hampshire-Cooperative Extension-NH Listens

Regional Themes from the NH Listens Public Outreach Event in Kingston, NH on May 14, 2013

UNH Cooperative Extension and NH Listens designed and hosted a public outreach and engagement event for residents in the region to talk with neighbors to identify local assets, local needs, and ways to effectively use limited government resources. Small group discussions focused on the core principles of traditional settlement patterns, housing choices, transportation choices, natural resources, community and economic vitality, climate change and energy efficiency. Participants were asked to consider the critical questions:

1. ***How should we plan for the future?***
2. ***What core considerations should be the basis of planning for a thriving future?***

Figure RO13 - Participants at the NH Listens Kingston, N.H. public outreach event in 2013.

Following is a summary of discussions from the public outreach and engagement event.

Who We Are and How We Are Changing

There was an interest in both the increase of senior populations and the declining populations of young people in New Hampshire

Seniors

- Groups expressed concern that seniors were untapped potential in the state, and that there was a need to

motivate this population to bring time and talent to the community.

- There was also a concern about how elderly populations would function in the future, particularly in relation to transportation and getting to needed services and resources.
- Participants discussed the need for competitively priced healthcare, particularly for seniors.

Youth

- In particular, groups expressed concern about youth migration out of the state.
- As groups discussed lack of jobs in the area, one focus was creating more jobs to support and attract young people.
- Another concern was the quality of education in general and a lack of affordable higher education in the state for young people

How We Use Land

- Groups discussed how to balance economic development with the local charm of the area, the beauty of the natural landscape, and a clean and healthy environment.
- There was discussion of the value of natural resources, the environment, green spaces, and an interest in developing local agriculture.
- The groups also discussed the potential and complications of attracting more tourism to the area. One concern was that people come to NH just to get affordable cigarettes and alcohol.
- There was some controversy among groups about land and taxes.
- Many groups discussed complications with zoning and guidelines in relation to development.
- Overall, there was a desire to value natural resources while supporting economic development.

Jobs and Economic Development

- Groups discussed a need for support of business growth.
- Many groups agreed upon a need for more types of job opportunities and increased availability of local jobs.
- There was discussion about a need for infrastructure that is supportive of a new economy and technology (broadband, cell phone coverage).
- Groups also commented on a need for educational training and improvement of education in general.

Quality of Life

- Many participants talked about maintaining our "quality of life" but admitted we think very differently about what quality of life means.
- Groups want to maintain the character of the state, enhance infrastructure, and attract jobs.
- There was an interest in building safe and healthier communities.
- People love the quality of life in the area but feel there needs to be jobs to support the community.

Housing and Transportation

- Groups discussed a need for more effective transportation for populations who experience challenges driving such as the elderly, sick, disabled, or low-income individuals.
- Some groups felt that this transportation should be publically funded whereas others discussed how a transportation system could evolve from volunteerism and local initiatives.
- There was a concern in the groups about where the funding would come from for public transportation.
- Some groups discussed an interest in creating more walkable communities and ride and walk services in addition to cars.
- Groups discussed the importance of proximity of local business and jobs to where people live.

How We Govern Ourselves

- There was discussion about a need for more effective communication both within towns and between different towns.
- Groups discussed a need for transparency in regional planning.
- Some groups commented on a distrust of the government.
- There was discussion about the limits of local and state regulations.

- Groups expressed some controversy over taxes and local funding.

Statewide and RPC Region Survey – UNH Survey Center

The Survey Center University of New Hampshire, July, 2013
Tracy A. Keirns, M.A.Zachary S. Azem, M.A. and Andrew E. Smith, Ph.D.

May 2013 - July 2013

During May-July 2013, the University of New Hampshire Survey Center conducted a statewide random sample survey for New Hampshire's nine Regional Planning Commissions, as part of the *Granite State Future* and *New Hampshire Broadband Mapping and Planning* initiatives. Funded in part by a grant from the US Department of Housing and Urban Development (HUD), and from the National Technology Infrastructure Administration (NTIA).

The specific areas of interest were New Hampshire resident's opinions on a range of issues facing communities around the state – transportation infrastructure, housing, economic development, natural resource management, energy, natural hazard mitigation, broadband services and others. A survey of two thousand nine hundred and thirty-five (2,935) New Hampshire adults was conducted by telephone between May 9 and July 21, 2013. The response rate was 33% and the margin of sampling error for the survey is +/- 2.2%. (See Technical Report for a more detailed description of survey methods.)

The intent of the survey was to provide the nine RPCs with statistically valid results on public opinion concerning these issues, and with enough sampling in specific areas so that differences in opinions and attitudes between regions could be discerned. The key difference and value of the survey is that it represents the opinion of a representative cross section of the population rather than those who have self-selected to participate.

The key findings from the survey are summarized below. The full report, including detailed tables and graphs and cross tabulated results for each question in the survey, can accessed at:

http://granitestatefuture.org/regions/rockingham-region/.

These are a few of the highlights of the results.

Key Findings

- Responses from residents of the Rockingham region were largely similar to those of statewide residents. The big difference involved what type of neighborhood residents live in (**more Rockingham residents live in a neighborhood close to the town center and less live in a rural location away from the town**).
- **Residents believe that environmental protection and natural resource protection should be the top priority for investing public dollars,** and a majority believes that all environmental protection measures mentioned should be high priorities for policymakers.
- Residents view energy efficiency and energy choices as the second most important priority for investing public dollars. **Residents are largely in favor of energy efficiency and renewable energy projects**, except for the idea of having public charging stations made for electric vehicles.
- **Residents view safe and affordable housing as another important priority** for investing public dollars. The development of single family housing and assisted living facilities were particularly favorable to residents while development of manufactured housing and apartments were the least favorable.
- **Residents say that the top activity that their community should actively encourage is promoting local agriculture (91%).** Majorities want to encourage many other activities as well, including protecting historic buildings and neighborhoods (90%), and promoting safe places to walk or bike (87%).
- **Residents view quality schools as the most important thing to have in their community (94%).** Other important aspects of a community include having small businesses and retail stores (83%), grocery stores (82%) nearby job opportunities (82%), and cultural and recreation facilities (82%).
- **Residents view maintaining our bridges and highways to be the most important priority for transportation funding (70%).** Residents were split on funding for other transportation initiatives,

with a narrow majority favoring funding for the availability of bike paths (58%), and for senior and special needs transportation (54%).

- **The vast majority of residents (94%) have internet access at home,** and almost all of them (94%) consider their internet access adequate for their uses. Almost as many (87%) would not be willing to pay any additional money in exchange for faster internet speeds.

RPC Online Community Survey Results

September through December 2013

From September through December 2013, Rockingham Planning Commission (RPC) conducted an online survey as part of the Commission's outreach efforts for updating the Regional Master Plan. The online survey focused on the needs and wants of residents in the region now and into the future on a range of topics including land use, transportation, economic development, natural resources, climate change and energy, and historical resources. Over 250 residents of the RPC region participated in the survey.

The online survey was a modification of a state-wide telephone survey conducted by the University of New Hampshire Survey Center on behalf of the state's nine Regional Planning Commissions as part of the Granite State Future project. (The intent of the Granite State Future project is to update all nine regional master plans in the state in a coordinated fashion.) The results of the state-wide survey are statistically representative and additional telephone survey work was conducted in the RPC region to obtain statistically representative regional results. The online survey was conducted to provide residents an additional opportunity to participate in the regional master plan update.

The online survey was published on the Commission's website, email notifications were sent to RPC contacts (including RPC Commissioners, municipal officials and land use boards), and postcards with the survey website were distributed at various local and municipal meets and events. Below are the number of survey responses by RPC municipality. The survey results below are intended to highlight major themes represented in the results. The results of the online survey are not statistically representative of the region. Ultimately, the results of all survey work, along with all other public input received, will be used to inform the Regional Master Plan update as part of the Granite State Future project.

Key Findings

- Most survey respondents (64%) live away from a town center (153 versus 85). A smaller majority of respondents (55 percent versus 45 percent) would prefer to live in a larger home with a larger yard even if it means longer commute time versus a smaller home and yard with a shorter commute time.
- Most respondents rate the condition and availability of public transit and pedestrian/bicycle transportation options as somewhat poor or poor. There is limited support for investing in more funds to invest in these areas of transportation. The condition of roads and highways is generally rated as good or excellent. There is general support for continued investment in maintaining the road network; however, respondents were split between a willing to pay more by paying a higher gas tax.
- Nearly all respondents considered protecting air and water quality a medium or high priority. Preserving farms and recreational areas were also considered relatively high priorities. These findings were also repeated with the majority of respondents indicating that having farms and recreational facilities in their community is important.
- Having quality schools, nearby job opportunities, and nearby business and retail opportunities were all considered either very important or somewhat important by the large majority of respondents.
- Very few respondents considered housing for rent or purchase very affordable in their communities. Most respondents supported town's encouraging single family homes almost twice as often as multi-family housing options.
- The top three items respondents indicated should be actively encourage in their communities were promoting safe places to walk or bike, promoting local agriculture, and protecting historic homes in neighborhoods.
- The majority of respondents strongly supported policies that encourage energy efficiency with the exception of public charging stations for electric cars.
- There was a mixture of concern for community emergency preparedness and most respondents indicated they were concerned with power outages and snow storms more than flooding, drought, wind damage, or wildfires.

Key Issues and Actions for the Future

During the course of developing this Plan many issues, opportunities, and potential recommendations have been identified which are relevant to the region's future development. They have come from multiple sources, including the analysis of conditions identification of relevant trends in the region, from common planning priorities expressed in local master plans, and from input from the public and various stakeholders. Each chapter of the Plan identifies key issues and challenges as well as recommendations and actions specific to that chapter's subject matter. Many cut across multiple topics and appear in multiple chapters. In the following section, the most important of these issues and recommendations are summarized. Additional detail and recommended actions can be found in individual chapters.

Transportation

Issues

Changing Travel Patterns: In 2004 the per capita Vehicle Miles of Travel (VMT) peaked after 30 years of growth and began to decline due to a combination of technology change, demographic shifts, and high oil prices and other economic factors. These trends and broad public input suggest that the way we prioritize investment in the transportation system needs to change, moving away from capacity increasing highway projects, and directing more resources towards roadway system preservation and expansion of access to pedestrian, bicycle, and transit to serve the growing number of non-drivers.

Adequacy of Funding for Transportation Infrastructure: The poor physical state of transportation infrastructure in the region remains a problem and maintaining the system with inadequate funding is a challenge. Funding for public transportation is a particular challenge as the state ranks consistently near the bottom nationally in funding and relies almost exclusively on local funds to maintain services.

Freight Movement: Goods movement is expected to increase by 48% and more freight will be moved by rail, ship, and pipeline. This raises concerns about roadway damage from heavier trucks, the safety of transporting hazardous materials, and the need for investment in rail, port, and other infrastructure.

Land Use Patterns: Existing land use patterns represent several significant challenges to the transportation system:

- Lower density development that is spread out over a large area is much more difficult to serve with transit than in a more compact development pattern, where centrally located stops can serve many residents and businesses within walking distance.
- Subdivisions with many dead end streets do not provide for a good network of interconnected streets and do not provide redundancy in access to land uses.
- Commercial highway development causes significant congestion on the region's secondary arterial highways if developed without appropriate access management features.

Climate Change: The trend of increased frequency and severity of storm events over the past decade has significant implications for transportation system operations, maintenance and future investment planning. Roadway infrastructure in coastal areas are particularly vulnerable to those impacts. Additional attention is needed to identify and make appropriate modification to vulnerable roads and culverts.

Complete Streets: Bicycle and pedestrian accommodations are often only prioritized in highway projects in response to input from advocacy organizations, rather than as an integral piece from the start. A response to this is the concept of *Complete Streets,* which emphasizes that streets should be designed and operated to enable safe access for all users.

Safe Sharing of Roadways: Each day in the United States, more than 9 people are killed and more than 1,060 people are injured in crashes that are reported to involve a distracted driver (NHTSA). Distracted driving is one of only two causative factors that is growing in New Hampshire and is a factor in 27 percent of fatal crashes over the last three years (Rayno, 2014). As bicycle and pedestrian use of roadways continues to grow, the region has seen an increase in user conflicts and a need for broader public outreach on the rights and responsibilities of all highway users, and safe sharing of the road.

Transportation Needs of an Aging Population: As documented in this Plan and many other sources, the population of non-drivers in the region will increase dramatically as the baby boom generation ages. With that, and the desire for many residents to age in place, a large increase in elderly transportation services will be needed. In rural areas, this will be exceedingly expensive to implement unless volunteer driver programs or other low cost rural transportation services are able to greatly expand.

Recommendations

- Prioritize transportation investment in the region's already developed areas through weighting of project selection criteria.
- Promote development of highway designs and standards and other methods of maximizing the efficiency and effectiveness of the transportation system.
- Work with NHDOT on the development of the Statewide Freight Plan.
- Work to increase the amount of Federal, State, local, and private funding available to address project needs across all modes. In particular, work to establish a dedicated state funding stream for public and community transportation.
- Expand volunteer driver programs and integrate them with existing community transportation systems to better serve elderly populations.
- Refine the project development process through early data collection and scoping to better enable project selection with more complete information.
- Develop and adopt a Complete Streets policy for the Rockingham Planning Commission MPO and ensure that pedestrian facilities are not omitted from highway projects due to lack of an entity willing to take responsibility for long-term maintenance.
- Provide technical assistance to municipalities for bicycle, pedestrian and public transportation planning.
- Identify and track performance measures related to transportation safety.
- Complete the current vulnerability analysis of the transportation system to severe storm events, and determine where investments can be made to reduce impact potential.

Economic Development

Issues

Demographic Headwinds: An aging population represents several challenges to the regional economy. We have a small age cohort of people aged 15-34, a very large cohort of those aged 45-64 and a labor force participation rate statewide that has fallen gradually for the past two decades. Over the next 20 years this will mean, unless mitigated by other factors, a smaller workforce available to businesses and low- to no-net population growth in the region. Second, the size of the aging population will add to healthcare and home care costs incurred by individuals, businesses and communities. The region lacks a well developed home health and community transportation systems that will enable a larger population of seniors to age place. Both factors will act as a drag on the regional economy.

Infrastructure Investment: Economic development depends on the availability and adequacy of infrastructure to support that development. Development in many communities in the region is and will continue to be limited because they lack the type of infrastructure, including sewer, water, natural gas, broadband and rail access that is a prerequisite for certain businesses and industries. Communities that do have infrastructure face high costs of maintaining and upgrading that infrastructure. Deferred investment, especially in sewer, water and transportation infrastructure is shifting these capital costs to the future and adding a cost burden on the economy going forward, either through loss of services from failed infrastructure or from higher fees and taxes required to restore it.

Broadband Access and Capacity: The ongoing ability of the region to attract the most sought after industries and manufacturers in the future will depend on near universal access to high speed internet connections, with the bandwidth and capacity to meet future demand of businesses, institutions and residents. Broadband access has become an important differentiator in determining the competitiveness of a region for

economic development and is likely to become much more so in the future. Broadband access in the region is very high (>90%) and available speeds in most areas are adequate, however costs are high. A significant concern going forward is that broadband services in most communities have very limited competition which may deter competitive pricing and service in the future.

Housing Supply: A constrained housing supply and high relative housing cost is likely to make some businesses, especially ones relying on lower wage employees less able to attract the workers they need. It may cause them to be less competitive compared to other regions if wages are commanded in order to compensate for higher costs of living. The RPC region has the highest average cost for housing, both purchase and rental in the state, but average wage rates are not significantly higher than the state average, according to NH Employment Security surveys.

Workforce Development & Training: Targeted, industry-specific workforce training and skill set development is increasingly recognized both in New Hampshire and elsewhere as a critical economic development strategy. Equally important is recruiting and retaining a well educated talented, creative workforce. Such efforts are well aligned with an overall strategy to identify and support the needs of the key industry clusters that either exist or are developing in the region including Advanced Materials, Manufacturing, Machine Manufacturing and others which require highly skilled and specialized workforce training.

Regional Cooperation: From an economic development standpoint, the region's and state's reliance on municipal government to deliver nearly all local services is both a strength and a potential weakness. The strengths come in having accessible, responsive, accountable and flexible government. The weaknesses lie in the inherent duplication, inefficiency and lack of capacity in organizing and administering those services, especially in smaller communities. Greater levels of regional cooperation in the delivery of certain municipal services such as sewer, water, waste disposal, emergency services, purchasing, IT management, etc. hold the promise of achieving economies of scale, while retaining the benefits of local governance.

Climate Change and Coastal Impacts: The region's coastal municipalities are confronted by a particularly challenging set of land use and hazard management concerns that include extreme weather events, storm surges, flooding, coastal erosion, and loss of key coastal habitats. These issues are exacerbated by changes in climate that result in an increase in the frequency and intensity of storms and an increasing rate of sea level rise. Projections of sea level rise over the next century range from 1.6 to 6.6 feet, according to the latest National Climate Assessment (2013) and has the potential to displace coastal populations, threaten infrastructure and may lead to the loss of homes, businesses, public infrastructure, recreation areas, public space, coastal wetlands and salt marsh. These increased flood risks are compounded by continued growth and development in low-lying vulnerable areas. Preparing for higher sea level could be enormously costly and economically damaging as it becomes necessary to elevate building and infrastructure.

Quality of Life: Perhaps the most important asset the region has in creating economic success is its overall appeal and quality of life from amenities the region offers – including a rich mix of historic, cultural and natural assets, and a location that is accessible to and from attractions like Boston, the ocean and the White Mountains. This high quality of life attracts people, especially those that have discretion about where they live, including young, creative and entrepreneurial workers as well as higher income retirees. These factors may be leveraged to maintain economic growth in the midst of the other negative factor described above as 'headwinds'. However, these assets must also be protected to attract economic development and in-migration. To the extent that these assets or the character of the region are diminished from poorly planned and poorly designed development or from inadequate investment in our communities, schools, and infrastructure then we will lose this advantage.

Recommendations

- Fund, maintain, upgrade and expand the region's infrastructure (transportation, sewer, water, energy, telecommunications and broadband) to address current and future needs of the region.
- Develop service models and governing capacity to enable municipalities to share and consolidate municipal services where efficiencies and outcomes would be improved.
- Develop the skills and education in the workforce at all levels (high school, vocational/technical, community college, university) to match the needs of the region's employers.
- Protect the region's high quality of life and cultural and natural amenities.

- Eliminate unnecessary barriers to the development of workforce-affordable housing in all parts of the region.
- Take "no-regrets" actions beginning immediately to reduce future vulnerabilities and costs associated with climate change.
- Implement regional strategies for transportation, land use and the built environment that improve energy efficiency, increase cost effective renewable energy production and utilization.
- Coordinate state, regional and local infrastructure and development project priorities to maximize funding and investment opportunities.
- Work with communities and service providers such as the University of New Hampshire and the state and Federal government to ensure adequate broadband access and capacity to meet the future needs of all users in the region.

Housing

Issues

Housing Affordability: The RPC region continues to be an expensive place to live. Median house costs ($299,900) and median gross rental costs ($1,237) are higher than those for the rest of the state. Although the recession caused a general down turn in housing costs, they have returned to an increasing trend in the past 18 months. Factors driving these costs include high land values associated with the regions proximity to Boston, restrictive zoning which often prohibits densities required to construct smaller more affordable homes, local and neighborhood resistance to workforce, affordable and multi-unit housing, and a housing industry that has tended to favor high end housing construction.

Housing Needs for an Aging Population: Like the rest of the state, the RPC region is experiencing a aging of its population. In the RPC region, the number of renters and owners aged 65 and older is expected to double by 2020. Seniors face significant challenges such as lower median incomes, higher levels of disability and limited access to transportation and other services making housing choices more limited. Dramatic increases in the number of elderly citizens will have an impact upon housing in the region in several ways. While seniors generally want to age in place, this desire is complicated by several factors, including high rates of disability, lower median income and savings, declining caregiver population, and lack of access to transportation and services. Older residents choosing to age in place often find their housing to become unaffordable as their income decreases. The existing housing stock in the region, with a preponderance of single family detached homes located away from services is not necessarily a good match for the housing needs of this population.

Workforce Housing: The opportunity for workforce housing remains elusive in many communities within the RPC region, especially where there is little multi-family housing available. The newest models of housing production that take into account the latest NHOEP population projections, indicate only a modest near term need for new workforce affordable housing. Based on the RPC region's near term future population growth from 2010 – 2020, the annual need for new housing construction will be 225 housing units per year. Of these 2,250 units approximately 1,000 of these will need to be workforce housing units.

Recommendations

- Communities should periodically evaluate their land use policies, including zoning and land use regulations to ensure that they provide adequate and realistic opportunities for the development of a diverse housing stock including workforce housing.
- Communities should encourage housing opportunities that address the needs of senior residents. This may include senior housing located close to necessary services and/or with community or elderly transportation access to health services and retail facilities, and allowing flexible use of single family homes to include accessory units, live-in caregivers and similar options.
- Communities should evaluate their present housing stock in regard to affordability thresholds and if existing housing stock does not meet appropriate thresholds for regional need, lands use regulations should be pursued, such as inclusionary housing provisions or density bonuses to allow for such housing developments.

- Encourage communities to develop mixed use and multi-density and nodal zoning ordinances which allow and encourage additional residential development in or near existing town centers or planned areas of new mixed use development.

Natural Resources

Issues

Impervious Surface and Water Quality: Increases in impervious surface and land use change is causing water quality to decline. In the RPC region, over 90 percent of the water pollution entering lakes, rivers, streams, and estuaries is from stormwater runoff. Much of this run off comes from impervious surfaces (e.g. parking lots, roads and rooftops) which have nearly doubled in the last twenty years. One of the most cost-effective ways to treat existing stormwater pollution is by keeping the areas near waterways as natural as possible.

Water Infrastructure Requires Greater Investment: The cost of maintaining water infrastructure is growing. The region's water systems, wastewater systems, dams, and stormwater infrastructure is becoming increasingly costly to maintain due to lack of historical investments, increase demands on the systems, stricter state and federal standards for water treatment, and increased demand from development and damage from storm events. For example, in the next 10 years the RPC region's wastewater systems are expected to need over $250 million in investments. The maintenance, repair and upgrade costs often fall entirely on the area or municipality they serve, and in some cases, such as dams, the individual owner.

Loss of Unfragmented, Open Space: The region continues to lose open space for recreation, agriculture, wildlife habitat, environmental service protection, and scenic beauty. Having 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. As the region has continued to grow, particularly into more undeveloped areas, open space is becoming increasingly smaller and fragmented. Currently, only 15 percent of the land in the RPC region is permanently protected from development and will always remain as open space. In 1962 the average size of undeveloped blocks in the region was 182 acres; in 2010 it was only 69 acres.

Recommendations

- Reduce the rate of growth of new impervious surfaces to minimize stormwater runoff and protect water resources.
- Increase the natural buffer areas around waterways to help remove pollution from stormwater.
- Develop long-term investment and maintenance plans for water infrastructure systems, including identification of long-term funding sources.
- Owners and operators of water infrastructure seek out opportunities for collaboration with other systems, by connecting systems or pooling maintenance resources, to reduce costs.
- Communities prioritize areas of open space to protect that provide multiple benefits (environmental, recreational, or cultural) and implement regulations to encourage their protection.

Historic Resources

Issues

Consideration of Historic Resources in Community Planning Process: While in the abstract, a large majority of the public sees protecting historic resources as a public role (UNH Survey). In practice the consideration of historic resources is not as well integrated into the planning process as it could be. This is particularly the case for resources outside of designated historic districts.

Redevelopment, Densification and Teardowns: Pressure for development and redevelopment is growing as the economy rebounds and land values increase. Where property values are highest, this is leading to tear-downs of relatively modest older homes and other historic structures to build larger residences or higher density commercial or mixed use developments.

Historic Resources and Sustainability: A characteristic of older buildings that is often overlooked by energy efficiency advocates and the building industry is the high level of embodied energy present in old buildings. Simply defined, *embodied energy* is the energy required to extract, process, manufacture, transport, and install building materials. When older buildings are preserved and reused this embodied energy is conserved, new material needs are minimized, and large carbon emissions from new construction avoided. Beyond energy efficiency, historic resources are in and of themselves key components of community sustainability – creating the character and sense of place in a community, adding economic value and fostering a sense of community pride and stewardship.

Historic Resource Inventories: Extensive historic resource inventory work was completed for Rockingham County in the 1980s-1990s. The location and status of some of these inventories is unknown and much of this information has never been integrated with local or regional Geographic Information Systems for ease of access by planners and policymakers. Further, much of this original survey work focused on 17th-19th Century, high-style buildings and did not address early 20th Century resources. Significant inventory work has been done more recently as part of major infrastructure projects per Federal requirements, but major gaps exist and most communities report a lack of resources for updating inventories.

Historic Assets to the Region: The region's historic assets are an underappreciated element of its desirability and appeal as a place to live work and play. The opportunity exists to better integrate and utilize these assets in the "heritage tourism" component of our economy.

Recommendations

- Include a chapter on historic and cultural resources in municipal master plans that: recognizes community character, includes provisions for updating resource inventories, and considers the economic and community development potential of protecting local heritage.
- Expand local use of innovative land use policies to promote rehabilitation and continued use of historic properties, and ensure new development and redevelopment complement community character.
- Establish Heritage Commissions and/or Historic District Commissions as local champions for the identification, recognition, protection, and management of historic and cultural resources.
- Promote local and regional efforts to use historic and cultural resources as economic development tools, including Scenic Byways and local Main Street programs and other heritage tourism initiatives.
- Expand and promote local and regional educational initiatives focusing on local history to further public understanding of and appreciation for historic resources.
- Develop funding sources in the region for conducting local historic resources inventories, conservation, rehabilitation, and education initiatives.
- Build local and regional capacity for the protection and management of historic and cultural resources; develop capacity at the Rockingham Planning Commission to assist member communities with historic and cultural resources planning.

Energy

Issues

Energy Pricing and Choices: Energy is not priced in ways that promote efficiency and choice of renewable sources. The built in advantages of natural gas and oil for base load electricity generation and for home heating together with public ambivalence toward social, environmental and health impacts of fossil based fuel use dampen choices toward renewable and alternative energy sources. Total energy production in the state is derived from 89 percent non-renewable sources and 11 percent renewable sources (State Energy Strategy, 2014).

Energy Security and Renewable Energy: Energy security and renewable energy are important for our economy and quality of life. Most of New Hampshire's energy is imported from outside the U.S. The N.H. Climate Action Plan and NH State Energy Strategy recommend expanding the capacity of renewable

energy sources. This can reduce the dependence on imported fuel and energy, and retain more energy dollars in New Hampshire, which also has a positive impact on non-energy sectors of the state economy.

State Energy Strategy: In 2014, the state developed a comprehensive energy strategy which developed recommendations for action in various areas including grid modernization, energy efficiency and development of renewable energy sources and markets. In terms of implementation, the state has several policies already enacted to help address energy consumption and GHG emissions (RGGI and RPS) but lacks dedicated funding or other necessary policies to advance the strategies and recommendations in either the N.H. Climate Action Plan and State Energy Strategy (2014).

Recommendations

- Implement a diverse and interconnected set of energy solutions that promote energy independence of both individuals, communities and New Hampshire as a whole.
- Expand the installation of and capacity to distribute energy from renewable energy sources.
- Increase energy production from renewable and low-CO^2-emitting sources of energy in a long-term sustainable manner.
- Implement energy strategies that reduce greenhouse gas emissions across all sectors of energy consumption.
- Increase energy efficiency and conservation measures to moderate use of non-renewable energy sources.
- Secure local and regional funding sources to implement recommendations from the N.H. Climate Action Plan and NH State Energy Strategy.

Natural Hazards and Climate Change

Issues

Increased magnitude and frequency of extreme precipitation events: Since the 1990's the magnitude and frequency of extreme precipitation events have increased compared with the historical trends since 1950. These events often cause widespread damage to roads and infrastructure and disruption of businesses, schools and daily life.

Sea Level Rise Threatens Coastal Resources: Seasonal coastal flooding and sea level rise is impacting ecosystems and environmental services. Resources impacted include coastal wildlife, forests and tidal wetlands, and environmental services that protect the built environment such as critical flood storage. The 2014 U.S. National Climate Assessment indicates that coastal communities should prepare for sea level rise over the next 100 years that could range between 1.7 and 6.6 feet. The Science Panel Report of the NH Coastal Risk and Hazards Commission (RSA 483-E) has concurred that these national estimates are applicable to the coast of New Hampshire. The report presents the plausible range of sea level rise along New Hampshire's coast is between 0.6 and 2 feet by 2050 and between 1.6 and 6.6 feet by 2100 (compared to mean sea level in 1992). The report recommends that for coastal locations where there is very low tolerance for risk in protecting new infrastructure, existing coastal settlements, infrastructure or ecosystems that the assumption of sea level rise in the range of 1.3 to 2.0 feet be used for the year 2050 and 3.9 to 6.6 feet be used for 2100.

Development in High Hazard Risk Areas: Development, investment and population have increased in high risk coastal areas and riverine floodplains. Seasonal flooding and coastal storm related flooding have worsened, often impacting public and private investments. Investment in these high risk areas has increased over time, including the density of development and conversion of seasonal structures to year-round residents and businesses.

Funding for Infrastructure Upgrades: The state and municipalities have limited financial resources for long-term infrastructure improvements and upgrades. The state and municipalities lack consistent and dedicated funding sources to implement necessary upgrades to roads and infrastructure today and to address future impacts of climate change. There is also a lack of information to help prioritize management actions.

Municipal and Agency Coordination for Natural Hazards Planning: Municipalities lack capacity for coordination and long range planning for natural hazards. Only a handful of municipalities have full-time planning staff. Others have part-time staff or circuit rider planners, or no planning support. Even those municipalities with planning support find it difficult to increase workloads particularly to address a complex topic like natural hazards and climate change. The NH Coastal Adaptation Workgroup (CAW) is a collaborative network of organizations agencies and municipalities working toward providing information and increasing the capacity of others to plan for future impacts of climate change.

Protect Coastal Resources: The protection of natural and constructed systems, social services, and historic and cultural resources should be integrated with engineering and regulatory frameworks of shoreline management. The formation of coastal dunes, beaches and marshes provide flood protection for the built environment. Shallow tidal waters provide critical habitat for fish, shellfish and recreation that support local and regional economies. Modification to natural shoreline and coastal processes today can significantly reduce the ability of these systems to adapt to rising sea level and greater storm surge.

Recommendations

- Prepare multi-hazard and climate change vulnerability assessments for coastal and Great Bay municipalities (including inventories of existing infrastructure, assets and facilities) to provide municipalities and state agencies the information necessary to adequately prepare for future conditions.
- Collaborate with natural resource and environmental agencies and organizations to conserve and protect environmental services provided by natural landscapes.
- Develop technical assessment tools to guide planning and regulatory decisions that consider both the human and natural environments.
- Work with state agencies, utilities and municipalities to plan for future use of lands in high risk areas served by state, municipal and private infrastructure, considering adaptive reuse, relocation, and retreat strategies.
- Evaluate new and alternative funding mechanisms for upgrades and planned actions that address future impacts of climate change.
- Prepare comprehensive management plans that prioritize improvements for regular maintenance and incorporate actions to address future impacts of climate change.
- Create local multi-sector planning committees to identify and integrate key cross-cutting issues and recommendations into municipal policies and programs, regulations and building codes.
- Incorporate information on future hazards and climate change in municipal planning documents (e.g. Hazard Mitigation Plans, Master Plans, capital improvement plans, and open space and land conservation plans).
- Continue support of collaborative partnerships and networks of professionals, practitioners, and researches that provide technical assistance and build capacity for municipal actions.
- Improve shoreline management to address the intensifying challenges posed by climate change, including management of development and infrastructure investments in high risk areas.

Support for the Regional Vision and Goal

The Vision and Goal for the RPC region for 2040 were developed by incorporating the goals of local master plans, past RPC regional master plans, RPC Commissioners and. public input received during the development of this Regional Master Plan. To help ensure the chapter goals found within each topical chapter of this Plan reflected the overarching Regional Goal, each chapter goal was ranked to determine to what level it supported the different aspects of the Regional Goal (***RO Figure 16).*** Overall, chapter goals support or partially support the Regional Goal. A detailed summary of each Chapters' goals support of the regional goal can be found within the Implementation Matrix chapter.

REGIONAL VISION

The southeastern New Hampshire region enjoys a high quality of life represented by a strong regional economy, distinct community character, and outstanding natural and recreational resources. This has been achieved through careful planning, wise stewardship of natural resources, infrastructure investment, and increasing regional cooperation on shared issues.

REGIONAL GOAL

Promote efficient use of land, resources and infrastructure in southeastern New Hampshire 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.

Figure RO14 – Summary of chapter goals support for the RPC Regional Goal.

	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.
Number of chapter goals that support the regional goal.	**58**	**54**	**50**	**41**	**34**
Number of chapter goals that partially support the regional goal.	**7**	**11**	**11**	**22**	**18**
Number of chapter goals that do not apply to the regional goal.	**1**	**1**	**1**	**3**	**14**
Number of chapter goals where it is unknown if the chapter goal supports the regional goal due to lack of information or unknown future conditions.	**0**	**0**	**4**	**0**	**0**

TRANSPORATION CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Transportation

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Cover photo credits: I-95 Open tolling construction, NHDOT (middle left), and Cooperative Alliance for Seacoast Transportation (COAST) bus at, COAST.

Transportation

Introduction

This chapter of the Regional Master Plan describes the transportation network of the Rockingham Planning Commission (RPC) region and the current issues and challenges faced in aligning limited financial resources with growing transportation network needs. The overarching goal of the Transportation Chapter is to establish and maintain a modern multi-modal passenger and freight transportation system that has sufficient capacity, is resilient to natural hazards, and is safe, convenient, affordable, and equitable for all users. The transportation system will support sustainable economic growth and development patterns, and foster stewardship of natural, historic, and cultural resources.

Regional Transportation Planning Philosophy

Every urbanized area of the United States has a federally-designated Metropolitan Planning Organization (MPO), made up of local, state and federal representatives, that is charged with assessing regional transportation needs and reviewing, prioritizing and approving all transportation projects in the region that use U.S. Department of Transportation funding. MPOs were developed to ensure local input into federal transportation project development, as a response to the leveling of many urban neighborhoods with limited local input during the peak of construction of the interstate highway system during the 1950s and 1960s. As the MPO for the region, the RPC is tasked with implementing and maintaining certain planning processes and these are guided by the transportation planning philosophy of the MPO:

- The transportation planning process will be comprehensive, cooperative, and continuous as required by the federal "3C" process.
- Transportation investments recommended by the MPO will be those that best support the New Hampshire Livability Principles, the goals and policies of the Regional Master Plan, and the MPO Long Range Transportation Plan.
- Transportation planning efforts of the region will be integrated and coordinated with state, regional, and local land use, economic, and environmental planning.
- The Transportation Investment priorities of the region are:
    1. Preserve, maintain, and modernize the existing transportation system
    2. Improve the safety and operations of existing transportation facilities
    3. Increase multi-modal capacity, particularly transit, bicycle and pedestrian connections

> ***Multi-modal*** is a word that appears throughout this document. A ***Multi-Modal*** transportation system features an integrated network of highways, transit, and bicycle and pedestrian facilities and travel options.

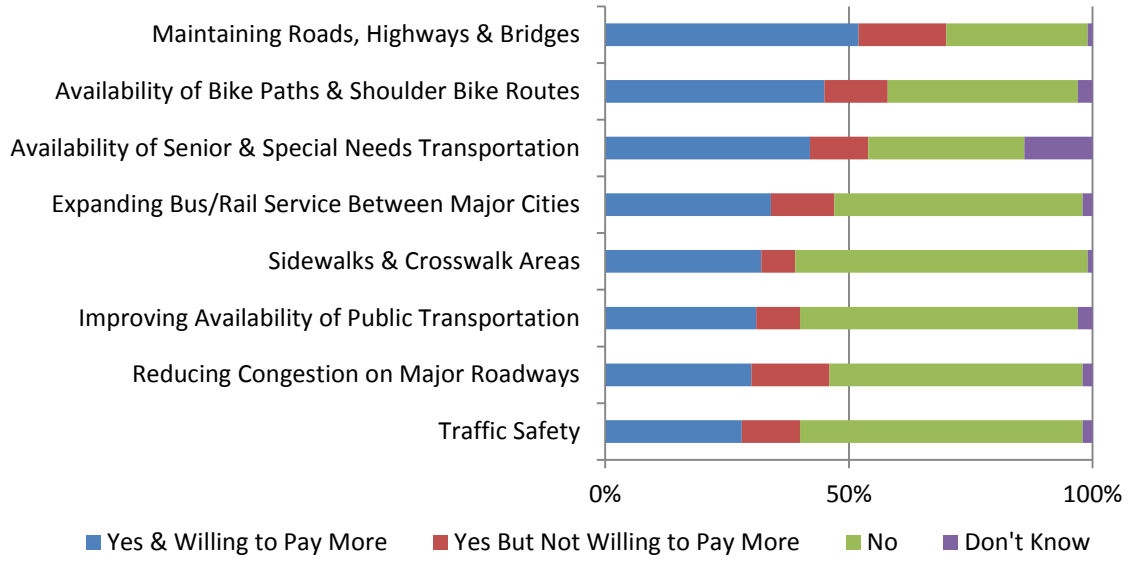
What the Region Said About Transportation

The regional household telephone survey conducted by the UNH Survey Center asked a series of questions about transportation system investments. Respondents were asked: *"Based on what you see now in your community, do you think policy makers should invest more money on each of the following aspects of the transportation system in the next five years?"* Respondents indicating more money should be spent in a given area were then asked whether they would be willing to pay more in taxes/fees to support this additional spending.

A majority of respondents expressed support for greater investment in three aspects of the transportation system: maintaining roads, highways and bridges (70 percent); availability of bike paths and shoulder bicycle routes (58 percent), and availability of senior and special needs transportation (54 percent). A majority of respondents were willing to pay more for system preservation (52 percent), with 45 percent willing to pay more for bicycle routes and 42 percent willing to pay more for better senior transportation. Interestingly these

alternative mode investments were viewed as higher priorities than congestion mitigation or general traffic safety improvements.

Figure TR1 – Should Policy Makers Invest More in These Elements of the Transportation System?



These regional results are consistent with the 2,900-response statewide sample, in which 74 percent supported greater investment in system maintenance, 55 percent supported greater investment in senior transportation, and 53 percent supported expanded funding for bicycle routes. In the statewide sample, expansion of intercity bus service also reached the 50 percent threshold. This stronger support for intercity transit expansion elsewhere in the state is not surprising given that the RPC region already enjoys extensive intercity bus service.

Transportation was also a specific topic at three of the Community Conversations. Findings from the Community Conversations were consistent with the survey results, emphasizing the need for investment in transportation system maintenance and operations, and a desire for improving transportation choice in the form of senior and special needs transportation, general public transportation, and safer bicycle and pedestrian facilities.

Strengths of the current transportation system identified across all three meetings included:

- The region enjoys a strong interregional backbone transportation network, with an excellent highway network, airport, deep water port, and intercity bus and rail access.
- Public transit and human service transportation are more readily accessible in the region than in many parts of the state with the COAST and CART transit systems.
- There have been significant improvements in mode choice in the past decade, with expansion of transit options as well as bicycle and pedestrian accommodation and mode share.
- Investments in system management have paid off including high speed tolling and signal coordination
- There is a good regional and state transportation planning process, with improved communication in recent years.

Challenges identified across all three meetings included:

- New Hampshire suffers from a lack of funding for the transportation system in general, including system maintenance and operation.
- There is a particular lack of funding for modes other than highways.
- Current disinvestment in infrastructure will lead to higher long term costs.

- Public transportation availability varies significantly across region by community, with major gaps in the middle of the county.
- The growing senior population will create new demands for transit option to support ageing in place
- There is a need to better integrate land use planning and transportation planning.

The existing system conditions and challenges identified above are discussed in greater detail in the following pages. Full information from the public involvement process is included in Appendix E.

Transportation Goals

The following goals reflect these community concerns and priorities and shape the region's approach to transportation planning.

Goal 1 - Mobility

The region's multi-modal transportation system offers safe, secure and efficient access to employment, housing, commerce, services, entertainment, and recreation.

Goal 2 – Equity and Accessibility

The region's transportation system provides adequate, appropriate and equitable transportation choices for all users.

Goal 3 - Land Use Integration

Transportation investments in the region support the Regional Vision and Regional Master Plan goals related to land use, housing, natural resources and other areas; and are aligned with other regional, interregional, interstate and international investments.

Goal 4 - Funding

Adequate and predictable funding is available to meet current and future needs for transportation system maintenance, operation and modernization across all modes.

Goal 5 – System Preservation

Maintenance, preservation, and modernization needs of the existing multi-modal transportation system are prioritized ahead of adding new highway capacity.

Goal 6 -Environmental Linkages

The region's transportation system is resilient to climate change, natural, and other hazards, is energy efficient, and minimizes adverse impacts to natural and cultural resources.

Table TR1– Transportation Goals in Relation to New Hampshire Livability Principles

Transportation Goals	New Hampshire Livability Principles					
	Traditional Settlement Patterns and Development Design	Housing Choices	Transportation Choices	Natural Resources Function and Quality	Community and Economic Vitality	Climate Change and Energy Efficiency
TR Goal 1 – Mobility	**S**	**S**	**S**	**S**	**S**	**S**
TR Goal 2 – Equity & Accessibility	**S**	**S**	**S**	**S**	**S**	**S**
TR Goal 3 – Land Use Integration	**S**	**S**	**S**	**S**	**S**	**S**
TR Goal 4 – Funding	**P**	**P**	**S**	**P**	**P**	**P**
TR Goal 5 – System Preservation	**S**	**P**	**S**	**S**	**S**	**S**
TR Goal 6 – Environmental Linkages	**P**	**P**	**S**	**S**	**S**	**S**

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

Table TR2 – Transportation Goals in Relation to Overall Regional Goals.

Transportation 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
TR Goal 1 – Mobility	**S**	**S**	**S**	**S**	**S**
TR Goal 2 – Equity & Accessibility	**P**	**P**	**S**	**S**	**P**
TR Goal 3 – Land Use Integration	**S**	**S**	**S**	**S**	**S**
TR Goal 4 – Funding	**S**	**S**	**S**	**S**	**P**
TR Goal 5 – System Preservation	**S**	**S**	**S**	**S**	**S**
TR Goal 6 – Environmental Linkages	**S**	**S**	**S**	**S**	**S**

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.

Existing Conditions

This portion of the document discusses the various modal components of the existing transportation network within the Rockingham Planning Commission region, including existing conditions and deficiencies, as well as connections to surrounding areas.

Highways

By providing access to land, the transportation system has a tremendous impact on the physical settlement patterns of a region, and in post-World War II New Hampshire, that has been defined almost solely by the extent of the roadway network. Historically, the early communities were located along navigable waterways and expanded inland as the first roadways were laid down. The 1840s brought railroads to the RPC region with the construction of the Boston and Maine Western Line, the Eastern Railroad, the Manchester and Lawrence, and the Portsmouth and Concord lines by 1849, opening new areas to development along those routes. (Abandonrails.com). With the advent of the automobile in the 1900s the pattern of development in the region changed again with growth pushing out from urban and town centers along roadways and resulting in the configuration that we see today. Since the 1940s emphasis has been placed on expansion of the capacity of the highway system, and this is reflected in the more than 1,800 miles of well-developed state and local roads in the region. (**See Map TR1 and Appendix A**). These roadways are organized in a classification scheme as Arterials, Collectors, or Local Roads depending upon their urban or rural location, their role in providing mobility or access to property, and the volume and type of traffic that they are intended to serve.

> ***Traffic Data***: NHDOT's Traffic Research Section monitors traffic volumes throughout the state and publishes monthly Automatic Traffic Recorder (ATR) reports for 63 locations on their website. An annual report, organized by town and route, of all traffic counts performed by the RPCs and DOT during the year is also maintained by NHDOT.

Functional Classification

The roadway functional classification system is designed to serve the varying transportation needs of the communities, the region, and the state in terms of mobility and accessibility. Accessibility refers to the ability to reach desired opportunities (goods, services, activities and destinations), while mobility refers to the actual physical movement between locations (Victoria Transport Policy Institute, 2014). ***Figure TR2*** illustrates the role of each class of roadway as well as where it fits on the access/mobility continuum with regional examples. All regional highways are shown on ***Map TR1*** and discussed below, organized based around that classification from the most heavily used roadways to the least. While there is some overlap at the transition points, larger capacity roadways generally have the role of providing mobility between regions and have more restricted access while local roads on the other end of the scale have direct access to individual properties but operate at much lower volumes and speeds.

Arterials

Arterials compose the backbone of transportation routes that carry the majority of long distance motor vehicle travel and connect the RPC region to the rest of New Hampshire, Maine, and Massachusetts. These routes tend to be on the Federal National Highway System (NHS) and are made up of Interstate Highways, Expressways, and other Principal Arterials. The focus of these roadways, particularly Interstate Highways and Expressways, are generally on mobility via motor vehicle travel although some principal arterials include facilities that support bicycle and pedestrian movement. To facilitate mobility direct access to these facilities is limited and design standards require wider, faster facilities.

Interstates

Interstates are the highest classified roadways and are designed to serve long-distance travel needs. They are generally divided highways that have limited access points that are grade separated from connecting roads of lower classes. This region is served directly by two: Interstate 93 in the western portion, and Interstate 95 in the eastern, and indirectly by Interstate 495 in Massachusetts.

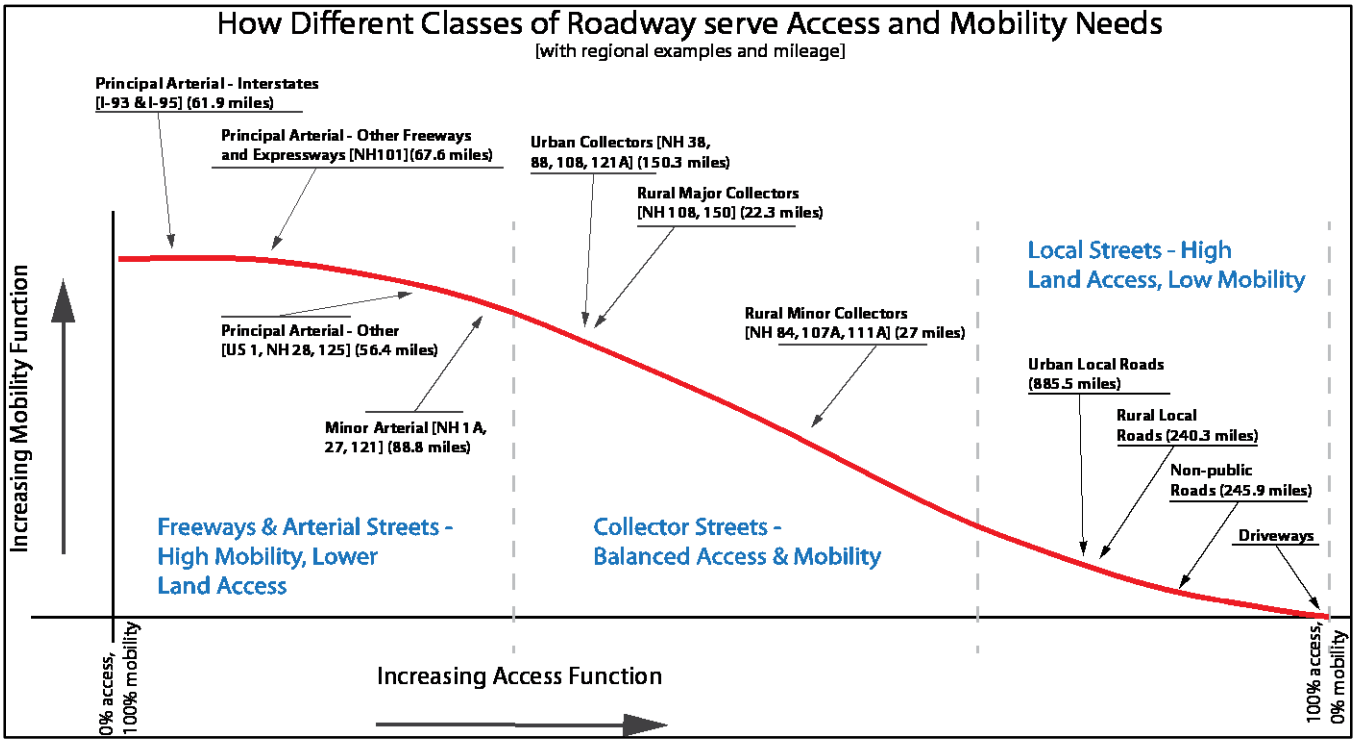


Figure TR2: Functional Classification & Access/Mobility. Source: Adapted from FHWA diagram

- *Interstate 93 (I-93)* is a north-south freeway that serves as a major commuting corridor connecting from Massachusetts through Salem and north to Manchester, Concord, and northern New Hampshire. The Annualized Average Daily Traffic (AADT) in Salem is approximately 100,000 and due to that high volume, the corridor is being expanded to 4 lanes in each direction with reconstructed interchanges, bridges.
- *Interstate 95* is an eight lane, open-road toll facility that crosses the southeastern portion of the RPC between Seabrook at the New Hampshire-Massachusetts state line and Portsmouth at the New Hampshire-Maine state line. The route serves both as a major commuter transport corridor and a year round conduit of commercial truck and tourist traffic between southern and northern coastal New England, the White Mountains, and the Maritime Provinces of Canada. The tourism based use of this roadway causes volumes to vary significantly by time of year from an average of 63,000 (2013) vehicles per day in the winter, to 112,000 vehicles per day on weekdays and 130,000 (2013) vehicles on an average Sunday at the peak of summer traffic in August.
- *Interstate 495,* although outside of the RPC region, is an important facility that follows an east-west path through the center of the adjacent Merrimack Valley Region. The highway forms an "outer belt" around the Boston Metropolitan area and provides access between highways in the area such as Routes 28, 97, and 125, as well as an east-west connection between Interstates 93 and 95.

Freeways and Expressways

Expressways look similar to Interstates and like them are designed to maximize mobility, have limited access locations, and do not serve abutting land uses directly. In this region there are two freeways that fit this classification; NH 16, known as the Spaulding Turnpike, and NH 101.

- *The Spaulding Turnpike (NH 16/US 4),* is a north-south, limited access toll roadway which carries commuter and tourist traffic, and serves as a gateway from the Seacoast to the Lakes Region and the east side of the White Mountains. AADTs on the turnpike are approximately 66,000 vehicles per day (2012) at the Little Bay Bridges between Newington and Dover. This facility is currently being improved

between Exits 3 and 6 by widening the bridges and roadway to 4 lanes in each direction and reconfiguring the interchanges. Additional work will occur on connecting roadways to improve traffic flow on and off of the highway.

- *NH 101* is the only four-lane, grade separated, east-west highway in the region, and it connects Interstate 93 in Manchester with NH 125 in Epping and Interstate 95 in Hampton. East of I-95 the roadway narrows to two lanes and connects with US 1, and then NH 1A at Hampton Beach. Traffic on the grade separated portion of the highway has grown significantly since the facility was widened in the 1990s and is consistently above 40,000 vehicles per day (2012). The two lane section of the roadway shows an AADT of 13,000 vehicles per day although the volume can be significantly higher during the summer as this is one of the primary access routes to Hampton Beach.

Other Principal Arterials

Other Principal Arterials provide a high amount of mobility serving major centers of activity. They are sometimes grade separated and provide a degree of access to abutting land uses through at-grade intersections and driveways.

- *NH 125* is a north-south arterial roadway that carries traffic from Massachusetts through Plaistow, Kingston, Brentwood and Epping where it exits the region. The road connects I-495 to Massachusetts 111, NH 101, and further north to US Route 4, and Route 16 (Spaulding Turnpike) and into Maine. NH 125 has four lane sections near the Massachusetts border and around NH 101, but is primarily a two lane roadway with AADTs that range from 22,000 (2011) at the Massachusetts border, to approximately 11-14,000 (2012) in Kingston, and 24,000 vehicles per day adjacent to NH 101 in Epping. NH 125 is being improved in Plaistow and Kingston by widening, adding traffic signals and other intersection improvements, and implementing access management policies.
- *US 1* is a heavily developed roadway that parallels I-95 between Massachusetts and Maine providing local connections to the seacoast communities, access to New Hampshire's beaches, as well as supporting high levels of commercial activity. Traffic volumes vary substantially and range from 14,000-25,000 (2013). Volumes stay above 20,000 vehicles per day south of the NH 101 interchange and are 14,000-17,000 north of that connection until reaching the Memorial Bridge which carries around 12,000 vehicles a day.
- *NH 28* provides a parallel route to Interstate 93 in Salem and Windham and on to Manchester. This is a heavily travelled roadway with significant retail and other commercial development, particularly in Salem. Volumes are heaviest south of Rockingham Park Boulevard where they average 40,000 (2013) vehicles per day and decrease as the roadway moves northward.
- *NH 111* provides an east-west route through the RPC region that connects from the coast in North Hampton to Salem and continues west to Nashua. This facility interconnects Route 1, NH 101, NH 107, NH 125, NH 28, and I-93. The roadway has two distinct regions of heavy activity located around I-93 in the west (17,000 vehicles per day), and Exeter and NH 101 in the east (10,000 vehicles per day).

Minor Arterials

Minor Arterials provide smaller geographic areas with connectivity between higher and lower classifications of roadways. In urban areas they often connect different parts of a community while in rural areas they may provide higher speed travel speeds. This region has several state highways classified as Minor Arterials and is where some community owned facilities, such as North and South Policy Streets (10,000 AADT) in Salem and Woodbury Avenue (20,000 AADT) in Portsmouth, start to appear in the classification scheme.

- *NH 33* provides a connection between Stratham where it intersects with NH 108 at the Stratham circle and I-95 in Portsmouth. Improvements to the I-95 interchange, the opening of the southern entrance to the Pease International Tradeport in Portsmouth, and the development of a large shopping center in Greenland have boosted the traffic volumes on the roadway to 29,000 (2012) vehicles per day at the Portsmouth/Greenland line. Traffic decreases to the west and drops to 19,000 (2011) in Greenland and to 14,000 (2010) east of the traffic circle that connects the roadway to NH 108 in Stratham.

- *NH 108* is a north-south two lane roadway with AADTs ranging from 6,000 (2012) vehicles per day at the Massachusetts border in Plaistow, to 15,000 per day in Exeter (2013) and Stratham (2013), where it serves commuters, commercial traffic, and provides a connection to NH 101. NH 108 continues on through Newfields where it exits the region towards Newmarket, Durham, and Dover carrying around 17,000 (2013) vehicles per day.
- NH 121 is a two lane north-south route between Plaistow at the Massachusetts border to Sandown where it exits the region. AADTs are 12,000 (2013) in Plaistow near the Atkinson town line, 8,000 (2013) vehicles per day at the Atkinson/Hampstead town line, and 7800 (2011) in the center of Hampstead where the roadway serves as Main Street. As residential growth continues in Atkinson, Hampstead and Sandown, N.H. 121 is becoming increasingly important as a commuter route to the large employment centers in the Merrimack Valley and the Boston Metropolitan area.

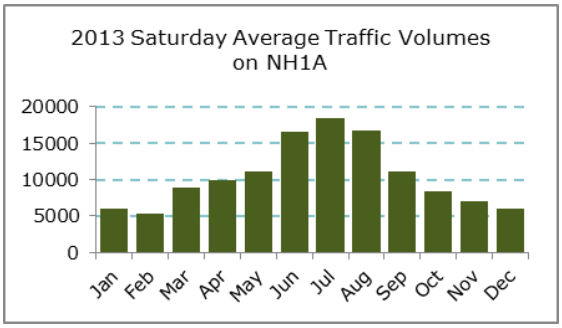


Figure TR3: NH 1A Monthly Traffic Volume. Source: NHDOT Automated Traffic Count Dataset

Collectors

In addition to the set of interregional roadways, there is a larger set of state secondary and local roadways that carry more localized traffic between the communities. These roadways tend to carry lower volumes of traffic on shorter trips but provide an important connection between local streets and the arterial network. In many cases, roadways classified as collectors are segments of arterial roadways that have lower use such as the southern portion of NH 108, NH 111 between Exeter and Kingston.

- *NH 1A* is a two lane coastal roadway, which was designated as a New Hampshire Scenic Byway in the 1990s. Much of the roadway is commercialized and in the summer is congested with both motorized and non-motorized beach traffic. AADTs range from 11,700 in Seabrook to 8,000 in New Castle. Annual averages of traffic volumes distort the picture of the use of this roadway given the seasonal nature of traffic (***Figure TR3***). In Hampton, once the volumes were averaged for the year it shows about 8600 vehicles per day using the roadway. Looking at the permanent recorder count data from 2013 shows that in February the roadway carried just over 5300 vehicles on an average Saturday, but when looking at August the same roadway averaged almost 18,500 vehicles per day.

Congestion

The U.S. Department of Transportation defines congestion as "the level at which transportation system performance is no longer acceptable due to traffic interference", and the Transportation Research Board defines congestion as "travel time or delay in excess of that normally incurred under light or free-flow travel conditions." However, determining exactly at what point delay becomes excessive or performance "no longer acceptable", is dependent upon geographic location, the type of transportation facility, and even time of day. On a basic level, congestion is easy to distinguish and define as stop-and-go traffic can be observed on the roadways of the region. For planning purposes however, more explicit definitions are needed to delineate those locations with excessive congestion, track trends, and identify locations expected to become congested in the future (Flanigan, 2008). Previous experience and research has shown that congestion is the result of seven root causes, often interacting with one another:

- ***Physical Bottlenecks ("Capacity")*** – Capacity is the maximum amount of traffic capable of being handled by a given highway section and is determined by a number of factors: the number and width of lanes and shoulders; merge areas at interchanges; and roadway alignment.
- ***Traffic Incidents*** – Events that disrupt the normal flow of traffic, usually by physical impedance in the travel lanes. Events such as vehicular crashes, breakdowns, and debris in travel lanes are the most common form of incidents.
- ***Work Zones*** – Construction activities that result in physical changes to the highway environment. These changes may include a reduction in the number or width of travel lanes, lane "shifts," lane diversions, reduction, or elimination of shoulders, and even temporary roadway closures.

- ***Weather*** – Environmental conditions that lead to changes in driver behavior impact traffic flow, such as slower traveling speeds and greater spacing of vehicles.
- ***Traffic Control Devices*** – Intermittent disruption of traffic flow by control devices such as railroad grade crossings and poorly timed signals also contribute to congestion and travel time variability.
- ***Special Events*** – Happenings that draw a relatively large number of attendees can cause demand fluctuations whereby traffic flow in the vicinity of the event will be radically different from "typical" patterns. Special events occasionally cause "surges" in traffic demand that overwhelm the system.
- ***Fluctuations in Normal Traffic*** – Day-to-day variability in demand leads to some days with higher traffic volumes than others. Varying demand volumes superimposed on a system with fixed capacity also results in variable (i.e. unreliable) travel times.

These causes generally can be collapsed into two categories; recurring, or those that happen regularly and consistently such as rush hour traffic, and non-recurring, which are those that occur in an inconsistent manner such as special events or crashes. Measures of recurring delay are the easiest to attain as traffic counts provide data to measure volumes and estimates of total travel that can be compared to capacity to identify those locations where demand exceeds supply. The Regional Travel Demand Model allows this type of analysis to occur on a large scale providing estimates of congested locations based on travel demand from the existing land use distribution and travel patterns of residents. ***Map TR6*** (located at the end of this chapter) shows AM and PM peak period congestion outputs from the travel demand model. Much of the region, indicated by green roadways, shows a moderate level of congestion during these periods. These are roadways where drivers cannot drive at their preferred speed or make turns immediately because of other traffic but overall traffic is moving smoothly. There is a much smaller subset of roadways are that are truly congested, primarily the larger commuter routes in the region such as I-93, NH 125, and the Spaulding Turnpike. NH 111 in Hampstead and Atkinson is also experiencing more problematic peak hour flow, as is NH 33 in Stratham and Greenland. This issue is discussed further in the Key Issues and Challenges portion of this chapter.

Bridges

The collapse of a bridge in Minnesota in 2007 has kindled renewed interest in the structural integrity of the bridges in New Hampshire and has accelerated work on many bridges in the area including the Memorial Bridge over the Piscataqua River between Portsmouth and Kittery (replaced in 2013). As of April, 2013, there 145 state-owned and 352 municipally-owned bridges listed as "Red Listed" indicating structural or functional obsolescence. The RPC region hosts 41 of these structures that need to be rehabilitated or replaced and basic information about these bridges can be found in the appendix of this chapter. ***Table TR3*** shows the challenge that the state and communities face in addressing the bridge replacement and rehabilitation needs of the state. Since 1997, the state has averaged adding 17.3 bridges each year to the list of those in need of repair while removing 18. If this timeframe is narrowed to the last five years, 22.8 have been added on average while only 21.2 have been removed which indicates that bridges are deteriorating into poor condition faster than they can be repaired given existing resources. This points to the increasing complexity and cost of these projects and while some very large projects are currently being addressed, resources do not allow for continued strong progress in reducing the number of structurally and functionally deficient bridges in the state and the region.

Table TR3: State Owned Bridges added/removed from the Red List

Year	Start Total	Added	Fixed	End Total
1997	156	17	29	144
1998	144	13	15	142
1999	142	24	22	144
2000	144	26	13	157
2001	157	24	13	168
2002	168	13	14	167
2003	167	5	19	153
2004	153	10	17	146
2005	146	7	13	140
2006	140	15	18	137
2007	137	9	9	137
2008	137	19	17	139
2009	139	26	23	142
2010	142	25	19	148
2011	148	17	25	140
2012	140	27	22	145

Source: NHDOT

Traffic Safety

During the period from 2003 and 2012, there were approximately 51,500 crashes in the RPC region involving cars, trucks, bicycles, and pedestrians. There is generally a trend indicating that the number of accidents per year is decreasing and the crash rates are following that trend as well with the overall rate dropping from 2.7 crashes per million Vehicle Miles of Travel (VMT) to 2.2 per million VMT and shown in ***Figure TR4***. Fatal and Injury accidents follow this trend as well decreasing from .086 to .068 per million VMT or about 6.8 injury/fatal crashes for every one hundred million VMT. The paragraphs below contain some basic traffic safety data and there are additional tables included in Appendix B detailing these, and other, safety statistics.

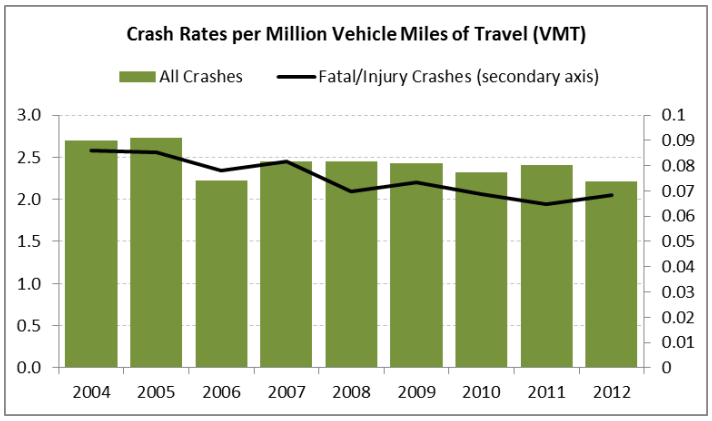


Figure TR4: Crash Rate per Million VMT. Source: NHDOT Crash Records Database, FHWA Highway Performance Monitoring System (HPMS)

Just over 70 percent include a collision with another moving vehicle. Another 17 percent involve colliding with a fixed object such as a telephone pole, tree, or building. The remaining accidents include everything from striking an animal (2.9 percent), pedestrian (0.9 percent), or bicyclist (0.5 percent), to overturns (1.5 percent).

Regional analysis of crash locations shows unsurprisingly that the majority of crashes occur in more urbanized areas and along heavily traveled roadway corridors. ***Map TR2*** shows this crash activity and highlights the areas of the region that have the highest crash frequencies. Region wide, the general locations of the accidents are distributed mainly between intersection/driveway access related (32.6 percent) and along the roadway (40 percent). An additional 14 percent occur in parking lots, with the remainder made up of run-off road, crashes at toll booths, exit ramps, rotaries and others.

Friday is the most common day for accidents with just over 17 percent occurring on that day. Thursday and Saturday are the next highest days with almost 15 percent each. During weekdays, the timing of accidents occurs with spikes during commuter periods and near noon. On weekends the pattern changes with most crashes occurring during the middle of the day.

Freight Transportation

The Rockingham Planning Commission area is well served by a broad range of domestic and international freight transportation carriers and all modes of goods movement are available within or near to the region. In addition to the major highways, the region is home to the Port of New Hampshire, Pan Am Railways main line (the former Eastern Line of the Boston and Maine Railroad), the Pease Airport, and a natural gas pipeline. The primary source of data regarding freight movement is the FHWA Freight Analysis Framework (FAF) and this system measures goods movement in three ways:

- Value – In 2007 dollars
- Tons – In thousands of short tons (2000 lbs.)
- Ton-miles – Product of tons and the weighted average distance by mode of shipment

Depending upon the unit of measure, each mode of goods movement handles a different percentage of the total volume of freight moving into and out of the region. The facts and figures in this section will focus on the tonnage of freight moved, however, Appendix C will include the full tables with value and ton-miles as well. With the exception of the data for the Port of New Hampshire, all information available is for the state as a whole and not specific to the region.

With the exception of air based freight services at Pease Tradeport, and Atlas Motor Express in Plaistow, freight transportation companies do not operate transportation facilities in the RPC region. Freight carriers located in

other parts of New Hampshire and in other New England states use trucks to carry freight to and from companies located here. LTL and TL motor carriers all (except Atlas) operate from terminal facilities outside of the region. With the minor exception of limited direct rail loading in Portsmouth and Newington, all rail shipments are loaded in or on rail cars at facilities located outside the area as well. The Port of New Hampshire is expected to expand and accept containerized shipments. Currently they move by highway to and from ports in Boston, Montreal and New York. Containerized shipments to and from the Far East generally move to rail facilities in Massachusetts for rail shipment via "Mini Land Bridge" to the West Coast for ship movement across the Pacific. Increasing volumes of airfreight move though Pease, but most airfreight continues to move through Logan. Carriers provide most truck services through freight terminals located elsewhere in New Hampshire or in Massachusetts.

Port of New Hampshire, 2003
Source: RPC

The Freight Analysis Framework (FAF) version 3 (USDOT) estimates that currently about 111 million tons of freight is shipped to, from, or within New Hampshire (2011) with trucks carrying 94 percent of those goods moving within the state, 86 percent of the goods leaving, and 78 percent of those coming into New Hampshire. Movement by Pipeline (7 percent) and Water (5.6 percent) are the next largest modes, while rail moves about 2.1 percent of goods. 31.1 million tons of goods are shipped within the state, the leading commodity by weight is gravel at 17.5 million tons, followed by Coal-N.E.C. at 13.5 million tons. By value there was approximately $160 billion in shipped goods moved to or from New Hampshire. The leaders were pharmaceuticals ($56.6 billion), electronics ($11.8 billion), textiles ($9.7 billion) and machinery ($9.6 billion).

Shipping

The region is host to the Port of New Hampshire in Portsmouth, an active port handling over 8.8 million tons of cargo (***Table TR4***) each year and expected to nearly double that by 2040 (USDOT). The Division of Ports and Harbors (DPH) Market Street Marine Terminal, located on the Piscataqua River, is the only public access, general cargo terminal on the River. The Piscataqua is a year-round, ice-free, deep draft river. The Market Street Terminal has 8 acres of paved outside lay down area, 50,000 square feet of covered warehouse space, onsite rail access, and is close to the regional highway network (1/2 mile from Interstate 95). The terminal can handle bulk cargo such as scrap metal, salt and wood chips, break bulk such as industrial machinery parts and construction materials, project cargo such as power plant components and vacuum tanks, as well as container cargo. In addition, Portsmouth is within 50 miles of the Port of Boston, one of America's major port facilities, and has convenient access by highway and rail to other major and regional ports including New York, Portland, and Montreal.

Table TR4:
Estimated Goods Movement through the Port of New Hampshire (1000s of tons)

	2011	2015	2020	2025	2030	2035	2040
Imports	8377.68	9330.36	10436.82	11461.28	12263.23	13198.45	14255.60
Exports	474.48	622.28	814.18	1041.30	1270.01	1491.81	1746.02
Total	8852.16	9952.64	11250.99	12502.58	13533.23	14690.26	16001.61

Source: Freight Analysis Framework

Rail

The area is served by the main line of Pan Am Railways, a major U.S. regional railroad, which was historically known as the Boston and Maine Railroad (B&M) Main Line West running between Boston and Portland, and in the RPC region traversing the towns of Atkinson, Plaistow, Newton, Kingston, East Kingston, Exeter, and Newfields. The mainline is currently categorized as a Class 4 track which allows passenger rail speeds up to 80 MPH and freight rail speeds of up to 60 MPH. Branch line freight services are currently available between the main line and Portsmouth and over the Sarah Long Bridge into Maine on a Class 1 track that limits speeds to 10 MPH. The Eastern Railroad corridor also ran from Boston to Portland, via Seabrook and Portsmouth in the RPC

region. This later became the B&M Main Line East, and is also known as the Hampton Branch, but is no longer in active rail use. The State has owned the segment from Hampton center to the Massachusetts border since the late 1990s, and is in negotiation to purchase the recently abandoned balance of the line, from Hampton to Portsmouth. Intermodal (rail-truck) facilities operated both by Pan Am and Conrail in the Boston area and by the St. Lawrence and Atlantic Railway in Auburn, Maine are within easy reach of the Seacoast region. Through these connections, shippers have access by rail to points throughout North America and, using Rail Land Bridge services, throughout the world.

Truck

While the trucking industry is privately operated, it depends upon state and local government to provide and maintain the highway network upon which it operates. The majority of freight shipments, both long distance movement to distribution centers and local delivery services to factories, wholesale and retail facilities, and households within the United States, occur via truck. Southeastern New Hampshire shippers and receivers are well served by motor carriers. High quality services are provided by the following types of carriers:

- National TL (truckload) and LTL (less-than-truckload) carriers such as Roadway and J.B. Hunt
- Regional TL and LTL carriers such as Atlas Motor Express.
- Bulk liquid carriers such a Superior and Matlack.
- Private carriers serving special markets such as the Wal-Mart fleet.
- Major parcel carriers such as United Parcel Service and Federal Express.

Air Freight

The region enjoys the potential for direct airfreight service at Pease International Tradeport. The Fixed Base Operator at Pease Airport provides cargo handling capability for build, break, load, offload, and onload, and includes cross dock transfer fly-truck, truck-fly operations. The facility can accommodate the largest cargo planes and includes 45,000 square feet of warehouse facilities available in close proximity to rail, deep water port and I-95. Boston's Logan Airport and the Manchester-Boston Regional Airport are located less than 50 miles away, adding access to a wide variety of air cargo services serving markets throughout North America and the world.

Pipeline

A natural gas pipeline is currently in place. As reported in the Federal Energy Regulatory Commission publication FERC/EIS-0111D, dated April 1997, Granite State Pipeline operates "a 10- and an 8-inch-diameter pipeline between Haverhill and Exeter" as well as "an 8-inch-diameter pipeline between Exeter, New Hampshire and Wells, Maine." (Federal Energy Regulatory Commission, 1997) In addition, Portland Natural Gas Transmission System and Maritimes & Northeast Pipeline, L.L.C. (Maritimes), are currently developing expanded natural gas pipeline service with the construction of a 30-inch-diameter high-pressure natural-gas pipeline between Dracut, MA and Wells, Maine. The pipeline is designed to deliver 60 million cubic feet per day of natural gas from the Sable Offshore Energy Project, offshore from Nova Scotia. The project includes 31.4 miles of 30-inch-diameter pipeline passing through Plaistow, Newton, East Kingston, Exeter, Stratham, Greenland, Portsmouth and Newington, in Rockingham County. The project also includes lateral lines as follows: 0.6 mile of 20-inch pipeline between the main trunk line in Plaistow and Haverhill, MA and 1.1 miles of 16-inch-pipeline in Newington. A number of projects are currently underway to interconnect pipelines to bring additional natural gas resources into the New England region from the Southeast states.

Public Transportation

Public transportation plays an important and growing role in addressing the mobility, traffic congestion, and air quality issues facing the RPC region. The number of communities in the region served by transit has increased in the past ten years, from five to seven; and ridership on all forms of transit has seen dramatic growth in response to rising fuel prices and growing transit dependent populations. Still, fewer than a third of the 26 communities in the region are served by public transportation, and significant challenges exist to expanding services, including funding availability, low density development patterns making fixed route service inefficient in many towns. Regional transit routes are shown on ***Map TR1.***

Local and Regional Public Transportation Service

Two public transit agencies serve the communities in the RPC region. The Cooperative Alliance for Seacoast Transportation (COAST) provides service in Exeter, Stratham, Greenland, Portsmouth and Newington, with connections northward to Dover, Somersworth, Rochester, Farmington, and South Berwick, Maine. COAST has set ridership records in four of the past five years, carrying over 506,000 rides in FY2012 and FY2013 as shown in ***Table TR5***. This represents a doubling of ridership over the past decade. The Greater Derry-Salem Cooperative Alliance for Regional Transportation (CART) provides demand-response public transportation to two RPC communities, including Salem and Hampstead; as well as Derry, Londonderry, Chester, and out-of region medical facilities in Manchester and northern Massachusetts. CART provides mainly demand-response transit service given the low density of much of its service area, but added its first fixed route service in 2012 with the Salem Shuttle. CART has grown from carrying fewer than 500 passengers per month at start-up in 2006, to moving approximately 1,300 passengers/month in 2013. A third fixed route system is UNH Wildcat Transit. Wildcat Transit connects the UNH campus in Durham to Newington and Portsmouth in the RPC region, as well as to Dover, Madbury, and Newmarket.

Table TR5: COAST Ridership

Fiscal Year	Ridership
2000	199,967
2001	211,920
2002	212,502
2003	242,235
2004	293,917
2005	316,867
2006	354,433
2007	375,535
2008	398,853
2009	370,068
2010	416,942
2011	461,866
2012	506,514
2013	506,173
Source: COAST	

Intercity Bus Service

Intercity bus service is available in the I95, I93, NH Route 125 and NH Route 101 corridors, with an emphasis on Boston-bound commuter travel as well as access to Logan Airport and Manchester-Boston Regional Airport (MBRA). C&J, formerly C&J Trailways, provides 30 round trips daily between Boston and the Portsmouth Transportation Center, with northbound connections to Dover. In the I93 corridor Boston Express operates extensive Boston-bound commuter bus service out of Exits 4 and 5 in Londonderry plus Exit 2 in Salem, with a combined 30 daily round trips. Greyhound provides two daily round trips between Portland and Boston with service to downtown Portsmouth; while the Coach Company provides two daily commute hour trips from Plaistow to Boston via Newburyport. The long-identified need for an East-West transit connection in the region was filled beginning in late 2013, with the FlightLine East-West Express service providing 20 hourly round trips between Portsmouth, Epping, MBRA and downtown Manchester. In 2013-2014 RPC conducted a feasibility study for constructing an intermodal transit facility at the interchange of Route 101 and Route 1 in Hampton, designed to support expanded Boston-bound intercity bus service in the I95 corridor, as well as the East-West Express service.

Passenger Rail Service

Amtrak's Downeaster service between Boston, Portland and Brunswick Maine includes several station stops in Southern Maine, Northern Massachusetts, and three New Hampshire communities – Exeter, Durham, and Dover. The service provides five daily round trips between Boston and Portland. In 2012 two daily trains extended the service from Portland north to Freeport and Brunswick, Maine. Plans are underway to construct an enclosed layover facility in Brunswick. When this is complete, all five daily trains will make stops at Freeport and Brunswick with a potential 6th daily round trip being added between Brunswick and Boston. During FY2013 the Downeaster carried over 556,000 riders, with 31 percent of passengers boarding or alighting at New Hampshire stations. MBTA commuter rail service is available from Newburyport, Haverhill and Lawrence in Northern Massachusetts.

Feasibility studies are underway to determine if an extension of the Haverhill commuter service to Plaistow, N.H., would have sufficient ridership to be financially viable. The studies are expected to be completed in the spring of 2015.

Park and Ride Facilities

There are currently seven Park & Ride facilities in the region operated by the N.H. Department of Transportation (NHDOT). These include lots in Epping at the intersection of Routes 101 and 125; in Hampstead at the intersection of Route 111 and 121; in Hampton at the intersection of Route 101 and 27; in Plaistow on Westville Road just east of Route 125; in Salem at Exit 2 on I93 and in Portsmouth at Exit 3A on I95, and on Route 33 just east of I95. The Exeter rail station, operated by the Town of Exeter, also functions as a Park & Ride facility.

Of these, four feature Boston-bound intercity transit service (Portsmouth, Salem, Plaistow and Exeter); and two feature East-West service to Manchester (Portsmouth and Epping). Those communities without transit service have seen limited usage historically, but are increasingly being used by car-poolers responding to increasing gas prices. The Route 101/Route 1 Interchange Realignment and Intermodal Transit Center Feasibility Study conducted in 2013-2014 identified a preferred design for a new intermodal transit facility in Hampton to support intercity bus service in the I95 and Route 101 corridors, as well as a shuttle connection between Hampton Beach, Hampton Town Center and the park and ride facility. Such a facility would be integrated with a plan to realign the interchange for safety and efficiency.

Other Community Transportation Services

In addition to the transportation providers listed above, there are a number of other transportation services available to communities in the RPC region. These can most easily be differentiated by type of service provided.

Shuttle and Taxi Services

Numerous companies offer shuttle services between the RPC region, Logan Airport and Manchester-Boston Regional Airport. Both door-to-door service and scheduled pickups at central locations are available. Over twenty companies also offer local and regional taxi service.

Special Population Services

There are more than two dozen health and human service agencies and volunteer driver organizations in Rockingham County providing demand response transportation for agency clients or specific eligible populations such as senior citizens or individuals with disabilities. Many of these agencies have been involved with regional planning initiatives in the Derry-Salem area or Seacoast area focused on coordinating and consolidating functions such as trip scheduling and dispatching, and expanding access in communities with limited service. These collaborative efforts are formalized through the Southeast New Hampshire Regional Coordination Council (RCC) for Community Transportation, and the Greater Derry-Salem RCC.

Transportation Demand Management

Transportation Demand Management (TDM) is an approach to improving the efficiency of the transportation system through encouraging alternatives to driving alone – particularly for commute trips. A number of TDM initiatives serve the RPC region, including statewide programs for New Hampshire and Massachusetts, as well as a new regional Transportation Management Association (TMA) working with seacoast employers to reduce commute trips. Efforts targeting Boston area commuters have a successful history, given high levels of congestion, high parking costs, a long commute distance, and a Massachusetts state law requiring large employers to invest in commute trip reduction programs. Initiatives in New Hampshire have had a more difficult time convincing employees to shift modes, given relatively limited traffic congestion, relatively abundant free parking, less frequent transit services, and lack of a state mandate for employers. However, as with transit ridership, increasing gas prices have led to increased interest and participation in ridesharing in the past several years. Similarly, transit service options have increased dramatically in the region in the past five years, making leaving one's car at home a more attractive choice. Existing TDM programs serving the RPC region are described below.

Rideshare Programs Managed by NHDOT and Massachusetts Entities

Since 1996 the NHDOT has run a statewide Rideshare program designed to match individuals interested in carpooling or vanpooling using an on-line ride matching service. This program was eliminated by the legislature in 2011 as part of cuts to the NHDOT budget. MassRides, funded by the State of Massachusetts, operates a relatively successful ride matching and vanpool program for Boston commuters, with daily vanpools departing from Portsmouth, Salem, Windham and other New Hampshire communities outside the RPC region.

Transportation Management Associations (TMA) – Seacoast and I93 Corridor

In 2013 COAST launched the commuteSMARTseacoast Transportation Management Association (TMA) to promote commute options to employees at Pease Tradeport and other major employers in the Greater Portsmouth-Dover Area. TMAs work with employers to promote alternative commute options to employees and establish incentives such as discounted transit passes, online ride matching programs, reduced parking fees for

carpooling, emergency rides home for transit users, and programs allowing use of pre-tax dollars for transit or vanpool expenses. Funding for commuteSMARTseacoast is part of the Newington-Dover Little Bay Bridges highway widening project. During its first year of operation commuteSMART has signed up 27 member companies, exceeding start-up expectations. Funding has also been programmed as part of the I93 widening project for TDM activities in the I93 corridor. Planning for these activities is currently underway by NHDOT.

Telecommuting Infrastructure

The number of people working from home and telecommuting in the United States has grown significantly since 2000. Between 2000 and 2010, those working from home nationally grew from an estimated 3.6 percent to 4.6 percent of the workforce. Telecommuters make up a larger share of the workforce in Rockingham County, where telecommuting grew from an estimated 4.1 percent to 5.8 percent of the workforce between 2000 and 2012. For Portsmouth this share is still larger, and grew from 5.4 percent to 7.3 percent of the workforce between 2000 to 2012.

Table TR6
Commuter Mode Share 2000-2012

Mode of Travel to Work	NH 2000	NH 2012	Rock County 2000	Rock County 2012	Exeter 2000	Exeter 2012	Ports-mouth 2000	Ports-mouth 2012
Car, truck, or van - drove alone	81.8%	81.4%	84.8%	84.2%	78.2%	81.7%	80.5%	78.5%
Car, truck, or van - carpooled	9.8%	8.0%	7.8%	6.3%	9.9%	5.4%	6.4%	4.5%
Public transportation	0.6%	0.8%	0.7%	0.7%	0.8%	0.9%	1.4%	1.7%
Walked	2.9%	3.1%	1.7%	1.8%	4.6%	5.3%	4.9%	5.7%
Taxicab, motorcycle, bicycle, other	0.9%	1.2%	0.9%	1.1%	1.3%	2.2%	1.4%	2.4%
Worked at home	4.0%	5.5%	4.1%	5.8%	5.2%	4.4%	5.4%	7.3%
	100%	100%	100%	100%	100%	100%	100%	100%

Source: 2000 U.S. Census; 2008-2012 ACS 5-Year Data Compilation

This relatively high instance of telecommuting in the region is consistent with the relatively high education levels and employment mix in the region. The increase since 2000 is also consistent with improvements in access to broadband telecommunications infrastructure, but there are still gaps within the region.

Bicycle Facilities and Programs

While the private automobile is the dominant mode of transportation in the RPC region, and will continue to be for the foreseeable future, improving the safety and convenience of non-motorized transportation is a key policy of the MPO. According to the most recent National Household Travel Survey (2009), more than 60 percent of all trips are fewer than five miles in length, and more than 22 percent are shorter than one mile – distances easily traveled by bicycle or on foot. However, more than 80 percent of these trips are taken with an automobile. Converting some of these short trips to bicycling and walking has the potential to reduce vehicle miles traveled, and consequently congestion, air quality impacts, and parking demand in downtowns. Investments in bicycle and pedestrian facilities also support public health and safety; and even economic development in the form of bicycle tourism. Achieving this increase in non-motorized transportation, though, will require investments in a combination of facility improvements and programs to encourage bicycling, teach safe bicycle operation to children and adults, and ensure enforcement of laws related to bicycle operation and safety.

Bicycle Transportation Facilities

For the purposes of this chapter, bicycle transportation facilities consist of shoulders with a width of four feet or greater on the region's roads (the minimum width for a shoulder bicycle route recommended by AASHTO) and off-road paved multi-use paths. Of course, many roads without such provisions are legally and appropriately

used by bicyclists. In addition, the State Bureau of Trails maintains a number of trails in the State and region that are unpaved or paved with gravel, such as the Rockingham Recreation Trail between Newfields and Manchester.

Paved off-road paths in the region are uncommon, but include the Southern New Hampshire Rail Trail being developed between Salem and Concord, the recently completed Pease Multi-Use Path at the south entrance to the Pease TradePort, a path connecting Fox Point Road in Newington to the Tradeport, and a side-path in Odiorne State Park in Rye. Planning is also underway for the New Hampshire segment of the East Coast Greenway, stretching from Florida to Maine. The State of New Hampshire is currently negotiation with Pan Am Railways to purchase a ten-mile segment of the Hampton Branch rail corridor between Hampton and Portsmouth for use as a rail trail. The State already owns the southern 4.5 miles of the corridor between Hampton and the Massachusetts border, on which the Town of Seabrook is actively pursuing rail trail development.

The remainder of what may be termed bicycle facilities in the region consists of paved shoulders on roads. Shoulders on many state roads in the region are narrower than four feet. The RPC has worked with Seacoast Area Bicycle Routes (SABR) and member communities to secure funding to extend shoulders and complete regional routes including the Great Bay Bicycle Loop and the Exeter-Hampton-North Hampton Bicycle Loop. The success of these efforts has varied by municipality, depending on the willingness of Towns to appropriate matching funding needed to access Transportation Enhancement funding. Two towns, Hampton and Newfields, have secured TE or CMAQ funding but later lost if after failing to appropriate matching funding. This points to the need for a more active role on the part of the state of New Hampshire in ensuring safe bicycle access on state highways. NHDOT has adopted a policy to add width for shoulder bicycle routes when state highways are rebuilt, which happens on a 20 to 30 year cycle, though not as part of routine resurfacing, which runs on a 10 to 15 year cycle.

After "maintenance of roads and bridges, respondents to the summer 2013 UNH Regional Needs Survey identified "availability of bike paths" as the next highest priority for increase transportation system investment in the region. Community meeting and other public input underscored this, identifying a particular need for improved bicycle and pedestrian facilities within communities that connect residential areas to services and schools and provide safe passage for students or adults on foot or bicycle. Reflecting this, six communities in the RPC region have initiated Safe Routes to School (SRTS) initiatives, including Hampton, Newfields, Plaistow, Portsmouth, Rye, and Seabrook. While federal Safe Routes to School funds have now been rolled into the new Transportation Alternatives program under MAP-21, the SRTS model remains an excellent one for municipalities and school districts.

Supporting Facilities for Bicycles

Bicycling is greatly supported by the provision of secure racks at school, work and recreational areas. Some larger businesses in the area do provide amenities for bicycle commuters such as allowing them to store their bicycles indoors and providing shower facilities. The RPC also works with commuteSMARTseacoast, the regional Transportation Management Association (TMA) to promote annual events for national Bike/Walk to Work Day.

Another important step is to support better connections between bicycles and other modes of transportation. This includes secure parking at bus stops and train stations as well as accommodations for carrying bicycles such as racks on the front of buses. COAST has installed bike racks on the front of all of their buses, as has Wildcat Transit. The NHDOT has installed bicycle lockers or racks at most Park & Ride locations as well as the Exeter rail station. With assistance of FTA Transit Enhancements funding from COAST, the City of Portsmouth has made extensive improvements to bicycle parking at downtown transit stops and other locations the past two years.

Education, Encouragement, and Enforcement

Providing new facilities is only part of the solution to encouraging non-motorized alternatives to driving. The other part of the equation involves changing behavior – of both potential cyclists as well as drivers. This integrated approach is often referred to as the "Five Es" – Engineering (bicycle infrastructure) must be accompanied by efforts at Education (regarding cyclists rights and responsibilities), Encouragement (to try a new way to travel), Enforcement (of traffic rules for both drivers and cyclists), and Evaluation to ensure data-driven decision making.

The ***"Five E"s*** of bicycle/pedestrian accommodation:

- Engineering
- Education
- Encouragement
- Enforcement
- Evaluation

At present, educational efforts in the region and much of the state are limited to outreach to young children first learning to ride a bicycle. The Bike/Walk Alliance of New Hampshire (BWANH) provides classroom instruction in bike safety to 4th and 5th grade classes with funding through the Safe Routes to School program. There is a significant need for companion efforts targeting older children, as well as adult cyclists and drivers. RSA 265:143a, passed in 2010, clarified many state traffic laws around bicycling, and included an innovative provision known as the Three Foot Law – that automobiles must allow at least 3 feet of buffer when passing a bicycle at 30 mph, and an additional foot for each 10 mph above that. BWANH has worked to get information on bike-related traffic law into the state driver education curriculum, as well as into police officer training. A public outreach program known as NH-PASS, involving signage and Public Service Announcements (PSAs) designed to raise awareness of the Three Foot Law has been piloted by the Claremont Police Department. RPC is working to expand the program in the RPC region.

Greater effort is also necessary to enforce traffic laws related to bicycles. A lack of bicycle safety education as well as enforcement results in some cyclists putting themselves and others at risk by failing to obey traffic laws. This causes resentment among drivers. Likewise, traffic enforcement to protect the rights of cyclists is rarely a priority.

In 2013, NHDOT took an important step by reconstituting its Bicycle Pedestrian Transportation Advisory Committee (BPTAC), which advises the department on bicycle and pedestrian accommodation, and safety issues. This advisory committee includes representation from state agencies, regional planning commissions, local government, public health and medical organizations, trails organizations, the bicycle industry and citizen members. The BPTAC is currently working on a range of initiatives including updating the state bicycle route network, an economic impact assessment of bicycling and walking in New Hampshire, an expansion of the NH-PASS bicycle safety outreach program, and an update to the State Bicycle & Pedestrian Plan.

Pedestrian Facilities and Programs

In the RPC region, pedestrian facilities vary considerably from community to community. Portsmouth, Exeter and Hampton feature substantial downtowns, as well as centrally located elementary schools, which favor the pedestrian and thus encourage people to walk. Many of the more rural communities in the region have few if any sidewalks. Beyond sheer size, the presence or absence of sidewalks relates in large part to when and how a community has grown. Salem provides a case in point. While the largest municipality in the region, Salem has experienced much of its development in the last 40 years when accommodating the automobile has been the focus of most transportation planning. As such, the town has a less comprehensive sidewalk network than smaller communities that developed earlier, such as Portsmouth and Exeter.

In more rural communities residents are compelled to use the roadway for foot travel. While people have done this for generations, increasing traffic volumes and speeds, and drivers increasingly distracted by cell phones and other devices, have reduced safety for all users of the road, whether on foot, on bicycle or in an automobile. This can be made somewhat safer when shoulder lanes are available for use. In general, less developed communities in the region give pedestrian issues less consideration, with the exception of facilities for recreational use. Many communities readily acknowledge that particular roadway segments are used frequently by pedestrians and that the provision of pedestrian facilities will play an important role in future growth. For example, in Plaistow sidewalks are already in place in parts of Town and the Town has developed a three-phase plan for developing sidewalks linking all the major facilities in the community that generate substantial

pedestrian traffic. The Town has implemented the plan incrementally using Transportation Enhancement (TE) funds. The Town of Salem also has sidewalks in place in some areas, but they do not form a cohesive network.

Construction of sidewalks can be expensive, and many communities are unable to identify local funds to construct facilities for pedestrians. The TE program has been is the primary source of federal funding assistance for sidewalk construction used in New Hampshire. These funds have always been limited and highly competitive, and will be still more competitive in the future as MAP-21 consolidated TE and SRTS with two other federal programs into a new funding pool known as the Transportation Alternatives Program (TAP) with an overall budget reduction of approximately 30 percent. An additional challenge has been implementation of the NHDOT's Local Public Agency (LPA) program at the directive of the Federal Highway Administration, which applies a level of reporting and oversight designed for multi-million dollar projects to small locally managed sidewalk or bicycle infrastructure projects. This has added significant administrative burden and oversight cost to projects. New Hampshire's nine RPCs are working with NHDOT, FHWA and the state's Congressional Delegation to identify ways this process can be streamlined.

Key Issues and Challenges

Vehicle Miles of Travel (VMT)

From the 1970's until the mid-2000s, the annual amount of vehicle miles of travel (VMT) per person in the United States grew steadily at an average rate of about 1.8 percent per year (FHWA, 2014), exceeding the average annual growth in population over the same time period of 1 percent per year (US Census Bureau, 2014).

Beginning in 2004 this changed as the per capita VMT peaked and began to decline. This trend is reflected in the New Hampshire data as well with consistently declining per capita VMT since 2007 and current levels are below those seen in 2004 (***Figure TR5***). This trend is seen in the traffic count data as well with approximately 67 percent of count locations showing year over year declines in volumes since 2007. This has important implications for future investment in the transportation network as current efforts are focused on expanding capacity to reduce congestion.

The economic downturn in the mid-2000's played a part in reducing individual vehicle travel in this country, this new trend started before that crisis and has continued despite the economic rebound that has occurred. There are three main reasons generally attributed to this change (Davis, 2012):

- Fuel Prices continue to remain high. While this is not the sole cause, the impacts of fuel prices cannot be discounted, especially for those with fixed or low incomes.

- The Millenial generation, born between the early 1980s and early 2000s, are choosing more cost effective ways to travel. This age cohort appears to be making choices of where to live and how to transport themselves in a period of high fuel and auto ownership costs and so are choosing to live in urban areas where car ownership is not necessary and transit, bikes, and walking are viable alternatives. (APTA/TCRP 2014)

- Technology is replacing the need for some trips: More people than ever can work from home at least part of the time and the pervasiveness of mobile communications technology and internet access has allowed many trips to be replaced by social networking, webinars, and video conferencing. Improved access to information on transit schedules and timing, and ride sharing opportunities is also shifting individual choices of how to travel.

Assuming that VMTs continue to decline or stay steady, the direction of our investment in the transportation system needs to change as well. Efforts should move away from large, capacity increasing highway projects,

and more resources directed towards preservation of the existing system and expansion of access to pedestrian, bicycle, and transit.

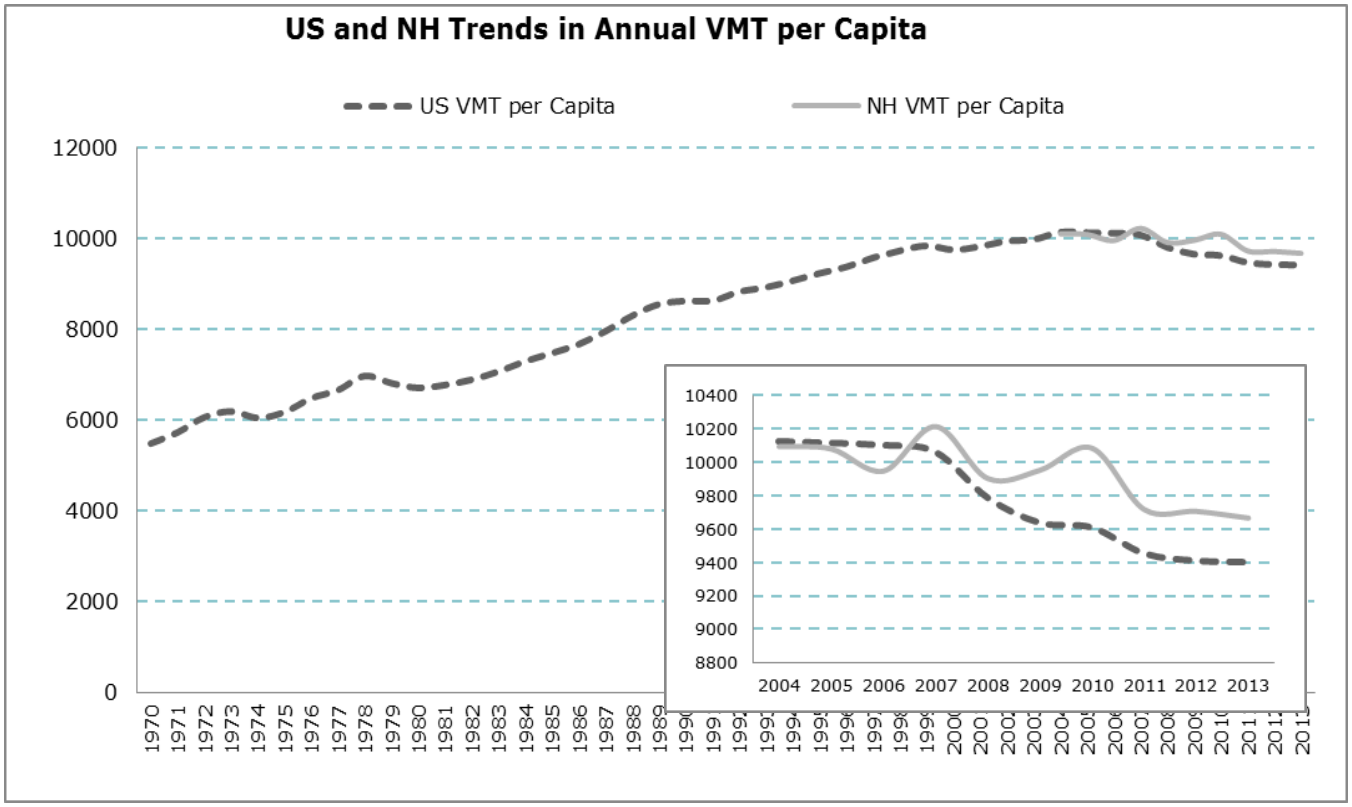


Figure TR5: Vehicle Miles of Travel Trends. Source: FHWA

Congestion

The trend of declining personal travel as indicated by declining per capita VMT would also seem to point toward reduced levels of congestion in the region. At the same time the spread of development to new areas, increased employment, and a population that continues to grow (if slowly) are contributing to congested travel along commuting corridors, near retail centers, and accessing recreational areas along the seacoast. ***Map TR 7*** at the end of this document utilizes the regional travel demand model to estimate congestion on regional roadways in 2040. This analysis is based on the expected growth in population and employment in the region as well as historical traffic patterns and can be compared to ***Map TR 6*** which shows the same information for the base year of the analysis (2010). Widening of the Spaulding Turnpike has reduced peak hour back-ups in that area however the same cannot be said on the I-93 corridor in Salem. Traffic congestion can also be seen spreading further along commuter corridors on NH 33, NH 111, NH 125 and begins to be seen on more rural roadways as well such as NH 111A in Danville, NH 151 in Greenland as well as smaller roadways such as Beede Hill Road in Fremont. Peak hour congestion also begins to have more of an impact on US Route 1 by 2040. While many segments of that roadway are impacted from tourism and retail activities, it has never been a substantial commuter corridor and so the worst travel periods tended to be on weekends or mid-day. While the 2010 map shows small areas of congestion primarily in Seabrook, by 2040 both AM and PM peak hour traffic in Seabrook, Hampton Falls, and Portsmouth will be experiencing more severe congestion.

Changing Demographics

The slowing of migration, particularly of young people, into the state has brought to the forefront the issue of the aging New Hampshire population. While the state and nation as a whole are graying as the baby boom

generation reaches retirement age, Rockingham County skews older than the state as a whole, due in part to significant development of age-restricted 55+ housing in the past two decades. AARP estimates that one in five Americans over age 65 does not drive, so in the transportation arena the needs of older residents and visitors may require a shift in the focus of investment to best serve that segment of the population, with increased attention to transit and paratransit, as well as safe pedestrian facilities (AARP Public Policy Institute, 2011).

Another aspect of changing demographics of the region is the growing ethnic and language diversity – particularly the growth in the region's Spanish-speaking population. This has implications for CART and other providers of transit service, to begin providing information on services in multiple languages.

Imbalance of Available Funding and Infrastructure Needs

The poor physical state of transportation infrastructure in the region has been a significant issue for many years and maintaining the system in the current era of inadequate funding remains a challenge. Bridges are added to the NHDOT's Red List at a faster rate than repairs can be made to remove others from the list. While NHDOT has traditionally targeted paving/rehabilitation of 500 miles of roadway on an annual basis, in recent years fiscal constraint has allowed less than 300 miles to be completed per year. The gas tax and other methods of funding the transportation system have remained static since the early 1990s and when combined with fuel efficiency gains, have not kept pace with inflationary pressures that have raised construction and materials costs significantly over the same timeframe. This has resulted in significant underfunding of investment in the transportation infrastructure.

Funding for public transportation is a particular problem in New Hampshire. Most states provide a significant portion of the funding needed to match Federal Transit Administration (FTA) resources supporting regional public transportation. New Hampshire ranks consistently near the bottom nationally in the amount of State funding contributed to public transportation (***Table TR7***). In 2010 the national average per capita state spending on public transportation was $40.00. Removing the influence of states with major urban rail systems, the median per capita state investment was $4.56. In comparison, New Hampshire contributed $0.37 per capita to public transportation, and most of this was in support of Intercity Bus service in the I93 corridor. Perhaps most important from a public transit operations standpoint, New Hampshire provides only $0.04/capita in support for public transit operations. Most matching funding for COAST and CART is provided by municipalities together with on-bus advertising and interagency partnerships. This reliance on municipal funding can create instability, especially in difficult municipal budget years.

Table TR7:
FY 2010 Per Capita State Spending on Public Transportation

	Transit	Public Transit Operations
Massachusetts	$ 207.56	$ 171.38
Connecticut	$ 87.14	$ 75.80
Rhode Island	$ 50.66	$ 39.54
Vermont	$ 10.17	$ 8.35
Maine	$ 0.40	$ 0.40
New Hampshire	$ 0.37	$ 0.04
National Average	$ 40.00	
National Median	$ 4.56	

Source: AASHTO 2012

In 2014 the NH Legislature passed a bill that increased the road toll by $0.04 for a limited time period. The increased revenue is dedicated to finishing I93 widening from Salem to Manchester, bridge rehabilitation and repair, and a small increase in the Highway Block Grant funding given to municipalities. While this is a step in the right direction, it falls short of providing the funds to address current, let alone future system needs.

Beyond funding for bus transit, New Hampshire has even more problems in funding rail service, as the New Hampshire Constitution prohibits use of revenues from gas tax, vehicle registration, or road tolls for rail service. Expansion of passenger rail in the state will require identification of a dedicated state funding source.

Coordination of Community Transportation Services

Beyond the public transportation and intercity bus and rail services described above, there are over two dozen health and human service agencies in the region which provide demand response transportation service for

various populations – in particular senior citizens, individuals with disabilities, and low income residents. Often these services target clients of specific human service agencies or communities, though in some cases they are open to broader populations. These agencies have historically operated independently with little coordination. Their vehicle operations should not be viewed as duplicative in that taken all together they collectively still do not meet the full trip need for transit dependent residents in the region. At the same time, each service typically maintains its own trip scheduling and dispatching capacity, agencies often only have operating funds for part-time drivers, such that vehicles are not fully utilized. Federal law requires MPOs to develop plans for coordination among these entities, with a goal of improving efficiency by centralizing functions such as scheduling, dispatching and billing, or developing joint agreements for maintenance and vehicle purchases. The RPC has been a partner in developing two Public Transit/Human Service Transportation Coordination Plans – one for the nine-town Greater Derry-Salem region, and one for the 28 cities and towns in southeastern New Hampshire, broadly defined as including Rockingham County east of Route 125 together with Strafford County. An initial step toward coordination has been transit agencies purchasing service from human service agencies to more fully leverage public and private resources. The more substantial integration of call taking and dispatching services envisioned in the coordination plans is just beginning to take hold in both regions, with agencies agreeing to consolidate some or all of their trip scheduling and provision through the regional call centers.

Freight Movement

Goods movement continues to be a growing sector of travel in the region as well as an important aspect of the regional and national economy. The Freight Analysis Framework is predicting that overall freight movement will increase by 48 percent between 2011 and 2040. Overall, truck freight share of freight has peaked and more goods will be shipped by all other modes. Truck freight currently carries about 82.5 percent of all goods by weight (KTons) but this is expected to decrease to 80.2 percent by 2040 with all other land based modes showing increased utilization. Between 2011 and 2040 the volume of Air freight is expected to increase by 195 percent, rail freight by 107 percent, and multimodal freight by 109 percent. The increased volume of freight being moved in the region brings with it a number of issues and concerns:

- Longer, heavier trucks are damaging roadways that were not designed to manage current allowable weights and infrastructure not designed for the turning radii necessary for the longest trucks.
- Public concern over the safety of moving hazardous materials through communities on rail and roadway.
- The investment in rail, port, and connecting transportation infrastructure has been lower than may be needed to adequately manage the expected freight volumes.

Regional Land Use Patterns and Transportation Choice

Existing land use patterns represent one of the most significant challenges to expanding transit service in the region. Development that is spread out over a large area is much more difficult to serve with transit than a compact development pattern, where centrally located stops can serve many residents and businesses within a short walking distance. Portsmouth, with its relative density and proximity of residential, retail, and employment locations, has worked with COAST to develop a solid network of transit connections throughout the city and invested in bicycle and pedestrian facility improvements. Higher commute mode shares for transit, bicycling and walking in compact, mixed-use downtowns with transit access, as compared to the county or state as a whole are shown in ***Table TR6*****.** For much of the central part of the RPC region, development densities are low enough that regular fixed route bus service is not practical. CART has sought to address this through use of demand response service and deviated fixed route service. Similar challenges exist for supporting safe bicycle and pedestrian transportation.

For generations public schools have been located in town centers to allow walking access. In the past two to three decades, new schools have often been constructed on the outskirts of communities. While this allows access to inexpensive land for playing fields, it can greatly increase overall operating costs including school and family transportation. To the extent that communities implement more compact development patterns, and ensure siting of public facilities considers transportation access, public transportation, bicycling and walking can become more convenient travel options.

Environment and Climate

Air Quality

The United States Clean Air Act, as amended, requires the Environmental Protection Agency to establish the National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health. The Environmental Protection Agency (EPA) currently enforces standards for six different pollutants including carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO^2), Ozone (O^3), particle pollution (PM2.5), and sulfur dioxide (SO^2). As of July, 2013, the RPC region (and all of New Hampshire) meets EPA standards for all transportation related emissions regulated under the NAAQS, and are therefore classified as attainment areas. This is the result of nearly 20 years as a Non-Attainment area with many efforts focused on reducing the impacts of the transportation system on air quality through projects and policies that reduce Vehicle Miles of Travel and promote less polluting modes of travel. That being said, air pollutants and greenhouse gases are still a concern within the region. The EPA is currently considering lowering the NAAQS and depending on where the threshold is set, the region could move return to a non-conforming status and be required once again to use Transportation Conformity and air emissions analysis to demonstrate that the projects being constructed and implemented in the region do not have a detrimental impact on air quality.

Climate Change

Carbon dioxide (CO^2), a primary contributor to the problem of global climate change, is emitted through the combustion of fossil fuels and the concentration of this compound has increased substantially since the industrial revolution and continues to do so today (EPA, 2014). The transportation sector contributes roughly 28 percent of the total US greenhouse gas emissions each year and is an area where we can continue to make changes to reduce the impacts. Increased frequency and severity of storm events over the past decade, and anticipated continuation of this trend in the coming decades related to climate change, has significant implications for transportation system operations, maintenance and future investment planning. It is the responsibility of the MPO to identify the measures that are necessary to plan for a transportation system that is resistant to damage from extreme weather and more resilient when weather-related impacts do occur. The challenges that the MPO faces from this are:

- Development of the data necessary to estimate the vulnerability of the transportation system to increased storm activity and sea level rise.
- Finding the funding to address specific facilities that are vulnerable to sea level rise and increased storm activity.

Climate change can have a variety of impacts on the transportation system of the region and coastal areas are particularly vulnerable to those impacts. Higher temperatures can cause problems with softening pavement and expanding bridge joints creating stresses on the effected facilities. More intense storm activity results in more frequent flooding causing traffic problems as well as damage to roadways, culverts, railroads, and bridges. Coastal inundation from storm events brings the addition of damage from wave action and salt water.

RPC is currently in the midst of an vulnerability analysis examining the impacts of flooding due to sea level rise and inundation from storm activity. This analysis has preliminarily data showing that under the highest expected sea level rise, 100 year storm events (1 percent probability per year) will impact over 80 miles of roadway and bridges in the seacoast. ***Map TR3*** shows the extent of these impacts under that scenario. The impacts from this flooding are in many of the regionally significant economic centers along the coast and could have substantial negative effects on tourism and the economy of the region and work needs to continue to mitigate these issues before the problems occur.

Wildlife, Habitat, and Open Space

There are a number of planning efforts that have occurred in the region and the state in recent years that can inform the transportation planning process and aid in understanding the impacts of projects on the natural environment. Several data sources for natural resources exist which can provide detailed information on the location, quality, and extent of discreet natural resource types as map "layers", such as wetlands, aquifers, forest areas by type, and soils. However, there are fewer sources which look at these resource layers in

combination and assess the value of different geographical areas based on the presence, quality, and interaction of two or more of these resource layers based on their value as a functioning ecosystem. Data on cultural resources tend to be less comprehensive, as few municipalities have comprehensive historical and cultural resource inventories. Much of the cultural resource inventory data from the past 20 years has been compiled for limited geographic areas as part of regulatory requirements for permitting public infrastructure projects such as highways or utility lines.

The Rockingham Planning Commission has been involved with the development of two sources of natural resource data for the region that provide resource information within a framework of analysis of the co-occurrence of two or more resource layers: the *New Hampshire Natural Services Network*, and the *Land Conservation Plan for New Hampshire's Coastal Watersheds*. In addition, the *New Hampshire Wildlife Action Plan* provides another important data set useful in identifying high-value resource areas, and was used in part in the Coastal Land Conservation Plan's co- occurrence data. Both the Wildlife Action Plan and the Natural Services Network contain data at state, regional, and municipal scales and are therefore available for the entire RPC/MPO area. The Land Conservation Plan contains data for the coastal watershed region of New Hampshire, which includes about three-fifths of the land area of the RPC/MPO. RPC has utilized these data sources as a primary source of identifying potential opportunities for mitigation activities that involve habitat protection and resource conservation, such as called for under water quality, wetlands, floodplains, farmland soils and habitat protection.

In addition, land use strategies have become increasingly important to the development and implementation of transportation projects, especially in regards to mitigating environmental impacts. These strategies may include, but are not limited to, land use planning techniques such as districts or ordinances based on identified natural resources areas, such as the Conservation Overlay District model ordinance found in the Land Conservation Plan, as well as ordinances as found in ***Innovative Land Use Controls: A Handbook***, prepared jointly by the NH Office of Energy and Planning, the NH Department of Environmental Services, and the regional planning commissions of the state of New Hampshire. Tools in the Handbook include model ordinances on Transfer of Density Rights, The Village Plan Alternative Subdivision, Conservation Subdivisions, Erosion and Sediment Control, and Protection of Wildlife Habitat, among others.

Complete Streets and Safe Accommodation for All Travelers

While experienced bicycle riders are typically comfortable riding on roads with narrow shoulders and significant traffic, the lack of a shoulder bicycle route will often prevent younger riders or adults unaccustomed to riding from choosing to ride a bicycle for a short trip instead of driving. Significant progress has been made in the past 20 years in developing regional bicycle routes such as the Great Bay Bicycle Loop, the Exeter-Hampton-North Hampton Loop, the Salem-Concord Bikeway, and constructing shoulder bicycle routes in various communities, projects tend to be developed in a piecemeal approach based on availability of local funds, or developer contributions.

In spite of FHWA policy regarding infrastructure investments, bicycle and pedestrian facilities are typically not considered on an equal footing with vehicle accommodations. Bicycle and pedestrian accommodations are often only prioritized in highway projects in response to organized input from advocacy organizations, rather than as an integral component of the roadway design process. A response to this is the concept of *Complete Streets,* which emphasizes the idea that streets should be designed and operated to enable safe access for all users, whether drivers, transit riders, pedestrians, and bicyclists, as well as for older people, children, and people with mobility impairments. What constitutes a Complete Street will vary by community and development density – what works for Boston, Portsmouth and Brentwood will be different responding to the relative prevalence of pedestrians or the presence of transit service. Fundamentally, though, Complete Streets policies direct transportation planners and engineers to consistently design with all users in mind, not just automobile drivers. Complete Streets policies have been adopted by 27 states, and more than 600 counties and municipalities nationwide. Portsmouth has adopted such a policy, as have the cities of Concord and Keene.

Distracted Driving

Each day in the United States, more than 9 people are killed and more than 1,060 people are injured in crashes that are reported to involve a distracted driver (NHTSA). Distracted driving is driving while doing another activity

that takes your attention away from driving. The Insurance Institute for Highway Safety estimates that cell phone use can increase the chance of a motor vehicle crash by a factor of four (IHS 2005). Distracted driving activities include things like using a cell phone, texting, and eating. Using in-vehicle technologies such as navigation systems can also be sources of distraction. The New Hampshire Legislature recently outlawed texting while driving, though surveys suggest (CDC 2014) it is still a widespread practice.

While distracted driving poses a threat to all road users, that threat is particularly great for those travels not protected by the steel frame of an automobile. Crash data provided by NHDOT for the 2003-2012 period shows that distracted driving is one of just two growing factors contributing to crashes (with the other being following too close). ***Map TR4*** illustrates the extent of distracted driving crashes in the region and it is a problem that is touching all communities and all roadway types. In 2003, driver distraction was cited as a causative factor in just under 12 percent of crashes in the region. By 2012 distraction had increased to 16 percent of crashes, and according to an article in the Manchester Union Leader, was a factor in 27 percent of fatal crashes over the last three years (Rayno, 2014).

Transportation Recommendations

Recommendation 1

Promote the effective and efficient utilization of existing transportation infrastructure through appropriate maintenance as well as lower cost improvement strategies such as Access Management and Intelligent Transportation Systems (ITS) to minimize the need for roadway widening.

As the condition of roadways and bridge structures decline the cost of repair rises substantially in both time and funds needed. At appropriate funding levels, these structures are addressed prior to declining to the point where extensive and expensive fixes are needed to bring the facility back to good condition. Similarly, the high cost of roadway expansion entails that existing capacity must be utilized as effectively and efficiently as possible. There are a variety of ways in which this can be implemented, notably through access management strategies and Intelligent Transportation Systems (ITS) improvements. Access management typically involves small scale policy, regulation, and design changes that minimize traffic conflicts and maximize traffic flow on existing facilities. Strong Access Management standards are recommended for communities to implement on state highways and other important roadways within their jurisdiction. This should be supplemented with an Access Management Memorandum of Understanding (MOU) between the New Hampshire Department of Transportation and the community to ensure that each entity understands the access control desired on a particular state highway. ITS uses technological advances to improve traffic flow and safety and reduce congestion through strategies like traffic signal synchronization, electronic tolling, and traveler information services. The region has an approved and up-to-date ITS Architecture in place that guides investment strategies through agreed on policies and technology standards.

Actions

- Promote development of Access Management standards for state highways in communities. (Timeframe: 1-10 Years)
- Assist communities and NHDOT with the development of Access Management MOU agreements. (Timeframe: 1-10 Years)
- Promote strong Access Management in designs for improvements (publicly and privately financed) along state highways and other corridors. (Timeframe: Immediate and ongoing)
- Continue scheduled updates to Regional ITS Architecture and Implementation Strategy and participate in updates to Statewide ITS Architecture. (Timeframe: 2-4 years)
- Promote integration of ITS and other efficiency strategies into the design of transportation projects as appropriate. (Timeframe: 1-10 years)

Recommendation 2

Encourage investment in freight infrastructure improvements to promote goods movement and economic development.

While overall volumes of personal travel appear to be declining the movement of goods around the region continues to grow and is forecast to continue this growth over the next twenty years. The region's highway network is robust and well suited to freight movement, however, the other modes of goods movement (air, rail, shipping, and pipeline) and the intermodal connections between them are in need of improvement.

Actions

- Evaluate intermodal connections on the transportation network and assess the need for maintenance and preservation or improvement projects to maintain freight flows. (Timeframe: 1-5 Years, periodically repeat)
- Continue to implement ITS improvements from the regional ITS architecture that will facilitate the movement of goods. (Timeframe: 1-10 Years)
- Work with NHDOT on the development of the Statewide Freight Plan (Timeframe 1-2 Years)
- Consider freight impacts in the decision-making process for evaluating transportation project proposals. (Timeframe: Ongoing)

Recommendation 3

Increase the funding available for operation, maintenance and modernization of transportation infrastructure and utilize public/private partnerships to facilitate project implementation where appropriate.

One of the biggest challenges facing the state, the region, and communities is maintaining, operating and updating the transportation system in an era of reduced resources and weak political will to invest in infrastructure. Traditionally projects have been advanced to the State Ten Year Plan to be queued for eventual construction. However, given the current financial limitations with respect to state and federal funding, waiting for any individual project to be constructed via that route is likely to take a minimum of 10 to 15 years, and might be a viable option only for large, long range projects. Even then, funding for maintaining the transportation system has not kept up with the repair and replacement needs of the infrastructure. The municipal and business sectors have a shared interest in working to restore state and federal investment in transportation infrastructure. In addition, communities will benefit from finding alternate means of financing many improvements. This will mean working with citizens, other communities, NH DOT, and private interests to find appropriate mechanisms. In addition, many communities have had success in recent years leveraging private development interests to achieve public transportation improvement goals through the use of development exactions and public/private partnerships.

Actions

- Work with federal, state and regional partners to increase the amount of Federal and State funding available in the region to address project needs. In particular work to establish a dedicated state funding stream for public transportation. (Timeframe: Immediate)
- Work directly with communities to expand the options available for local financing of transportation system maintenance, preservation, and improvement. (Timeframe: Immediate and ongoing)
- Promote the use of public/private partnerships to spur investment in the transportation system where private development goals facilitate achievement of public priorities.
- Assist communities with the development of policies and regulations that aid in securing private development funding appropriate for the amount of impact expected on adjacent transportation facilities.
- Work with NH DOT to identify projects that might benefit from non-traditional contracting mechanisms such as design-build to expedite implementation.

Recommendation 4

Establish and implement a project selection and implementation strategy that uses criteria consistent with the State of New Hampshire and other NH MPOs to prioritize projects in the Metropolitan Transportation Plan (MTP), State Ten Year Plan, and the Transportation Improvement Program (TIP).

A critical role of the MPO is to establish project priorities for implementation given limited funding for investment in the maintenance, preservation, modernization, and improvement of transportation infrastructure. Project selection criteria and processes have been used by the MPO for many years to quantify and justify priorities but until the last iteration of the State Ten Year Plan this effort was not consistently applied and was not taken into consideration at the state level. In 2012-2013 NHDOT and the MPO developed and utilized a comprehensive process and a common set of criteria based around project benefits and impacts as well as project readiness and support concerns.

There is a strong interest in applying this process to project prioritization at the regional and state level for many types of projects across all modes of travel. To facilitate that, this process and the selection criteria need to be further defined and refined to better reflect the need for a strong transportation system across all modes and that reflects local, regional, and state priorities in the implementation of projects in the Ten Year Plan and the Transportation Improvement Program (TIP). ***Appendix D*** lists thee current prioritized list of transportation projects for the region and ***Map TR5*** illustrates the general location of these projects.

Actions

- Work with NHDOT to ensure that project selection criteria continue to reflect local and regional priorities. (Timeframe: 1-2 Years)
- Refine the project development process through early data collection and scoping to better enable the project selection process with more complete information regarding project proposals. (Timeframe: 1-2 Years)
- Update the list of prioritized projects in the Long Range Transportation Plan to reflect the latest planning assumptions. (Timeframe: 1-2 Years - cyclical)
- Solicit communities, Transit providers, and NH DOT for transportation needs over the short and long-term within the region . (Timeframe: 1-2 Years - cyclical)
- Propose projects to be constructed as part of the State Ten Year Plan process. (Timeframe: 1-2 Years - cyclical)
- Propose projects to be constructed as part of the Transportation Alternatives and Congestion Mitigation and Air Quality Programs. (Timeframe: 1-2 Years - cyclical)

Recommendation 5

Employ a context-sensitive, Complete Streets design approach to transportation system planning, operation and maintenance.

Beyond ensuring adequate maintenance of the region's existing transportation system, the priorities that emerged most consistently throughout the public input process involved expanding access to bicycle and pedestrian infrastructure and community transportation – particularly for special needs populations such as senior citizens and individuals with disabilities. A key step in this is ensuring that streets are designed for safe accommodation of all travelers, not solely the optimal movement of automobile traffic. The Context Sensitive Solutions (CSS) approach to project development that the NHDOT has used increasingly in the past five is an important counterpart to a complete streets approach, as it is designed to ensure input in the design process by all interested members of the community. Beyond design, a complete streets approach is also needed for operations and maintenance. Failure to maintain sidewalks, in particular failure to plow sidewalks within a reasonable window during winter months, imposes safety threats and barriers to mobility for many in our communities.

Actions

- Develop and adopt a Complete Streets policy for the Rockingham Planning Commission MPO. (Timeframe: 1-3 years)
- Provide technical assistance to member communities in the development of local Complete Streets policies. (Timeframe: Ongoing)

- Work with municipalities and NHDOT to ensure that sidewalks, crosswalks or other pedestrian facilities are not omitted from highway projects due to lack of an entity willing to take responsibility for long term maintenance. (Timeframe: Ongoing)
- Use local and regional planning processes such as corridor studies, Safe Routes to School travel plans, and local master plan chapters to promote traffic calming strategies to balance traffic movement with pedestrian and neighborhood safety. (Timeframe: Ongoing)
- Provide technical assistance on implementation of Complete Streets policies, such as design solutions on regional transportation facilities

Recommendation 6

Consider the interaction of land use and transportation investments in the development of plans and program; including preservation of open space and natural/cultural resources, economic development and environmental justice.

Land use and transportation are closely linked. The transportation system and the access it provides have a significant effect on land use -- and vice-versa. It has also become clear that development patterns can strongly influence the growth in travel demand in a region. Regions with compact city centers that have a mix of uses and serve as employment hubs can generate from 20-30 percent less automobile travel per capita than regions that are highly sprawled in their pattern. While the RPC region historically was fairly compact in its settlement pattern, with many traditional downtown and village centers that remain active and viable, most of the development that has occurred over the past four decades has been far more dispersed and sprawling in character. This led to growth in the number of vehicle miles travelled at a rate two to three times that of the population growth and was unsustainable in the long term. In recent years, the trend in VMT growth has changed to a decline indicating that people are finding reasons not to drive as much as in the past. As a transportation planning policy therefore, this Plan advocates land use strategies which, among other benefits, continue to lower demand for automobile travel. In the past such strategies have been seen as important mechanisms to reduce traffic congestion, maintain air quality conformity and slow land consumption. Today, rapid increases in energy costs and concern about global climate change make the implementation of these land use/transportation strategies that much more critical.

Actions

- Promote TOD and Mixed Use Development. (Timeframe: Ongoing)
- Prioritize transportation investment in the region's already developed areas through weighting of project selection criteria. (Timeframe: Ongoing)

Recommendation 7

Employ an integrated approach to increase the share of trips made in the region by bicycling, walking, transit and ridesharing.

Ensuring that all travelers have options beyond the single occupant vehicle is key to meeting the mobility and accessibility goals of the region. Beyond simply providing bicycle and pedestrian facilities and transit services, though, there is a role for the MPO in actively encouraging use of these options. The New Hampshire Climate Action Plan identified the transportation sector as the source of 33 percent of greenhouse gas emissions in New Hampshire, and identified actions for reducing those emissions including promoting alternatives to driving alone. Experience nationally in promoting safe walking and bicycling to school has shown that building new sidewalks or bikeways alone is often not enough to induce more kids walk or bicycle. There is a need for the other four elements of the 5Es model - Education, Encouragement, Enforcement and Evaluation – to build awareness, incentive behavior change and ensure safety.

Actions

- Provide technical assistance to communities in bicycle and pedestrian planning, including development and implementation of Safe Routes to School initiatives, and securing federal funding support through multiple programs. (Timeframe: Ongoing)

- Continue to provide technical assistance to COAST, CART and TASC in developing regional community transportation options. (Timeframe: Ongoing)
- Continue facilitating regional efforts to better coordinate public transit and human service transportation as a key strategy to expand access to community transportation. (Timeframe: Ongoing)
- Work with State and regional partners to develop and sustain expanded inter-city rail and bus transportation options. (Timeframe: Ongoing)
- Collaborate with regional and statewide partners on public education and enforcement initiatives to promote safe travel on the region's transportation system for all users, such as the NH PASS program focused on raising awareness of RSA 265:143a, New Hampshire's "three foot" passing distance law. (Timeframe: 1-3 years and ongoing)
- Collaborate with regional and statewide partners in development and ongoing implementation of a bicycle and pedestrian counting program to provide a better basis for evaluating bicycle and pedestrian project needs. (Timeframe: 1-3 years and ongoing)
- Develop a stand-alone bicycle and pedestrian plan for the RPC region. (Timeframe: 1-3 years)
- Collaborate with commuteSMARTseacoast and other regional and statewide partners on initiatives to encourage alternative commutes such as Seacoast Bike/Walk to Work Day and Commute Green New Hampshire (Timeframe: Ongoing)

Recommendation 8

Undertake planning studies that can identify safety concerns and begin to address them.

Much of the work of the MPO addresses the safety of the transportation system. Examples include corridor studies which identify and address safety problems; assistance to communities in developing Safe Routes to School initiatives and other education programs and facility projects that support bicycle and pedestrian safety; and technical assistance to regional transit agencies in the development of transit safety plans. Motor vehicle crashes are the most common safety concern in the region and in light of that safety is generally given significant consideration during the development and programming of projects for construction.

Actions

- Identify and track performance measures related to transportation safety (Timeframe: 1-5 Years, Ongoing)
- Undertake corridor-wide safety studies on facilities with high accident rates. (Timeframe: Ongoing)
- Assist regional transit agencies in the development and implantation of safety plans as necessary. (Timeframe: As needed)
- Work with NHDOT and communities to undertake road safety audits at sites of specific concern in the region. (Timeframe: As needed)

Recommendation 9

Undertake efforts to reduce the vulnerability of the transportation system to natural hazards, storm surge, and the potential impacts of sea level rise and other climate change related concerns.

Changing weather patterns and the prevalence of extreme storm events in the northeast over the last ten years have focused attention on the vulnerability of the transportation network. The MPO can play a role in conducting the analysis necessary to understand where impacts from natural or other hazards may occur and work to mitigate that potential where possible. ***Map TR3*** indicates that over 80 miles of roadways in the seacoast could be impacted by sea level rise and coastal inundation from storms and the region needs to begin addressing and mitigating that issue.

Actions

- Complete the vulnerability analysis that is examining stream crossings on the state highway system and determine where investments can be made to reduce flooding potential and other damage. (Timeframe: 1-5 Years)

- Work with state and regional partners to define the MPO role in security planning for the transportation system. This role should provide tangible benefits without adding a level of bureaucracy to the security planning process. (Timeframe: Ongoing)
- Incorporate transportation network planning into the current work with FEMA and local communities to develop hazard mitigation plans. (Timeframe: 5-10 Years)
- Analyze the transportation system for capacity and safety deficiencies that impact security and disaster planning concerns. (Timeframe: 5-10 Years)
- Incorporate security and disaster planning aspects into the project design and prioritization process. (Timeframe: 1-5 Years)
- Prioritize projects designed to increase the resiliency of the transportation system to anticipated impacts of climate change (Timeframe: Ongoing)

Transportation Goals and Recommendations Matrix

	Mobility	Equity & Accessibility	Land Use Integration	Funding	System Preservation	Environmental Linkages
Recommendation 1	P	S	S	S	S	S
Recommendation 2	P	S	S	S	S	S
Recommendation 3	P	P	P	S	P	P
Recommendation 4	S	S	S	P	S	S
Recommendation 5	S	S	S	P	P	S
Recommendation 6	S	S	S	S	S	S
Recommendation 7	S	S	S	P	P	S
Recommendation 8	P	P	P	P	S	S
Recommendation 9	P	P	S	P	S	S

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

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Appendix A: Functional Classification Data

Road Miles by Functional Class and Community

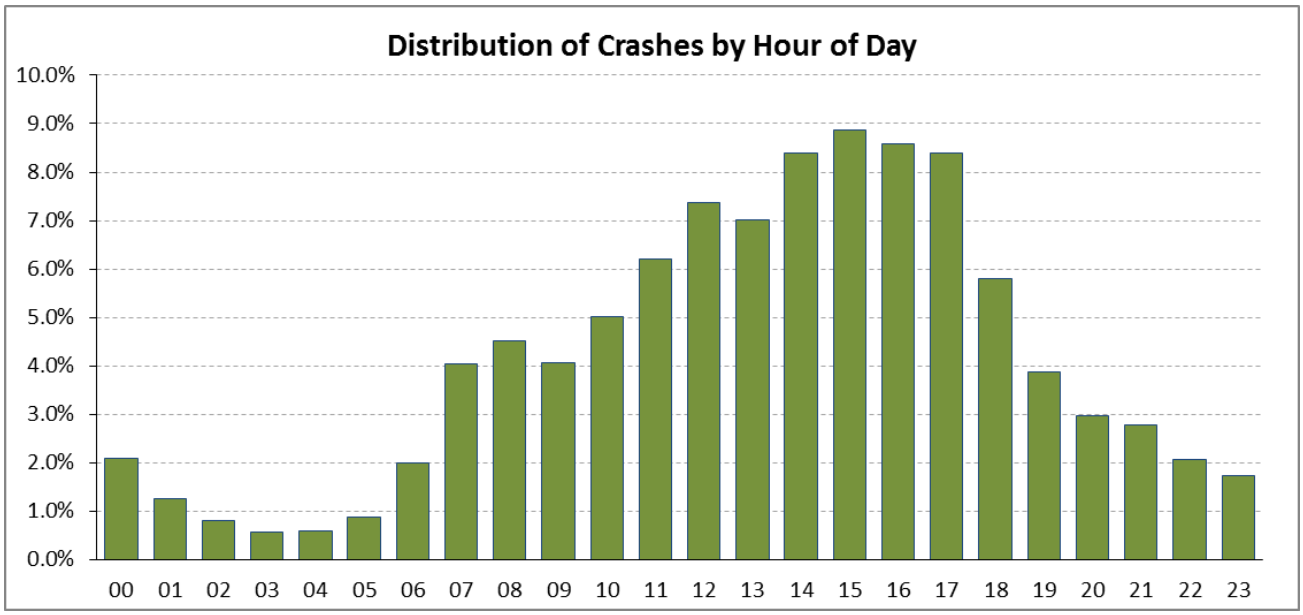
	Rural						Urban						
Town	Private Roads	Principal Arterials	Minor Arterials	Major Collector	Minor Collector	Local Road	Principal Arterial Interstate	Principal Arterial – Other Freeways & Expressways	Principal Arterials – Other	Minor Arterial	Collector	Local Road	Grand Total
Atkinson	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	4.2	2.2	49.8	69.2
Brentwood	6.4	0.0	0.0	3.4	1.3	32.1	0.0	8.9	1.8	0.0	2.5	9.3	65.8
Danville	12.9	0.0	0.0	0.0	1.5	11.3	0.0	0.0	1.7	0.0	2.9	24.0	54.4
East Kingston	7.3	0.0	0.0	2.5	2.1	7.4	0.0	0.0	0.0	0.0	4.8	7.1	31.2
Epping	22.4	1.8	0.0	0.0	4.1	38.8	0.0	16.2	0.0	0.0	5.0	27.9	116.1
Exeter	17.9	0.0	0.6	1.0	1.8	11.7	0.0	15.5	0.0	9.5	9.3	45.6	112.8
Fremont	15.2	0.0	0.0	3.6	1.4	23.4	0.0	0.0	0.0	0.0	1.4	15.6	60.6
Greenland	4.1	0.0	0.0	1.1	0.0	3.8	6.2	0.0	0.0	3.3	3.7	23.5	45.8
Hampstead	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	5.0	3.4	59.8	86.7
Hampton	10.1	0.0	0.0	0.0	0.0	3.1	8.5	4.2	11.8	13.8	9.3	56.1	116.9
Hampton Falls	0.9	0.0	0.0	0.4	6.0	16.4	4.3	0.0	0.0	1.8	1.9	9.2	41.0
Kensington	2.4	0.0	0.0	6.7	3.5	20.6	0.0	0.0	0.0	0.0	0.0	0.0	33.2
Kingston	9.6	0.0	0.0	0.0	0.0	11.1	0.0	0.0	10.6	0.0	6.7	52.0	90.0
New Castle	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	5.0	11.0
Newfields	0.4	0.0	0.0	0.0	2.4	5.2	0.0	0.0	0.0	0.0	4.2	9.0	21.1
Newington	19.0	0.0	0.0	0.0	0.0	8.4	0.0	7.7	0.0	1.0	2.4	9.9	48.4
Newton	4.4	0.0	0.0	0.6	0.0	1.7	0.0	0.0	0.0	0.0	10.3	28.3	45.3
North Hampton	6.5	0.0	0.0	1.1	0.0	10.3	7.9	0.0	3.4	0.0	12.4	22.4	64.0
Plaistow	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	7.0	13.9	28.2	57.2
Portsmouth	24.9	0.0	0.0	0.0	0.0	0.0	18.0	10.4	6.1	14.1	8.1	82.9	164.5
Rye	7.7	0.0	0.0	0.0	0.0	4.2	0.0	0.0	1.2	1.1	15.2	34.7	64.1
Salem	11.2	0.0	0.0	0.0	0.0	0.2	12.2	0.0	9.2	14.1	17.4	153.0	217.3
Sandown	7.7	0.0	0.0	0.4	0.0	12.8	0.0	0.0	0.0	0.0	6.6	42.8	70.2
Seabrook	8.3	0.0	0.0	0.1	0.0	0.0	4.9	0.0	0.0	4.7	5.2	38.3	61.4
South Hampton	2.6	0.0	0.0	1.4	2.9	8.3	0.0	0.0	0.0	0.0	0.0	1.8	17.1
Stratham	9.8	0.0	0.0	0.0	0.0	9.4	0.0	4.7	0.0	6.0	1.5	49.5	80.9
Grand Total	**245.9**	**1.8**	**0.6**	**22.3**	**27.0**	**240.3**	**61.9**	**67.6**	**54.6**	**88.2**	**150.3**	**885.5**	**1846.2**

Appendix B: Crash Statistics

Data from all tables and charts is from the NH Crash Records Database for years 2003-2012,

Crashes by Day of Week

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total	%
SUN	629	646	637	495	518	549	603	554	502	499	5632	11.0%
MON	820	800	742	646	731	674	774	617	646	622	7072	13.8%
TUE	910	833	757	604	695	676	634	715	688	627	7139	13.9%
WED	836	807	853	602	705	807	796	715	674	543	7338	14.3%
THU	915	740	874	663	781	722	774	672	709	789	7639	14.9%
FRI	1082	967	962	723	1008	882	787	872	837	791	8911	17.3%
SAT	901	776	910	748	772	734	738	760	655	672	7666	14.9%
Total	6093	5569	5735	4481	5210	5044	5106	4905	4711	4543	51397	



Crashes by Location on the Roadway

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total	%
Intersection/Driveway	2178	1891	1890	1522	1705	1592	1665	1523	1414	1393	16773	32.6%
Along the Road	2397	2227	2372	1907	2073	1889	1904	1942	1948	1888	20547	39.9%
Off the Road/Shoulder	242	262	250	221	274	247	240	225	187	248	2396	4.7%
In a Parking Lot	784	781	753	468	739	866	897	834	803	671	7596	14.8%
Other/Unknown	501	413	479	367	426	456	416	399	370	352	4179	8.1%
Total	6102	5574	5744	4485	5217	5050	5122	4923	4722	4552	51491	

Crashes by Injury Type

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total	Average
Fatalities	8	17	15	13	20	12	12	15	9	18	139	13.9
Severe Injury	84	92	91	73	87	63	60	68	57	68	743	74.3
Minor Injuries	614	582	637	580	598	491	540	548	529	555	5674	567.4
Possible Injury	531	442	389	357	390	341	351	282	236	234	3553	355.3
Unknown	276	484	457	306	309	269	229	185	164	183	2862	286.2
No Injury	4589	3957	4155	3156	3813	3874	3930	3825	3727	3494	38520	3852.0
Total	**6102**	**5574**	**5744**	**4485**	**5217**	**5050**	**5122**	**4923**	**4722**	**4552**	**51491**	**5149.1**
% Injury/Fatal	**20.3%**	**20.3%**	**19.7%**	**22.8%**	**21.0%**	**18.0%**	**18.8%**	**18.5%**	**17.6%**	**19.2%**	**19.6%**	**19.6%**

Crash Types

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total	%
Collision With Other MV	4363	3880	4024	3056	3655	3520	3682	3494	3363	3099	36136	70.2%
Collision with MV Crossing Median	13	15	12	1	14	7	3	11	9	10	95	0.2%
Collision with Parked MV	174	187	149	70	115	129	130	97	105	92	1248	2.4%
Collison with Train	1					1					2	0.0%
Collision with Bicyclist	37	17	21	25	17	25	33	22	18	21	236	0.5%
Collision with Pedestrian	53	55	42	50	53	43	42	35	31	48	452	0.9%
Collision with Animal	160	156	139	140	140	156	142	148	151	157	1489	2.9%
Collision with thrown/falling object	41	25	25	15	28	16	21	26	29	29	255	0.5%
Collision with other object	50	45	53	53	70	58	56	55	47	50	537	1.0%
Collision with fixed object	925	953	1038	873	881	849	785	824	755	874	8757	17.0%
Overturn	103	82	92	71	84	69	64	52	79	54	750	1.5%
2 wheel vehicle spill	21	26	24	15	23	17	15	21	16	22	200	0.4%
fire	2	1		1			1		1	1	7	0.0%
submersion	3	2	5	4	9	5	3	6	1	3	41	0.1%
jacknife	1	2		2	3	2	4	1	1	1	17	0.0%
Explosion			1				1	1			3	0.0%
Collision with MV in transport	15	5	8	2	7	9	6	5	3	5	65	0.1%
Collision with Moped	9	9	14	11	10	12	9	13	7	8	102	0.2%
Collision with Snowmobile/OHRV	4		1	1	2	1					9	0.0%
Other	63	55	45	77	79	92	86	61	66	53	677	1.3%
Unknown	64	59	51	18	27	39	39	51	40	25	413	0.8%
Total	**6102**	**5574**	**5744**	**4485**	**5217**	**5050**	**5122**	**4923**	**4722**	**4552**	**51491**	

Appendix C: Freight Data

Data from all tables and charts is from the Freight Analysis Framework, 3rd version developed by the Federal Highway Administration.

Freight Movement by Ton-Miles

Total Exports (Ton-Miles)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	39.43	43.61	55.64	70.29	86.05	100.53	105.65
Multiple modes & mail	672.24	742.88	914.54	1109.25	1327.09	1556.26	1657.60
Other and unknown	157.99	194.04	224.61	235.93	243.35	258.83	286.93
Pipeline	2839.11	3239.88	4178.78	4604.73	4496.89	4541.32	4866.05
Rail	311.48	350.32	408.30	481.35	559.14	641.36	736.97
Truck	5288.85	6192.30	7242.34	8024.02	8731.75	9565.19	10619.04
Water	97.13	107.80	130.47	145.32	155.40	170.49	194.07
Grand Total	9406.24	10870.83	13154.69	14670.88	15599.67	16833.97	18466.31

Total Imports (Ton-Miles)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	8.73	12.31	14.72	17.65	20.57	23.63	26.32
Multiple modes & mail	21.31	26.41	34.43	42.76	51.53	60.29	70.92
Other and unknown	252.82	324.55	412.14	498.43	587.69	689.31	806.05
Pipeline	2901.25	3076.77	2970.28	2844.80	2539.65	2368.20	2293.78
Rail	758.55	907.71	1034.35	1148.96	1245.94	1343.09	1447.65
Truck	6451.31	7491.31	8348.01	8885.25	9187.83	9650.74	10167.28
Water	968.60	1034.40	1096.65	1162.38	1217.02	1292.95	1393.41
Grand Total	11362.56	12873.45	13910.59	14600.21	14850.22	15428.23	16205.40

Total Goods Movement (Ton-Miles)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	48.15	55.92	70.36	87.94	106.61	124.17	131.97
Multiple modes & mail	693.55	769.29	948.97	1152.00	1378.62	1616.55	1728.53
Other and unknown	410.81	518.59	636.75	734.36	831.04	948.14	1092.98
Pipeline	5740.37	6316.65	7149.06	7449.52	7036.54	6909.52	7159.83
Rail	1070.03	1258.02	1442.66	1630.30	1805.08	1984.45	2184.62
Truck	11740.16	13683.61	15590.35	16909.26	17919.59	19215.93	20786.32
Water	1065.73	1142.20	1227.13	1307.70	1372.42	1463.44	1587.48
Grand Total	20768.80	23744.28	27065.28	29271.09	30449.89	32262.20	34671.71

Percentage of Total Goods Movement

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	0.23%	0.24%	0.26%	0.30%	0.35%	0.38%	0.38%
Multiple modes & mail	3.34%	3.24%	3.51%	3.94%	4.53%	5.01%	4.99%
Other and unknown	1.98%	2.18%	2.35%	2.51%	2.73%	2.94%	3.15%
Pipeline	27.64%	26.60%	26.41%	25.45%	23.11%	21.42%	20.65%
Rail	5.15%	5.30%	5.33%	5.57%	5.93%	6.15%	6.30%
Truck	56.53%	57.63%	57.60%	57.77%	58.85%	59.56%	59.95%
Water	5.13%	4.81%	4.53%	4.47%	4.51%	4.54%	4.58%

Freight Movement by Tonnage

Total Exports (1000s of Tons)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	27.60	13.33	37.37	49.92	62.77	74.21	80.56
Multiple modes & mail	942.79	790.81	1178.12	1357.84	1530.60	1711.72	1840.44
Other and unknown	1660.69	1581.64	1924.00	2019.63	2065.21	2146.56	2272.79
Pipeline	3464.04	2720.89	4155.97	4636.94	4818.07	5119.49	5581.61
Rail	1224.76	1147.61	1402.54	1631.18	1878.77	2142.57	2445.85
Truck	49398.12	46066.84	57223.46	60633.48	62326.86	64716.70	68384.53
Water	357.94	458.28	595.82	745.17	888.04	1030.83	1203.29
Grand Total	57075.94	52779.40	66517.27	71074.17	73570.33	76942.08	81809.05

Total Imports (1000s of Tons)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	6.32	8.95	10.74	12.92	15.11	17.38	19.36
Multiple modes & mail	83.48	104.55	138.24	175.92	217.35	257.93	306.26
Other and unknown	1346.51	1751.14	2037.72	2165.58	2255.73	2388.72	2575.38
Pipeline	4727.12	5110.09	5471.43	5931.67	6253.66	6726.24	7273.40
Rail	1221.95	1414.10	1645.90	1889.78	2117.90	2357.95	2622.77
Truck	49343.75	58237.50	65478.91	68240.28	68842.27	70739.66	73664.83
Water	5897.17	6504.54	7118.48	7621.73	7943.34	8348.69	8837.78
Grand Total	62626.30	73130.87	81901.42	86037.87	87645.36	90836.57	95299.78

Total Goods Movement (1000s of Tons)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	33.92	22.28	48.11	62.84	77.88	91.59	99.91
Multiple modes & mail	1026.27	895.37	1316.35	1533.76	1747.95	1969.65	2146.70
Other and unknown	3007.20	3332.78	3961.72	4185.21	4320.94	4535.29	4848.17
Pipeline	8191.15	7830.98	9627.40	10568.60	11071.73	11845.72	12855.01
Rail	2446.71	2561.72	3048.44	3520.96	3996.67	4500.52	5068.62
Truck	98741.88	104304.33	122702.38	128873.76	131169.13	135456.36	142049.36
Water	6255.11	6962.82	7714.30	8366.90	8831.38	9379.52	10041.06
Grand Total	119702.23	125910.28	148418.69	157112.04	161215.69	167778.64	177108.83

Percentage of Total Goods Movement

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	0.03%	0.02%	0.03%	0.04%	0.05%	0.05%	0.06%
Multiple modes & mail	0.86%	0.71%	0.89%	0.98%	1.08%	1.17%	1.21%
Other and unknown	2.51%	2.65%	2.67%	2.66%	2.68%	2.70%	2.74%
Pipeline	6.84%	6.22%	6.49%	6.73%	6.87%	7.06%	7.26%
Rail	2.04%	2.03%	2.05%	2.24%	2.48%	2.68%	2.86%
Truck	82.49%	82.84%	82.67%	82.03%	81.36%	80.74%	80.20%
Water	5.23%	5.53%	5.20%	5.33%	5.48%	5.59%	5.67%

Freight Movement by Value

Total Exports (Millions of Dollars)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	3706.87	4834.98	7158.98	11140.19	15176.50	18590.28	21070.81
Multiple modes & mail	32487.23	35640.27	44092.13	54144.70	64833.97	75052.90	76412.81
Other and unknown	800.55	981.12	1188.38	1369.23	1530.90	1721.32	1971.07
Pipeline	1024.88	1143.48	1380.29	1537.75	1588.43	1680.06	1828.90
Rail	551.51	612.93	704.40	821.95	948.81	1082.37	1238.08
Truck	56360.78	63465.52	76252.66	88156.59	99685.20	112671.76	123727.53
Water	588.70	757.04	1011.78	1316.17	1633.24	1925.40	2285.47
Grand Total	95520.52	107435.33	131788.62	158486.58	185397.04	212724.09	228534.66

Total Imports (Millions of Dollars)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	785.02	1132.04	1326.91	1505.54	1632.01	1781.31	1932.88
Multiple modes & mail	730.72	898.16	1170.24	1450.95	1741.91	2002.65	2296.19
Other and unknown	2370.64	2661.64	3052.66	3467.77	3831.27	4247.01	4705.67
Pipeline	1510.94	1631.56	1736.56	1870.60	1957.46	2093.75	2255.48
Rail	565.59	638.07	720.49	810.66	893.85	983.51	1081.54
Truck	56857.71	65168.80	76203.27	84163.55	90259.17	97781.39	106639.54
Water	3519.50	3944.84	4436.01	4862.69	5185.92	5538.33	5972.67
Grand Total	66340.11	76075.10	88646.15	98131.75	105501.57	114427.96	124883.98

Total Goods Movement by Value (Millions of Dollars)

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	4491.89	5967.01	8485.89	12645.73	16808.50	20371.59	23003.69
Multiple modes & mail	33217.95	36538.43	45262.37	55595.64	66575.88	77055.55	78708.99
Other and unknown	3171.19	3642.76	4241.04	4837.00	5362.17	5968.33	6676.74
Pipeline	2535.82	2775.03	3116.85	3408.35	3545.89	3773.81	4084.38
Rail	1117.10	1251.00	1424.89	1632.61	1842.66	2065.88	2319.62
Truck	113218.50	128634.32	152455.94	172320.14	189944.37	210453.15	230367.08
Water	4108.20	4701.88	5447.80	6178.86	6819.16	7463.73	8258.14
Grand Total	161860.63	183510.44	220434.77	256618.33	290898.62	327152.05	353418.64

Percentage of Total Goods Movement

Mode	2011	2015	2020	2025	2030	2035	2040
Air (include truck-air)	2.78%	3.25%	3.85%	4.93%	5.78%	6.23%	6.51%
Multiple modes & mail	20.52%	19.91%	20.53%	21.66%	22.89%	23.55%	22.27%
Other and unknown	1.96%	1.99%	1.92%	1.88%	1.84%	1.82%	1.89%
Pipeline	1.57%	1.51%	1.41%	1.33%	1.22%	1.15%	1.16%
Rail	0.69%	0.68%	0.65%	0.64%	0.63%	0.63%	0.66%
Truck	69.95%	70.10%	69.16%	67.15%	65.30%	64.33%	65.18%
Water	2.54%	2.56%	2.47%	2.41%	2.34%	2.28%	2.34%

Appendix D: Transportation Projects Listed by Mode

The following tables include the projects in the MPO Long Range Transportation Plan organized by mode. These lists are prioritized with the lowest value for each mode being the highest priority for the region. Readers desiring more detailed information about the projects included in these tables should examine the MPO Metropolitan Transportation Plan which is available on the RPC website. That document includes more detailed project descriptions, the most up-to-date listings, and timeframes.

Prioritized List of Roadway Improvement Projects

(See the MPO Long Range Transportation Plan for full project descriptions)

Priority	Project #	Location	Project Name	Route/Road	Est. Cost
1	6409003	Seabrook	US 1 Capacity Expansion near Railroad Ave	US 1	$ 960,000
2	6199001	Hampton Falls	US 1 Intersection & Capacity Improvements	US 1	$ 3,680,000
3	6375005	Plaistow	NH 125 Capacity Expansion from East Road to Old Rd.	NH 125	$ 3,515,000
4	6409004	Seabrook	US 1 capacity improvements between NH 107 and North Access Road	US 1	$ 3,565,000
5	6147001	Epping	NH 125 Expansion from NH 27 to NH 87.	NH 125	$ 9,945,000
6	6399001	Salem	Salem Depot intersection reconstruction	NH 28	$ 4,017,000
7	6001001	Atkinson-Hampstead	NH 111 Reconstruction	NH 111	$ 11,040,000
8	6197001	Hampton	Ocean Blvd Reconstruction	Ocean Blvd	$ 11,500,000
9	6001010	Plaistow-Kingston	NH 125 Old County Rd to Hunt Rd/Newton Junction Rd.	NH 125	$ 14,547,500
10	6345007	North Hampton	US 1 North Rd intersection relocation	US 1	$ 3,375,000
11	6197002	Hampton	US 1/NH 27 Intersection Improvements	US 1/NH 27	$ 6,175,000
12	6331001	Newington	Pease Arboretum Drive Expansion	Pease Blvd/ Arboretum Dr	$ 1,100,000
13	6409005	Seabrook	US 1 Capacity Improvements between the North Access Rd and the Hampton Falls Town Line	US 1	$ 480,000
14	6379017	Portsmouth	US 1 Capacity Expansion from Constitution Ave to Wilson Rd.	US Route 1	$ 9,800,000
15	6379011	Portsmouth	US 1 Capacity Expansion from Ocean Rd to White Cedar Blvd.	US Route 1	$ 5,750,000
16	6397002	Rye	US 1 Washington Rd. Intersection capacity improvements	US 1	$ 2,415,000
17	6409001	Seabrook	US 1 Capacity improvements at the Seabrook Rotary	US 1	$ 2,875,000
18	6153001	Exeter	Epping Road Access Management	Epping Rd	$ 1,897,500
19	6379002	Portsmouth	Grafton Drive Capacity Expansion	Grafton Drive	$ 1,500,000
20	6345001	North Hampton	US 1 Capacity Expansion Hampton Town Line to Atlantic Avenue	US 1	$ 9,545,000
21	6199002	Hampton Falls	US 1 Shoulders	US 1	$ 1,200,000
22	6195001	Hampstead	NH 121 Depot Road Intersection Capacity Expansion	NH 121	$ 300,000
23	6379003	Portsmouth	Corporate Dr/Grafton Drive intersection signalization	Corporate Dr/ Grafton Dr	$ 1,400,000
24	6197006	Hampton	Reconstruction of Exeter Road	NH 27	$ 12,420,000
25	6197009	Hampton	Reconstruction of High Street	High Street	$ 7,935,000
26	6197010	Hampton	Reconstruction of Winnacunnet Road	Winnacunnet Rd	$ 8,280,000
27	6197011	Hampton	Reconstruction of Church Street	Church Stret	$ 1,725,000

Prioritized List of Roadway Improvement Projects

(See the MPO Long Range Transportation Plan for full project descriptions)

Priority	Project #	Location	Project Name	Route/Road	Est. Cost
28	6409002	Seabrook	US 1 Capacity Improvements between Walton Rd and Gretchen Rd	US 1	$ 2,760,000
29	6379006	Portsmouth	Reconstruct US 1 Bypass from Lafayette Rd to Traffic Circle	US Route 1 Bypass	$ 9,867,000
30	6379001	Portsmouth	NH Ave/Corporate Drive intersection signalization	NH Ave/ International Dr	$ 1,100,000
31	6341002	Newton	Newton Rowe's Corner Improvements	NH 108	$ 1,944,000
32	6431003	Stratham	Signalize NH 108/Bunker Hill Avenue intersection	NH 108	$ 565,200
33	6379021	Portsmouth	US 1 Bypass Traffic Circle Improvements	US Route 1 Bypass	$ 5,031,250
34	6379016	Portsmouth	Market St. RR Crossing upgrade	Market Street	$ 883,200
35	6199003	Hampton Falls	US 1 Shoulders & Access Management	US 1	$ 1,200,000
36	6397003	Rye	US 1 Shoulders from N. Hampton T/L to Breakfast Hill Rd.	US 1	$ 720,000
37	6397001	Rye	US 1 Shoulders Breakfast Hill to Portsmouth City Line	US 1	$ 1,200,000
38	6345006	North Hampton	US 1/North Road (west approach) improvments	US 1	$ 2,645,000
39	6431004	Stratham	Signalize NH 108/Frying Pan Lane intersection	NH 108	$ 873,600
40	6147004	Epping	Signalize intersection of NH 125 & NH 87	NH 125	$ 300,000
41	6379007	Portsmouth	Maplewood Ave RR Crossing upgraded	Maplewood Ave	$ 690,000
42	6345009	North Hampton	US 1 Shoulders from North RD to Rye t/l	US 1	$ 2,645,000
43	6147007	Epping	NH 125 Expansion - NH 87 to Lee Hill Road	NH 125	$ 3,829,500
44	6379010	Portsmouth	Pannaway Manner Noise Barrier	I-95	$ 1,210,000
45	6239001	Kensington	NH 150/NH107 Intersection Improvements	NH 107	$ 900,000
46	6153008	Exeter	High St./Portsmouth Ave Intersection Improvements	Portsmouth Ave	$ 4,735,700
47	6147006	Epping	Signalize intersection of NH 125 with Lee Hill Road	NH 125	$ 300,000
48	6345004	North Hampton	US 1 Intersection improvements (Hobbs Rd, Elm Road in N. Hampton)	US 1	$ 3,450,000
49	6379020	Portsmouth	Reconstruct US 1 Bypass from Traffic Circle to Sarah Long Bridge	US Route 1 Bypass	$ 7,590,000
50	6147002	Epping	Signalize Lagoon Road Intersection with NH 125	NH 125	$ 300,000
51	6135001	East Kingston	NH 107/Willow Road Sight Distance Improvements	NH 107	$ 76,800
52	6147005	Epping	NH 125/North River Road Intersection Improvements	NH 125	$ 600,000
53	6375004	Plaistow	NH 121A/North Ave. Intersection improvements	NH 121A	$ 1,806,650
54	6345008	North Hampton	US 1 Shoulders North Rd to Lafayette Terrace	US 1	$ 600,000
55	6345005	North Hampton	US 1 Shoulders Elm Rd to North Road	US 1	$ 480,000
56	6345003	North Hampton	US 1 Shoulders Glendale Rd to Hobbs Rd	US 1	$ 600,000
57	6021001	Atkinson	Hilldale Ave Improvements	Hilldale Ave	$ 403,200
58	6055002	Brentwood	NH 111A/ Pickpocket Rd. Intersection realignment	NH 111A	$ 96,000
59	6055001	Brentwood	North Rd/Prescott Rd. Intersection realignment	North Road	$ 96,000
					$ 200,440,100

Prioritized List of Bridge Projects

(See the MPO Long Range Transportation Plan for full project descriptions)

Priority	RPC #	City/Town	Project Name	Route/Road	Est. Cost
1	6001011	Portsmouth, NH-Kittery, ME	Replace Sarah Long Bridge	US 1 Bypass	$ 57,241,650
2	6379004	Portsmouth	Woodbury Ave & Stark St. Bridge Replacements over US 1 Bypass	US Route 1 Bypass	$ 6,300,000
3	6153002	Exeter	Park St. Bridge Replacement	Park St	$ 2,990,000
4	6197008	Hampton	Rehabilitate NH 1A Bridge between Hampton & Seabrook	NH 1A	$ 7,475,000
5	6153003	Exeter	String Bridge Rehabilitation	String Bridge Rd	$ 1,196,000
6	6379005	Portsmouth	Replace Maplewood Ave Culvert over North Mill Pond	Maplewood Ave	$ 1,150,000
7	6379018	Portsmouth	Pierce Island bridge Replacement	Pierce Island Rd	$ 2,875,000
8	6055003	Brentwood	Crawley Falls Rd Bridge Replacement	Crawley Falls Road	$ 4,600,000
9	6345002	North Hampton	Cedar Road Bridge Replacement	US 1	$ 1,725,000
10	6405002	Sandown	Bridge rehabilitation/replacement on Fremont Rd.	Fremont Rd	$ 420,000
11	6405001	Sandown	Phillips Rd bridge replacement	Phillips Rd	$ 480,000
12	6135002	East Kingston	NH107 Bridge Replacement	NH 107A	$ 4,600,000
13	6147009	Epping	Lamprey River Bridge Repair/Replacement	Main St	$ 744,000
14	6417001	South Hampton	Whitehall Rd Bridge Replacement	Whitehall Rd	$ 306,000
15	6417002	South Hampton	Hilldale Ave bridge replacement	Hilldale Ave	$ 720,000
16	6379015	Portsmouth	Cate Street Bridge Replacement	Cate Street	$ 480,000
17	6147008	Epping	Bridge Replacement, Blake Road over Lamprey River [059/054]	Blake Rd	$ 660,000
18	6379013	Portsmouth	Bartlett St. Bridge Replacement	Bartlett St	$ 342,000
19	6379012	Portsmouth	Coakley Road Bridge Replacement	Coakley Rd	$ 198,000
20	6341001	Newton	Replace Pond Road Bridge	Pond Rd	$ 2,070,000
21	6399007	Salem	Town Farm Rd. Bridge replacement	Town Farm Rd	$ 1,209,800
22	6001007	New Castle-Rye	NH 1B Bridge Rehabilitation New Castle-Rye	NH 1B	$ 11,022,110
					$ 108,804,560

Prioritized List of Operational Projects

(See the MPO Long Range Transportation Plan for full project descriptions)

Priority	Project #	Location	Project Name	Route/Road	Est. Cost
1	6375003	Plaistow	NH 125 Signal Coordination - Plaistow	NH 125	$ 806,400
2	6147010	Epping	NH 125 Signal Coordination - Epping	NH 125	$ 626,400
3	6001016	Region	ITS Improvements at Park and Rides	Multiple	$ 810,000
4	6001014	Region	Cross-border ITS Improvements	NH 125	$ 600,000
5	6001018	Seabrook-Hampton	Route 1A Evacuation ITS Improvements	NH 1A	$ 2,139,000
6	6001015	Region	Bridge Security Video ITS Improvements	Multiple	$ 1,840,000
7	6001013	Region	Portable VMS for Region	Multiple	$ 84,000

8	6001012	Region	Improvements to ITS/IMS Communications backbone	Multiple	$ 3,450,000
					$10,355,800

Prioritized List of Bike & Pedestrian Projects

(See the MPO Long Range Transportation Plan for full project descriptions)

Priority	RPC #	City/Town	Project Name	Route/Road	Est. Cost
1	6001020	Hampton to Portsmouth	Hampton Branch ROW Purchase	East Coast Greenway	$ 3,500,000
2	6409007	Seabrook	Multiple-use pathway on former B&M line from Mass s/l to Seabrook Station	East Coast Greenway	$ 918,000
3	6379019	Portsmouth	Hampton Branch Rail-trail improvements	East Coast Greenway	$ 2,125,000
4	6147003	Epping	Rockingham Rail Trail NH 125 Crossing	NH 125	$ 360,000
5	6431001	Stratham	Stratham Town Center/Stratham Circle Improvements	Rte. 108/33/ Ports. Ave	$ 2,959,300
6	6409006	Seabrook	NH 1A Sidewalk in Seabrook	NH 1A	$ 324,000
7	6001017	Salem-Windham	Phase 3 of Salem-Concord bikeway	NH 28	$ 576,000
8	6113001	Danville	Danville NH111A Sidewalks	NH 111A	$ 1,840,000
9	6153004	Exeter	Exeter NH 111 Bike Shoulders	NH 111	$ 876,000
10	6431002	Stratham	Bike lanes on Squamscott Rd	Squamscott Rd	$ 1,200,000
11	6197004	Hampton	NH 27 Bike Shoulders	NH 27	$ 1,500,000
12	6001008	North Hampton - Greenland	NH 151 Shoulders	NH 151	$ 1,817,000
13	6001002	Exeter-Newfields	NH 87 shoulder widening -Exeter-Newfields	NH 85	$ 1,200,000
14	6153005	Exeter	NH 88 Shoulders	NH 88	$ 2,275,850
					$ 21,471,150

Appendix E: Maps

Map TR1: Current Infrastructure Roads, Transit, Rail and Port.

Map TR2: Crash Heatmap

Map TR3: Potential Road Impacts of Highest Modeled Sea Level Rise (11x17)

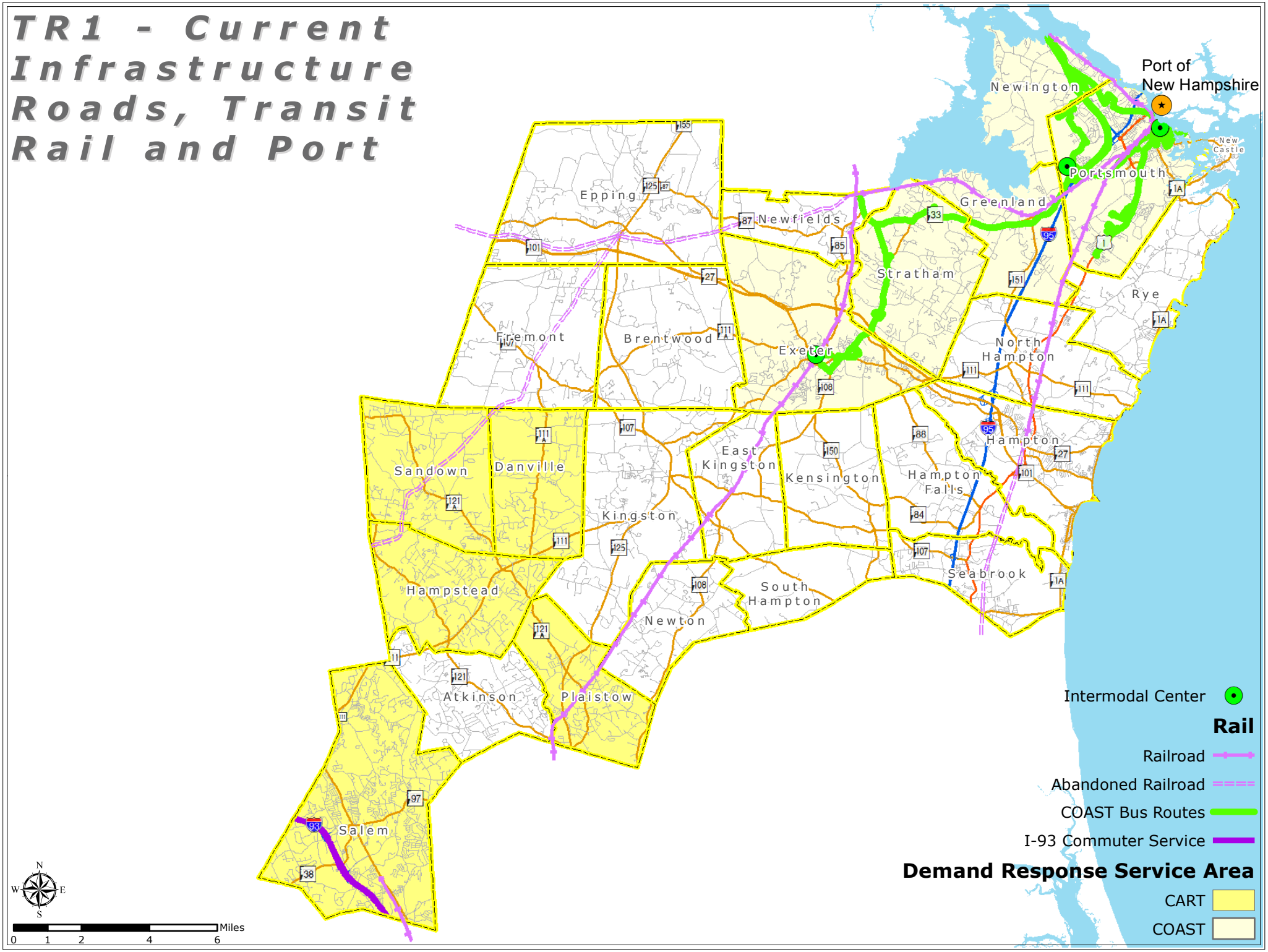
Map TR4: Crashes from Distracted Driving

Map TR5: TIP and Long Range Plan Projects

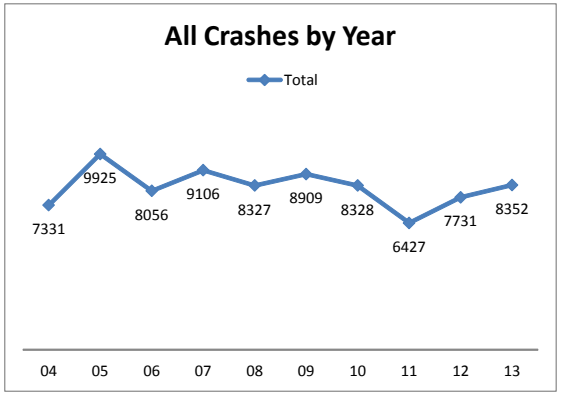
Map TR6: 2010 Base Year Traffic Congestion

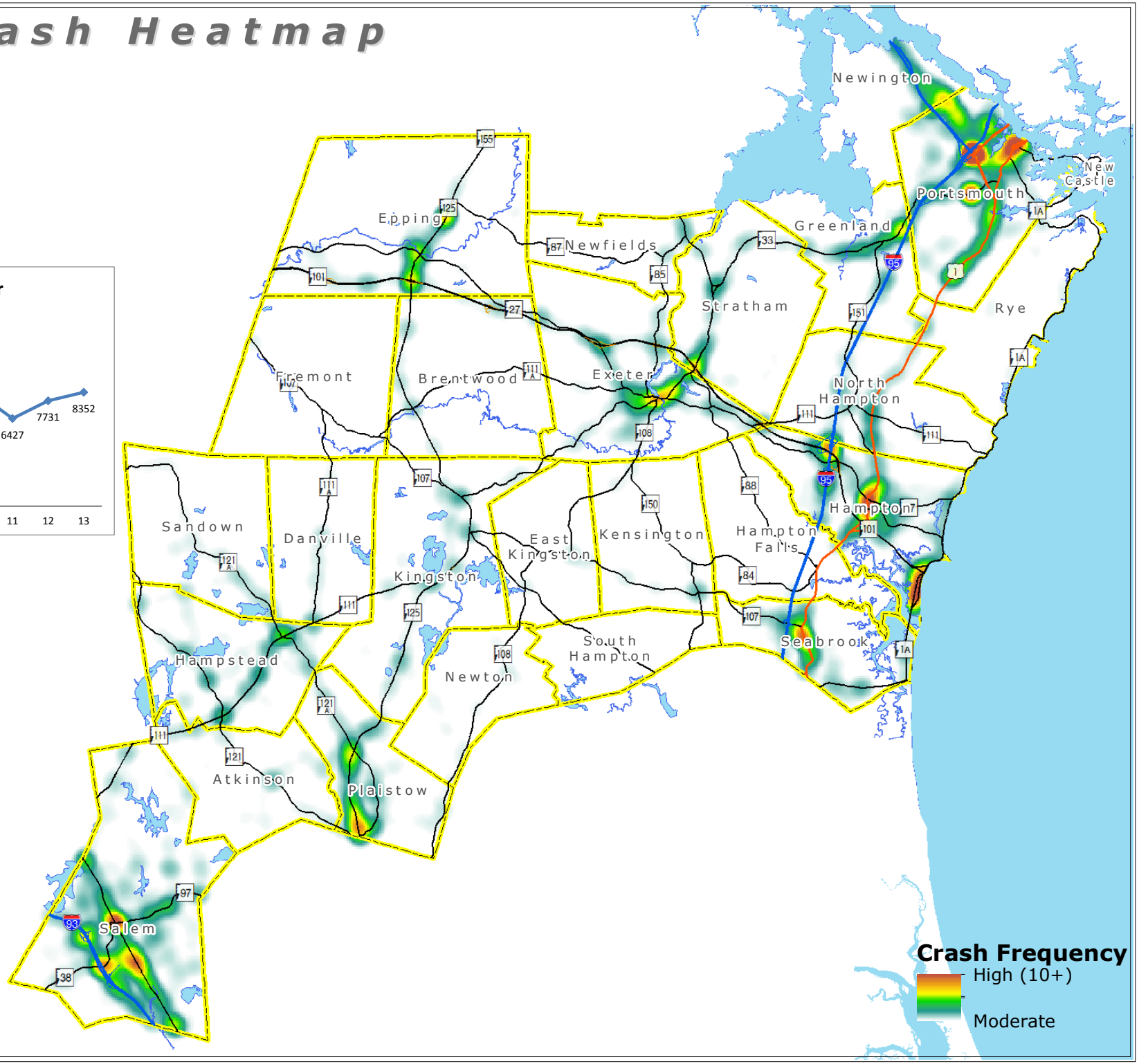
Map TR7: 2040 Estimated Traffic Congestion

TR1 - Current Infrastructure Roads, Transit Rail and Port

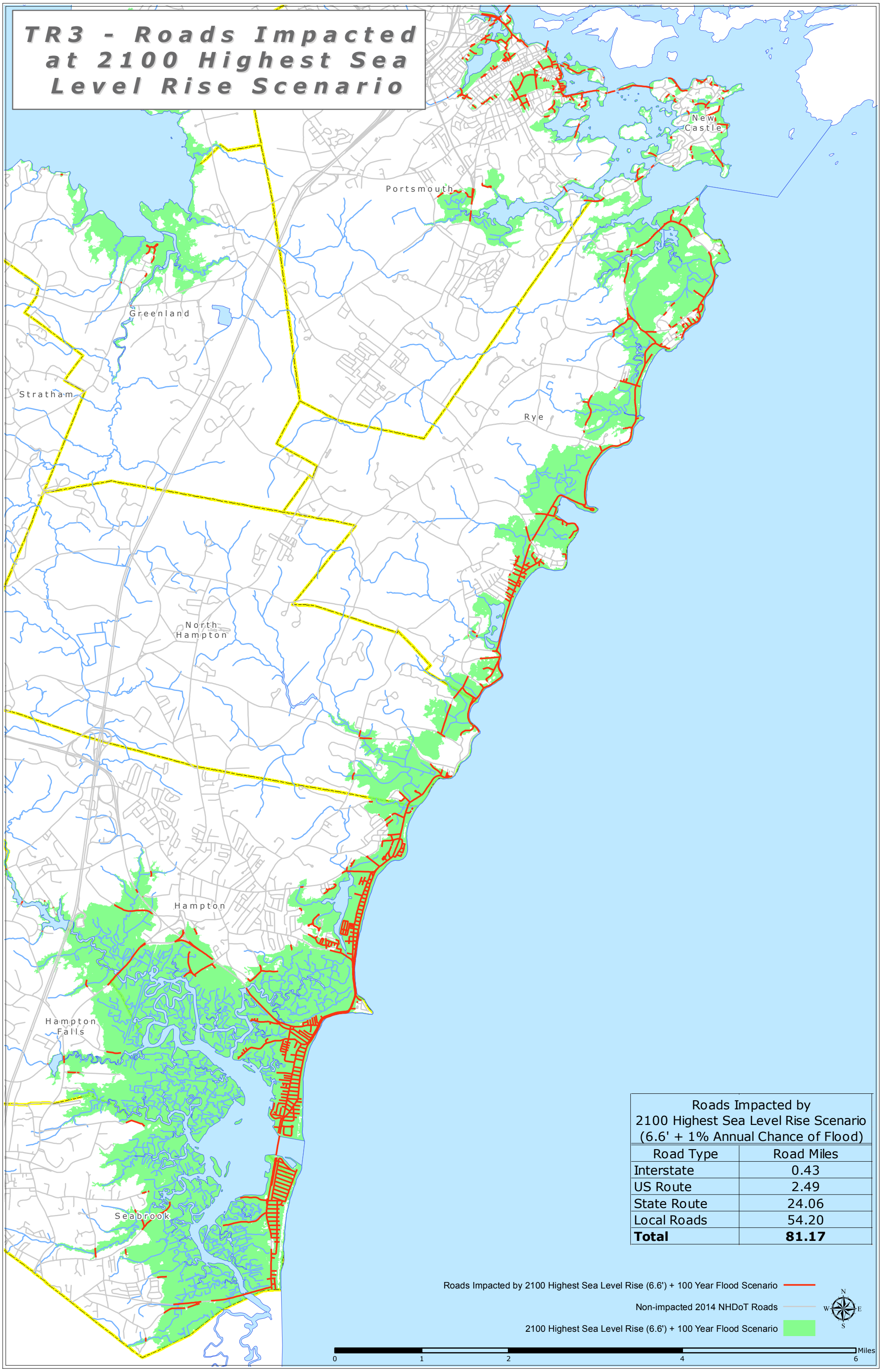


TR2 - Crash Heatmap



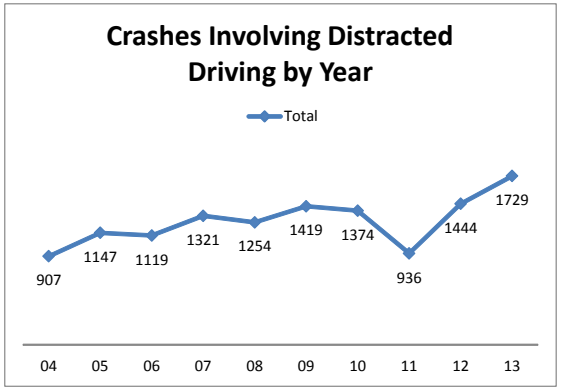


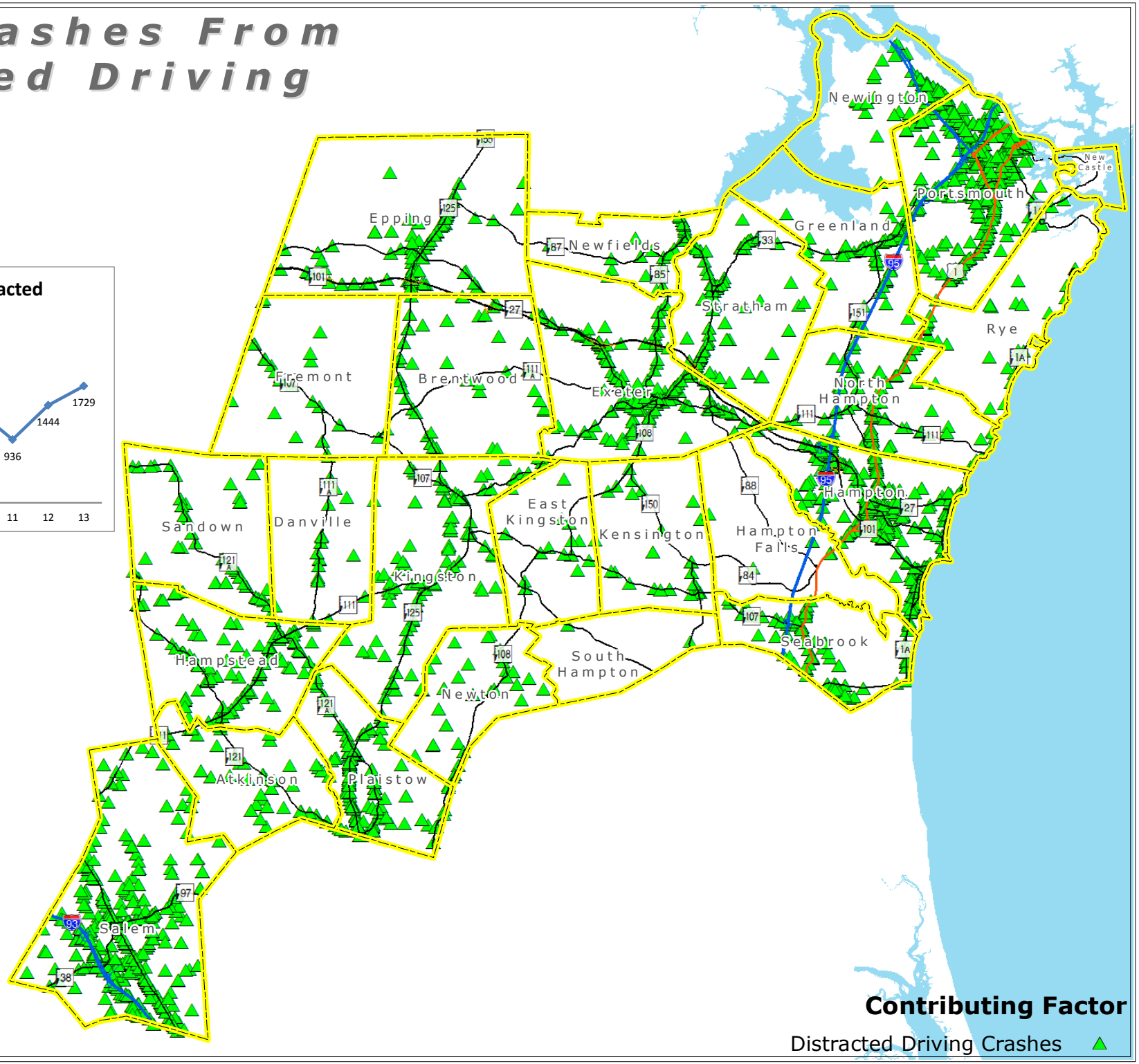
TR3 - Roads Impacted at 2100 Highest Sea Level Rise Scenario



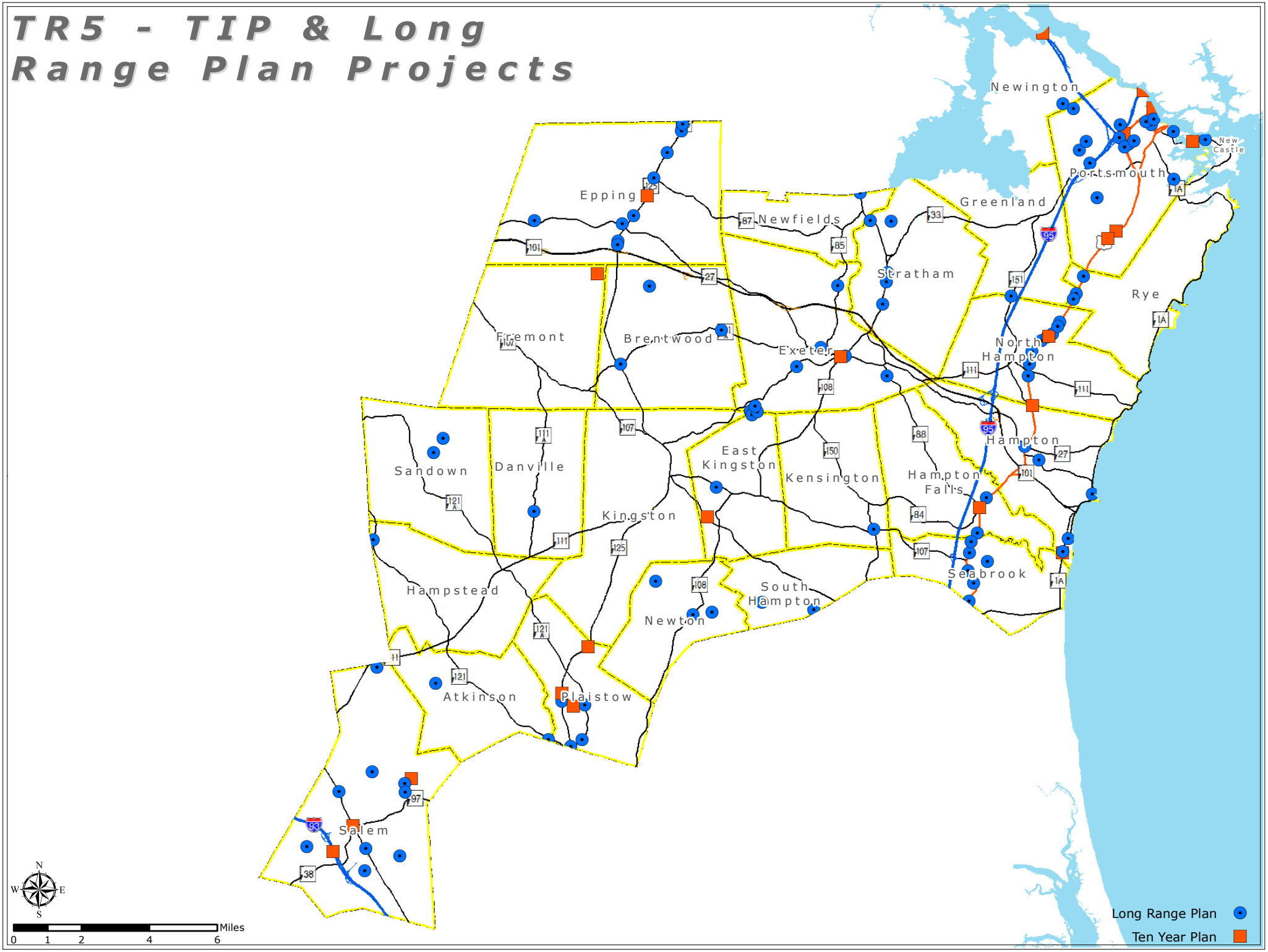
Roads Impacted by 2100 Highest Sea Level Rise Scenario (6.6' + 1% Annual Chance of Flood)	
Road Type	Road Miles
Interstate	0.43
US Route	2.49
State Route	24.06
Local Roads	54.20
Total	**81.17**

TR4 - Crashes From Distracted Driving





TR5 - TIP & Long Range Plan Projects



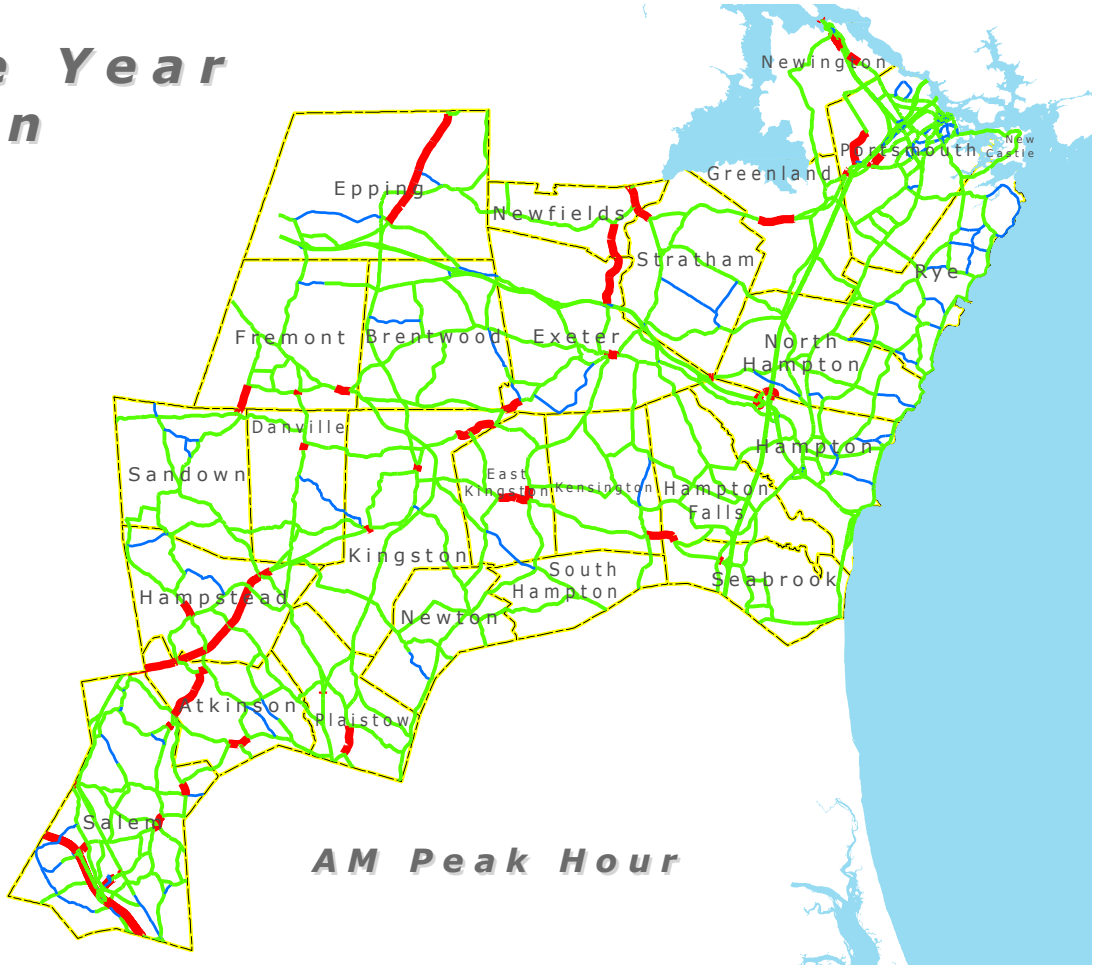
Map TR6
2010 Base Year Congestion

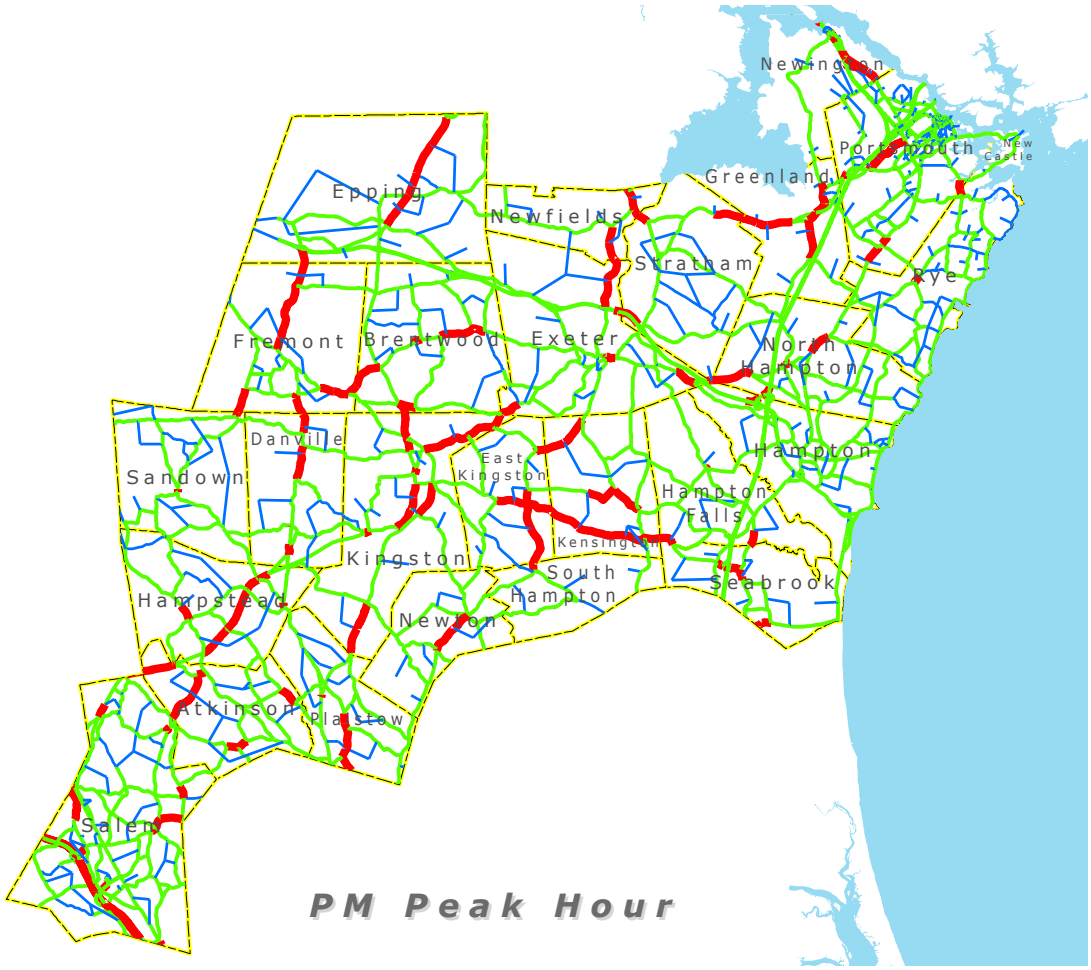
These maps reflect the baseline 2010 condition to which the future growth is compared.

Uncongested

Moderate

Congested



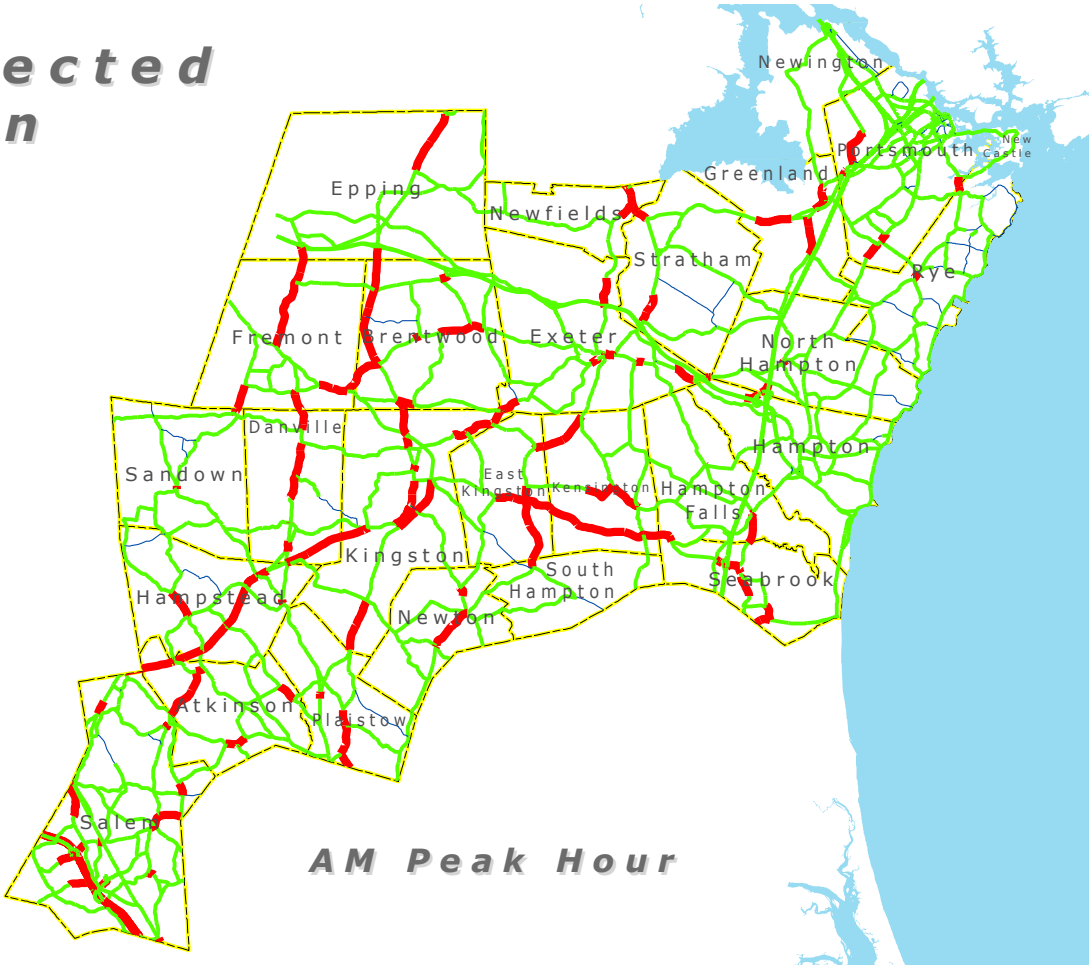


N W E S

0 1 2 4 6 Miles

Map TR7
2040 Projected Congestion

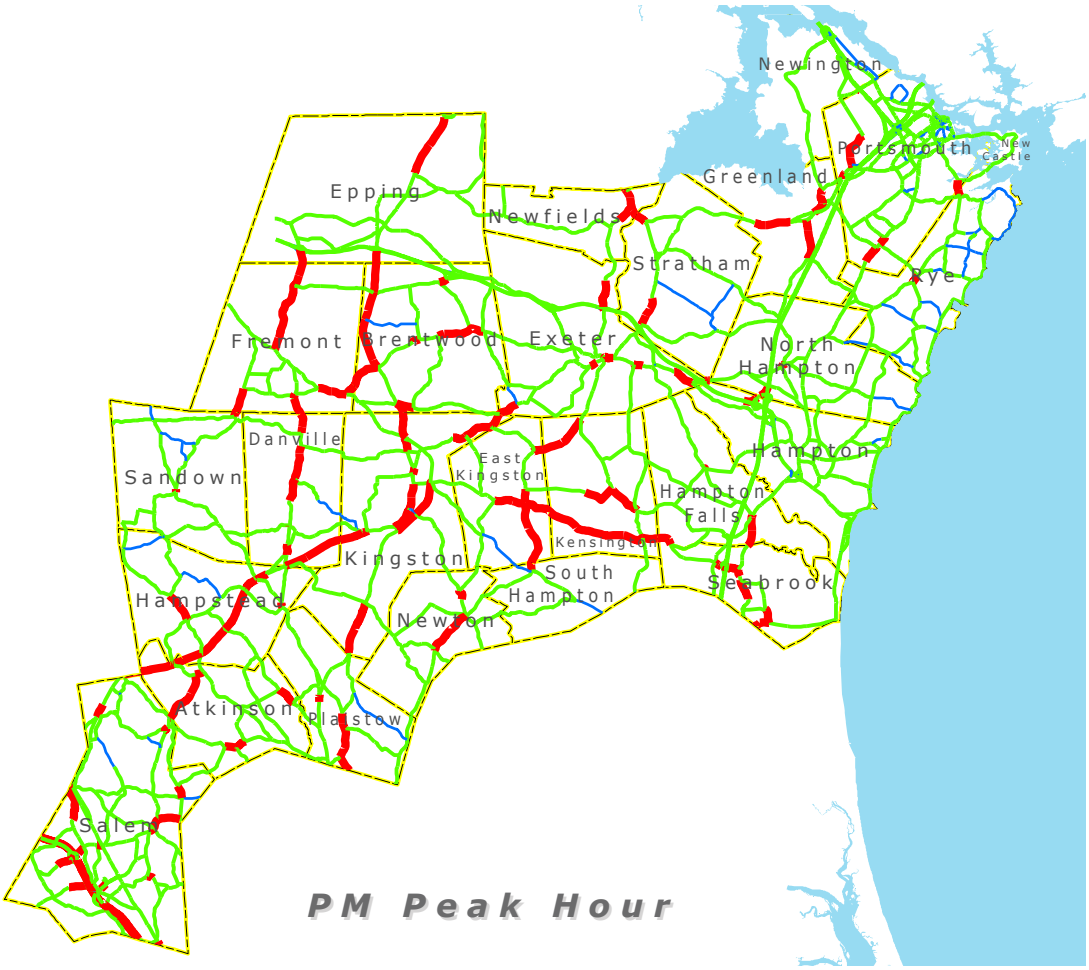
This alternative continues the existing pattern of development and a slow growth rate of growth



Uncongested

Moderately Congested

Congested



N W E S

0 1 2 4 6 Miles

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Map TR7: 2040 Estimated Traffic Congestion

Housing

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Housing

Introduction

The purpose of this *Housing Chapter* of the Regional Master Plan is twofold: first to evaluate the housing conditions in the region and using that information, make responsible recommendations for future land use decisions which effect the region's housing stock, and second to serve as resource and reference to communities as they prepare or update the housing section of their community master plans, as required in RSA §674:2, III**.**

The Rockingham Planning Commission last prepared a Regional Housing Master Plan element in 1990, which was updated and amended in 1994 to incorporate a regional housing needs assessment as required by RSA §36:47, II. The last housing needs assessment for our region was completed in 2008 and this assessment detailed the status of housing affordability in our region and offered strategies that communities might take to insure housing is available to all income levels.

This chapter includes sections which address the following:

- Goals for our region with respect to housing
- Existing conditions and trends in housing stock, including housing unit production, type, vacancy rates, condition, cost, and affordability issues;
- Recent trends in the balance between job production and housing production in the region;
- General current and future housing needs in the region;
- A Fair Housing Equity Assessment (required by the Department of Housing and Urban Development)
- Analysis of the barriers to the development of more affordable housing;
- Strategies to address housing needs;
- Housing recommendations and implementation strategies for the region.

What the Region Said About Housing

The regional planning Commission used various avenues to gather input from the general population. Here are some of the highlights of what we heard from our outreach activities.

Statewide Survey

A statewide telephone survey undertaken by the University of New Hampshire Survey Center on behalf of all nine regional planning Commissions also incorporated a region-specific over-sampling in order to provide a statistically supportable result for the RPC. This survey provided feedback on a number of housing related topics. These are summarized below.

A plurality of residents (47%) describe where they live as a neighborhood close to a town center, followed by those in a development away from a town center (28%), rural location away from the town center (18%), and those downtown or a town center (6%).

- Rockingham residents are *more likely* to live in a neighborhood close to the town center than statewide residents. They are also *less likely* to live in a rural location away from the town center.
- Those aged 30 to 39 are *more likely* to live in a neighborhood close to the town center.
- Households earning less than $60,000 are *more likely* to live in a rural location away from the town center.

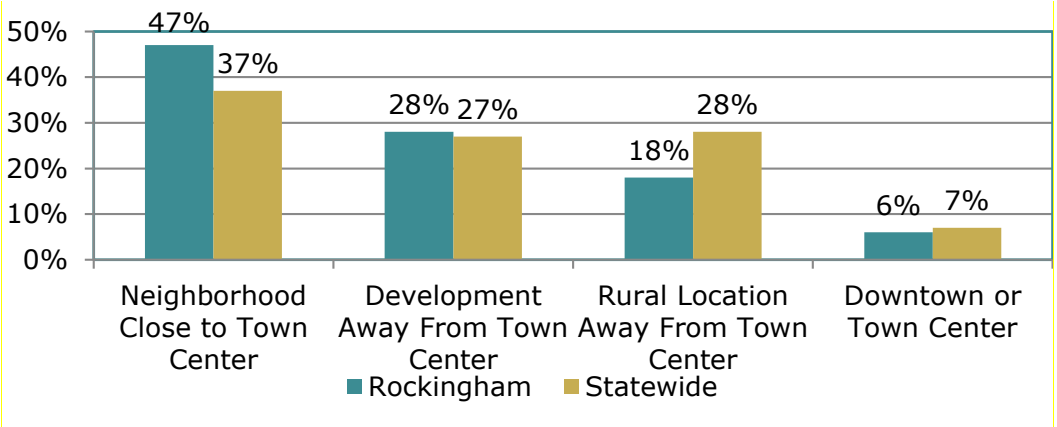


Figure HOU1 -

When asked whether they would prefer to live in a small house but have a short commute to work or a large home with a longer commute, a majority (59%) said they would prefer the small home and short commute, 39% would prefer the large home and long commute and 2% did not know**.**

Meanwhile, a slight majority of residents (52%) would prefer to live in a strictly residential neighborhood while 47% would prefer a mixed residential/commercial neighborhood and 1% did not know. Younger people (18 to 39) are *more likely* to want a larger home with a longer commute.

When asked a preference for a large home with long commute or small home with short commute, respondents answered:

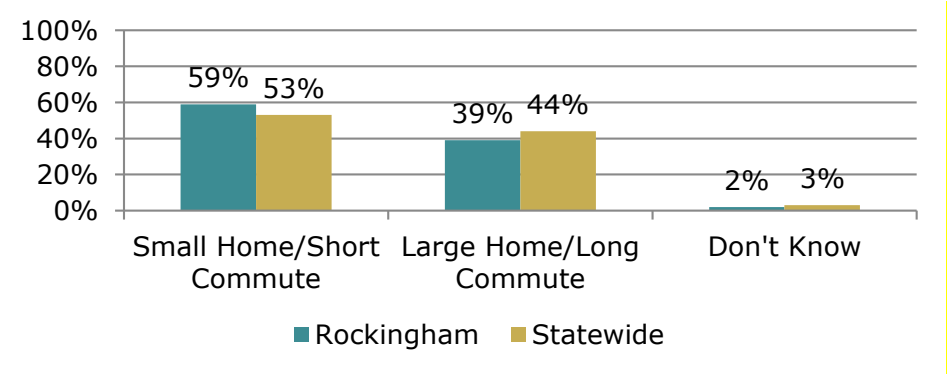


Figure HOU2 -

When asked a preference for a mixed neighborhood with stores or residential only neighborhood respondents answered:

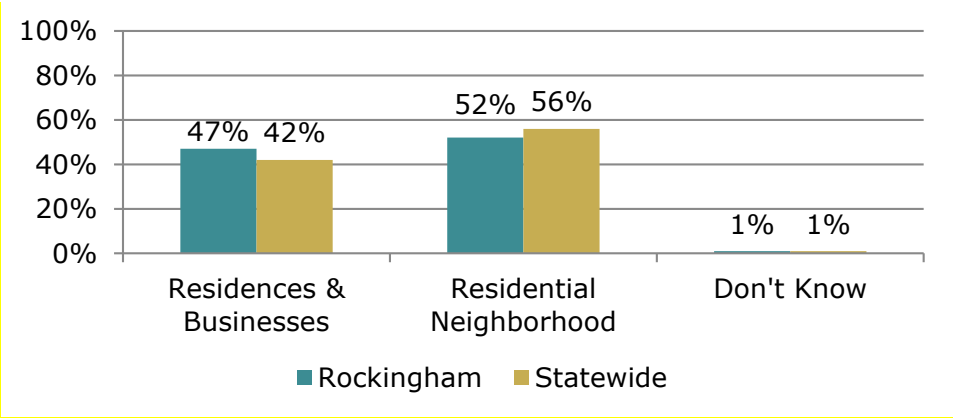


Figure HOU3 -

The large majority (78%) who answered that they would like to live in a neighborhood with a mix of residences and business would prefer a smaller house with a short commute. A slight majority (56%) of those who chose a residential neighborhood where you have to drive to services also prefer a larger house with a longer commute.

Living Preference – Home Size and Commute vs. Type of Neighborhood

Would you choose to live in a small home with a small backyard, if it means you have a short trip to work, school or shopping, or would you choose to live in a large home with a large backyard, with a long trip to work school or shopping.	Would you choose to live in a neighborhood with a mix of residences and businesses where you can walk to stores, schools, and services, OR would you choose to live in a residential-only neighborhood where you needed to drive a car to get to stores, schools and services?		
	Mix of residences and businesses - walk	**Residential neighborhood - drive**	**Total**
Small home, small yard	78% (142)	44%(88)	60% (230)
Large home, large yard	22% (41)	56% (113)	40% (154)
Total	**48% (183)**	**52% (201)**	**100%**

University of New Hampshire-Cooperative Extension-NH Listens

Regional Themes from the NH Listens Public Outreach Event in Kingston, NH on May 14, 2013

The Carsey Institute at UNH also held an open forum in Kingston in the summer of 2013 to allow residents of the region to engage in a facilitated discussion over a broad range of topics. Below are the significant ideas expressed at this forum with respect to housing:

- Many communities do not offer a range of housing types.
- Affordable housing is an issue region-wide and plays a part in young people being unable to stay in the region.
- Many households pay more than 50% of income for housing/transportation.
- Housing should be located near jobs.

Regional Visioning Sessions

The RPC held a series of facilitated conversations throughout the region in the fall of 2013. Six meetings were held in the communities of Hampstead, Epping, Plaistow, Portsmouth, Seabrook and

Brentwood. Three of these sessions incorporated small group discussions about housing in the RPC planning region. The most common housing themes revealed during these conversations were:

- Larger communities have well diversified housing opportunities, smaller communities offer few options beyond single family residences.
- Many communities have land use ordinances that encourage housing development that integrates open space preservation.
- Workforce housing opportunity has expanded in the region recently but many communities still fail to allow the opportunity for the provision of workforce housing.
- The provision of age-restricted housing has increased throughout the region recently, but often this kind of housing (especially in rural communities) is poorly located away from services vital to the elderly.
- Well preserved and historic housing stock creates a positive environment across the region.
- Lack of housing diversity negatively impacts groups on both ends of the age scale…young people are forced to find housing suitable for their needs in less expensive markets and seniors are often unable to age in place.
- The existing housing market doesn't support the construction of small homes.

Housing Goals

Goal 1

Housing is accessible for citizens from a full range of age and incomes groups and should include opportunities for owned and rental housing.

Goal 2

Make good use of existing housing and building stock and rehabilitated, older and substandard housing.

Goal 3

Local zoning and land use regulations provide opportunity for compact residential development near downtowns, town centers and villages and in mixed use settings.

Goal 4

New single family homes and multi-family dwellings are constructed to be highly efficient with the goal of being energy neutral.

Goal 5

Housing is developed in conjunction with expanded water and sewer service areas or is developed using community water or septic systems in appropriate areas of town.

Goal 6

Appropriate housing should be available to allow the "aging-in-place" of the elderly.

Goal 7

Most new housing is developed near town centers and close to employment centers.

Goal 8

Housing is planned to include well-designed neighborhoods, streets and paths that encourage neighborhood interactions, provide opportunities for physical activity and provide connections between adjacent neighborhoods and other destinations.

Housing 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
HOU Goal 1	S	S	S	P	N/A
HOU Goal 2	S	S	S	P	N/A
HOU Goal 3	S	S	S	S	P
HOU Goal 4	S	S	N/A	S	S
HOU Goal 5	S	S	S	S	N/A
HOU Goal 6	S	S	S	P	N/A
HOU Goal 7	S	P	S	N/A	N/A
HOU Goal 8	S	S	S	S	N/A

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.

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

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

This section of the housing chapter is intended to analyze the data that is available related to the region's housing stock. In addition, the analysis of regional conditions as they relate to the state of New Hampshire is intended to help identify the unique characteristics of the region. This section also serves to act as a baseline for future investigations of the state of housing in the Rockingham Planning Commission region.

Demographic and Socioeconomic Trends

As reported in the population table above the region, county and State have all experienced relatively high and sustained growth over the last 30 years. For each region, The RPC area, the county and the State of New Hampshire, the highest growth period was from 1980-1990 and the slowest growth occurred in the decade from 2000 to 2010.

Table HOU1. Total Population in the Region in 1990, 2000 and 2010

Municipality	1990	2000	2010	1980 to 1990	1990 to 2000	2000 to 2010
Atkinson	5,188	6,178	6,751	1.7%	1.8%	0.9%
Brentwood	2,590	3,197	4,486	2.6%	2.1%	3.4%
Danville	2,534	4,023	4,387	6.8%	4.7%	0.9%
East Kingston	1,352	1,784	2,357	1.8%	2.8%	2.8%
Epping	5,162	5,476	6,411	4.1%	0.6%	1.6%
Exeter	12,481	14,058	14,306	1.2%	1.2%	0.2%
Fremont	2,576	3,510	4,283	6.8%	3.1%	2.0%
Greenland	2,768	3,208	3,549	2.7%	1.5%	1.0%
Hampstead	6,732	8,297	8,523	5.9%	2.1%	0.3%
Hampton	12,278	14,937	14,976	1.6%	2.0%	0.0%
Hampton Falls	1,503	1,880	2,236	0.9%	2.3%	1.7%
Kensington	1,631	1,893	2,124	2.1%	1.5%	1.2%
Kingston	5,591	5,862	6,025	3.1%	0.5%	0.3%
New Castle	840	1,010	968	-1.1%	1.9%	-0.4%
Newfields	888	1,551	1,680	0.8%	5.7%	0.8%
Newington	990	775	753	3.3%	-2.4%	-0.3%
Newton	3,473	4,289	4,603	1.2%	2.1%	0.7%
North Hampton	3,637	4,259	4,301	0.6%	1.6%	0.1%
Plaistow	7,316	7,747	7,609	2.7%	0.6%	-0.2%
Portsmouth	25,925	20,784	21,233	-0.1%	-2.2%	0.2%
Rye	4,612	5,182	5,298	0.2%	1.2%	0.2%
Salem	25,746	28,112	28,776	0.7%	0.9%	0.2%
Sandown	4,060	5,143	5,986	7.0%	2.4%	1.5%
Seabrook	6,503	7,934	8,693	0.9%	2.0%	0.9%
South Hampton	740	844	814	1.2%	1.3%	-0.4%
Stratham	4,955	6,355	7,255	7.1%	2.5%	1.3%
Windham	9,000	10,709	13,592	4.7%	1.8%	2.4%
RPC Region	161,071	178,997	191,975	1.8%	1.1%	0.7%
Rockingham County	245,845	277,359	295,223	2.6%	1.2%	0.6%
New Hampshire	1,109,252	1,235,550	1,316,470	1.9%	1.1%	0.6%

Source: US Census 1990-2010

Age Group	Total Population	Total Households	Ownership Tenure	Rental tenure	%Own	%Rent

The two tables below offer insight into the anticipated change of age of residents in our region according to recent studies by the New Hampshire Housing Finance Authority. As shown in the table the total population for the region in 2020 is expected to decrease from 178,383 to 161,571 with the majority of this being the result of Windham leaving our planning region. Although the total population goes down by 2020, the number of individuals older than 65 rises sharply from 25,544 to 34,577.

Table HOU2. 2020 population projections by age group.

Age Group	Total Population	Total Households	Ownership Tenure	Rental tenure	%Own	%Rent
Under 15	30,912	---	---	---	---	---
15 to 24	19,763	1,364	241	1,123	17.7%	82.3%
25 to 34	17,305	7,170	3,270	3,900	45.6%	54.4%
35 to 44	25,399	13,165	9,844	3,321	74.8%	25.2%
45 to 54	33,131	18,649	15,062	3,587	80.8%	19.2%
55 to 64	25,396	14,918	12,532	2,386	84.0%	16.0%
65 to 74	14,414	8,916	7,484	1,432	83.9%	16.1%
75 to 84	8,537	5,557	4,393	1,164	79.1%	20.9%
85 & older	3,526	2,188	1,407	781	64.3%	35.7%
Total	178,383	71,927	54,233	17,694	75.4%	24.6%

Group Quarters Population	
Total	2,139
Under Age 65	1,206
65 & Older	933

Population in Households (Total less Group Quarters)		Total Households	Owner Households	Renter Households	%Own	%Rent
Total	176,244	71,927	54,233	17,694	75.4%	24.6%
Under Age 65	150,700	55,266	40,949	14,317	74.1%	25.9%
65 & Older	25,544	16,661	13,284	3,377	79.7%	20.3%

Average Number of Persons per Household (excluding GQ Population)		
Total	2.45	Resulting ratios held constant in forecast years
Under Age 65	2.73	Ratios that change with projection age distribution
65 & Older	1.53	

Under 15	4,098	---	---	---	---	---
15 to 24	19,718	1,361	240	1,120	17.7%	82.3%
25 to 34	23,300	9,654	4,403	5,251	45.6%	54.4%
35 to 44	21,633	11,213	8,384	2,829	74.8%	25.2%
45 to 54	25,898	14,578	11,774	2,804	80.8%	19.2%
55 to 64	31,263	18,364	15,427	2,937	84.0%	16.0%
65 to 74	21,572	13,344	11,201	2,143	83.9%	16.1%
75 to 84	9,991	6,504	5,141	1,362	79.1%	20.9%
85 & older	4,098	2,543	1,635	908	64.3%	35.7%
Total	161,571	77,560	58,206	19,354	75.0%	25.0%

Group Quarters Population		
Total	2,298	
Under Age 65	1,214	<---Grows based on 25 to 64 cohort
65 & Older	1,084	<---Grows based on 85 & Older cohort

Population in Households (Total less Group Quarters)		Total Households	Owner Households	Renter Households	%Own	%Rent
Total	159,272	77,560	58,206	19,354	75.0%	25.0%
Under Age 65	124,696	55,170	40,229	14,941	72.9%	27.1%
65 & Older	34,577	22,390	17,977	4,413	80.3%	19.7%

Average Number of Persons per Household (excluding GQ Population)		
Total	2.05	Resulting ratios held constant in forecast years
Under Age 65	2.26	Ratios that change with projection age distribution
65 & Older	1.54	

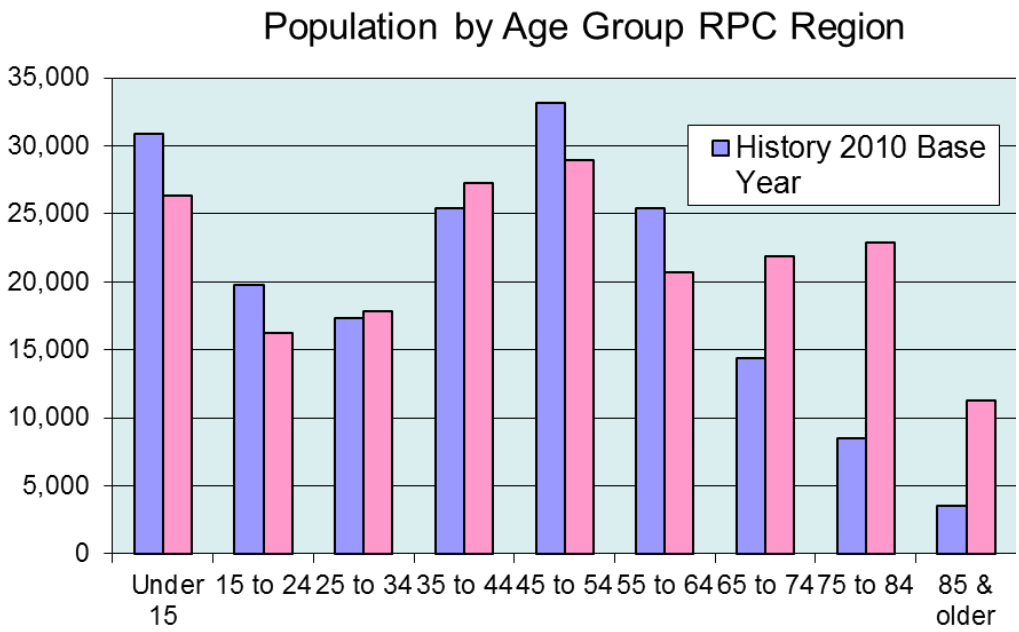


Figure HOU4 -

The graphs above and below show the dramatic shift in population toward an older citizenry. By age group in 2010 the population of those aged 65 and older represented the smallest cohort groups in total numbers. By 2040 these cohort groups grow significantly and are exceeded only by those cohort groups aged under 15 or aged 35 to 54. Concurrently the number of persons aged 65 and older living in both owner units and renter units more than doubles by the year 2040.

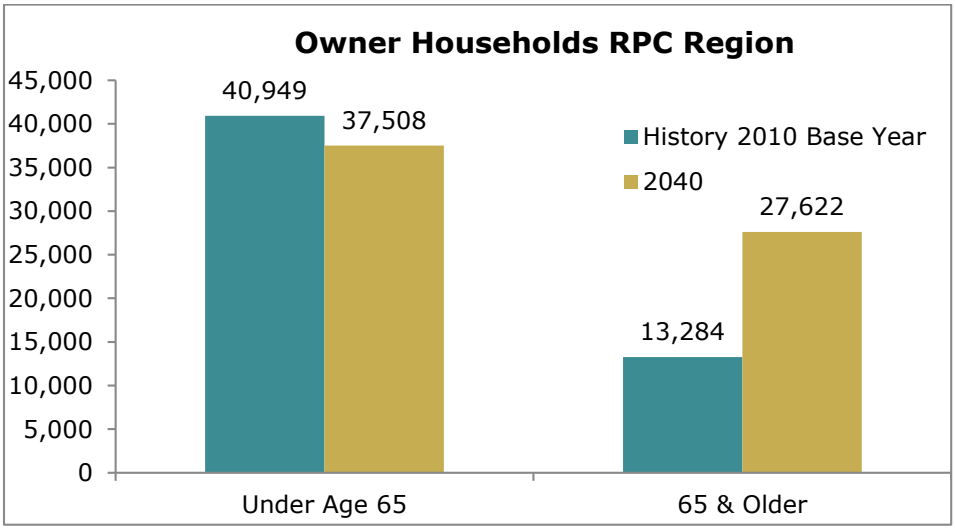


Figure HOU5 -

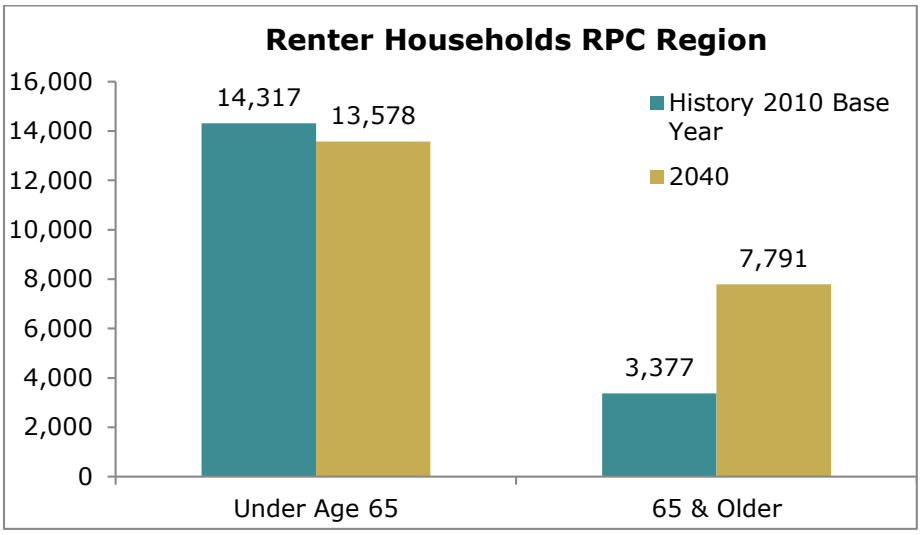


Figure HOU6 -

This dramatic increase in the number of elderly citizens will have an impact upon housing in the region in several ways. First, many older residents chose to stay in their homes as they get older even though this often places a heavy burden upon them financially as their income opportunity typically decreases with age meaning that a greater percentage of their income is required to maintain their homes. In addition elderly people often experience a decrease in overall health which can make staying in large single family homes more difficult.

Over the past five to ten years the region has seen a proliferation of age restricted units. Predominantly age 55 and up these developments have been fairly well received by communities because for the most part such development do not result in new populations of school aged children and the associated education costs at the local level. There have however been some concerns about these developments. One is that they are often located fairly distant from the municipal and other services like shopping areas, hospitals and medical offices that are important for this population. Keeping these developments closer to town centers reduces the resident's reliance upon automobiles for accessing these services.

Another concern that has been discussed but not observed is the potential to saturate a community with older residents. There are few educational costs required of these developments so communities have been fairly accepting of them. Some concern has been raised that if community populations become too elderly, proposals for education initiatives that require voter support may be challenged by large populations with little interest in passing such projects.

Source: NHHFA 2013

Table HOU 3 - 2012 home prices by municipality within the region.

RPC REGION HOME PRICES 2012

	All Homes		Existing Homes		New Homes	
Town/Area	Median Purchase Price	Sample Size	Median Purchase Price	Sample Size	Median Purchase Price	Sample Size
Atkinson	$260,000	58	$260,000	54	$229,900	4
Brentwood	$325,000	68	$333,000	41	$299,759	27
Danville	$190,000	27	$190,000	23	$204,500	4
East Kingston	$275,000	31	$239,000	28	$279,000	3
Epping	$230,000	83	$199,900	62	$245,600	21
Exeter	$252,000	191	$242,000	152	$286,650	39
Fremont	$193,000	48	$193,000	39	$195,895	9
Greenland	$360,000	48	$349,000	32	$407,000	16
Hampton	$284,000	202	$275,000	190	$358,365	12
Hampstead	$249,933	70	$249,900	63	$270,000	7
Hampton Falls	$385,000	29	$348,500	26	$399,900	3
Kensington	$375,000	16	$375,000	16	0	0
Kingston	$216,200	67	$202,000	58	$259,900	9
New Castle	$972,500	21	$972,500	20	$700,000	1
Newfields	$395,000	19	$395,000	19	0	0
Newington	$530,000	3	$530,000	3	0	0
Newton	$247,900	56	$245,000	42	$247,933	14
North Hampton	$405,000	44	$390,000	38	$449,000	6
Plaistow	$205,000	59	$205,000	58	$159,900	1
Portsmouth	$340,000	255	$320,550	225	$395,660	30
Rye	$512,500	64	$512,500	61	$650,000	3
Salem	$238,000	226	$229,300	203	$305,000	23
Sandown	$229,900	74	$215,000	54	$279,933	20
Seabrook	$265,000	59	$238,000	48	$388,385	11
South Hampton	$520,000	3	$520,000	3	0	0
Stratham	$322,000	118	$320,000	106	$343,478	12
RPC Region	$337,613	1939	$328,813	1664	$333,918	275
Rockingham County	$255,000	3,118	$247,900	2,700	$299,933	418
New Hamsphire	$205,000	11,693	$199,000	10,790	$280,000	903

The table above shows the median home price for both new and existing homes for the communities in the Rockingham Planning Region. The home values are significantly higher than those for both Rockingham County as a whole and those for the State of New Hampshire. The median home costs presently nearly match the affordable housing limits established by the Department of Housing and Urban Development for one of the federally delineated housing markets in the Rockingham Planning Commission Region. As an indicator that the region is still feeling the impacts of the recession, four communities (Kensington, Newfields, Newington and South Hampton) in the region saw no new home construction in 2012

The table below provides information regarding the number of dwelling units in each RPC community as well as the number of occupied and vacant units. In 2010 which was in the mid-point of the recession the region had an occupancy rate of roughly 89%. This is higher than the State rate of 83% for the same period.

Table HOU4 - Dwelling units, occupancy and persons per household by municipality.

Dwelling Units, Occupancy and Persons per Households Rockingham Planning Commission Region 2010					
Municipality	**Total Population**	**Total dwelling units**	**Occupied**	**Vacant**	**PPH**
Atkinson	6,751	2,788	2,666	122	2.53
Brentwood	4,486	1350	1,319	49	3.02
Danville	4,387	1684	1,569	62	2.79
East Kingston	2,357	907	862	740	2.73
Epping	6,411	2723	2,466	45	2.60
Exeter	14,306	6496	6,114	257	2.28
Fremont	4,283	1573	1,508	382	2.81
Greenland	3,549	1443	1,372	65	2.57
Hampstead	8,523	3727	3,396	71	2.51
Hampton	14,976	9921	6,868	331	2.16
Hampton Falls	2,236	900	834	3,053	2.68
Kensington	2,124	806	761	66	2.79
Kingston	6,025	2480	2,288	45	2.63
New Castle	968	537	449	333	2.16
Newfields	1,680	591	575	88	2.92
Newington	753	322	292	16	2.53
Newton	4,603	1751	1,667	282	2.76
North Hampton	4,301	1914	1,760	84	2.44
Plaistow	7,609	3016	2,911	252	2.61
Portsmouth	21,233	10625	10,014	105	2.03
Rye	5,298	2852	2,252	329	2.34
Salem	28,776	11,810	11,145	600	2.57
Sandown	5,986	2214	2,072	665	2.89
Seabrook	8,693	4544	3,706	142	2.34
South Hampton	814	504	315	838	2.58
Stratham	7,255	2864	2,746	189	2.64
RPC Region	178,383	81,138	71,927	9,211	2.57

Source: 2010 US Census

The table below displays the most recent information regarding rental prices in the RPC region. Rents have shown a continuous increase over time with the greatest increases being shown in those units with two or more bedrooms. These units are particularly important to families and the increased cost is an important factor to keep in mind when housing affordability is considered.

Table HOU5 - Gross median rent from 2000 to 2014.

Gross Median Rent by Year Rockingham Planning Commission Region					
Year	Median Gross Rent	Median Gross Rent	Median Gross Rent	Median Gross Rent	Median Gross Rent
2014	$1,162	$798	$947	$1,237	$1,526
2013	$1,114	$814	$948	$1,224	$1,523
2012	$1,114	$768	$908	$1,176	$1,536
2011	$1,065	$796	$913	$1,202	$1,521
2010	$1,086	$742	$910	$1,205	$1,463
2009	$1,047	$743	$905	$1,161	$1,482
2008	$1,042	$725	$902	$1,160	$1,447
2007	$1,038	$725	$821	$1,095	$1,450
2006	$999	$712	$895	$1,066	$1,367
2005	$975	$653	$780	$1,044	$1,150
2004	$1,010	$628	$865	$1,041	$1,200
2003	$958	$555	$792	$1,009	$1,280
2002	$944	$582	$762	$989	$1,236
2001	$838	$529	$734	$936	$1,142
2000	$802	$516	$657	$839	$1,081

Source: NHHFA 2014

The table above displays median homes sales prices for Rockingham County since 2003. The table illustrates the impact of the recent recession on home values. The median value in Rockingham County reached a high of $299,900 in 2005 and a low of $237,518 in 2011. Median Prices have increased since then to a median average of $257,500 in 2013. The number of homes sold has steadily increased since 2010 and the average monthly listings have declined along with the time required to absorb homes as the county begins to shake the effects of the recession.

Table HOU6 - Property valuation and taxes from 2000 to 2010.

Property Valuation and Taxes - 2000 and 2010

Town/Area	Total Population 2000	Property Valuation and Taxes (excluding State School Tax portion) 2000 Total Equalized Valuation	2000 Valuation per Capita	Full Value Tax Rate	Total Population 2010	Property Valuation and Taxes (excluding State School Tax portion) 2010 Total Equalized Valuation	2010 Valuation per Capita	Full Value Tax Rate
Atkinson	6,178	$ 568,265,309	$ 91,982.08	$15.53	6,751	$ 861,030,452	$ 127,541	$ 18.09
Brentwood	3,197	$ 233,194,427	$ 72,941.64	$20.41	4,486	$ 470,144,965	$ 104,803	$ 24.14
Danville	4,023	$ 214,092,999	$ 53,217.25	$21.23	4,387	$ 334,406,107	$ 76,227	$ 26.75
East Kingston	1,784	$ 154,616,166	$ 86,668.25	$19.47	2,357	$ 289,170,347	$ 122,686	$ 23.70
Epping	5,476	$ 287,776,138	$ 52,552.25	$17.06	6,411	$ 625,629,077	$ 97,587	$ 22.66
Exeter	14,058	$ 935,779,524	$ 66,565.62	$25.62	14,306	$ 1,621,490,834	$ 113,343	$ 23.48
Fremont	3,510	$ 199,089,190	$ 56,720.57	$16.95	4,283	$ 356,628,293	$ 83,266	$ 26.67
Greenland	3,208	$ 377,967,612	$ 117,820.33	$13.38	3,549	$ 661,543,605	$ 186,403	$ 13.99
Hampstead	8,297	$ 624,215,437	$ 75,233.87	$18.30	8,523	$ 1,002,613,788	$ 117,636	$ 21.26
Hampton	14,937	$ 1,712,248,450	$ 114,631.35	$17.84	14,976	$ 2,848,886,991	$ 190,230	$ 17.20
Hampton Falls	1,880	$ 254,650,452	$ 135,452.37	$17.86	2,236	$ 430,759,104	$ 192,647	$ 19.15
Kensington	1,893	$ 168,381,556	$ 88,949.58	$16.04	2,124	$ 320,650,021	$ 150,965	$ 20.12
Kingston	5,862	$ 418,903,013	$ 71,460.77	$17.91	6,025	$ 647,698,604	$ 107,502	$ 22.20
New Castle	1,010	$ 354,151,741	$ 350,645.29	$8.26	968	$ 600,907,304	$ 620,772	$ 6.82
Newfields	4,289	$ 259,137,332	$ 60,419.06	$19.86	1,680	$ 238,242,064	$ 141,811	$ 23.79
Newington	1,551	$ 158,882,087	$ 102,438.48	$17.92	753	$ 975,640,252	$ 1,295,671	$ 7.57
Newton	775	$ 561,026,562	$ 723,905.24	$10.39	4,603	$ 458,059,244	$ 99,513	$ 23.78
North Hampton	4,259	$ 610,719,443	$ 143,395.03	$14.80	4,301	$ 1,018,252,684	$ 236,748	$ 14.77
Plaistow	7,747	$ 630,961,687	$ 81,445.94	$18.98	7,609	$ 920,467,303	$ 120,971	$ 22.18
Portsmouth	20,784	$ 2,565,939,311	$ 123,457.43	$15.89	21,233	$ 4,088,268,814	$ 192,543	$ 16.51
Rye	5,182	$ 1,063,922,690	$ 205,311.21	$12.34	5,298	$ 1,787,153,031	$ 337,326	$ 9.95
Salem	28,112	$ 2,498,642,148	$ 88,881.69	$17.29	28,776	$ 3,834,094,419	$ 133,239	$ 18.07
Sandown	5,143	$ 283,183,773	$ 55,061.98	$23.77	5,986	$ 525,943,436	$ 87,862	$ 22.87
Seabrook	7,934	$ 1,474,672,085	$ 185,867.42	$15.67	8,693	$ 2,416,157,324	$ 277,943	$ 14.16
South Hampton	844	$ 84,461,383	$ 100,072.73	$15.39	814	$ 144,846,432	$ 177,944	$ 16.86
Stratham	6,355	$ 659,211,043	$ 103,731.08	$16.63	7,255	$ 1,171,990,634	$ 161,542	$ 19.15
RPC Region	168,288	$ 17,354,091,558	$ 103,121.38	$17.11	178,383	28,650,675,129	$ 160,613	$ 19.07
Rockingham County	***277,359***	***$24,135,313,224***	***$87,018.32***	***$17.89***	***295,223***	***$ 41,057,907,008***	$ 139,074	***$ 19.04***
New Hampshire	**1,235,786**	***$ 86,703,541,057***	***$ 70,160.64***	***$20.10***	***1,316,759***	***$ 156,897,212,108***	$ 119,154	***$ 19.56***

Source: N.H. Department of Revenue Administration (comparison of effective tax rates); US Census, 2000, 2010

The table above shows the increase in property valuation in the region between 2000 and 2010. Two things are clear; the RPC region experienced a sharp increase in property valuation in the decade going from 17 billion dollars in taxable valuation to over 28 billion in taxable valuation. The valuation per capita increased significantly as well going from $103,000 per capita in 2000 to $161,000 in 2010. This increase represents the basis for increases in person property taxes. Per capita valuation in the RPC region surpasses both the county as a whole and the State by a considerable amount.

Table HOU7 - Comparison of per capita income by municipality in 2010, 2011 and 2012.

RPC Region Per Capita Income			
Municipality	2010	2011	2012
Atkinson	$41,588	$41,143	$39,628
Brentwood	$37,518	$37,385	$35,815
Danville	$28,716	$29,699	$30,857
East Kingston	$42,114	$42,916	$43,887
Epping	$34,193	$30,179	$32,416
Exeter	$37,043	$38,018	$38,220
Fremont	$29,486	$29,274	$32,512
Greenland	$42,017	$45,333	$53,652
Hampstead	$37,666	$38,704	$37,425
Hampton	$37,680	$41,022	$40,827
Hampton Falls	$53,371	$57,770	$54,410
Kensington	$39,837	$44,747	$49,509
Kingston	$29,267	$30,549	$30,025
New Castle	$70,462	$83,682	$86,051
Newton	$31,969	$32,027	$32,207
Newfields	$43,346	$50,351	$52,774
Newington	$39,115	$36,086	$37,970
North Hampton	$45,595	$48,534	$57,216
Plaistow	$34,147	$35,390	$31,583
Portsmouth	$36,823	$39,344	$40,111
Rye	$51,493	$56,171	$54,214
Salem	$33,751	$34,496	$35,290
Sandown	$32,961	$33,208	$34,130
Seabrook	$29,907	$30,218	$30,014
South Hampton	$41,185	$41,922	$40,721
Stratham	$45,238	$51,674	$53,833
RPC Region	$39,480	$41,532	$42,511
Rockingham County	*$35,889*	*$37,422*	*$37,820*
New Hampshire	*$31,422*	*$32,357*	*$32,758*

Source: American Community Survey, 2010, 2011, 2012

Per capita income in the RPC region was $42,511 in 2012. The region's per capita income is higher than both Rockingham County and the State of New Hampshire.

Housing Needs Assessment

NHRSA §36:47 requires that "For the purpose of assisting municipalities in complying with RSA §674:2, III(m), each regional planning commission shall compile a regional housing needs assessment, which shall include an assessment of the regional need for housing for persons and families of all levels of income." RSA §674:2, II(l) provides guidance for municipalities which include a housing section in their master plan, suggesting that any such section include a discussion of affordable housing based on the regional housing needs assessment performed by the regional planning commission. This document fulfills the requirements of RSA §36:47.

The immediate purpose of the Regional Housing Needs Assessment is to quantify and project the demand for housing in the RPC region in the horizon year (2020 in this update), and further to estimate the present and projected need for housing that is considered affordable for various household income groupings, both for owned and rented units. The more general purpose for the Needs Assessment is to provide communities in the region with background information and analysis needed to develop their own housing needs assessments for master planning purposes.

This Needs Assessment is written with the understanding that the passage of RSA §674-58 Workforce Housing (7/2008), both provided definitions for "affordable" and "workforce" housing, and placed new emphasis on the obligations that communities in New Hampshire have to accommodate the development of such housing. As such it has been updated from previous editions to use definitions and thresholds for rental and owner affordability that are consistent with the new law. In addition, the needs assessment has been apportioned to the town level to help communities quantify their proportionate share of the region's housing need.

Prior Housing Needs Assessments

The RPC developed its first Regional Housing Needs Assessment in 1989 as a component of its regional master plan. The assessment was updated in 1994 to incorporate updated income and household data from the 1990 US Census. It was substantially replaced in 2008 with a new Needs Assessment which employed a different method to estimate housing needs and omitted the town-by-town fair share estimate of new affordable units needs in each community.

While RSA §36:47 requires that all regional planning commissions prepare regional housing needs assessments, the statute does not prescribe a methodology. An initial standard methodology for New Hampshire was developed among the regional planning commissions and NHOEP, which was adapted from the fair share distribution methods created to address the landmark U.S. Supreme Court case from the community of Mt. Laurel in New Jersey. This method produced an estimate of the number of additional affordable rental housing that was needed in each community to address the regional need for affordable housing. The method resulted in a redistribution of housing need based on 5 factors: income, employment, size of community, assessed value and amount of developable land. The results, while technically sound, appeared inconsistent and in some cases illogical; as a result the needs assessment was not well accepted or used by the communities in the region.

In 2013 The NH Housing Finance Authority (NHHFA) worked with the NH Center for Public Policy to update the State's housing production needs model to better reflect changes in demographics and employment. This model examines factors influencing future housing needs in NH and forecasts anticipated housing supply needs for the period between 2010 and 2040.These estimates of future housing production are projected at the state, county, and regional planning commission levels.

The model utilized two approaches to calculating anticipated housing need. The first is a population-based housing production model which rests its assumptions in part on demographic data from the 2010 U.S. Decennial Census. Demographic indicators include population, household formation the distribution of population and households by age groups and the number of NH residents in group quarters. The second is an employment-based housing production model which relies on economic forecasts of labor force, employment and county commuting patterns.

An average of the employment and population based estimates projects housing production across New Hampshire to grow by 5,264 units per year (4,398 owner units and 866 renter units) from 2010 to 2020. For Rockingham County (this study was performed at the county level not the regional level)

the average of the employment and population based estimates projects housing production to grow by 16,523 units by 2020. This results in an annual production of 1652 units of which 1,294 will be owner units and 348 will be renter units.

Table HOU8 - Estimated housing supply requirements in 2020 excluding seasonal units.

Estimated Housing Supply Requirements - 2020 - Excluding Seasonal Units						
Basis	Employment-Driven*	Employment Population Average	Population-Driven**	Average Annual Production Needed 2010-2020		
Rockingham County						
	2020 A	**2020 B**	**2020 C**			
Owner	106,009	102,783	99,558			
Renter	33,560	32,459	31,359			
Total	139,569	135,243	130,916			
Total Production Potential 2010-2020						
Owner	16,164	12,938	9,713	1,616	1,294	971
Renter	4,685	3,584	2,484	468	358	248
Total	20,849	16,523	12,196	2,085	1,652	1,220
Subtotal: Need for Residents Working Within County						
Owner	8,720	6,980	5,239	872	698	524
Renter	2,527	1,934	1,340	253	193	134
Total	11,247	8,913	6,579	1,125	891	658

* ELMI 2010 to 2020 Forecast ** NH RDC Projections April 2013 Source NHHFA, 2013

Table HOU9 - Projected housing demand in 2020

Household Type	2010 total (existing)	2020 Projected Demand	2010 % (existing)	2020 Projected Demand
Homeowners				
Under 30% MAI	6,243	7,063	7.0%	7.4%
Under 50% MAI	14,526	16,435	16.2%	16.3%
Under 60% MAI	18,979	21,472	21.1%	21.4%
Under 80% MAI	27,917	31,584	31.1%	32.8%
Under 100% MAI	36,875	41,719	41.1%	45.1%
Under 120% MAI	45,618	51,611	50.9%	57.5%
All Homeowners	89,626	101,400	100.0%	100.0%
Renters				
Under 30% MAI	6,345	7,819	25.3%	21.7%
Under 50% MAI	10,790	13,297	43.0%	40.0%
Under 60% MAI	13,113	16,159	52.2%	48.8%
Under 80% MAI	17,019	20,972	67.8%	64.9%
Under 100% MAI	20,505	25,266	81.7%	76.0%
Under 120% MAI	21,956	27,055	87.4%	86.0%
All Renters	25,108	30,939	100.0%	100.0%
Total Households				
Under 30% MAI	12,588	14,882	10.7%	11.2%
Under 50% MAI	23,317	29,731	20.3%	22.5%
Under 60% MAI	32,092	37,630	27.9%	28.4%
Under 80% MAI	44,936	52,556	39.1%	39.7%
Under 100% MAI	57,381	66,967	50.0%	50.6%
Under 120% MAI	67,574	78,666	58.9%	59.4%
All Households	114,734	132,339	100%	100.0%

Table HOU10 – Estimated proportionate fair share work force housing need in the RPC region.

Estimated Proportionate Fair Share Work Force Housing Need
Rockingham Planning Commission Region
2010 and 2020

A	B	C	B	C	D	E	F	G	H	I	J	K
Community	2010 Households	2010 Share of Regional Households	2020 Households	2020 Share of Regional Households	HUD HMFA Area	HMFA 100% Median Income (4-person Household)	Max. Monthly Payment, Owner	HMFA 60% Median Income (3-person Household)	Max Monthly Payment, Renter	Estimated Workforce Housing Need		Increase in Need 2010-2020
										2010	2020	
Atkinson	2,666	3.7%	2,844	3.8%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	1,144	1,221	77
Brentwood	1,488	2.0%	1,920	2.6%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	639	824	186
Danville	1,570	2.2%	1,671	2.2%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	674	717	43
East Kingston	862	1.2%	1,070	1.4%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	370	459	89
Epping	2,466	3.4%	2,797	3.7%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	1,058	1,201	142
Exeter	6,263	8.6%	6,211	8.3%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	2,688	2,666	(22)
Fremont	1,526	2.1%	1,788	2.4%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	655	767	113
Greenland	1,382	1.9%	1,490	2.0%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	593	640	46
Hampstead	3,398	4.7%	3,404	4.5%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	1,458	1,461	3
Hampton	6,921	9.5%	6,751	9.0%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	2,970	2,898	(72)
Hampton Falls	834	1.1%	958	1.3%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	358	411	53
Kensington	761	1.0%	832	1.1%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	327	357	31
Kingston	2,288	3.1%	2,293	3.1%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	982	984	2
New Castle	449	0.6%	415	0.6%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	193	178	(15)
Newfields	575	0.8%	608	0.8%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	247	261	14
Newington	297	0.4%	280	0.4%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	127	120	(7)
Newton	1,667	2.3%	1,747	2.3%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	715	750	34
North Hampton	1,760	2.4%	1,732	2.3%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	755	743	(12)
Plaistow	2,913	4.0%	2,774	3.7%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	1,250	1,191	(59)
Portsmouth	10,452	14.4%	10,409	13.9%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	4,485	4,468	(17)
Rye	2,270	3.1%	2,262	3.0%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	974	971	(3)
Salem	11,187	15.4%	11,164	14.9%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	4,801	4,792	(9)
Sandown	2,073	2.8%	2,339	3.1%	Lawrence MA-NH	$82,800	$2,070	$44,710	$1,118	890	1,004	114
Seabrook	3,706	5.1%	3,977	5.3%	Boston-Cambridge-Quincy	$94,100	$2,353	$52,810	$1,320	1,590	1,707	117
South Hampton	315	0.4%	294	0.4%	Boston-Cambridge-Quincy	$94,100	$2,353	$50,810	$1,270	135	126	(9)
Stratham	2,746	3.8%	3,047	4.1%	Portsmouth-Rochester	$84,300	$2,108	$45,520	$1,138	1,178	1,308	129
TOTAL	**72,835**	**100.0%**	**75,077**	**100.0%**	**NA**	**NA**	**NA**	**NA**	**NA**	**31,255**	**32,224**	**969**

TABLE KEY	
Column	Explanation
A	RPC Community
B	Total number of households, (single, multi, and manufactured), OEP estimate.
C	Town's share of the region's (26 town RPC region) total households in 2010 and 2020
D	The town's federally assigned HUD-Fair Market Rent Area Housing Market: Lawrence NH-MA, Bos-Q-Cmb., or Ports.-Rochester
E	HUD Fair Market Rent Area's "100%" Median Area Income (MAI) for a 4-person family. Amount called out in SB 342
F	Maximum payment (mortgage, Insurance and taxes) for a ownership unit to qualify as Workforce Housing
G	60% of HUD Fair Market Rent Area's Median Area Income (MAI) for a 3-person family. Amount called out in SB 342.
H	Maximum payment (Rent and Utilities) for a rental unit to qualify as Workforce Housing
I	Estimated Workforce Housing need for 2010
J	Estimated Workforce Housing need for 2020
K	Increase in Workforce Housing need between 2010 and 2020

INCOME LIMIT CALCULATION (per NHHFA, 2012)		
HOME OWNERSHIP		
		Est. Max Purchase
100% MAI, 4 pers. Hsld		30 yr, 4% int 5% down, incl PM
Bos-Q-C	$94,100	$339,000
Lawr MA-NH	$82,800	$266,000
Ports-Roch	$84,300	$284,000
HOME RENTAL		
60% MAI, 3 pers. Hshld		Estimated Max Rent/mo.
Bos-Q-C	$50,810	$1,270
Lawr MA-NH	$44,710	$1,120
Ports-Roch	$45,520	$1,140

The fair share work force housing need table on the preceding page gives a best estimate of the number of workforce housing units (owner and renter units combined) for each community in our region. This exercise is an attempt to give our member communities an idea of the number of affordable units they should be providing for their residents. The total number of units found in column K is the result of projected numbers of renters in the income bands lower than 30% a area median income and homeowners making 100% of area median income as derived by the NH Housing Finance Authority. They derived these figures for each planning region throughout the state and a direct percentage growth figure mirroring the population growth estimate was applied to determine the number of units for 2020. For our region this number is 969 units and these units have been apportioned to each community based open that communities 2010 percentage of units.

The table also shows the income limits required for the HUD determined threshold limits for owner occupied and renter housing. As the tables earlier showed per capita income for the region is roughly $42,000 meaning a dual income household does not qualify for the homeownership in those parts of our region that fall in the Boston market. Concurrently the gross median rent for a 2-bedroom unit in our region is $1.237. This threshold barely qualifies in the Lawrence Ma-NH market and is lower than the Boston market threshold. The median home price in the RPC region in 2012 for all homes (new construction and existing) was 337,000. This is $2,000 less than maximum purchase price threshold for the Boston market but considerably more than the Lawrence Ma – NH market ((266,000) and the Portsmouth-Rochester market which has a threshold of $284,000. With the trend for both median house prices and median gross rents moving constantly higher it seems likely that residents earning the median income in the RPC region will continue to find housing costs a challenge.

Key Issues and Challenges

Overly restrictive local zoning and land use regulations are the most often cited reason for limiting the supply of housing in Southern New Hampshire. While local regulation is certainly an important contributing factor, there are other causes and factors that are as important in constraining the supply of housing.

Towns without access to sewer and water infrastructure are limited in their ability to address the single most the important factor in accommodating more affordable housing: the ability to support overall development densities that are high enough to make building lower cost housing economically attractive or viable to developers.

There are other barriers as well, both market and non-market driven. These barriers include a diminished construction labor force, more restricted access to capital; limited supply of developable land resulting in high land costs; high commodity and construction costs, community resistance to residential development. In our recent history, the supply of housing has been also constrained by the attractiveness of developing upscale homes on large lots because of the lower risk and greater profitability and high demand for this type of development. Our proximity to the Boston metro area and its higher relative incomes has helped skew the demand toward higher end housing.

While it may appear that communities are attempting to prevent new housing development, many municipal officials believe that they are carrying out goals stated in the Master Plan that stress the importance of maintaining community character. Local efforts to manage growth are usually driven by valid concerns about the impact of development the environment, on sprawl and loss of community character and open space, on municipal infrastructure and facilities and similar concerns. While these are valid they must be properly balanced with other community and regional needs, such as for workforce and affordable housing.

Several indicators, median home costs, median gross rents and per capita income all show that for our region there is a small margin within which a necessary proportion of housing will remain affordable. HUD established limits for home ownership and rental units seem to be running at exactly the median levels for these indicators. As the region recovers from the recession, housing cost trends seem to be on the increase that will mean housing affordability will remain a challenge. In fact, housing across the region may become less affordable in the future making it all the more necessary for towns to take measures to ensure that the opportunity to create workforce housing exists. While it is clear that local

land use controls are but one of several interrelated causes of the housing problem, communities can and should play a role in reducing the barriers and creating incentives where they can to stimulate the development of workforce housing.

As discussed in the Transportation chapter residents of the region are often spending more than 50% of their income on transportation costs and housing costs combined. This offers weight to the argument that well placed housing proximate to employment opportunities is an important consideration in future development of the region.

The New Hampshire Housing Finance Authority recently (2013) commissioned a study on the state's future housing needs and preferences, performed by the New Hampshire Center for Public Policy Studies and Applied Economic Research. The purpose of the study was to gauge the amount and type of housing that needs to be generated over the next ten years, as well as identify the impacts demographic and market trends are having on the types of housing that Granite State residents want.

The study is made up of three parts: The first focuses on perceptions and preferences about housing; the second on housing the growing senior population; and the third on the future of housing in New Hampshire. Below are summarized the major findings of this study.

Overall homeownership demand in New Hampshire is declining.

The reasons for this include the weak economy, lower rates of in-migration, and difficulties in obtaining financing. Among older homeowners, low levels of liquidity continue to pose problems, while high levels of student debt and mediocre wage growth limit home-buying options for younger generations. In the more rural parts of the state this decline in demand has been particularly apparent in communities that are more than two towns removed from major transportation networks. Real estate professionals, in particular, noted significant differences in demand geographically. Moreover, growth in low-wage service jobs and housing costs are described as creating a growing affordability problem, particularly north of Concord.

New Hampshire's current housing supply is poorly aligned with evolving preferences among different age groups

This mismatch exists both for aging Baby Boomers and younger workers. Older residents are likely to seek to "down-size" to smaller living arrangements, yet housing units of 3+ bedrooms far outnumber one- and two-bedroom units in the state. Given the relatively small number of young households in the state, it's unclear whether the larger units built for Boomers during their childrearing years will draw sufficient interest from buyers in future years.

In addition, younger age groups are, in general, less likely to be homeowners compared to previous generations. In fact, each new group of young people is increasingly less likely to be homeowners. Moreover, financial pressures cause younger generations to gravitate toward more non-conventional housing solutions, including co-ownership and "doubling up," and a preference for the flexibility associated with renting.

Affordability and the New Hampshire advantage

These factors have an impact on the affordability of housing in New Hampshire, something which may have been a big part of New Hampshire's attraction to new migrants from higher-priced states over the past four decades. While the median price of homes is more affordable than just a few years ago, this is not necessarily true for first-time buyers, who have traditionally provided important liquidity to the housing market. The home purchases of first-time buyers enabled those who were selling their homes to "move up" or "down-size." But younger residents now face inferior job prospects and high levels of student debt, and they are delaying marriage, and are unsure of the benefits of homeownership—including the ability to easily resell at a later date.

In addition, the state's rental market has grown less affordable in recent years. NHHFA's 2013 rental housing survey indicated that since 2006, the median monthly gross rent rose by 4 percent (in contrast to the 40 percent drop in the monthly mortgage cost) and vacancy rates decreased, meaning

renters were paying more, with fewer options to choose from. This reflects a national pattern for a growing percentage of households in rental housing.

Seniors Will Occupy a Growing Proportion of the State's Housing Units.

New Hampshire's senior population is expected to nearly double between 2010 and 2015, from 178,000 to 323,000 people, a change that is not matched among younger age groups. As a result, seniors will occupy a growing proportion of the state's housing units, filling one in three units by 2025. The number of senior households in the state, both owners and renters, will nearly double by 2025. While seniors generally want to age in place, this desire is complicated by several factors, including high rates of disability, lower median income and savings, declining caregiver population and other factors. The median income of the state's senior homeowners is barely half that of the state median, and their home equity has been significantly reduced by the state's housing downturn.

New construction will likely be limited in a projected era of slower population growth.

The rehabilitation of the existing housing stock may become more needed, yet much of New Hampshire's housing regulations, including local planning and zoning ordinances, are not currently geared towards this segment of the market.

Housing Recommendations

Recommendation 1

Encourage the availability of diverse housing opportunities for all citizens of the region. Work toward growth in housing to match growth in employment, and advocate for the allowance of a balance of housing styles, densities, and a distribution of prices that are affordable to a range of income levels.

Recommendation 2

Develop programs to educate the public about the economic effects of local regulations and the importance and value of adequate affordable housing for a sustainable economy.

Recommendation 3

Encourage communities to consider areas of town suited for mixed-use and incorporate land use ordinances and regulations that will allow this. The concepts included in these ordinances would include allowances for higher densities, more diverse permitted uses, reduced setbacks, etc.

Recommendation 4

Encourage the construction of single family homes and multi-family dwellings which are energy efficient in their design and use construction materials that are energy efficient in their design.

Recommendation 5

Encourage municipalities to consider expanding existing water and sewer service areas. Encourage communities without such systems to consider constructing them. Alternatively, municipalities should consider allowing community water or septic systems in appropriate areas of town. These are small systems, often development-based and maintained by an association of homeowners that allow the project developer to realize a diminished land development cost thereby enabling the construction of affordable units.

Recommendation 6

Balance the need for additional housing development with the need to preserve open space and identify and protect green belts, wildlife habitats and other linkages with existing open space and conservation lands.

Recommendation 7

Provide visual examples of a range of alternative, affordable housing developments, highlighting quality architecture, design and integration into the community.

Recommendation 8

Promote the development of infill housing and, where appropriately sited, the redevelopment of brownfield sites for residential and supporting land uses.

Recommendation 9

Collaborate with not-for-profit housing organizations, government agencies, developers and builders in pursuing options and solutions for meeting the housing needs of the region.

Recommendation 10

Promote the development of mixed-income multi-family housing at appropriate locations along major corridors and near employment centers.

Recommendation 11

Encourage communities to use incentive programs such as low income or historic preservation tax credits to support the development of workforce housing.

Recommendation 12

Encourage the creation of residential use of downtown second and third story spaces above commercial.

Recommendation 13

Evaluate the potential for zoning ordinance models that support the preservation or replacement of affordable housing affected by redevelopment.

Recommendation 14

Work with larger communities and the New Hampshire Housing Finance Authority to help preserve affordability in existing subsidized rental housing by monitoring the expiration of subsidy commitments and income or rent limitations in the developments.

Recommendation 15

Encourage and facilitate the use of Community Development Block Grant (CDBG)and other funds to rehabilitate and improve housing stock serving low to moderate income homeowners and renters.

Recommendation 16

Assist communities in evaluating their compliance with state statutes regarding workforce housing and continue to maintain and update the regional housing needs assessment per RSA 36:47 II.

Recommendation 17

Encourage and support the Pease Development Authority to consider amending its land use plan to allow mixed residential use in appropriate locations.

	HOU Goal 1	HOU Goal 2	HOU Goal 3	HOU Goal 4	HOU Goal 5	HOU Goal 6	HOU Goal 7	HOU Goal 8
Recommendation 1	S	S	P	P	S	N/A	N/A	S
Recommendation 2	S	S	P	N/A	P	N/A	N/A	S
Recommendation 3	S	N/A	S	N/A	S	P	N/A	S
Recommendation 4	P	N/A	N/A	S	N/A	N/A	N/A	N/A
Recommendation 5	P	P	S	N/A	P	S	N/A	N/A
Recommendation 6	P	N/A	S	P	P	S	N/A	N/A
Recommendation 7	S	N/A	N/A	N/A	N/A	N/A	N/A	P
Recommendation 8	P	P	P	P	P	S	N/A	S
Recommendation 9	S	S	S	P	P	P	S	S
Recommendation 10	S	P	S	N/A	S	P	S	P
Recommendation 11	S	S	P	N/A	P	N/A	P	P
Recommendation 12	S	N/A	S	S	S	P	S	P
Recommendation 13	S	2	N/A	N/A	N/A	N/A	S	S
Recommendation 14	S	S	P	N/A	N/A	P	N/A	N/A
Recommendation 15	S	S	P	N/A	P	P	P	P
Recommendation 16	S	S	P	N/A	N/A	P	N/A	N/A
Recommendation 17	S	N/A	S	P	P	N/A	S	S

Appendix A

Fair Housing Equity Assessment

Rockingham Planning Commission

January, 2015

This Fair Housing Needs Assessment is intended to analyze the data that is available related to the region's housing stock. In addition to the analysis of regional conditions as they relate to the state of New Hampshire, it is intended to help identify the unique characteristics of the region. It also offers information regarding concentrations of certain populations to determine if these populations are faced with undue barriers to housing. The FHEA was completed to explore other factors that may be barriers to housing access (such as cost or transportation constraints). This analysis allows communities to better assess housing needs and impacts at a deeper level than what the basic housing chapter can provide. It provides further analysis in order to better describe the factors that might be barring people from access to adequate housing in the region. This can assist communities in developing more comprehensive local development strategies if they wish.

Description of Geographic Region for Analysis

The Rockingham Planning Commission is comprised of 26 communities in southeastern NH. For this housing assessment information was utilized at the county, municipal and census tract level. At the census tract level each community is one census tract except for the communities of Exeter, Hampstead, Hampton, Portsmouth, Salem and Seabrook. In addition Kensington and South Hampton are a combined tract and Newfields and Newmarket are as well.

Demographic and Socioeconomic Trends

As reported in the population table above the region, county and State have all experienced relatively high and sustained growth over the last 30 years. For each region, The RPC area, the county and the State of New Hampshire, the highest growth period was from 1980-1990 and the slowest growth occurred in the decade from 2000 to 2010.

Table FHEA 1. Total Regional Population in 1990, 2000 and 2010.

Municipality	1990	2000	2010	1980 to 1990	1990 to 2000	2000 to 2010
Atkinson	5,188	6,178	6,751	1.7%	1.8%	0.9%
Brentwood	2,590	3,197	4,486	2.6%	2.1%	3.4%
Danville	2,534	4,023	4,387	6.8%	4.7%	0.9%
East Kingston	1,352	1,784	2,357	1.8%	2.8%	2.8%
Epping	5,162	5,476	6,411	4.1%	0.6%	1.6%
Exeter	12,481	14,058	14,306	1.2%	1.2%	0.2%
Fremont	2,576	3,510	4,283	6.8%	3.1%	2.0%
Greenland	2,768	3,208	3,549	2.7%	1.5%	1.0%
Hampstead	6,732	8,297	8,523	5.9%	2.1%	0.3%
Hampton	12,278	14,937	14,976	1.6%	2.0%	0.0%
Hampton Falls	1,503	1,880	2,236	0.9%	2.3%	1.7%
Kensington	1,631	1,893	2,124	2.1%	1.5%	1.2%
Kingston	5,591	5,862	6,025	3.1%	0.5%	0.3%
New Castle	840	1,010	968	-1.1%	1.9%	-0.4%

Newfields	888	1,551	1,680	0.8%	5.7%	0.8%
Newington	990	775	753	3.3%	-2.4%	-0.3%
Newton	3,473	4,289	4,603	1.2%	2.1%	0.7%
North Hampton	3,637	4,259	4,301	0.6%	1.6%	0.1%
Plaistow	7,316	7,747	7,609	2.7%	0.6%	-0.2%
Portsmouth	25,925	20,784	21,233	-0.1%	-2.2%	0.2%
Rye	4,612	5,182	5,298	0.2%	1.2%	0.2%
Salem	25,746	28,112	28,776	0.7%	0.9%	0.2%
Sandown	4,060	5,143	5,986	7.0%	2.4%	1.5%
Seabrook	6,503	7,934	8,693	0.9%	2.0%	0.9%
South Hampton	740	844	814	1.2%	1.3%	-0.4%
Stratham	4,955	6,355	7,255	7.1%	2.5%	1.3%
Windham	9,000	10,709	13,592	4.7%	1.8%	2.4%
RPC Region	161,071	178,997	191,975	1.8%	1.1%	0.7%
Rockingham County	245,845	277,359	295,223	2.6%	1.2%	0.6%
New Hampshire	1,109,252	1,235,550	1,316,470	1.9%	1.1%	0.6%

Source: US Census 1990-2010

The two tables below offer insight into the anticipated change of age of residents in our region according to recent studies by the New Hampshire Housing Finance Authority. As shown in the table the total population for the region in 2020 is expected to decrease from 178,383 to 161,571 with the majority of this being the result of Windham leaving our planning region. Although the total population goes down by 2020, the number of those older than 65 rises sharply from 25,544 to 34,577.

Table FHEA 2. 2020 population projections by age group.

Age Group	Total Population	Total Households	Ownership Tenure	Rental tenure	%Own	%Rent
Under 15	30,912	---	---	---	---	---
15 to 24	19,763	1,364	241	1,123	17.7%	82.3%
25 to 34	17,305	7,170	3,270	3,900	45.6%	54.4%
35 to 44	25,399	13,165	9,844	3,321	74.8%	25.2%
45 to 54	33,131	18,649	15,062	3,587	80.8%	19.2%
55 to 64	25,396	14,918	12,532	2,386	84.0%	16.0%
65 to 74	14,414	8,916	7,484	1,432	83.9%	16.1%
75 to 84	8,537	5,557	4,393	1,164	79.1%	20.9%
85 & older	3,526	2,188	1,407	781	64.3%	35.7%
Total	178,383	71,927	54,233	17,694	75.4%	24.6%

Group Quarters Population	
Total	2,139
Under Age 65	1,206
65 & Older	933

Population in Households (Total less Group Quarters)		Total Households	Owner Households	Renter Households	%Own	%Rent
Total	176,244	71,927	54,233	17,694	75.4%	24.6%
Under Age 65	150,700	55,266	40,949	14,317	74.1%	25.9%
65 & Older	25,544	16,661	13,284	3,377	79.7%	20.3%

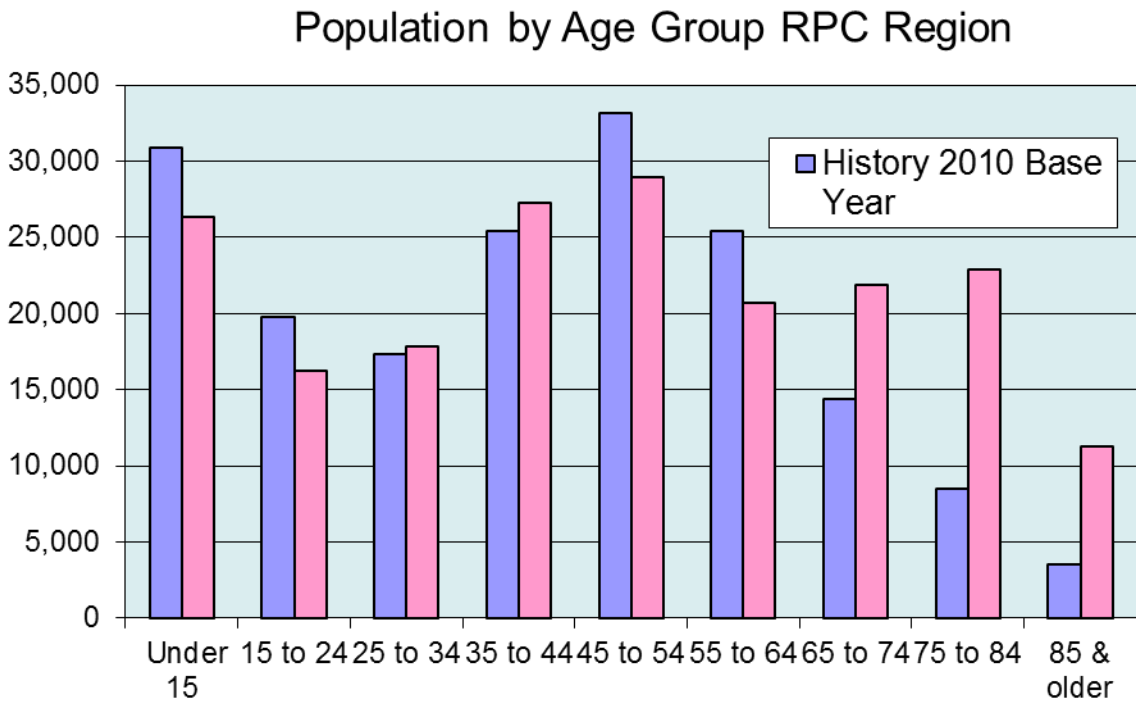
Average Number of Persons per Household (excluding GQ Population)		
Total	2.45	Resulting ratios held constant in forecast years
Under Age 65	2.73	Ratios that change with projection age distribution
65 & Older	1.53	

Age Group	Total Population	Total Households	Ownership Tenure	Rental tenure	%Own	%Rent
Under 15	4,098	---	---	---	---	---
15 to 24	19,718	1,361	240	1,120	17.7%	82.3%
25 to 34	23,300	9,654	4,403	5,251	45.6%	54.4%
35 to 44	21,633	11,213	8,384	2,829	74.8%	25.2%
45 to 54	25,898	14,578	11,774	2,804	80.8%	19.2%
55 to 64	31,263	18,364	15,427	2,937	84.0%	16.0%
65 to 74	21,572	13,344	11,201	2,143	83.9%	16.1%
75 to 84	9,991	6,504	5,141	1,362	79.1%	20.9%
85 & older	4,098	2,543	1,635	908	64.3%	35.7%
Total	161,571	77,560	58,206	19,354	75.0%	25.0%

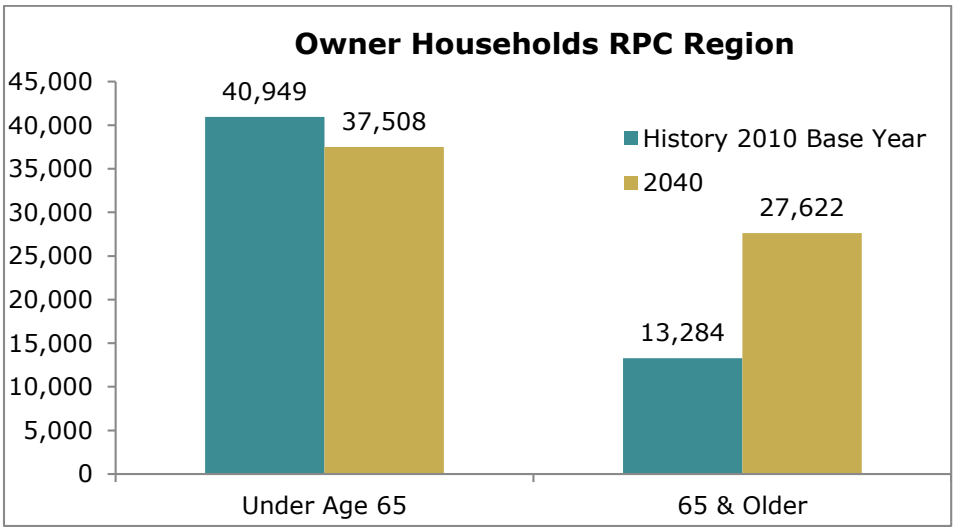
Group Quarters Population		
Total	2,298	
Under Age 65	1,214	<---Grows based on 25 to 64 cohort
65 & Older	1,084	<---Grows based on 85 & Older cohort

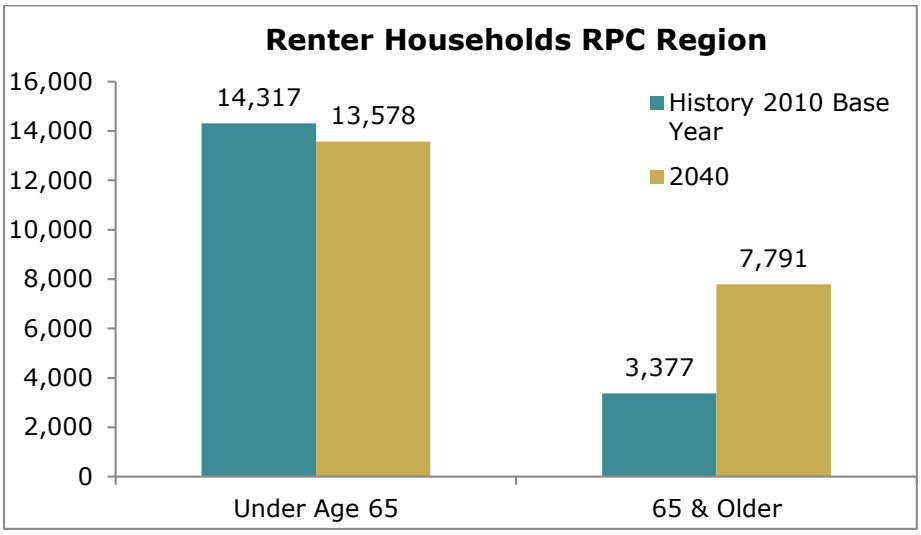
Population in Households (Total less Group Quarters)		Total Households	Owner Households	Renter Households	%Own	%Rent
Total	159,272	77,560	58,206	19,354	75.0%	25.0%
Under Age 65	124,696	55,170	40,229	14,941	72.9%	27.1%
65 & Older	34,577	22,390	17,977	4,413	80.3%	19.7%

Average Number of Persons per Household (excluding GQ Population)		
Total	2.05	Resulting ratios held constant in forecast years
Under Age 65	2.26	Ratios that change with projection age distribution
65 & Older	1.54	



The graphs above and below show this dramatic shift in population toward an older citizenry. By age group in 2010 the population of those aged 65 and older represented the smallest cohort groups in total numbers. By 2040 these cohort groups grow significantly and are exceeded only by those cohort groups aged under 15 or aged 35 to 54. Concurrently the number of persons aged 65 and older living in both owner units and renter units more than doubles by the year 2040.





This dramatic increase in the number of elderly citizens will have an impact upon housing in the region in several ways. First, many older residents chose to stay in their homes as they get older even though this often places a heavy burden upon them financially as their income opportunity typically decreases with age meaning that a greater percentage of their income is required to maintain their homes. In addition elderly people often experience a decrease in overall health which can make staying in large single family homes more difficult.

Over the past five to ten years the region has seen a proliferation of age restricted units. Predominantly age 55 and up these developments have been fairly well received by communities because for the most part such development do not result in new populations of school aged children and the associated education costs at the local level. There have however been some concerns about these developments. One is that they are often located fairly distant from the municipal and other services like shopping areas, hospitals and medical offices that are important for this population. Keeping these developments closer to town centers reduces the resident's reliance upon automobiles for accessing these services.

Another concern that has been discussed but not observed is the potential to saturate a community with older residents. There are few educational costs required of these developments so communities have been fairly accepting of them. Some concern has been raised that if community populations become too elderly, proposals for education initiatives that require voter support may be challenged by large populations with little interest in passing such projects.

Source: NHHFA 2013

Table FHEA 3. 2012 home prices by municipality within the region.

RPC REGION HOME PRICES 2012

	All Homes		Existing Homes		New Homes	
Town/Area	Median Purchase Price	Sample Size	Median Purchase Price	Sample Size	Median Purchase Price	Sample Size
Atkinson	$260,000	58	$260,000	54	$229,900	4
Brentwood	$325,000	68	$333,000	41	$299,759	27
Danville	$190,000	27	$190,000	23	$204,500	4
East Kingston	$275,000	31	$239,000	28	$279,000	3
Epping	$230,000	83	$199,900	62	$245,600	21
Exeter	$252,000	191	$242,000	152	$286,650	39
Fremont	$193,000	48	$193,000	39	$195,895	9
Greenland	$360,000	48	$349,000	32	$407,000	16
Hampton	$284,000	202	$275,000	190	$358,365	12
Hampstead	$249,933	70	$249,900	63	$270,000	7
Hampton Falls	$385,000	29	$348,500	26	$399,900	3
Kensington	$375,000	16	$375,000	16	0	0
Kingston	$216,200	67	$202,000	58	$259,900	9
New Castle	$972,500	21	$972,500	20	$700,000	1
Newfields	$395,000	19	$395,000	19	0	0
Newington	$530,000	3	$530,000	3	0	0
Newton	$247,900	56	$245,000	42	$247,933	14
North Hampton	$405,000	44	$390,000	38	$449,000	6
Plaistow	$205,000	59	$205,000	58	$159,900	1
Portsmouth	$340,000	255	$320,550	225	$395,660	30
Rye	$512,500	64	$512,500	61	$650,000	3
Salem	$238,000	226	$229,300	203	$305,000	23
Sandown	$229,900	74	$215,000	54	$279,933	20
Seabrook	$265,000	59	$238,000	48	$388,385	11
South Hampton	$520,000	3	$520,000	3	0	0
Stratham	$322,000	118	$320,000	106	$343,478	12
RPC Region	$337,613	1939	$328,813	1664	$333,918	275
Rockingham County	$255,000	3,118	$247,900	2,700	$299,933	418
New Hamsphire	$205,000	11,693	$199,000	10,790	$280,000	903

The table above shows the median home price for both new and existing homes for the communities in the Rockingham Planning Region. The home values are significantly higher than those for both Rockingham County as a whole and those for the State of New Hampshire. The median home costs presently nearly match the affordable housing limits established by the Department of Housing and Urban Development for one of the federally delineated housing markets in the Rockingham Planning Commission Region. As an indicator that the region is still feeling the impacts of the recession, four communities (Kensington, Newfields, Newington and South Hampton) in the region saw no new home construction in 2012

The table below provides information regarding the number of dwelling units in each RPC community as well as the number of occupied and vacant units. In 2010 which was in the mid-point of the recession the region had an occupancy rate of roughly 89%. This is higher than the State rate of 83% for the same period.

Table FHEA 4. Dwelling units, occupancy and persons per household by municipality.

Dwelling Units, Occupancy and Persons per Households Rockingham Planning Commission Region 2010					
Municipality	Total Population	Total dwelling units	Occupied	Vacant	PPH
Atkinson	6,751	2,788	2,666	122	2.53
Brentwood	4,486	1350	1,319	49	3.02
Danville	4,387	1684	1,569	62	2.79
East Kingston	2,357	907	862	740	2.73
Epping	6,411	2723	2,466	45	2.60
Exeter	14,306	6496	6,114	257	2.28
Fremont	4,283	1573	1,508	382	2.81
Greenland	3,549	1443	1,372	65	2.57
Hampstead	8,523	3727	3,396	71	2.51
Hampton	14,976	9921	6,868	331	2.16
Hampton Falls	2,236	900	834	3,053	2.68
Kensington	2,124	806	761	66	2.79
Kingston	6,025	2480	2,288	45	2.63
New Castle	968	537	449	333	2.16
Newfields	1,680	591	575	88	2.92
Newington	753	322	292	16	2.53
Newton	4,603	1751	1,667	282	2.76
North Hampton	4,301	1914	1,760	84	2.44
Plaistow	7,609	3016	2,911	252	2.61
Portsmouth	21,233	10625	10,014	105	2.03
Rye	5,298	2852	2,252	329	2.34
Salem	28,776	11,810	11,145	600	2.57
Sandown	5,986	2214	2,072	665	2.89
Seabrook	8,693	4544	3,706	142	2.34
South Hampton	814	504	315	838	2.58
Stratham	7,255	2864	2,746	189	2.64
RPC Region	178,383	81,138	71,927	9,211	2.57

The table below displays the most recent information regarding rental prices in the RPC region. Rents have shown a continuous increase over time with the greatest increases being shown in those units with two or more bedrooms. These units are particularly important to families and the increased cost is an important factor to keep in mind when housing affordability is considered.

Table FHEA 4. Gross median rent from 2000 to 2014.

Gross Median Rent by Year Rockingham Planning Commission Region					
Year	Median Gross Rent	Median Gross Rent	Median Gross Rent	Median Gross Rent	Median Gross Rent
2014	$1,162	$798	$947	$1,237	$1,526
2013	$1,114	$814	$948	$1,224	$1,523
2012	$1,114	$768	$908	$1,176	$1,536
2011	$1,065	$796	$913	$1,202	$1,521
2010	$1,086	$742	$910	$1,205	$1,463
2009	$1,047	$743	$905	$1,161	$1,482
2008	$1,042	$725	$902	$1,160	$1,447
2007	$1,038	$725	$821	$1,095	$1,450
2006	$999	$712	$895	$1,066	$1,367
2005	$975	$653	$780	$1,044	$1,150
2004	$1,010	$628	$865	$1,041	$1,200
2003	$958	$555	$792	$1,009	$1,280
2002	$944	$582	$762	$989	$1,236
2001	$838	$529	$734	$936	$1,142
2000	$802	$516	$657	$839	$1,081

Source: NHHFA 2014

The table above displays median homes sales prices for Rockingham County since 2003. The table illustrates the impact of the recent recession on home values. The median value in Rockingham County reached a high of $299,900 in 2005 and a low of $237,518 in 2011. Median Prices have increased since then to a median average of $257,500 in 2013. The number of homes sold has steadily increased since 2010 and the average monthly listings have declined along with the time required to absorb homes as the county begins to shake the effects of the recession.

Table FHEA 5. Property valuation and taxes from 2000 to 2010.

Property Valuation and Taxes - 2000 and 2010

Town/Area	Total Population 2000	Property Valuation and Taxes (excluding State School Tax portion)			Total Population 2010	Property Valuation and Taxes (excluding State School Tax portion)		
		2000 Total Equalized Valuation	2000 Valuation per Capita	Full Value Tax Rate		2010 Total Equalized Valuation	2010 Valuation per Capita	Full Value Tax Rate
Atkinson	6,178	$ 568,265,309	$ 91,982.08	$15.53	6,751	$ 861,030,452	$ 127,541	$ 18.09
Brentwood	3,197	$ 233,194,427	$ 72,941.64	$20.41	4,486	$ 470,144,965	$ 104,803	$ 24.14
Danville	4,023	$ 214,092,999	$ 53,217.25	$21.23	4,387	$ 334,406,107	$ 76,227	$ 26.75
East Kingston	1,784	$ 154,616,166	$ 86,668.25	$19.47	2,357	$ 289,170,347	$ 122,686	$ 23.70
Epping	5,476	$ 287,776,138	$ 52,552.25	$17.06	6,411	$ 625,629,077	$ 97,587	$ 22.66
Exeter	14,058	$ 935,779,524	$ 66,565.62	$25.62	14,306	$ 1,621,490,834	$ 113,343	$ 23.48
Fremont	3,510	$ 199,089,190	$ 56,720.57	$16.95	4,283	$ 356,628,293	$ 83,266	$ 26.67
Greenland	3,208	$ 377,967,612	$ 117,820.33	$13.38	3,549	$ 661,543,605	$ 186,403	$ 13.99
Hampstead	8,297	$ 624,215,437	$ 75,233.87	$18.30	8,523	$ 1,002,613,788	$ 117,636	$ 21.26
Hampton	14,937	$ 1,712,248,450	$ 114,631.35	$17.84	14,976	$ 2,848,886,991	$ 190,230	$ 17.20
Hampton Falls	1,880	$ 254,650,452	$ 135,452.37	$17.86	2,236	$ 430,759,104	$ 192,647	$ 19.15
Kensington	1,893	$ 168,381,556	$ 88,949.58	$16.04	2,124	$ 320,650,021	$ 150,965	$ 20.12
Kingston	5,862	$ 418,903,013	$ 71,460.77	$17.91	6,025	$ 647,698,604	$ 107,502	$ 22.20
New Castle	1,010	$ 354,151,741	$ 350,645.29	$8.26	968	$ 600,907,304	$ 620,772	$ 6.82
Newfields	4,289	$ 259,137,332	$ 60,419.06	$19.86	1,680	$ 238,242,064	$ 141,811	$ 23.79
Newington	1,551	$ 158,882,087	$ 102,438.48	$17.92	753	$ 975,640,252	$ 1,295,671	$ 7.57
Newton	775	$ 561,026,562	$ 723,905.24	$10.39	4,603	$ 458,059,244	$ 99,513	$ 23.78
North Hampton	4,259	$ 610,719,443	$ 143,395.03	$14.80	4,301	$ 1,018,252,684	$ 236,748	$ 14.77
Plaistow	7,747	$ 630,961,687	$ 81,445.94	$18.98	7,609	$ 920,467,303	$ 120,971	$ 22.18
Portsmouth	20,784	$ 2,565,939,311	$ 123,457.43	$15.89	21,233	$ 4,088,268,814	$ 192,543	$ 16.51
Rye	5,182	$ 1,063,922,690	$ 205,311.21	$12.34	5,298	$ 1,787,153,031	$ 337,326	$ 9.95
Salem	28,112	$ 2,498,642,148	$ 88,881.69	$17.29	28,776	$ 3,834,094,419	$ 133,239	$ 18.07
Sandown	5,143	$ 283,183,773	$ 55,061.98	$23.77	5,986	$ 525,943,436	$ 87,862	$ 22.87
Seabrook	7,934	$ 1,474,672,085	$ 185,867.42	$15.67	8,693	$ 2,416,157,324	$ 277,943	$ 14.16
South Hampton	844	$ 84,461,383	$ 100,072.73	$15.39	814	$ 144,846,432	$ 177,944	$ 16.86
Stratham	6,355	$ 659,211,043	$ 103,731.08	$16.63	7,255	$ 1,171,990,634	$ 161,542	$ 19.15
RPC Region	168,288	$ 17,354,091,558	$ 103,121.38	$17.11	178,383	28,650,675,129	$ 160,613	$ 19.07
Rockingham County	***277,359***	***$24,135,313,224***	***$87,018.32***	***$17.89***	***295,223***	***$ 41,057,907,008***	$ 139,074	***$ 19.04***
New Hampshire	***1,235,786***	***$ 86,703,541,057***	***$ 70,160.64***	***$20.10***	***1,316,759***	***$ 156,897,212,108***	$ 119,154	***$ 19.56***

Source: N.H. Department of Revenue Administration (comparison of effective tax rates); US Census, 2000, 2010

The table above shows the increase in property valuation in the region between 2000 and 2010. Two things are clear; the RPC region experienced a sharp increase in property valuation in the decade going from 17 billion dollars in taxable valuation to over 28 billion in taxable valuation. The valuation per capita increased significantly as well going from $103,000 per capita in 2000 to $161,000 in 2010. This increase represents the basis for increases in person property taxes. Per capita valuation in the RPC region surpasses both the county as a whole and the State by a considerable amount.

Table FHEA 6. Comparison of per capita income by municipality in 2010, 2011 and 2012.

RPC Region Per Capita Income			
Municipality	2010	2011	2012
Atkinson	$41,588	$41,143	$39,628
Brentwood	$37,518	$37,385	$35,815
Danville	$28,716	$29,699	$30,857
East Kingston	$42,114	$42,916	$43,887
Epping	$34,193	$30,179	$32,416
Exeter	$37,043	$38,018	$38,220
Fremont	$29,486	$29,274	$32,512
Greenland	$42,017	$45,333	$53,652
Hampstead	$37,666	$38,704	$37,425
Hampton	$37,680	$41,022	$40,827
Hampton Falls	$53,371	$57,770	$54,410
Kensington	$39,837	$44,747	$49,509
Kingston	$29,267	$30,549	$30,025
New Castle	$70,462	$83,682	$86,051
Newton	$31,969	$32,027	$32,207
Newfields	$43,346	$50,351	$52,774
Newington	$39,115	$36,086	$37,970
North Hampton	$45,595	$48,534	$57,216
Plaistow	$34,147	$35,390	$31,583
Portsmouth	$36,823	$39,344	$40,111
Rye	$51,493	$56,171	$54,214
Salem	$33,751	$34,496	$35,290
Sandown	$32,961	$33,208	$34,130
Seabrook	$29,907	$30,218	$30,014
South Hampton	$41,185	$41,922	$40,721
Stratham	$45,238	$51,674	$53,833
RPC Region	$39,480	$41,532	$42,511
Rockingham County	*$35,889*	*$37,422*	*$37,820*
New Hampshire	*$31,422*	*$32,357*	*$32,758*

Source: American Community Survey, 2010, 2011, 2012

Per capita income in the RPC region was $42,511 in 2012. The region's per capita income is higher than both Rockingham County and the State of New Hampshire.

Segregation and Racial Concentrations of Poverty

Table FHEA 7 Neighborhood Segregation Index

	Share of Population		Dissimilarity Index	
	RPC Planning Area (2000) (1)	RPC Planning Area (2010) (2)	RPC Planning Area (2000) (3)	RPC Planning Area (2010) (4)
Non-White/White	**4%**	**6%**	**0.25**	**0.24**
Black-African American/White	**1%**	**1%**	**0.00**	**0.38**
Hispanic/White	**1%**	**2%**	**0.28**	**0.28**
Asian/White	**1%**	**2%**	**0.38**	**0.35**

The following tables and maps show the areas and populations of minorities found within the RPC planning region. As detailed below, the region is overwhelmingly white with small populations of Black, Hispanic, Asian, Pacific Islander, and Native American residents. These tables and maps also show that except for concentrations of populations in some census tracts in Portsmouth, Exeter, Salem and Hampton the populations of minorities are a small percentage of overall population in the majority of our communities. Racial concentrations of poverty are often the result of segregation correlating to poverty. The RPC region is very homogeneous and lacks any statistically significant racial segregation

Pacific-Islander/White	**0%**	**0%**	**0.00**	**0.00**
Native-American/White	**0%**	**0%**	**0.00**	**0.00**

	Share of Population		Isolation Index (2010)	
	RPC Planning Area (2000) (1)	**RPC Planning Area (2010) (2)**	**RPC Planning Area (2000) (5)**	**RPC Planning Area (2010) (6)**
Non-White/White	**4%**	**6%**	**0.03**	**0.04**
Black-African American/White	**1%**	**1%**	**0.00**	**0.01**
Hispanic/White	**1%**	**2%**	**0.01**	**0.02**
Asian/White	**1%**	**2%**	**0.02**	**0.02**
Pacific-Islander/White	**0%**	**0%**	**0.00**	**0.00**
Native-American/White	**0%**	**0%**	**0.00**	**0.00**

Table FHEA 7 shows ethnic populations when reviewed for concentration of population. Values in column (1) and (2) are the share of racial/ethnic groups in the participant geography in years 2000 and 2010, respectively. Columns (3) and (4) are the dissimilarity index for years 2000 and 2010. The index compares the spatial distribution of the two groups identified in the left-hand column, summarizing neighborhood differences over a larger geography (in this case the RPC region). Higher values of dissimilarity imply higher residential segregation. Column (5) is the isolation index calculated over the program participant geography for the year 2000, column (6) is the same for the year 2010. The isolation index compares average neighborhood minority share for a minority person to the average minority share in the larger geography (again the RPC planning Commission Planning Region). Again, higher values imply higher levels of segregation. These index are calculated using block group 100% count data from the 2000 and 2010 Decennial Census SF1.As can be seen, there are no areas indicating residential segregation by race in the RPC Planning Region.

Table FHEA 8 - Disparity in Access to Neighborhood Opportunity - All Persons Rockingham Planning Commission

Program Participant Area

Panel A - All Persons (All Households)

	All Persons (1)	White Persons (2)	Black /African American Persons (3)	Hispanic or Latino Persons (4)	Asian Persons (5)	Native American Persons (6)	Pacific Isldr. Persons (7)	Disparities: Black - White [(2)-(3)] (8)		Hispanic - White [(2)-(4)] (9)		Asian - White [(2)-(5)] (10)		Amer. - White [(2)-(6)] (11)		Isldr. - White [(2)-(7)] (12)
Opportunity Dimensions:																
Poverty Index	64	64	59	67	68	0	0	5	***	-3	N/A	-4	***	0	N/A	0
School Proficiency Index	71	71	68	69	68	0	0	3	***	3	N/A	3	***	0	N/A	0
Labor Market Engagement Index	52	52	52	49	50	0	0	0	0	4	N/A	2	***	0	N/A	0
Job Access Index	32	31	45	36	41	0	0	-14	***	-4	N/A	-10	***	0	N/A	0
Transit Access Index	1	1	1	1	1	0	0	0	0	0	N/A	0		0	N/A	0
Health Hazards Exposure Index	78	78	77	77	77	0	0	1	***	1	N/A	1	***	0	N/A	0
Counts	178,383	168,039	1,043	3,696	2,990	231	58									

Panel B: Persons in Poverty

Disparities

	All Poor Persons (1)	Poor White Persons (2)	Poor Black Persons (3)	Poor Hispanic or Latino Persons (4)	Poor Asian Persons (5)	Native American Persons (6)	Poor Pacific Isldr. Persons (7)	Poor Black - White [(2)-(3)] (8)	Poor Hispanic - White [(2)-(4)] (9)	Poor Asian - White [(2)-(5)] (10)	Poor Native Amer. - White [(2)-(6)] (11)	Poor Pacific Isldr. - White [(2)-(7)] (12)
Opportunity Dimensions:												
Poverty Index	54	55	0	0	0	0	0	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0
School Proficiency Index	68	69	0	0	0	0	0	0	N/A	0	N/A	0	N/A	0	N/A	0
Labor Market Engagement Index	49	49	0	0	0	0	0	0	N/A	0	N/A	0	N/A	0	N/A	0
Job Access Index	30	27	0	0	0	0	0	0	N/A	0	N/A	0	N/A	0	N/A	0
Transit Access Index	1	1	0	0	0	0	0	0	N/A	0	N/A	0	N/A	0	N/A	0
Health Hazards Exposure Index	78	78	0	0	0	0	0	0	N/A	0	N/A	0	N/A	0	N/A	0
Counts	3,221	2,897	164	144	123	11	0					

Notes: Colums (1)-(7) provided a weighted average neighborhood percentile ranking for each dimension (row) described in the left-hand column, weighted by corresponding population group in each column header in Panel A. *The percentiles are expressed as 100 centile buckets. Higher percentile values always reflect more favorable average neighborhood characteristics irrespective of the dimension being an asset (proficient schools) or a stressor (poverty)*. Exposure weighted average are calculated of the program participant geography. Columns (8)-(12) are the differences across average neighborhood conditions between whites and the column group indicated in the header. Positive values imply that whites are in a differentially higher ranking neighborhood on average than the particular group for the given dimension. Negative values imply the reverse, that the given racial/ethnic group is in a differentially higher ranking neighborhood relative to whites along the given dimension. Panel B repeats the analysis in Panel A, but focuses on the average neighborhood of persons in poverty (income< federal poverty line) . Disparities may differ due to rounding. Data for the opportunity dimensions are described in detail in the data documentation. Data on the populations in Panel A is from the 2010 Decennial Census SF1. Data on impoverished population in Panel B comes from the American Community Survey (ACS) 2006-2010 five year estimates. Population groups smaller than 250 people (in census 2010) or 1,000 people for ACS-sourced data are coded as zero. The higher minimum population threshold for the ACS data is motivated by concerns about sampling error. Disparity columns (8-12) have associated significance flags for statistically significant differences. *** 0.01 significance level **0.05 significance level *0.1 significance level

Although Table FHEA 8 is difficult to read the information it shows is important for the RPC region. For the six Opportunity Dimensions measured, the centile buckets for the different racial groups within our region display roughly the same levels of opportunity. Across the categories the values for each of the Opportunity Dimensions are similar and for the most part high. For instance for "poverty" across the racial categories, if the population was significant enough to garner a rating these ratings ranged between 59 and 68 indicating little disparity between races. Of note is the very low rating for transit access for all races within the region. Access to transit resources is extremely limited for the majority of residents in the Rockingham Planning Commission region.

The "school proficiency index" shows the same relative equality for the racial groups represented. The range of ratings is even less distributed in this category with a range from 68-71 for the racial groups represented.

Table FHEA 9 Racial & Ethnic Makeup of Rockingham Planning Commission MPO Region

Source: 2010 U.S. Census

Area	Total Pop	Black	Amer Indian	Asian & Pacific Islander	2+ Races	Hispanic or Latino	Minority Total	Minority Percent
Atkinson	6,751	34	3	65	50	96	**264**	**3.9%**
Brentwood	4,486	30	6	50	59	67	**233**	**5.2%**
Danville	4,387	28	8	15	83	68	**214**	**4.9%**
East Kingston	2,357	3	1	17	21	22	**71**	**3.0%**
Epping	6,411	22	13	84	105	100	**343**	**5.4%**
Exeter	14,306	79	15	289	234	240	**887**	**6.2%**
Fremont	4,283	9	6	11	66	54	**159**	**3.7%**
Greenland	3,549	22	3	66	45	31	**177**	**5.0%**
Hampstead	8,523	23	7	71	87	84	**287**	**3.4%**
Hampton	15,430	89	32	199	205	264	**867**	**5.6%**
Hampton Falls	2,236	9	1	17	17	14	**63**	**2.8%**
Kensington	2,124	7	4	24	14	24	**77**	**3.6%**
Kingston	6,025	20	16	34	90	85	**264**	**4.4%**
New Castle	968	1	1	8	8	5	**23**	**2.4%**
Newfields	1,680	6	2	17	10	22	**64**	**3.8%**
Newington	753	4	1	10	9	8	**36**	**4.8%**
Newton	4,603	14	11	19	41	67	**167**	**3.6%**
North Hampton	4,301	19	8	56	38	41	**167**	**3.9%**
Plaistow	7,609	42	13	45	47	175	**358**	**4.7%**
Portsmouth	20,779	359	46	725	479	573	**2,335**	**11.2%**
Rye	5,298	16	1	50	41	58	**177**	**3.3%**
Salem	28,776	259	42	942	410	1,270	**3,454**	**12.0%**
Sandown	5,986	18	7	19	61	94	**232**	**3.9%**
Seabrook	8,693	46	10	92	119	126	**446**	**5.1%**
South Hampton	814	8	0	4	13	13	**41**	**5.0%**
Stratham	7,255	11	7	143	90	95	**356**	**4.9%**
MPO Region	**191,975**	**1,237**	**290**	**3,472**	**2,586**	**3,914**	**12,638**	**6.6%**
Rock County	**295,223**	**1,996**	**486**	**5,043**	**4,054**	**6,142**	**19,399**	**6.6%**
State of NH	**1,316,470**	**15,035**	**3,150**	**28,791**	**21,382**	**36,704**	**117,124**	**8.9%**

Map FHEA1 and Table FHEA 9 above indicate that there are very small populations of minorities in the RPC planning region. With the exceptions of The City of Portsmouth and the Town of Salem none of our communities have populations greater than the averages for the county or the State of New Hampshire. In addition, these higher concentrations are located in the communities offering the highest levels of social services and greater access to public transportation.

Map FHEA2 shows the geographic distribution across our communities of low income persons by census tract. There are only 3 census tracts in our region that exceed the Statewide average of 8% . These census tracts are located in Portsmouth (16.7%, 17.8% and 10.5%), Exeter (10.5%) and Seabrook (9.8%). Two of these census tracts exceed the national average of 15%.

ECONOMIC DEVELOPMENT CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Economic Development

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Cover photo credits: Portsmouth waterfront, NH Sea Grant (top right); Great Bay Community College, GBCC (middle right)

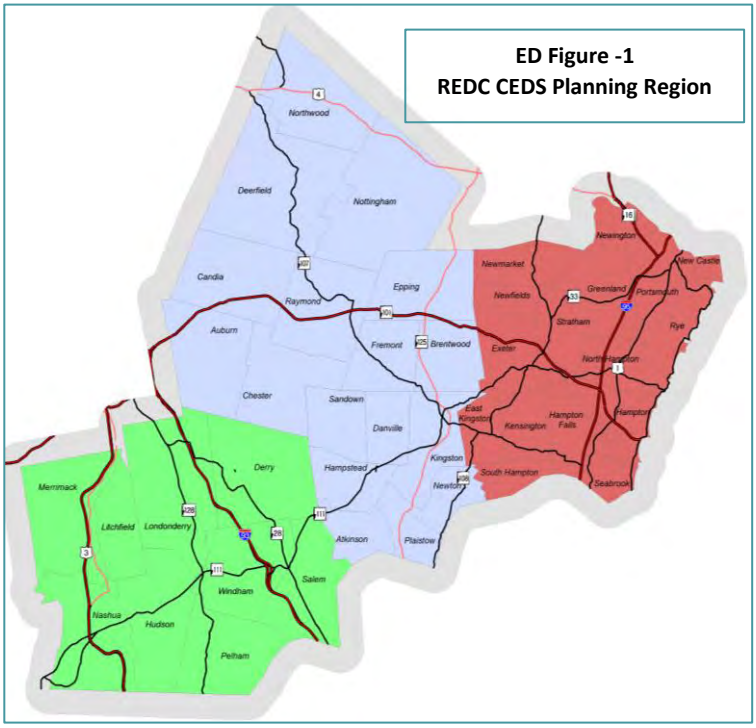
Economic Development

Introduction

Economic development both strongly influences and is influenced by land use planning polices and is of high importance in developing the region's master plan. The success or failure of economic development will have a profound effect on the future prosperity and character of the region. One of the central purposes of regional planning commissions in New Hampshire is to assist municipalities in coordinating polices for the development of the region, including economic development policies. Approaching economic development regionally can lead to better coordination of investments in infrastructure, workforce development and other areas of need and can magnify their effectiveness in achieving economic development goals.

Relationship to CEDS

The RPC partners with Regional Economic Development Center of Southeastern New Hampshire (REDC) which has the lead responsibility for economic development planning in southeastern New Hampshire. The REDC was initially established in the early 1990s during a severe recession caused by a retraction in the housing, construction and banking industries. It was established to cover Rockingham County and funded by the U.S. Economic Development Administration to development an economic development strategy for the County. Since then, this ongoing planning effort has evolved into what is now the "Comprehensive Economic Development Strategy" or CEDS, and the REDC itself has expanded to a include a significant portion of Hillsborough County in addition to all of Rockingham County. In addition, the REDC has been designated by EDA as an economic development district, which helps communities, and other public entities in the region gain access to federal economic development grants to fund infrastructure (sewer, water, transportation access) improvements and other investments to support economic development. ED Figure - 1 shows the geographic area encompassed by the REDC and covered by the CEDS.



ED Figure - 1 The REDC Region, shown in green, covers all of Rockingham County and 5 communities in Hillsborough County including Nashua. Coastal communities are within the Coastal EDC, but share the REDC's CEDS. Source: REDC

The CEDS is an economic development planning tool for the region, and a means to prioritize which development projects are most important and most deserving of public investment. The list of prioritized projects, which is updated annually, has become a key indicator of the economic development priorities for the broader region. The CEDS is developed in a bottom-up fashion whereby communities submit proposals for consideration to REDC. The CEDS advisory committee, made up a diverse mix of municipal, education and business officials, evaluates projects and establishes the priorities among them.

The RPC works closely with REDC each year in developing the CEDS. RPC assists by gathering the economic and demographic data needed to monitor the state of the regional economy, updating information about major infrastructure projects planned or underway, in identifying key trends which may impact growth and development, and ensuring that an integrated planning perspective is brought to the table on issues like public transportation, water quality, natural hazards, housing and other factors. Rather than maintaining a separate

regional plan for economic development, the RPC defers to the CEDS as the primary document to serve that function. In so doing, the planning efforts are combined rather than duplicated. The intent of this chapter is to distill relevant parts of the CEDS, to summarize information about the current state, direction and challenges of our region's economy, to articulate the common goals, policies and strategies for economic development in the region, and make recommendations that are relevant to the region's economic development objectives. Communities can use this chapter to inform the content of their individual master plans, to act on the strategies and recommendations that are appropriate for them locally, and to provide the means to cooperate with their neighbors in pursuing broader economic development in the region.

Common Visions and Goals Related to Economic Development

Throughout the 1970s and 1980s most communities in the RPC region did not place a significant emphasis on economic development in their local land use planning efforts. Often, economic development was not even included as a subject in local master plans. The more urgent concern at the time in much of southern New Hampshire in those years was in managing high rates of growth and the significant land use and infrastructure development impacts that flowed from that growth. Encouraging economic development in many communities experiencing high growth was often considered not needed or even desirable. However, as overall growth slowed in the 1990s and 2000s, and local tax rates rose in response to requirements for increased services brought on by their earlier growth, many communities recognized a need to plan for economic development to achieve overall community development goals and a diversified tax base.

What the Region Said About Economic Development

The vision and goals for the economic development chapter are drawn from five sources:(1) content of the individual master plans from communities in the region (as available through 2013); (2) opinions expressed by attendees at the regional workshops held during the development of the regional master plan (2013-2014); (3) results from the statewide opinion survey conducted by the UNH Survey Center (Spring 2013); (4) the 2013 BIA Strategic Economic Plan for New Hampshire; and finally, (5) the current CEDS for the region, updated in June of 2014. Together, these were considered against the RPC's economic development positions in the Commission's existing land use policies.

Local Master Plans

The review of current local master plans untaken as part of this plan development shows an increased emphasis in economic development. The following generalized vision or goal statements are common:

- Diversify the local tax base to include more commercial and industrial development.
- Encourage high quality jobs to attract and retain young people.
- Encourage economic development that is in character with the community.
- Create tax incentives to encourage local agriculture and preserve remaining agricultural land.
- Promote moderate density downtown/town center development with a mix of practical, useful stores.
- Provide infrastructure and services necessary to promote economic development.
- Establish limits to the amount of retail commercial development allowed by zoning.

Public Input from Regional Workshops

Three general visioning workshops, called "community conversations", were held around the region in 2013 soliciting input about key concerns and issues on a variety of topics, including economic development. The discussion format followed the "SWOT" format: a brainstorming session that moved sequentially from discussion of the region's strengths, weaknesses, opportunities and threats. The key theme's that arose from these discussions are more fully explored in the Key Issues and Challenges section of this chapter. The perceptions of key strengths and opportunities focused on a high quality of life, both the natural environment and cultural resources, quality schools, good transportation infrastructure, a highly educated and motivated workforce, and access to developable land. Weaknesses and threats centered on lack of infrastructure in parts of the region (sewer, water, natural gas, broadband internet access, transit) and in the maintenance and upgrading of existing infrastructure, the scarcity of workforce-affordable housing, high relative cost of energy, and the lack of intermunicipal cooperation in approaching regional scale problems and needs.

Statewide and Regional Survey

A statewide random sample survey was conducted by UNH Survey Center in the spring of 2013 as part of the statewide Granite State Future project. The survey included a number of questions aimed at measuring public attitudes toward community and economic development. Among the notable findings for the RPC region related to economic development are the following:

- Quality schools was by far the most important asset to have in a community, followed by local businesses and stores, nearby jobs, and cultural and recreational facilities.
- Two-thirds of respondents' favored future development occur in already developed areas as opposed to undeveloped areas.
- The majority supported additional public investment in roads and bridges (70%), water and sewer lines/facilities (61%), bike and pedestrian facilities (58%) and special needs/senior transportation (54%). The least support was shown for public investment in broadband access (36%).
- People most favored taking local action to encourage local agriculture (91%), protect historic buildings and neighborhoods (90%), create safe places for walking and biking (87%), expand existing businesses (78%), promote non-polluting industries (76%) and improve access to forests, trails and other recreation (76-74%). Least favored was attracting new retail stores (43%) and promoting tourism (49%).
- Environmental protection in general (66%-81%) and protecting drinking water supplies (94%) were highly supported.
- Just over half of respondents in the region (51%) felt that houses for purchase were very or somewhat affordable, but less than half (40%) felt that rental units were affordable.

The full results of this survey, both for the statewide and RPC region samples can be found in the Regional Overview Chapter Appendix.

BIA Strategic Economic Plan for New Hampshire

In November 2013, the Business and Industry Association of New Hampshire, the statewide chamber of commerce organization released its strategic economic plan for the state. This was done, as explained in the Plan's preface, because there is presently a need for a statewide 'playbook' for economic development and no such statewide plan exists. It is motivated by a growing sense that, unlike in the past when circumstances nearly guaranteed healthy economic growth, our state's future economic success will require a well thought-out strategic economic plan coupled with thoughtful, intentional decision-making about public investments. Past successes are no longer guaranteed due to slowing population growth and several other economic "headwinds", including a shrinking workforce, aging population, growing healthcare costs, high energy prices and a backlog of needed infrastructure investment.

The BIA strategic plan identified nine strategic goals, five of which parallel the goals of the CEDS and this chapter (shown in italics). They are as follows:

- Business growth, retention and attraction – New Hampshire offers the best environment for innovation and entrepreneurship in the Northeast United States, consistently growing, creating and drawing in successful businesses and the people that create and lead them.
- *Education, workforce skills and labor pool – New Hampshire possesses a high-quality, cost-effective, lifelong educational system that provides access and affords all residents the same educational opportunities to create a robust, innovative, flexible and productive workforce.*
- *Energy – New Hampshire businesses have access to reliable, high-quality, low-cost, diverse energy sources.*
- Fiscal policy – New Hampshire encourages business growth and retention by maintaining a state tax structure that is simple and equitable and by efficiently operating state and local governments.
- Health care – All New Hampshire residents are among the healthiest in the nation and have lifelong access to a high-quality, affordable, integrated and preventive health and community support system.

- *Infrastructure – Safe, reliable multi-modal transportation; high bandwidth, high-speed communication; and improved water supply, wastewater and storm water systems able to meet the needs of businesses and residents throughout New Hampshire.*
- *Natural, cultural and historic resources – New Hampshire values, stewards and enhances its natural, cultural and historic resources, making them available for current and long-term public benefit to foster vibrant communities, engaged citizens and economic vitality.*
- Regulatory environment – New Hampshire's regulations are clear, appropriate and consistently applied, providing the state's businesses with objective, predictable and consistent outcomes while protecting the state's natural resources, workers and residents.
- *Workforce housing – New Hampshire's workforce has access to diverse, attractive housing options that are affordable to the full range of incomes for working men and women throughout the state.*

CEDS Goals and Objectives

The 2014 CEDS for Southeastern New Hampshire identifies and articulates six broad goals and a series of objectives for each. The RPC incorporates the CEDS goals in this plan (below) as being wholly consistent with our own agency priorities. In addition, however, we have added two goals, one relating to energy efficiency and security, and another to climate change and resiliency, which we believe are important to the region's future economic development success.

Economic Development Goals

Goal 1 (CEDS): Dynamic, Diverse Economy

The region maintains a diverse, dynamic and creative economy which supports innovative industry clusters and creates high-skill, higher-wage jobs.

Goal 2 (CEDS): Infrastructure Development

Investment in infrastructure improvements, such as roads, bridges, sewer and water facilities, broadband, and multi-modal transportation systems is adequate to support the needs of the regional economy.

Goal 3 (CEDS): Regional Cooperation

Cost-effective regional approaches to shared problems and municipal service sharing are developed which enable more regional cooperation and other intermunicipal solutions.

Goal 4 (CEDS): Workforce Development

The resources available through the workforce development and university/ community college systems are effectively utilized and coordinated to address the training and educational needs of the work force and business community.

Goal 5 (CEDS): Workforce Housing

A diverse mix of workforce-affordable housing options exist in all parts of the region able to live in **the region and support a growing workforce for the region's expanding** businesses and new firms.

Goal 6 (CEDS): Environmental Preservation

The high quality of life in the region is maintained through the preservation and restoration of natural, cultural and historic resources and a balanced approach to economic development.

Goal 7: Resilience to Climate Change

Businesses and communities in the region have recognized potential risks and vulnerabilities from climate change and prepared for those threats by protecting and adapting critical infrastructure including culverts, roads, bridges, utilities, and community buildings.

Goal 8: Secure & Efficient Energy Supply

The region has advanced energy developments that diversify energy sources, emphasize cost effective renewable sources and create innovative means to use existing utilities and smart power grids to achieve these ends.

TABLE ED-1

Relationship of Economic Development Goals to Regional Master Plan Goals

Economic Development 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
ED Goal 1	P	S	S	P	N/A
ED Goal 2	S	P	S	S	P
ED Goal 3	P	P	S	S	N/A
ED Goal 4	N/A	P	S	N/A	N/A
ED Goal 5	P	P	S	S	N/A
ED Goal 6	S	S	P	P	P
ED Goal 7	S	S	P	S	S
ED Goal 8	S	S	P	S	S

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.

TABLE ED-2

Relationship of Economic Development Goals to NH Livability Principles

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

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

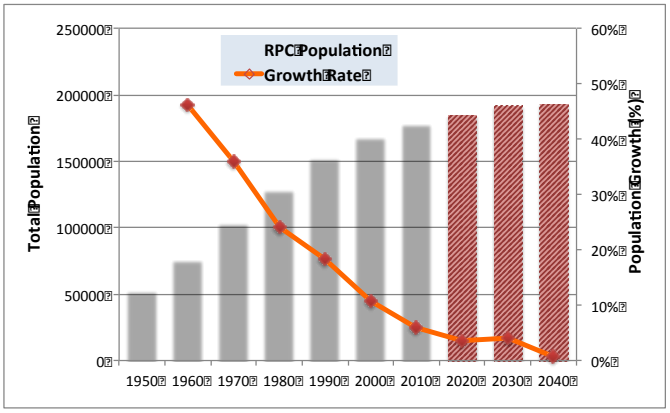
Demographic Conditions and Trends[1]

Demographic conditions and trends significantly influence the trajectory of the region's economic development. For example, as is more thoroughly presented in the regional overview of the Plan, the aging of our baby boom population cohort will, all other factors being equal, lead to a net reduction in the size of the region's available workforce over the next 20 years. Likewise, the availability of workforce-affordable housing, as well the skill and education of the workforce, can affect the ability of businesses to expand. The following is a summary of the key demographic conditions and trends that effect economic development.

Population

As noted in the introduction to this chapter, for most of the past 50 years, the RPC regional economy has been strongly influenced by rapid population growth. At times during the 1970s and 1980s several towns in the region were growing faster than any in the state. The number of people added between 1950 and 1990 averaged nearly 3% per year or about 25,000 per decade. Between 2000 and 2010, that rate fell by 60% to about 1000 persons per year across the region (Figure ED-3).

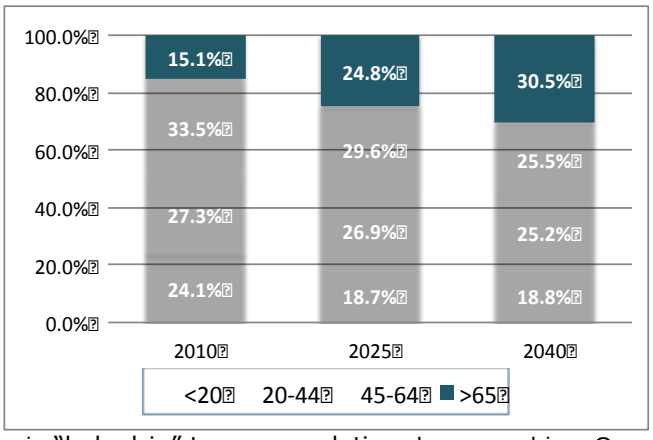
Figure ED-3
Population Growth & Projections 1950-2040



Since then the annual growth rate has been less than 1% per year. The period of rapid population and housing growth supported a very strong construction sector of the economy, but that changed in the early 1990s with a recession followed by housing market collapse and state banking crisis. Housing construction has never returned to those levels.

Figure ED-4

Age Cohorts – RPC Region – 2010-2040



Looking forward, based on the age structure of the region's population alone, it is likely that we have entered a prolonged period of very slow growth unless other factors intervene. The New Hampshire RPCs together with the NH Office of Energy and Planning (NHOEP) collaborated in 2013 to produce update population projections for the state. The new projections show relatively slow growth in the region's population from 2010 to 2040 and zero growth from 2030-2040. This projection is driven primarily by the effect of the large baby-boom cohort beginning to age out of the population after 2030. It assumes that migration, the net number of people moving into the region, will remain on average as it was from 2000 to 2010 so even within migration occurring, population growth will flatten as a natural consequence of the age structure. As depicted in Figure ED-4, this demographic determinism is "baked-in" to our population demographics. Over

[1] The data summarized in this section is available in the Economic Development Chapter Appendix on a town-by-town basis when the data is available at that geographic level.

the next 30 years the fraction of the population over age 65 and over 80 will grow very rapidly, more than doubling in their proportion while most other cohorts remain the same or shrink in size.

Compared to the U.S. average, Rockingham County has a significantly smaller number of people younger than 35, a significantly larger number between the ages of 45 and 64, and close to the average older than 65. This unbalanced age distribution has consequences to the region's economy over time. For the present, the age distribution is economically favorable because we have a bulge in the age segments where workforce participation, wages and household income are at their peak. As this large cohort ages, it becomes less favorable with a number consequential effects on the region's economy, some positive, but most negative. A shrinking school aged population will likely mean higher education costs per student (since fixed costs won't change significantly) or school closures and reduced staff. A decline in the 45-64 age group would likely mean a loss of household income and spending since they both peak with this age group. The rapid rise in people over 65 will mean expanded need for services catering to seniors such as healthcare, home services which will create business opportunities, but also higher per capita health care expenditures, less demand for housing, especially larger houses, property tax losses from senior exemptions and a smaller workforce. These are trends, not yet outcomes. Other factors, such as delayed retirement for some seniors and an effective economic development strategy that results in an increase in in-migration for younger age cohorts, may intervene to mitigate these trends.

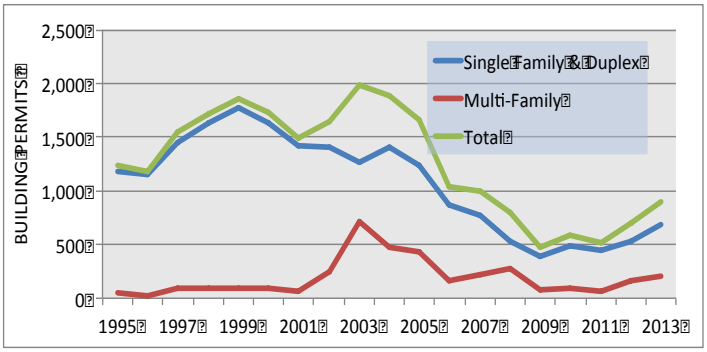
Housing

Housing availability, diversity and affordability are important factors in creating and maintaining a favorable environment for economic development. The quality of the housing stock in the region, as measured by common census statistics like age of units, number of bedrooms, utility status, etc., is generally good. Another positive metric for the state and region is the high homeownership rate which is correlated with higher income and overall prosperity. New Hampshire ranked 2nd nationwide in homeownership with 71% occupied housing units being owned versus rented (ACS 2012, 3 Year Average). In Rockingham County, 77% are owned, the highest of all areas in the state except Carroll County. On the other hand, the RPC region has comparatively high housing costs which can translate into higher living costs for the region's workforce, and in turn, high labor costs for the region's employers if higher wages are needed to attract the workforce their business demands.

Both the REDC CEDS document and several recent studies of economic indicators in New Hampshire, flag housing affordability as a key factor in the sustainability of a healthy economy. The New Hampshire Center for Public Policy Studies publication New Hampshire's Economic Climate: Key Indicators (NHCPPS, October 2013) found that New Hampshire ranked among the lowest states on housing affordability metrics, including the percent of household owner costs that were greater than 30% of income (43 of 50) and the ratio of median housing price to median income (34 of 50).

Figure ED-5

Housing Unit Production



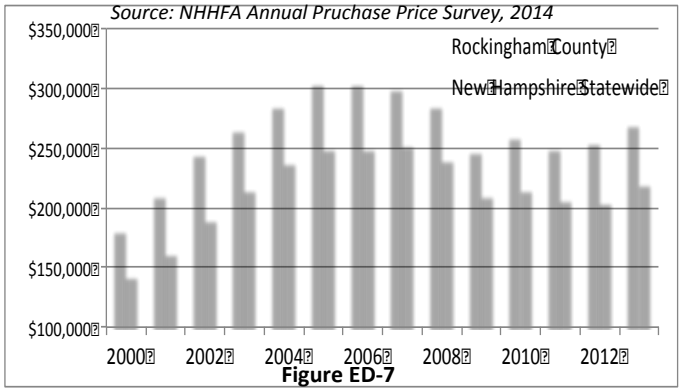
Housing affordability has been a long-standing and significant challenge for southern New Hampshire and is identified both here and in the CEDS as a key issue to address. Beginning in the 1970s and continuing to today, the region has had a relatively constrained supply of workforce-affordable housing, both owned and rental. At least two factors have and continue to contribute to this. First, the proximity to the Boston housing market and high housing costs in neighboring communities in Massachusetts tends to inflate the cost of housing here, whereas wages are not as strongly affected. Second, there is an undersupply in multifamily housing, the source of most rental and other affordable housing. This is especially true in the region's smaller communities. As of the 2010 Census, about two-thirds of the housing units in the region were single-family units, but for many small communities that number is over 80%. Zoning restrictions in many communities make it relatively more difficult to construct affordable multi-family housing, but these restrictions are often in place because of the lack of municipal sewer and water

infrastructure in the majority of the towns in the region. Only ten of the 26 RPC communities have municipal sewer systems, and in most of those, the sewer district covers only a small portion of the town. Even where allowed by zoning, that lack of infrastructure increases the relative cost of multifamily construction in rural areas and becomes less attractive to builders.

Another factor in the comparatively small supply of multifamily housing presently available in the region is the relative weakness in the housing construction sector which began with the recession in the early to mid 1990s which affected the multi-family sector more than the single family sector. As shown in Figure ED-5 construction for all types of housing significantly weakened after 2006 and began recovering in 2012. Multifamily construction was virtually non-existent in the mid to late 1990s and slowed dramatically again after 2005. The net affect is a lagging housing stock for multifamily units. Since average prices and rents for multifamily housing are lower than single family housing, the affect is to reduce the available stock of workforce affordable housing.

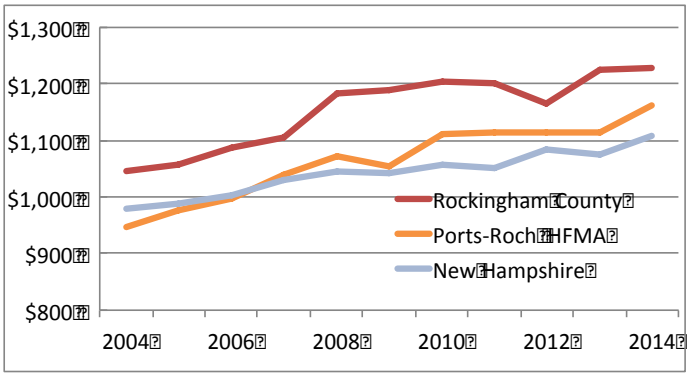
One effect of the great recession was to ease high prices in the ownership housing market. Since their peak in 2005, purchase prices for all homes in Rockingham County, fell nearly 30% by their low point in 2010 and are still selling on average at 20% below the peak (Figure ED-6). As wages have remained more or less steady in that time, the result has been a lessening in the affordability "gap" (the difference between the median selling price and what is affordable at the median household income) largely disappeared for median income households, though certainly not for low and moderate income families.

Figure ED-6
Average Housing Purchase Prices
Source: NHHFA Annual Pruchase Price Survey, 2014



Unfortunately, the same cannot be said for rental prices, which have remained very high and are presently the highest in the State by a significant margin[2]. (Figure ED-7) The result is that housing affordability for renters, where the need is greatest, remains a significant problem. In the Portsmouth area rental costs are particularly high, followed closely by costs in the I-93 corridor.

Figure ED-7
Average Housing Rental Costs (Monthly incl. Utilities)
Source: NHHFA Rental Cost Survey, 2014



Overall housing affordability is relatively low in the region. For the state as a whole the percentage of households where costs for housing exceed 30% of income, is similar to the other New England states. In Rockingham County and the Seacoast region, the percentage is only modestly higher due to higher incomes.

It is likely that the relatively high unemployment and low wage pressure that existed during the recession (and has persisted) is masking the negative impact of housing affordability on businesses. In a weak job market, employees are less likely to risk giving up a job to relocate to a more affordable location and instead will accept the higher housing or longer commute costs. As this reverses, housing affordability may once again become a significant concern among the region's larger employers.

Income

[2] NH Housing Finance Authority 2014 Residential Rental Cost Survey, June, 2014.

Median income, whether expressed as family, household or per capita income, is a common and important indicator of a community's or a region's relative prosperity. It is linked to other factors including labor force participation, unemployment, wages, and dominant industries in the region. Income is measured through the American Community Survey (ACS) which is taken annually and aggregated into 3 and 5 year moving averages. The most recent income data available for the RPC region is for 2012 and shows a median household income significantly higher than for the surrounding counties or state. Median household income for the RPC region is $79,449, the highest of any region in the state and slightly higher than the county average of $77,939. (Figure ED-8) Looking at individual communities within the region there is a wide and growing disparity of incomes. (Figure ED-9) The community with the highest household income, Newfields, ($114,896), has more than double that of the lowest, Seabrook ($56,031). The 200% difference between highest and lowest has been more or less constant since 1990, according to the decennial census income estimates.

Figure ED-8

Median Household Income

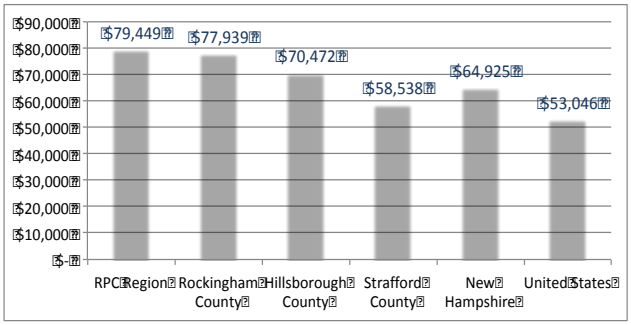
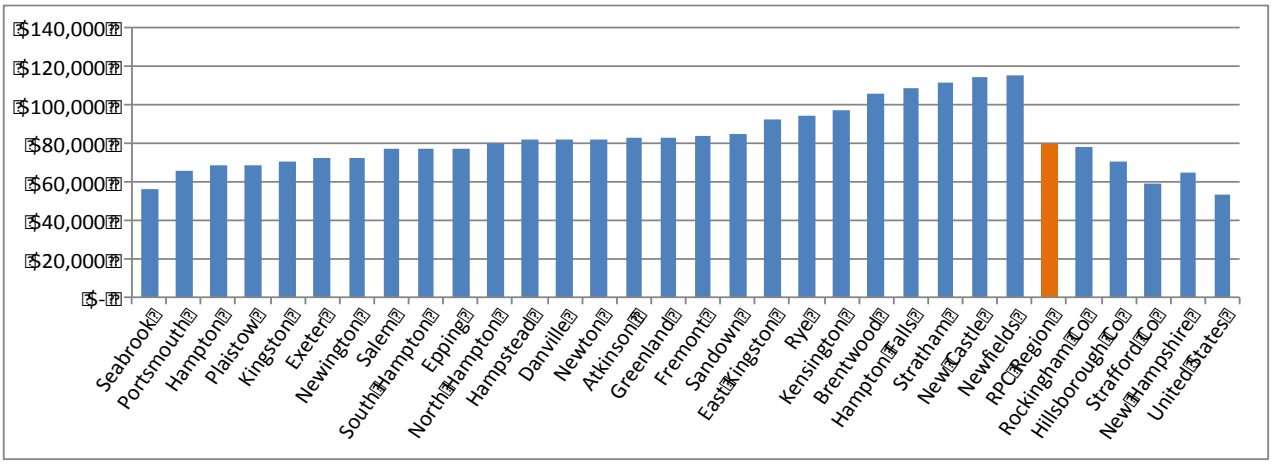


Figure ED-9

Median Household Income – RPC Communities

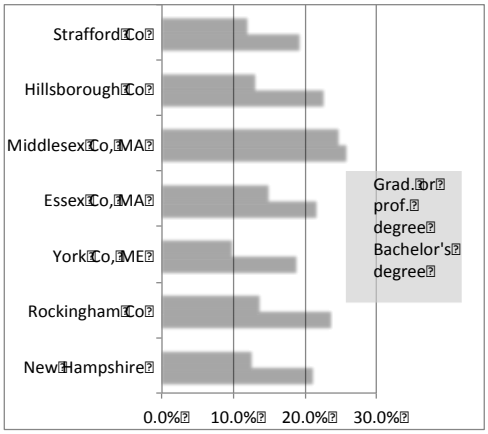


Educational Attainment

Educational attainment, as an indicator of workforce quality, is an important predictor of economic development success for the region. A skilled labor force with high levels of education is an increasingly important differentiator in attracting new entrepreneurial companies to the region. An analysis in the 2014 REDC CEDS Update shows that over the past ten years, job growth among those with a bachelors degree or higher is twice that of the general workforce.[3] The previously cited NHCPPS report on key economic indicators for New Hampshire reported that, statewide, New Hampshire ranks high among the 50 states in the high school graduation rate (#4), and the percentage that have an Associate's degree or better (#6) but not so well in two other measures: the rate at which those high school graduates go on to college (#24) and the level of student debt (#50). The ACS provides several commonly used metrics for education attainment at the county and town level including the level of traditional education that has been completed: grade school, high school, associate's degree, bachelor's degree and graduate or professional education. As shown in Figure ED-10, Rockingham County compares favorably with New Hampshire averages and other New Hampshire counties. However, Middlesex County Massachusetts to our immediate south has much higher rates of individuals with graduate and professional degrees and will compete favorability for businesses that rely of high education attainment, especially in the knowledge economy.

Figure ED-10

Educational Attainment



Economic Conditions and Trends

Employment and Wages

The Southern tier of New Hampshire, especially Hillsborough and Rockingham Counties, account for the majority of jobs in the State. In 2012, together they accounted for 323,821 of 612,432 or 52% of employed persons in the state. The RPC region itself accounted for 102,855 persons employed. This is 16.8% of the total employment in the state that year, larger than its 14.6% share of the state's population. Statewide, the average ratio between jobs and people is 1:2 and the ratio between jobs and households is about 1:0.84 (Table ED-3). Those ratios hold for most of every other region except for the RPC area where the number of jobs per person and per household are noticeably higher. A likely explanation is that several of the key job centers, most notably Portsmouth/Newington/Pease, Salem, Seabrook and Plaistow are on the edge of the region and many of those employees are commuting into these centers from outside the region. These ratios have increased significantly since 1990 when they were more nearly in line with the state averages. In other words, since 1990, the RPC employment has grown faster than its population and its dependence on employment across the borders in Massachusetts has lessened. This has obvious implications both to future development of housing and an appropriately skilled workforce.

[3] CEDS 2014, Rockingham Economic Development Center of So. NH, page 60

Table ED-3

Employment and Wage Data - 2012

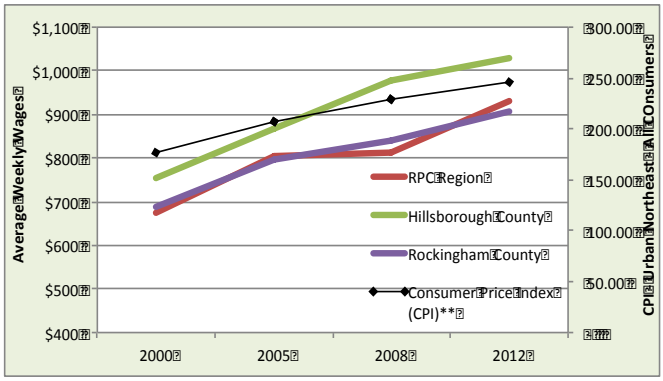
AREA	Population	Households	Business Estab.	Avg. Employment	Avg. Weekly Wages	Ratio: Employment to Population	Ratio: Employment to Households
RPC Region	179,210	72,329	7,187	102,855	$929.68	0.57	1.42
REDC CEDS region	453,993	176,545	27,428	214,470	$999.22	0.47	1.21
Hillsborough County	401,585	153,747	11,245	188,425	$1,030.00	0.47	1.23
Rockingham County	296,594	115,552	9,828	135,396	$907.00	0.46	1.17
New Hampshire	1,231,000	516,845	44,804	612,432	$928.00	0.50	1.18

Source: REDC CEDS, 2014; NH Dept. of Employment Security, Labor Market Information Bureau

Surprisingly, given the strong employment, educational attainment and comparatively high income, reported average weekly wages in the region are nearly the same as the state average – $930 vs. $928 in 2012. This may be explained by the fact that seasonal, tourism and retail-related jobs are more prevalent in the RPC region than in Hillsborough County, where wage rates are significantly higher (Figure ED-11). In addition while Hillsborough wages have just kept pace with inflation, growing 37% since 2000, compared with the regional CPI of 38% wages in Rockingham County have grown less, showing only a 31% gain in that period. Wages within the RPC region fared better, matching those of Hillsborough County. The state as a whole exactly matched the CPI at 38%. Level to slightly negative real wage growth has been a characteristic of the wage stagnation that most of the country experienced in this period.

Figure ED-11

Wages and CPI



The region's employment base has grown faster than its population over the last two decades, in part due to the development of Pease International Tradeport as a major employment center, and very slow growth in new housing development. However, the latest employment projections from the Economic and Labor Market Information Bureau (ELMI) of the NH Department of Employment Security indicates that the region's share of state employment in the next ten years will remain about the same as it is today. This is supported by the fact that the Pease Tradeport is approaching buildout, at least under its existing land use plan.

Figure ED-12

Regional Employment Share – Top Cities and Towns

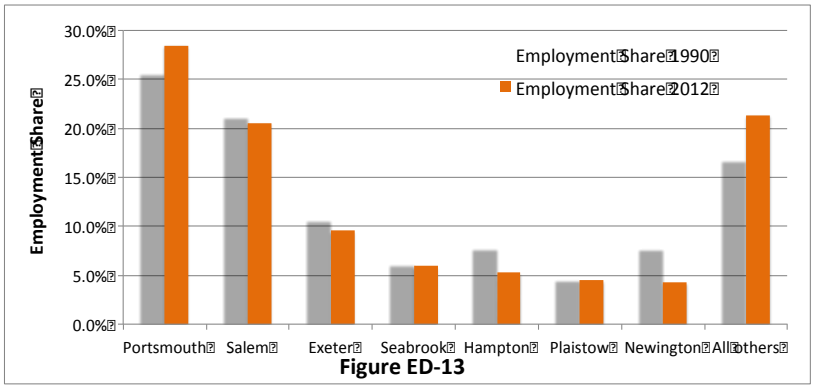


Figure ED-13

Net Growth in Jobs from 1990-2012 – Top Cities and Towns

Employment in the region is relatively concentrated in a half dozen communities which together account for nearly 80% of all jobs. (Figure ED-12) As expected, Portsmouth and Salem are by far the largest of the region's job centers,

accounting for 50% of total employment. The next largest are Exeter, Seabrook, Hampton, Plaistow and Newington. The remaining 21% of the region's jobs are shared in small amounts among the remaining 19 communities.

Two trends regarding the distribution of employment around the region are evident from changes that have occurred since 1990. First, Portsmouth has grown significantly in its share from about 25% in 1990 to about 29% in 2012. Second, every other community has lost share to the "All Other" set of smaller communities, which grow from 17% to 22% of the total. As shown in Figure ED-13, absolute employment growth from 1990 to 2012 was dominated by Portsmouth and the development at Pease, with the addition of over 10,000 jobs, more that 35% of the net 28,700 jobs added in the region in that period. Salem was next largest, with about 5500 jobs added, or 19% of the total.

Unemployment Rates and Trends

Historically, unemployment rates in the region have been well below both national and New England averages, on par with Rockingham County, but somewhat above the state as a whole. In the several years leading up to the Great Recession, New Hampshire experienced historically low levels of unemployment, dipping below 3% in 2000, considerably lower than the 4-5% rate that most economists consider 'full employment'. Since the recession ended in 2010 the unemployment rates have been slow to recover – uncharacteristic of New Hampshire's employment response to recent recessions. As depicted in Figure ED-14, the region's rates generally follow broader national employment trends but like New Hampshire as a whole are nearly always well below both the national number and average of New England states as well. In the Great recession, the region's unemployment rate peaked in 2009 at about 6.7% and fell to 5.5% at the end of 2013.

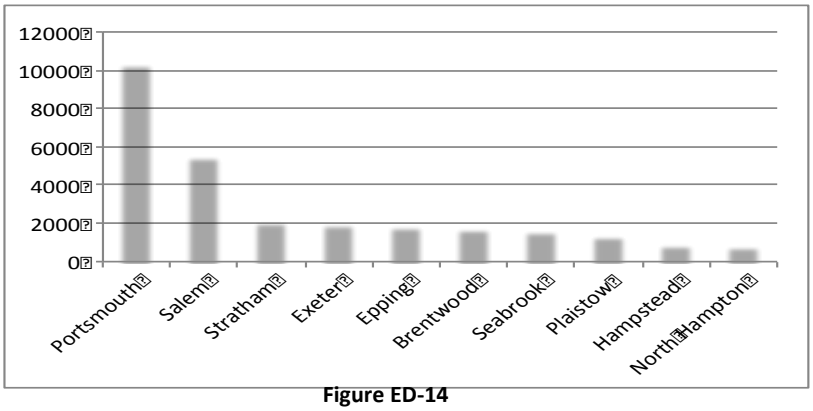
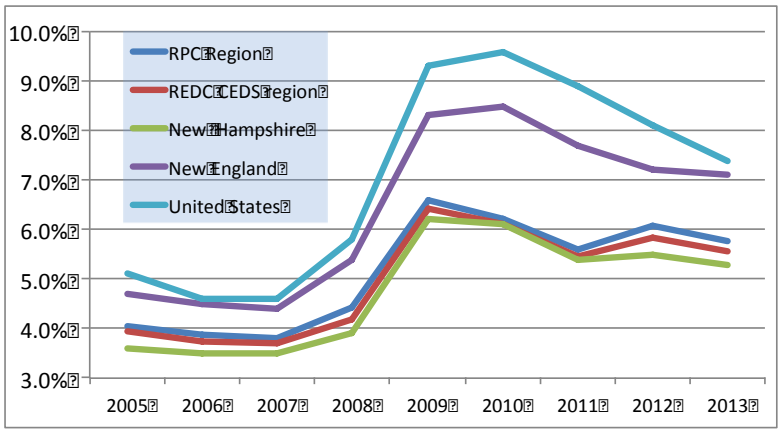


Figure ED-14
Unemployment Rate Comparisons

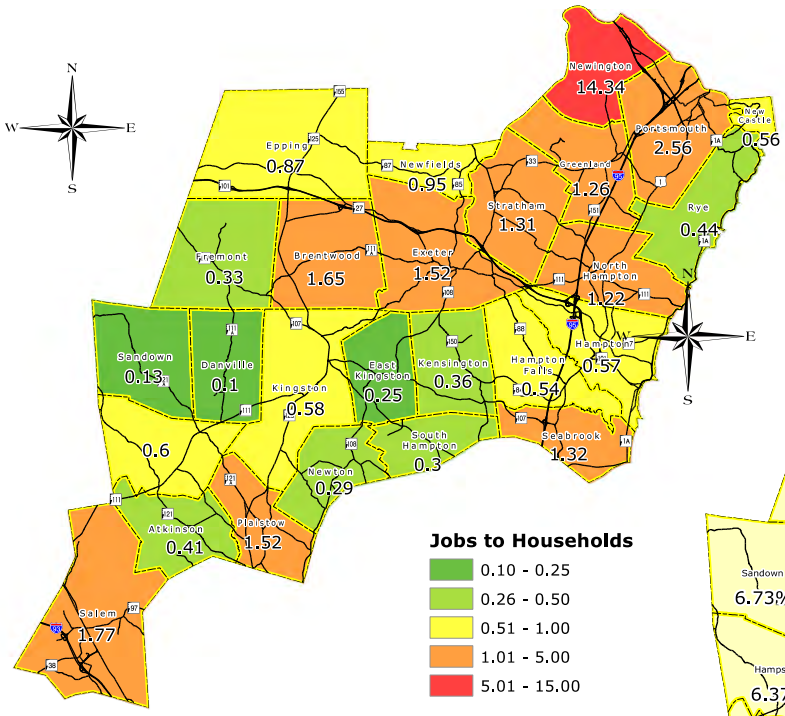
Sources: US Bureau of Labor Statistics (BLS); NH Dept. of Employment Security

While the region has historically done well in maintaining low unemployment rates, there are persistent pockets of higher unemployment, especially among the border communities with Massachusetts that have a high percentage of a retail employment. These pockets include Seabrook, Plaistow and Salem where employment rates are historically and consistently higher than the regional average by 1.5 to 3 percentage points. (Map ED-2)



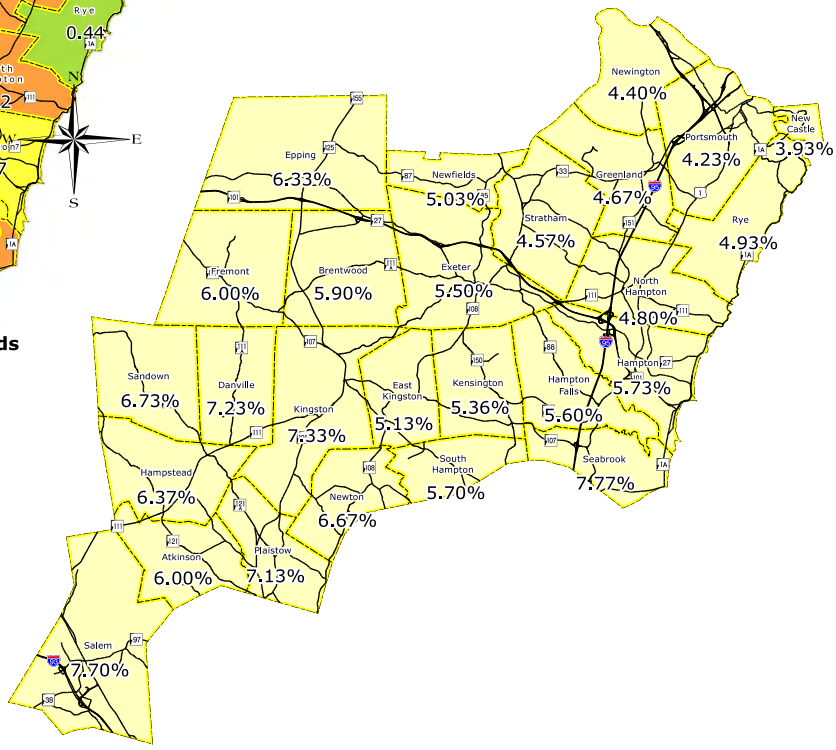
Map ED-2

Ratio of Jobs to Households - 2013



Map ED-3

Average Unemployment Rates – 2012-13



Labor Force

Labor force is defined as the total number of workers of working age able and eligible to work. It includes both employed and unemployed people. Whereas employment measures the number of people working at establishments within the region but living both inside and outside the region, labor force measures the number of people living in the region and working either within or outside the region. It indicates the number of people that make up the labor pool. As of the end of 2013, Rockingham County had a total labor force of 178,000 representing 24% of the state total (Table ED-4). Since 2005, the County's labor force has grown significantly faster than New Hampshire's as a whole (3.7% compared to 1.7%) and faster than our neighboring states. More

Table ED-4

Changes in Labor Force 2005-2013

Area	2005	2007	2009	2011	2013	% Change '05-13
ockingham ounty	***171.6***	***173.9***	***174.8***	***174.9***	***178.0***	3.7
ew Hampshire	***729.6***	***738.0***	***745.0***	***738.0***	***742.1***	1.7
aine	703.1	705.0	698.0	704.0	709.0	0.8

importantly, it is growing faster than the population which averaged only 0.7% over the same 8 year period (Figure ED-15).

This is a favorable development considering what is known about the age demographic of the region over the next 20 years. The concern described earlier in this section about a shrinking labor pool caused by the aging workforce may be partially mitigated by this differential positive growth in the labor force.

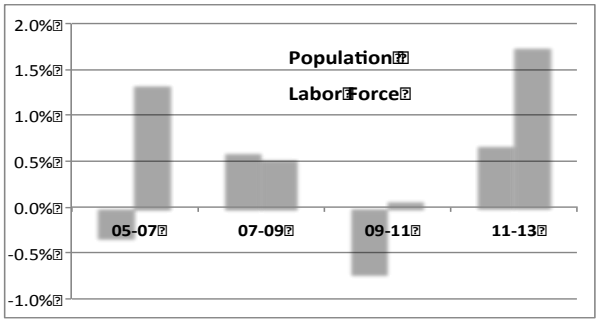
Occupation and Industry Clusters

An important consideration for economic development strategy across the country in recent years has been the identification of concentrations of certain industry types or "clusters." It is known that many businesses tend to locate near where others in the same industry in order to take advantage of conditions like a trained workforce and supporting businesses that locate with them. Industry clusters may initially develop informally, but often grow because they receive some type of benefit from the cluster. For example, by locating in such clusters, businesses gain efficiencies and locational advantages by making use of related suppliers, infrastructure and workforce.

Economic development regions can use this knowledge to develop polices that support these industry types and make their regions attractive to other businesses of the same industry. For example if specific labor force skills or transportation infrastructure or land uses or secondary support businesses are needed by the industry cluster, efforts can be made to help ensure that these conditions are supported. The REDC CEDS plan has, for many years, contained an analysis of the industry clusters in Rockingham County to help identify strategies that can help support success in these groups of businesses.

Figure ED-15

Population vs. Labor Force Growth 2005-2013



An industry cluster analysis identifies industries that are geographically concentrated and that are connected by the flow of goods and services. This is measured primarily by what is known as a "Cluster Location Quotient" which measures industry concentration by comparing the employment shares in the region compared to shares in the same industry in a broader area – in this case the entire US. An LQ of greater than 1.00 means that the industry group has a relative concentration higher than average, and we are a net exporter of goods and services in that industry.

Table ED-5 shows a compilation of the Industry Cluster results from the 2013 and 2014 CEDS. It shows LQ values not only for employment but for the number of establishments and total wages. The main analysis is for 2010 data, but changes as of 2012 are shown as well. The top industry clusters, ranked by 2012 employment LQ are as shown to the right:

Notably absent from this list is the tourism industry (arts, entertainment, recreation, visitor industries) which is sometimes described as one of the region's key industries. This may be explained, however by the fact that the cluster analysis is for all of Rockingham County. Considering the RPC region which likely show greater concentration given tourism employment in seacoast communities.

Comparing changes in LQ values over time shows that some of the county's clusters are increasing in their importance and some are decreasing. Growing clusters include Advanced Manufacturing, Glass and Ceramics, Fabricated Metal Manufacturing, Primary Metal Manufacturing and Chemical Products. Declining clusters include Defense and Security, Education and Knowledge Creation and Computer & Electronic Product Manufacturing. The decline in the Education section is likely specific to the contraction in local government spending following the end of ARRA stimulus funding which helped prevent layoffs earlier in the recession. Clusters with significantly declining location quotients were all in manufacturing industries including electronics, electrical equipment and computer products manufacturing.

Figure ED-16

Project Job Growth by Industry 2010-2020 – RPC Region

Top Industry Clusters – Rockingham County	*LQ Index*
Glass & Ceramics	2.44
Computer & Electronic Product Mfg	1.94
Electrical Equipment, Appliance & Component Manufacturing	1.62
Chemicals & Chemical Based Products	1.58
Advanced Materials	1.44
Information Technology & Telecomm.	1.43
Fabricated Metal Product Mfg	1.42
Machinery Mfg	1.4

Table ED-5

Industry Clusters in Rockingham County 2010 & 2012

	2010							2012		
INDUSTRY	Cluster Establishments	Industry Cluster Establishment LQ	Cluster Wages ($M)	Industry Cluster Annual Wages LQ	Cluster Employment	Cluster Employment LQ	Average Industry Cluster LQ	Cluster Employment LQ	Empl. Growth 2010-2012	Empl. LQ Change 2010-2012
Total All Industries	10542	1	$[illegible]5,912	1	131904	1	1.00	1	1.5%	0.0%
Advanced Materials	***273***	***1.63***	***$[illegible]403***	***1.24***	***6153***	***1.27***	***1.38***	***1.44***	***8.4%***	***13.4%***
Agribusiness, Food Proc. & Technology	65	0.4	$[illegible]77	0.68	1595	0.51	0.53	0.41	3.2%	-19.6%
Apparel & Textiles	74	0.81	$[illegible]36	0.89	698	0.71	0.80	0.96	4.1%	35.2%
Arts, Entertainment, Recreation & Vistor Ind.	351	1.14	$[illegible]126	0.72	5111	0.98	0.95	0.98	3.1%	0.0%
Biomedical/Biotechnical (Life Sciences)	308	0.82	$[illegible]588	0.89	12139	0.84	0.85	0.86	4.5%	2.4%
Business & Financial Services	1680	1.01	$[illegible]798	0.87	10928	0.94	0.94	0.96	2.7%	2.1%
Chemicals & Chemical Based Products	***82***	***1.03***	***$[illegible]174***	***1.4***	***2911***	***1.42***	***1.28***	***1.58***	***5.0%***	***11.3%***
Defense & Security	443	1.15	$[illegible]296	0.62	4465	0.62	0.80	0.6	-4.4%	-3.2%
Education & Knowledge Creation	173	1.2	$[illegible]76	0.33	1846	0.36	0.63	0.31	-58.8%	-13.9%
Energy (Fossil & Renewable)	534	1.14	$[illegible]405	0.99	5711	0.98	1.04	0.9	2.5%	-8.2%
Forest & Wood Products	76	0.94	$[illegible]43	0.69	939	0.66	0.76	0.64	-1.8%	-3.0%
Glass & Ceramics	***17***	***1.37***	***$[illegible]28***	***2.33***	***612***	***2.32***	***2.01***	***2.44***	***-1.2%***	***5.2%***
Information Technology & Telecomm.	***568***	***1.42***	***$[illegible]610***	***1.39***	***7554***	***1.49***	***1.43***	***1.43***	***3.6%***	***-4.0%***
Transportation & Logistics	233	0.93	$[illegible]139	0.78	2968	0.76	0.82	0.73	1.1%	-3.9%
Manufacturing Supercluster	239	1.52	$[illegible]498	1.42	6915	1.24	1.39	1.2	-1.9%	-3.2%
Primary Metal Mfg	6	0.88	$[illegible]17	0.79	338	0.91	0.86	1.33	-14.1%	46.2%
Fabricated Metal Product Mfg	***105***	***1.54***	***$[illegible]92***	***1.55***	***1662***	***1.3***	***1.46***	***1.42***	***20.2%***	***9.2%***
Machinery Mfg	***31***	***0.9***	***$[illegible]149***	***2.52***	***1640***	***1.6***	***1.67***	***1.4***	***-4.3%***	***-12.5%***
Computer & Electronic Product Mfg	***72***	***3.27***	***$[illegible]195***	***1.93***	***2539***	***2.24***	***2.48***	***1.94***	***-14.0%***	***-13.4%***
Electrical Equip., Appliance & Compnt. Mfg	***16***	***1.86***	***$[illegible]40***	***2.11***	***665***	***1.81***	***1.93***	***1.62***	***-4.1%***	***-10.5%***
Transportation Equipment Mfg	9	0.53	$[illegible]4	0.05	71	0.05	0.21	0.08	44.6%	60.0%
Mining	21	1.51	$[illegible]8	0.71	148	0.8	1.01	0.78	1.2	-2.5%
Printing & Publishing	220	0.99	$[illegible]82	0.66	1490	0.69	0.78	0.67	1.7%	-2.9%

Source: US Commerce Department's Economic Development Administration, Innovation in American Regions

Employment Forecasts

The Economic and Labor Market Information Bureau of New Hampshire Employment Security has recently completed New Hampshire industrial and occupational employment projections for 2012 – 2022. Over the ten-

year period, employment in the state is expected to grow by 10.3 percent, an average of just under one percent per year. The 2012 estimated employment of 668,268 is projected to grow to 736,999 by 2022 statewide. These projections follow a long standing condition where service providing industries dominate New Hampshire's employment accounting for 80% of all jobs, while 13% are in good producing industries and the remainder equally divided between government and self employment. Positive growth is expected for all the broad industry sectors both goods producing and service producing.

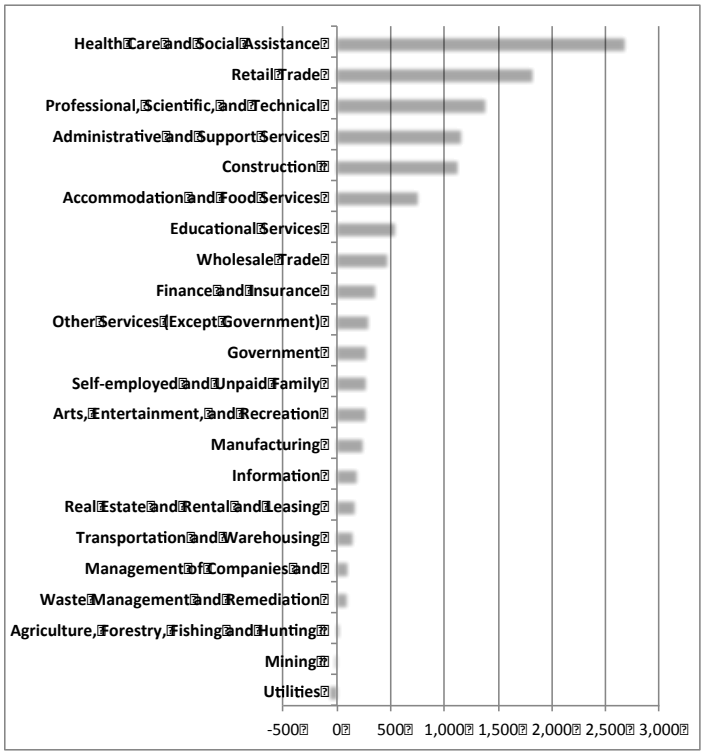
ELMI also produces employment project by regional planning commission. The most recent available cover, the period 2010-2020. While these are two years older than the current statewide numbers, the overall growth projection of about 10% employment growth over 10 years remains the same. Jobs in the RPC are expected to grow from 112,612 in 2010 to 124,819 in 2020, a net increase of 12,207 jobs or 10.8% - just slightly faster than the overall rate for the state of 10.4%.

Figure ED-16 shows the result by major industry sector in order of highest to lowest job growth. Trends from the recent past are forecast to continue with the most rapid growth, by far occurring in the health care sector, followed by strong growth in retail trade, professional and technical, administrative support and construction.

Whether longer term projections, to 2030 or 2040 continue to show positive employment growth will depend on whether the region is successful in attracting the necessary workforce to move to, or commute into, the region. As discussed earlier, based on existing age demographics and the continuation of average migration rates that occurred from 2000-2010, the OEP/RPC population projection suggest that the labor force within the region will peak at about 95,000 workers in 2020 decline by about 5000 workers by 2040. (Figure ED-17) There are factors that may mitigate this outcome which are discussed in the key issues section below, and are also the subject of one of the employment scenarios in the Land Use Chapter.

Figure ED-17

Projected Labor Force 2010-2020 – RPC Region

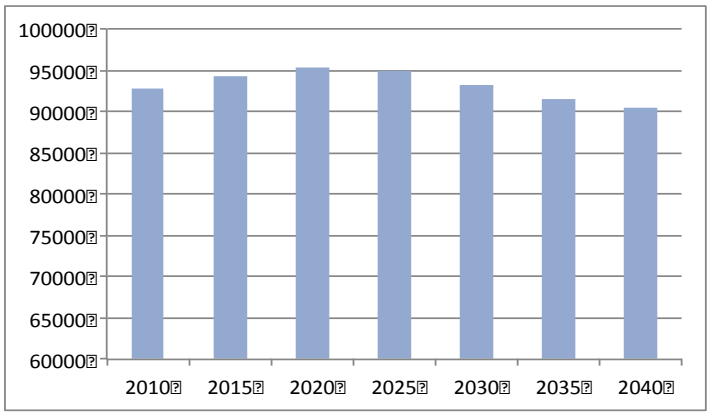


Property Valuation and Taxes

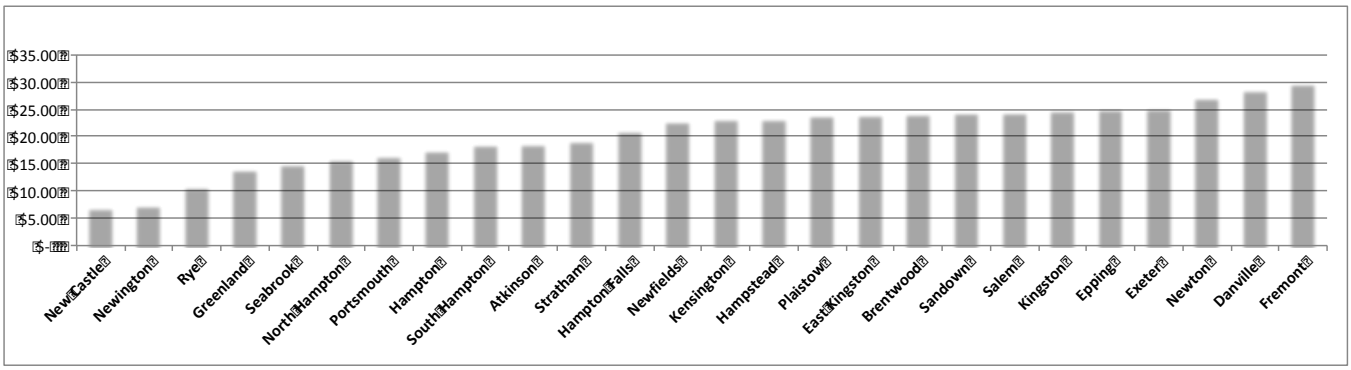
Many communities in the region are driven to focus on economic development as a means to expand their non-residential tax base and thus to mitigate the dependence on the residential tax base to fund the local schools and government. The existing tax rates in the region in 2012 averaged $21.00 per thousand but varied considerably, ranging from just under $30.00 to under $7.00 per thousand in equalized valuation. (Figure ED-18)

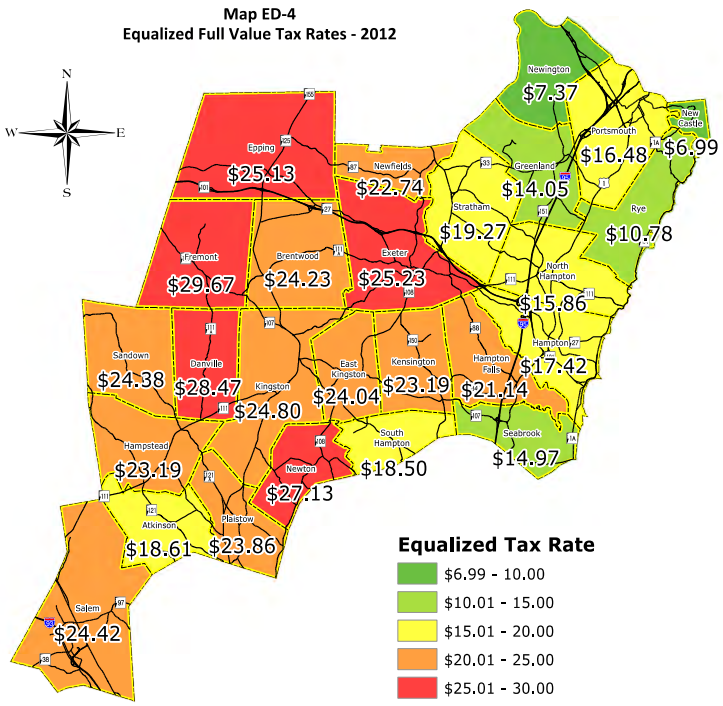
Figure ED-18

Equalized Tax Rate - 2012



While a high non-residential valuation is effective in some communities, the relationship between high non -residential valuation and low tax rate does not always hold true. There are a number of communities such as Salem, Exeter, Epping and Plaistow that have both a high non residential valuation but also are on the higher end of the tax rate scale. There are other factors that significantly interact with this relationship, such as whether the community supports sewer and water infrastructure, whether those cost are included in the tax rate, whether the non residential development requires a high degree of services (such as with retail development) or whether it is largely due to one or a few very high value properties, such as a power station or major manufacturer. Maps ED-4 and ED-5 illustrate the lack of correlation between equalized value and tax rates. A much stronger correlation is found, as expected, between high valuation per capita and low tax rate as seen in Figure ED-19 which graphs the ordinal regional rank of low-to-high tax rates with high-to-low ranks of per capita valuation.





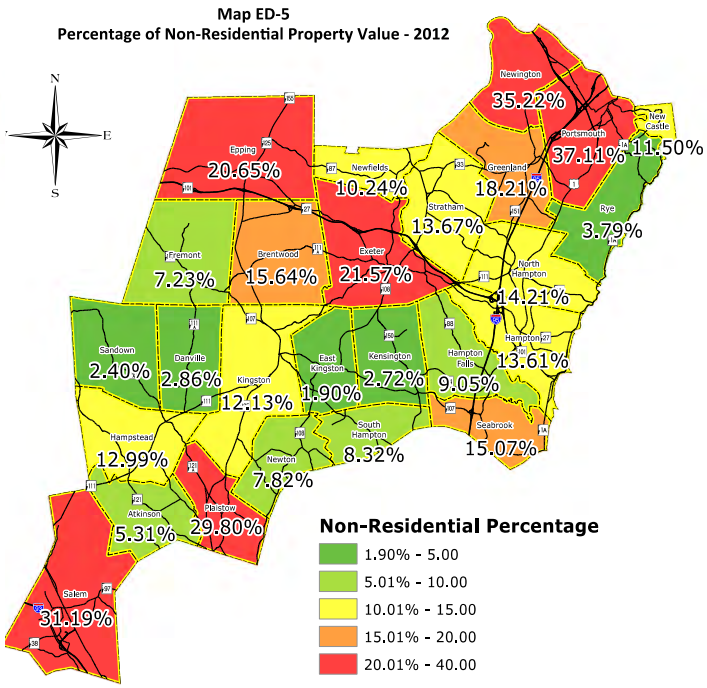
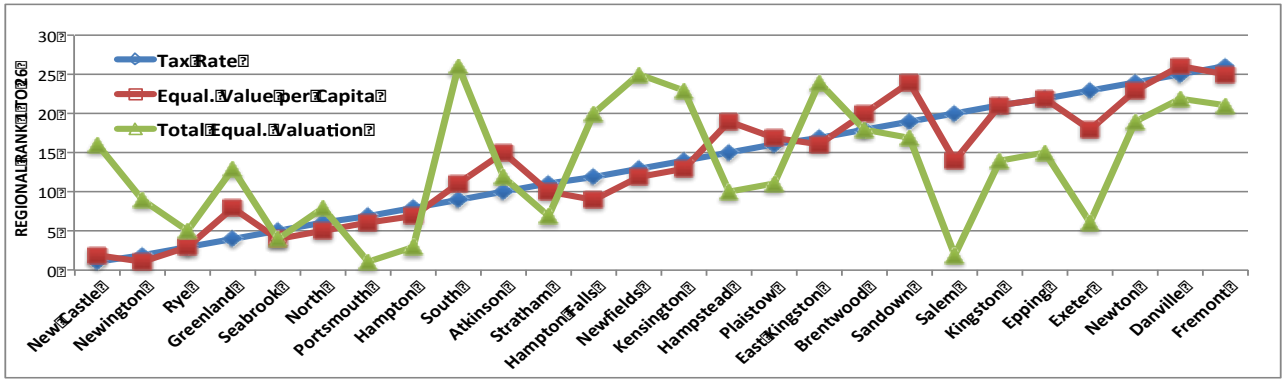


Figure ED-19



Broadband Access, Capacity & Planning

Residents, visitors, municipalities and businesses, educational institutions and cultural organizations, and the health care industry in the RPC region all consider broadband to be critical infrastructure. Reliable, high speed internet service is an essential tool for accomplishing tasks that make positive contributions to our regional economic health and social welfare. In a short period of time, access to broadband has changed the ways in

which we manage both home and work. Today, no region can expect to have a healthy, competitive economy without it.

In 2010, the New Hampshire Broadband Mapping and Planning Program (NHBMPP) was initiated with funding through the National Telecommunications and Information Administration (NTIA) as part of a national effort to expand broadband access and adoption. The goals of the NHBMPP were to develop base line information of current access, capacity and use of broadband in New Hampshire, to better understand its importance to economic development, and what steps can be taken to ensure that it is widely (universally) available and has sufficient capacity to meeting the needs of the future. The NHBMPP is a collaborative effort between the NH Office of Energy and Planning (OEP), NH Department of Resources and Economic Development (DRED), UNH Cooperative Extension (UNHCE), UNH Information Technology (UNHIT), and the state's nine regional planning commissions (RPCs) and is managed by he GRANIT System within the Earth Systems Research Center at the University of New Hampshire (UNH).

The NHBMPP is comprised of several components, including a broadband service inventory and mapping and the development of broadband plans in each regional planning commission area. The following paragraphs summarize the current conditions information presented in the RPC Regional Broadband Plan. The issues and recommendations identified in the Plan are presented in their respective sections of this chapter.

Statewide Broadband Access

According to the NH Division of Economic Development and the National Telecommunications Information Administration (NTIA) national assessment, adoption of broadband has increased significantly in the past several years. In 2010, New Hampshire had a 73% broadband penetration rate (2nd in the Nation). In March 2013, broadband penetration rate had risen to 88% and was subsequently estimated to be 96% in September 2013. It should be noted, However these figures almost certainly overestimate the actual level of access to broadband services at individual addresses. Based on the mapping protocol, the smallest unit at which access was determined was the census block level, such that if any household with a block has broadband access, availability is assumed for all units in the block.

The National Telecommunications Information Administration (NTIA) also provided ARRA funds in New Hampshire to implement the Broadband Technology Opportunities Program (BTOP), which created a network of publically controlled "middle mile" fiber that provides long term broadband capacity between the major trunk fiber line and local distribution. The fiber will remain non-proprietary and accessible to a variety of public and private users. This was completed on December 31, 2013. (Map ED-5)

Regional Broadband Access

In the RPC region, most sectors of the economy perceive broadband service to be adequate. However, lack of competition is seen as preventing consumer choice and creating high costs for service. Lack of information on the location and type of broadband service available is an obstacle to planning for service improvements.

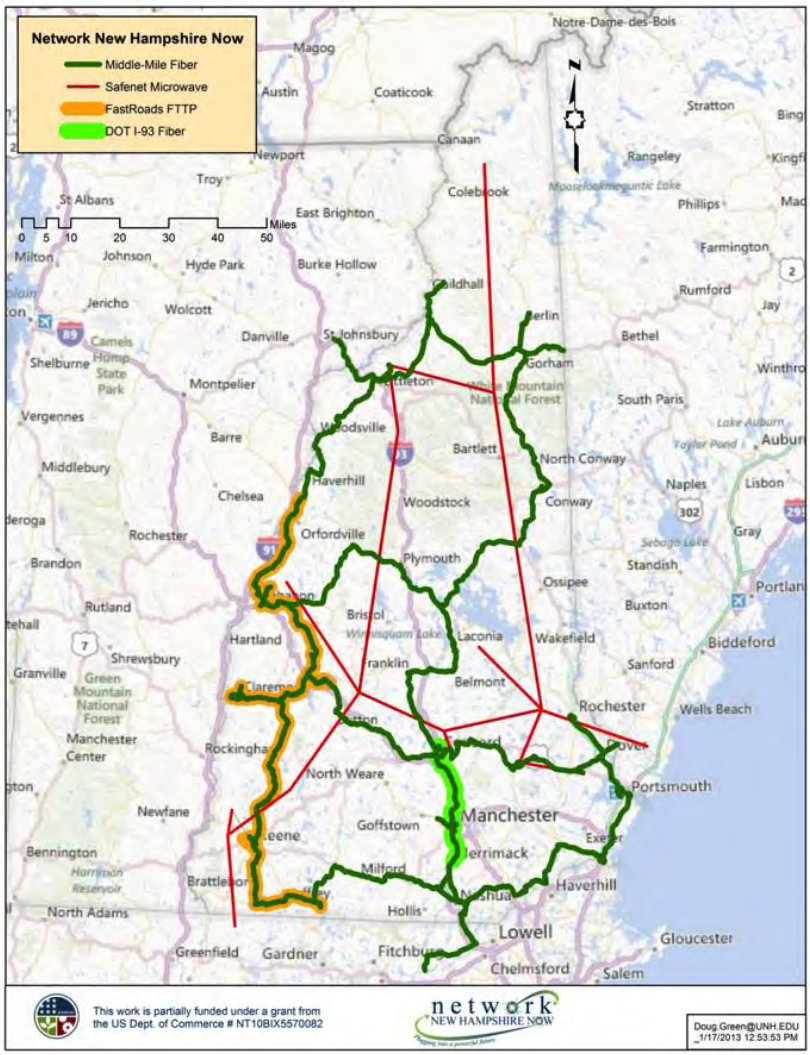
As part of the BMPP the RPC inventoried and mapped broadband access Community Anchor Institutions (CAIs) and utilized map information prepared by UNH to depict general areas of broadband access, speed and provider competition. The maps and information included in this section represent data received on broadband availability through UNH's direct work with over 40 of the state's 63 identified broadband service providers and through an inventory 4,067 community anchor institutions (CAIs) across the state.

It should be noted that NTIA defines broadband as providing a minimum speed of 768 Kbps download and 200 Kbps upload. The NHBMPP has chosen to consider areas with available broadband download speeds less than 768 Kbps as 'un-served' and areas with download speeds of less than 3 Mbps as 'underserved.' A selection of the resulting maps are shown on the following page and described as follows:

In 2010. This initiative is part of a national effort, led by the National Telecommunications Information Administration (NTIA), to create and maintain a searchable, public database of information on broadband availability in the United States. It is also the first comprehensive effort to understand where broadband is currently available in New Hampshire. Broadband is defined in terms of how fast data can be downloaded and uploaded from the Internet. That capacity can be described in terms of how much data, measured in bits (8 bits to 1 Byte), can be transmitted per second, and is reported in kilobits (Kbps), megabits (Mbps), and gigabits (Gbps). NTIA defines broadband as providing a minimum speed of 768 Kbps download and 200 Kbps upload. The NHBMPP has chosen to consider areas with available broadband download speeds less than 768 Kbps as 'un-served' and areas with download speeds of less than 3 Mbps as 'underserved.'

Map ED-6

BTOP "Middle Mile" Fiber Optic Network



MAP ED-7 Broadband Availability at Community Anchor Institutions: This map illustrates the location and broadband access status of 496 CAIs in the Rockingham Planning Commission Region. Information regarding the internet speeds, cost of service, types of technology, service provider, and level of satisfaction with current service was collected from each of these CAIs through a comprehensive survey completed by RPCs in 2010. Since that time, this information has been verified and updated semiannually by UNH and RPC staff. See the Regional Broadband Plan for the full list of CAI and inventory results.

MAP ED-8 Broadband Availability: This map displays the status of available service for each census block within the RPCs planning region. The yellow and purple areas, these highlight census blocks with residences that have limited or no access to broadband. As noted earlier, the map almost certainly over-estimates the actual level of access to broadband services at individual addresses. Based on the mapping protocol, the smallest unit at which access was determined was the census block level, such that if any household with a block has broadband access, availability is assumed for all units in the block and the block will show that broadband is available even though that may not be true for all addresses within the block. The Census block is the smallest geography measured by the U.S. Census Bureau. These blocks are determined by population and can be greater than 2 square miles in size, especially in less densely populated areas.

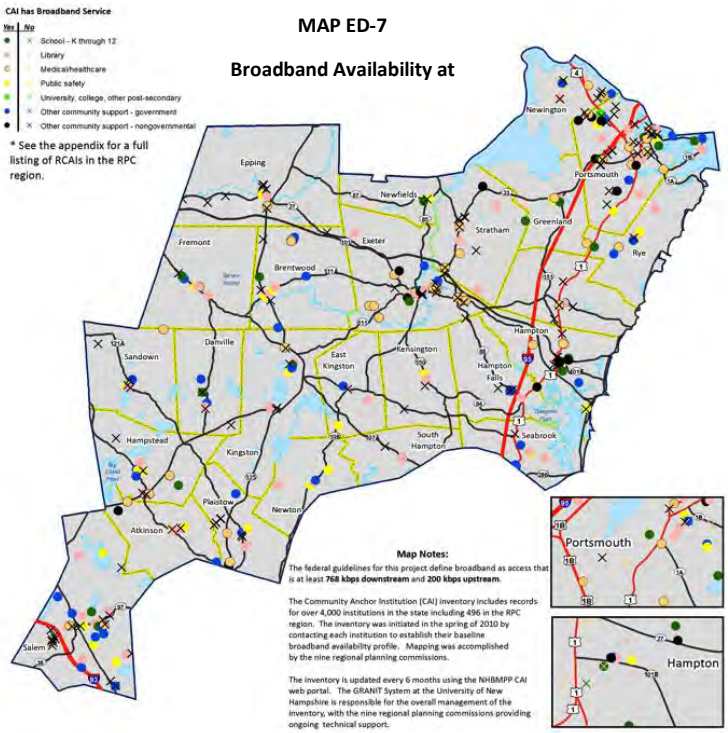
MAP ED-9 Maximum Advertised Download Speed: This displays the maximum download speeds available to customers from any provider in each census block. The level of generalization described in Map 2 applies

here as well. The information made available to the NHBMPP does not differentiate between speeds provided for business/commercial service and residential broadband service.

MAP ED-10 Competition for Broadband Availability: This depicts the number of broadband providers actively offering service within the Rockingham Planning Region. Providers represented on this map include fixed wireline (cable, fiber and DSL), wireless, and mobile internet service providers.

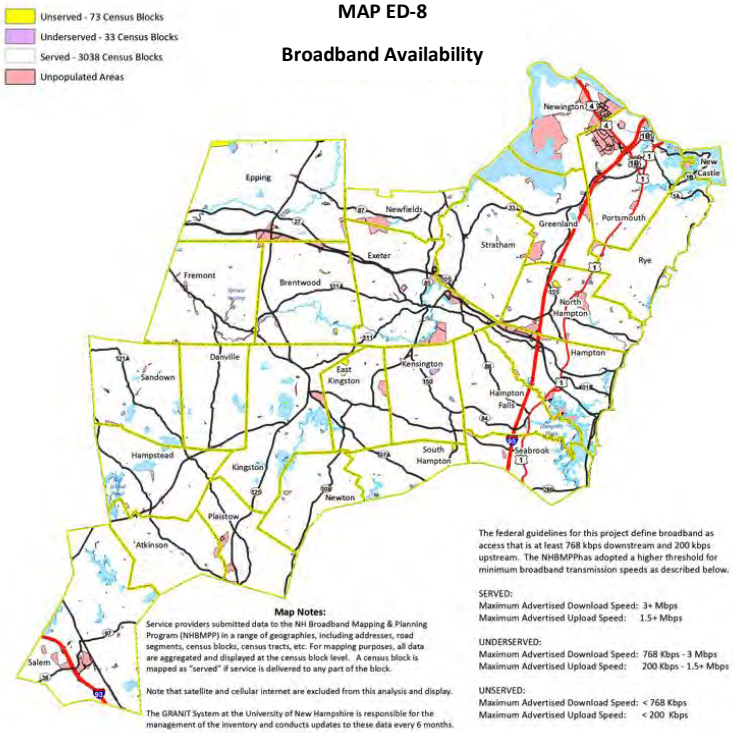
MAP ED-7

Broadband Availability at



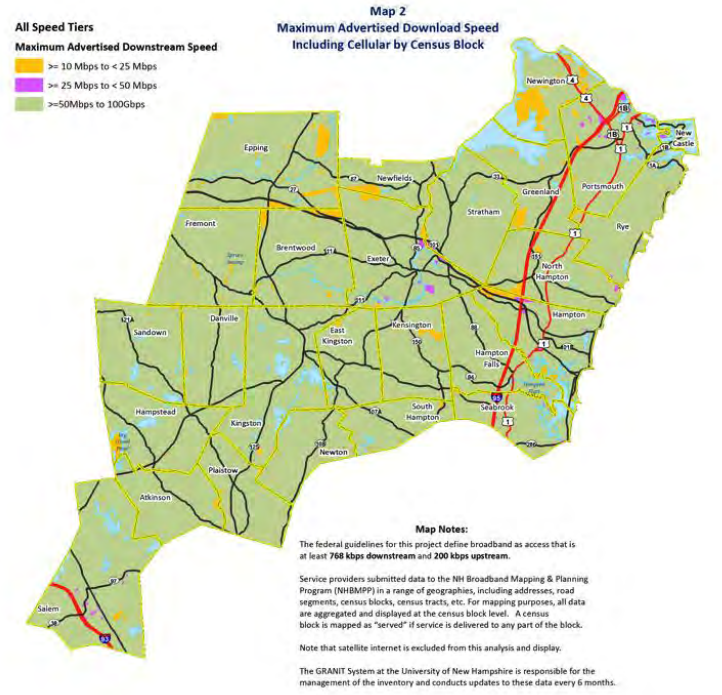
MAP ED-8

Broadband Availability



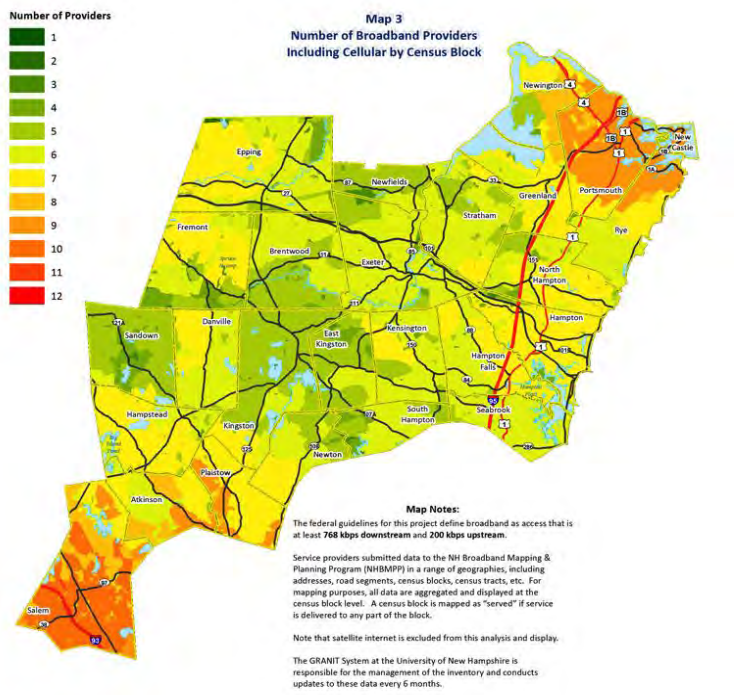
MAP ED-9

Maximum Advertised



MAP ED-10

Service Provider Competition



Statewide Access Survey

In 2012 the UNH Survey Center conducted survey of broadband technology uses and needs of small businesses in New Hampshire. Some of the key results include the following:

- 70% of respondents use the internet for advertising
- 64% said their internet speed is sufficient
- 50% accessed the internet via cable

The Survey Center also surveyed local governments and educational institutions in New Hampshire. Key survey findings for these groups include the following:

- 55% of local government respondents said they would like to learn more about e-governance, or conducting municipal business via the internet
- 51% of local government respondents would like training on making websites interactive
- 74% of educational institutions respondents stated that their biggest internet challenge was keeping up with technology
- 59% of educational institutions responding would like to learn how to effectively use technology for teaching

A survey of residential broadband access and use in New Hampshire was conducted by the UNH Survey Center in 2012. The findings indicated the following:

- 86% of respondents had access to the internet at home
- of those 86%, seventy three percent had broadband
- Respondents indicated that the biggest barrier to broadband use was keeping up with the technology
- 31% percent of respondents who did not have internet access at home said they did not because it was too expensive
- 94% of residents stated that their internet connection is adequate for their uses

Regional Access Survey

During May-July 2013, the UNH Survey Center conducted surveys for several regions, including the nine regional planning commissions, as part of the Granite State Future project and the NH BMPP. Several regions, including the RPC, commissioned a region-specific survey. Key findings from the survey of RPC region residents included:

- 94% of residents surveyed have internet access at home
- 75% of residents have a cable internet connection
- 30% of residents pay $50-99 per month for internet service
- 83% of residents pay for a bundled internet service, which includes, phone, cable and internet services
- 94% of residents state that their internet access is adequate for their uses
- 87% of residents would not be willing to pay for more faster internet speeds

Responses from residents of the RPC region were largely similar to those of statewide residents. The big difference involved what type of neighborhood residents live in, with more RPC residents living in a neighborhood close to the town center and less living in a rural location away from town.

The proprietary nature of broadband access and capacity information means that it is difficult to directly determine whether access and capacity of broadband is adequate. Based of survey result, however, it appears that most residents and business are satisfied with current levels of access, but are concern about cost and lack of competition. In summary the basic picture that emerges is that (1) the region has comparatively good access to broadband in most communities; (2) there are pockets in the most rural area of the region where broadband access is poor or non-existent except via satellite; (3) choice between providers is typically limited two companies and often just one thus limiting competition in the Broadband marketplace. Broadband speeds available in fiber and cable networks have continued to increase and appear to be keeping pace with increased demand and (4) the private and proprietary nature of broadband infrastructure information means that it is not possible to discern the condition and capacity of the system. At this point we must rely on the private providers to ensure the system remains adequate to meet the region's needs the future.

Key Issues and Challenges

Regional Strengths and Weaknesses in Economic Development (SWOT)

As described earlier, part of the process for gathering public input for this Plan involved three general visioning workshops, called "community conversations", were held around the region in 2013 soliciting input about key concerns and issues on a variety of topics, including economic development. The discussion format followed the "SWOT" format: a brainstorming session that moved sequentially from discussion of the region's strengths, weaknesses, opportunities and threats.

The key theme's that arose from this discussion, which specifically relate to Economic Development are summarized in Figure ED-20. In general they are highly consistent with the goals and issues identified both in this document, in the CEDS, several recent NH Center for Policy Studies analyses and the BIA State Economic Development Strategy. The perceptions of key strengths and opportunities focused on a high quality of life, both the natural environment and cultural resources, quality schools, good transportation infrastructure, a highly educated and motivated workforce, and access to developable land. Weaknesses and threats centered on lack of infrastructure in parts of the region (sewer, water, natural gas, broadband internet access, transit) and in the maintenance and upgrading of existing infrastructure, the scarcity of workforce-affordable housing, high relative cost of energy, and the lack of intermunicipal cooperation in approaching regional scale problems and needs. The themes are further addressed in the issues and challenges described below.

Figure ED-20

"SWOT" Analysis Summary from Community Conversations

- Economic Development -

Strengths / Assets	*Weaknesses / Needs*
• Transportation infrastructure, esp. highway system and access to Amtrak passenger rail • Quality of life, both regarding the natural environmental and cultural and heritage assets • High quality schools • Well educated, motivated workforce • Good broadband access in most locations • Geography: access to metro Boston, ocean, mountains	• Poor access to sewer and/or water and/or natural gas in many parts of the region • High local property taxes in many communities • High energy costs • Inadequate supply of workforce–affordable housing • Lack of intermunicipal cooperation to solve problems or share services • Lack of competition in broadband access; monopoly
Opportunities / Resources	*Threats / Barriers*
• Developing as specialized manufacturing center • Growing, vibrant local agriculture, crafts movement, heritage tourism • Available undeveloped and redevelopable (e.g. Brownfields) land, incl. Pease • Deep water port • Recreational trails and open space networks • Attractive to mobile workforce incl. creative economy and entrepreneurs	• Backlog of infrastructure investment needs (sewer, water, stormwater, roads/bridges) • Cost of servicing aging population (e.g aging-in place support, transit) • Declining workforce, caused by demographics, high cost of living, limited workforce housing supply • Cost of managing climate change • Public intolerance for project impacts, i.e. "NIMBY-ism"

Demographic Headwinds

As presented in the Existing Conditions section of this chapter, our aging population presents several challenges to the regional economy. We have a small age cohort of people aged 15-34 and a very large cohort of those aged 45-64 and a labor force participation rate statewide that has fallen gradually for the past two decades. Over the next 20 years this will mean, unless mitigated by other factors, a smaller workforce available to businesses and low-to-no net population growth in the region. Second, the size of the aging population will add to healthcare and home care costs incurred by individuals, businesses and communities. The region lacks a well developed home health and community transportation systems that will enable a larger population of seniors to age place. Both factors will act as a drag on the regional economy.

There are mitigating factors and developments that may lessen these impacts. For example, higher levels of daily in-migration through increased commuting could occur which would supplement the available workforce. The labor force participation rate among older residents could (and likely will) increase for both part time and full time jobs to supplement retirement income. The region may 'buck the trend' of flat population growth by attracting more in-migration than in the recent past. All of these possible outcomes would effectively expand the available labor force and result in more economic activity. The implications of some of these outcomes are explored in the Scenario Planning section of the Land Use chapter of this Plan.

This challenge is not unique to this region and in fact is common to the state as a whole and most of New England. These and other factors causing collective economic "headwinds" are well described in The NH Center for Public Policy Research study "From Tailwinds to Headwinds[4]" published in 2012. The basic points made in that report are that the circumstances causing our past economic success in southern New Hampshire have changed, that future economic growth is no longer a 'given' and that a more deliberate effort to counter the trends will be necessary if we are to continue to have sustainable economic growth in the future.

from ***"Tailwind to Headwind: New Hampshire's Shifting Economic Trends" –*** *Sept. 2012*

"Here, as elsewhere in the country, the Great Recession has disrupted much of the state economy. But it is a mistake to assume that the recession is the sole reason for the recent slowdown in New Hampshire's economic engine, or that, once the impacts of the recession are behind us, New Hampshire will return to the pattern of steady, reliable growth of years past.

A more expansive analysis of the state's economic and demographic trends – with a time frame of decades, not months or years – shows that the forces that helped create New Hampshire's advantage have largely run their course. As a result, the model that defined the state's economy since the 1980s – consistent population growth, increased productivity, and a more resilient economy than our competitors – no longer holds. After benefiting from nearly three decades of economic tailwinds, New Hampshire now faces a strong headwind: net out-migration, an aging population and decreased labor productivity.

The outcomes of these changes may not necessarily all be negative. Slower population growth will likely mean less congestion and less pressure on natural resources. And some of the core advantages upon which New Hampshire's economy is founded – proximity to Boston and a beautiful natural environment, for example – are not disappearing any time soon. But, at the least, the shift outlined in this paper demands a recalibration of the assumptions upon which much state and local policy is based. In short, we can no longer assume that New Hampshire will continue along the economic trajectory it has for many years.

There is no single, simple response to this new set of circumstances; policymakers will have to weigh various options. These include investing in human capital (an area where we rank relatively high when you consider educational attainment), redesigning the state's tax structure (where New Hampshire enjoys one of the lowest per-capita tax collection rates in the country but maintains high corporate taxes), or investing in improved infrastructure and transportation (an area in which the state ranks relatively poorly).

Infrastructure Investment

Economic development depends on the availability and adequacy of infrastructure to support that development. Development in many communities in the region is and will continue to be limited because they lack the type of

[4] "From Tailwind to Headwind: New Hampshire's Shifting Economic Trends", NH Center for Public Policy Research, September 2012

infrastructure, including sewer, water, natural gas, broadband and rail access that is a prerequisite for certain business and industry. Communities that do have infrastructure face high cost of maintaining and upgrading that infrastructure. Deferred investment, especially in sewer, water and transportation infrastructure is shifting these capital costs to the future and adding a cost burden on the economy going forward, either through loss of services from failed infrastructure or from higher fees and taxes required to restore it.

Higher wastewater discharge standards are required in new EPA NPDES permits because of the Great Bay and other water body impairments. It has been estimated that the cost of upgrading or replacing the eight wastewater treatment plants in the Great Bay and coastal watersheds may be as much as $500 million, all occurring over the next 10 years. Drinking water treatment facilities and distribution systems also face increase treatment and regulatory standards have investment backlogs as well. The SB60 infrastructure

Investment Study Commission found multiple drivers for increasing water infrastructure costs:

- Water systems: Enhanced Surface Water Treatment Rule, Disinfection Byproducts Rule, Lead & Copper Rules, etc.
- Wastewater: Dechlorination, Nitrogen & Phosphorus reduction, and other NPDES permit requirements
- Dams: Safety and climate change (extreme precipitation events)
- Storm Water: Clean Water Act MS4 requirements

The SB-60 Commission estimated the following costs for the backlog of water related infrastructure investment

Infrastructure Type	10 Year Need
Wastewater – 98 municipal wastewater systems	$1,710,000,000
Stormwater – In every community, MS4 permits in more urban areas	$272,000,000
Drinking Water – 700 community systems	$857,000,000
Dams – State Owned (278)	$18,000,000
Dams- Municipal (358)	$40,000,000
10 Year Total	$2,897,000,000

statewide over the next ten years:

No similar estimates are available for the RPC region itself, but five of the eight wastewater treatment plants requiring upgrades are within this region, and our communities with water systems, like Portsmouth and Exeter, have among the oldest infrastructure in the state. In part because of the water quality impairment of the Great Bay and requirement for treatment plant upgrades, communities in this region face a disproportionate share of these costs.

Transportation infrastructure is another area where delayed and deferred maintenance and upgrades have been the norm, creating similar deficits in capital investment. The Transportation Chapter of this Plan identifies long range project needs in the RPC region over the next 20 years to be $305.3M while the State 10 Year Plan (2014) budgets $31 million for these projects over a 10 year period. (Note: neither figure includes major projects currently underway including Newington-Dover, the Sarah Long Bridge, and the remaining segments of the I-93 expansion).

In the case of both water systems and roads, user fees pay for the cost of maintaining and upgrading most infrastructure. Federal and state highway trust fund dollars come from the federal and state gas taxes while

local road costs are borne by property taxes. Water and sewer systems are funded by a combination of rate payer fees and property taxes. Federal support for capital investments, both in grants and loans, especially for water and wastewater infrastructure has diminished over time. Rates and fees have not adjusted to account for the loss of capital grants funds, or for the need to build in replacement costs into the user rates. To date, as a generalization, all levels of government have been unwilling to increase fees and taxes to address these infrastructure investment gaps and there is no sign that this will change in the near future.

Broadband Access and Capacity

The ongoing ability of the region to attract the most sought after industries and manufacturers will increasing depend on near universal access to high speed internet connections, and I have the bandwidth and capacity to meet future demand of businesses, institutions and residents. Broadband access has become an important differentiator in determining the competitiveness of a region for economic development and is likely to become much more so in the future as the reliance on fast, high capacity broadband access increases for many businesses. The importance of access to good broadband services for home based businesses and workers, especially entrepreneurs and the creative class adds to its importance as basic infrastructure necessary for a competitive economy.

The RPC region enjoys a very high level of residential access as measured by the percent of population identified in the mapping component of this project (See Map ED-4). However, gaps do remain, especially in the least densely populated areas of rural communities. Although these gaps do not always appear in the broadband mapping because of the Census block limitations, we are aware that there are numerous residential addresses in the lowest density Census blocks in the region that do not have broadband service. Achieving conventional wire-line broadband access to all of these unserved locations through private sector carriers will continue to be a challenge due to low or negative return on investment of broadband deployment in low density areas. Other perceived barriers exist in the form of providing superior bandwidth rates to commercial users, regulatory issues, and a perceived lack of competition among broadband providers.

Over the course of the RPC Broadband Plan development in 2013, the RPC Broadband Stakeholder Group (BSG) discussed and identified barriers, opportunities and recommendations to deployment and to expanding access to broadband service in the region. These are presented below.

Barriers

Political/Regulatory Barriers

- *Regulatory Concerns* - Internet providers do not fall under the purview of the Public Utilities Commission. Broadband providers do not want internet service to be considered a utility as they would face increased regulation under the PUC. While cable TV (video) access franchises are subject to negotiated agreements with individual municipalities, the broadband/internet component of the service is not and is therefore is not formally part of franchise service negotiations with municipalities between providers.
- *Deployment Difficulties* - Deployment of landline broadband is cost-prohibitive in low density areas. Securing pole attachment rights can be time consuming and costly and sometimes abetted by competitive conflicts may impede service expansion and choice. Legislative effort (such as HB 1391) aimed to eliminate barriers to deployment have been unsuccessful to date.
- *Cable Franchise Agreements* –Cable Franchise Agreements (CSAs) cover the use of public rights-of-way to deliver video services. Even when internet service is delivered by the same company over the same 'pipe,' communities to not have the legal authority in include internet services in the terms of the CFA. This is so because of the fractured regularity environment of telecommunications. Telephone service is regulated by the PUC; broadband/internet service is regulated by the FCC, and cable/video service by local government (via the Cable Franchise Agreement).

Economic Barriers

- *Adequacy of Service for Commercial Applications* - While the RPC region has better coverage than many parts of New Hampshire, the Regional Economic Development Center (REDC) still receives complaints

from businesses stating that greater bandwidth and improved technology infrastructure are needed, or are needed at ore competitive rates, in the region. Anecdotally, it is thought that some industrially-zoned properties go underutilized due to the distance of "last-mile" connections and the cost of obtaining high speed access. Further, the level of service required by technologically demanding business (including some of this region's targeted cluster industries) in the foreseeable future could potentially outstrip the planned build-out of broadband services in the region.

- *Economic Constraints* – The capital investment required to provide broadband service in areas with low population densities may not be feasible because the return on investment is too low. Additionally, some providers appear to be focusing on expansion of wireless broadband services rather than wired infrastructure, indicating it may offer better returns on investment. This may also be seen as a positive since wireless towers typically utilize a fiber-optic connection and can provide increasingly high speed service to users where last-mile connections are cost-prohibitive. Alternative economic models (e.g. municipal or neighborhood association financing) to provide last mile connections exist but are in some cases discouraged by existing providers.

Social Barriers

- *Complacency* – As noted in the 2013 UNH survey of RPC region residents, a large majority of respondents in our region say they are adequately served by existing broadband service. Throughout the planning process; however, input from our most rural communities indicates have observed there is some lack of concern about broadband access. The perception is that, by and large, broadband access and speed are adequate, and, while lack of provider competition is a concern, the consequence of that in terms of cost of service is not yet perceived as a major problem.

Technological Barriers

- *Infrastructure Information* - In order to understand future network expansion, the large commercial broadband users need to understand the existing broadband infrastructure, and its ability to meet future needs. The BSG has expressed a desire to have better information relating to the location of broadband backbone infrastructure as well as existing and potential bottlenecks. This information is available from public providers (such as NH Now) but is considered proprietary by the private providers and unavailable to us or users.

The RPC BSG also discussed opportunities to improve broadband access and adoption. The group identified the following opportunities in the region:

Opportunities

- *Public/Private Partnerships*: A guidance document to help communities and neighborhoods understand the potential to partner with service providers to extend lines into underserved areas of the community. A revolving loan grant program may support such an initiative.
- *Service Expansion Grants:* Explore grant opportunities to extend service/capabilities in underserved neighborhood/communities.
- *Regional collaboration:* Bundle a larger numbers of users to leverage increased investment and responsiveness from existing service providers to enhance their offerings.
- *Publish Accurate Service Maps:* Accurate service maps may show providers the potential savings by displaying accurate service regions (less wasted advertising to areas with no infrastructure), provide customers with information on the extent (or lack of) service.
- *Community Master Plans:* Develop a broadband-specific chapter into local and regional master plans to help with understanding of zoning for broadband infrastructure and awareness of broadband as critical infrastructure for economic development and quality of life.

- *Legal reform:* Identify regulatory issues, such as pole attachment, and work to resolve those within communities where possible.
- *Local Technical Assistance:* Develop a regional white paper for communities in the region to help local decisions makers better understand how to foster broadband through franchise agreement and other means.
- *Broadband Technological Opportunities Program (BTOP):* Ensure there is availability to expand or ensure there is adequate coverage of business quality broadband infrastructure, including regional access to fiber capacity implemented through the NH BTOP.
- *Cable Franchise Agreements:* Even though broadband services cannot be incorporated in CFA per se, the fact that broadband signals are delivered over the same system means that terms negotiated about cable service coverage and access in the community achieved through the CFA will also benefit broadband coverage and access.

Workforce Housing

A constrained housing supply and high relative housing cost is likely to make some businesses, especially ones relying on lower wage employees less able to attract the workers they need. It may, in turn, stifle their ability to expand and may cause them to be less competitive compared to regions where housing costs are lower. Ensuring the availability of workforce housing is one of the nine strategic goals of the BIA's Strategic Economic Plan for New Hampshire, and for many hears has been included as one of the REDC's major goals for the CEDS.

New Hampshire's Workforce Housing Laws require that municipalities provide reasonable and realistic opportunities for the development of workforce housing under their zoning and land use regulations. Workforce housing is defined in the statute as being affordable to households with moderate incomes. Specifically, workforce-affordable homes for purchase should not cost more than is affordable to a family of four with the area's median income (meaning an equal number of home in the region have higher and lower incomes). Workforce-affordable home for rent should cost no more that can be afforded by a 3 person household making 70% of the median household income for the region. The limited underlying concept or goal of the statute appears to be simply that a region should, more or less, allow for the housing needed by its workforce, and that individual communities should take on their share of that need.

As reported in the Existing Conditions section of the chapter, average housing purchase and rental costs in the RPC region are, by considerable margins, the most expensive in New Hampshire, yet average wage rates are no higher than the state's. The current median purchase price of $295,000 (2014, RPC region existing homes, NHHFA) is slightly less than the NHHFA' estimated maximum affordable price of $309,500 for the region.[5] We estimate that this price would be unaffordable to about 45% of the households in the region. Monthly rental cost of $1,237 (2 bedroom, with utilities, NHHFA), almost exactly equal to the current NHHFA maximum affordable rent guideline. Likewise, this rent would be unaffordable to about 50% of renter households (with 60% median income). More problematic is that the gap in affordability appears to be growing again. From 2000 to 2012 the average increase in housing rental and purchase price was 36-38%, and the average wage increase was 31%. Average rental costs in the RPC region have increased 5% in the past two years and average purchase prices have increased 9.5% while average wages have risen less than 2%.

Is housing affordability a serious concern of businesses if they can still attract the workers they need? The answer is almost certainly that it depends on the business. Businesses that are able pay high wages to complete for a highly skilled and creative workforce (the kind of businesses we say we seek) probably have less concern about his issue. Businesses at the lower end of the wage scale; however, are more sensitive to the availability

[5] Based on the average maximum affordable price calculated by NHHFA for the four HUD Fair Market Rent Area which included in the RPC region

of workers. Yet they are vital to a thriving regional economy, which requires a diverse workforce with diverse wage demands. For those businesses, the lack of affordable housing within a reasonable commuting distance will make it more difficult to recruit workers and most costly to retain them. From a regional perspective it is in the general interest to ensure that a diverse housing supply exists to match to needs of the region's economy.

Workforce Development

Targeted, industry-specific workforce training and skill set development is increasingly recognized both in New Hampshire and elsewhere as a critical economic development strategy. Equally important is recruiting and retaining a well educated talented, creative workforce. Such efforts are well aligned with an overall strategy to identify and support the needs of the key industry clusters that either exist or are developing in the region. Many of those industry clusters (Table ED-4) including Advanced Materials, Fabricated Materials Manufacturing, Machine Manufacturing and others require a highly skilled specialized workforce training.

This is an important area of growing collaboration between the public and private sectors. Regionally, the most important example is the development of advanced materials and manufacturing curriculum and private sector partnership at the Great Bay Community College (GBCC). GBCC was the lead applicant in 2011 on a $19.9 million grant from the US Depart of Labor to develop comprehensive training programs within the Community College System of New Hampshire specifically to support the State's emerging advanced manufacturing industries. Known as Advanced Manufacturing Partnerships in Education (AMPed) the program will provide training and skill development to over 8,000 students across the Community College System. In Rockingham and Strafford counties industry partners include Saffron (aerospace advanced manufacturing) and Albany International (advance textiles and material processing), Foss manufacturing and the Portsmouth Naval Shipyard.

AMPed is an outstanding model for a proactive public/private partnership in workforce development that supports a target industry cluster and an overall economic development strategy which can serve as a positive model for other such efforts that could extend beyond education to areas such as infrastructure improvements including freight access and broadband development.

Regional Cooperation

From an economic development standpoint, the region's and state's reliance on municipal government to deliver nearly all local services in both a strength and a potential weakness. The strengths come in having accessible, responsive, accountable and flexible government. The weakness lies in the inherent inefficiency and lack of capacity in organizing and administering those services, especially in smaller communities. Greater levels of regional cooperation in the delivery of certain municipal services such as sewer, water, waste disposal, emergency services, purchasing, IT management, etc. hold the promise of achieving economies of scale, while retaining the benefits of local governance.

Gaining those efficiencies is becoming more important as a means to address rising cost of local government and thereby maintaining tax competitiveness with other regions and states. The economic and competitiveness concern is that the cost of duplicating services in every small town across the region drives up local property taxes. High taxes not only affect the affordability of living here but also may deter new business from locating here. Several studies of this issue, including in Maine and Vermont have shown that very small towns are relatively efficient because they rely on volunteers to handle certain basic services and require very few paid staff. As they exceed a population of about 5000 this reliance often breaks down and the need arises to professionalize some previously volunteer functions of town government to manage the growing demand for services. Many of the smaller towns in the RPC region have followed that pattern over the last 30 years and property taxes in many have risen as a result. In addition, the technical and regulatory requirements of local government have increased as well.

Excerpt from *"Towns and Taxes: Growing Dilemma,"* New England Futures Project

…And then there's the sheer cost of today's sprawling development. New residents in quiet, outlying town typically start demanding a town manager, more police and professionalized services. They want new facilities, from safety buildings to expanded water and sewer systems to new roads to serve the spread-out development. So do the people in the next town of city over. So what's the result? Immense duplication, dramatically rising maintenance costs, inflated cost of government, and little accountability for the full regional costs.

While the potential gains in efficiency seem evident, real regional cooperation has been slow to develop and difficult to achieve. Many local officials voice support for regional service sharing and problem solving in concept but find there are real barriers to implementation, including institutional, financial and administrative. While state law (RSA 53-A) allows virtually unlimited forms of intermunicipal cooperation, communities lack a common and reusable structure through which to implement cooperative relationships. In addition, there have been few compelling examples or models of successful municipal cooperative approaches that have yielded obvious cost savings and/or improved services.

Nevertheless, a number of small steps have been taken around specific issues including joint purchases, water supply and wastewater treatment. These are likely to become more widespread as the potential cost savings to be gained become compelling. The best strategy for communities may be to begin with small steps around very specific contracted services that are easy to share.

There are several important and long-standing instances of regional cooperation that do exist both in this region and elsewhere in the state. Obvious examples are the SAUs, regional (county) emergency dispatching, solid waste districts, regional transit agencies (such as COAST and CART), regional economic development organizations (like REDC) and even the regional planning commission. Many of these started, or were enabled through specific state legislation, and some formed to gain access to specific funding sources.

The Rockingham Planning Commission, as enabled under RSA 36, was formed by its member communities in the 1970s as an early form of regional cooperation. Its three-part mission is to undertake regional planning (such as developing this Plan) to share professional planning services at low cost, and to facilitate regional cooperation among its members. The last part is used less frequently than the others but that is beginning to change. Past examples include circuit rider planning services (10 communities), highway corridor planning (Route 1, Route 125), sewer and water facilities sharing feasibility study (Exeter and Stratham), regional household hazardous waste collection. Future efforts by the RPC to facilitate municipal services sharing will depend on the desire of communities in the region to pursue such efforts and their directive to us to assist.

Climate Change and Coastal Impacts

The region's coastal municipalities are confronted by a particularly challenging set of land use and hazard management concerns that include extreme weather events, storm surges, flooding, coastal erosion, and loss of key coastal habitats. These issues are exacerbated by changes in climate that result in an increase in the frequency and intensity of storms and an increasing rate of sea level rise. Projections of sea level rise over the next century range from 1.6 to 6.6 feet, according to the latest National Climate Assessment (2013).

Sea level rise has the potential to displace coastal populations, threaten infrastructure and ultimately lead to the loss of homes, businesses, public infrastructure, recreation areas, public space, coastal wetlands and salt

marsh. These increased flood risks are compounded by continued growth and development and escalating property values in low lying vulnerable areas.

Preparing for higher sea level could be enormously costly and economically damaging as it becomes necessary to elevate building and infrastructure. Even assuming a conservative level of sea rise of two to three feet over the next 100 years, as most coastal states now do, such actions will become necessary. Yet the uncertainty of the risk and it distance in time makes it difficult to take action now. However, early action is the key to reducing the cost of preparing for these increased risks. Over the course of 100 or even 35 years, many of the buildings and facilities at risk will require renovation, reconstruction and replacement whether the seas rise or not. Implementing new design and construction standards now, which assume additional flood elevation to account for sea level rise, will help reduce and stretch out any additional costs of preparation. Guidance from state agencies such as OEP, NHDOT and the NHDES - Coastal Program, as well as assistance from the RPC will be important to help these communities begin to prepare.

Seacoast Advantage - Quality of Life

The demographic and economic "headwinds" that are faced both as a state and region are cause for concern about future economic growth. Unlike in the past when circumstances nearly guaranteed healthy economic growth, there is no such guarantee in the future. A combination of circumstances as discussed in this chapter including slowing population growth, shrinking workforce, aging population, high energy prices and a backlog of needed infrastructure investment, mean that future economic success will require, to quote the BIA's Economic Strategy, "a well thought-out strategic economic plan coupled with thoughtful, intentional decision-making about public investments."

There are reasons to believe that the RPC and seacoast region more broadly will fair better than the state as a whole despite these headwinds – provided we protect the assets that set us apart.

Some evidence for this is seen in the fact that job growth in the RPC region since 2005 has been significantly stronger than in the state overall and rebounded faster after the recession. (Table ED-4) There are several factors that contribute to this, as described in the "State of the Economy" analysis of the 2014 CEDS:

- stronger labor force growth and labor force participation,
- faster growth in the core working age cohort (25-64),
- relatively higher in-migration than the rest of the state, and
- increasing entrepreneurial activity and an environment attractive to young, creative and entrepreneurial workers

Perhaps the most important asset the region has in creating this economic advantage is a less tangible one: an overall appeal and quality of life from amenities the region offers – including a rich mix of historic, cultural and natural assets, and a location that is accessible to and from attractions like Boston, the ocean and the White Mountains. This high quality of life attracts people, especially those that have discretion about where they live, including young, creative and entrepreneurial workers as well as higher income retirees.

These factors may be leveraged to maintain economic growth in the midst of the other headwinds. But they must also be protected to attract economic development and in-migration. Planning matters in this context. To the extent that these assets or the character of the region are diminished from poorly planned and poorly designed development or from inadequate investment in our communities and schools, then we will lose this advantage.

Recommendations and Implementation

The recommendations made in this chapter are organized roughly according the goals presented earlier in the chapter. Where identified, specific actions to be taken are included below each recommendation. An important mechanism for implementing economic development policy in the region the Priority Project List of the REDC's CEDS, which is divided into short, intermediate and long range projects. The projects identified represent initiatives and infrastructure that have been evaluated through the CEDS process as important for the future economic development of the region. Also included is an implementation table which identifies both the primary party responsible for the implementation action, the timeframe within which the action should be taken.

Recommendation 1

Fund, m**aintain, upgrade and expand the region's infrast**ructure (transportation, sewer, water, energy, telecommunications and broadband) to address current and future needs of the region.

Actions

- Encourage future development expansion in locations already served by adequate infrastructure.
- Utilize cooperative and coordinated regional approaches in addressing infrastructure needs.
- Ensure that modern asset management principles, including life cycle cost accounting, is used in setting user fees to maintain & replace infrastructure.
- Work with state and federal policy makers to seek full funding of revolving loan programs for the region's water and wastewater facility upgrades.
- Undertake a feasibility study of connecting and consolidating multiple small water systems in the Southern Rockingham region.
- Update the Southern New Hampshire Water Supply study to evaluate adequacy of water supply sources through 2040.
- Promote changes at the Federal and State levels that ensure competition among internet service providers or that redefines broadband infrastructure as a public utility.
- Work with communities and appropriate state and federal agencies to facilitate development of broadband access to underserved pockets of the region.

Recommendation 2

Develop service models and governing capacity to enable municipalities to share and consolidate municipal services where efficiencies and outcomes would be improved

Actions

- Pursue regional cooperation in planning for infrastructure and financing.
- Identify services where interest and potential benefits for cooperation are highest.
- Develop capacity within the RPC to facilitate regional cooperation and services sharing.
- Facilitate cooperative regional approaches in addressing water quality infrastructure needs, including development of shared planning and implementation components of MS4 permit requirements.

Recommendation 3

Develop the skills and education in the workforce at all levels (high school, vocational/technical, **community college, university) to match the needs of the region's employers**

Actions

- Use the model of the advanced manufacturing partnership (AMPed) to establish active collaboration between educational institutions and companies with specific workforce needs
- Target the specific employee skill sets and training most needed by the industries and industry clusters developing in the region.
- Support the REDC efforts and those of educational institutions in regional workforce development, including funding to address retaining of displaced workers

Recommendation 4

Protect the region's high quality of life and cultural and natural amenities

Actions

- Enact policies and incentives that favor redevelopment of existing developed land (i.e. 'brownfields') over the development on previously undeveloped land ('greenfields') and around existing town centers, or other development nodes.
- Address water quality impairments in the region by working collaboratively on a watershed basis to address both point and non-point pollution sources.
- Protect, through easements and other means, the remaining forest and agricultural resources in the region to support the resurgent agricultural economy.
- Encourage and assist communities in the identification and preservation of their natural and historic resources.
- Leverage the region's amenities and overall high quality of environment to recruit new businesses, tourism and a skilled, educated labor force.

Recommendation 5

Eliminate unnecessary barriers to the development of workforce-affordable housing in all parts of the region.

Actions

- Work with communities to ensure that their land use polices create realistic opportunities for private development of workforce-affordable housing.
- Create collaboration among employers, housing and development entities, banks and private developers to ensure adequate access to financing for workforce housing development.
- Ensure that adequate workforce housing opportunities exist in proximity to the region's major employment centers.
- Include commuting distances and transportation costs in policies, programs related to housing affordability.

Recommendation 6

T**ake "no-regrets" actions beginning immediately to reduce future vulnerabilities and costs** associated with climate change.

Actions

- Develop detailed assessments regarding specific vulnerabilities related to climate change and guidance to communities to plan for increased flood risk and extreme weather
- Develop and implement updated, zoning, building and infrastructure design standards to improve general resiliency to natural hazards and account for increased flood risk, especially in areas vulnerable to sea level rise.
- Establish business continuity plans to better cope with service disruptions resulting from natural disasters.
- Periodically reassess climate change assumptions to determine if greater or lessor actions may be needed to reduce vulnerabilities.

Recommendation 7

Implement regional strategies for transportation, land use and the built environment that improve energy efficiency, increase cost effective renewable energy production and utilization.

Actions

- Provide guidance and technical assistance to municipalities to retrofit energy conservation measures in municipal buildings, infrastructure and other facilities to reduce costs and energy consumption.
- Promote effective utilization of available RGGI and Renewable Energy funds to municipalities and business to subsidize investments in energy conservation measures.
- Expand natural gas distribution systems and access to services in the more densely developed areas of the region.

Recommendation 8

Coordinate state, regional and local infrastructure and development project priorities to maximize funding & investment opportunities.

Actions

- Utilize existing CEDS, MPO TIP and other similar processes to identify and prioritize the region's top development project priorities.
- Facilitate joint economic development efforts between communities.

Recommendation 9

Work with communities, service providers the University of New Hampshire and the state and Federal government to ensure adequate broadband access and capacity to meet the future needs of all users in the region.

Actions

- Develop a service map for the region which includes information from private providers.
- Encourage competition among broadband providers.
- Support legislation that will allow municipalities to develop public broadband access services where private provider service is inadequate or too costly.
- Include broadband service continuity in hazard mitigation and recovery/response planning and ensure the broadband network is sufficiently resilient and redundant to serve in times of crisis.
- Improve broadband access in underserved areas by improving cable service area buildout through cable service agreement negotiations.
- Promote the installation of broadband conduit when construction occurs in roadway rights of way.
- Simplify the process to allow pole attachments.
- Support programs that provide internet access to underserved populations
- Identify and use financing mechanisms to improve broadband access.
- Develop local master plan chapters that address broadband service and needs.

CEDS Priority List

A key component of the REDC Comprehensive Economic Development Strategy (CEDS) is a list of priority projects for the region. This project list is the means through which the CEDS is implemented. It is updated annually and includes projects and programs that support CEDS goals and objectives for economic development in the region. It includes primarily infrastructure projects, but also contains planning studies and programmatic elements. While development of the CEDS is funded by the U.S. Department of Commerce, Economic

Development Administration (EDA), the priority project list in intended to cover major projects with any funding source, whether local, state or federal. The CEDS priority projects are included here in the RPC regional plan to ensure consistency. Table ED-6 below and accompanying Map (ED-8) include the current CEDS priority projects that are within the RPC region.

Table ED-5 - 2014 CEDS Priority Projects for the RPC Region

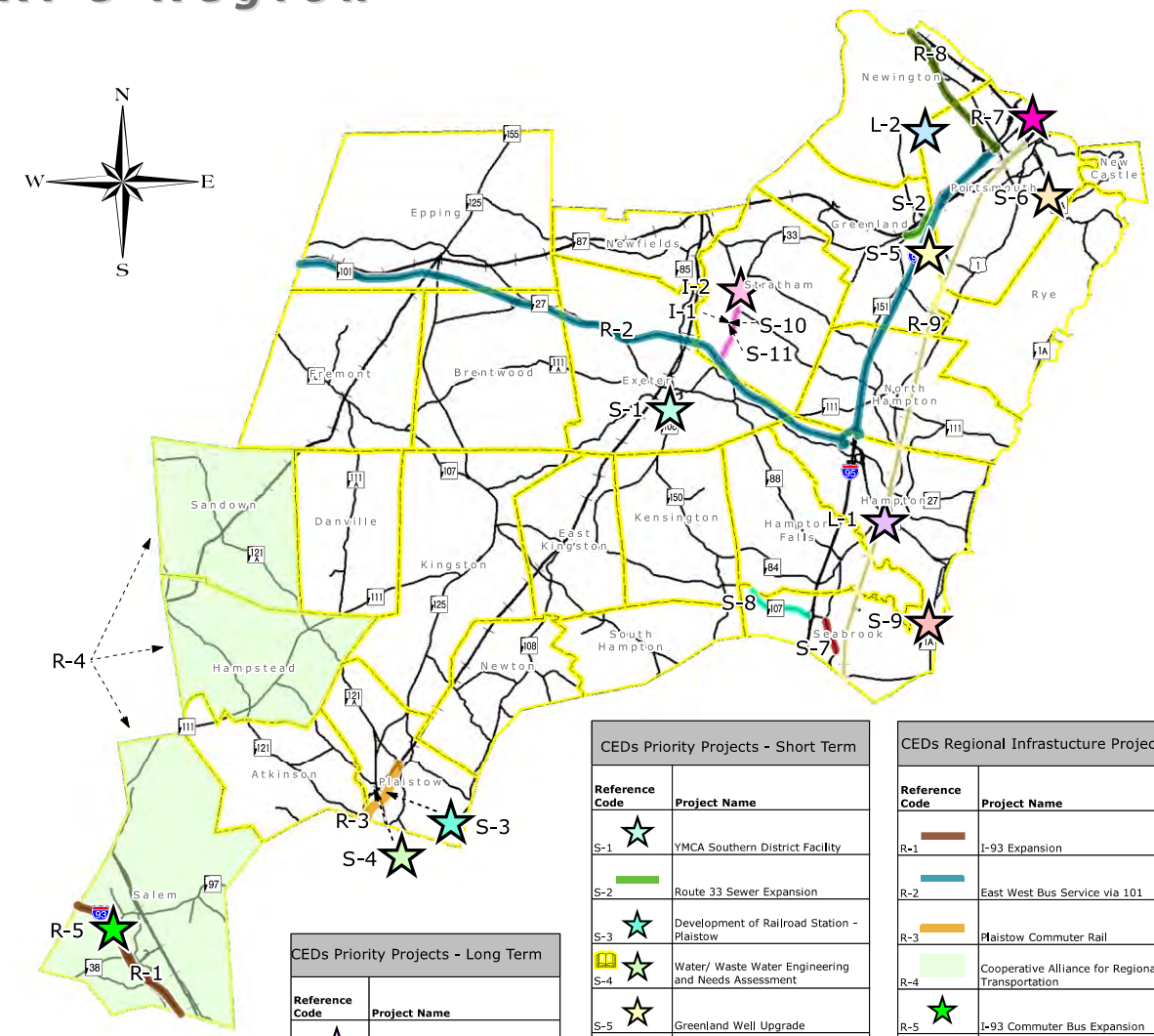
1 = Economic Development	4 = Workforce Development
2 = Infrastructure Development	5 = Workforce Housing
3 = Regional Cooperation	6 = Environmental Preservation

Map ID	Project Name & Proponent	Project Description	Estimated Cost	Possible Funding Source	Start Date	Goals
Short Term (0 - 24 Months to Completion)						
S=1	YMCA Exeter Project Exeter/Southern District YMCA	Demolition of abandoned asbestos contaminated buidling, cleanup of site, construction of 30K UMCA in 2 phases.	Phase I: $4 million; Phase 2: $2 million	Private, YMCA fundraising, Tax credit	Ongoing	1, 6
S-2	Route 33 Sewer Expansion - Greenland	Extend Portsmouth municipal sewer from its existing location, through the commercial/industrial zone of Greenalnd along Route 33 and sections of Portsmouth Ave and Ocean Road.	$14 million	Local, Private, EDA	2014	2, 3, 6
S-3	Commuter Rail Extension - Plaistow	Feasibility Study for extending Boston commuter rail service to Plaistow, including consdtruting station and layover facility.	$8.4 million	EDA, CMAQ, Local, MBTA, Brownfields	Ongoing	1, 2, 3, 4
S-4	Water/Waste Water Engineering & Needs Assessment - Plaistow	Update a comprehensive engineering and needs assessment report from the 1970's addressing water supply and wastewater treatment.	$150,000	EPA, USDA, State, Local	2014	2, 6
S-5	Greenland Well Upgrade - Portsmouth	Upgrades at Greenland Well to improve reliability & efficiency of region's water source.	$1 million	Municipal Bonding	2014	2, 3, 6
S-6	Route 1A/Sagamore Bridge Replacement - Portsmouth	Replacement of outdated bridge that carries loads well in excess beyond designed limits.	$5 million	State Funding secured	2013	2, 3, 4
S-7	Route 1 Expansion South of Route 107 - Seabrook	Widening main road through Seabrook business district for improved traffic flow.	$1.5 million	Private,businesses, State DOT, local	2013	1, 2, 3

S-8	Route 107 West to (of I-95) Development Master Plan - Seabrook	Plan to evaluate & analyze the feasibility for the highest & best future development of Route 107 in Seabrook west of the interchange with I-95.	$50-60,000 for study only	Public funding, Private developers	2013	1, 2
S-9	Replacement of Harbor Seawall - Seabrook	Repair and restore aproximately 550 linear feet of failing seawall abutting the Seabrook/Hampton Harbor.	$1.2 million	Local, Private, EDA2014	1, 2, 3, 6	
S-10	Stratham Gateway Project - Stratham	Upgrade water lines in business corridor for job growth.	$1 million	EDA, Local, Private	2013	2, 6
S-11A	Well Development/ Testing/Permitting (Water System Phase I) - Stratham	Complete analysis of 2 potential well sites, construct production well, test water quality/quantity, seek NH DES permits to use as water supply for Route 108 commercial corridor/town Center.	$150,000	Local, state, Coastal	Ongiong	1, 2, 3, 6
S-11B	Water System Treatment/Storage/Distribution Design (Water System Phase II) - Stratham	After Phase I completed: design a water supply treatment, storage and distribution system for 108 corridor/Town Center. May be a multi-jurisdictional proejct with Exeter.	$400,000	TIF, State revolving funds, Bonds, Local	Ongoing	1, 2, 3, 6
S-11C	Waste Water Disposal/Testing/ Permitting (Waste Water System Phase I) - Stratham	Evaluation and testing of potential site for waste water discharge for Rt. 108 commercial Corridor/Town Center; obtain DES permits.	$175,000	Local, State, Coastal	Ongoing	1, 2, 3, 5, 6
Region-wide	REDC Revolving Loan Fund REDC/Region-wide	Establishment of an EDA RLF to supplement existing loan funds. The money will be used to make loans to new & existing businesses across the region.	$500K - $1 million	50% RLF EDA grant 50% TBD	2014	1
Intermediate Projects (2 - 4 Years to Completion)						
I-1A	Sewer Collection/ Treatment/Disposal Design (Waste Water System Phase II) - Stratham	After Phase I completed: design a sewer collection, treatment and disposal system for 108 corridor/Town Center. May be a mulit-jurisdictional project with Exeter.	$600,000	TIF, State Revolving Funds, Bonds, Local	2015-2017	1, 2, 3, 5, 6
I-1B	Water Supply System Construction (Water System Phase III) - Stratham	After Phase II construct water system for 108 corridor/Town Center. Maybe a multi-jurisdictional proejct with the Town of Exeter.	$7.5 million	TIF, State Revolving Funds, Bonds, Local	2015-2017	1, 2, 3, 6

I-1C	Waste Water System Construction (Waste Water System Phase III) - Stratham	After Phas II completed - construct waste water system for 108 corridor/Town Center. May be a multi-jurisdictional project with Exeter.	$6 million	TIF, State Revolving Funds, Bonds, Local	2015	1, 2, 3, 5, 6
I-2	Stratham Town Center Project - Stratham	Infrastructure Improvements and Master Plan study aimed at increasing development potential, future job growth and housing needs.	$90,000	Local - municipal	Ongoing	1, 2
Long Term Projects (5+ Years to Completion)						
L-1	Hampton Intermodal Transportation Center - Rockingham Planning Commission with Hampton	Development of an intermodal transportation center at the Route 1 - Highway 101 interchange - constructing new center with park and ride facility and multi-user transportation participants.	Center: $35.4 million; Road reconfiguration: $19 million; reconfiguration: $19 million	Federal Highway programs (CMAQ), state DOT, Brownfields	Study: Ongoing Construction: Unknown	1, 2, 3, 6
L-2	Regional Biosolids/Septage Treatment Facility - Portsmouth	Design and construction of a regional biosolid/septage treatment and energy recovery facility .	$6-7 million	Private, user fees, local, State/Fed grants, EPA, EDA	2015-2017	1, 2, 3, 6

CEDs Priority and Regional Infrastructure Projects RPC Region



CEDs Priority Projects - Long Term	
Reference Code	**Project Name**
L-1	Hampton Intermodal Transportation Center
L-2	Regional Biosolids/ Septage Treatment Facility

CEDs Priority Projects - Intermediate	
Reference Code	**Project Name**
I-1	Sewer Collection/ Treatment/ Disposal Design and Construction (Water System Phase 2 and 3)
I-2	Stratham Town Center Project

CEDs Priority Projects - Short Term	
Reference Code	**Project Name**
S-1	YMCA Southern District Facility
S-2	Route 33 Sewer Expansion
S-3	Development of Railroad Station - Plaistow
S-4	Water/ Waste Water Engineering and Needs Assessment
S-5	Greenland Well Upgrade
S-6	Route 1A/ Sagamore Bridge Replacement
S-7	Route 1 Expansion South of Route 107
S-8	Route 107 Development West of I-95 Master Plan
S-9	Replacement of Harbor Seawall
S-10	Stratham Gateway Project
S-11a	Well Development/ Testing/ Permitting (Water System Phase 1)
S-11b	Water System Treatment/ Storage/ Distribution Design (Water System Phase 2)
S-11c	Waste Water Disposal/ Testing/ Permitting (Water System Phase 3)

CEDs Regional Infrastucture Projects	
Reference Code	**Project Name**
R-1	I-93 Expansion
R-2	East West Bus Service via 101
R-3	Plaistow Commuter Rail
R-4	Cooperative Alliance for Regional Transportation
R-5	I-93 Commuter Bus Expansion
R-7	Sarah Long Bridge
R-8	Spaulding Turnpike Project
R-9	East Coast Greenway

* Denotes Study or Planning Project

RPC Towns
State Roads
Railroad

ROCKINGHAM PLANNING COMMISSION

New Hampshire DOT Department of Transportation

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MAPS

ED-1 CEDS region

ED-2 Ratio of Jobs to Households - 2013

ED-3 Average Unemployment Rates 2012-13

ED-4 Equalized Full Value Tax Rates - 2012

ED-5 Proportion of NoEDesidential Assessed Value - 2012

ED-6 **BTOP "Middle Mile" Fiber Optic Network**

ED-7 Broadband Availability at Community Anchor Institutions

ED-8 Broadband Availability in the RPC Region

ED-9 Maximum Advertised Download Speed

ED-10 Service Provider Competition

ED-11 CEDS Priority Projects in RPC Region

NATURAL RESOURCES CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Natural Resources

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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.

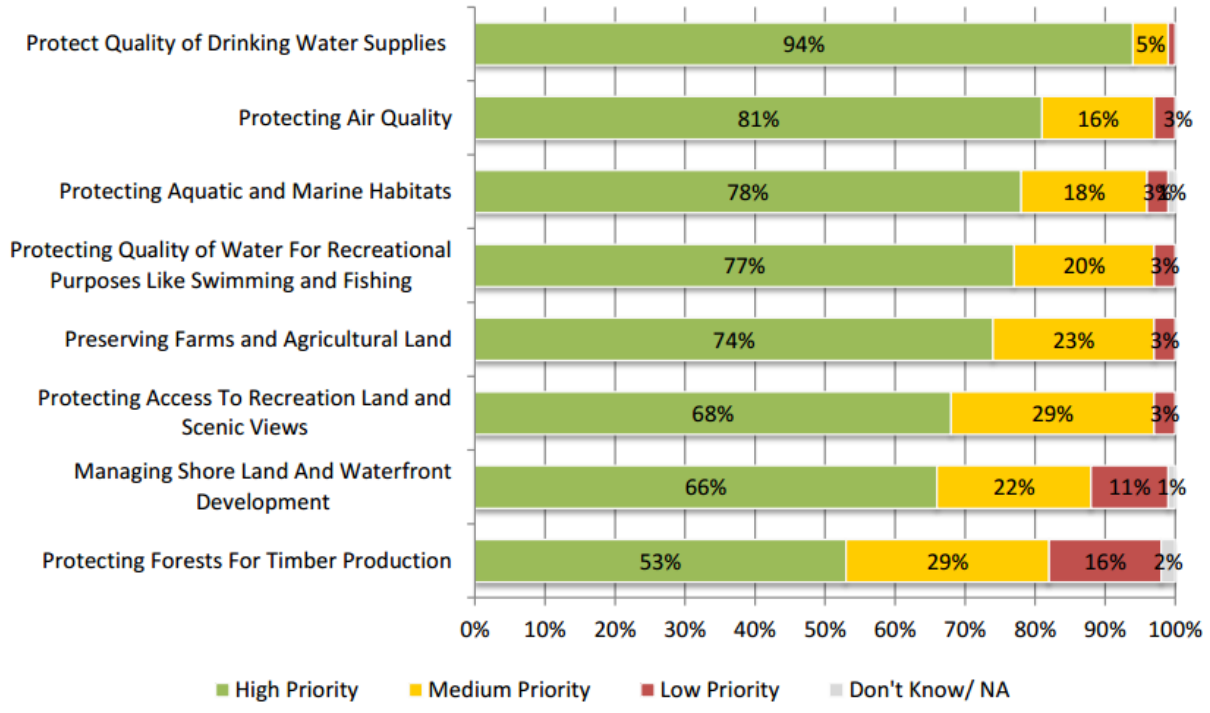

Figure NR1 - Statewide and Regional survey results about priority for protection for different environmental issues. Source: UNH Survey Center

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.

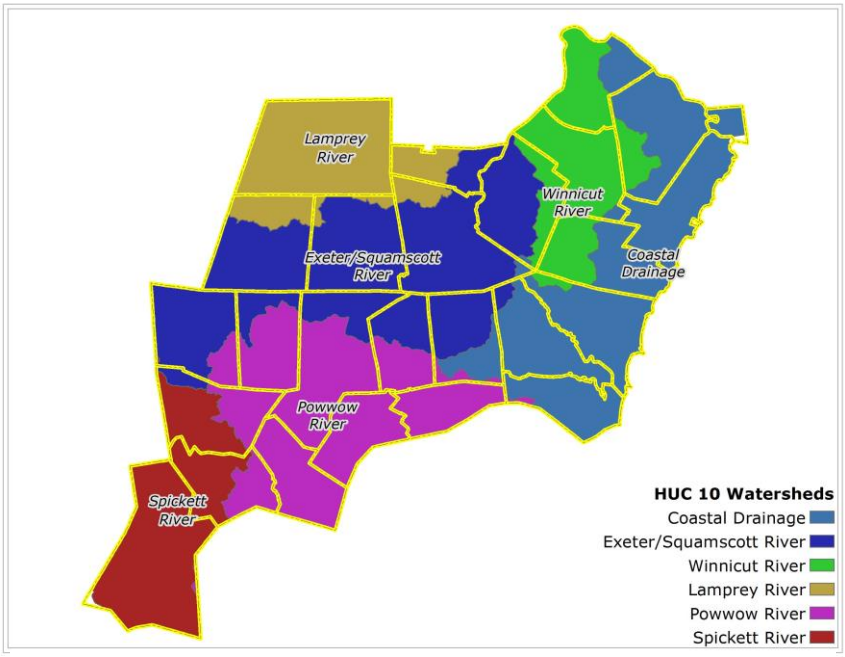

Figure NR2 -Watersheds in the RPC region. Source: NHGRANIT

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.

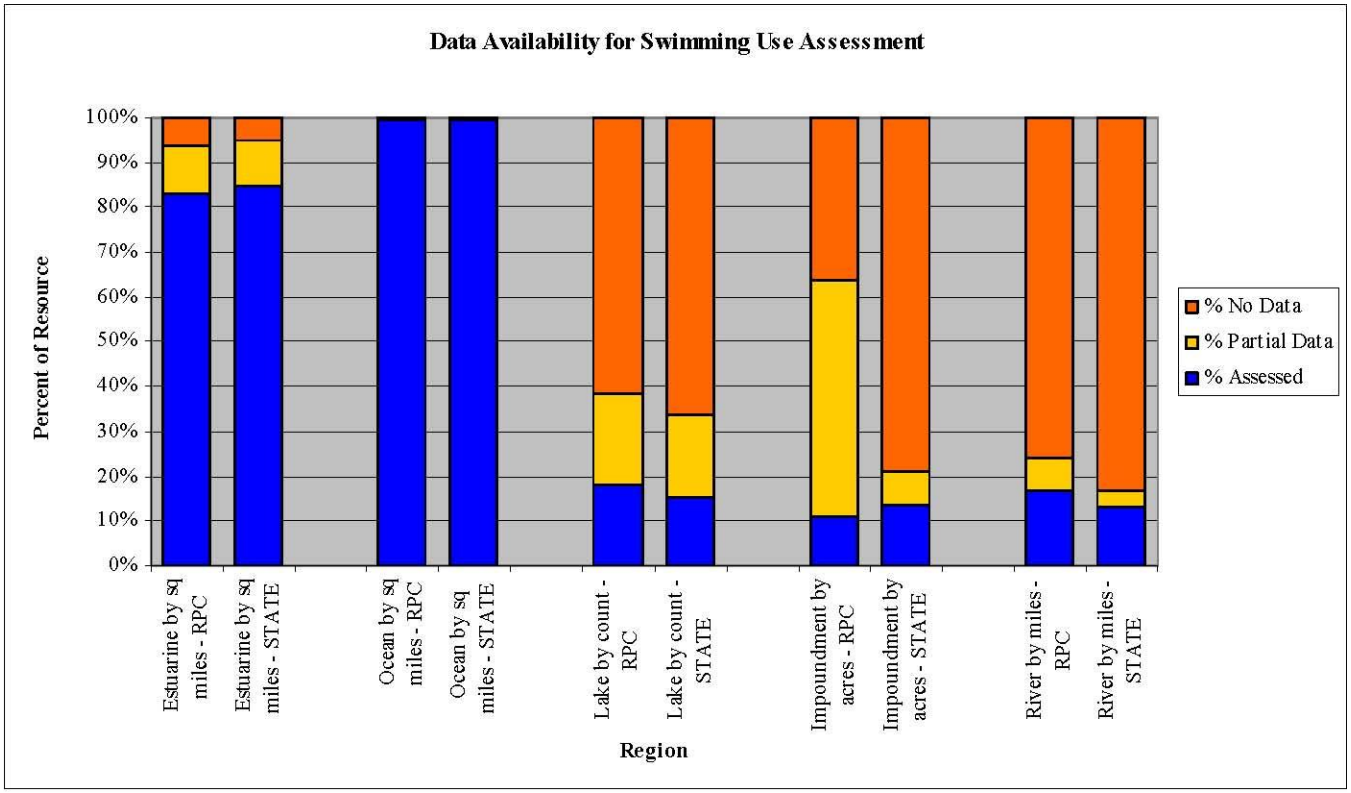

Figure NR3 - Data availability on waterbodies for water quality to meet state standards for swimming. Source: NHDES, 2013.

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.

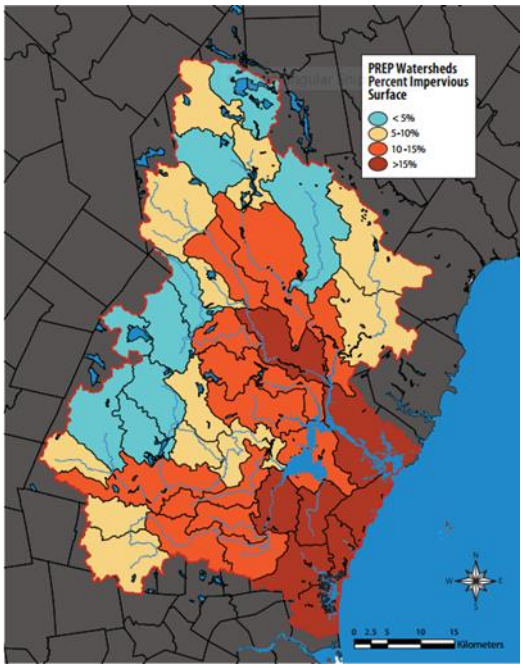

Figure NR4 - Percent of impervious surface coverage by watershed in the Piscataqua-Salmon Falls Watershed. Source: PREP, 2012.

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.

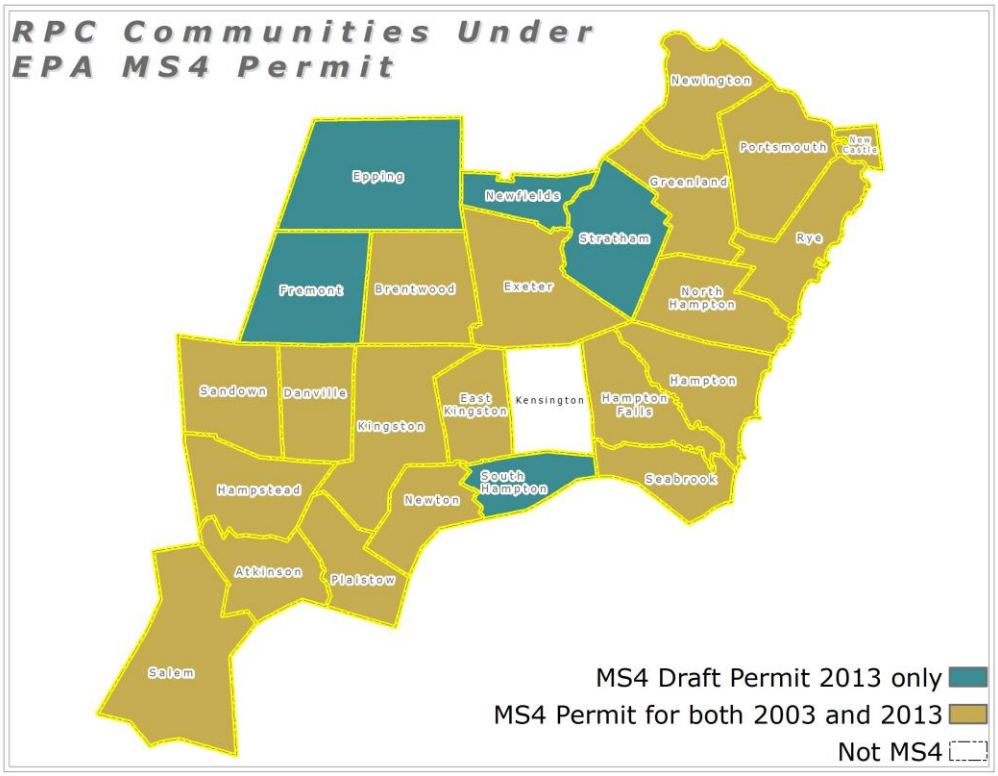

Figure NR5 – RPC Communities subject to the 2003 or draft 2013 MS4 Stormwater Permit. Source: EPA

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.

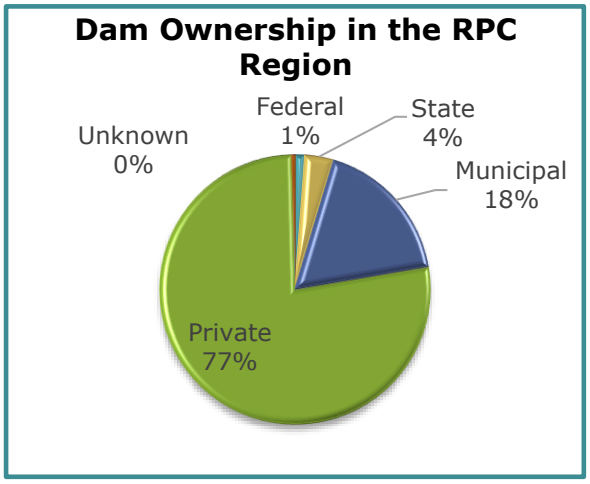

Figure NR6 - Dam ownership in the Rockingham Planning Commission region. Source: N.H. Department of Environmental Services Dam Bureau.

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.

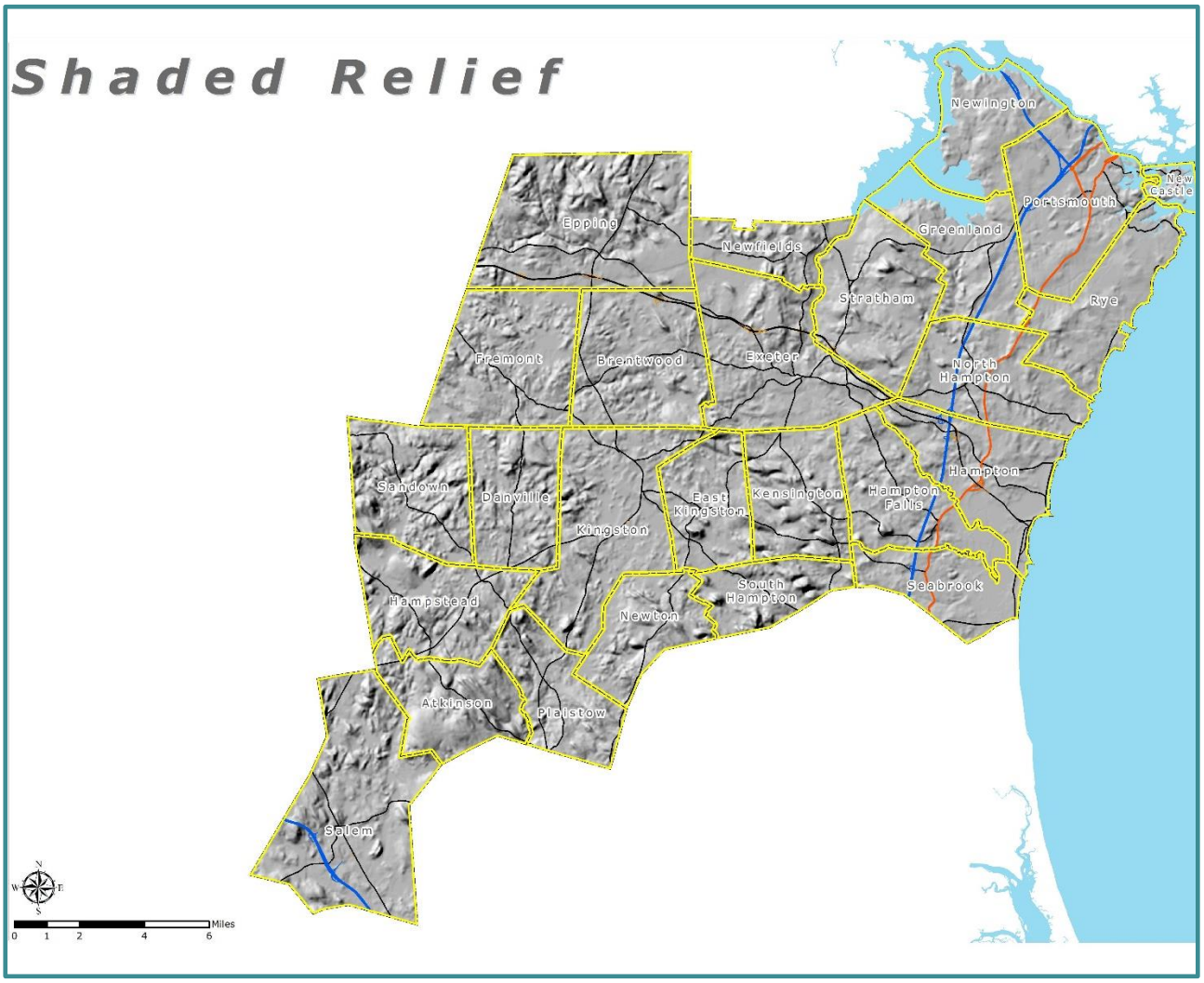

Figure NR7 – Topgraphic hillshare relief of the RPC region: Source: NHGRANIT.

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).

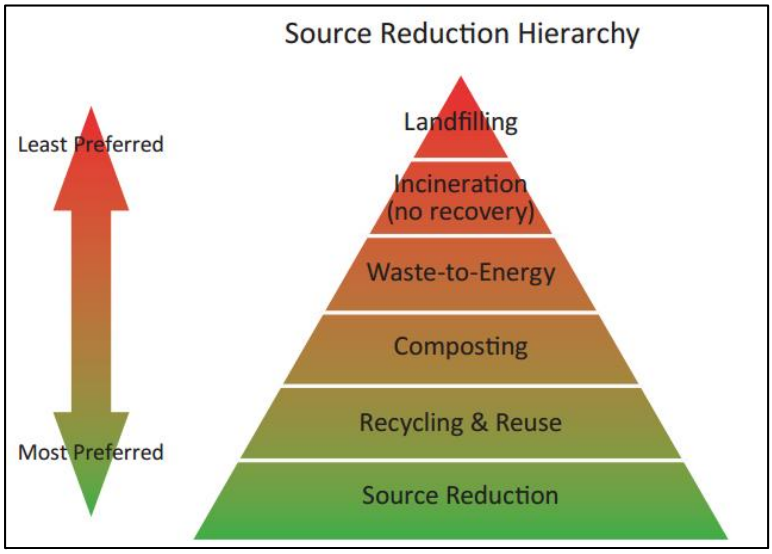

Figure NR8 - Hierarchy of preferred solid waste management options in New Hampshire established RSA 149-M. Source: NHDES Best Management Practices for N.H. Solid Waste Facilities, 2014.

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.

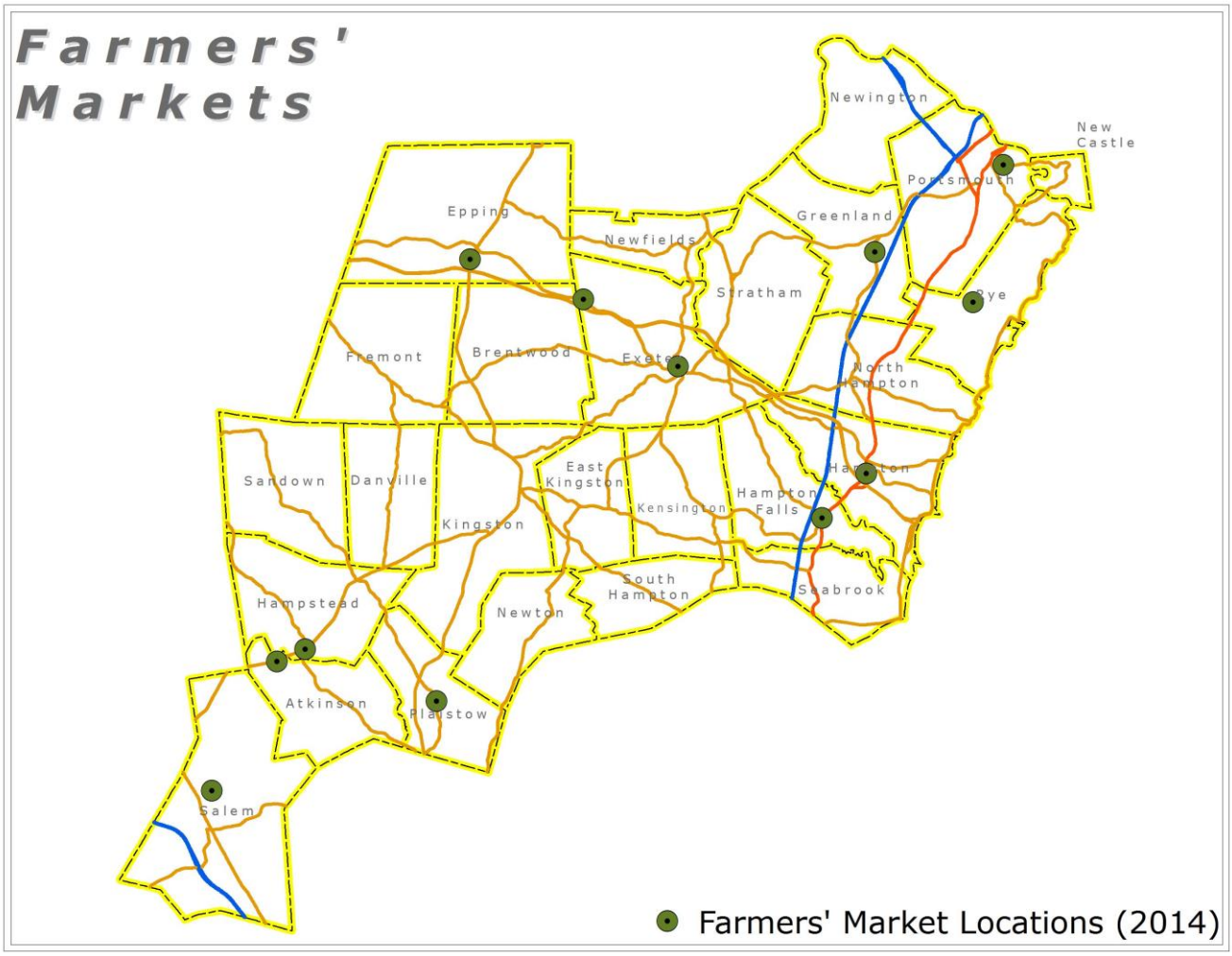

Figure NR9 – Locations of Farmers' Markets in the region.

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.

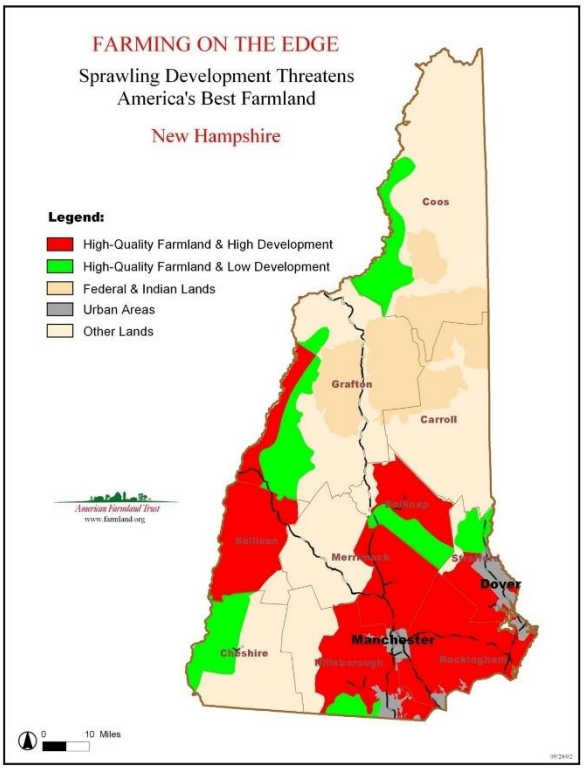

Figure NR11 - The RPC region's high-quality agricultural land is under increasing pressure from development, and is amongst the most threatened in the state. Source: American Farmland Trust, Farming on the Edge: New Hampshire *(2007).*

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

HISTORIC RESOURCES CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Historical Resources

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Historic Resources

Introduction

The Rockingham Planning Commission (RPC) region is rich in American history, dating to its original European settlement in 1623; but also extending back into pre-history with the earliest Native American sites dating back 9,000 years. Among these resources are buildings, sites, documents, and institutions that trace the history of not just individual towns or cities, but the State of New Hampshire and the nation as a whole. These resources help to define the character of our communities, and contribute to the region's quality of life and economic vitality.

The purpose of this chapter is fourfold: 1) to identify and describe the historical resources of the Rockingham region and their significance in local, regional, state and national history; 2) to present an overview of preservation tools and techniques that communities in the region currently use or should consider; 3) to identify key issues that communities will need to address as part of local preservation efforts; and 4) to offer recommendations and action steps for the Planning Commission and communities to better identify, preserve, promote, and benefit from the region's cultural heritage.
Perspective

The pace of change altering the character of New Hampshire communities accelerated dramatically during the second half of the 20th century, particularly in Rockingham County. As the time series of land use maps in the Land Use Chapter of this plan shows, in the 1970's through the early 2000's, the region saw tremendous growth and land development. This pattern has changed somewhat in the past decade with extensive planning and land conservation efforts, and the economic downturn of the late 2000s has temporarily reduced or removed development pressure in many communities. While the region as a whole is not likely to see growth on the order of the 1980s again, development pressure is returning as the economy rebounds from the Great Recession, and indeed never really slowed in communities such as Portsmouth and Seabrook. As the supply of open land diminishes, there is also increasing emphasis on redevelopment in some communities, with implications for existing lower density historic development. More communities are facing up to the dilemma: how to allow for necessary growth while preserving traditional community character.

Change is seen and felt in the destruction of local landmarks; loss of affordable housing and open space; proliferation of strip and big box development, and increased crowding and traffic. All too often efforts at "preservation" have been reactions to a crisis rather than part of the planning process; and are often too late to be effective. Preservation is often confused with prevention. Traditionally, preservation meant conservation: the necessary maintenance and stewardship of resources. It meant patching and remaking worn-out clothes and passing them down to younger family members; it meant preserving food for use during the winter. Architecturally, it meant keeping buildings in sound repair so they could be passed on to future generations.
More recently the image of "preservation" has often been limited to house museums, monuments and battlefields, as the idea of "history" has been restricted to certain famous people or important events. But history is more than heroic events, and preservation is more than buildings.
The spaces around buildings and the landscape itself--farmland, parks, forests, river valleys and coastlines--are a legitimate aspect of each community's history and character. The landscape is a setting that has historical meaning, that either was altered or improved by our forebears and is related to how we once lived, worked or played.
Viewed in this way, much of the region's landscape has disappeared or been so changed that the links to the past are now obscured. Not only is the rural economy close to being a thing of the past, especially in the southern tier communities, but the landscape associated with that economy and way of life--farmland, meadows, productive woodland, unpaved narrow roads, stone walls, small reasonably self-contained (and self-sufficient) communities--is fast disappearing, too.
This said, in the twenty years since this Historical Resources Chapter was last updated, municipalities in the Rockingham Planning Commission region have made strides in recognizing the value of their historical resources – buildings, structures, neighborhoods, and landscapes – and the role they play in economic development and

a community's sense of itself. Seventeen of the twenty six communities in the RPC region currently have Historical resources chapters in their local master plans. An increasing number of communities have established Heritage Commissions to raise local awareness of the value of Historical resources and protect those resources. Local, regional and statewide initiatives in land conservation over the past decade have protected thousands of acres of environmentally and culturally valuable lands, and supported a resurgence of small scale farming as part of a nationwide local agriculture movement. Heritage tourism is an increasingly important component of the regional visitor industry; and as communities have looked to manage sprawl there has been increasing recognition that contemporary models of compact, mixed use development actually draw largely on traditional New England village development patterns.

About "Character"

Character is what gives a community its identity. It is part imagery, part memory, part attitude and values. Character is found in whatever gives resonance to a place; whatever references the way life has been, and is, lived there; whatever identifies the community, its history, and its resources.

Because character is expressed in so many small and large things, it is very vulnerable to change. Change is part of the life of a community. It can't be stopped, and shouldn't be. But the scale of change can be managed and the kinds of change can be influenced.

The courts have recognized the importance of the character of a place. Rulings have determined that a community can't arbitrarily bar growth from one area and allow it in another; but they have also said that municipalities may develop comprehensive plans to protect community character and those resources that give a community its strong sense of place. RSA 674:2 specifically enables communities to include a section of the local master plan addressing cultural, archaeological and Historical resources.

This chapter draws heavily on *Preserving Community Character: A Preservation Planning Handbook for New Hampshire*, published by the New Hampshire Association of Historic District Commissions in 1988 and updated by the New Hampshire Preservation Alliance in 2006, which deals with the subject of historic preservation and municipal planning in depth and is strongly recommended to any community considering any preservation effort. (NHPA, 2006) (NHAHDC, 1988)

Character is what gives a community identity. Character is found in whatever gives resonance to a place; whatever references the way life has been and is lived there; whatever identifies the community, its history, and its resources.

What the Region Said About Historical Resources

The value placed on Historical resources and community character in the region was expressed clearly in public input gathered through the planning process. The regional household telephone survey conducted by the UNH Survey Center asked several questions about historic and cultural resources. A full 90% of respondents indicated that their communities should be actively involved in protecting historic buildings and neighborhoods, second only to promoting local agriculture. Similarly, access to Cultural and Recreational Sites was identified as among the top five factors important to have in their community, with 82% of respondents identifying this as "important" or "very important".

A full 90 percent of survey respondents indicated communities should be actively involved in protecting historic resources.

Historical resources were also a specific topic at three of the Community Conversations. Participants at all three meetings identified historical resources as shaping community character and a source of local pride in their towns. At all three meetings historical resources were also identified as an economic asset to communities, whether as a tourism driver or simply as a facet of what makes their towns desirable places to live and do business. Challenges identified included a lack of funding for updating historical resource inventories or rehabilitating publicly-owned historic structures; a disconnect between valuing community character broadly defined, and valuing specific older building stock (some historic) in the planning and development process; and a sense that regulation in local historic districts can be over-zealous or at times based on individual senses of aesthetics as opposed to clear

standards. Positive trends and opportunities identified include the growth in the number of communities with Heritage Commissions; the development of the New Hampshire Land and Community Heritage Investment Program (LCHIP) as a source of funding for local preservation efforts; use of innovative local regulation such as demolition review ordinances; and opportunities to do more with public education on historic resources, including making use of the internet and mobile applications.

Historical Resources Goals

Goal 1.

Historical resources and community character are routinely considered and protected as part of the planning and development review process.

Goal 2

The region's historical and cultural resources are well documented and interpreted to promote public understanding and appreciation.

Goal 3

New development and redevelopment respect and complement the historical and architectural character of communities.

Goal 4

Historic structures are rehabilitated and adaptively reused whenever possible.

Goal 5

Historical and cultural resources are leveraged to support economic development.

Historical Resources 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
HIST Goal 1	S	S	S	P	N/A
HIST Goal 2	S	S	S	P	N/A
HIST Goal 3	S	S	S	P	N/A
HIST Goal 4	S	S	S	N/A	P
HIST Goal 5	S	N/A	S	P	N/A

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.

Historical Resources Goals	**NH Livability Principles**					
	Traditional Settlement Patterns & Development Design	Housing Choices	Transportation Choices	Natural Resources Function & Quality	Community & Economic Vitality	Climate Change & Energy Efficiency
HIST Goal 1	S	P	N/A	N/A	S	N/A
HIST Goal 2	S	N/A	N/A	N/A	S	N/A
HIST Goal 3	S	P	N/A	N/A	S	N/A
HIST Goal 4	S	P	P	P	S	P
HIST Goal 5	S	N/A	N/A	N/A	S	N/A

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

The following pages offer an overview of the Rockingham region's physical, economic, and cultural development from the period of European settlement to the present day. The overview is divided into four sections, each with a description of key events and trends, along with examples of historic structures, artifacts, and other resources characterizing the period.

Historical Background and Resources in the RPC Region

The architectural heritage of Rockingham County, New Hampshire's earliest settled area, can be equated with the architectural development of the entire state (Tolles, 1979). The two earliest settlements, Portsmouth and Exeter, have excellent examples of colonial era, Georgian and Federal houses that reflect the transmission of styles from England and the European Continent. They also feature a group of public, commercial and ecclesiastical structures credited to such skilled master builders and designers as Bradbury Johnson (1766-1819), a builder-architect born in Epping; Alexander Parris of Portland, Maine (1780-1852); Exeter builder-architect Ebenezer Clifford (1746-1821), and James Nutter. Despite Portsmouth's decline as a seaport after the War of 1812, structures constructed in 19th century styles continued to be built, some under the auspices of local industrialist and financier Frank Jones. Although smaller in size, Exeter exhibits the same architectural cross-section as Portsmouth (Tolles, 1979).

In the county's more rural areas, there is a large concentration of 18th and early 19th century meeting houses, houses - mainly farmhouses - and agricultural outbuildings. Due to the decline in the agricultural economy, high style examples of late 19th and early 20th century architecture are less common outside of Portsmouth and Exeter (Tolles, 1979). The county's best preserved 19th century industrial community, Newmarket, is located on the Lamprey River near Great Bay, though is outside of the RPC planning region. Large-scale industrial development, based mainly on the textile industry in cities such as Manchester and Dover, and its accompanying residential and commercial development, is largely absent in Rockingham County, though both Exeter and Portsmouth were home to significant manufacturing enterprises, as was Derry, though the latter is outside of the RPC planning region.

Pre-European Settlement

Native American groups arrive as first settlers of the region as far back as 9,000 years ago

The earliest settlers of the Rockingham region were the Abenaki. While various tribal subdivisions or bands spanned New Hampshire, Maine, Vermont and eastern Canadian provinces, local bands included the Squamscot, near present day Exeter, and Piscataqua near present day Dover and Portsmouth. (Waldman, 2006) Depending on the season the groups lived alongside the rivers that today bear their names and fished or lived further inland and hunted.

The small group pattern changed radically in the early 1600's with the arrival of the Europeans. The Indians started living in larger groups in more permanent settlements near the newcomers. As a general rule, relations between the Indians and the settlers were good as long as local resources lasted. Once the settlers turned to farming as an economic mainstay, and sought Indian lands, however, relations soured.

As attitudes changed, and following a smallpox epidemic that killed many tribe members, inland migration took the rest of the tribes out of the seacoast. Today there is little trace of the region's Indian heritage and very limited acknowledgement of our archeological past.

Archaeological Resources and the Pre-European Settlement Period

New Hampshire contains a wide array of prehistoric sites worthy of protection. Such sites represent non-renewable resources that contain a unique record of human activity spanning well over 10,000 years. This period followed after the retreat of the glaciers through the displacement of Native peoples by European colonists.

Archaeological sites are the only source of information we have about the prehistoric period, and can also provide an important dimension for understanding more recent history. Archaeological sites balance, corroborate, or contradict the written and oral record of history.

Evidence uncovered at prehistoric sites in Rockingham County demonstrates that human habitation in the Squamscott and Piscataqua areas dates to the Early Archaic period spanning 9,000-8,000 years BP (Before Present). (Waldman, 2006)

To the 1720s - Frontier exploration and settlement, early industries and roads

Historical Background

- The region is settled initially for fishing and the fur trade. Lumber gradually becomes the economic mainstay of the region for shipbuilding and construction.
- The earliest European settlements of the region are at Pannaway (Portsmouth) and Dover Point in 1623, followed by Great Island (New Castle)
- Exeter is founded in 1630 by John Wheelwright, followed by Winnacunnet (Hampton) in 1638.

Historical Resources

- English timber framing traditions brought by settlers are adapted to take advantage of timber supplies far more abundant than in England.
- The Richard Jackson House in Portsmouth (1664) is the earliest remaining timber-frame structure in New Hampshire.
- Other wood-frame residences of era include the Gilman Garrison in Exeter (1709) and the Wentworth Coolidge Mansion in Portsmouth.
- Early brick houses remaining include the Weeks house in Greenland (c. 1710), and McPheadris-Warner House in Portsmouth (1718-1723).
- Early commercial structures are exemplified by the surviving Sheafe Warehouse in Portsmouth
- Fort Constitution is established as early as 1631 with an earthen redoubt and four “great guns” and named “The Castle”. A timber block house is added in 1666, and in 1692 renamed Fort William and Mary. The first stone walls were built in 1705.
- The “King’s Great Highway”, leading from Exeter to Portsmouth via Stratham and Greenland, is laid out by order of the Royal Governor in 1681. Present day Routes NH108 and NH33 largely follow this corridor.

1720s-1770s - Second tier towns granted, end of the French and Indian Wars, Revolutionary War

Historical Background

- New Hampshire separates from Massachusetts Bay Colony 1642 with Portsmouth as its Capitol.
- Settlement north and west of the original four towns begins in tiers around Seacoast beginning with Chester, Nottingham, Barrington and Rochester in 1722.
- Scots-Irish settlers arrive in Londonderry in 1719 bringing the potato to North America.
- Shipbuilding and trade grow in Portsmouth and Exeter through Revolutionary era, while most of county remains agrarian.
- Gundalows become the major means of freight shipping on inland waterways
- In 1769 the New Hampshire Colony is divided into five counties: Rockingham, Strafford, Grafton, Hillsborough and Cheshire.
- The Royal Governor is overthrown in 1775 and Exeter becomes the seat of independent State government.

Historical Resources

- The Georgian Style takes hold, named for the English kings reigning during the period. It is characterized by symmetrical facades, window caps or pediments, and elaborate pilastered doorways with triangular, segmented or scrolled pediments.
- High style examples are found especially in Portsmouth and Exeter, including the Ladd-Gilman House (1721) in Exeter and the Gov. John Langdon House (1784) in Portsmouth.
- Simpler vernacular examples with center chimney are found in all communities of region.
- Scattered village centers develop around schools, grist or other mills, crossroads, as well as political village centers around meeting houses.

- Meeting Houses are constructed during this period in many communities, with examples including Hampstead (1745), Danville (1755), Sandown (1773).
- The "Lottery Bridge" over the Squamscott River connecting Stratham and Newfields is built in 1773, on the site of the present day Stratham-Newfields bridge on NH108.

1780s-1830s - Post-revolution growth, bridges and turnpikes, downturn following War of 1812

Historical Background

- The region experiences an economic upswing following the Revolutionary War.
- The mercantile economy revives, with expansion of trade with Europe and West Indies.
- Settlement expands north and west to the Merrimack and Connecticut River valleys.
- Goods from New Hampshire are increasingly shipped south to Boston via Merrimack river and canal.
- The Piscataqua River Bridge is constructed in 1794 between Durham and Newington improving connections to the north.
- The First NH Turnpike opens between Portsmouth-Concord in 1805.
- Shoemaking develops as a cottage industry in New Hampshire in collaboration with factories in Lynn and Haverhill Massachusetts. Development of other local mills follows.
- Slow economic decline of Rockingham towns begins following trade embargoes of War of 1812 and growth in Merrimack Valley cities.

Historical Resources

- The Federal style succeeds the Georgian style, incorporating influences of ancient Roman architecture popular following excavations of Pompeii and Herculaneum. It kept the symmetry of the Georgian style but with more limited ornamentation
- Examples include the John Pierce House (1799) and Rundlett-May House (1806-1807) in Portsmouth and the Samuel Tenney House in Exeter (c. 1800).
- Much of Portsmouth downtown rebuilt during Federal era following major fires in 1802, 1806, 1813. The Portsmouth Athenaeum (1803-1805) also exemplifies the period.

1840s-1910s - Railroads, emerging industrial economy, early tourism, abandoned farm movement

Historical Background

- Railroads arrive in the 1840s beginning with Eastern Railway (1840), B&M Western Division (1843), Manchester & Lawrence Railroad (1849), and Concord and Portsmouth Railroad (1850).
- Local industries include shoemaking, brickyards, carriage manufacture, ice exporting, and iron and brassworks.
- By the mid-19th century Rockingham County is largely deforested by the lumber trade and cleared for agriculture.
- Agriculture shifts away from subsistence farming and toward market crops such as apples, hay, vegetables and dairy products for local consumption as well as shipping to Boston. Larger commercial farms prosper and expand.
- Summer tourism becomes an economic factor by the late 19th century, driven by a rise in leisure time and easy transportation on electric streetcars and railroads.
- Streetcar development is driven by expansion of electric power generation. The Exeter Street Railway Company builds Hampton Beach Casino in 1890s to encourage ridership. The Massachusetts Northeast Street Railway Company builds Canobie Lake Park in 1902 for similar reasons. Abenaki Country Club opens 1899.
- "Streetcar Suburb" neighborhoods develop away from town centers along streetcar lines in Exeter, Portsmouth, Hampton and other communities.
- The first historic house museums open in Portsmouth in 1907, part of the Colonial Revival Movement, influenced by growing national identity following the Centennial celebration of 1876 and reaction to industrialism and expanding immigration.

Historical Resources

- Development of railroads shifts industrial activities away from waterfronts and to new areas of town adjacent to tracks, such as the West Ends of Exeter and Portsmouth.

- Success with market crop agriculture leads to boom in barn building and expansion at larger commercial farms. Classic New England connected farm structures following the "big house, little house, back house, barn" vernacular form become an icon of regional character.
- The Greek Revival style becomes popular nationally by the late 1830s, seen as representing democracy and civic virtue, and rejecting aristocratic associations. It is relatively uncommon in the Rockingham region, and seen most clearly in church architecture such as the First Congregational Society church in Hampton Falls (c. 1838).
- Numerous architectural styles proliferate during this period, spread by pattern books and relatively inexpensive manufacture and transportation of architectural millwork in a growing industrial economy.
- These include the Gothic Revival Style, Second Empire Style, Queen Anne Style, Shingle Style and Romanesque Revival Style, and are often referred to collectively as Victorian Eclecticism. These are not widely adopted for residential architecture in the region, and are found most commonly as public buildings such as churches, libraries, schools, railroad stations, and some high style residences.
- Railroad expansion also introduces new types of structures to the built environment, including passenger depots, freight buildings, stone bridges and culverts, and signal equipment. Numerous fine examples survive.
- Tourism development brings wood-frame Grand Hotels such as the Wentworth by the Sea (1874), small clusters of vacation rental cottages lining ponds and lakes, and beachfront resorts such as the Hampton Beach Casino.

1910s-1960s - World wars, interstate highways, suburbanization and Pease Air Force Base

Historical Background

- Shipbuilding supporting the war efforts for World Wars I and II contributes to economic growth in the region, including Portsmouth Naval Shipyard as well as Shattuck Shipyard in Newington.
- The rise of the automobile leads to the Good Roads Movement and creation of a State highway system, with an initial set of three North-South Trunk Lines, following the Piscataqua, Merrimack and Connecticut Rivers.
- Highway construction expands dramatically with the initiation of the Interstate Highway system by President Eisenhower in the 1950s. I93 is built between 1961-1977. The Blue Star Turnpike opens in 1950, and is designated as I95 in 1957, though doesn't connect to I95 in Maine until 1972 with construction of the Piscataqua River Bridge.
- Pease Air Force Base opens in 1952, developing nearly half of the land area of Newington as well as portions of Portsmouth and Greenland. The base is a major employer in the region for nearly 40 years, closing in 1991 and eventually redeveloped as Pease International Tradeport.
- Widespread ownership of private automobiles and inexpensive fuel lead to major shifts land development patterns, decentralizing residential, commercial and industrial development.
- Numerous rural towns in Rockingham County develop as bedroom communities for industry in Greater Boston and Northern Massachusetts.

Historical Resources

- Residential neighborhoods of Atlantic heights, Pannaway Manor and Wentworth Acres in Portsmouth are developed to house workers at PNSY and private shipyards.
- Major bridge projects carry new highways across water barriers, including the Memorial Bridge (US1 - 1923), General Sullivan Bridge (NH16 - 1935) and Sarah Mildred Long Bridge (US1 Bypass - 1940).
- The decades prior to WWII see little development in rural Rockingham County as agricultural economies of small towns continue decline. This is reversed during the postwar era with developments of dispersed subdivisions of Colonial Revival, Ranch and Post-War Cottage style homes.
- Commercial development revives along automobile corridors such as Route 28 in Salem, Route 111 in Kingston, Windham and Salem; route 1 in Portsmouth, Rye, the Hamptons and Seabrook; Route 125 in Plaistow; and Route 108 in Exeter.
- Several good examples of mid-century modern architecture by well-known architects are at Phillips Exeter Academy, including the Academy Library (1973) by Louis Kahn, Love Gymnasium by the firm of Kallman & McKinnell (1969), and the Lewis Perry Music Building by the firm of Shepley, Bulfinch, Richardson and Abbott (1960).

- There are likely many other mid-20th century buildings in the region eligible for the National Register, significant as exemplary of architectural movements of the time, or for their relationship to the history and significant people of the region. Identifying what may be significant in the recent past is a key value of keeping local historical resources inventories up to date.

Preservation Tools

Part of the value of historical resources is in the information they provide about specific events and people, socio-ecological conditions and cultural processes in the past. The objective of a study of these resources is the identification of significant historical resources in order to protect or preserve the information they contain. Due to the nature of historic settlement and political subdivision, historical resources are typically studied in a municipal context. Although this chapter discusses the development and resources of the region as a whole, its reference is to the municipality as the individual unit of identification. The study of historical resources is separated into two parts - identification and protection – discussed on the following pages.

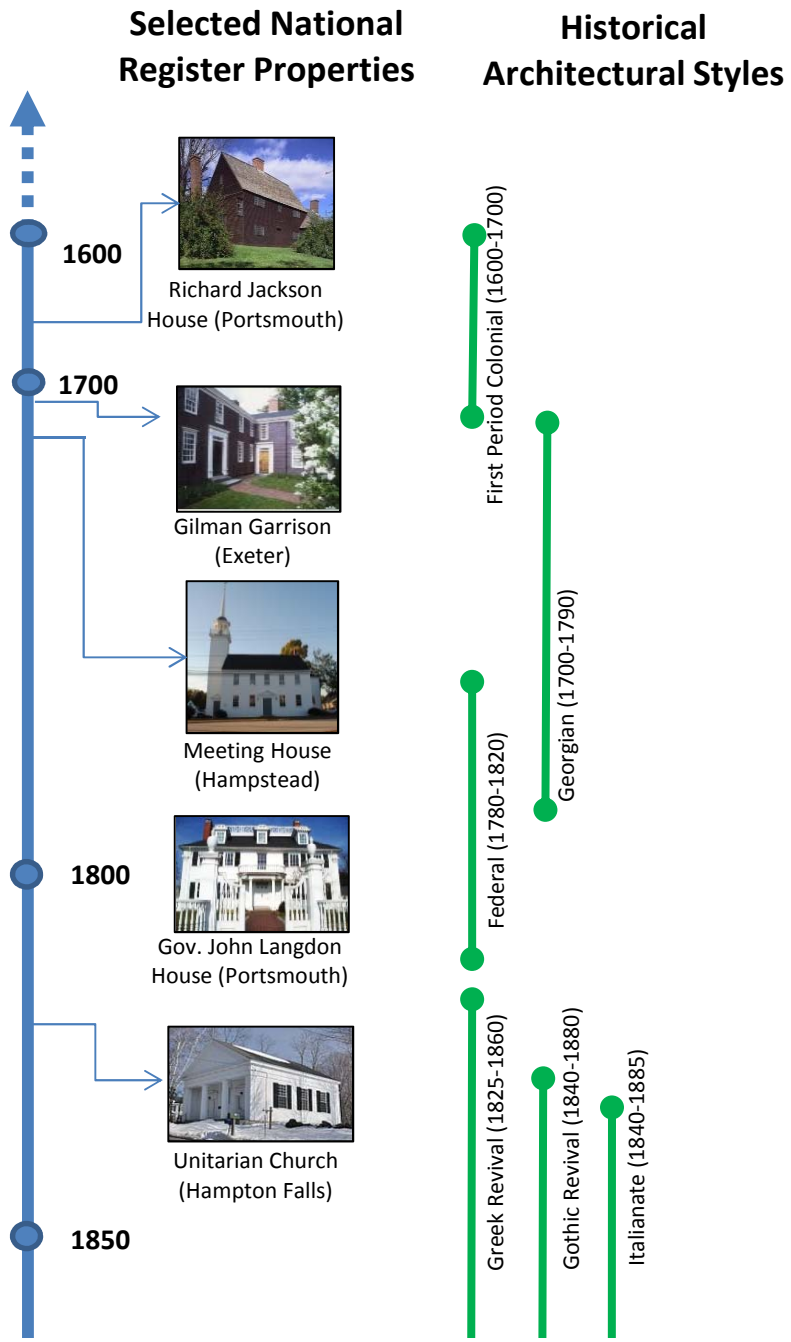
Identification

The identification or survey of historical resources is conducted at two levels of intensity: 1) a reconnaissance or "windshield" survey, and 2) an intensive survey. A reconnaissance level survey is a first step to identify areas or properties worthy of further study, but typically does not involve research on the histories of individual properties. Intensive level surveys include research to determine whether individual properties have historic significance worthy of designation.

Identification of historical resources on the local level is usually undertaken as part of the comprehensive planning process. Local surveys are coordinated with the New Hampshire Division of Historical Resources (DHR - see description below, under State government). Traditionally, there has been a lack of money available for survey activity at municipal, regional or state levels. The Rockingham Planning Commission was the leader in survey activity in the late 1970's and 1980's due to the availability of funding by the Comprehensive Employment Training Act (CETA). Seven towns in the Rockingham Planning Commission region have Reconnaissance Level Surveys: Atkinson, Hampstead, South Hampton, Kingston, Greenland, Newington, and Portsmouth.

Figure HIST1 - Timeline of Regional History & Resources

Earliest evidence of Abenaki indian sites in the Piscataqua and Squamscot areas	9,000 before present
First European exploration of region - Giovanni Caboto (John Cabot) claims New England for England	1487
Portsmouth settled	1623
Exeter & Hampton settled	1638
Richard Jackson House built in Portsmouth (First Period Colonial Style)	1664
Gilman Garrison built in Exeter (First Period Colonial)	1709
Hampstead Meeting House built (Georgian Style)	1745
Danville Meeting House built	1755
Fort William & Mary in New Castle raided and powder and arms seized for use by revolutionaries	1774
American Revolutionary War	1775-1783
Dunlap Broadside of Declaration of Independence read in Exeter on July 16, 1776	1776
New Hampshire Provincial Congress meets in Exeter	1775-1789
Gov. John Langdon House built (Georgian Style)	1784
First US Census, conducted in 1790, counts 43,184 people in Rockingham County and 141,885 in NH	1790
US Census of 1800 counts 45,427 people in Rockingham County and 183,858 in New Hampshire	1800
Portsmouth Naval Shipyard established	1800
Portsmouth Athenaeum built (Federal Style)	1805
Unitarian Church built in Hampton Falls (Greek Revival Style)	1838
First hotels open at Hampton Beach	1840s
Opening of Eastern Railroad	1840
Opening of Boston & Maine Western Division Railroad	1843
Opening of Manchester & Lawrence Railroad	1849
US Census of 1850 counts 49,194 people in Rockingham County and 317,976 in New Hampshire	1850
Republican Party estab at Squamscott Hotel in Exeter	1853



Timeline Continued

Wentworth by the Sea Hotel built (Second Empire Style)	1874
Current municipal boundaries finalized	1882
Watson Academy built in Epping (Stick Style)	1883
UNH relocates to Durham from Hanover	1891
Frank Jones brewery produces 250,000 barrels of ale	1896
Nichols Library built in Kingston (Richardsonian Romanesque Style)	1898
Dudley Survey completed to establish Ocean Boulevard	1899
Development of electric streetcar systems in Exeter, Hampton, Portsmouth, Seabrook, Rye, Salem	1899-1902
US Census of 1900 counts 51,118 people in Rockingham County and 411,588 in New Hampshire	1900
Hudson, Pelham & Salem Railway opens streetcar service to Salem and Canobie Lake Park	1902
Treaty of Portsmouth signed ending Russo-Japanese War	1905
First New Hampshire Primary election held	1916
American involvement in WWI	1917-1918
Atlantic Heights shipyard workers housing built	1918-1920
Completion of Gen. Sullivan Bridge	1935
Coastal fortifications upgraded around Odiorne Point	1942
American involvement in World War II	1941-1945
Portsmouth Naval Shipyard builds 32 subs in 12 months	1944
Prescott Park & Prescott Sisters Trust Established	1949
US Census of 1950 counts 70,059 people in Rockingham County and 531,000 in New Hampshire	1950
USS Albacore launched at PNSY	1953
Opening of Pease Air Force Base	1956
Interstate 93 constructed	1961-1977
USS Thresher, built at PNSY, sinks during sea trials	1963
Strawbery Banke Museum opens	1965
PEA Library designed by Louis Kahn opens	1971
Blizzard of 1978 leads to construction of berms along NH1A for storm surge protection	1978
US Census of 2000 counts 277,359 people in Rockingham County and 1.1 million in New Hampshire	2000

NRHP Properties

Wentworth by the Sea Hotel (New Castle)

Watson Academy (Epping)

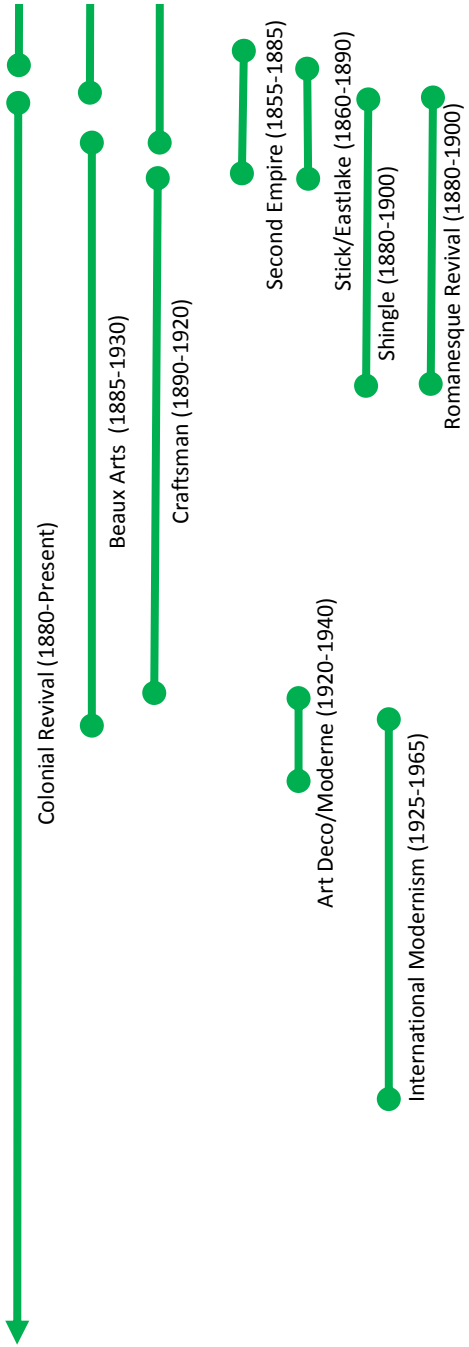
Nichols Memorial Library (Kingston)

Atlantic Heights (Portsmouth)

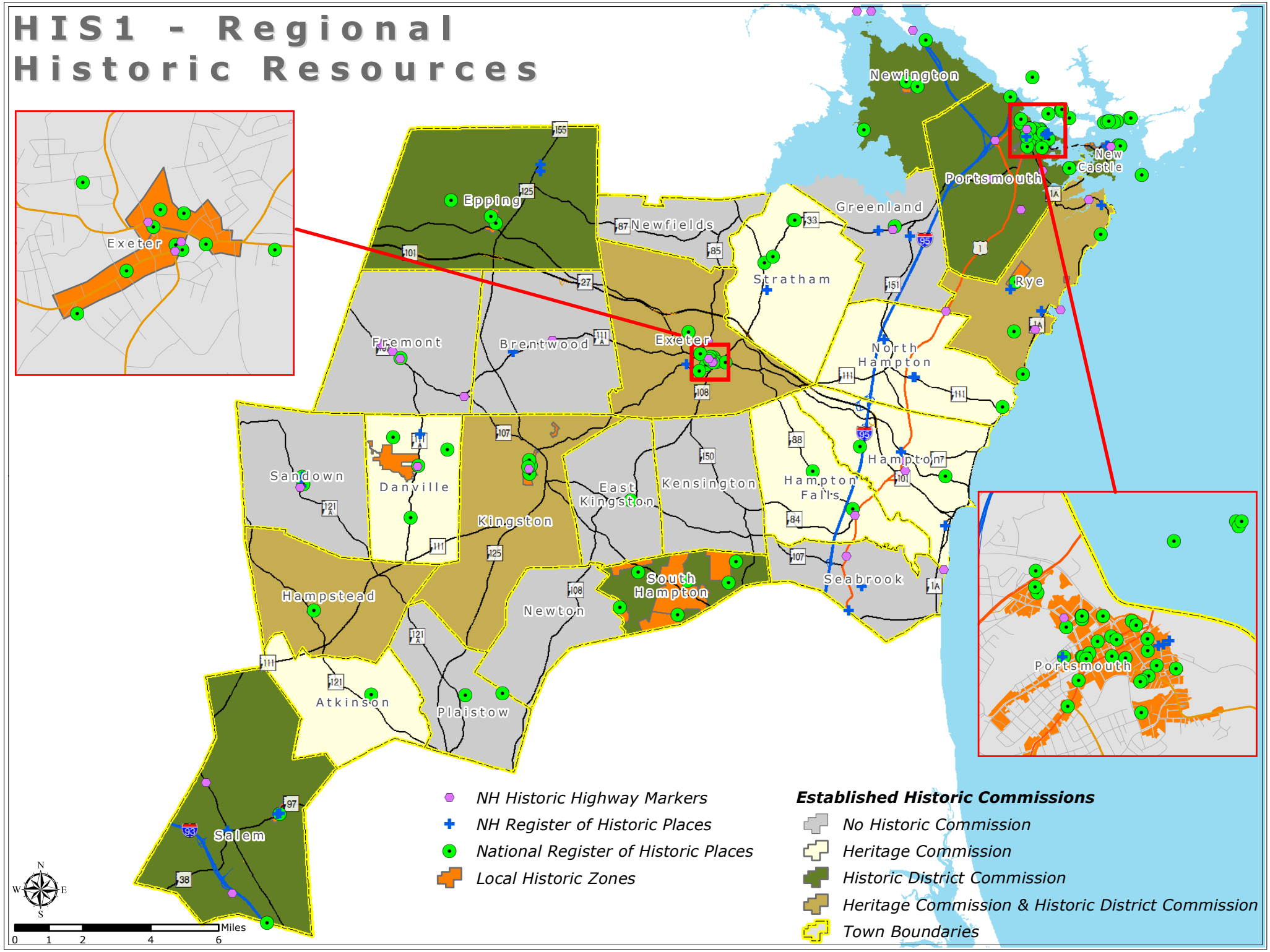
Pulpit Rock Base End Station (Rye)

U.S.S. Albacore (Portsmouth)

Architectural Styles



HIS1 - Regional Historic Resources



Some of the most intensive identification has been produced as part of the federal requirements of the Section 106 review process (defined below), in particular for highway projects in the I93, Route 125, Route 16, and Route 101 corridors; bridge rehabilitations such as Memorial Bridge and Sarah Mildred Long Bridge; and utility projects such as natural gas pipelines or electric power lines.

In additional to the two levels of formal historical resource surveys described above, in 2004 the RPC undertook a survey of local planning boards, conservation commissions, historic district commissions and heritage commissions to gather input on natural and historical resources most valued in their communities. This survey was part of the Regional Environmental Planning Program (REPP), and yielded a database of over 640 sites around the region including historic structures and sites, scenic views, agricultural landscapes and other natural areas.

Survey information is ideally then incorporated into a broader document called a Town-Wide Area Form that places the documented structures into the context of local political, economic, and social history. A Town-Wide Area Form typically includes a narrative history of the area divided into distinct eras of local development; mapping of surveyed resources as well as water bodies and transportation infrastructure that often shape development; a statement of significance describing why identified resources are important in the context of local, state or national history; and a statement of integrity describing the condition of the identified resources and whether they still reflect their period of historic significance. Area forms also usually include recommendations for historic designations and further research.

Protection

Protection of identified historical resources is possible through laws and programs designated by federal, state and local governments and by the stewardship of informed private property owners.

Federal Level Protection Tools

Historical resources that are listed, or eligible for listing, on the National Register of Historic Places are afforded special protection by Section 106 of the National Historic Preservation Act, and Section 4(f) of the Department of Transportation Act.

Section 106 of the National Historic Preservation Act of 1966 requires a federal agency with jurisdiction over a federal, federally-assisted, or federally-licensed undertaking to take into account the effects of the agency's undertakings on properties included in or eligible for the National Register of Historic Places and, prior to approval of an undertaking, to afford the Federal Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on the undertaking. Section 110(f) of the Act requires that federal agencies undertake such planning and actions as may be necessary to minimize harm to any National Historic Landmark that may be directly and adversely affected by an undertaking and, prior to approval of an undertaking, to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. Before the Advisory Council comments on a project, the resources and effect on those resources are evaluated by the State Historic Preservation Officer (SHPO). In New Hampshire, the State Historic Preservation Office is known as the Division of Historical Resources (DHR). See state resources below.

Section 4(f) of the Department of Transportation Act of 1966 ensures that no program or project shall be approved that requires the use of any publicly owned land as from a public park, recreation area, wildlife/waterfowl refuge, or adversely impacts an historic site of national, state or local significance unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such a program includes all possible planning to minimize harm. The language stipulating "*no feasible and prudent alternative*" establishes a stronger standard of protection for historical resources than under Section 106.

National Register of Historic Places

The National Register of Historic Places is the official list of the nation's historical resources worthy of preservation. Properties listed may be of local, state and/or national significance in terms of history, architecture, engineering, archeology or culture. Properties may be nominated individually, in groups and in districts.

Structures may qualify for the National Register based on one or more of four criteria. These include: (A) association with events that have made a significant contribution to the broad patterns of national, state or local history; (B) association with the lives of persons significant in our past; (C) embodiment of distinctive characteristics of a type, period or method of construction, or that represent the work of a master; or (D) potential to yield information important to prehistory or history (ACHP 2008). In addition to meeting one of these criteria for significance, properties must meet separate criteria for integrity or condition.

National Register listing can help to foster local pride and respect for a community's resources and character. It does not, however, provide any protection against changes by private property owners unless federal funding, licensing and/or assistance are involved. Federal agencies are obligated to take into account the effect of any proposed undertaking on resources either listed or eligible for listing in the National Register. In other instances, National Register designation is required for qualification in certain rehabilitation, certification and easement programs.

A district including buildings and setting of local, state or national significance in terms of history, architecture, engineering, archeology or culture may be listed on the National Register of Historic Places. National Register listing recognizes districts worthy of preservation and serves to foster local respect for them. It does not, however, impose any restriction or limitation on the use of private or non-federal property unless federal funds or programs are involved.

As of October 2014 there are 101 National Register of Historic Places listings in the RPC region. These include 13 National Register Historic Districts and 88 individual property listings. Of the individual listings, ten are designated as National Historic Landmarks. While a property may be listed on the National Register due to local or statewide significance, only properties of national significance in American history become National Historic Landmarks.

State Level Protection Tools

The State Division of Historical Resources (DHR) is a service agency, advisory in nature, that assists other state agencies, communities and citizens in recognizing and protecting their heritage and encourages stewardship of their architectural, archeological, historical and other cultural resources. The DHR also acts as a resource center for preservation-related information and assistance; it distributes technical literature, suggests referrals and provides some limited consultation services. At various times, the DHR offers the option of survey and planning grants to communities for preservation activities.

The DHR has established guidelines to meet the requirements of the historic preservation review process for federally licensed or funded projects. The purposes of this process are to (1) locate and identify historical, architectural and archeological resources within a project impact area; (2) apply the criteria for evaluation of significance of a resource for possible inclusion in the National Register of Historic Places if not already listed or nominated, and (3) assess the probable effects a project would have on resources listed in or eligible for the National Register. These properties are referred to as having Determination of Eligibility (DOE) status, which is the same as National Register listing without the recognition.

Local Level Protection Tools

Heritage Commissions

Heritage Commissions provide a valuable tool for municipalities to manage, recognize and protect historical resources, and have been adopted by an increasing number of communities in the region. As of 2014, ten communities in the region have Heritage Commissions. While the purview of historic district commissions is limited to the boundaries of specific designated historic districts, heritage commissions are town-wide in scope. A heritage commission's role in protecting historical resources is akin to a conservation commission's role with natural resources. It advises and assists other boards and commissions; conducts resource inventories; provides outreach to the public on local resources and their value to the community; and can acquire property in the name of the town or city and spearhead revitalization efforts. Heritage commissions may, if authorized by the town or city, assume the composition and duties of historic district commissions, or the municipality may choose to maintain separate and distinct commissions, with a separation of the regulatory role from the education and

advocacy role. If separate, the heritage commission is advisory to the historic district commission, the planning board and other local boards. The municipality may appropriate funds, and the proper handling of these or other related funds is specified. The Preserving Community Character handbook includes extensive information for municipalities interested in establishing a heritage commission.

Locally-Designated Historic Districts

A historic district may be either a locally-designated district or National Register district, or both. Historic districts of either type have the same general purpose, but they function in different ways and provide very different kinds of protection. In many cases it is most effective for significant areas to be designated as local districts and listed on the National Register. In the RPC region seven communities host National Register Historic Districts: Exeter, Newington, North Hampton, Portsmouth, Rye, Salem and South Hampton. With the exception of the Little Boars Head Historic District in North Hampton, all of these are also locally designated districts. The towns of Danville, Epping, Kingston and New Castle also have locally designated historic districts not co-listed on the National Register. In all, ten communities in the RPC region have Historic District Commissions overseeing locally designated historic districts.

Local designation of a historic district is the most comprehensive mechanism for protecting historic structures and areas. In concept, a historic district is similar to zoning. The purpose of a locally-designated historic district is to preserve the significant character of the district, while accommodating change and new construction in accordance with regulations tailored to local consensus. Within the designated bounds of a district, alteration, construction and demolition are regulated by a citizen commission (RSA 674:45-46). Historic districting is not a substitute for zoning or for community planning. The district and the ordinance must be related to a master plan and must be adopted by ballot vote of the community.

Historic districting is the most comprehensive and effective technique for protecting the character of a qualifying area. Unlike zoning which focuses on land use, a historic district focuses on exterior appearance and setting. A locally-designated district is administered by a citizen commission, which should be responsive to local concerns. Property rights are restricted within a historic district, which may seem a disadvantage. But it is this limitation of rights that conserves the resources of the area and protects property values.

Historic districting is not the best means for protecting all historical resources of a community. Widely scattered properties are difficult to include in a district. There may be opposition to the restriction of rights imposed by district regulations.

Preserving Community Character similarly provides extensive information for municipalities on locally designated historic districts, including what qualifies as an historic district, the legal process to establish a district, and elements of administering a district including developing design criteria and guidance, application processes, training, public outreach programs, enforcement and appeals.

Certified Local Government Program for Historic Preservation

The national historic preservation program operates as a partnership between the federal and state governments. Local governments (counties and incorporated cities and towns) have the option to manage much of this program locally. "Certified Local Governments" are assigned responsibility for review and approval of nominations of local properties to the National Register of Historic Places and become eligible to apply for earmarked matching funds. In the RPC region Exeter, Kingston and Newington are Certified Local Governments.

To be certified, a local government must, at a minimum, enforce appropriate state or local legislation for designation and protection of historic properties; establish an adequate and qualified historic preservation review commission; maintain a system for surveying and inventorying historic properties, and provide for adequate public participation in the local historic preservation program. Qualified governments are certified by the State Historic Preservation Office and the Secretary of the Interior.

Other Local Regulatory & Management Tools

Preserving Community Character details other local, state and federal strategies that a municipality might implement toward protecting the historical resources that define its character. The advantages and disadvantages of these techniques are described in Preserving Community Character and in Historic Preservation and Master Planning manuals. Briefly summarized, these strategies include:

- **Zoning** - Carefully established zoning regulations can insure that the use, type, density, height and setback of new development are reasonably sympathetic with surrounding uses and structures. Zoning controls can help preserve the appearance and character of a community. Unsympathetic zoning can actually encourage the decline of historic properties if it establishes requirements that are incompatible with the community's historical resources.

- **Site Plan Review** - allows for site-specific control of development. It gives a municipality regulatory control over major development that does not involve subdivision. Significant control over visual characteristics of a proposed project is possible.

- **Form Based Code -** A form-based zoning code is a local land development regulation that uses physical form, rather than separation of uses, as the organizing principle for the code. A form-based code is a mechanism for promoting compatibility of new development with existing historic development patterns from the standpoint of massing, height and setbacks.

- **Demolition Review Ordinances** - Demolition review ordinances, also referred to as demolition delay ordinances, create a waiting period for issuance of a demolition permit for potentially historic buildings. The intent is to allow time to document a building and determine its historic significance. The ordinance typically applies only to buildings at least 50 years old, consistent with the National Register age threshold. If the building is found to be significant, the ordinance provides a limited window of time in which a Heritage Commission or other body may work with the property owner to find an alternative solution to demolition – whether adaptive reuse, purchase, or moving the structure. If no alternative solution can be agreed upon the demolition is allowed to move forward.

- **Innovative Land Use Controls** - RSA 675:2-5 grants municipalities significant creativity in designing controls that respect and preserve community character. These include phased development, intensity and use incentives, transfer development rights, planned unit development, cluster development, impact zoning, performance standards, and others described in Appendix E.

- **Building Code Provisions for Historic Structures** - Amending the local building code to exempt historic structures from certain code requirements can be a significant protection for historical resources.

- **Easements, Covenants and Deed Restrictions** - For a municipality, easements, covenants and deed restrictions are cost-effective mechanisms for protecting the character of the community and the resource base. Property remains in private ownership and the recipient is not burdened with full acquisition costs, maintenance, taxes or insurance obligations. It is advantageous to the property owner because by donating restrictions in perpetuity to a qualifying receiver, the property owner may take a charitable deduction on federal income taxes.

- **Acquisition** – Acquisition can be either public or private. All levels of government can be involved in acquisition of property for conservation and preservation purposes. Heritage commissions are now authorized to acquire property. Through acquisition, important properties can be protected permanently. Fee simple acquisition combined with brokering can be used to transfer properties to safe ownership without the costs of actual possession.

- **Stone Wall Protection** - Stone walls, which contribute in such an important way to the scenic and historic character of the New Hampshire landscape, are protected by several statutes.

- **Roadside Tree Protection** - RSA 231:139-156 provides protection against insensitive roadside clearing or removal of roadside trees, banks and hedges that "add to the beauty of the roadside."

- **Agricultural Zoning Districts** - These districts may help to preserve the large tracts of land necessary for farming. If combined with cluster development, agricultural zoning can protect a community's remaining farmland and still accommodate growth.

- **Capital Improvements Program** - Public costs associated with maintaining and enhancing historical resources including town-owned structures can be programmed over time, together with identifying sources of revenue.

Funding & Incentive Programs

- **Estate Planning Advice** - Heritage commissions, conservation commissions, planning boards and local non-profit preservation or conservation organizations can stimulate private initiatives by offering advice on estate planning to members of the community who own sizeable tracts of land, farms, or large older single-family houses. Through estate planning, substantial property value, which could be exposed to estate taxes, can be reduced, so that taxation that often forces development can be avoided.

- **Acquisition** can be either public or private. All levels of government can be involved in acquisition of property for conservation and preservation purposes. Heritage commissions are now authorized to acquire property. Through acquisition, important properties can be protected permanently. Fee simple acquisition combined with brokering can be used to transfer properties to safe ownership without the costs of actual possession.

- **New Hampshire Land & Community Heritage Investment Program (LCHIP) -** Established in 2000, LCHIP is an independent state authority that provides matching grants to New Hampshire communities and non-profits to protect and preserve the state's most important natural, cultural and historic resources. Funding comes through a combination of fees on real estate transactions at the County Registry of Deeds, and proceeds from the sale of conservation license plates (moose plates). Through 2013, LCHIP has made 240 grants to 141 communities, conserving more than 260,000 acres of land and 142 historic structures and sites. Grants have totaled $27 million in state funding and leveraged over $237 million in total project value.

- **Local and Regional Land Trusts** have played a major role in land conservation, including historic agricultural landscapes, over the past two decades. Land trusts conduct independent fund-raising, but also often help cobble together a mix of funding from sources such as the US Department of Agriculture or local municipal land conservation funds, and the play an ongoing management role, overseeing easements on secured land.

- **Current Use Taxation** helps preserve open landscapes and land uses integral to a community's character by taxing qualifying land at its value as a woodlot or farm instead of its value as potential house lots. Tax relief to owners of undeveloped land is provided in recognition of the public benefit of preserving the land. If land that has been in Current Use designation is sold, it is subject to a Land Use Change Tax (LUCT) to recoup back revenue. Most communities in the region channel LUCT revenues toward conservation purposes.

- **Tax Increment Financing** can effectively stimulate private investment in rehabilitation of properties that contribute to a community's character.

- **Community Development Block Grant Programs** are substantial and accessible sources of funding for projects stressing the reuse of historic structures. They provide a way to keep housing affordable and inhabitable and can be used to address preservation concerns while averting gentrification. (Add note about CDBG access)

- **Revolving Funds** are self-replenishing loan pools that can be used for building rehabilitation and conservation of open space and critical historical and natural resources. Revolving funds can be self-perpetuating if capital is recycled through the sale of rehabilitated property.

- **Federal Tax Incentives for Rehabilitation of Historical Buildings** - Since 1976, the Internal Revenue code has contained incentives to stimulate capital investment in income-producing historical buildings and revitalization of historical communities. Investment tax credits provide some incentives for developers and investors to rehabilitate older buildings instead of undertaking new construction. When these credits were sufficient, the program accounted for significant preservation efforts in New Hampshire and nationally.

- **New Hampshire's Community Revitalization Tax Relief Incentive**, passed by the State Legislature 2006 as RSA 79-E, provides tax incentives for the substantial rehabilitation of historic structures by allowing that for a defined period as determined by the local governing body the assessed value of the property shall not increase to reflect the value of the rehabilitation investment. Historic status is defined as listing on or eligibility for the National or State Registers of Historic Places.

- **Scenic Road Designation** can stimulate local pride in and respect for landscape areas that contribute to the character of a community. Designation as a State or National Scenic Byway can also bring with it access to funding for interpretive activities and other projects that improve public access to and appreciation for historic and cultural resources.

Key Issues and Challenges

Communities in the region face a range issues and challenges in implementing efforts to maintain, enhance, and benefit from their historic and cultural resources. One critical challenge is building and maintaining public support for these efforts, which involves ensuring that the public both perceives the value to the community of historic and cultural resources, and understands the measures proposed to protect them.

Another issue with which communities grapple is that of what resources receive recognition as being significant and worthy of recognition and/or protection. Is the full extent of the region's cultural, physical, and economic development represented by those buildings and structures currently listed on the National Register of Historic Places or included within local historic districts, or are there additional places that should be recognized? The following paragraphs address these challenges, and suggest approaches for their resolution.

What Do We Preserve?

The buildings in local historic districts in the region date predominantly to the 18th and 19th centuries; and from the early 19th Century forward, most listed properties represent high-style residential, commercial, and civic architecture. They are a remarkable collection of buildings that represent important aspects of local, state, and national history – but they do not necessarily represent the full scope of historically significant places in the region that demonstrate the variety of ways in which residents earned a living and went about their daily lives.

The definition of historic significance as recognized by the National Register of Historic Places is substantially more inclusive than many people realize, and is broader than the concept of significance that is reflected in most local historic districts.

A key difference between the National Register and most New Hampshire historic districts has to do with building age. While most of the buildings in local historic districts date to the 19th century or earlier, buildings as young as 50 years are eligible for the Register provided they meet other criteria for historic significance. The history of the region did not end in 1900. The Register includes not just places of national significance, but also places significant in state and local history. This is not limited to high style architecture designed by professional architects, but can include more modest buildings such as mills, structures associated with railroads, outbuildings, and even agricultural landscapes. In fact, much of what community members identify as the character of the region is not based on high style buildings but on vernacular structures such as traditional New England connected farm buildings, barns or stone walls. This importance could be linked to a specific remarkable

event, or to broad trends and patterns in the local development, such as industrialization in the 19th century, or suburbanization in the 20th century. Beyond this, towns are not bound by the requirements of the National Register in deciding what buildings are important to their local history and character, and can make their own determinations of historical value.

One barrier to such an approach is that many buildings from the later 19th Century or early 20th Century have not captured the public's imagination as have buildings dating to the Colonial era. Ultimately what receives recognition as significant is determined by what citizens see as historic; so while buildings from the more recent past may be eligible for the National Register, actual designation as a local historic district is a community decision.

Some have argued that such a comprehensive approach to significance means that virtually anything over 50 years old could be defined as historic, with the result that nothing old could be changed. However, preservation is not about slowing or stopping development, but about recognizing the value of what is already here, integrating new development in ways that maintain the character of communities, and leveraging community heritage as an economic asset. A first step toward addressing both of the concerns noted above is developing historical resources chapters for local master plans that make a clear statement of the value communities place on their historical resources and identify ways that historical resources are considered in the planning and development process.

A second key step is completing what the N.H. Division of Historic Resources calls Town-Wide Area Forms, which takes historical resources survey information and puts it in the context of local geography and the political, economic, social, and cultural trends that have shaped that community.

These documents identify major events and periods in a town's economic, social, and political history, from pre-European contact to the present day, and how these shaped the built environment. For example, the arrival of the railroad by the 1840s to a community like Exeter completely changed the town's orientation and industrial landscape, with factories moving from the river to alongside the railroad tracks. Similarly, broad ownership of automobiles by the mid-20th century opened up the hinterlands for residential development and contributed to the deindustrialization of downtowns and a gradual shift for many communities towards being bedroom communities for larger regional employment centers.

The context statement identifies types of resources associated with different aspects of local history. When coupled with a comprehensive historic resource inventory, it provides a context in which to evaluate the significance of individual resources or groups of resources in the development of the Town. It aids in the prioritization process, helping to identify which buildings are the best examples of their types, and are worthy of recognition and preservation.

Education and Awareness

Ultimately, the decision of what elements of a community's history are recognized, celebrated, and preserved depends on people's understanding of what is here and why it is of value. Twenty two of the twenty six communities in the region have Historical Societies that engage in some level of educational outreach. A growing number of communities have established Heritage Commissions, which go beyond the regulatory role of Historic District Commissions and often engage in community outreach, resource inventories and even property management. There is a broad a range of organizations and initiatives in the region with a shared goal of raising awareness of local and regional history and cultural resources. These include local historical societies and heritage commissions and the various museums and self-guided and occasional guided walking tours and interpretive brochures they offer; Historic New England (formerly the Society for the Preservation of New England Antiquities or SPNEA) and the four historic properties they maintain and interpret in the region; other private non-profit museums and interpretive centers in the region such as the American Independence Museum, Strawbery Banke Museum, the Portsmouth Athenaeum and the Gundalow Company; and events like the American Independence Festival or local Old Home Days. At the same time, opportunities exist to broaden these efforts in both the public and private sector.

Examples discussed in local master plans include additional outreach efforts such as specific outreach targeting planning board, conservation commission and select board members; information and interpretive programming related to historical resources on municipal websites and the local public access cable stations; and better

dissemination of guides produced by the N.H. Division of Historic Resources for owners of historic properties on the benefits and implications of historic designation and tips on maintaining historic properties. Completing these projects will require resources in the form of both funding and time from volunteers, but initial low-cost outreach efforts can be undertaken to spur public interest and additional volunteer resources. (NHDHR, 2012)

Redevelopment, Densification, and Tear-Downs

While the economic downturn of the late 2000s temporarily reduced development pressure in many communities, and the region as a whole is not likely to see growth on the order of the 1980s again, development pressure is returning as the economy rebounds from the Great Recession. Land conservation efforts of the past 15-20 years have protected a great deal of open space in the region (as much as 25% in a few communities), much of it with historic and cultural significance as agricultural landscapes. As the supply of open land diminishes, though, there is increasing emphasis on redevelopment. Particularly in communities with high land values, this may mean teardown of older low density development such as modest beach cottages or small scale tourist motels, and replacement with larger, denser, and more expensive construction. In some cases the individual buildings removed may have little historic significance, and the new development boosts the local tax base and provides new housing or community amenities that on balance are positive. Over time, though, this changes the landscape and sense of a place. Weighing such trade-offs is a central role of municipal planning. A key step toward ensuring decisions on these trade-offs are well informed is ensuring that cities and towns have up to date historic resource inventories, and through their master planning processes have discussed what aspects of local history most shape community character and are important to residents to protect.

Historical Resources and Sustainability

Old buildings are often seen as inefficient from an energy standpoint, leading in some cases to teardowns and replacement by new construction with newer energy efficiency technology. Indeed most buildings prior to the mid-20th century lacked insulation in walls and roofs. The N.H. Preservation Alliance and N.H. Division of Historic Resources frequently offer workshops on weatherizing old buildings.

> **Embodied Energy** is the energy required to extract, process, manufacture, transport, and install building materials**.**

More broadly though, a characteristic of older buildings that is often overlooked by energy efficiency advocates and the building industry is the high level of embodied energy present in old buildings. Simply defined, embodied energy is the energy required to extract, process, manufacture, transport, and install building materials. (Curtis, 2008) The N.H. Climate Action Plan highlighted this, noting that the typical house in New Hampshire contains about 1.5 billion Btu of embodied energy – enough to drive an average automobile for over 25 years (New Hampshire Department of Environmental Services, 2009) When older buildings are preserved and reused this embodied energy is conserved, new material needs are minimized, and huge carbon emissions from new construction avoided. When older buildings are torn down and replaced, the original building materials go to a landfill, and an enormous amount of new energy is required to cut, mill, transport and assemble new timber; mine, process, and transport components of new concrete and steel; and manufacture windows, electrical systems and other components of new construction. In focusing only on the operating efficiency of buildings the huge energy capital cost of new building is missed.

According to the U.S. Energy Information Administration, commercial buildings constructed prior to 1920 have an average energy consumption of 80,127 BTUs per square foot. For the more efficient buildings built since 2000, that number is 79,703 BTUs – a difference of only 0.5 percent. The energy efficiency of buildings constructed during the second half of the 20th Century was much worse, reaching 100,000 BTUs—reflecting the cheap oil and electricity of that era. (Curtis, 2008), (U.S. Energy Information Agency, 2003)

Before sustainability became a watchword, traditional builders had little choice but to design with energy efficiency in mind, including siting to maximize solar gain and guard against winter storms, using natural ventilation, and placing chimneys at the center of houses to use their thermal mass for heating.

Beyond these technical aspects of energy efficiency, historical resources are in and of themselves key components of community sustainability – creating the character and sense of place in a community, adding economic value and fostering a sense of community pride and stewardship.

Funding

Funding for historic preservation work, whether inventories or brick and mortar rehabilitation, is a perennial challenge. The major source of funding for historic resource inventory work has traditionally been major infrastructure projects such as highway expansions or utility corridors that are required to evaluate impacts to historical resources as part of the National Environmental Policy Act (NEPA) process.

A major source of State funding for historic and cultural resource protection has been the New Hampshire Land and Community Heritage Investment Program (LCHIP). Established in 2000, LCHIP is an independent state authority that provides matching grants to New Hampshire communities and non-profits to protect and preserve the state's most important natural, cultural and historic resources. LCHIP receives a small portion of its funding through the conservation license plate ("moose plate") program, but since 2008 the bulk of LCHIP funding has come from $25 fees charged on four types of documents that are recorded at Registry Offices in the state's ten counties. These fees yield approximately $4 million annually. These funds have been raided by the Legislature to cover General Fund shortfalls in some years, though are fully allocated to LCHIP in the FY14-FY15 State Budget. Legislation to ensure these fee revenues are used for their intended purpose, to fully fund LCHIP, should be a policy priority.

At the federal level the range of funding available for preservation initiatives has diminished significantly over the past 20-30 years. During the 1990s-2000s federal funds for historic preservation and heritage tourism projects were available through programs like Transportation Enhancements and Scenic Byways, which are now gone. Small grant programs continue to exist through the National Trust for Historic Preservation, as well as technical assistance through the National Park Service Rivers, Trails and Conservation Assistance Program. The federal historic preservation tax credit program still exists as well, though benefits are less extensive than in the 1980s. Other funding and financial incentive programs are described in greater detail in the Preservation Tools section on pages 19-20.

Federal tax credits as well as state and local grants leverage private dollars, and have played a key role in public-private partnerships to save and adaptively reuse historic buildings. Well known examples of adaptive reuse in the RPC region and surrounding area include revitalization of the Newmarket Mills as mixed residential, retail, office and manufacturing space, rehabilitation of the façade of the old Exeter Fire House on Water Street as part of conversion to a restaurant, and adaptive reuse of the 1810 Portsmouth Academy, later Portsmouth Public Library, as the Discover Portsmouth Center.

Historical Resources Recommendations

The following are recommendations for better identifying, protecting, and benefiting from the rich historical and cultural resources of the region. Some target action by municipalities, some by the Rockingham Planning Commission, and some by coalitions of interested parties.

Recommendation 1

Include a chapter on historic and cultural resources in municipal master plans that: recognizes community character; includes provisions for updating resource inventories; and considers the economic and community development potential of protecting local heritage.

Actions

- Update and maintain historical resources data in the RPC Geographic Information System.
- Encourage the NH Division of Historic Resources to prioritize digitalization of their historical resources inventory data and make these data available to municipalities, regional planning commissions and other state agencies.
- Assist communities as resources allow with development of local Master Plan historical resources chapters.

Recommendation 2

Establish Heritage Commissions and/or Historic District Commissions as local champions for the identification, recognition, protection, and management of historic and cultural resources.

Actions

- Assist communities on request with the process of establishing Heritage Commissions and/or Historic District Commissions.
- Develop Town-Wide Area Forms in those communities that currently lack them, that address historical resources extending into the 20th century.

Recommendation 3

Expand and promote local and regional educational initiatives focusing on local history to further public understanding of and appreciation for historic resources.

Actions

- Encourage collaboration between schools and heritage education organizations, particularly efforts making use of local historical resources as teaching tools, as part of 4th grade New Hampshire history or other curricula.
- Utilize local access cable, town websites, mobile applications, markers and other media to convey information on local history and historical resources to residents and visitors.

Recommendation 4

Expand local use of innovative land use policies to promote rehabilitation and continued use of historic properties, and ensure new development and redevelopment complement community character.

Actions

- Support communities in the implementation of policies such as demolition delay and review ordinances, preservation easements, or form based code.
- Support inclusion of allowances for traditional agricultural use in land conservation easements.

Recommendation 5

Promote local and regional efforts to use historic and cultural resources as economic development tools, including Scenic Byways and local Main Street programs and other heritage tourism initiatives.

Actions

- Continue technical assistance to Scenic Byway initiatives in the region, including the NH Coastal Scenic Byway, American Independence Byway, and Robert Frost/Old Stage Coach Scenic Byway.
- Assist communities as requested with development of Main Street Programs.

Recommendation 6

Encourage expansion of funding available for historical resources inventory, conservation, rehabilitation, and education initiatives.

Actions

- Be proactive in seeking federal, state and private sector funding to support efforts to protect and promote historic and cultural resources and community character.
- Advocate at the state level for maintaining and expanding funding for the NH Land and Community Heritage Investment Program (LCHIP).
- Encourage local initiatives to dedicate proceeds from the Land Use Change Tax (LUCT) to conservation and preservation purposes.

Recommendation 7

Build capacity at the Rockingham Planning Commission to assist communities with historic and cultural resources planning

Actions

- Educate RPC staff and commissioners on historic and cultural resource issues; designate one staff planner as a historic preservation coordinator.
- Participate in biennial regional networking meetings of local Heritage Commissions
- Maintain contact with identified historic preservation organizations by membership in order to keep abreast of workshops, conferences and publications.
- Maintain close communication with the New Hampshire Division of Historic Resources (DHR) and disseminate materials as developed for and by DHR to communities involved.
- Digitize copies of the historical resources reconnaissance surveys conducted by RPC in the 1970s and 1980s.

Recommendation 8

Build community level capacity for the protection and management of historic and cultural resources.

Actions

- Encourage and help publicize public program and workshops on issues related to historic preservation directed at both municipalities and private property owners.

Historical Resources Goals and Recommendations Matrix

	HIST Goal 1	HIST Goal 2	HIST Goal 3	HIST Goal 4	HIST Goal 5
Recommendation 1	S	P	P	P	P
Recommendation 2	S	S	S	S	S
Recommendation 3	P	P	S	P	P
Recommendation 4	S	S	P	S	P
Recommendation 5	P	P	P	P	S
Recommendation 6	P	P	S	S	S
Recommendation 7	S	S	S	S	S
Recommendation 8	S	S	S	S	S

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

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Appendices

Appendix A - Historical Background and Resources of the Rockingham Region

Appendix B - Rockingham Region Properties on the National Register of Historic Places

Appendix C - Historical Resources Recommendations in Local Master Plans

Appendix D - NH Architecture: Common Historic Styles and Building Types (NHPA)

Appendix E - Historical Resources, Documentation and Institutions by Community

Appendix A

Historical Background & Resources of the Rockingham Region

The architectural heritage of Rockingham County, New Hampshire's earliest settled area, can be equated with the architectural development of the entire state. (Tolles, 1979) The two earliest settlements, Portsmouth and Exeter, have excellent examples of colonial era, Georgian and Federal houses that reflect the transmission of styles from England and the European Continent. They also feature a group of public, commercial and ecclesiastical structures credited to such skilled master builders and designers as Bradbury Johnson (1766-1819), a builder-architect born in Epping; Alexander Parris of Portland, Maine (1780-1852); Exeter builder-architect Ebenezer Clifford (1746-1821), and James Nutter. Despite Portsmouth's decline as a seaport after the War of 1812, structures constructed in 19th century styles continued to be built, some under the auspices of local industrialist and financier Frank Jones. Although smaller in size, Exeter exhibits the same architectural cross-section as Portsmouth. (Tolles, 1979)

In the county's more rural areas, there is a large concentration of 18th and early 19th century meeting houses, houses -- mainly farmhouses -- and agricultural outbuildings. Due to the decline in the agricultural economy, high style examples of late 19th and early 20th century architecture are less common outside of Portsmouth and Exeter. (Tolles, 1979) The county's best preserved 19th century industrial community, Newmarket, is located on the Lamprey River near Great Bay; though is outside the RPC planning region. Large-scale industrial development, based mainly on the textile industry in cities such as Manchester and Dover, and its accompanying residential and commercial development, is largely absent in Rockingham County.

Pre-European Settlement

Native American groups arrive as the first settlers of the region as far back as 9,000 years ago.

The earliest settlers of the Rockingham region were the Abenaki. While various tribal subdivisions or bands spanned New Hampshire, Maine, Vermont and eastern Canadian provinces, local bands included the Squamscot, near present day Exeter, and Piscataqua near present day Dover and Portsmouth. (Waldman) Depending on the season the groups lived alongside the rivers that today bear their names and fished or lived further inland and hunted. (Waldman, 2006)

The small group pattern changed radically in the early 1600's with the arrival of the Europeans. The Indians started living in larger groups in more permanent settlements near the newcomers. As a general rule, relations between the Indians and the settlers were good as long as local resources lasted. Once the settlers turned to farming as an economic mainstay, and sought Indian lands, however, relations soured.

As attitudes changed, and following a smallpox epidemic that killed many tribe members, inland migration took the rest of the tribes out of the seacoast. Today there is little trace of the region's Indian heritage and very limited acknowledgement of our archeological past.

Archaeological Resources and the Pre-European Settlement Period

New Hampshire contains a wide array of prehistoric sites worthy of protection. Such sites represent non-renewable resources that contain a unique record of human activity spanning well over 10,000 years. This period followed after the retreat of the glaciers through the displacement of Native peoples by European colonists.

Archaeological sites are the only source of information we have about the prehistoric period, and can also provide an important dimension for understanding more recent history. Archaeological sites balance, corroborate, or contradict the written and oral record of history.

Evidence uncovered at prehistoric sites in Rockingham County demonstrates that human habitation in the Squamscott and Piscataqua areas dates to the Early Archaic period spanning 9,000-8,000 years BP (Before Present). (Waldman, 2006)

To the 1720s
Frontier exploration and settlement, early industries and roads

Historical Background

Rockingham County, and the state of New Hampshire, was first settled at the seacoast by men who made their fortunes through lumber, fishing, fur trading and land speculation. As early as 1600, English fishermen were fishing on the offshore banks, using the Isles of Shoals for seasonal shelter and drying racks for their catches. Although the colony was formed to take advantage of the lucrative fishing and fur trades, lumber quickly became the economic mainstay. The region was densely covered by vast stands of pine, oak and other hardwoods. In the 17th century, England was largely deforested, and the Crown was desperate to locate new sources of lumber, particularly to build ships for the Royal Navy. In addition to the great stands of timber, the area's rivers supplied both transportation and water power for saw mills, making New Hampshire a very valuable colony.

In 1623, two "plantations" or permanent settlements were established at Pannaway, now Rye, by David Thompson, and at Dover Point by Edward Hilton. A third village was established on "Great Island," now New Castle, along with two agricultural clusters on the mainland, at Strawbery Banke and Sagamore Creek, both in what is today Portsmouth. By the 1680's, Portsmouth was the largest of the earliest settlements, a linear maritime community with wharves, shops and homes lining the river banks. (Candee 1992)

Settlement further south in Rockingham County was more influenced by its proximity to Puritan communities in Massachusetts. In 1630 John Wheelwright, a Puritan minister from Newburyport, founded the town of Exeter at the falls of the Squamscott River. Exeter soon became influential in the lumber industry, although more conservative in its religious and social predilections than the mercantile community of Portsmouth (Dow, 1893). In 1638, another Massachusetts minister, Steven Batchelor from Newbury, founded the settlement of Winnacunnet on the Taylor River, now the town of Hampton. The only other Rockingham County town settled in the 17th century was Plaistow, then part of Haverhill, Massachusetts.

Historical Resources

In the mid-17th and early 18th centuries, dwellings, churches and mills were constructed almost exclusively of wood in the seacoast region. The earliest English settlers brought with them English timber framing traditions. Given the abundance of both timber and saw mills, added to these building techniques were "logg" or garrison construction, which employed thick planks of wood dovetailed at the corners, and use of vertical planks instead of studs and sheathing between corner posts. (Candee, 1992). The earliest extant timber-framed building in both Maine and New Hampshire is the c.1664 Richard Jackson House on Northwest Street in Portsmouth. The two-story, hall and parlor, central brick chimney house is framed with one inch thick vertical boards running from sill to plate, sheathed on the exterior with clapboards. The Gilman Garrison in Exeter is the only surviving logg building in the study area; it was built in the early 18th century as both a home and fortified structure protecting the nearby Gilman family sawmills. The Capt. John Sherburne House (c.1695-1703) at Strawbery Banke Museum in Portsmouth is another early example of a timber-frame hall and parlor house.

An unusual house from this early period is the Wentworth-Coolidge Mansion in New Castle, built in three stages, probably about 1650, 1700 and 1750. An assemblage of at least four, and possibly five, pre-existing buildings, linked with awkward passages and transitions, the house served as the official residence of Governor Benning Wentworth and was the center of social life when Portsmouth's maritime aristocracy was at its height. The interior was lavishly finished and furnished, and the 18th century gentleman's farm with gardens, orchards, fields and pastures eventually covered more than 100 acres (Candee, 1992). The house fell into decline in the early 19th century, but was then restored during the colonial revival period by J. Templeman Coolidge beginning in 1885; it served as an icon of the earliest phases of the colonial revival movement throughout New England (Tolles, 1979). Today it is owned and maintained by the State of New Hampshire.

Two early brick houses on the seacoast introduced a floor plan that remained popular through the mid-19th century: the five bay, center entry 2-1/2 story house. The basic plan varied in depth -- two to four bays -- by the addition of ells and wings, the placement and number of chimneys, and type of roof. The Weeks House on Route 101 in rural Greenland was constructed c.1700-1705 in the 5x2 bay center hall plan (Tolles 1979). The Macpheadris-Warner House on Daniel Street in Portsmouth is the oldest surviving example of an early 18th century brick urban residence in this county. Constructed under the supervision of John Drew, a London-trained

joiner, the Warner House is an important early example of the transfer of provincial classical brick design to America (Candee, 1992). The other common house type from this period was the 1-1/2 story, five bay cape with a center chimney, also known as a hall and parlor house. No known examples of the hall and parlor form dating from before 1720 survive in Rockingham County.

The Sheafe Warehouse on the Piscataqua River in Portsmouth, which may date as early as 1705, is a last survivor of a once-widespread Piscataqua mercantile building form (Tolles, 1979). The vertical plank structure originally sat on a crib of logs with its overhanging upper story projecting above the river, but has since been moved onto a concrete foundation and restored. The nearby Shaw Wharf and Warehouse date from late 18th century (Candee, 1992).

A third type of 17th century building was the construction of fortifications to protect the mouth of the Piscataqua River. As early as 1632, four "great guns" were put in place at the site of today's Fort Constitution Coast Guard Station in New Castle. A timber blockhouse was erected in 1666, and a breastwork followed in 1692. Many of the late 18th century improvements remain in place, including the west portcullis gateway, brick magazine and sentry room (Tolles, 1979).

1720s-1770s
Second tier towns granted, end of the French and Indian Wars, Revolutionary War

Historical Background

The four early settlements of Portsmouth, Exeter, Hampton and Dover first were politically under the jurisdiction of the Massachusetts Bay Colony. New Hampshire was named a separate province in 1697 with its own lieutenant governor. The exact boundaries between the two colonies remained in dispute until 1742, when New Hampshire was completely separated from Massachusetts, the boundaries were clarified, and a New Hampshire governor was appointed. Portsmouth was named the colonial state capital, and a court house was constructed in the 1750's at what is today Market Square. (The courthouse has been taken down and disassembled and is now in storage in Concord.) In 1769, the colony was divided into five counties: Rockingham, Strafford, Grafton, Hillsborough and Cheshire (Hazlett, 1915). (In the first half of the 19th century, five more counties were added through the subdivision of the initial five.)

In the early 18th century, the New Hampshire provincial government began a campaign to expand the settled territory beyond the original four towns. Groups of proprietors were granted a township and hired surveyors to explore the granted territory, create a map and divide the land into lots. Settlement north and west of the original four towns occurred in tiers or semi-circles around the seacoast. The first tier of towns, granted in 1722, were Chester, Nottingham, Barrington and Rochester (Garvin D. B., 1988). Much of the hinterland remained unsettled until after the French and Indian wars in the early 1760's.

All of the towns in Rockingham County were set apart from the four original settlements or parts of Massachusetts, with the exception of Candia, Derry, Londonderry, Northwood, Nottingham and Windham. The chart below illustrates the evolution of town boundaries through 1883, when the area assumed its current political configuration (U.S. Census Bureau, 1940).

Exeter -- Settled and granted 1638,
part became Newmarket in 1727,
part of Newmarket became **Newfields** in 1849,
known as South Newmarket 1840-1895,
part of Newfields to Newmarket in 1852, from Newmarket in 1883.
part became **Epping** in 1741.
part became **Brentwood** in 1742,
part of Brentwood became **Fremont**/Poplin in 1764,
part of Fremont became part of Danville in 1783.

Hampton -- Settled 1638, incorporated 1639,
part became **Kingston** in 1694,
part became **East Kingston** in 1738,
parts of East Kingston to South Hampton in 1824, Newton in 1845.
part became **Sandown** in 1756.
part became **Danville** in 1760, known as "Hawke" until 1836,
Danville annexed parts of Fremont in 1783 and parts of Hampstead in 1877.
part annexed to Plaistow in 1831.
part became **Hampton Falls** in 1718,
annexed part of South Hampton in 1742,
part became **Kensington** in 1737.
parts became **Seabrook** in 1768 and 1816,
Seabrook annexed parts of Hampton Falls in 1816 and parts of
South Hampton in 1822.
part became **North Hampton** in 1738.
part became **Newton** in 1749, known as "Newtown" until 1846,
part of South Hampton annexed in 1749 and of East Kingston in 1845.

Portsmouth -- Settled 1623, incorporated in 1653, part of Newington annexed in 1821,
part became **New Castle** in 1693.
part became **Rye** in 1693,
Rye annexed parts of Portsmouth, Hampton and New Castle in 1726, more of New Castle in 1791.
Gosport, Isle of Shoals, annexed in 1876.
part became **Greenland** in 1704,
Greenland annexed parts of Portsmouth in 1721, of Stratham in 1805, 1847

Hampstead -- Part of Haverhill, Mass., until 1749, known as "Timberlane,"
annexed part of Atkinson in 1859, part to Danville in 1877.

Newington -- Part of Dover (Strafford County) until 1713, part to Portsmouth in 1821.

Plaistow -- Part of Haverhill, Mass., until 1759, part of Kingston annexed in 1831,
part became **Atkinson** in 1767.

Salem -- Part of Haverhill and Methuen, Mass., until 1750.

South Hampton -- Part of Amesbury and Salisbury, Mass., until 1742,
parts to Hampton Falls in 1742, to Newton in 1749, to Seabrook in 1882,
part of East Kingston annexed in 1824.

Stratham -- Part of Squamscott Patent (Hampton) until 1715,
parts to Greenland in 1805 and 1847.

Windham -- Part of Londonderry until 1752, parts of Londonderry annexed in 1777, 1778 and 1805.

Another in the settlement of Rockingham County was the migration of a group of Scotch-Irish emigrants to Londonderry in 1719. The Scotch-Irish were descendants of Scottish Presbyterians who settled in northern Ireland about 1612, after the British monarch James the First forced the native Catholic Irish off millions of acres of land and encouraged Protestant settlement with liberal land grants (Parker, 1974). The native Irish did not welcome the immigrants, and the group emigrated to Massachusetts in 1718. Massachusetts Bay awarded

the group a 12 mile square township called Nutfield, which was later divided into the towns of Londonderry, Derry and Windham, and parts of Manchester, Hudson and Salem. The settlement grew rapidly, and by the 1730's Londonderry accounted for one-tenth of the state's population.

With the exception of Portsmouth and Exeter, towns in Rockingham County developed agrarian economies based on self-sufficient farming. As virgin forests were cleared for agricultural land, lumbering became the secondary mainstay of the early economies in Atkinson, Plaistow, East Kingston, South Hampton, Brentwood, Epping, Fremont, Greenland, Kensington, Kingston, Newton, Hampstead, Danville, Hampton, Seabrook, Rye, North Hampton, and Hampton Falls. The vast salt marshes along the coast were useful for grazing livestock, and salt hay was an important early annual crop. Fish were harvested for food and fertilizer, as well as seaweed. Integral to the development of these agricultural communities was the construction of water-powered saw and grist mills along any stream with sufficient fall. By the Revolution, the local industrial base had expanded to include clothe, planing, fulling, shingle, carding and cardboard mills on small inland waterways. By the mid-1720's, the Scotch-Irish in Londonderry and neighboring communities had gained a reputation for producing an excellent grade of linen and selling it throughout the colonies and in international markets as well. This unusual flax production was among the only industries in the state, beside the mast trade, allied wood products, and grist and cider mills. The Scotch-Irish also introduced the potato, which was successfully assimilated into the region's agricultural economy.

By Revolutionary War, Portsmouth's population had reached about 5000. The city served as the major port of northern New England, exporting lucrative cargoes of dried fish, hides and all types of lumber products. Politically, the city had quickly become the center of the royal government under an oligarchy of merchant families clustered around the political dynasty of the Wentworth family. Wealthy merchants built and furnished large Georgian-style homes, patterned after their British counterparts, and invested their capital in trade and land speculation. The city's residents concern for lavish display prompted Puritan John Adams to criticize their habits as "the pomps and vanities and ceremonies of that little World, Portsmouth" (Jobe, 1993).

During the Revolution, the emphasis of the region's economy shifted from the international timber trade to internal transportation and shipbuilding. Although Exeter, Newfields and other inland ports on the Piscataqua River system built large seagoing vessels, few returned after they were launched. Traveling the inland waterways were gundalows -- large, broad-beamed and heavy sailing barges, built to sail in shallow water with stepped masts that could be lowered under bridges. Gundalows carried bricks, granite, cord wood and later cotton and raw materials to the towns and cities in the Piscataqua basin.

After the royal government was overthrown in 1775, Exeter became the unofficial seat of the new independent state government. It remained the seat of the state government during the struggle to build a new government after the Revolution. After the turn of the century, as political and economic power shifted to the Merrimack Valley, the state government moved to Concord.

Historical Resources

In the 18th century, a new style of architecture derived from the work of the Italian architect Andrea Palladio (1518-1580) was introduced to Great Britain in the 18th century. The publication of numerous architectural guidebooks for the use of craftsmen and builders facilitated the transfer of the Palladian or Georgian style to the colonies, particularly to the Anglo Seacoast region (Tolles, 1979). The **Georgian** style was characterized by classical moldings, symmetrical facades, window caps or pediments and elaborate pilastered doorways with triangular, segmental and scrolled pediments. On the interior, classical cornice moldings, wall paneling and stairway balustrades were carved and turned in a variety of combinations.

The largest Georgian dwellings in Portsmouth and Exeter were double houses, with two or four chimneys and an elaborate center hall with a grand staircase (Tolles, 1979). Individual examples in Exeter include the Edward Sewall Garrison, listed on the National Register of Historic Places in 1980, and the c.1721 and 1747 Ladd-Gilman House on Water Street, built as a two-story hall and parlor plan brick house and enlarged to its current configuration in 1747 when it was sheathed with clapboards (Tolles, 1979).

A large number of center hall Georgian style houses survive in Portsmouth. A list of the better known examples includes the c.1730 Joshua Peirce House on Gates Street; c.1740 Tobias Lear House on Hunking Street; the

John Paul Jones House, built 1758-59 on State Street; c.1765 Jacob Wendell House on Pleasant Street; c.1760 Captain Thomas Shaw House on Marcy Street, and the c.1760 Wentworth-Gardner House on Mechanic Street. The c.1750 double pile Capt. John Clark House, c.1762 Chase House, 1761 Stoodley's Tavern and c.1770 Joshua Wentworth House are all located at Strawbery Banke Museum in Portsmouth (Candee, 1992; Tolles, 1979). The Moffatt Ladd House at 154 Market Street was one of the first three-story residences with a shallow hip roof in Portsmouth. The Gov. John Langdon House was built in 1785 on Pleasant Street, based on plates in Abraham Swan's A Collection of Designs in Architecture (London:1757) and The British Architect (London:1745). The interior finish, attributed to Exeter designer Ebenezer Clifford, is a lavish display of rococo carving. The Capt. Thomas Thompson House, a smaller scaled version of the Langdon House, was built simultaneously next door.

In every town in rural Rockingham County, a large number of more vernacular center entry houses survive. Built on large self-sufficient farms in the agricultural towns that subdivided from the original four towns, these houses largely lacked the elaborate finish and carving of the more urban examples in Portsmouth and Exeter. Wood predominated as a building material, and ornamentation was limited to minimal entry treatments, such as a transom or entablature. These early farmsteads included many small, wood frame outbuildings necessary to accommodate subsistence farming. These were generally gable or shed roof barns and sheds used for poultry, livestock, vegetables, washing, smoking, and shoe piece work. The small shoe shops were usually placed near the road for easy pick up and delivery. Several survive in the rural communities. A large number of settlement farms in their early agricultural context remain standing in such towns as Kensington, South Hampton, Danville, Hampton Falls, Brentwood and Stratham.

In each of the region's rural towns, several small village centers developed around early school districts, small industrial ventures such as grist and saw mills, and at major crossroads. Examples of scattered village development have been identified by the local survey process in the towns of South Hampton, Greenland and Hampstead. In many areas, village centers declined in importance and usefulness as school districts consolidated and small-scale local industries were replaced by manufacturing in large urban centers. Political village centers developed around the town meetinghouses or churches, and later libraries. Several well-preserved examples of meetinghouses dating from this era, known as second period meeting houses, exist in the region. These include the Hampstead Meeting House, crudely finished in 1745; the Sandown Meeting House on Phillips Road, and the Old Meeting House on Route 111A in North Danville, built in 1760.

1780s-1830s

Post-revolution growth, bridges and turnpikes, downturn following War of 1812

Historical Background

Although the seacoast experienced a depression in the years following the Revolution due to interruptions in trade caused by the war, the 1790's and the first decades of the 19th century were a time of national and regional upswing in commerce, education, industry, transportation and architecture. The Seacoast's mercantile economy revived in the 1790's, when trade with Europe and the West Indies quadrupled annually over the decade. Stores and warehouses lined the waterfront in Portsmouth, and the city's population grew rapidly, from 4,720 in 1790 to close to 7,000 in 1810 (Candee, 1992).

Following the Revolutionary War, as settlement in New Hampshire rapidly spread north and west to the Merrimack and Connecticut river valleys, the need for better roads and bridges into the wilderness quickly became apparent. Much of the trade from these areas was funneled down the Merrimack River and canal system to Boston, an easier transportation route than the overland trek by bad roads to Portsmouth. Ferries had been used as early as 1640 to cross the water obstacles of the Great Bay/Piscataqua basin, which largely cut Portsmouth and the seacoast off from the developing hinterlands. To partially answer these needs, the Piscataqua River bridge was constructed by subscription in 1794, connecting the towns of Newington and Durham at Goat Island. The bridge was chosen as the starting point of the First New Hampshire Turnpike, which opened from Portsmouth to Concord in 1805.

Turnpikes throughout the state followed, but only the First New Hampshire Turnpike connected the seacoast with towns to the north and west. The internal road system had largely coalesced after 200 years of settlement. The Concord, Londonderry and Lawrence, Massachusetts Turnpike opened in 1806 as the most direct route

between Concord and Boston, passing diagonally through Salem and the eastern part of Windham. New industries developed to support travel on the improved roads, including stage lines, taverns and blacksmiths, and towns such as Kingston, Brentwood and Atkinson served as way stations on stage lines.

Small-scale local manufacturing increased during this period with the expansion of transportation routes and larger markets. In the 1830's, farmers discovered a new cash crop -- shoemaking. Working with suppliers from shoe factories in Lynn and Haverhill, Massachusetts, New Hampshire farmers did the finish work on shoes, largely in small home shops. Shoes were trucked to Hampton or Dover, then sent south by wagon, boat and later rail. Shoe outwork and its support industry, tanning, were particularly prevalent in the towns of Fremont, Kensington, Kingston, Epping and South Hampton. In addition to saw and grist mills and shoe making, other local industries included a warp and yarn, cotton and plow factory in Brentwood; woolen, plaster and box mills in West Epping; carriage and furniture making and later coopering in Fremont. By 1840, a total of twenty-two small manufacturers and tradesmen worked in the town of South Hampton, producing bricks, shoes and lumber-related products such as pails and carriage parts. (Monroe, 1991d)

The opening decades of the 19th century proved to be the peak in population and economic expansion throughout much of Rockingham County. Following the War of 1812 and its trade embargoes, commerce began a slow decline in Portsmouth. Increased competition from Boston, Newburyport and Portland cut into the town's profitable shipping trade. Lumbering operations relocated further inland. The move of the state capital to Concord, a lack of a substantial industrial base and limited access to markets in the interior further eroded the town's position of prominence (Jobe, 1993). As the interior of New Hampshire opened for settlement and urban centers such as Manchester and Lowell expanded, many of the agricultural towns in Rockingham suffered population losses. Brentwood, Greenland, Kensington, Newington, New Castle, Sandown, Stratham and Windham all declined in population after the first quarter of the 19th century (U.S. Census Bureau, 1940)

Historical Resources

In the 1780's, the Georgian style was superseded by a new style, the **Federal**, popularized by British designers such as Robert and James Adam and again introduced to this country through English architectural pattern books. Adorned with light and delicate classical details, Federal-period houses are rectangular and usually have low-pitched hip roofs, screened by a turned balustrade. Center entries are often flanked by sidelights and topped by a fanlight (Tolles, 1979). Floor plans were opened up by the placement of chimneys against the outer walls, staircases in the rear of the center hall, and the removal of kitchens and other working areas to an ell or wing. The two- or three-story brick or wood main block with a roof or gable roof is the most commonly found Federal form in Rockingham County. Another variation appears in a small number of wooden houses that have brick gable ends with paired chimneys (Tolles, 1979). In smaller examples of the Federal form, the center entry house is only one bay deep, with working areas in a rear ell.

The earliest known example of a Federal style house on the seacoast was the Woodbury Langdon House on State Street in Portsmouth, a three story brick house built c.1785 but no longer standing. In 1799 the John Peirce Mansion on Middle Street in Portsmouth introduced the Federal style of Boston and Salem to northern New England and established the west end of the city as a fashionable residential neighborhood. A number of large Federal style houses followed in the west end, including the c.1800 Langley Boardman House; the 1807-09 wood Larkin House; c.1810 Long-Ladd House, and the c.1815 brick Larkin-Rice House, built with privateering profits from the War of 1812. The largest example of a Federal house in Portsmouth is the Rundlet-May House, built in 1806-1807 on an artificial terrace above Middle Street. The house is notable for its U-shaped connected accessory building and the survival or its original landscape plan.

A similar row of Federal houses is located on Front Street in Exeter. The Sleeper, Gardner and Perry-Dudley Houses, all three-story center hall houses, were built between 1809 and 1826 (Tolles, 1979). An unique example of the Federal style is the Dr. Samuel Tenney House at 65 High Street, designed by either Bradbury Johnson or Ebenezer Cilfford about c.1800. The facade -- three central bays topped with a raised clerestory roof -- may have been derived from James Paine's Noblemen and Gentlemen's Houses (London 1765). The entry is framed by fluted Doric pilasters, which support a full Doric entablature and a pediment with wood tracery in the tympanum, similar to designs in William Paine's The Practical Builder (London 1774; Boston 1792).

Many examples of Federal style homes were built throughout rural Rockingham County, particularly along expanding stage coach routes and village centers. The rural examples are more vernacular that their urban counterparts and differed proportionately from their more massive Georgian predecessors. These vernacular examples were built in two and three story forms with end chimneys and shallow hip roofs; the most common type of ornamentation was a semi-elliptical fanlight above the center entry. Small farmhouses dating from the 18th century were often updated with the addition of a large Federal main block during the prosperous opening decades of the 19th century.

The first three decades of the 19th century saw the construction of many neoclassical churches inspired by the architectural pattern books of Asher Benjamin and others. These public buildings differ from second period examples in having square towers incorporated within the body of the church and pedimented porches supported by columns or pilasters. Many later churches blend Federal, **Greek Revival**, **Gothic Revival** or **Italianate** elements (Tolles, 1979). Ebenezer Clifford and Bradbury Johnson cooperatively designed the First Parish Meeting House in Exeter between 1798 and 1800. The two-story church with gable roof is oriented laterally to the street, as were older meeting houses. Centered on the facade are a three stage tower and two-story pavilion decorated with Doric pilasters and entablatures. Fremont Meeting House on Route 107, erected in 1800, is also similar to its second period predecessors in form. Built in 1800 by the Society for the Propagation of the Gospel among the Indians and Others in North America, the Gosport Chapel at the Isles of Shoals is a stone, single-story structure with a square tower on the south gable end (Tolles, 1979). Two well-known examples in Portsmouth are the brick St. John's Church, built in 1807 on Chapel Street; and the Granite Unitarian Church on State Street, built 1824-1826.

Much of Portsmouth's downtown streetscape was rebuilt during the Federal era following the destruction of three major fires in 1802, 1806 and 1813. Streets were widened and replacement construction was in more fireproof materials such as brick and composite roofs of tar and gravel. In 1814, the state provided legal authority to mandate brick building throughout the urban core to avoid the future destruction of fires (Candee, 1992). The masonry blocks along Market and neighboring streets illustrate a full range of New England commercial building types of the first half of the 19th century. The centerpiece of new construction was the Portsmouth Athenaeum, built 1803-1805, by Bradbury Johnson, assisted by master mason Daniel Blasdel, joiner James Nutter and carver William Dearing (Tolles, 1979). Later additions to the downtown were in the Italianate style, such as the 1854 brick North Church at Market Square, designed by Boston architects Towle and Foster (Candee, 1992). The only other towns in the study area that developed commercial downtowns were Exeter and Epping; in both cases, commercial construction coincided with industrial expansion, beginning in the 1840's.

Industrial architecture in Rockingham County began with plain wood-frame grist, saw and fulling mills that once could be found along most streams and rivers; few survive today. In the 19th century, wood, stone and brick mill buildings were erected as textile factories, powered by both water and steam. The earliest were of modest size with clerestory roofs, outside stair towers and bell cupolas. These were superseded by larger structures, mainly of more fire-proof brick, with pitched roof, dormer windows and skylights. After the Civil War, still larger factories with low-pitched or flat roofs were constructed in such large textile centers as Manchester and Dover, outside of Rockingham County (Tolles, 1979). The largely unaltered textile mills of the Newmarket Manufacturing Company on the Lamprey River in Newmarket are the best example in the state of granite mills, built c.1822.

1840s-1910s

Railroads, emerging industrial economy, early tourism, abandoned farm movement

Historical Background

Beginning in the 1840's, the railroad arrived in Rockingham County and opened new transportation and market routes, marking the end of the turnpike as the primary route of travel. As had the turnpikes, the line of the railroads largely followed north-south paths. In 1840 the Eastern Railroad opened from Portsmouth, south through Greenland, North Hampton, Hampton, Hampton Falls, Seabrook and on through Essex County to Boston

(Hazlett, 1915). Three years later, the Boston and Maine Railroad began operation through the largely agricultural towns of Atkinson, Plaistow, Newton, East Kingston, Exeter, Newfields, Newmarket, Durham, Madbury, Dover, Rollinsford and South Berwick, Maine.

In 1849, the Manchester and Lawrence Railroad began operation with tracks through Windham, Salem and Canobie Lake. The first east-west railroad line opened in 1850; Concord and Portsmouth Railroad traveled from Concord to West Epping, Epping, Rockingham Junction at Newmarket, Stratham, Greenland and Portsmouth. In 1872, the cities of Portsmouth and Dover were linked with the Portsmouth and Dover Branch Railroad. The Nashua and Rochester Railroad, constructed in 1874, linked the cities of Worcester and Portland, passing through Windham, Hampstead, Sandown, Fremont, and Epping.

The small scale industrial development established in the early 19th century continued to expand in several towns. In Newfields, a brass works, iron foundry, the Squamscott Machine Company, Fifield's Machine Shop, and a tannery were all clustered near the railroad depot. (Monroe, 1991c)Established factories such as the Exeter Manufacturing Company on the banks of the Squamscott River were joined by a burst of industrial activity near the newly established railroad in the west end of Exeter. The Exeter Machine Works opened in 1864, followed by the Rockingham Machine Company, Exeter Brass Works, the R.E. Prescott Company, Lamson's Pottery, Exeter Marble Works and Gale Brothers Shoe. By the 1890's, Gale Brothers was the largest employer in town, with a work force of 700 (Monroe, 1991b). In Portsmouth, the presence of the railroad opened the west end of the city to industrial and residential expansion. Among the largest industries were the Eldredge Brewery, established 1858, the Frank Jones Brewery in 1870's, the Portsmouth Shoe Company in 1886 and Morley Button Factory in 1891. An interesting support industry to the Frank Jones Brewery in Portsmouth was the production of large amounts of barley in Brentwood.

The smaller towns in the study area were affected by the presence of the railroad as well. In towns such as Newton and Kingston, small villages developed around the passenger and freight depots (Hurd, 1882). Atkinson, Plaistow and East Kingston served as early railroad bedroom communities, with residents commuting to factories in Haverhill, Lowell and Lawrence, Massachusetts. Atkinson, East Kingston, Seabrook, Kingston and Newton residents continued to turn out piece work for Haverhill and Lynn shoe factories, which were shipped by rail. Large and small shoe factories opened near the railroads in East Kingston, Epping and Hampton. The shoe industry continued well into the third quarter of the 20th century in Epping (Hartford, 1975). Ice was shipped by rail from the towns of Hampton and East Kingston. In addition to shoe finishing operations, tanneries, sawmills, carriage manufacturing were the largest industries in Kingston. In 1870 alone, the town produced more than 600 wagons and 200 carriages (Rockingham Planning Commission, 1983). In the 1880's, businesses in Newton included a carriage manufactory, five shoe contractors, several manufacturers of shoes, blacksmiths and house contractors (Hurd, 1882). Shoe manufacturing the most important industry in Salem; F.P. Woodbury Shoe Company, Evans Artificial Leathers and W.H.H. Kelly Shoe Factory all operated there, as well as smaller shops and home outwork. During the mid-19th century, extensive brickyards developed in Fremont, Epping, Exeter, East Kingston, Newington, Newfields, South Hampton. These yards supplied bricks for mill buildings and commercial blocks in urban centers such as Manchester, Lowell and Boston. In some areas, brick making lasted through the first quarter of the 20th century.

By the mid-19th century, most of Rockingham County had been deforested by the lumber trade and cleared for agriculture and pasture. The emphasis shifted from self-sufficient farming to specialty crops, market gardening, the production of dairy and orchard produce and later poultry to feed the growing populations of nearby industrial cities. Milk, eggs and cheese were transported to urban centers such as Boston and Haverhill both by rail and by individual farmers with milk routes. The production of hay, both for local and urban consumption, increased through the end of the 19th century. Farms across New Hampshire produced just under two million pounds or more of maple products in the 1870's and 1880's. Despite the growing food needs of nearby cities, large numbers of farms in Rockingham County and throughout the state went out of production during the second half of the 19th century; the land returned to forest and town populations declined. The agrarian towns of Atkinson, East Kingston, Greenland, Hampstead, Hampton Falls, Kensington, Kingston, New Castle, Newfields, Newington, North Hampton, Rye, Sandown, South Hampton, Stratham and Windham all suffered population losses between 1850 and 1910 (U.S. Census Bureau, 1940)

In an effort to improve the sagging economy, in 1889 the state appointed a Commission of Immigration to bring about the "re-peopling of rural districts." Statistics published by the Commission listed 1,342 abandoned farms in the state, and an advertising campaign was launched aimed at attracting both future farmers and affluent city dwellers interested in buying "a pleasant and beautiful home for the whole or some part of the year." The program was apparently successful; in 1902, 849 farms were being used as summer homes across the state (Strafford Rockingham Regional Council, 1980).

Summer tourism took several forms and proved to be the best incentive for the region's late 19th century economy, partially aided by a new form of transportation, the electric street car. Beginning in 1899, street cars connected the towns of Portsmouth, Greenland, Rye, North Hampton, Exeter, Hampton Beach and points south. Other electric railroads in the county were the Haverhill, Plaistow and Newton Railway Company; the Hudson, Pelham and Salem Street Railway Company; Manchester and Derry Street Railway, and the Chester and Derry Railroad Association (Hazlett, 1915).

Oceanfront hotels had opened as early as 1819 in Hampton, particularly at Boar's Head. As elsewhere along the Atlantic coast in New England, many of these large wood-frame buildings burned and were quickly replaced with other hotels. Later in the 19th century, the character of Hampton Beach changed rapidly, as summer homes and businesses were built, leveling the dunes. The owners of the Exeter Street Railway Company built the Hampton Beach Casino in the 1890's to encourage ridership. In 1876, the town of Gosport on the Isles of Shoals was annexed to Rye, including the popular summer destinations of the Appledore and Oceanic hotels. In 1899, the Abenaqui Golf Club was organized on the mainland in Rye, and by 1915, three hotels and five boarding houses had opened in town (Hazlett, 1915). The Wentworth-by-the-Sea Hotel opened in New Castle in the 1870's, one of the few grand, wood-frame hotels still standing today.

Further inland, visitors to cottages and summer boarding houses along lakes in Kingston, Salem and Windham arrived by train. Amusement areas such as the Granite State Grove were established on the shores of Canobie Lake; crowds of day visitors took the electric street railway from Nashua, Lawrence, Methuen and Haverhill. In 1905, Rockingham Park horse track was built in Salem by a group of New York promoters. The state outlawed gambling in 1906, and the track lay idle until after World War I when it was used for automobile and motorcycle racing. After gambling was legalized in 1933, Rockingham Park was again used for horse racing and has become one of the state's largest sources of revenue.

In addition to natural scenic beauty, visitors were attracted to the Piscataqua region by its colonial history, romanticized and popularized by such late 19th century writers as Thomas Bailey Aldrich and Sarah Orne Jewett, architect Arthur Little and photographer Emma Coleman. In 1907, the first historic house museum opened in Portsmouth, the Thomas Bailey Aldrich Memorial, followed by the Moffatt-Ladd House, Wentworth-Gardner House, John Paul Jones House and the Warner House.

In Epping, the Hedding Campground opened in the 1860's; tent meetings were held through 1921 in an effort to convert people to Christianity, specifically Methodism. In the late 19th century, the draw of the campground began to change, cottages were built, and the campground flourished as a middle class vacation spot. In 1881, 18,000 people came to Hedding on a single day, via a separate spur and depot on the Concord and Portsmouth Railroad, and by 1882, the Hedding Association owned about 200 acres (Monroe, 1991a).

Historical Resources

Following the building explosions of the Georgian and Federal periods, much of New Hampshire was slow to adopt the Greek Revival style, and examples are not widespread in Rockingham County. **Greek Revival** style houses are often temple-like rectangular blocks oriented gable end to the street and have columned porches or porticos, low-pitched roofs without dormers, flat-headed windows and doors and heavy entablatures under the eaves (Tolles 1979). Buildings were often painted white to simulate the marble of classical antiquity. Just as the center hall plan remained popular through the Georgian, Federal and Italianate styles, the sidehall end house plan continued to be built through the 1920's with a variety of stylistic ornamentation.

The Greek and **Gothic Revival** styles had the greatest impact on church architecture constructed or remodeled in the mid 19th century (Tolles, 1979). The first Congregational Society church on Route 88 in Hampton Falls was built in 1838. It is a Greek Revival single story building, with a temple facade, full Doric entablature, portico

supported by two Doric columns and two antae decorated with recessed trefoils, screen two identical entries with heavy entablatures. Local tradition records that itinerant Italian painters did the frescoed walls and ceilings on the interior (Tolles, 1979). The 1837 Congregational Church on Emery's Lane in Stratham combines motifs from several styles -- a Federal cupola and pediment fan, Greek Revival corner pilasters and tower details, as well as a Gothic Revival pointed doorway, window and belfry arches (Tolles, 1979).

Buildings in the **Italianate** style or with Italianate elements are more common in the region. Among the prominent features of this style are asymmetrical facades and temple and wing floor plans, low-pitched or flat roofs, projecting eaves with wooden brackets, round and flat-headed windows with hoods, towers, verandas, bay windows and balustraded balconies. Several public buildings built in the Italianate style in downtown Portsmouth include the North Congregational Church at Market Square (1854-55); the Portsmouth High School/City Hall on Daniel Street built c.1858 by local carpenter William Tucker; the c.1866 Old South Meeting House in the South End, and the U.S. Custom House and Post Office, built 1857-1860 on Pleasant Street. This massive granite rectangular Italianate edifice was designed by Ammi Burnham Young (1798-1874), the first supervising architect in the U.S. Treasury Department. In an attempt at fireproofing, the building was constructed with wrought iron beams supporting brick floor vaults; columns and stairways are cast iron.

The 2-1/2 story Amos Tuck House at 89 Front Street in Exeter is an example of the temple and wing form, with a flat-pitched gable roof with paired eave brackets, a flush-boarded facade, and a simple columned entrance porch. It was built in 1853 for Amos Tuck, a prosperous Exeter lawyer, congressman, naval officer and railroad developer. In 1855, Boston architect Arthur Gilman (1821-1882) designed the Exeter Town Hall in the Italianate style. The 4x12 bay two-story brick building is topped with a hip roof with gable pavilions centered on the north and south elevations. The imposing structure has a balustraded Ionic portico on the east elevation, and arched first and second floor windows. Crowning the structure is an octagonal cupola with engaged Ionic columns, arched windows and an octagonal dome topped by the statue of Justice.

The **Second Empire** style, mainly characterized by the mansard roof, made its initial appearance before 1860, but did not flourish until the 1870's, particularly in urban areas such as Portsmouth and Exeter (Tolles, 1979). In nearly every other town in Rockingham County, there are a few examples of the Second Empire Style. Many Georgian or Federal era houses were updated with the addition of a Second Empire roof. The Moses-Kent House on Pine Street in Exeter was built about 1870 for Henry C. Moses, a wood dealer in Exeter and Boston. The house is an excellent example of Victorian eclecticism: a Second Empire mansard roof and off-center tower, an Italianate bracketed cornice and rusticated wall surfaces, and Renaissance Revival porches. The house's landscape was designed by Frederick Law Olmsted (1822-1903) (Tolles, 1979).

Ale maker and industrialist Frank Jones is responsible for several late 19th century building projects in the seacoast, most notably, his own home, Maplewood Farm, built in 1867-1876 in the Italianate and Second Empire styles on Woodbury Avenue in Portsmouth. The surrounding thousand-acre estate, enclosed by stone walls, included exotic trees and plants, vegetable gardens, greenhouses, fish ponds, statuary, fountains, tennis courts, croquet lawns and a race track. Jones also financed the purchase and expansion of the Wentworth-by-the-Sea Hotel in New Castle in 1879; the construction of the Second Empire style brick Jones-Sinclair House at 241 Middle Street for his son in 1865; his brick brewery complex beginning in the 1870's off Islington Street; and the reconstruction of the Rockingham Hotel on State Street in 1884-85.

The seacoast has only occasional traces of other architectural styles popular in mid to late 19th century America (Tolles, 1979). The **Queen Anne, Shingle** and **Romanesque Revival** styles, popular elsewhere after the Civil War, are not broadly represented, largely due to a lack of economic expansion in Rockingham County during this period. Existing houses were often updated with the addition of a Queen Anne style veranda, supported by turned posts and sawn brackets. Exceptions include South Danville and the town center of Newton, where a large number of Queen Anne style buildings were constructed after a fire destroyed much of the area in 1887.

Although agriculture was largely in decline in Rockingham County during the second half of the 19th century due to competition from markets in the mid-West, those farms that remained in operation often adopted the progressive building technique of connecting residential and working buildings, creating the model of a "big house, little house, back house, barn." Connected farm buildings were considered more efficient than the English tradition of separate work buildings scattered throughout agricultural fields. The connected farm buildings were

in an L- and U-shape, creating separate front and barn yards, usually with southern and eastern exposures. The front yard was attractively landscaped, and the facades of the connected buildings were painted and trimmed with architectural ornamentation, presenting the tidy appearance of a prosperous farm. The Towle Farm on Towle Farm Road in Hampton, the Beane dairy farm on Dover Road in Newington, and a number of farms along Route 101 in Stratham are all good examples of late 19th century connected farm buildings. (Monroe, 1991f)

One interesting resource in the study area is the county farm in Brentwood, which offers examples of late 19th century brick institutional building. In 1868, Rockingham County Convention purchased the 160 acre Thyng farm and the D.W. Ladd farm as the county farm, and Brentwood became the seat of county activities. The county farm complex contains several significant structures, including hospital, county jail, county home, farm buildings and one cemetery. It is surrounded by expanses of open land still in farming operation.

The construction of railroads and street car lines throughout Rockingham County after 1840 introduced new types of historical resources, including freight and passenger depots, signals, bridges and roundhouses in a variety of architectural styles. Among the rail-related buildings that remain standing in the county include the Powwow River flag stop shelter, now moved to the East Kingston depot; the Romanesque Revival stone passenger station, built 1890-91 in Exeter; the Rockingham Junction passenger depot and freight house and nearby saloon and eating house in Newfields; wood-frame depots in North Hampton and Plaistow; and the brick Exeter, Hampton and Amesbury electric railroad power station on Exeter Road in Hampton. The East Kingston is a well-preserved example of a rural depot village that developed in response to the railroad; the Italianate style passenger depot, freight house, the Powwow River shelter, storage shed, and general store and several residences.

Late 19th century tourism was cause of much new construction in the late 19th and early 20th century. The Camp Hedding Association began construction of its Epping campground in 1862. The area currently includes 126 cottages -- small wood-frame vernacular buildings sided with shingles or clapboards with modest ornamentation -- about five large public buildings, including a recreation center, post office and Chataqua Hall, at least one spring and several archeological sites. Similar types of cabins and cottages lined the shores of Cobbett Pond, Canobie Lake and Shadow Lake in Windham and Salem and Great and Country ponds in Kingston. The Wentworth-by-the-Sea Hotel in New Castle was built in 1874 as an 82-room house and expanded throughout the turn of the century in the Second Empire and Colonial Revival styles. It remains the only Victorian wood frame summer hotel on the northern New England Atlantic coast. Beachfront properties in Hampton were rapidly developed in the late 19th/early 20th centuries. The largest attraction was the Casino at Hampton Beach, a large wood Stick style building that housed an auditorium and amusements. More vernacular examples of historical resources along the oceanfront are fish houses on Atlantic Avenue in North Hampton and beach cabanas on Route 1A in Rye.

Public buildings, such as church, libraries and schools, were among the few buildings constructed in late 19th century architectural styles. The stone and timber St. Andrews-by-the-Sea Church on Church Road in Rye was built in 1878, funded by summer residents of Rye and Little Boar's Head and designed by the Boston architecture firm of Walter T. Winslow and George H. Wetherell. The round west stained glass window was laid out by architect Charles A. Platt and executed by Tiffany and Company (Tolles, 1979). The Phillips Church in Exeter, an English Gothic Revival church, was designed by Cram, Goodhue and Ferguson of New York City. The L-shaped building has an off-center tower, uncoursed stone walls, tower crenellations, pointed-arch ventilators, pointed-arch windows with stained glass and simple belt courses. The Sanborn Seminary on Route 107 in Kingston is an example of academic High Victorian Gothic architecture. The building has polychrome wall and roof materials, stone belt courses set against brick; pointed window arches; high stories; steep-pitched dormer and tower roofs; complex roof lines; tall corbelled chimneys; and wrought iron finials and crestings.

Small public library buildings were constructed throughout the region and the country in the late 19th and early 20th centuries, prompted by the philanthropic example of Andrew Carnegie. One example on the National Register is the Nichols Memorial Library in Kingston, designed by Henry Hyde Dwights and Howland Shaw Chandler of Boston. The building is sheathed with weather faced granite, with oiled cypress trim, red slate roof, and the solid massing characteristic of the Romanesque designs of Boston architect Henry Hobson Richardson.

1910s-1950s:
World wars, interstate highways, suburbanization and Pease Air Force Base

Historical Background

After decades of slow growth, large numbers of workers poured into the seacoast era to work at private shipyards such as the Shattuck Shipyard in Newington, the Portsmouth Naval Shipyard and for the defense industry during World Wars I and II. The character of this section of Newington changed radically during the early to mid-20th century as more industries were developed along the Piscataqua River. In Portsmouth, neighborhoods such as Atlantic Heights, Pannaway Manor and Wentworth Acres were constructed to house war-time workers, and much of the city's older housing stock was divided into several apartments to house the overflow.

A significant agricultural business in Rockingham County was poultry. By the 1940's in Kingston, poultry was an international million dollar business, employing about 200 people in town. A slump in the industry just before 1960 caused the decline of the Kingston enterprise. Housing subdivisions were built on the former breeding farmlands. Poultry farming peaked in Salem in the 1950's, followed by a quick and complete decline in the 1960's.

Between 1903 and 1905, the state legislature passed laws that created the post of state highway engineer, called for a highway survey of the entire state, designated certain roads as state highways, and established regular state highway appropriations (Garvin D. B., 1988). A system of three "trunk lines" was proposed, running from the Massachusetts border in the Piscataqua, Merrimack and Connecticut river valleys and converging in the White Mountains. Many roads that had been under-utilized during the railroad era were widened and paved, eventually causing the demise of railroading in the state (Monroe, 1992a). Transportation around Great Bay remained a problem through the early 20th century. A 1923 article in Engineering News Record described Portsmouth as still being remarkably shut off by waters from the state to the north and west, even though "It is on the natural route from these parts of the state to the beach resorts at Hampton and south to Boston, Providence and resorts at Cape Cod and Narragansett Bay" (Anonymous, 1934) As part of the Piscataqua trunk line system (today's Route 16), the General Sullivan Bridge completed in 1935 replaced the old Boston and Maine Railroad and highway bridge between Newington and Dover.

The construction of Pease Air Force Base in 1952 radically altered the historical character of the town of Newington. The strategic air base occupied parts of Portsmouth and Greenland and nearly half of Newington's land area, including some of the town's best farmland and many homes. It bisected the northern and southern parts of town, forcing residents to travel through Portsmouth to reach the other side of Newington. A public road was put through the base in 1972 to alleviate this difficulty. Following the end of the Cold War and the down-sizing of the country's military operations, the air base closed in 1991.

Despite the increase in the defense industry, much of the region's economy remained depressed until the 1960's, when economic growth was spurred by a new interstate highway system, including Route 95 through the seacoast towns and Route 93 through Salem and Windham. The state's favorable tax rate and proximity to new technology-based industries in Massachusetts brought a new wave of settlement, which resulted in extensive new building to accommodate the unprecedented increase in population. Much of the region's former agricultural land has now been reforested or subdivided for suburban neighborhoods. Much has fast become a bedroom community for Merrimack Valley industrial prosperity, increasing suburban character. [Note about speed and intensity of land development]

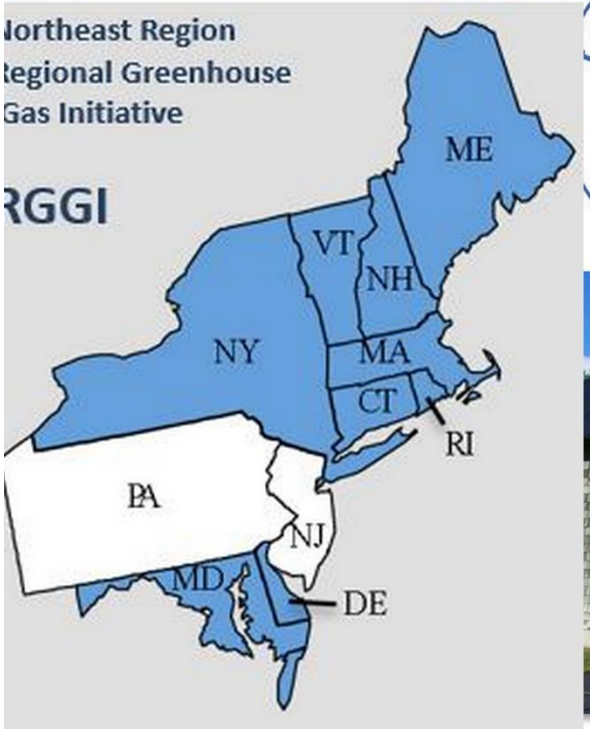
Historical Resources

A singular architectural phenomenon in Rockingham County during this period was the construction of the Searles School and "Stanton Harcourt"/Searles Castle on Route 111 in Windham, both designed in the Tudor Gothic style by Boston architect Henry Vaughan (1845-1917) for millionaire Edward F. Searles. Searles consolidated many older farms and built a medieval stone castle, Shingle style stable and carriage house, surrounded by granite walls on a high hill overlooking Route 111. The influence of the stone architecture can be seen in the extent of other early 20th century stone work in the area.

During the first four decades of the 20th century, little construction occurred in rural Rockingham County as towns continued to decline due to the loss of farms and population. Most of the scattered early 20th century historical resources in these areas are small simple, vernacular dwellings that represent no major architectural styles. On a limited scale in more populated areas, automobile suburbs in the **Colonial Revival** and **Bungalow** styles developed in such areas as the west end of Exeter; on the street car line along Hampton Road, and on the edges of the urban core of Portsmouth on Woodbury Avenue, Lafayette Road and Islington Street (Monroe, 1991e). A limited number of civic buildings such as schools, libraries and post offices were built most often in the Colonial Revival style (Tolles, 1979). The largest residential developments during this period were Atlantic Heights, Pannaway Manor and Wentworth Acres, built during World Wars I and II with federal funding to house defense workers. Atlantic Heights, designed by Boston architects Kilman & Hopkins and built in 1918-1919, contained 278 brick and wood Colonial Revival residences in 150 single family homes and duplexes and eight dormitories laid out along winding streets, a design promoted by the English Garden City movement. The Atlantic Heights development was designated as a National Historic District in 2006. Built in 1941 by the federal Defense Homes Corporation, the 159 Colonial Revival ranches and capes in Pannaway Manor line curvilinear streets and cul-de-sacs. Also built in the early 1940's, Wentworth Acres differed in the use of "garden-style" apartments and duplexes constructed around courtyards.

The stagnant built environment of Rockingham County changed rapidly after the construction of Interstates 93 and 95 and the expansion of high technology industries in northern Massachusetts and in the Merrimack Valley. Huge tracts of unused farmland were subdivided into house lots, and formerly agricultural towns such as Salem, Atkinson, Windham, Stratham, Hampstead and South Hampton grew rapidly as bedroom communities for the first time in 100 years. The accompanying commercial development centered around automobile corridors such as Route 28 in Salem; Route 111 in Kingston, Windham and Salem; Route 1 in Portsmouth, Rye, the Hamptons and Seabrook; Route 125 in Plaistow; and most recently, Woodbury Avenue in Portsmouth. Much of the initial strip development was in the form of small-scale structures such as gas stations and convenient stores, fast food restaurants and shopping plazas. Many former farm houses have been adaptively reused as commercial and office buildings with varying amounts of sensitivity. With the advent of recreational shopping, larger-scaled plazas, malls and later big-box complexes have been built along much of Route 1 from Seabrook to Portsmouth, Woodbury Avenue in Portsmouth and Newington, Route 125 in Plaistow and Epping, Route 28 in Salem, and Route 33 in Greenland. Generally these structures are out of scale with surrounding older neighborhoods and development patterns, and have been built at the expense of historic structures and landscapes.

Several good examples of mid-century modern architecture can be found at Phillips Exeter Academy. The academy library on Front Street was built from 1971 to 1973 from designs by Philadelphia architect Louis I. Kahn. The brick, steel, glass, concrete and Italian travertine marble square box appears to have five stories, but in fact has nine separate levels. The George H. Love Gymnasium was designed in 1968 by the firm Kallman and McKinnell, architects of Boston City Hall. The building appears to be turned inside out, with exterior roof trusses, interior flying buttresses, and columns tapered toward the bottom rather than the top (Tolles, 1979). Shepley, Bulfinch, Richardson and Abbott of Boston designed the Lewis Perry Music Building, a rectangular white limestone and glass building with a flat-roof.



LOCAL ENERGY SOLUTIONS

New Hampshir
Local Energy
Work Group

ENERGY CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Energy

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Cover photo credits: Electric vehicle charging station, Portsmouth Patch (top right); SEAREI PV installation project, searei.org (bottom right).

Energy

Introduction

The Complex Energy Picture

Our region and New Hampshire's response to energy, climate change, and our economic future are inextricably linked. As a result of this interaction, energy consumption and climate change share common ground with respect to the actions that can address not only their impacts but their benefits and possible opportunities. The most effective actions include energy efficiency and conservation, which reduce the amount of energy consumed, while renewable energy eliminates emissions and shifts the source of the energy to local and domestic sources. Locally produced energy creates jobs and keeps dollars in the state economy.

All citizens in New Hampshire depend on reliable energy to carry out their work and conduct their lives. As a result of this need, 10 to 50 percent of the income of many New Hampshire households goes to paying energy bills, and energy is a significant expense for businesses, industries, and government. (Vermont Energy Investment Corporation, 2011) As energy costs rise, the region can strengthen its economy and preserve the environment by focusing on energy conservation and efficiency, making the best use of our region's renewable resources, and implementing sustainable land use and resource conservation practices.

> While expanded energy efficiency will reduce total energy demand and emissions, further emission reductions can be achieved as New Hampshire meets an increasing portion of its total energy demand by developing renewable and low- CO^2 emitting energy resources.
>
> *NH Climate Action Plan (2009)*

In order to preserve our quality of life, it is important to understand and plan for our future energy use, recognizing that rising energy costs influence municipal budgets and local and regional economies. Dependence on energy sourced from outside the state affects our energy security. Use of carbon based energy sources can adversely influence climate, air quality, water quality, ecosystems, and public health. New Hampshire as a state is heavily dependent on the use of petroleum, coal, natural gas, and nuclear energy to generate electricity, heat our homes and businesses, and fuel our vehicles. Much of this energy is imported from outside our state. According to the New Hampshire Office of Energy and Planning, 89 percent of our gross energy inputs came from non-renewable sources. Because New Hampshire lacks fossil fuel and nuclear material resources, most of the money to purchase energy leaves the state and the country.

Statewide climate change mitigation efforts (greenhouse gas reductions) are focused on the sources of energy we use, how we produce energy, how much energy we use and for what purpose. Future economic growth in New Hampshire – paired with climate change mitigation and adaptation actions - will depend on how quickly we transition to a far more diversified energy portfolio, more efficient use of energy and development of our communities in ways that strengthen neighborhoods and urban centers, preserve rural areas, and retain New Hampshire's quality of life.

Statewide planning efforts in climate change and energy serve as guides for all regions of the state to work toward a more resilient and secure energy future. The New Hampshire Climate Action Plan (2009) and State Energy Strategy (2014) contain recommendations that have the potential to guide collaborative efforts across the state toward common goals. These plans are described in more detail in the following sections.

Municipal Energy Initiatives

Municipalities play an important role in the region's energy future by becoming themselves energy efficient, leading their community by example to conserve and make beneficial energy choices. Local energy production is also key to keeping energy dollars in the state, adding security in the supply of energy, and diversifying energy choices for residents, businesses and other consumers. In most cases, municipal zoning and land use regulations do not offer incentives to implement energy efficient site design and construction or renewable energy installations, although recent legislation has opened many opportunities for municipalities to adopt

such incentives. For example, 2013 legislation permits net metering whereby groups of buildings, even subdivisions, can share an energy source (typically renewable), selling back to the distribution grid any unused power generated by the facility. Net metering does not require changes to existing zoning and land use regulations.

Refer to the Enabling Statues section below for information about energy legislation.

In recent years, municipalities across the region have undertaken a wide range of energy related actions to better understand their energy expenditures and discuss long range energy planning. Examples include formation and technical support of energy committees, energy use inventories, building and facilities audits, master planning, infrastructure improvements, renewable energy installations, and community outreach. These efforts were largely supported by energy programs implemented by the N.H. Office of Energy and Planning and funded through federal grant programs, tax credits and rebates. Overall, municipalities benefited in many ways through their participation in these programs. Benefits ranged from gaining insight about dollars spent on energy each year, sharing experiences and challenges to meet community needs, learning about the value of preserving their historic facilities, and exchanging innovative practices.

Refer to the Energy Technical Assistance Partnership Program and Local Support of Renewable Energy sections for more information.

New Hampshire State Energy Strategy

New Hampshire Senate Bill 191-FN-A established a state energy council for the purposes of developing a ten year energy strategy for the state. Released by the Office of Energy and Planning in September 2014, the New Hampshire State Energy Strategy (prepared by Navigant Consulting, Inc.) serves to provide "forward looking guidance on electric, gas and thermal energy strategies in order to optimize the use of readily available energy resources while minimizing negative impacts on the economy, the environment, and the natural beauty of the state."

The Strategy was prepared using a phased approach which included:

- Development of a forecast for the projected consumption of electricity, natural gas and other fuels taking into consideration the existing infrastructure, expected retirements, and the possibility of alternative resources.
- Development an energy vision to guide strategy recommendations.
- Evaluation of the resource potential for energy efficiency, renewable energy, alternative fuels, distributed energy resources, demand response, storage, and transportation options across New Hampshire.
- Analysis of the existing policies, comparison to examples of best in class policy from other states, and synthesis of this data to provide strategy recommendations.
-

The Strategy summarizes the results of the energy baseline, energy vision, resource potential study, and policy analysis. It addresses the barriers and gaps standing in the way of the vision and puts forth a series of policy recommendations and strategies to address them.

As shown in Figure EE1, the Strategy identifies as part of the Energy Vision key drivers (high impact, high influence) that will define New Hampshire's energy future – energy efficiency, renewable power generation, fuel choice and availability, transportation options, and grid modernization.

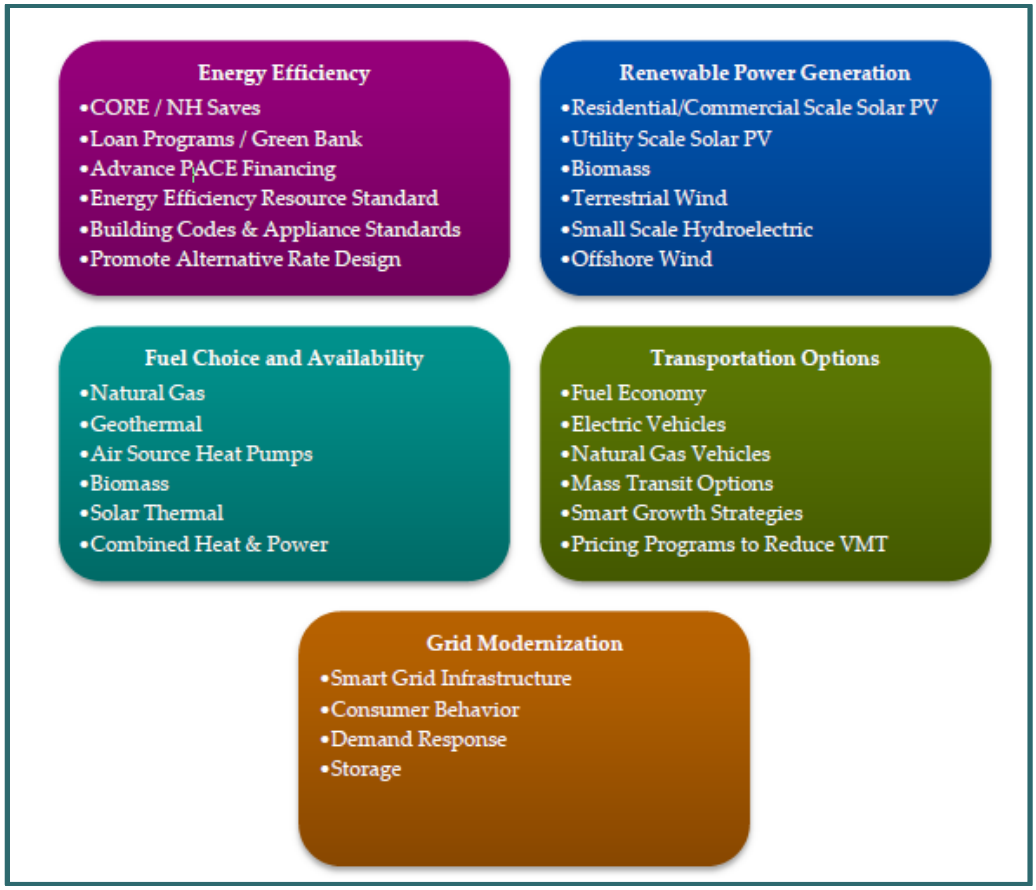


Figure EE1. Resources, programs and initiatives that influence the key drivers of the state's energy future.

New Hampshire Climate Action Plan

In 2009, the Governor's Climate Change Policy Task Force released the N.H. Climate Action Plan, containing 67 overarching strategies necessary to meet the states greenhouse gas reduction, economic, environmental, and climate change related goals. The Plan's Task Force recommended that New Hampshire strive to achieve a long-term reduction in greenhouse gas emissions of 80 percent below 1990 levels by 2050. The recommended strategies are organized into the following 10 overarching plan goals:

1. Maximize energy efficiency in buildings.
2. Increase renewable and low CO_2-emitting sources of energy in a long-term sustainable manner.
3. Support regional and national actions to reduce greenhouse gas emissions.
4. Reduce vehicle emissions through state actions.
5. Encourage appropriate land use patterns that reduce vehicle-miles traveled. Reduce vehicle-miles traveled through an integrated multi-modal transportation system.
6. Protect natural resources (land, water and wildlife) to maintain the amount of carbon fixed or sequestered.
7. Lead by example in government operations.
8. Plan for how to address existing and potential climate change impacts.
9. Develop an integrated education, outreach and workforce training program.

The Plan aims to achieve the greatest feasible reductions in greenhouse gas emissions while also providing the greatest possible long-term economic benefits to the citizens of New Hampshire. The most significant reductions in both emissions and costs will come from substantially increasing energy efficiency in all sectors of our economy, continuing to increase sources of renewable energy, and designing our communities to reduce our reliance on automobiles for transportation.

New Hampshire's Climate Action Plan presents an opportunity to:

- Spur economic growth through investment in our state's economy of monies currently spent on energy imports.
- Create jobs and economic growth through development of in-state sources of energy from renewable and low-emitting resources, and green technology development and deployment by New Hampshire businesses.
- Avoid the significant costs to the state's infrastructure, economy, and the health of our citizens needed to respond to climate change.
- Preserve the unique quality of life that makes New Hampshire an outstanding place to live, work, and raise a family.

The plan was intended to act as a broad guide to examine - across a broad spectrum of sectors - projected future conditions and needs, and adjust our actions as needed to maintain a high quality of life in our state. The N.H. Climate Action Plan has helped guide many research and planning initiatives, policy decisions, and audits of the existing regulatory standards and procedures by state agencies to address climate change. Currently, there is no dedicated funding source or staff to assist with implementing the recommendations of the plan.

Enabling Statutes

New Hampshire statutes establish the purpose for implementation and the authority given to municipalities to pursue planning initiatives and adopt land use regulations relating to energy. As described below, legislative actions have enabled greater flexibility and choices, provided incentives, and removed barriers for municipalities and private citizens to pursue energy alternatives.

State Economic Growth, Resource Protection, And Planning Policy RSA 9-B:3 (enacted in 2000): Defines smart growth as ''the control of haphazard and unplanned development and the use of land which results over time, in the inflation of the amount of land used per unit of human development, and of the degree of dispersal between such land areas. The statute permits the results of smart growth to address land use, environmental protection and quality of life elements.

Energy Commissions RSA 38-D (effective September 27, 2009): Enables the appointment of an energy commission by either the local legislative or the local governing body of 3-10 members with staggered three year terms. The purpose of an energy commission is "…for the study, planning, and utilization of energy resources for municipal buildings and built resources of such city or town", to research municipal energy use, and recommend to local boards pertaining to municipal energy plans and sustainable practices, such as energy conservation, energy efficiency, energy generation, and zoning practices.

Persons and Property Liable to Taxation RSA 72:61-72:73: Permits municipalities to offer a property tax exemption on solar, wind and wood heating energy systems. These systems include solar hot water, solar photovoltaic, wind turbine or central wood heating systems (not stovetop or woodstoves).

State Building Code RSA 155-A:2(VI): Permits communities to adopt stricter measures than the New Hampshire State Building Code.

Net Energy Metering RSA 362-A:9 (enacted in 2013): Permits net metering in conformance with net metering rules adopted and orders issued by the Public Utilities Commission.

Master Plan; Purpose and Description RSA 672:1 III-a: "Proper regulations encourage energy efficient patterns of development, the use of solar energy, including adequate access to direct sunlight for solar energy uses, and the use of other renewables forms of energy, and energy conservation. Therefore, zoning ordinances should not unreasonably limit installation of solar, wind, or other renewable energy systems or the building of structures that facilitate the collection of renewable energy, except where necessary to protect the public health, safety, and welfare."

Planning and Zoning, Master Plan, Purpose and Description RSA 674:2.III(n): "An energy section, which includes an analysis of energy and fuel resources, needs, scarcities, costs, and problems affecting the municipality and a statement of policy on the conservation of energy."

What the Region Said About Energy

Statewide and Regional Surveys

Statewide Survey Results

Three of four residents (77%) support expanding incentives for home energy efficiency improvements (with 52% who "strongly support"), followed by higher energy efficiency standards in new buildings (74%), and promoting renewable energy sources such as solar, wind and geothermal (73%). Meanwhile only 34% were in support of public charging stations for electric vehicles.

- Those who work at home are *more* likely to strongly support expanding incentives for home energy efficient improvements.
- Households earning less than $40,000 are *more* likely to strongly support promoting renewable energy sources.

Half of residents (49%) think that local governments should be very involved in guidelines for renewable energy (such as large wind farms), 38% think they should be somewhat involved, 6% think they shouldn't be very involved, 6% think they should be not at all involved and 1% don't know.

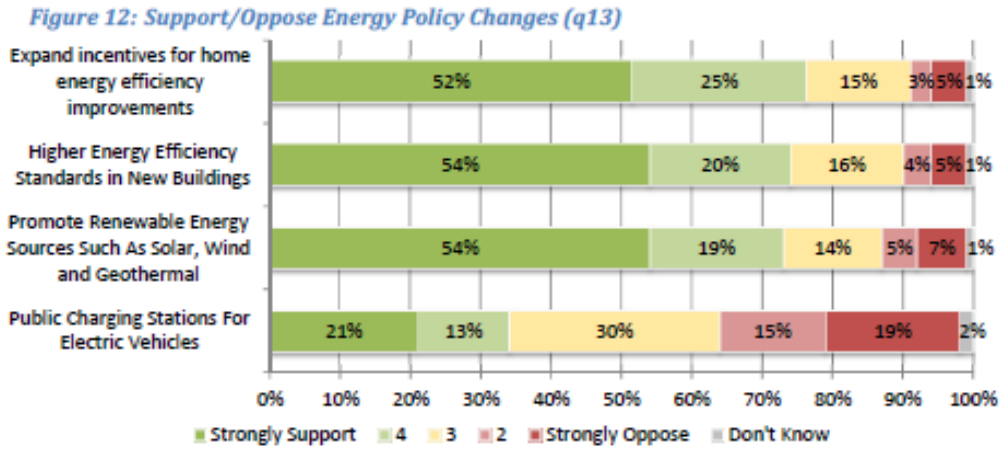


Figure EE2. Public input about changes in state and local energy policy.

Survey Question: We are seeing more proposals for (local) renewable energy projects such as large wind farms. How involved do you feel local communities should be in developing guidelines and standards for such renewable energy facilities?

Answer Options	Response Percent	Response Count
Very involved	52.3%	114
Somewhat involved	33.5%	73
Not very involved	7.3%	16
Not at all involved	6.9%	15
	answered question	218
	skipped question	42

Figure EE3. Public input about implementation of renewable energy project and level of local involvement.

Survey Question: Which of the following issues facing New Hampshire communities do you think should be the TOP priority for investment of public dollars? Select Top priority.

Answer Options	Response Percent	Response Count
Safe and Affordable housing choices	12.6%	26
Transportation system	12.1%	25
Energy efficiency	8.7%	18
Environmental Protection/Natural Resources Conservation	23.2%	48
Economic Development	17.9%	37
Infrastructure for development	12.6%	26
Preparedness for weather-related and other emergencies	13.0%	27
Other (please specify):		12
	answered question	207
	skipped question	53

Figure EE4. Public input about investment of public dollars in energy related issues.

Regional Visioning Sessions Summary

Question – Do you have energy choices?

Comments/Observations

- Propane, oil and electric. Natural gas only in new developments (cost of running new lines)
- Electricity price is stable. Most people not changing due to low cost of electricity
- Propane is cheap, reasonable. Wood to supplement but product options needed
- Solar pay back is too long. Economic benefit to solar or other alternative energy isn't viable; solar is costly for most. Incentive/leasing option can cause solar to be a more affordable option
- Most money spent on heat, smaller amount spent on cooling. Both costs reduced with conservation measures.
- Municipal collaborative groups (Plaistow Area Commerce Exchange) are effective at the local level; Use renewable energy LEAN program to help people buy/install renewable energy
- Portable generators use widely but noisy and stinky (pollute)
- Transportation costs high to get to work as jobs aren't where people live.
- Health/heat impacts to vulnerable populations
- Local actions can make impact (e.g. energy Committees, conservation, energy options, reduce use)

Actions Supported

- Establish a statewide energy policy including state and municipal level interactions
- Need more/better public transportation options. Improve bike transport.
- Incentives for energy efficiency conservation to reduce vehicle miles of travel, reduce consumption
- New developments incorporate walkable neighborhoods, reduce energy use
- Need more energy efficient buildings
- Need more regional cooperation on energy issues (i.e. RGGI-Regional Greenhouse Gas Initiative)
- For alternative sources (geothermal, wind and solar) efforts needed to expand individual use (could benefit real estate values). Renewable energy desirable but 'not in my back yard'.
- More use of tax incentives for alternative energy uses
- Increase use of alternative energy by municipalities and institutions (schools)
- State should increase support of public transportation

Energy Goals

Goal 1
State plans and regional initiatives focus energy planning and implementation toward local energy sources and supplies.

Goal 2
Federal and state standards, programs and initiatives reduce greenhouse gas emissions.

Goal 3
Municipalities lead their communities by example in becoming energy efficient in their policies, operations and facilities management.

Goal 4
More energy is produced from renewable energy sources.

Goal 5
Consumer choices across all sectors increase energy efficiency and conservation and use of renewable energy sources.

Goal 6
Impacts of climate change are mitigated through improved energy policies and standards.

Goal 7
Energy strategies capitalize on positive benefits and opportunities created by changes in climate.

Energy 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
EN Goal 1	S	P	S	P	S
EN Goal 2	S	S	S	S	S
EN Goal 3	P	S	S	P	S
EN Goal 4	S	S	S	S	S
EN Goal 5	S	S	S	P	S
EN Goal 6	S	S	S	S	S
EN Goal 7	S	P	S	S	S

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.

Energy Goals	N.H. Livability Principles					
	Traditional Settlement Patterns & Development Design	Housing Choices	Transportation Choices	Natural Resources Function & Quality	Community & Economic Vitality	Climate Change & Energy Efficiency
EN Goal 1	P	TBD	S	P	S	S
EN Goal 2	S	TBD	S	S	S	S
EN Goal 3	P	TBD	S	S	S	S
EN Goal 4	P	TBD	S	S	S	S
EN Goal 5	P	P	S	S	S	S
EN Goal 6	P	TBD	S	S	S	S
EN Goal 7	P	P	S	S	S	S

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

Existing Conditions

Energy Utilities

Southeast New Hampshire is served by several electric utilities – Unitil, Eversource (formerly PSNH) New Hampshire Electric Cooperative, Inc., and Granite State Electric. Unitil also provides natural gas to a portion of its service area. Refer to the map below for the electric utility service areas and to the Appendix B Map EE1 for location of electric and gas distribution lines in the region.

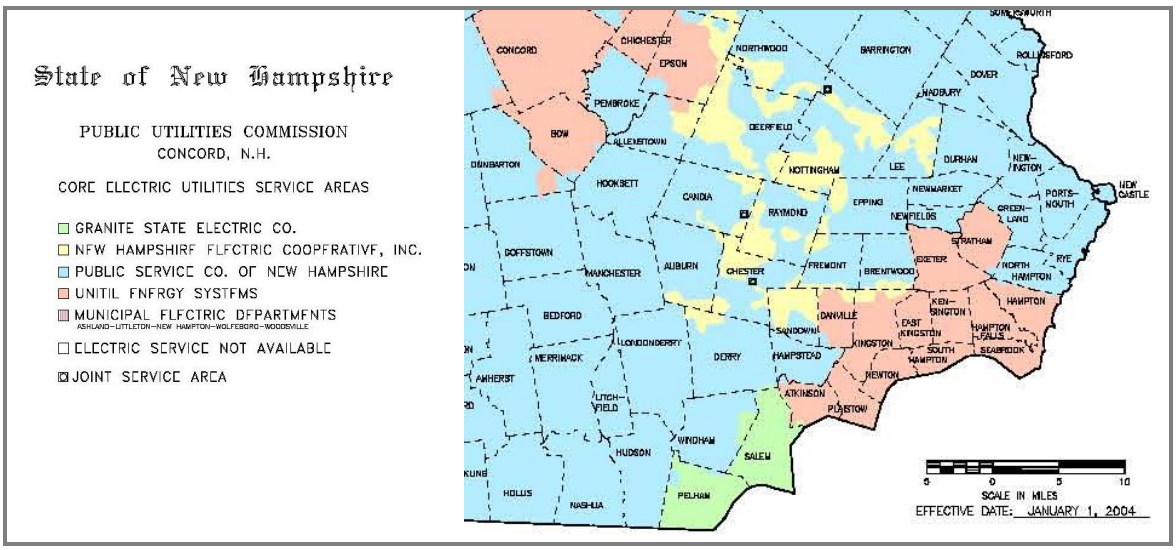


Figure EE5.Map of electric utility service areas in the region.

Each utility offers a variety of residential, business and municipal energy efficiency, purchasing and rebate programs focused on retrofits, replacement systems and new construction. New Hampshire's regulated electric distribution utilities jointly develop and offer their customer's energy efficiency programs under a statewide umbrella program, NH Saves. These programs are funded via a charge included in customer rates. Each year, the New Hampshire Public Utilities Commission reviews and approves program plans and budgets submitted by the utilities. Utilities can earn performance incentives based on successful implementation of their programs and meeting performance goals.

Recently additional funding for New Hampshire's "core" customer energy efficiency programs is provided via the "Regional Greenhouse Gas Initiative" (RGGI). The legislation governing RGGI requires that the first dollar from the sale of greenhouse gas allowances is to go to fund electric energy efficiency programs. Refer to the section Statewide Initiatives and Programs for more details about RGGI.

Natural gas efficiency programs are not part of NH Saves. New Hampshire natural gas utilities administer energy efficiency programs that are approved by the New Hampshire Public Utilities Commission.

Energy Production, Terminal and Storage Facilities

The region has six energy production facilities and four energy terminal and storage facilities. The energy production facilities are owned primarily by utilities and one manufacturing business.

The energy terminal and storage/distribution facilities, primarily import fossil fuels (oil, coal, coke, propane and jet fuel) and sell these materials wholesale where they are distributed by transport truck, tanker truck and rail to retail buyers. These facilities are located in Portsmouth and Newington along the Piscataqua River, the only deep water port in New Hampshire.

Refer to Appendix A for a map of the energy production, terminal and storage facilities in the region.

Table EE1. Energy Production, Terminal and Storage Facilities in the Region

Energy Production Facilities					
Plant Name	**Plant Code**	**Utility Name**	**Utility ID**	**Total Net Summer Capacity**	**Net Summer Capacity by Energy Source**
Seabrook	6115	NextEra Energy Seabrook LLC	6854	1,246.2 MW	Nuclear = 1246.2 MW
Schiller	2367	Public Service Co of NH	15472	155.5 MW	Coal = 95.4 MW Petroleum = 17 MW Wood = 43.1 MW
Newington	8002	Public Service Co of NH	15472	400.2 MW	Petroleum = 400.2 MW
EP Newington Energy LLC	55661	EP Newington Energy LLC	13538	525 MW	Natural Gas = 525 MW
Hampton Facility	10108	Foss Manufacturing Company LLC	6636	7.6 MW	Natural Gas = 3.8 MW Petroleum = 3.8 MW
Energy Terminals and Storage Facilities					
Company Name			**Site Name**	**Products**	
Sprague Operating Resources LLC			Avery Lane and River Road	Petroleum and coal imports	
Irving Oil Terminals Inc.			Portsmouth Marine	Petroleum imports	
SEA 3 Inc.			Newington	Liquefied petroleum imports	
Port of Portsmouth, New Hampshire			Port ID: 135	Handles 200 or more short tons per year in total volume (import and export) of petroleum products	

Refer to Appendix A Map EE1 for distribution of energy facilities and infrastructure in seacoast New Hampshire.

Energy Sources and Use

New Hampshire sources nearly 90 percent of its energy from out of state as it has no in-state sources of fossil fuels or nuclear material. The graph below shows the types of energy used and their relative percent of consumption. Petroleum and nuclear power alone comprise 55 percent of the state's total energy portfolio.

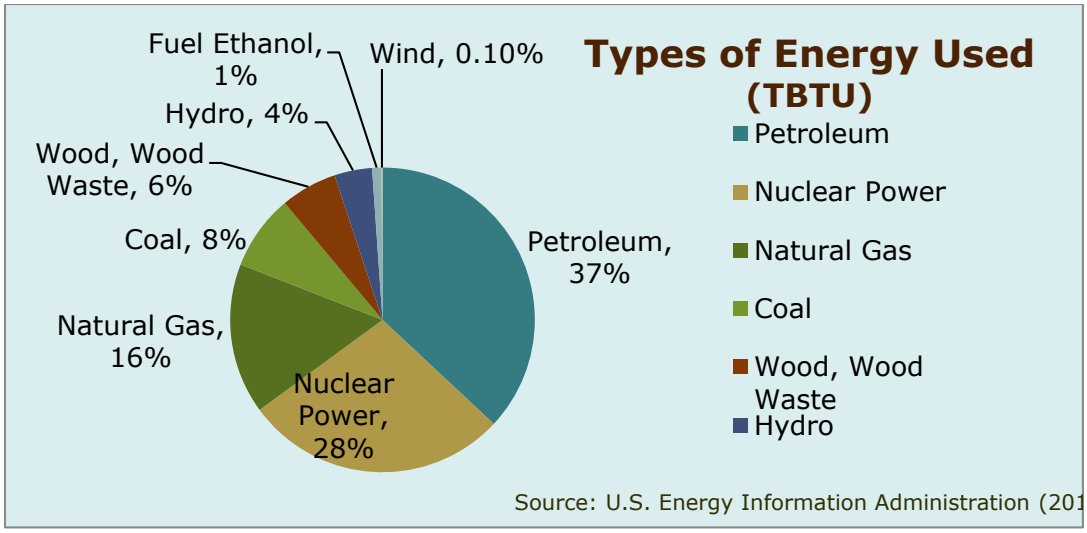


Figure EE6. Types and relative percentage of fuels consumed in New Hampshire. TBTU means "trillion British Thermal Units"; British Thermal Units is a standardized measure of energy produced by any energy or fuel source.

Of the electricity produced in-state, 79 percent is derived from nuclear power and natural gas, with lesser use of renewable sources, hydroelectric, coal and petroleum sources. Total energy production in the state is derived from 89 percent non-renewable and 11 percent renewable sources. The N.H. Climate Action Plan recommends increasing renewable and low-CO2-emitting sources of energy in a long-term sustainable manner.

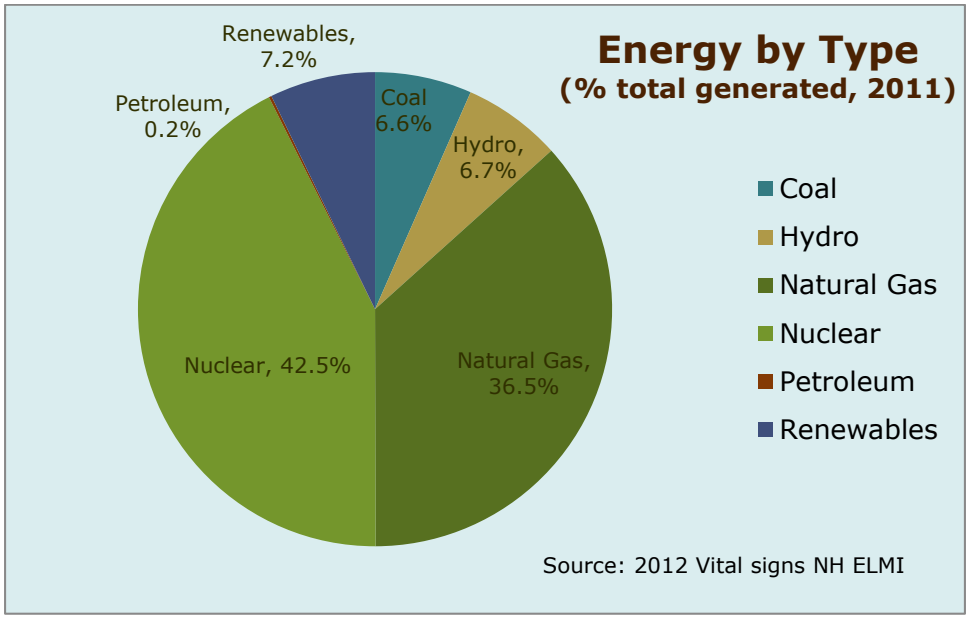


Figure EE7. Types and relative percentage of energy produced in New Hampshire.

New Hampshire consumes the most amount of energy in four areas: the transportation, residential, commercial and industrial sectors. Residential and commercial development combined account for 52.5 percent of energy consumption in the state.

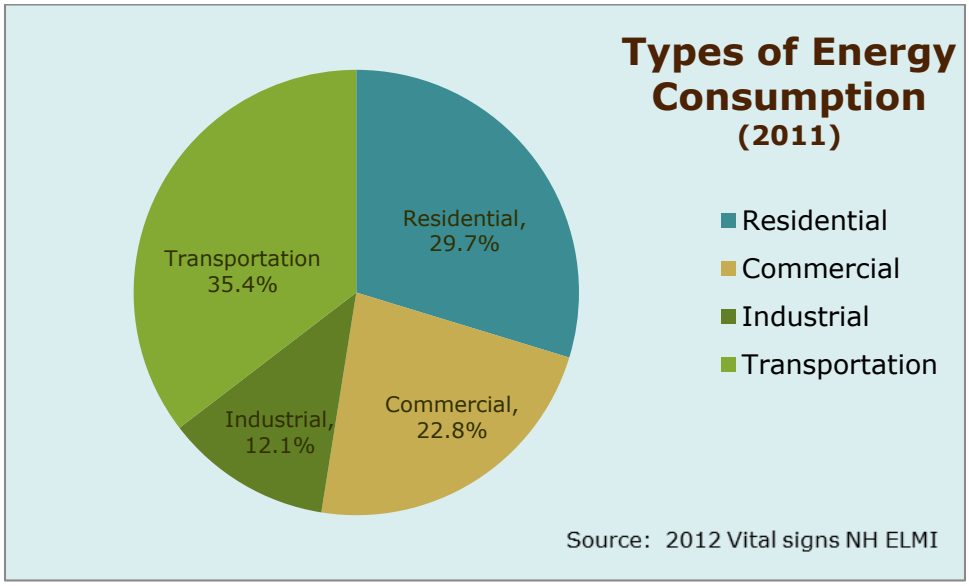


Figure EE8. Energy consumption in New Hampshire by type of use.

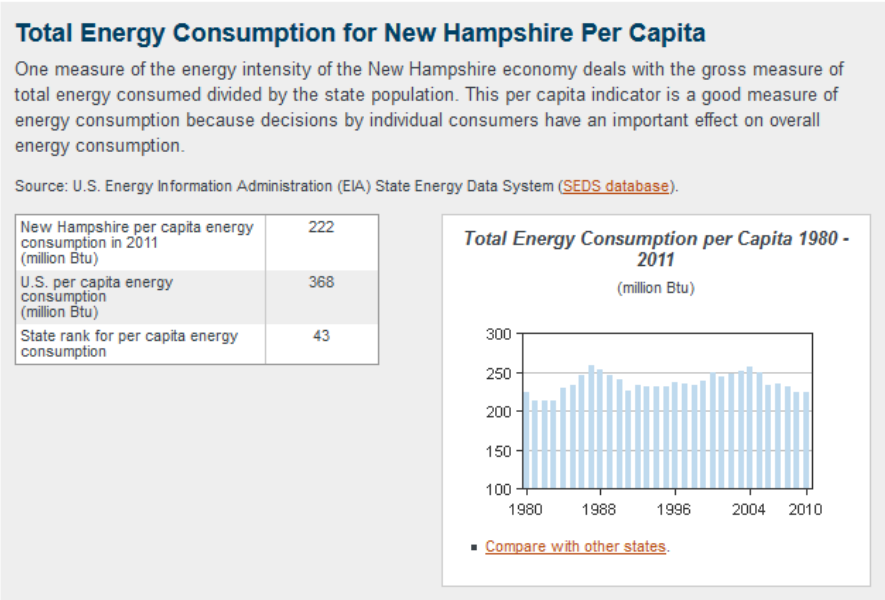
The N.H. Climate Action Plan recommends the following to reduce consumption of fossil-based fuels through increased efficiency and emissions reductions: maximize energy efficiency in buildings; support regional and national actions to reduce greenhouse gas emissions; reduce vehicle emissions through state actions; and encourage appropriate land use patterns that reduce vehicle-miles traveled through an integrated multi-modal transportation system.

Energy Consumption and Population Growth

Over the past 20 years, it is clear that total energy use has risen, primarily within the transportation and electric generation sectors.

When total energy consumption is analyzed per capita (comparison to the state's population), energy consumption or intensity of use in 2010 was very similar to 1960's levels of just over 200 Million Btu's. Consumption per capita in the preceding decades reached the highest levels during the 1960 to 2010 time period, exceeding 250 million Btu's.

This may be due to improvements in technology and efficiency as well as a shift in New Hampshire's economy as industrial activity has declined.



Total Energy Consumption for New Hampshire Per Capita

One measure of the energy intensity of the New Hampshire economy deals with the gross measure of total energy consumed divided by the state population. This per capita indicator is a good measure of energy consumption because decisions by individual consumers have an important effect on overall energy consumption.

Source: U.S. Energy Information Administration (EIA) State Energy Data System (SEDS database).

New Hampshire per capita energy consumption in 2011 (million Btu)	222
U.S. per capita energy consumption (million Btu)	368
State rank for per capita energy consumption	43

Figure EE9. Energy consumption compared with population growth.

Vehicle Miles of Travel (VMT)

From the 1970's until the mid-2000s, the annual amount of vehicle miles of travel (VMT) per person in the United States grew steadily at an average rate of about 1.8% per year (FHWA, 2014), exceeding the average annual growth in population over the same time period of 1% per year (US Census Bureau, 2014). Beginning in 2004 this changed as the per capita VMT peaked and began to decline. This trend is reflected in the New Hampshire data as well with consistently declining per capita VMT since 2007 and current levels are below those seen in 2004. This trend has important implications for redirecting future investment in the transportation network towards preservation of the existing system and expansion of access to pedestrian, bicycle, and transit. Current efforts are focused on expanding capacity to reduce congestion. There are three main reasons generally attributed to this change (Davis, 2012):

- Fuel prices continue to remain high which impacts those with fixed or low incomes and businesses reliant on the mass transport of goods.
- Youth, as a group, are choosing more cost effective ways to travel. People under 35 are making choices of where to live and how to transport themselves in a period of high fuel and auto ownership costs and so are choosing to live in urban areas where car ownership is not necessary and transit, bikes, and walking are viable alternatives.
- Technology is replacing the need for some trips. Work from home, home based businesses, mobile communications technology and internet access have allowed many trips to be eliminated. Improved access to information on transit schedules and timing, and ride sharing opportunities is also shifting individual choices of how to travel.

The current decreasing trend in VMT is in part responsible for statewide reductions in greenhouse gas emissions. In 2011, the weighted average combined fuel economy of cars and light trucks combined was 21.4 miles per gallon (FHWA 2013). The average vehicle miles traveled in 2011 was 11,318 miles per year. Based on these figures, the annual greenhouse gas emissions per passenger vehicle is roughly 4.75 metric tons CO^2 per vehicle per year. (EPA, http://www.epa.gov/cleanenergy/energy-resources/refs.html)

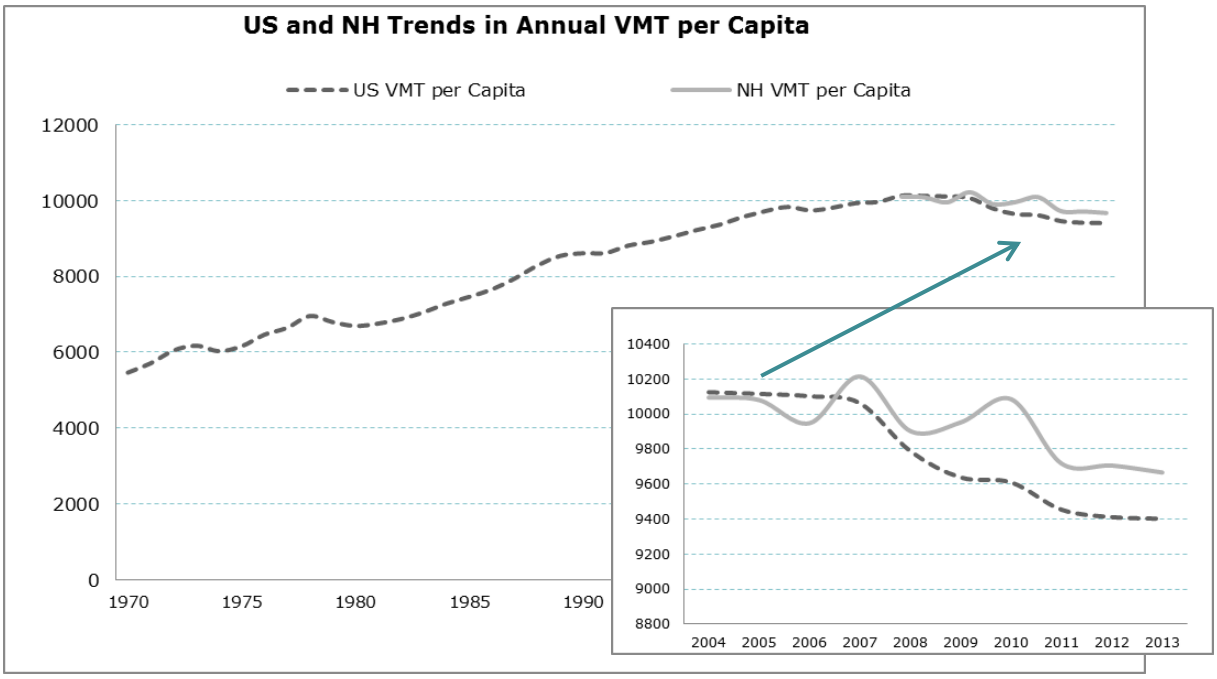


Figure EE10. U.S. and N.H. Per Capita Vehicle Miles of Travel.

Efficiency

The American Council for an Energy Efficient Economy ranks New Hampshire 21st nationally in energy efficiency, behind all other New England states as well as most other Northeast and Mid-Atlantic States.

As reported in the New Hampshire State Energy Strategy (draft, 2014), the lack of a clear statewide goal for energy efficiency savings in is one of the factors affecting the state's national efficiency ranking.

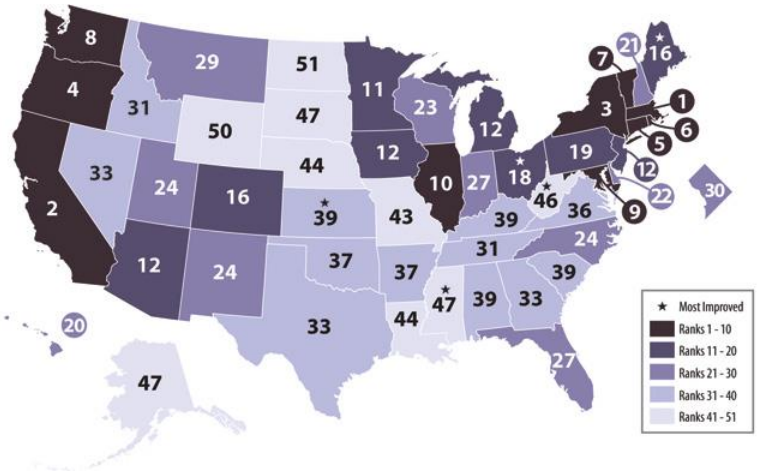


Figure EE11. ACEEE energy efficiency rankings by state. [Source: American Council for an Energy Efficient Economy, State Policy]

New Hampshire Public Utilities Commission

New Hampshire restructured its electric utility markets and has maintained support for its utility energy efficiency programs. In Order No. 23,574, issued November 2000, the New Hampshire Public Utilities Commission (PUC) emphasized its commitment to energy efficiency programs that complement new energy markets and do not hinder their development. The Commission requested that utilities work together to design a set of "core" programs that are consistent in their design and meet the Legislature's directive to target cost-effective opportunities that may otherwise be lost due to market barriers.

On May 31, 2002, the Commission issued an order approving the implementation of "core" energy efficiency programs by the state's electric utilities. This order established the basis for the NH Saves statewide energy efficiency program. The PUC reviews and authorizes the utilities' joint program plans and budgets annually. The utilities offer joint, statewide programs to gain the benefits of uniform planning, delivery, and evaluation. Within the umbrella of a statewide program, however, each individual utility incorporates flexibility in its implementation strategies and program delivery. The statewide program, NH Saves, uses shared marketing and information materials. (American Council for an Energy Efficient Economy) Refer to the Statewide Initiatives and Programs for more information about NH Saves.

Greenhouse Gas Emissions (GHG)

Greenhouse Gas Emissions (GHG) and the build-up of carbon dioxide in our atmosphere cause changes to our state and worldwide climate. GHG emissions are a signature of the types of energy used and how much. Use of fossil based fuels (for heating/cooling, transportation and production), reduction of carbon storage areas, and energy inefficient of vehicles, infrastructure and appliances are the primary contributors of GHG emissions.

New Hampshire ranks in the upper range of per capita CO^2emissions compared with other New England states. From 1990 to 2002, New Hampshire emitted roughly 14-15.5 million metric tons of CO^2 per capita annually. From 2003 to 2005, emissions increased to a low of 16.3 and a high of 17.9 million metric tons of CO^2 per capita annually, followed by a steady decline through 2009 to a low of 13.4 million metric tons of CO^2 per capita annually.

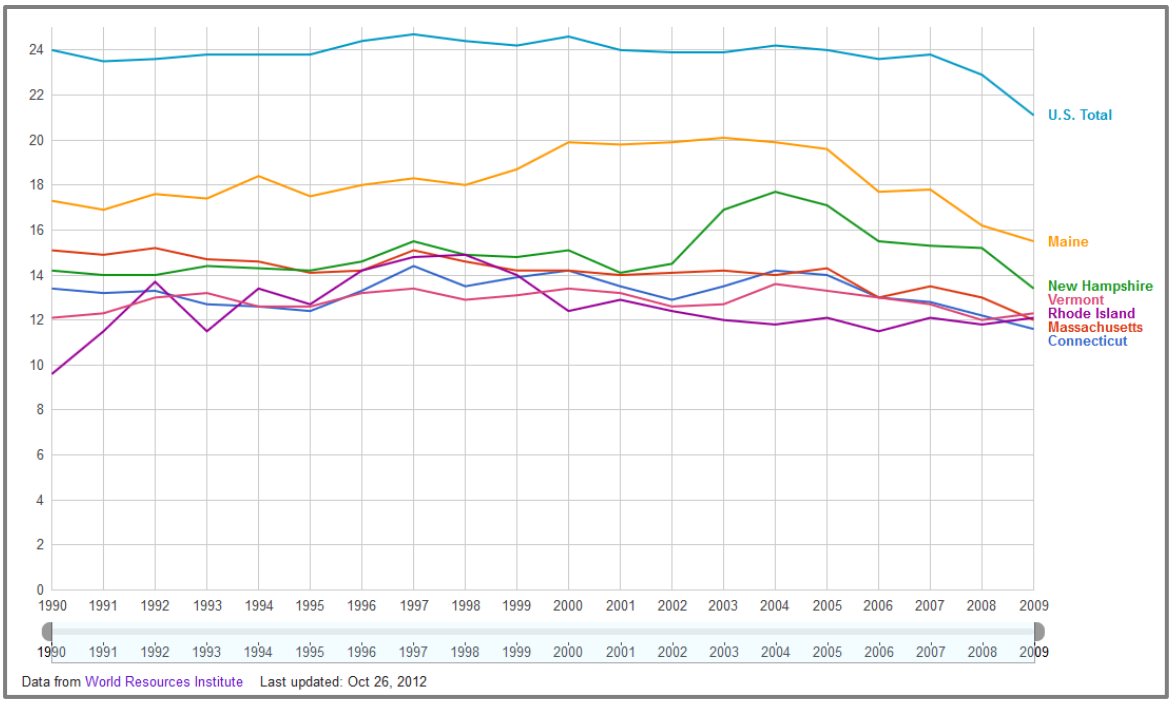


Figure EE12. Total CO2 emissions per capita for New England States measured in million metric tons.

The New Hampshire Climate Action Plan recommends that New Hampshire strive to achieve a long-term reduction in greenhouse gas emissions of 80 percent below 1990 levels by 2050. The goal of reducing greenhouse gas emissions 80 percent below 1990 levels by 2050 has been adopted by numerous states, cities and organizations based on the reductions that climate scientists believe to be necessary to stabilize greenhouse gases in the atmosphere at or below 450 parts per million CO^2. Experts project that stabilizing concentrations of greenhouse gases at this level will avoid the most severe and catastrophic potential climate change impacts including sea level rise, drought and ecosystems.

In 2013, NOAA reported global atmospheric concentrations of CO^2 reached a daily average above 400 parts per million. Historically, comparable CO^2 levels were present more than 10 million years ago, during the middle of the Miocene period when global temperatures were substantially warmer than today, and there was very little ice around anywhere on the planet.

2014 EPA Proposal for Guidelines to Cut Carbon Pollution

The U.S. Environmental Protection Agency (EPA) released the Clean Power Plan proposal, which for the first time cuts carbon pollution from existing power plants, the single largest source of carbon pollution in the United States. Power plants account for roughly one-third of all domestic greenhouse gas emissions in the United States. While there are limits in place for other atmospheric pollutants and particle pollution that power plants can emit, there are currently no national limits on carbon pollution levels. (EPA, 2014)

The Clean Power Plan proposes guidelines that build on trends already underway in states and the power sector to cut carbon pollution from existing power plants, making them more efficient and less polluting. The Plan strives to protect public health, move the country toward a cleaner environment and fight climate change while supplying consumers with reliable and affordable power.

The Clean Power Plan will be implemented through a state-federal partnership under which states identify compliance strategies using either current or new electricity production and pollution control policies to meet the goals of the proposed program. The proposal provides guidelines for states to develop plans to meet state-specific goals to reduce carbon pollution and gives them the flexibility to design a program that makes the most sense for their unique situation. States can choose the right mix of generation using diverse fuels,

energy efficiency and demand-side management to meet the goals and their own needs. It allows them to work alone to develop individual plans or to work together with other states to develop multi-state plans.

New Hampshire's carbon reduction requirements under the Plan are summarized below and apply to the state's one coal fired power plant, Schiller Station in Newington.

Table EE2. EPA proposed reductions in carbon dioxide emissions from power plants in N.H.

Proposed State Goal (Adjusted MWh-Weighted Average Pounds of CO_2 per Net MWh from all Affected Fossil Fuel Fired EGUs)				
Criteria	**Option 1**		**Option 2**	
	Interim Goal (2020-2029)	**Final Goal (2030 forward)**	**Interim Goal (2020-2029)**	**Final Goal (2030 forward)**
	546	486	598	557

Note: EPA is proposing state-specific rate-based goals to guide states in the development of their plans. The agency is proposing one option (Option 1) for state-specific goals and requesting comment on a second set of state-specific goals and compliance period (Option 2).

Energy Technical Assistance Partnership Program

Energy Technical Assistance Partnership Program (ETAP) for New Hampshire Communities was a federally funded two year program designed to raise awareness of the benefits of energy efficiency planning, and provide the technical assistance to municipalities. ETAP was funded by the American Recovery and Reinvestment Act (ARRA) of 2009 through the Department of Energy and administered by the New Hampshire Office of Energy and Planning.

The Energy Technical Assistance and Planning for N.H. Communities (ETAP) was a two year program providing energy efficiency technical assistance free of charge and open to all municipalities in the region. ETAP's goal was to advance energy efficiency and provide the tools communities need to monitor energy performance and plan for energy efficiency and conservation for the future. ETAP provided assistance and training on how to conduct municipal energy inventories and develop preliminary "roadmaps" for municipal energy planning. Over two years, ETAP also offered the following services:

- Assisted communities to track and understand energy consumption in municipal buildings and other facilities
- Provided a web-based tool to collect and analyze energy performance
- Worked with communities to identify and prioritize energy cost reduction opportunities
- Helped develop strategies for energy cost reduction and secure technical and financial resources needed to implement energy savings

For communities that had completed inventories and sought to implement projects, ETAP provided support services, including grant writing assistance, energy audits of municipal facilities, energy audits of zoning and regulations, energy master plan chapters, capital improvement plans for energy efficiency, and preparation of procurement and service documents for infrastructure upgrades and new installations.

RPC's 2-year work plan reached nearly every municipality in the region and accomplished the following outcomes listed in the table below. RPC worked closely with approximately 16 municipalities on a wide variety of projects including municipal energy use inventories, building and facilities assessments, Energy Chapters for local Master Plans, and organizational and communications plans for local energy committees. For most municipalities, ETAP program activities were led by a local energy committee with support from municipal staff, elected officials, planning boards and conservation commissions.

Although the ETAP program has ended, the program provided technical tools, capacity building and organization of local energy committees all of which continue to benefit municipalities now and into the future.

Table EE3. Energy Technical Assistance and Planning program activities lead by local energy committees with support from municipal staff, elected officials, planning boards and conservation commissions.

Year 2 Actions	Community	Year 2 Outcomes
Technical Assistance, Energy Assessments and Audits, Energy Inventories	Hampton Falls	Master Plan Energy Chapter (adopted), Lincoln Ackerman Elementary School energy audit, Town Hall historic preservation assessment, technical assistance for Energy Committee
	Atkinson	Master Plan Energy Chapter (adopted), technical support to the Energy Committee
	East Kingston	Municipal energy inventory
	Fremont	Master Plan Energy Chapter (adopted), Municipal energy inventory, technical assistance for Energy Committee
	New Castle	Municipal energy inventory, Maude Trefethen Elementary School energy audit, Master Plan Energy Chapter (draft)
	Newton	Municipal energy inventory, energy database enrollment, building assessments
	Plaistow	Municipal energy inventory, energy database enrollment, building assessments
	Rye	Complete building assessments, develop Energy Chapter for Master Plan
	Sandown	Municipal energy inventory and building assessments, Master Plan Energy Chapter (adopted)
	Seabrook	Municipal energy inventory, energy database enrollment, building assessments
	Hampton	Library energy audit, Roadmap Towards a More Energy Efficient Hampton, analysis of landfill as a solar installation site, outreach and education materials
	Windham	Review of existing building assessments, energy database enrollment, master plan, public outreach and education
	Stratham	Finalize selection of vendor for OEP grant funded work, master plan, prioritization of projects for municipal buildings
	Exeter	Building assessments of Town Offices and Library, prioritization of improvement projects for municipal buildings, draft Master Plan Energy Chapter
	Kensington	Building assessments, energy database enrollment, prioritization of projects for municipal buildings
Engagement and Enrollment	Brentwood, East Kingston, Epping, Greenland, Hampstead, Newington, North Hampton, South Hampton	Engagement with the goal of completing a municipal inventory, enrolling in the energy database, and reviewing model master plan chapter
General Outreach and Education	Kingston, Newfields, Portsmouth, Salem	General outreach to Clean Air-Cool Planet MEAP* towns and other communities in the region
Regional Energy Workshop	All municipalities invited; 26 participants	Guest speakers highlighting innovative energy efficiency projects, renewable energy installations, outreach and planning.

MEAP = Municipal Energy Assistance Program administered by Clean Air-Cool Planet

Statewide Initiatives and Programs

U.S. Department of Agriculture (USDA)
In 2014 the U.S. Department of Agriculture, Rural Energy for American Program awarded five New Hampshire small businesses with $163,568 in USDA grants to install 200 kilowatts of solar capacity. The new solar projects will help reduce energy costs for the businesses and are estimated to generate enough electricity to power the equivalent of 180 homes a year. These competitive grants cover up to 25 percent of a project's cost with matching funds of nearly $500,000 from other sources. The three businesses in the region awarded grants are:

959 Boys (Portsmouth): $26,270 will assist with the purchase and installation of a 28.28 kilowatt solar photovoltaic roof-mounted system offsetting the current electrical usage of three businesses by 99.64 percent.

Conner Bottling Works (Newfields): $49,921 will assist with the purchase and installation of a 43.68 kilowatt solar photovoltaic roof- and ground-mounted system offsetting current electrical usage by 100 percent.

The Storage Barn (Newington): $19,900 will assist with the purchase and installation of a 20.16 kilowatt solar photovoltaic roof-mounted system offsetting electrical usage by 100 percent.

Energy Efficiency & Sustainable Energy Board (EESE)
The Energy Efficiency & Sustainable Energy Board was established pursuant to RSA 125-O:5-a, effective October 1, 2008. It was created by the New Hampshire Legislature "to promote and coordinate energy efficiency, demand response, and sustainable energy programs in the state." And serves as a key advisory body to the Governor and State Legislature on energy matters The EESE Board is administratively attached to the Public Utilities Commission. N.H. Office of Energy and Planning serves as vice-chair of the EESE Board.

In 2012, the EESE Board released a report and recommendations calling for a comprehensive energy policy for New Hampshire and detailing the steps the state should take to implement policies and enhance programs that will contribute to economic development, increased resilience and security of energy supply, and a cleaner environment. A copy of the "Final Report on the Independent Energy Study" is available at http://www.puc.nh.gov/eese.htm. (Energy Efficiency & Sustainable Energy Board, 2012)

The Energy Efficiency and Sustainable Energy (EESE) Board was charged with review of the independent energy policy study required by Senate Bill 323 (SB323, 2010 Session). The Independent Energy Study was conducted by the Vermont Energy Investment Corporation (VEIC) to provide a comprehensive review of energy policy options and opportunities related to energy efficiency and sustainable energy for the state. The report submitted to the N.H. Public Utilities Commission (PUC) and Legislature contained fourteen chapters and more than 300 recommendations. The overarching finding of the study and review is that energy efficiency and renewable energy technologies provide significant economic and environmental benefits to residents, business owners and investors in New Hampshire and appropriate policies need to be developed.

In its review, the EESE Board identified several key themes reported below that informed many of the detailed recommendations of VEIC's Study and the EESE Board's resulting assessment.

Need for a clear, coordinated and consistent policy and program landscape.
New Hampshire's current energy policy environment is fragmented and subject to frequent modifications. Consumers would benefit from a more comprehensive and consistent approach in state energy policy and energy program offerings, stability in program funding, and a single lead entity within state government to coordinate the implementation of policies and programs. Stable and predictable policies facilitate the ability of private businesses as well as individuals to plan for and invest in energy efficiency and sustainable energy.

Need for a market development and market transformation focus.
Energy programs should encourage high-functioning markets that provide consumers and businesses with more options and better choices to achieve long-term energy priorities of efficiency, sustainability, and lower costs. Programs should foster responsiveness to changes in the marketplace to ensure that investments encourage adoption of new technologies and optimize strategic use of public dollars.

Need for targeted resources.
The state has achieved significant positive results in energy efficiency and renewable energy with limited financial resources. However, financial constraints impact the ability of many initiatives to achieve the full potential energy savings. Careful and judicious increases in funding and staff support in specific program areas would provide significant added benefits to meet the needs of the state and its consumers.

The 2012 EESE Board report includes three recommendations that support N.H.'s Long Term Growth and Prosperity as a framework under which all New Hampshire energy programs and policies could be developed and aligned.

1. Clearly Articulate a Comprehensive Energy Policy
2. Develop and Establish an Energy Efficiency Resource Standard (EERS)
3. Maintain and Strengthen the Renewable Portfolio Standard (RPS)

Regional Greenhouse Gas Initiative (RGGI)
Regional Greenhouse Gas Initiative, Inc. (RGGI, Inc.) is a 501(c)(3) non-profit corporation created to support development and implementation of the Regional Greenhouse Gas Initiative (RGGI). (Regional Greenhouse Gas Initiative)

In the northeast, RGGI is a cooperative effort among nine states – Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont – to reduce greenhouse gas emissions.

RGGI Mission Statement

RGGI, Inc.'s exclusive purpose is to provide administrative and technical services to support the development and implementation of each RGGI State's CO_2 Budget Trading Program.

RGGI, Inc.'s activities include:

- Development and maintenance of a system to report data from emissions sources subject to RGGI, and to track CO_2 allowances
- Implementation of a platform to auction CO_2 allowances
- Monitoring the market related to the auction and trading of CO_2 allowances
- Providing technical assistance to the participating states in reviewing applications for emissions offset projects
- Providing technical assistance to the participating states to evaluate proposed changes to the States' RGGI programs

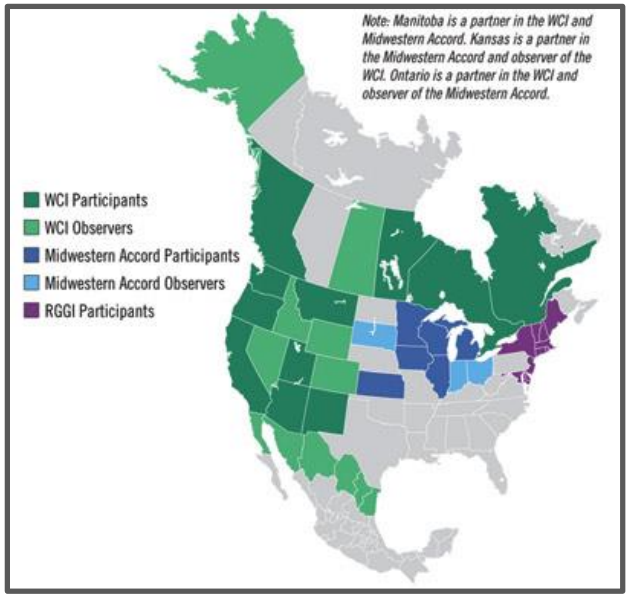


Figure EE13. Regional greenhouse gas initiatives and partnerships in the United States.

Progress and Benefits

Released in February 2014, the *Regional Investment of RGGI CO_2 Allowance Proceeds, 2012* report estimates that investments of Regional Greenhouse Gas Initiative (RGGI) auction proceeds to date are projected to return more than $2 billion in lifetime energy bill savings to more than 3 million participating households and more than 12,000 businesses in the region.

These investments are projected to offset the need for approximately 8.5 million megawatt hours (MWh) of electricity generation, save more than 37 million British Thermal Units (million BTU) of fossil fuels, and avoid the release of approximately 8 million short tons of carbon dioxide (CO_2) pollution into the atmosphere over their lifetime.

The program has powered a $700 million investment in the region's energy future: reducing energy bills, helping businesses become more competitive, accelerating the development of local clean and renewable energy sources, and limiting the release of harmful pollutants into the air and atmosphere, while spurring the creation of jobs in the region.

N.H. Regional Greenhouse Gas Initiative (RGGI)

On June 23, 2012, New Hampshire enacted House Bill 1490, which revised the state's investment plan for its RGGI CO_2 allowance proceeds, effective January 1, 2013. Under the bill, New Hampshire's proceeds from the sale of RGGI CO_2 allowances will now supplement the electric distribution company CORE energy efficiency programs, funded by the System Benefits Charge (SBC) funds. Prior to this legislative change, New Hampshire directed more than 90 percent of its RGGI proceed clean energy investments to energy efficiency programs, such as the Stay Warm N.H. and the Greenhouse Gas Emissions Reduction Fund (GHGERF) managed by the New Hampshire Public Utilities Commission.

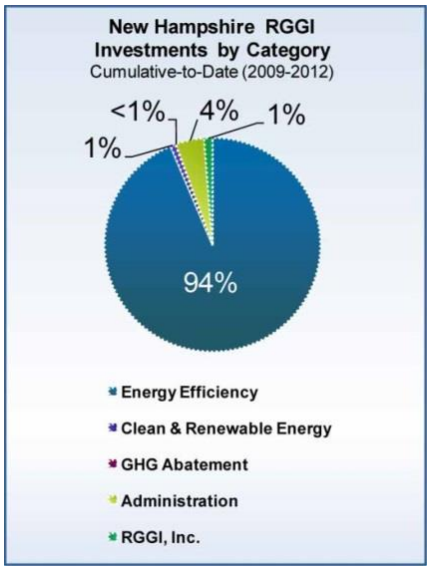


Figure EE14. N.H. investments by category in Regional Greenhouse Gas Initiative.

Analysis conducted by the University of New Hampshire Carbon Solutions New England program found that as of June 2012, projected cumulative energy savings due to GHGERF funded projects ($21.8 million spent) are expected to be $107.8 million through 2030 based on current energy prices. For every dollar spent as of June 2012, the projected expected return is $4.95 in energy savings.

New Hampshire Pay for Performance Program (N.H. P4P)

Currently in its third year, the New Hampshire Pay for Performance (N.H. P4P) Program is funded through proceeds from the RGGI. N.H. P4P Program has met and surpassed the energy savings goals that were set forth when the program launched. N.H. P4P comprehensively addresses the energy efficiency needs of the commercial, industrial, and municipal government sectors by working with developers, building owners and their representatives to improve energy efficiency of commercial and industrial buildings. With funding from the GHGERF, TRC Energy Services designed and manages the N.H. P4P Program which has delivered comprehensive energy efficiency solutions to 47 commercial, industrial, and municipal facilities across the state, totaling more than $12 million in construction (see map at http://nhp4p.com/program-impact). With a whole-building approach to energy savings, N.H. P4P estimates that it has saved more than 10.6 million kWh of electricity and 71,000 million BTUs of fossil fuels – resulting in projected GHG reductions of more than 10,886 metric tons. A project funded in the region was installation of heat pumps mat the Newton Memorial School.

Renewable Portfolio Standard

New Hampshire's renewable portfolio standard (RPS), established in May 2007, requires the state's electricity providers (with the exception of municipal utilities) to acquire by 2025 renewable energy sources (certificates or RECs) equivalent to 24.8 percent of their retail electricity sold to end-use customers.

Eligible Renewable/Other Technologies:	Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Fuel Cells, Geothermal Heat Pumps, CHP/Cogeneration, Hydrogen, Anaerobic Digestion, Small Hydroelectric, Tidal Energy, Wave Energy, Ocean Thermal, Renewable Fuels, Biodiesel, Fuel Cells using Renewable Fuels, Micro-turbines

Technology Minimum:	New Renewables (including thermal energy): 15% by 2025 New Solar-Electric: 0.3% by 2014 Existing Biomass: 8% by 2015 Existing Hydro: 1.5% by 2015

The RPS includes four standards for different types of energy resources requiring incremental increases for each type through 2025; these are classified as Class I New Renewable Energy, Class II New Solar, Class III Existing Biomass/Methane, and Class IV Existing Small Hydroelectric. The table below reports past data and future standards for each RPS Class.

Table EE4. New Hampshire's Renewable Portfolio Standards by Class.

Resource	2008	2009	2010	2011	2012	2013	2014	2015	2025
Class I	0.0%	0.5%	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	15.0%
Class II	0.0%	0.0%	0.04%	0.08%	0.15%	0.2%	0.3%	0.3%	0.3%
Class III	3.5%	4.5%	5.5%	6.5%	6.5%	6.5%	7%	8%	8%
Class IV	0.5%	1%	1%	1%	1%	1.3%	1.4%	1.5%	1.5%

The Public Utilities Commission (PUC) adjusts these rates annually by January 31 using the federal Consumer Price Index. The PUC is authorized to fine a supplier that violates RPS requirements, to revoke its registration, or to prevent it from doing business in the state.

The PUC must conduct a review of the RPS program and report of its findings to the legislature in 2011, 2018 and 2025, and include any recommendations for changes to the class requirements or other aspects of the RPS.

NH Saves

New Hampshire's regulated electric distribution utilities jointly develop and offer their customers energy efficiency programs under a statewide umbrella program, NH Saves. These programs are funded via a system benefits charge included in customer rates.

> A ***system benefit charge*** is a charge on a consumer's bill from an electric distribution company that helps pay for the costs of certain public benefits program such as low-income assistance, energy efficiency programs, and public interest R&D efforts.

The mission of NH Saves is to advance the efficient use of energy, while caring for the environment and promoting economic development in New Hampshire. *NH Saves: Energy Efficient Products for Your Home and Business* is an annual publication offering state-of-the-art energy efficient lighting and products. The NH Saves website (http://www.nhsaves.com) offers tools, tips, design and purchasing information to help save money through efficiency.

Local Energy Working Group

The Local energy Working Group (LEWG) comprises many organizations and programs that collectively providing guidance, resources and coordination for New Hampshire's communities in addressing energy and climate change challenges. LEWG works in coordination and fiscal sponsorship from the New England Grassroots Environment Fund, through generous support from the N.H. Charitable Foundation.

> The LEWG Mission and Purpose is to *"Provide collaborative guidance and technical support to Local Energy Committees/Commissions (LEC's), municipalities, schools, and other political subdivisions seeking to reduce energy use, minimize energy costs, and/or reduce fossil-fuel consumption."*

The LEWG strives to foster collaboration among public, private and non-profit entities to identify and support the development of the necessary resources and tools; interconnect community leaders to establish a network of local energy planners; and provide a clearinghouse to facilitate the communication of information and ideas.

LEWG provides resources including their annual Local Energy Solutions Conference, trainings and events and information about energy guides and reports, tools, and programs. See their website at http://www.nhenergy.org/.The LEWG is working toward the following energy-based outcomes.

Short Term Outcomes: 1-3 years

- The Local Energy Work Group will be the conduit for connecting energy committee members, and municipal and school staff/elected officials to each other throughout the state through peer-to-peer networking that is established and self-sustaining.
- An effective New Hampshire portal will be established to act as a clearinghouse of information on best practices, projects throughout the state, funding and technical assistance opportunities, and resources and guides that are available for LEC's, municipalities and schools to utilize.
- Teams with work plans that meet regularly and are well represented will be established to address the barriers in the following areas: Education, Outreach and Technical Assistance; Policy; and Financing.
- The Energy Work Group will annually identify the priority tools and resources needed by LEC's and municipalities to achieve significant reductions in energy use, cost or fossil fuel consumption.

Medium Term Outcomes: 3-5 years

- 50% of New Hampshire communities will possess increased knowledge and skill through the provision of ongoing outreach, education and technical assistance, which will enable them to take on increasingly sophisticated planning and project management efforts
- 25% of municipalities and schools integrate energy planning into all aspects of municipal facilities, vehicles and operations.

Long Term Outcomes: 5+ years

- Total community fossil-fuel-based energy consumption will be reduced 50% below 2005 levels by 2025

State Building Code

According to the 2013 Department of Energy determination, energy cost savings for New Hampshire resulting from the state updating its commercial and residential building energy codes in accordance with federal law are significant, estimated to be on the order of nearly $40 million annually by 2030.

Upgraded standards for State-owned or funded buildings were set per Executive Order 2011-1. New construction or renovations in excess of 25,000 square feet or $1 million shall meet or exceed current Interagency Energy Efficiency Committee (IECC) energy code. Energy modeling is required to be conducted during the design process and third party commissioning is required in accordance with the recommendations of the IECC. Where practicable, all new construction projects shall include a renewable energy component in their design. The IECC code includes residential single-family housing and multifamily housing three stories or less above-grade intended for permanent living (hotels and motels are not "residential").

Figure EE15. Primary building envelope requirements for Zones 5 and 6 (http://quickfacts.census.gov/qfd/maps/new_hampshire_map.html)

The 2009 IECC code applies to new buildings and additions, alterations, renovations and repairs. The map below shows the location of Zone 6 and Zone 5 and the primary building envelope requirements for all residential buildings in each zone.

New Hampshire Building Energy Code Compliance Roadmap

The New Hampshire Building Energy Code Compliance Roadmap: Volume 1 Market Actor Identification and Barrier/Recommendations (GDS Associates, Inc. for NH Office of Energy and Planning, 2012) recommends a plan to reach the state's goal of 90 percent compliance with the state energy code by the year 2017. This is an important goal because buildings use more energy and emit more carbon dioxide than either the industrial or transportation sectors. Residential and commercial development combined account for 52.5 percent of total energy consumption in the state.

90% by 2017. In response to the American Recovery and Reinvestment Act (ARRA), many state governors committed to reaching specific energy efficiency and conservation targets in their energy codes. Specifically, ARRA called for the development of plans to achieve 90% compliance with the 2009 International Energy Conservation Code for residential buildings and commercial buildings by the year 2017. Governor Lynch committed to these targets which qualified New Hampshire to receive $25.8 million in ARRA – State Energy Program (SEP) stimulus funding.

The Volume I report concludes that with respect to energy codes [it appears] sufficient specific and enabling legislation, regulations, policies and guidelines exists for effective adoption and enforcement of appropriate energy codes and administrative requirements and responsibilities. However this is an overall lack of common understanding and implementation of these requirements/responsibilities within and across key organizations and stakeholder groups. Barriers to the ability to effectively enforce energy code compliance center around lack of resources (including funding, staffing and time) and the need to prioritize other responsibilities. (GDS Associates, Inc. for NH Office of Energy and Planning, 2012)

The report provides a detailed Navigation Plan which identifies key elements and indicators needed to reach the 2017 target (see page 7). Specific energy code "roadmaps" detail top energy code compliance barriers and high priority recommendations for various stakeholder groups called NH market actor groups (see pages 12-21).

KEY ELEMENTS	STAKEHOLDER GROUPS
Strong Leadership and Policies	Legislative, Policy and Regulatory Stakeholders
Targeted outreach and Education	Code Officials and Building Inspectors
Adequate Resources and Funding	Building Professionals - Builders/Contractors
Verification and Enforcement	Architects, Engineers, Designers
Measurement and Evaluation	Real Estate Professionals and Appraisers
	Lenders and Financing Organizations
	Commercial, Industrial Building Owners and Managers
	Homeowners, and the General Public
	Equipment Suppliers, Distributors, Manufacturers and "Hard to Reach" Communities

The New Hampshire Building Energy Code Compliance Roadmap Volume 2: Detailed Project Report provides an in-depth description of the nine (9) New Hampshire Building Code Compliance Program tasks, associated findings, and recommendations directly resulting from these activities. The nine New Hampshire Building Code Compliance Program Tasks are to"

1. Establish a baseline of energy code compliance in NH (both residential and commercial buildings), identifying roadblocks and solutions to improve compliance,

2. Create a roadmap to achieve 90% compliance with the NH state energy code (2009 IECC) by 2017,
3. Promote the program throughout the state to building and code professionals,
4. Train/mobilize building professionals for code compliance and promote above-code performance,
5. Develop a public awareness campaign for homeowners, landlords, commercial property owners, real estate professionals, and appraisers to understand the value of the energy code and above-code performance,
6. Update and gather building code resources in one publicly accessible site,
7. Develop recommended enforcement and compliance policy options for the 2009 IECC,
8. Establish a review process to monitor and track compliance under the 2009 IECC, and
9. Submit monthly reports to OEP to submit to the NH Office of Economic Stimulus, DOE, and the US Office of Management and Budget on data for number of jobs created/retained, trainings held, and people reached, and funding leveraged.

Green Building

Seacoast Area Renewable Energy Initiative
The Seacoast Area Renewable Energy Initiative (SEAREI) was formed in 2009 by members of the Piscataqua Sustainability Initiative (PSI) in partnership with Plymouth Area Renewable Energy Initiative. SEAREI is a not-for-profit organization working to build sustainable communities through energy efficiency, renewable energy and education in the Piscataqua region of New Hampshire and southern Maine. SEAREI is modeled after the traditional New England style "barn-raising" of neighbor helping neighbor. Homeowners and volunteers learn to install renewable energy systems and in turn help others with installations.

SEAREI accomplishes its mission by:

- Bringing down the cost of installing renewable energy systems
- Providing hands on education for the homeowner so they end up with a strong understanding of how their system works
- Developing a support network of knowledgeable families
- Providing local tradespeople an avenue to learn about installing renewable energy systems
- Building community connections while we all prepare for life in a lower energy world

Figure EE16. Solar panel installation on an outbuilding. [Photo: SEAREI http://searei.org/seareis-photo-album/index.html

N.H. Green Building Council
Organizations such as the Build Green N.H. Council and the N.H. Chapter of the U.S. Green Building Council (USGBC) promote and support transforming the built environment to one that supports a healthy community built on social responsibility, environmental stewardship and economic prosperity. N.H. USGBC offers a webinar series and case study presentations about innovative energy efficiency and green building projects.

The Build Green N.H. Council is comprised of industry professionals dedicated to providing green building guidelines for building and remodeling professionals and environmentally concerned consumers through its certification program.

The Build Green N.H. Council represents professional green builders and remodelers in New Hampshire by unifying the industry, promoting a broader understanding of green building, and increasing consumer

awareness of green building options. Build Green N.H. encourages builders and consumers to look to the National Green Building Standard for guidance. Houses that are designed or built to this standard include the following elements:

- Design of the Lot and Site
- Material, Resource Efficiency
- Energy Efficiency
- Recycled, Renewable, Reusable
- Water Efficiency
- Indoor Air Quality
- Education for Homeowners

Green Building Facts

The USGBC reports the following market impact statistics relating to green building and the economy.

Economy	Building Stock
By 2015, an estimated 40-48% of new nonresidential construction by value will be green, equating to a $120-145 billion investment	More than 2.8 billion square feet of building space are LEED-certified (as of January 1, 2014)
The construction market accounts for 5.5% of the $14.7 trillion U.S. GDP. This includes all commercial, residential, industrial and infrastructure construction	41% of all nonresidential building starts in 2012 were green, as compared to 2% of all nonresidential building starts in 2005
With energy efficiency financing having the potential to soar from $20 to $150 billion annually, over one million jobs could be created	***New Hampshire ranks among states with the greatest proportion of green office buildings relative to total stock of buildings in the market****

** Among Washington D.C., Oregon, Vermont, Washington, Colorado, Massachusetts, Maine, Illinois, California*
[Source with references: http://www.usgbc.org/articles/green-building-facts]

Historic Preservation - Reuse Equals Reduce

According to the report *The Greenest Building: Quantifying the Environmental Value of Building Reuse* (The National Trust for Historic Preservation, 2011), the reuse and retrofit of existing buildings compared to new structures of equivalent size and functionality can, in most cases, meaningfully reduce the negative environmental impacts associated with construction of new buildings. The report's key findings offer policy-makers, building owners, developers, architects and engineers compelling evidence of the merits of reusing existing buildings as opposed to tearing them down and building new. Those findings include:

- **Reuse.** Building reuse typically offers greater environmental savings than demolition and new construction. It can take between 10 to 80 years for a new energy efficient building to overcome, through efficient operations, the climate change impacts created by its construction. The study finds that the majority of building types in different climates will take between 20-30 years to compensate for the initial carbon impacts from construction.
- **Scale.** Collectively, building reuse and retrofits substantially reduce climate change impacts. Retrofitting, rather than demolishing and replacing, just one percent of the city of Portland's office buildings and single family homes over the next ten years would help to meet 15 percent of their county's total CO2 reduction targets over the next decade.
- **Design.** The environmental benefits of reuse are maximized by minimizing the input of new construction materials. Renovation projects that require many new materials can reduce or even negate the benefits of reuse.
- **The Bottom Line:** Reusing existing buildings is good for the economy, the community and the environment. At a time when our country's foreclosure and unemployment rates remain high, communities would be wise to reinvest in their existing building stock. Historic rehabilitation has a

thirty-two year track record of creating 2 million jobs and generating $90 billion in private investment. Studies show residential rehabilitation creates 50% more jobs than new construction.

The report is available at: http://www.preservationnation.org/information-center/sustainable-communities/green-lab/valuing-building-reuse.html.

Municipalities Support Renewable Energy

In the last 5 years, several municipalities have capitalized on grant opportunities to make their buildings and infrastructure more energy efficient, reduce harmful emissions, and save money. The efforts are highlighted below demonstrate a strong commitment in the region toward replacing fossil fuel based systems with local renewable energy sources.

East Kingston Elementary School Solar Installation

The East Kingston Elementary school solar installation project was funded by a $300,000 donation from the Richard E. Sargent Trust, a $330,000 grant from the American Relief and Recovery Act, and $30,000 from the school budget. The solar array located behind the school provides a 35 to 40 percent reduction in energy costs. Since the solar array came up in 2010, it has generated over 87,000 kilowatt-hours and has offset 109,000 pounds of CO_2. The school also boasts a new high-efficiency boiler and an extensive recycling program.

Exeter Department of Public Works Solar Array

A solar photovoltaic array was installed at the Town of Exeter's waste water treatment plant (WWTP) in 2012. The ground mounted 50-kilowatt array, located on the Department of Public Works campus, will produce up to 5 percent of the plant's electricity, resulting in an estimated savings of $31,000 over 10 years. The project was carried out through a combination of state and federal funding - a $100,000 grant from the Energy Efficiency and Conservation Block Grant (EECBG) helped offset the upfront installation costs for the town.

To put carbon dioxide emissions into perspective, about one metric ton of carbon dioxide (CO_2) is produced to meet the average monthly energy demand of the typical American household.

Exeter Area High School Solar Array

The solar array at Exeter Area High School — which generates 100 kilowatt hours of energy and offsets about 5 percent of Exeter High School's energy needs — has been producing energy since September 2010. Combined the solar array and new high efficiency natural gas boilers save the school district about $200,000 per year. The 465 solar panels located at the entrance to the school are the result of a partnership between Revolution Energy (a scalable renewable energy solutions company) and four other entities who call themselves the New England Seacoast Energy Partnership as well installation help from 55 students from the Seacoast School of Technology. The system will offset 57.5 metric tons of carbon dioxide annually.

Hampton Falls co-generation installation at the Police/Fire Station

With a $78,000 grant from the N.H. Office of Energy and Planning, New Hampshire's Energy Efficiency and Conservation Block Grant Program, the Town of Hampton Falls replaced a very inefficient oil fired furnace with a new high efficiency cogeneration unit for building heat and solar thermal panels for hot water. Combined heat and power (CHP), also known as cogeneration, is an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source and has both economic and environmental benefits. The installation produces 21,000 kWhs (equivalent to 2 to 3 homes) of electricity annually, while recovering 191 MMBTU's (equivalent to 1,400 gallons of fuel oil) of heating energy annually and has an estimated payback period of approximately 7 to 10 years based on yearly energy savings of $8,127.

North Hampton Residential Solar Installation

A private developer in partnership with a New Hampshire based solar installation company, are currently in the permitting phase to construct a community Solar Garden. A community Solar Garden is a solar PV array

that is built at one location, also knows as a "host", and the value of the power is shared with participants, also known as a "group member". The installation will be a group net metering whereby the energy generated will be distributed to two existing homes (though the system can support 4 additional homes) and any unused electricity will be sold back to the PSNH distribution grid and other PSNH customers can join this "group" to take advantage of a reduced energy rate.

Local Actions to Expand Energy Choices and Efficiency Standards

Hampton Residents Work with Unitil to Extend Natural Gas Service to a Residential Neighborhood
By Sunny and Barbara Kravitz, Hampton Residents

We live in a neighborhood of 62 homes in Hampton built during the 1980's when oil was inexpensive. Because oil prices began changing hourly, I decided to try to bring natural gas to the homes in my neighborhood. In 2013 I decided to take a petition around and 47 homes signed saying they would convert to natural gas if Unitil (Northern Utilities) would make it available. I spoke with Janet Oliver, Business Development at Unitil, and gave her the petition. In 2014 Unitil responded with an offer: if 31 homes would sign a contract to install a natural gas boiler, and agree to share in the infrastructure installation cost at $1,800 dollars per household, payable at 0% over 5 years on our utility bill ($30 dollars a month), Unitil would agree to construct the gas line. Unitil estimated the project would cost about $600,000 and it would be the first time Unitil would install a gas line in an existing residential area. They normally work on new construction where the developer picks up the installation costs. By the time we got the 31 signed contracts it was early fall and too late to start the installation.

Last spring Unitil asked the 31 homes to sign a new contract with the same terms. A few of the homes had changed hands and only 29 homes signed the contract. Installation was completed by October 2014. Representatives of Unitil have said that they would like to replicate this model to expand the use of natural gas for home heating.

Town of Epping Adopts an Energy Efficiency Ordinance

Article 22 Energy Efficiency and Sustainable Design (ICLEI)

Motivated by participation in the New Hampshire Carbon Coalition's Climate Change resolution, Epping set a goal to reduce their greenhouse gas emissions by 25 percent by the year 2025. The Town Planning Board agreed to participate in reaching this commitment by drafting a new ordinance that would require all new buildings to implement energy efficiency, conservation and sustainable design principles in its construction. Called Article 22 Energy Efficiency and Sustainable Design, the ordinance was placed on the Town Warrant in March 2007 and passed 700-606.

Article 22 is designed similarly to LEED certification with points being awarded based on number and types of energy efficiencies and encourages the use of on-site renewable energy. The ordinance applies a graduated compliance system meaning that the square footage of the building dictates number of minimum points required and therefore, the larger the building, the more points are required. This was included to address the concerns of small business owners. Regardless of the size of the new building or development, each structure must meet requirements for energy production and/or sustainable design.

Community Outreach

The Town Planner and Planning Board spent several months educating the community about the ordinance by engaging involve community residents and business owners in a series of public meetings held once a month for three months. Existing buildings were used as examples of how sustainable design and energy efficiency in buildings was already happening, and saved money. The Board created a website to provide detailed

information including links to presentations, photographs of existing buildings, and data on projected cost savings and greenhouse gas emissions reductions.

Leading by Example

Epping Town Hall has lead by example by completing a variety of energy retrofits, including a 4 kWh combined heat and power system, the first one at a town hall in the country. Epping also retrofitted the windows and insulation and installed a 1 kWh solar array which reduced their electricity bill 50 percent and heating costs by 50 to 60 percent. The School Department replaced their windows and has saved approximately 15 percent in energy savings, while the Library replaced their oil boiler with a modulating propane boiler, achieving significant energy savings.

Key Issues and Challenges

Key Energy Issues

Energy is not valued in ways that promote efficiency and choice of renewable sources.
For the time being, the convenience and relative stability of gas and fuel oil prices coupled with public ambivalence toward social, environmental and health impacts of fossil based fuel use dampen choices toward renewable and alternatives energy sources. By embracing a diverse and interconnected set of energy solutions, these systems promote the self-reliance of both individual communities and New Hampshire as a whole. The options for power generation, transportation, industry and building function are enhanced by a boom in home-grown clean energy from New Hampshire - keeping dollars in state and reducing pollution.

Energy security and renewable energy are important for our economy and quality of life.
Most of New Hampshire's energy is imported from outside New England and outside the U.S. The N.H. Climate Action Plan recommends expanding the capacity of renewable energy sources to reduce the dependence on imported fossil fuel and retain more energy dollars in New Hampshire, which also has a positive impact on non-energy sectors of the state economy.

As reported in the State Energy Strategy (draft, 2014), the combination of reduced demand and further development of diverse renewable power generation assets helps New Hampshire achieve its renewable portfolio standard target level. The Renewable Portfolio Standard program requires electric suppliers to procure an increasing percentage of their supply from renewable energy up to 23.8% by 2025. Currently, 7.2 percent of the energy New Hampshire produces in-state comes from renewable sources. How does renewable energy benefit New Hampshire? Renewable energy helps to:

- Decrease our dependence on imported oil
- Enhance national security
- Diversify the state's energy supply
- Stabilize and reduce energy prices
- Boost the state's economy by creating new jobs and industries
- Keep more energy dollars in the state's economy
- Reduce harmful emissions from all sources to improve air quality

Renewable energy production, especially on a smaller scale, will help meet New Hampshire's energy goals and consumer needs while increasing resiliency of distributions systems and markets and energy independence. Localized energy systems provide a measure of surety against grid outages and other supply disruptions by allowing customers and the distribution system to utilize various fuels and stored power as needed. Relying on renewable resources will foster self-sufficiency within communities across the state particularly during weather related events that damage distribution systems.

Most energy sources used in New Hampshire are carbon based.
The N.H. Climate Action Plan recommends increasing energy production from renewable and low-CO2-emitting sources of energy in a long-term sustainable manner. By understanding the role of energy use all consumers are in a position to address both energy choices and climate change simultaneously. As shown in Figure EE7, total energy production in the state is derived from 89 percent non-renewable sources and 11 percent renewable sources. Reliance on imported energy sources means consumers are subject to instability of energy markets and their purchasing dollars leave the regional and states economy.

Energy efficiency and conservation are necessary to moderate use of non-renewable energy sources.
The three primary means to address the use of energy are energy conservation, energy efficiency and use of renewable energy. Energy conservation is the most cost effective means to reduce the import of energy into the state, reduce greenhouse gas emissions and reduce energy costs as it involves the avoidance of energy use.

Efficiency entails is using less energy to accomplish the same amount of work. This can include lighting efficiency, where advanced lighting can be installed that provides the same or higher quality light at a fraction of the energy consumption of the old lighting. It also includes production efficiency where machinery, fixtures and processes within facilities can be improved to reduce the amount of energy consumed to produce goods.

Energy efficiency and conservation focuses on one main objective - reducing overall energy consumption across all sectors thus reducing energy costs and environmental pollutants. Communities can achieve reductions in energy consumption by taking these steps:

- Efficiency for both existing and new buildings, infrastructure and vehicles
- Community awareness and participation
- Transportation system choices and alternatives for transit and non-motorized travel
- Access to clean, renewable and alternative energy choices
- Recycling, composting and reuse programs
- Consumerism of local products and services
- Education and assistance programs

Energy Challenges

Managing the state's energy future and enacting solutions will require state, regional, municipal and consumer participation. The challenge therefore is effective implementation at all scales and across multiple sectors.

Energy is fundamentally linked to climate change and mitigating its impact by controlling the levels of greenhouse gases in the atmosphere, CO^2 being the largest component. Mitigation can be implemented in many ways including energy efficiency and conservation, use of renewable and low CO^2 emitting energy sources, and protecting the resources that capture and store CO^2 such as forests and other vegetation. Climate change certainly is a challenge but one that offers opportunities with respect to energy. Many recommendations in the State Climate Action Plan and State Energy Strategy (2014) call for changes that also benefit our economy, environment and quality of life. Enhancing these benefits can only provide positive results that make our state more resilient and competitive.

Electric Vehicle Charging Station Opens at Redhook Brewery in Portsmouth
On September 16, 2014, a publically-available electric vehicle charging station was opened at the Redhook Brewery at the Pease International Tradeport. Redhook Brewery in partnership with and funding support from Public Service of New Hampshire (PSNH) has purchased Renewable Energy Credits to offset the electricity used by the station.

Implementation of State Strategies and Plans
In terms of implementation, the state has several policies already enacted to help address energy consumption and GHG emissions (RGGI and RPS) but lacks dedicated funding to advance strategies and recommendations in the N.H. Climate Action Plan and State Energy Strategy (2014).

Table EE5. Comparison of energy strategies and recommendations from the N.H. Climate Action Plan and State Energy Strategy (2014).

Strategy	Energy Efficiency	Emissions Reductions	Fuel Choice and Availability; Renewable Power Use/Generation	Transportation Options
N.H. Climate Action Plan (2009)	Maximize energy efficiency in buildings. Lead by example in government operations.	Protect natural resources (land, water and wildlife) to maintain the amount of carbon fixed or sequestered. Reduce vehicle emissions through state actions.	Increase renewable and low CO_2-emitting sources of energy in a long-term sustainable manner.	Encourage appropriate land use patterns that reduce VMT. Reduce VMT through an integrated multi-modal transportation system.
	Other: Plan for how to address existing and potential climate change impacts. Develop an integrated education, outreach and workforce training program.			
N.H. State Energy Strategy (2014)	Finance infrastructure and building efficiency with state programs Efficiency through state standards and codes Controlling costs through alterative rates and pricing	*Applicable to all strategies*	Fuel Choice: primarily in-state renewable and alternative sources Renewable: residential and commercial solar PV Utility scale PV Biomass, wind, hydroelectric and offshore wind	Fuel economy Electric and natural gas vehicles Mass transit options Smart growth strategies to reduce VMT and efficiency Pricing programs to reduce VMT
	Other: Grid Modernization			

The N.H. Climate Action Plan and N.H. State Energy Strategy (2014) contain strategies to address energy efficiency, emissions reductions, fuel choice and availability, grid improvements and management, renewable power use and generation and transportation options. While both Plans focus on state and local implementation, the N.H. State Energy Plan (draft) relies more on state programs and standards, pricing and efficiency.

Grid Modernization

The N.H. State Energy Strategy (2014) describes a vision for electric grid modernization that could provide multiple benefits to New Hampshire consumers and meet several strategies outlined in the Plan. Grid modernization would provide the platform upon which to effectively manage energy sources, demand, supply and efficiency state-wide. Grid modernization refers to ensuring that the electric grid is more resilient and flexible, has adequate storage capacity, able to integrate intermittent energy sources (such as energy produced through net metering), and able to provide real-time information to help customers manage their energy use. The potential benefits of grid modernization can include: better outage response and increased reliability; customer engagement in reducing peak demand; improved integration of distributed generation, renewable resources and storage; improved efficiencies for distribution utilities; integration of electric vehicles; and cost savings for all customers.

Once modernized, distribution grid efficiency will rely on consumer behavior to manage demand and availability. Consumer behavior programs (residential and small users) and demand response programs (large users) are voluntary programs that create energy savings and shift energy use away from peak periods when energy is most expensive by engaging and incenting consumers. New Hampshire utilities have piloted several

such programs focused on increased efficiency as a means to reduce peak load (total demand on the system). Peak load reduction is important to lowering the overall costs for all customers of the regional electric system. In the absence of peak load management, the grid must be sized to serve the highest peak minute of the year, even though the majority of the year the load is considerably lower. This 'oversizing' of the system creates considerable costs for ratepayers, so any reductions in the peak mean real savings for all customers.

Local Energy Committees

Many municipalities in the region have well-established energy committees that have advanced energy considerations and planning in their communities. Actions include Master Plan Energy Chapters, municipal energy inventories, and facilities audits, zoning and land use regulation changes, and public outreach and education. For most municipalities, energy related activities are led by a local energy committee with support from municipal staff, elected officials, planning boards and conservation commissions.

The technology, equipment, and techniques to drastically reduce municipal energy use and expand renewable and alternative sources are now readily available for buildings, infrastructure, street lighting and transportation. By reviewing all investments and decisions for energy efficiency and sustainability, municipalities can not only reduce their operating expenses and energy consumption, and lower their emissions, but it can also set an example for residents and business owners to follow.

Successful intra-municipal collaboration relies on a well-organized and informed local energy committee with strong support by the town.

Voluntary intra-municipal collaboration will be an important component of local implementation of energy actions and strategies, in addition to those required or enabled by federal and state standards and programs. Successful intra-municipal collaboration relies on a well-organized and informed local energy committee with strong support by the town.

Environment

Applying strategies that mitigate the impacts of climate change are recommended in the state's Climate Action Plan. Many strategies require coordinated on at all levels – federal, state, regional municipal and non-governmental – and focus on:

- Reduction of greenhouse gas emissions.
- Protection of land that provides carbon storage.
- Replacement of fossil fuel based energy sources with renewable and low emissions sources.

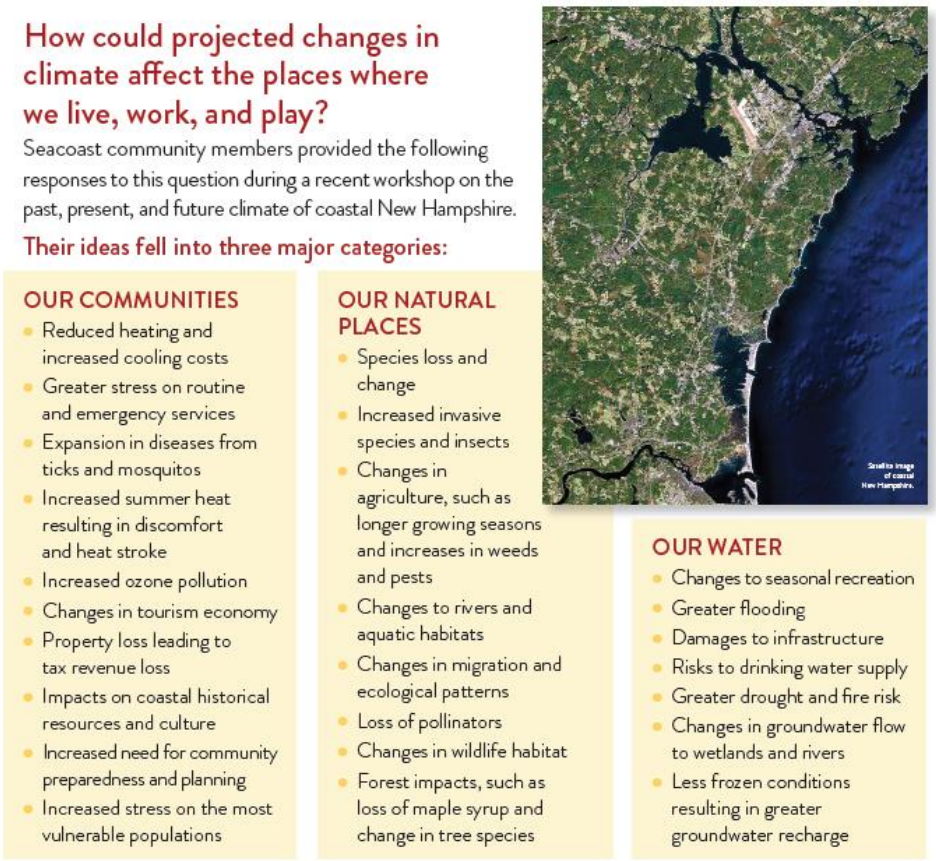


Figure EE17. Type and extent of projected change to natural systems resulting from climate change. (Wake, et al., 2011)

Figure EE17, from a summary of the report *Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future* (Wake, et al., 2011) describes the type and extent of projected change to natural systems resulting from climate change, largely driven by energy consumption and choices. Alterations to our region's climate could result in changes or decline in certain natural systems on which we rely for services and economic value, recreation, flood protection and quality of life.

Public Health
The increasing trend of pollutants and harmful emissions to our atmosphere in recent decades has caused concern over its effect on public health, environmental ecosystems and climate worldwide. Concentrations of a number of pollutants, byproducts of the burning of fossil fuels, have increased rapidly in the atmosphere as consumption of fossil based fuels has also increased. However, the long-term effects of air pollution on public health are largely unknown in New Hampshire.

Refer to the Climate Change Chapter for additional information about the health effects of emissions.

Planning Our Energy Future

Incorporating Energy in Existing Planning Processes and Tools
Many communities have discovered that traditional approaches to planning and development are creating, rather than solving, societal and environmental problems. Where traditional approaches can lead to congestion, sprawl, pollution and resource overconsumption, sustainable growth development offers real, lasting solutions that will strengthen communities in the future. Applying principles of sustainability can address many of these impacts and negative consequences.

Sustainability is based on the principle that everything we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions that permit fulfilling the social, economic and other requirements of present and future generations.

Sustainability principles cut across most sectors of daily life: environmental, economic and societal. Ecologists recognize that there may be limits to sustainable growth and offer the alternative of a "steady state economy" in order to address environmental concerns such as resource consumption, energy production, and land conservation.

Table EE6. Integrating Energy Planning with Community Planning

Energy Conservation Measures	▪ Energy efficiency in buildings, fixtures and infrastructure. ▪ Behavioral changes including trip consolidation, ride sharing, lighting and appliance use, efficient equipment and other products, and recycling and composting (minimize post-consumer waste)
Sustainability	▪ Incorporate a mix of uses to provide a variety of housing, employment, shopping, services, and social opportunities for all members of the community. ▪ Preserve working landscape by sustaining farm and forest land and other rural resource lands to maintain contiguous tracts of open land and minimize land use conflicts. ▪ Provide choices and safety in transportation to create livable, walkable communities that increase accessibility for people of all ages, whether on foot, bicycle, or in motor vehicles. ▪ Protect environmental quality by minimizing impacts from human activities and planning for and maintaining natural areas that contribute to the health and quality of life of communities. ▪ Involve the community in planning and implementation to ensure that development retains and enhances the sense of place, traditions, goals, and values of the community. ▪ Manage growth respecting the local community tradition, but work

	with neighboring towns to achieve common goals and address common problems more effectively. ▪ Protect human health and safety
Alternative Transportation	▪ Public transit infrastructure including access, convenience, and competitive pricing ▪ Voluntary actions such as carpools, rideshare programs, and park and ride facilities ▪ Accommodations for bicycles and pedestrians.
Local Production and Services	▪ Support agriculture and local businesses ▪ Buying local supports the community and state economy ▪ Ensures self-sustaining practices and security

Planning for sustainability promotes responsible development and includes the following processes, practices, and outcomes. (American Planning Association, 2000)

Process

- Making planning decisions in a holistic and fully-informed manner that involves all segments of the community and the public and private sectors.
- Educating all age groups to raise public understanding of and regard for the future consequences of past and current planning decisions and ultimately change human behavior.

Practice

- Developing a future-oriented vision, looking beyond current needs and recognizes environmental limits to human development.
- Advancing projects and activities that promote economic development that: efficiently and equitably distribute resources, services and goods; minimize, reuse and recycle waste; and protect natural resources.
- Foster a widely accepted ethic of stewardship that strongly encourages individuals and organizations to take full responsibility for the economic, environmental, and social consequences of actions, and balances individual needs with environment and public welfare.
- Take leadership in implementation of local, regional and state policies and engage in inter-municipal and regional initiatives that support sustainability.

Outcomes

- Local and regional development patterns that expand choice and opportunity for all persons.
- Resilient, diverse, and self-sufficient local economies that meet the needs of residents and build on the unique characteristics of the community whenever possible.
- Communities with a healthy environment and social climate that function in balance with natural ecosystems and allow individuals to lead healthy, productive and enjoyable lives.

Energy Recommendations and Implementation

Recommendation 1

Regional strategies for transportation, land use and environment improve energy efficiency, increase renewable energy production and decrease emissions.

Actions

- Incorporate cross-cutting energy issues and recommendations from the Transportation, Land Use and Environment Chapters of the Regional Master Plan in RPC's Long Range Transportation Plan.

- Work with regional stakeholders and municipalities to align existing and future funding sources to implement cross-cutting energy issues and recommendations from the Regional Master Plan.

Recommendation 2

Evaluate and develop recommendations, in collaboration with the N.H. Coastal Adaptation Workgroup, to incorporate energy planning (sources, availability, efficiency and cost) as a climate change adaptation strategy.

Actions

- Evaluate ways municipal zoning, land development regulations and plans might incorporate standards that result in reduction of greenhouse gas emissions.

- Identify measures that incorporate energy efficiency and renewable energy sources when retrofitting buildings and infrastructure for purposes of adaptation and resiliency.

- Collaborate with state agencies to identify policies and standards to reduce greenhouse gas emissions and vehicles miles travelled, protect lands that provide carbon storage, retrofit buildings and facilities, and improve access to public transportation options in the region.

Recommendation 3

Provide guidance and technical assistance to municipalities to implement energy conservation measures in municipal investments, policies and plans.

Actions

- Apply successful strategies and actions from the Energy Technical Assistance Partnership (ETAP) program to municipal investments, policies and plans.

- Inform municipalities of federal, state, and non-profit programs to fund energy retrofits and installations for buildings and infrastructure, and development of long range policy and planning actions.

- Coordinate with utility companies to provide information to municipalities, residents and businesses on cost-saving and energy efficiency measures.

- Prepare Energy Chapters for local Master Plans.

Recommendation 4

Municipalities enable installation of renewable energy sources through zoning, land development regulations and plans.

Actions

- Engage residents and businesses in discussions about the benefits of renewable energy sources, and challenges in managing their buildings and infrastructure.

- Complete an audit of zoning, land development regulations and plans to identify barriers and create incentives for development of local renewable energy sources.

Recommendation 5

Support municipalities to adopt zoning and land use regulations requiring site design and construction methods that maximize energy efficiency in homes, buildings and infrastructure.

Actions

- Engage residents and businesses in discussions about energy efficiency and conservation options, cost and availability of energy sources, and challenges in managing their buildings and infrastructure.
- Inform municipalities of energy efficiency standards and energy incentives applied successfully in zoning and land use regulations at the local level.
- Facilitate collaboration between municipalities and the site design, construction, and renewable energy sectors.

Recommendation 6

Implement recommendations relating to energy from the State Climate Action Plan and N.H. State Energy Strategy (2014).

Actions

- Collaborate with state, regional and non-profit practitioners to implement recommendations that meet goals of the State Climate Action Plan and N.H. State Energy Strategy (2104)**.**
- Implement recommendations from the Regional Master Plan that meet goals of the State Climate Action Plan and N.H. State Energy Strategy (2014).
- Incorporate goals from the State Energy Strategy in RPC's Long Range Transportation Plan.

Energy Goals and Recommendations Matrix

	EN Goal 1	EN Goal 2	EN Goal 3	EN Goal 4	EN Goal 5	EN Goal 6	EN Goal 7
Recommendation 1	S	P	P	S	P	S	TBD
Recommendation 2	P	TBD	S	P	P	S	S
Recommendation 3	S	P	S	P	S	P	TBD
Recommendation 4	S	P	P	S	S	P	TBD
Recommendation 5	P	S	S	P	S	P	TBD
Recommendation 6	S	S	S	S	S	S	S

S = Energy Recommendation significantly supports the Energy Goal.
P = Energy Recommendation partially supports the Energy Goal.
TBD = to be determined
N/A= not applicable

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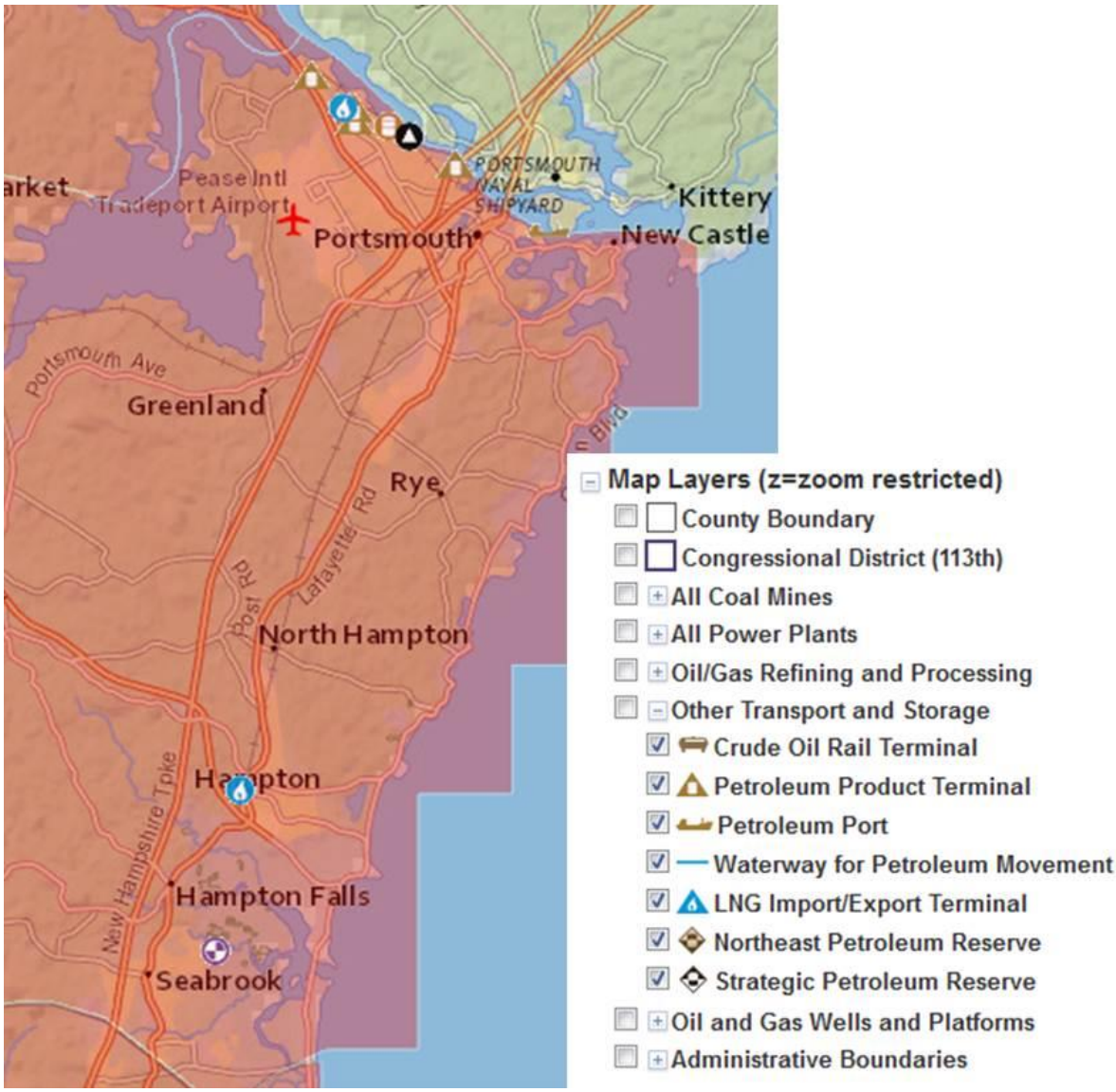
Appendices

Appendix A Map EE1. Energy facilities and infrastructure in seacoast New Hampshire.



[Source: U.S. Energy Information Administration at http://www.eia.gov/special/floodhazard/]

Appendix B Map EE2. Location of electric and gas distribution lines.

Map EE2 is attached on the following page.

NATURAL HAZARDS CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Natural Hazards

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Cover photo credits: Road washout, Dave Kellam, PREP (top left); Snowstorm impacting powerlines, Miss Tessmacher, flickr.com (middle right).

Natural Hazards

Introduction

This chapter describes natural hazards that have occurred in the region in the past and discusses the potential risks and extent to which natural hazards could impact the region in the future. Climate change can increase the severity of existing and future hazards such as coastal storms, flooding, strong winds, extreme precipitation, extreme temperatures and drought, and alter the frequency and occurrence of weather related events. The potential impacts of climate change are covered in greater detail in the Existing Conditions section of the Climate Change Chapter.

> In hazard planning and management, mitigation refers to measures that result in avoidance and minimization of impacts.

The New Hampshire Department of Safety Division of Homeland Security and Emergency Management (HSEM) has a goal for all communities within the State of New Hampshire to establish local hazard mitigation plans as a means to reduce and mitigate future losses from natural hazard events. Local hazard mitigation plans provide a framework to recognize and address the impacts of natural hazards and climate change. Local officials identify natural hazards most likely to impact their community, document existing programs and policies in place to reduce and prevent these hazards, and develop a mitigation action plan. These plans describe actions the community will undertake to reduce loss and damage of public and private assets. The plans are reviewed by HSEM and Federal Emergency Management Agency (FEMA) and adopted by the local governing body. Hazard mitigation plans offer short and long-term strategies and practices aimed at creating sustainable, disaster-resilient communities.

> Hazard mitigation plans offer short and long-term strategies and practices aimed at creating sustainable, disaster-resilient communities.

What are Natural Hazards?

Natural hazards are weather-related events and natural earth processes that can impact lives, property, infrastructure, natural resources and other significant assets. Common natural hazards in the RPC region include flood and severe winter storms. Often, natural hazards can be predicted in a timeframe of days or by long-term trends and models. They tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical and environmental characteristics of an area. Natural hazards include extreme weather and climate events that occur in all parts of the world, although some regions are more vulnerable and susceptible to certain natural hazards than others. The same is true for New Hampshire and the physical geographic diversity that defines the state's distinct ecoregions including the Coastal Lowlands, Eastern New England Upland, and White Mountain Region.

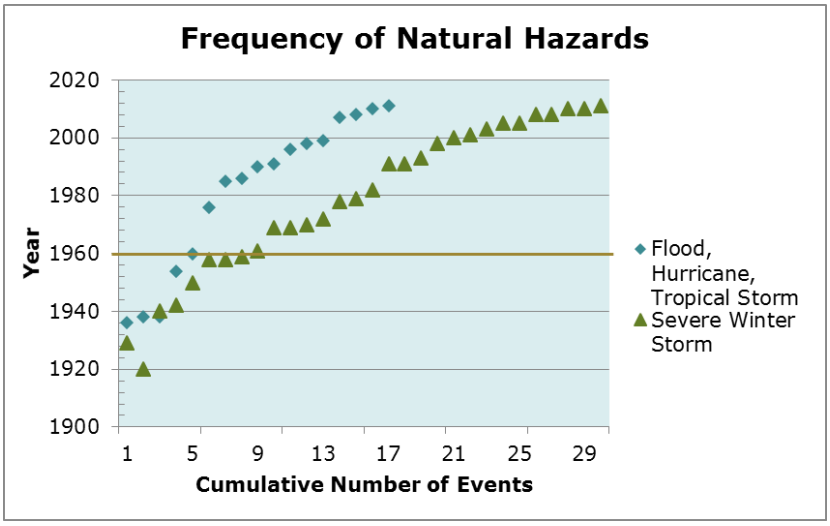


Figure NHZ1. Year and cumulative number of natural hazard events in the region: Severe Winter Storms and Flood, Hurricane, Tropical Storms. Source: State of NH Multi-Hazard Mitigation Plan (2013)

Impacts to the Region

Since the early 1900's, the region has been impacted by a number of natural hazards: 30 Severe Winter Storms, 18 Flood/Hurricane/Tropical Storms, 10 Tornado/Downbursts, 6 Drought Periods, 4 Earthquakes, and 2 Wildfires.

The two most frequent natural hazard events affecting the region are Severe Winter Storms (winter events) and Flood/Hurricane/Tropical Storms (spring through fall events). The frequency of these types of events is reported in Figure NHZ1. Note that the majority of both types of events occur most frequently from 1960 to the present.

What the Region Said About Natural Hazards

Statewide and Regional Surveys

Questions about Emergency Preparedness

Nearly three-quarters of residents (74%) are concerned (34% "very concerned" and 40% "somewhat concerned") with snow or ice storms in their community followed by power outages (73%), wind damage (61%), flooding (48%), drought (30%), and wildfires (23%).

- Households earning less than $40,000 and older people (50 to 59, 70 and older) are *more likely* to be very concerned about drought.
- Older people (70 and older) and households earning less than $40,000 are *more likely* to be very concerned about wildfires.
- Young people (18 to 29), households earning less than $20,000 and more than $160,000 are *more likely* to be very concerned about power outages.

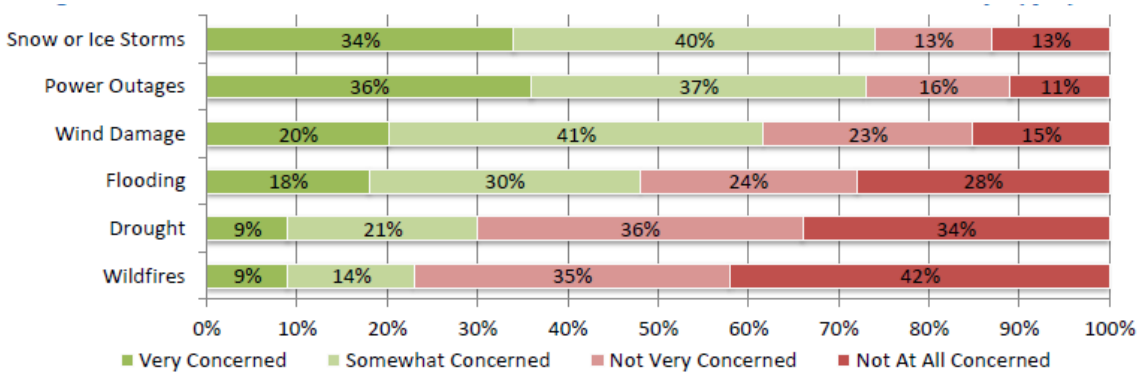


Figure NHZ2. Question - Concern About Weather Related Events In Your Community? (q14

Only 12% of residents are very concerned about their community's level of preparedness in weather-related situations, while 35% are somewhat concerned, 35% are not very concerned, 17% are not at all concerned and 1% said they don't know.

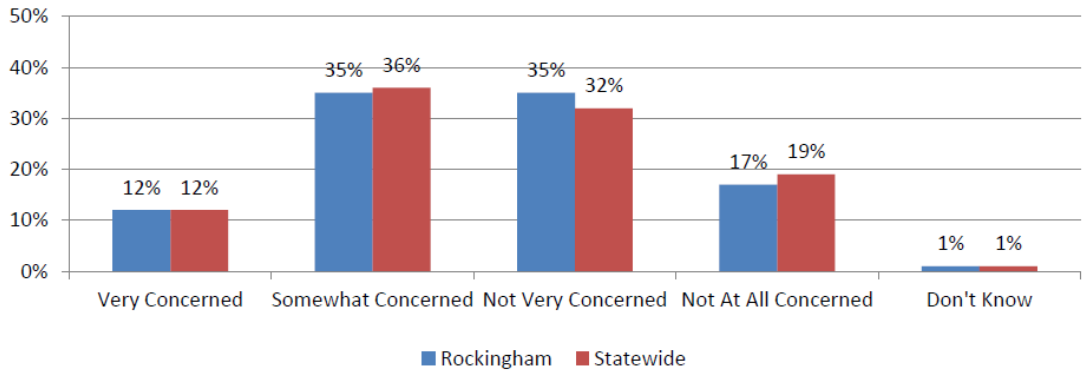


Figure NHZ3. Question - Concern about Your Community's Level of Preparedness? (q15)

RPC Online Survey Results

Respondents expressed a mixture of concern for community emergency preparedness and most respondents indicated they were concerned with power outages and snow storms more than flooding, drought, wind damage, or wildfires.

Regional Visioning Sessions

Following is a summary of common ideas and concerns expressed at topical listening sessions held throughout the region in 2013.

Table NHZ1.Questions about hazard preparedness and response from topical visioning sessions.

***Question** – Have you or your community been affected recently by severe weather events or changes in seasonal weather patterns?*	Damage to trees, powerlines, buildings and private property. Flooding near rivers and in areas not typically prone to flooding. Road damage from undersized culverts, drainage infrastructure. Flooding caused from inadequate drainage infrastructure. Changes to crop production/harvest and growing seasons. Increased frequency and intensity of severe weather events. Prolonged dry periods between storms. More extended periods of power outages over wide areas. More residents and businesses are equipped with generators.
***Question –** How could your community be better prepared to respond to and adapt to changes in seasonal weather patterns, extreme weather and more frequent storm events?*	More community based emergency centers and shelters. Inventory municipal infrastructure and prioritize improvements for under-performing sites. Invest in new infrastructure that is more resilient. Improve drinking water management to increase storage capacity. Improve business resilience and continuity planning. Educate public, citizens, decision makers and land use boards/commissions. Improve power distribution systems, create back-up systems.
***Question** – What investments, assets, resources or populations are most at risk due to changes in seasonal weather patterns, extreme weather and more frequent storm events?*	High risk, vulnerable populations and need for services. Damage to coastal shorelands and structures. Fisheries, winter recreation, agriculture. Flood damage to infrastucture and buildings in floodplains. Water quality and water pollution. Increase in tick and mosquito borne diseases and cases in NH.

Natural Hazards Goals

Goal 1

State and municipalities have the tools necessary to anticipate and plan for natural hazards.

Goal 2

Practitioners, regional partners and municipalities collaborate to identify and address impacts from natural hazards to assets and resources.

Goal 3

The region increases preparedness for and become more resilient to natural hazards.

Goal 4

Municipalities adopt Natural Hazards chapters in local Master Plans. Coastal municipalities adopt Coastal Management Chapters in local Master Plans.

Goal 5

Information from Hazard Mitigation Plans is referenced or applied when preparing municipal Capital Improvement Plans and reviewing development proposals.

Goal 6

Recommendations from the New Hampshire Multi-Hazard Mitigation Plan are implemented.

Goal 7

Municipalities adopt standards that protect built infrastructure, local and regional assets (eg. cultural, historical, economic) and natural resources from impacts of natural hazards.

Goal 8

Municipalities and regional partners support multi-jurisdictional hazard mitigation planning efforts.

Natural Hazard 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
NHZ Goal 1	S	S	S	S	S
NHZ Goal 2	S	S	S	S	S
NHZ Goal 3	S	S	S	S	S
NHZ Goal 4	S	S	S	S	S
NHZ Goal 5	S	S	S	S	S
NHZ Goal 6	P	P	P	P	P
NHZ Goal 7	S	S	S	S	S
NHZ Goal 8	P	P	TBD	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 Hazard Goals	NH Livability Principles					
	Traditional Settlement Patterns & Development Design	Housing Choices	Transportation Choices	Natural Resources Function & Quality	Community & Economic Vitality	Climate Change & Energy Efficiency
NHZ Goal 1	S	S	S	S	S	S
NHZ Goal 2	P	P	P	S	S	S
NHZ Goal 3	P	P	P	S	S	S
NHZ Goal 4	P	P	P	S	S	S
NHZ Goal 5	S	S	S	S	S	S
NHZ Goal 6	TBD	TBD	TBD	S	S	S
NHZ Goal 7	TBD	TBD	S	S	S	S
NHZ Goal 8	P	P	P	S	S	S

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

Types of Natural Hazards

Following are descriptions of natural hazards that most frequently affect the region and pose a significant threat in the future. A history of natural hazard events that have impacted the region is provided in Appendix B of this chapter. Following are brief descriptions of these natural hazards.

Flooding is a common hazard throughout the region. Several areas experience chronic reoccurring flooding or high potential for future flooding. All municipalities in the RPC region are enrolled in the National Flood Insurance Program (NFIP). Municipalities in the NFIP must identify local areas of flood concern within their Hazard Mitigation Plans. Areas most likely to have high flood risk are those within or near Flood Zones identified on the FEMA Flood Insurance Rate Maps (FIRMs). The region contains coastal areas, rivers and associated tributaries that fall within identified FEMA flood zones. Both coastal and riverine areas contain flood zones that correspond to Special Flood Hazard Areas (100-year and the 500-year flood zones).

The coastline is particularly vulnerable to flooding from both coastal and upland sources including storm surge, seasonal events, heavy rain, and sea level rise. Vulnerable assets and resources located in the coastal flood zone include buildings, roadways, utilities, infrastructure, beaches, dunes, marshes, wildlife habitat, and cultural and historical sites.

Refer to Appendix D Map NHZ1 for the extent of the 100-year and 500-year flood zones in the coastal area. Flood zones are depicted on the FIRMs as Zones A, VE, AE and X.

Riverine Flooding

Riverine flooding is typically the temporary inundation of water - from ice melt, precipitation, rivers, tide and storm surge - onto lands that are not normally covered by water. Such flooding occurs at regularly throughout the year during spring snowmelt and as a result of seasonal storm events. Refer to the Appendix for a comprehensive list of past flood and storm events.

The specific types of flood events common in the region are described below.

100-year Storm

Floodplains associated with the 100-year storm are usually located in lowlands near rivers and near tidally influenced and coastal areas. The term 100-year flood or the "1% annual chance flood" means there is a one percent chance of a flood of that size happening in any given year.

Upland and freshwater riverine flooding occurs during extreme precipitation events and during periods of rapid snow melt.

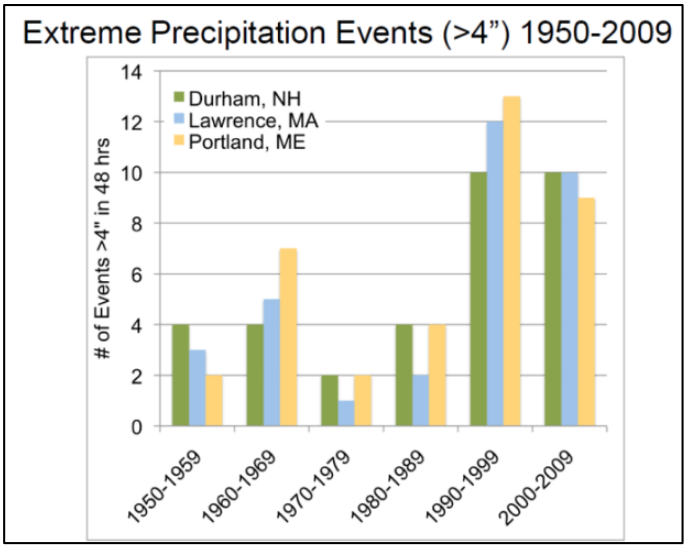


Figure NHZ4. Number and frequency of extreme precipitation events greater than four inches in 48 hours.. (Source: Wake et al, 2013)

Larger volumes of water flowing at greater velocity can result in erosion that undermines roads, culverts, embankments and river channels. Evidence of erosion from extreme precipitation events is well-documented by municipalities across the region. Refer to the Existing Conditions section of Climate Change Chapter for more detailed description of the changes in rainfall in the region.

As shown in Figure NHZ5, since the 1990's the magnitude and frequency of **extreme precipitation** events have increased compared with the historical trends since 1950. This change in precipitation has been documented by the Northeast Regional Climate Center at Cornell University. Their data shows a marked increase in the amount of rain associated with large events such as the 50-year, 100-year and 500-year storms. As a result of these changes, many areas experience extensive flooding including flooding caused by undersized stormwater management infrastructure not designed to manage larger flows.

Refer to the Coastal Flooding section below for information about FEMA Flood Insurance Rate Maps and Federal Flood Insurance.

Erosion

Erosion is the process of wind and water wearing away soil and earth materials. Erosion is a significant threat to populated and development areas during inland floods and coastal storms. During extreme precipitation events, riverine erosion or *fluvial erosion* has caused catastrophic failure of channels, floodplains, and road infrastructure. This type of failure damages buildings, homes, roads and structures and can result in substantial loss of upland. Often such failures are not anticipated with little to no preparation in place. In such cases emergency response is typically needed to close roads, remove debris and rescue stranded people from cars, homes and businesses.

For more information about erosion refer to the Fluvial Erosion Hazards section of the Natural Resources Chapter.

Rapid Snow Pack Melt

Warm temperatures and heavy rains cause rapid snowmelt in winter and spring months. These conditions can result in severe flooding during times when the earth is still frozen and has limited capacity to absorb runoff. The cumulative effect of rapid snowmelt in upper portions of a watershed can result in extensive flooding in lower lying and downstream communities.

River Ice Jams

Rising waters in early spring often break apart ice covering rivers and streams, causing the ice to float downstream and pile up, resulting in flooding. Small rivers and streams pose special flooding risks because they are easily blocked by jams. Ice floating in rivers can damage bridges, roads, and the surrounding lands, vegetation and aquatic habitats.

Dam Breach and Failure

Dam failure results in rapid loss of water that is normally held by the dam. These kinds of floods are extremely dangerous and pose a significant threat to life, property and aquatic habitats. Refer to the Appendix for a map showing dam locations in the region. For more information about erosion refer to the Dams section of the Natural Resources Chapter.

Note: Coastal flooding from sea level rise and storm surge differs from river flooding, which is generally caused by severe precipitation. Depending on the storm event, in the upper reaches of some tidal rivers, flooding from storm surge may be followed by river flooding from rain in the upland watershed. This can increase the flood severity for coastal municipalities.

Coastal Flooding

Coastal flooding, or coastal inundation, is the flooding of normally dry, low-lying coastal land, primarily caused by severe weather events along the coast, estuaries, and adjoining rivers. These flood events are some of the more frequent, costly, and deadly hazards that can impact coastal communities. Coastal

flooding in the region is primarily due to major rain storms and nor'easters but can also occur from full-moon tides. In some areas, human activities, particularly disruption of natural protective coastal features (e.g. dunes or wetlands) or the lowering of land as a consequence of drainage, may also exacerbate coastal flooding hazards.

Coastal flooding is particularly dangerous when there is a storm surge, which is an abnormal rise in water level, over and above the regular astronomical tide, caused by forces generated from a severe storm's wind, waves, and low atmospheric pressure. Storm surges are extremely dangerous because they are capable of flooding large coastal areas. According to the National Oceanic and Atmospheric Administration (NOAA) the greatest loss of life and economic damage from a hurricane is due to storm surge. (http://www.noaa.gov/)
There are several factors that contribute to coastal floods:

- Severe weather events create meteorological conditions that drive up the water level, creating a storm surge. These conditions include strong winds and low atmospheric pressure, and can be caused by hurricanes, extra tropical storms such as Nor'easters, or by other severe storm conditions.
- Large waves, whether driven by local winds or swell from distant storms, raise average coastal water levels and individual waves roll up over land.
- High tide levels caused by normal variations in the astronomical tide cycle.
- Other larger scale regional and ocean scale variations are caused by seasonal heating and cooling and ocean dynamics.

Very intense storms, like hurricanes, can generate large and devastating storm surges. The surge occurs when high winds push water toward the shore. The low pressure associated with intense storms has a small effect on surge as well.

The size of a storm surge for a particular location depends on a number of factors. Storm surge is very sensitive to the shape of the coast, and to changes in storm track, intensity, forward speed, and size. Tidal height at the time of maximum storm surge is an important factor, too. (The combined effect of the storm surge and the astronomical tide is called the storm tide.)
The slope of the sea floor also influences the level of surge in a particular area. Areas with a shallow slope of the sea floor off the coast will allow a greater surge. Areas with a steeper slope will not see as much surge, but will generally have large breaking waves that can destroy lower elevation buildings near the coast and open bays.

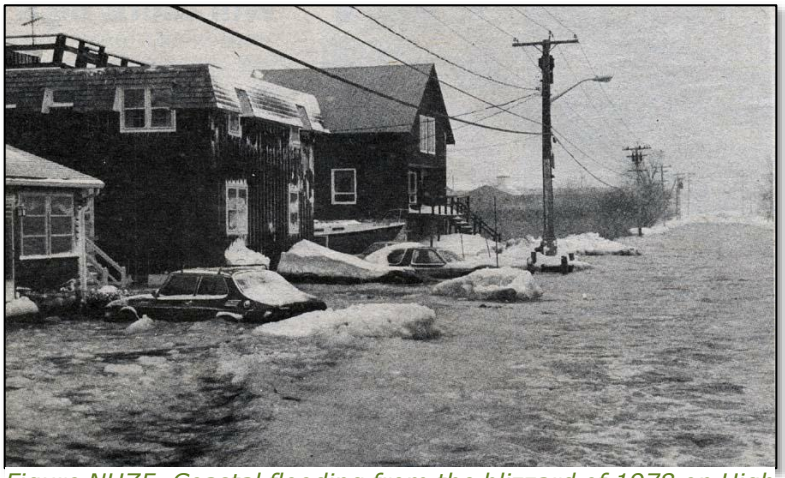


Figure NHZ5. Coastal flooding from the blizzard of 1978 on High Street in Hampton, approximate a half mile from the beach. [Source: www.hampton.lib.nh.us]

A history of coastal storms that have impacted the region can be found in Appendix B of this chapter.

Flood Insurance Rate Maps and Federal Flood Insurance

The FEMA produces regulatory maps - Flood Insurance Rate Maps (FIRMs) - that delineate the 100-year and 500-year floodplains (coastal and upland areas) across the state. The purpose of the maps is to determine areas that flood during such storm events whereby properties within these areas are eligible for federal flood

insurance. Municipalities that adopt the FIRMs along with minimum floodplain regulations in their zoning ordinance are eligible for federal disaster assistance for declared disasters.

Currently, property owners hold 3,414 federal flood insurance policies totaling $677,081,800 of insurance in force. As of March 2014, $13,369,316 has been paid to property owners in the region for building losses and damages and $48,235,266 statewide. By far the Town of Hampton holds the largest number of federal flood insurance policies, insurance in force, and payments for building losses and damages. The majority of these policy owners are located in tidally influenced and coastal areas. The number of NFIP policies does not reflect the number of properties located in the 100-year floodplain as only properties with a mortgage or lean are required to have federal flood insurance.

Table NHZ2. FEMA National Flood Insurance Program Disaster Report – Flood Insurance summary for municipalities in RPC's region.

Municipality	# of Policies	Insurance $ In Force	Total # Paid Losses	Total $ Paid	Repetitive Loss Buildings	Repetitive Loss Payment $
Atkinson	2	610,000	0	0	0	0
Brentwood	10	2,132,700	10	83,730	1	49,752
Danville	13	3,169,600	1	0	0	0
East Kingston	5	820,500	1	1,086	0	0
Epping	29	5,648,600	38	621,278	9	504,627
Exeter	111	21,621,800	88	1,198,416	17	1,032,753
Fremont	37	7,500,600	45	1,098,573	5	214,043
Greenland	16	3,231,100	12	272,095	2	245,488
Hampstead	42	9,502,900	9	80,472	1	48,746
Hampton Falls	12	3,452,000	7	74,529	0	0
Hampton	1,789	317,700,100	681	4,577,739	40	1,821,624
Kensington	The town joined the NFIP in spring of 2014.					
Kingston	39	8,352,300	9	100,318	2	83,102
New Castle	40	11,676,600	8	9,607	0	0
Newfields	8	2,290,800	0	0	0	0
Newington	7	1,999,000	0	0	0	0
Newton	2	52,100	0	0	0	0
North Hampton	59	11,795,000	46	470,422	2	67,665
Plaistow	7	1,412,300	1	0	0	0
Portsmouth	140	41,075,100	31	198,896	2	51,561
Rye	309	79,131,800	255	1,709,579	15	584,940
Salem	432	76,213,100	140	2,485,831	15	1,687,963
Sandown	7	1,795,000	2	6,759	0	0
Seabrook Beach Village District	177	42,122,400	27	170,893	4	135,169
Seabrook	99	18,643,900	47	168,092	2	36,428
South Hampton	3	795,000	6	18,627	1	11,394
Stratham	19	4,337,500	3	22,374	1	17,288
Totals	**3,414**	**677,081,800**	**1,467**	**13,369,316**	**119**	**6,592,543**

Statistics for the policy and insurance in force are current as of March 2014. For the number of paid losses, paid loss amounts, and repetitive loss data, the totals are to date beginning in 1978. [Source: NHOEP 2014]

Updated Coastal Flood Insurance Rate Maps

In 2013, FEMA issued update preliminary FIRMs for tidally influenced and coastal municipalities in NH. The NH Office of Energy and Planning anticipates that the new FIRMs will be finalized by 2015 for adoption by municipalities. On the following page is a summary of the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014 which amended the Biggert-Waters Flood Insurance Reform Act enacted in 2012. As shown in Table 2, the Town of Hampton holds by far the largest number of federal flood insurance policies, insurance in force, and payments for building losses and damages; the majority of these policy owners located in tidally influenced and coastal areas.

Refer to Appendix C for a summary of the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014, a law that repeals and modifies certain provisions of the Biggert-Waters Flood Insurance Reform Act, which was enacted in 2012.

Hurricane and High Wind Events

Significantly high winds occur especially during hurricanes, tornadoes, winter storms and thunderstorms. Downed trees and power lines, and blown and falling objects are dangerous risks associated with high winds. In addition, property damage and downed trees are common during high wind occurrences.

Hurricanes

A hurricane is a tropical cyclone in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. The eye of the storm is usually 20-30 miles wide and may extend over 400 miles. High winds are a primary cause of hurricane-inflicted loss of life and property damage.

Tornadoes

A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. Tornadoes produce the most violent winds on earth, at speeds of 280 mph or more. In addition, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be in excess of one mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage. Refer to Appendix A for a description of the Fujita Tornado Damage Scale (F-Scale).

The Fujita Scale (refer to Appendix B) is the standard scale for rating the severity of a tornado as measured by the damage it causes. A tornado is usually accompanied by thunder, lightning and heavy rain. In comparison with a hurricane, a tornado covers a much smaller area but can be more violent and destructive.

Severe Thunderstorms

All thunderstorms contain lightning. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction of the air causes a shock wave that we hear as thunder, which can damage building walls and break glass.

Lightning

Lightning is a giant spark of electricity that occurs within the atmosphere or between the atmosphere and the ground. As lightning passes through air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the sun. Lightning strikes can cause death, injury and property damage.

Hail

Hailstones are balls of ice that grow as they are held up by winds, known as updrafts, which blow upwards in thunderstorms. The updrafts carry droplets of super cooled water – water at a below freezing temperature – but not yet ice. The super cooled water droplets hit the balls of ice and freeze instantly, making the hailstones grow.

Downburst

A downburst is a severe, localized wind blasting down from a thunderstorm. These "straight line" winds are distinguishable from tornado activity by the pattern of destruction and debris. Depending on the size and location of these events, the destruction to property can be devastating. Downbursts fall into two categories: Microburst which covers an area less than 2.5 miles in diameter; and Macroburst which covers an area at least 2.5 miles in diameter.

Severe Winter Weather

Ice and snow events typically occur during the winter months and can cause loss of life, property damage and tree damage.

Heavy Snow Storms

A winter storm can range from moderate snow to blizzard conditions. Blizzard conditions are considered blinding wind-driven snow over 35 mph that lasts several days. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period.

Ice Storms

An ice storm involves rain, which freezes upon impact. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires and similar objects, often resulting in widespread power outages. Refer to Appendix A for a description of the Sperry–Piltz Ice Accumulation Index.

Extreme Cold

Extreme cold consists of temperatures and wind chills that are significantly lower than normal and can cause a number of health and safety concerns, including frostbite, hypothermia, carbon monoxide poisoning and fires from alternative heating sources. Extreme winter cold often causes poorly insulated water pipes to freeze. Even some poorly-protected indoor plumbing may rupture as frozen water expands within them, causing property damage. Fires become more hazardous during extreme cold. Water mains may break and water supplies may become unreliable, making firefighting more difficult.

Nor'easters

A nor'easter is a large weather system traveling from south to north passing along or near the seacoast. As the storm approaches New England and its intensity becomes increasingly apparent, the resulting counterclockwise cyclonic winds impact the coast and inland areas from a northeasterly direction. The sustained winds may meet or exceed hurricane force, with larger bursts, and may exceed hurricane events by many hours (or days) in terms of duration.

Drought

Although New Hampshire is typically thought of as a water-rich state, there are times the demand for water can be difficult to meet. A combination of increased population and extended periods of low precipitation can cause reduced water supplies in the state. Drought is a normal, recurrent feature of climate. (NHDES Water Division)

The report *Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future* (Wake, 2011) projects increases in summer temperatures, decreases in the coldest winter temperatures, precipitation in the form of more rain and less snow, and longer dry periods punctuated by extreme storm events. Together these changes point to a greater likelihood of drought in the future.

In 1990, New Hampshire adopted a Drought Management Plan. The purpose of the Plan is to ensure that the state will respond in an organized, responsive and appropriate manner in the event of a drought related water shortage.

Key Issues and Challenges

Natural hazards have impacted and will continue to impact the state and the region. Coupled with climate change, it is very likely that these naturally occurring events may intensify and prove costly to municipalities,

businesses and residents. Impacts will be particularly noticeable on the coast where the combined effects of sea level rise coupled with coastal storm surge and upland flooding can cause the most damage to private and public property, assets and resources.

Municipalities have a critical role to play in natural hazard mitigation. Public Works staff and Emergency Management Directors are on the front lines of identifying mitigation actions, including infrastructure upgrades and public education on storm preparedness. Changes in climate are driving many of the mitigation projects municipalities need to implement to reduce risks posed by natural hazards. The Mitigation Action Plans included in every local Hazard Mitigation Plan provide the information local officials need to increase community resiliency.

Regional Trends

This section will examine trends, challenges and opportunities posed by natural hazards in the region.

Increase in the Magnitude and Frequency of Extreme Precipitation Events

Since the 1990's the magnitude and frequency of extreme precipitation events have increased compared with the historical trends since 1950.

Seasonal Coastal Flooding and Impacts from Sea Level Rise

Seasonal flooding and coastal storm related flooding have worsened.

Sea level rise is impacting coastal wildlife, forests and tidal wetlands.

Increased Investment and Populations in High Risk Areas

Seasonal coastal homes are redeveloped into permanent residences.
Value of coastal property continues to increase despite and overall downturn in market and assessed values.

Current and Future Challenges

Limited Financial Resources for Infrastructure Improvements and Upgrades

The state and municipalities lack consistent and dedicated funding sources to implement necessary upgrades to roads and infrastructure today and to address future impacts of climate change. There is also a lack of information to help prioritize those upgrades.

Lack of Municipal Inventories and Mapping of Infrastructure, Critical Facilities and Utilities

Many municipalities lack detailed inventories and mapping of infrastructure, critical facilities and utilities. This information is necessary to prepare comprehensive management plans that prioritize improvements for regular maintenance and incorporate actions to address future impacts of climate change.

Lack of Capacity for Coordination and Long Range Planning

Only a handful of municipalities have full-time planning staff. Others have part-time staff or circuit rides, or no planning support. Even those municipalities with planning support find it difficult to increase workloads particularly a complex topic like natural hazards and climate change.

Strategies and Opportunities

State and Federal Assistance

Stafford Act of 1988

The Stafford Act of 1988 (Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988. Pub. L. No. 100-707. Codified at 42 U.S.C. §§ 5121-5207) provides the legal authority for the federal government to provide assistance to states during declared major disasters and emergencies.

The Stafford Act authorizes the president to declare a "major disaster" or "emergency" in response to an incident or threatened incident that is beyond the combined response capabilities of state and local governments. The Federal Emergency Management Agency (FEMA) coordinates administration of disaster relief resources and assistance to states and the presidential declaration specifies the types of assistance authorized which can include other public health emergency response authorities. A presidential declaration enables access to disaster relief assistance and funds as appropriated by Congress. Congress may authorize additional funds as an event dictates. The Disaster Relief Fund is limited to those purposes specifically authorized and defined in the Stafford Act - implementing allowed activities to respond to major disasters and emergencies (Robert T. Stafford Disaster Relief and Emergency-Assistance Act Fact Sheet).

Resources and Assistance Available

Three types of assistance are authorized by the Stafford Act. Assistance includes direct federal aid in terms of services, grants, and technical support, or as reimbursement for services provided by or contracted for by affected states. FEMA has extensive rules, policies, and guidance to further define eligibility and procedures for Stafford Act assistance.

Individual Assistance:- Provides immediate direct and financial assistance to individuals for housing and other disaster related needs.

Hazard Mitigation: Provides grants to affected governments to implement long-term hazard mitigation measures after a major disaster declaration. Only areas within the geographic area designated in the declaration are eligible for hazard mitigation aid. Hazard mitigation assistance is available for major disasters but not emergencies under the Stafford Act.

Public Assistance: Provides aid to eligible applicants seeking assistance with eligible costs for eligible work performed at eligible facilities. Funding for public assistance is divided generally into a 75 percent federal share and 25 percent state share; however, the federal share may be raised in a presidential declaration.

Additional Assistance through Mutual Aid Agreement Reimbursement

FEMA will reimburse for services provided through written mutual aid agreements, like the Emergency Management Assistance Compact (EMAC), for aid provided to states where there has been a presidential declaration, the activities and costs directly relate to the event and eligible work, and costs are reasonable. (Robert T. Stafford Disaster Relief and Emergency-Assistance Act Fact Sheet)

N.H. Office of Energy and Planning

The Office of Energy and Planning (OEP) administers the National Flood Insurance Program (NFIP) in New Hampshire. The NFIP is a partnership between a community and the federal government. Currently, there are 214 communities (91 percent) in New Hampshire that participate in the NFIP. Communities participate by agreeing to adopt and enforce a floodplain management ordinance designed to reduce future flood risks and in return all residents in those participating communities (whether in floodplain or not) can purchase flood insurance. Through FEMA's Community Assistance Program, OEP provides technical assistance to communities and the public on floodplain management and helps to promote sound land use planning techniques that will reduce flood losses. OEP conducts Community Assistance Visits to ensure that communities participating in the NFIP are meeting program goals. OEP staff is available to help you and your community understand the NFIP.
OEP provides assistance on Flood Insurance, Floodplain Maps and Studies, Floodplain Outreach, and Floodplain Regulations. For more information and resources about floodplain management, refer to the N.H. Office of Energy and Planning website at http://www.nh.gov/oep/planning/programs/fmp/index.htm. (N.H. Office of Energy and Planning, Floodplain Management Program)

Refer to the following website for federal assistance programs: FEMA's Community Assistance Program, FEMA Community Status Book, FEMA Regional Office in Boston.

N.H. Homeland Security and Emergency Management

The N.H. Homeland Security and Emergency Management HSEM is responsible for coordinating the state's response to natural disasters including hurricanes, floods and severe winter storms. The NH HSEM Planning Section administers the Hazard Mitigation Assistance programs, assisting in the development of comprehensive hazard mitigation plans and projects to protect citizens, and their property from exposure to all hazards including: natural, human caused, and technological. The Planning Section is also responsible for management of the FEMA Public Assistance grant program and the Emergency Management Performance Grant. HSEM also prepares the State Hazard Mitigation Plan (last updated in 2013) which lays out goals and recommendations to protect the state, municipalities and residents from impacts from natural and human caused hazards. (Homeland Security and Emergency Management)

The United States Congress, in 2000, adopted the Disaster Mitigation Act of 2000, providing federal funding for the development of state and local hazard mitigation plans and projects.
States and municipalities must adopt hazard mitigation plans in order to be eligible for federal hazard mitigation project funding and disaster relief. These plans are reviewed and approved by the Federal Emergency Management Agency (FEMA).

For more information about programs and assistance refer to the Homeland Security and Emergency Management website at http://www.nh.gov/safety/divisions/hsem/.

FEMA Community Rating System

To meet the need for property insurance coverage in floodplains, the Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP). The NFIP offers reasonably priced flood insurance in communities that comply with minimum regulatory standards for floodplain management. The NFIP's Community Rating System (CRS) recognizes community efforts beyond those minimum standards by reducing flood insurance premiums for floodplain property owners in participating communities. CRS discounts on flood insurance premiums range from 5% up to 45%.Those discounts provide an incentive for new flood protection activities that can help save lives and property, and reduce impacts in the event of a flood.

To participate in the CRS, communities can choose to undertake some or all of the 18 public information and floodplain management activities in the program. The CRS assigns credit points for each activity. Table __ describes the activities, the possible number of credit points for each activity and the average number of credit points communities earn for each activity. Based on the total number of points earned, the CRS assigns the community to one of ten classes; the class determines the percentage of discount on flood insurance premiums.

Table NHZ3. FEMA community Rating System floodplain management activities.

Series	Description	Maximum Points	Average Points
300	Public Information: *Elevation certificates*, map information service, outreach projects, real estate hazard disclosures, flood protection information, flood protection assistance	936	393
400	Mapping and Regulations: *Additional local flood data*, open space preservation, *higher floodplain regulatory standards*, flood data maintenance, stormwater management	5,895	620
500	Flood Damage Reduction: Floodplain management planning, *acquisition and relocation, flood protection (flood proofing, elevation)*, drainage system maintenance	6,689	653
600	Flood Preparedness: Flood warning program, *levee safety*, dam safety	1,330	357

Total eligible Points	***14,850***	***2,023***
Note: Activities in italics are eligible for the highest number of point in that series.		

Below is an example of a recommendation from the CRS Program, Series 500). The graph below shows the substantial level of savings on NFIP flood insurance premiums associated with raising the first floor elevation of structures above the base flood elevation also referred to as "freeboard".

Note: The Zone VE includes areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action, typically located on the immediate coast. The Zone AE are areas subject to inundation by the 1-percent-annual-chance flood event.

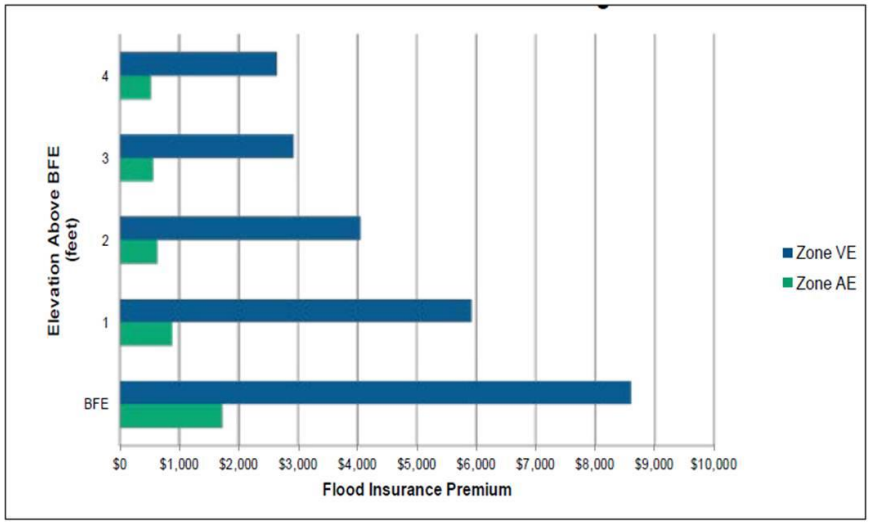


Figure NHZ6. Potential savings on flood insurance policy rates in National Flood Insurance Program flood based on elevating buildings by varying amounts above the base flood elevation.

Regional and Local Initiatives

Local Multi-Hazard Mitigation Plans

Federal Requirements and Plan Preparation

Local hazard mitigation plans create a framework for risk-based decision making to reduce damages to lives, property, and the economy from future hazards including impacts from climate change. Hazard mitigation planning forms the basis for a municipality's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. In 2000, the United States Congress adopted the Disaster Mitigation Act of 2000 [42 U.S.C. §5165], providing Federal funding for the development of State and local hazard mitigation plans and projects. These plans are reviewed by NH HSEM and the Federal Emergency Management Agency (FEMA), and adopted by the local governing body. New Hampshire Homeland Security and Emergency Management (NH HSEM) coordinate the updates of the State Hazard Mitigation Plan and provide technical assistance to state agencies and local governments in developing their hazard mitigation plans and projects. NH HSEM also provides funding assistance to local governments through the regional planning commission to develop their hazard mitigation plans. Hazard mitigation plans are updated every 5 years. (New Hampshire Department of Safety)

The Disaster Mitigation Act of 2000 requires municipalities to adopt a compliant and approved hazard mitigation plan to be eligible for federal disaster relief funds and federal hazard mitigation project funding programs such as FEMA Pre-Disaster Mitigation grants.

FEMA provides comprehensive guidance on how best to prepare and implement hazard mitigation plans to ensure plans provide the maximum benefit to the municipality (see additional resources on their website at http://www.fema.gov/hazard-mitigation-planning-resources).

Benefits to the Municipality

Hazard mitigation plans provide multiple functions and benefits to municipalities. Local plans serve as a framework for many types of planning including emergency preparedness and response, infrastructure and capital improvement investments, land use planning and regulation, public health and safety, public education and outreach, and land conservation. The local hazard mitigation planning process brings together a diverse group of representatives within the municipality allowing a coordinated and collaborative approach across all sectors of governance, planning and regulatory duties. All communities that RPC has assisted with updating their hazard mitigation plans maintain a list of vulnerable residents to provide necessary services during hazard events and emergencies (ill, elderly, day cares, etc.).

In hazard mitigation planning, ***'mitigation'*** refers to application of strategies and practices that reduce risk and vulnerability to natural hazards. Climate change defines mitigation as activities that reduce greenhouse gas emissions, the major cause of climate change.

Climate Change Considerations

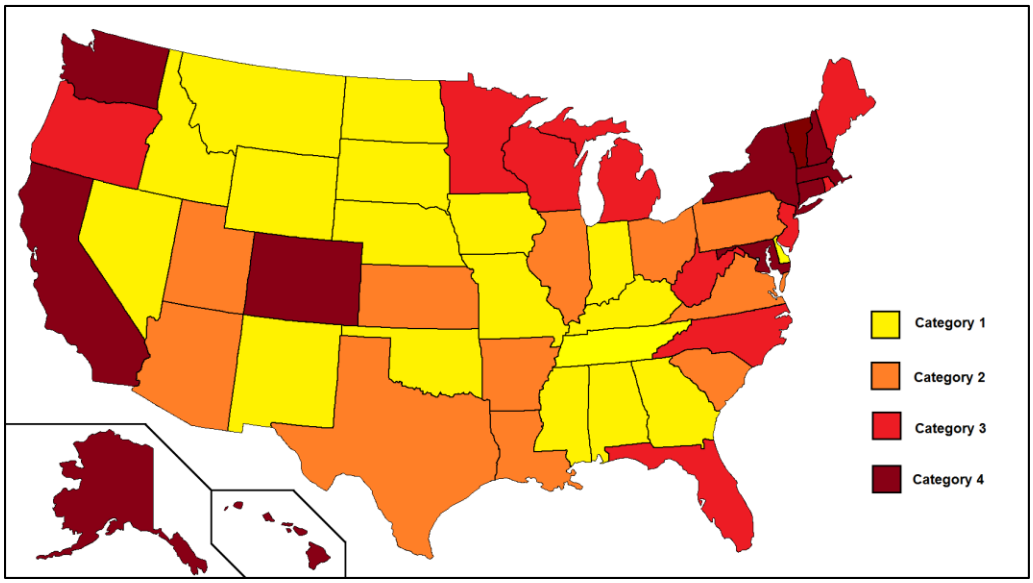
Current and future conditions relating to natural hazards and climate change can be incorporated into hazard mitigation plans; however, FEMA and HSEM offer no specific guidance or standards on how to do so. Being a coastal state that has experienced severe storm events in the past, New Hampshire incorporated climate change goals and recommendations in the 2009 update of the State Hazard Mitigation Plan.

The primary goal of hazard mitigation planning is to reduce loss and damage of public and private assets and resources and provide a long-term plan that results in sustainable, disaster-resilient communities. There are several distinct benefits to using the Hazard Mitigation planning process as a tool for climate adaptation planning.

- ✓ Plans are an existing tool with multiple functions and part of an established local planning process.
- ✓ A FEMA reviewed HMP is required for municipalities to be eligible for disaster relief funds and grant programs.
- ✓ Current and future conditions and associated risk and vulnerability can be incorporated.
- ✓ Plans are updated every five years which allows for iterative and adaptive revisions based on changing conditions.
- ✓ Updates are supported by a dedicated funding source through FEMA.

According to a 2013 study conducted by the Center for Climate Change Law at Columbia Law School, NH's State Hazard Mitigation Plan ranked highest – category 4 along with Vermont, Massachusetts and Connecticut and seven other states – for featuring the most complete and helpful integration of climate change related information. (Babcock, 2013)

Figure NHZ7. Map of the ranking category for each state from the Columbia Law School report State Hazard Mitigation Plans & Climate Change: Rating the States (2013). Category 4 includes states having adopted Hazard Mitigation Plans that have the most complete and helpful integration of climate



The study evaluated the extent climate change related issues are incorporated into existing State Hazard Mitigation Plans, with an emphasis on identifying which states have a more accurate and thorough discussion of the issue. The survey identified those state plans that address climate change and climate-related issues in an accurate and progressive manner, and those that do not. According to the report, the results of the survey indicate that coastal states are more likely to acknowledge climate change, possibly due in part to recent emphasis on and awareness of the relationship between climate change and sea level rise, coastal storms, and related hazards.

Local Emergency Operations Plans

The primary purpose for Local Emergency Operations Plans (LEOPs) is to implement disaster and emergency preparedness, response, and short-term recovery planning. LEOPs describe who will do what, as well as when, with what resources, and by what authority before, during, and immediately after an emergency. Local Emergency operations Plans serve as the basis for effective response to any hazard that threatens a municipality, both natural and man-made. The Plans facilitate integration of mitigation into response and recovery activities, and facilitate coordination with the Federal Government during catastrophic disaster situations that necessitate implementation of the Federal Response Plan (FRP). The specific actions implemented by local emergency operations plans are to:

- Assign responsibility to organizations and individuals for carrying out specific actions at projected times and places in an emergency.
- Establish lines of authority and organizational relationships, and describes assigned actions will be coordinated.
- Describe how people and property will be protected in emergencies and disasters.
- Identify personnel, equipment, facilities, supplies, and other resources available within the municipality or by agreement with other jurisdictions for use during response and recovery operations.
- Identify steps to address mitigation concerns during response and recovery activities.

(Federal Emergency Management Agency, 1996)

Watershed Based Research

Fluvial Geomorphology Studies of the Exeter and Lamprey Rivers

Fluvial geomorphology is the study of how running water shapes the landforms on the Earth's surface. Fluvial erosion is the wearing away of river channel banks and beds by the action of water.

RSA 674:56 II (a) Flood Hazards states "Municipalities may adopt fluvial erosion hazard ordinances. Any fluvial erosion hazard zoning shall be based on delineation of zones consistent with fluvial erosion hazard protocols established by the department of environmental services." This statute became effective July 2009. To date no municipalities in the RPC planning region have adopted fluvial erosion hazard zones or ordinances.

However, the fluvial geomorphic studies of the Exeter and Lamprey Rivers contain inventories of erosion hazards with recommendations for repair and restoration of actively eroding areas (buffers, revegetation) along the river and its floodplain, and recommendations for replacing and upgrading infrastructure such as bridges, culverts and stabilizing walls. These inventories and recommendations have been used by several towns to prioritize activities in the river corridor and floodplain and obtain funding for project implementation.

The Exeter and Lamprey River reports are available on the NHDES website at http://des.nh.gov/organization/divisions/water/wmb/was/watershed_based_plans.htm.

Lamprey River Watershed Climate and Land Use Study

Coastal communities in New England are confronting the effects of rapid development and associated land use change, while also dealing with the serious impacts of an increase in extreme precipitation events. Both factors influence the frequency and magnitude of flood events. In response, local decision-makers and regional planners seek improved scientific information regarding flood risk as a basis for guiding development, supporting land use decision-making, and planning infrastructure investments.

To address this gap, NOAA funded a study for the Lamprey River watershed - *Assessing the Risk of 100-year Freshwater Floods in the Lamprey River Watershed of New Hampshire Resulting from Changes in Climate and Land Use* - to assess flood risks based on existing and future land use and climate change scenarios. Key products from this study include maps at the watershed and municipality scale of projected 100-year flood risk areas under modelled land use and development patterns, stormwater runoff generation, and climate change scenarios.

Refer to the section Riverine Flooding on page 7 of this chapter for a definition of the 100-year floodplain.

The full report and additional information about flooding is available on the Carbon Solutions New England website at http://100yearfloods.org/.

Collaborative Networks

Federal and state agencies and regional organizations offer municipalities a wide range of technical assistance, funding and support program for hazard mitigation and emergency planning efforts. The greatest benefit to partnering with these agencies and organizations is the opportunity to participate in collaborative networks that share information and resources, work together to address common problems, and learn from peers about the challenges they face in preparing and protecting their communities for the impacts of natural hazards and disasters.

New Hampshire Public Works Municipal Aid Program

The New Hampshire Public Works Municipal Aid (NHPWMA) program is a network of municipalities that assist one another during emergencies through partnering agreements and a protocol for requesting and receiving aid. Since most disasters impact multiple municipalities, NHPWMA allows communities from all over the state to respond to those most affected. The program maintains contact information and inventories of services and equipment for each member of the program. NHPWMA is currently available to municipalities and other governmental entities including village districts and private water and wastewater utilities. During emergencies, members can either contact other members directly, use the toll-free hotline (877-731-9908) or via email using the pw.net listserv. Providing aid is optional and aid agreements are reciprocal. For more information about the program, visit the University of New Hampshire, Technology Transfer, New Hampshire Public Works Municipal Aid program website.

Nearly half of the municipalities in the region are members of the NHPWMA program, including all seven municipalities immediately bordering the coastline.

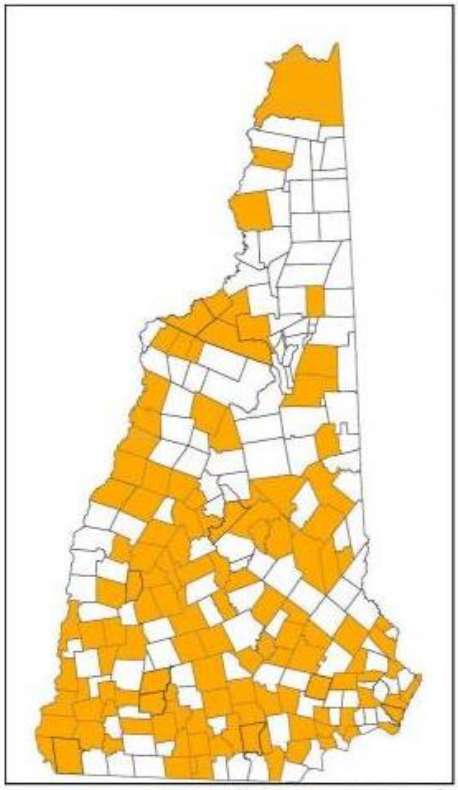


Figure NHZ8. Municipalities participating in the New Hampshire Public Works Municipal Aid (NHPWMA) program.

Participation in the program provides the region with enhanced response capacity and ability to provide timely services during hazardous events or life threatening circumstances. Coordinating regional systems such as evacuation routes, local flooding and damage to infrastructure will assist residents, businesses and visitors to execute their own safety and preparedness plans.

Best Practices to Minimize Impacts and Create Resilience

Understanding community vulnerability and the level of risk posed by natural hazards is the first step in prioritizing municipal response. Municipal mitigation action plans that are developed as part of local hazard mitigation plans identify many proven projects or programs that improve community preparedness and response. The following practices can be incorporated into municipal policies plans and procedures. Adopting proactive practices to reduce risk and exposure to natural hazards, in addition to emergency response planning, can help to increase municipal and community-wide resilience and preparedness.

Table NHZ4. Best practices for municipalities to minimize impacts and create resilience.

Implementation Methods	Integrated Practices
Emergency Response Plan **Disaster Response and Recovery Plan** **Hazard Mitigation Plan** **Capital Improvement Plan** **Zoning and Land Development Regulations** **Master Plan**	Conduct an annual culvert inspection and maintenance program. Work with utilities and public works departments to trim trees overhanging utility wires and poles. Conduct outreach and education programs on homeowner and business preparedness. Adopt hazard resilient stormwater management regulations. Activate emergency notification call systems. Update Emergency Response Plan with best available information (including sea level rise, flooding and infrastructure mapping). Establish goals that address emergency management, climate change and management of critical assets and resources.

Best Practices by Municipalities in the Region

Every town in the region has a Natural Hazards Mitigation Plan. These plans describe actions being undertaken by towns to increase resiliency to natural hazards and climate change and increase effectiveness of local response to weather related events. Examples of these best practices include:

- Conserving shoreland and associated uplands to enable flood storage and reduce the impact of flooding;
- Conducting regular inspection and maintenance of drainage systems, including clearing debris and sediment from drains, culverts and roadside ditches;
- Elevating roads and bridges above base flood elevation;
- Educating residents seasonally about how to prepare their homes and businesses for natural hazards;
- Using social media to alert and inform residents about pending weather related events;
- Referring to local, county and state natural hazard mitigation plans when developing master plans, land use regulations, capital improvement plans, and land conservation plans;

Refer to the Climate Change Chapter for a detailed list and description of climate adaptation strategies that increase resilience and reduce risk and exposure.

Federal, State and Regional Resources

An effective strategy to address impacts of natural hazards is to build networks to encourage collaboration with agencies, academia and other practitioners to improve preparedness and reduce loss and damage. Each organization listed in the table below offers tools, technical assistance or financial resources for hazard mitigation planning, project implementation and community outreach and engagement. Municipalities benefit immensely from partnering with these organizations by increasing their knowledge of and capacity to address hazards through thoughtful planning and investment.

Table NHZ5. Agencies and organizations assisting with hazard preparedness and climate adaptation. To be Completed.

Agency/Organization	Tools-Resources
N.H. Homeland Security and Emergency Management	Provides guidance and informational materials. Assists with applying for FEMA grant funds and disaster relief. Manages and funds (through FEMA) Hazard Mitigation Plan updates.
N.H. Office of Energy and Planning Jennifer Gilbert, CFM, ANFI State Coordinator – Floodplain Management Program Voice: (603) 271-1762 Email: jennifer.gilbert@nh.gov	National Flood Insurance Program (NFIP) compliance assistance. Technical assistance to communities and the public on floodplain management. Community Assistance Visits to evaluate/update floodplain standards. Community Rating System Program assistance
Coastal Adaptation Workgroup	Assists communities to prepare for the effects of extreme weather events and other effects of long term climate change. Provides communities with resources, education, facilitation and guidance materials. Collaborative network support. Website at http://nhblog.stormsmart.org/
N.H. Department of Environmental Services (DES): NH Coastal Program Air Resources Division Water Resources Division	Provides technical assistance and resources. Coastal management and information and website at http://des.nh.gov/organization/divisions/water/wmb/coastal/index.htm
Climate Research Centers at University of New Hampshire and Antioch University	Research, conferences, technical assistance. Collaborative network support.
N.H. Coastal Risks and Hazards Commission	Science and Technical Advisory Panel Report (2014). Recommendations on legislation and other actions (in process through 2016).
Association of State Floodplain Managers (ASFM)	Promote education, policies, and activities that mitigate current and future losses, costs, and human suffering caused by flooding. Protect the natural and beneficial functions of floodplains - all without causing adverse impacts. ASFM website at http://www.floods.org/

Natural Hazards Recommendations

Recommendation 1

Incorporate information on future hazards and climate change in municipal planning documents (e.g. Hazard Mitigation Plans, Master Plans, capital improvement plans, and open space and land conservation plans).

Actions

- Prepare multi-hazard and climate change vulnerability assessments for coastal and Great Bay municipalities (including inventories of existing infrastructure, assets and facilities).
- Support municipalities in adopting a Climate Change Chapter in their local hazard mitigation plans.
- Adopt natural hazards and climate adaptation measures in municipal infrastructure and facilities management plans.
- Adopt long term goals in local Master Plans to reduce risk and exposure to natural hazards and climate change impacts based on recommendations from vulnerability assessments and local Hazard Mitigation Plans.
- State and regional partners (such as NH HSEM, Coastal Adaptation Workgroup, NH Coastal Program and RPC) secure funding for regional and local hazard mitigation planning and climate adaptation projects.

Recommendation 2

Implement strategies to minimize impacts to people, property, and infrastructure.

Actions

- Work with state agencies, utilities and municipalities to plan for future use of lands in high risk areas served by state, municipal and private infrastructure, considering adaptive reuse, relocation, and retreat strategies.
    - Assess risk and level of exposure of key regional and local infrastructure and facilities.
    - Identify strategies to implement phased and iterative adaptation measures through the life-cycle of infrastructure and facilities in high hazard areas.
    - Plan for future relocation or replacement of infrastructure and facilities in high risk areas.
- Evaluate new and alternative funding mechanisms for upgrades and planned actions that address future impacts of climate change.
- Create local multi-sector planning committees to identify and integrate key cross-cutting issues and recommendations into municipal policies and programs, regulations and building codes.
    - Committees may consist of elected officials, department heads and staff, land use boards and commissions and water/sewer utilities.
- Adopt standards in local zoning and land development regulations that protect and minimize impacts to public and private investments, and critical resources.

Recommendation 3

Implement strategies to conserve and minimize impacts to ecosystems, natural resources and historical and cultural resources.

Actions

- Assess risk and level of exposure of critical ecosystems, environmental services, and historical and cultural resources to natural hazards and climate change.

- Collaborate with natural resource and environmental agencies and organizations to prepare resource based plans (natural, historical, cultural) at the (sub)watershed scale that consider existing hazards and future impacts of climate change.

- Collaborate with natural resource and environmental agencies and organizations to conserve and protect environmental services provided by natural landscapes.

- Develop technical assessment tools to guide planning and regulatory decisions that consider both the human and natural environments.

Recommendation 4

Local emergency response and planning officials develop regional and/or local disaster response and recovery plans.

Actions

- Encourage municipalities to participate in the New Hampshire Public Works Municipal Aid program.

- Coordinate federal, state and municipal regulatory and permitting standards following a disaster or extreme event.
    - Determine what types of structures may be rebuilt and to what standards.
    - Identify lands where rebuilding is not feasible or able to be supported by infrastructure.
    - Identify restoration opportunities for natural systems.

- Integrate response and recovery plans with local Hazard Mitigation Plans, Master Plans, zoning and land development regulations.

Recommendation 5

Municipalities proactively communicate and provide resources to residents and businesses about the impacts of natural hazards and how to better prepare for such events.

Actions

- Provide informational materials and guidance to property owners about the FEMA National Flood Insurance Program, ways to reduce exposure and risk, and manage costs of insurance premiums.

- Provide information to residents and businesses on ways to improve preparedness before and after hazardous events.

- Require information about existing and potential future hazards be provided to prospective property buyers.

- Communicate the level of municipal costs associated with declared disasters and other hazardous events and ways these costs might be minimized or avoided through changes to municipal decisions and regulatory requirements.

- Coastal Adaptation Workgroup provides technical resources and guidance to municipalities, residents and businesses in the region.

Natural Hazard Goals and Recommendations Matrix

	NHZ Goal 1	NHZ Goal 2	NHZ Goal 3	NHZ Goal 4	NHZ Goal 5	NHZ Goal 6	NHZ Goal 7	NHZ Goal 8
Recommendation 1	P	S	S	S	S	S	S	S
Recommendation 2	S	S	S	P	P	S	S	S
Recommendation 3	S	S	S	P	P	S	S	S
Recommendation 4	S	S	S	P	P	S	S	S
Recommendation 5	P	P	S	P	TBD	S	P	S

S = Natural Hazards Recommendation supports the Energy Goal.
P = Natural Hazards Recommendation partially supports the Energy Goal.
TBD = to be determined
N/A= not applicable

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Appendices

Appendix A. Description of Less Frequent Natural Hazards That Affect the Region

Below are descriptions of natural Hazards that infrequently affect the region but have caused damage and disruption in the past occurrences.

Wildfire

Wildfire is an uncontrolled and rapidly spreading fire which generally occurs in woodland and grassy areas. New Hampshire forests occupy 84 percent or 4.8 million acres making these areas vulnerable to wildfire particularly during periods of drought and/or large-scale natural disturbances causing unusual buildup of deadfall. The most recent significant wildfire in the region occurred in 1963 involving 760 acres in the towns of Kensington and Exeter.

The proximity of many developed areas to forested lands exposes their populations to the potential impact of wildfire. New Hampshire is the second most forested state in the United States. Growth in the region has extended commercial and residential development into previously forested areas. Although this development has slowed, the "sprawl effect" has increased risk of damage in remaining heavily forested.

New Hampshire experiences an average of 350-400 wildfires involving 200-250 acres per year. Approximately 95% of these fires are caused by humans, whereas the remaining 5% are caused by lightning. The primary causes of wildfires in the state are escaped debris burns, miscellaneous causes from power lines, fireworks, and campfires. (NH Homeland Security and Emergency Management)

Fires typically occur in April and May with fewer occurring in October and November. The reason the majority of fires occur in spring and fall are due to the fact that the predominant forest type is hardwood trees. While most of the State is covered in northern hardwood forests containing maple, birch and beech, there are numerous smaller "pockets" of high-hazard fuel types scattered throughout the state consisting of pitch pine/scrub oak, spruce-fir, and oak-pine forests. Phragmites, pervasive on the seacoast area and freshwater wetland complexes, also provides fuel for wildfires.

Drought

A drought is a natural hazard that evolves over months or even years and can last as short as a few months or as long as several years. The severity of the drought is gauged by the degree of moisture deficiency, its duration and the size of the area affected. The effect of droughts, or decreased precipitation, is indicated through measurements of soil moisture, groundwater levels, lake levels, stream flow and increased fire danger. Not all of these indicators will be minimal during a particular drought. For example, frequent minor rainstorms can replenish the soil moisture without raising ground water levels or increasing stream flow for a sustained period of time.

Low stream flow correlates with low ground water level because it is ground water that discharges to streams and rivers that maintain stream flow during extended dry periods. Low stream flow and low ground water levels commonly cause diminished water supply.

There are five magnitudes of drought outlined in the New Hampshire State Drought Management Plan. The highest magnitude is Exceptional, followed by Extreme, Severe, Moderate and Abnormally Dry. Each level has varying responses. The statistical recurrence interval of each magnitude is summarized in Table 1. Table 2 lists the years in which the magnitude of drought in New Hampshire was at least "Extreme" for some period of time. [Source: State of NH Multi-Hazard Mitigation Plan Update 2013]

The current State Drought Management Plan from 1990 is currently being updated by NHDES. http://nhdrought.org/

Earthquakes

An earthquake is defined as a series of vibrations induced in the Earth's crust by the abrupt rupture and rebound of rocks in which elastic strain has been slowly accumulating. New Hampshire is considered to lie in an area of

moderate seismic hazard compared to other areas within the United States. New Hampshire has had and will continue to experience damaging earthquakes; however, the intervals between such events are greater in New Hampshire than in high hazard areas such as the Pacific Northwest. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, and avalanches. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks and end in vibrations of gradually diminishing force called aftershocks. The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is determined by the use of scales such as the Richter scale and Mercalli scale.

Earthquakes in New Hampshire cannot be associated with specific, known faults. Although identified active faults in New Hampshire have not been identified, there is little doubt that active faults located beneath the surface do exist. Currently, there is a "zone" that extends from north of the Lakes Region south along the Merrimack River into Massachusetts where most New Hampshire earthquakes have occurred. New Hampshire is in the low attenuation of seismic waves in the eastern United States. Attenuation means the slow loss of intensity of flow through any kind of medium. Seismic waves can cover an area 4 to 40 times greater in the east than they do in the west mainly due to the hard rock geology of New Hampshire. The importance of this to emergency planning and response is that damages can be expected to be spread over a much greater area, and an earthquake's location does not have to be close to a particular point to cause damage. [Source: State of NH Multi-Hazard Mitigation Plan Update 2013]

Tsunamis

Earthquakes can also generate tsunamis. A tsunami is a set of ocean waves caused by any large, abrupt disturbance of the sea-surface. Tsunamis are most commonly generated by earthquakes in marine and coastal regions. Major tsunamis are produced by large (greater than 7 on the Richer scale), shallow focus (< 30km depth in the earth) earthquakes associated with the movement of oceanic and continental plates. They frequently occur in the Pacific, where dense oceanic plates slide under the lighter continental plates. When these plates fracture there is vertical movement of the seafloor that initiates a quick and efficient transfer of energy from the solid earth to the ocean which creates the tsunami.

Appendix B. History of hazardous events and hazard scales used to measure their intensity.

Notable Natural Hazard Events in Southeast New Hampshire Source: State of NH Multi-Hazard Mitigation Plan (2013)				
Hazard	**Date**	**Location**	**Impacted Area**	**Remarks/Description**
Flood, Hurricane, Tropical Storm	March 11-21, 1936	Statewide	$133,000,000 in damage throughout New England, 77,000 homeless.	Double Flood; snowmelt/heavy rain.
Flood, Hurricane, Tropical Storm	September 21, 1938	Statewide	Unknown	Hurricane; stream stage similar to March 1936
Flood, Hurricane, Tropical Storm	July 1986 – August 10, 1986	Statewide	Unknown	**FEMA DR-771-NH**: Severe storms; heavy rain, tornadoes , flash flood, severe wind
Flood, Hurricane, Tropical Storm	August 7-11, 1990	Statewide	Road Network	**FEMA DR-876-NH**: A series of storms with moderate to heavy rains; widespread flooding.
Flood, Hurricane, Tropical Storm	August 19, 1991	Statewide, Primarily Rockingham and Strafford Counties	Road Network	**FEMA DR-917-NH:** Hurricane Bob; effects felt statewide; counties to east hardest hit.
Flood, Hurricane, Tropical Storm	October 28, 1996	Rockingham County	Unknown - Typically structures and infrastructure in the floodplain	North and west regions; severe storms.
Flood, Hurricane, Tropical Storm	June – July 1998	Rockingham County	Heavy damage to secondary roads occurred	**FEMA DR-1231-NH:** A series of rainfall events
Flood, Hurricane, Tropical Storm	May 12, 2006	Central and Southern Regions	100 yr – 500 yr	**FEMA-1643-DR:** Severe storms and flooding. Counties Declared: Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford
Flood, Hurricane, Tropical Storm	April 15 - 23, 2007	Statewide	100 yr – 500 yr	**FEMA-1695-DR:** Severe storms and flooding associated with a Nor'easter. Counties Declared: Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan.
Flood, Hurricane, Tropical Storm	July 24 2008	Central and Southern Regions	100 yr – 500 yr	**FEMA-1782-DR** Severe storms, tornado and flooding. Counties Declared: Belknap, Carroll, Merrimack, Rockingham, and Strafford
Flood, Hurricane, Tropical Storm	March 14 – 31, 2010	Southeastern Region	100 yr – 500 yr	**FEMA-1913-DR** Severe storms and flooding. Counties Declared: Hillsborough and Rockingham County

Flood, Hurricane, Tropical Storm: Great Hurricane of 1938	September 21, 1938	All of Southern New England	2 billion board feet of timber destroyed; electric and telephone disrupted, structures damaged, 1,363 families received assistance.	Max. wind speed of 186 mph in MA and 138mph max. elsewhere 13 of 494 dead in NH; $12,337,643 total storm losses (1938 dollars, timber not included).
Flood, Hurricane, Tropical Storm: Hurricane Carol	August 31, 1954	Southern New England	Extensive tree and crop damage in state.	Saffir/Simpson Hurricane Scale[1] - Category 3, winds 111-130 mph
Flood, Hurricane, Tropical Storm: Hurricane Donna	September 12, 1960	Southern and Central NH	Unknown	Category 3 Heavy Flooding
Flood, Hurricane, Tropical Storm: Hurricane Belle	August 10, 1976	Southern New England	Unknown	Category 1, winds 74-95 mph Rain and flooding in NH
Flood, Hurricane, Tropical Storm: Hurricane Gloria	September 27, 1985	Southern New England	Unknown	Category 2, winds 96-110 mph >70 mph winds; minor wind damage and
Flood, Hurricane, Tropical Storm: Tropical Storm Floyd	September 16-18, 1999	Statewide	Unknown	
Flood, Hurricane, Tropical Storm: Tropical Storm Irene	August 26- September 6, 2011	Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, Sullivan, Hillsborough and Rockingham Counties	Extensive Flooding and power outages due to downed trees	FEMA- 4026-DR Emergency declaration from Tropical Strom Irene for Hillsborough and Rockingham Counties
Tornado	May 21, 1814	Rockingham County	Unknown	F2[2]
Tornado	May 16, 1890	Rockingham County	Unknown	F2
Tornado	August 21, 1951	Rockingham County	Unknown	F2
Tornado	June 9, 1953	Rockingham County	Unknown	F3
Tornado	June 19, 1957	Rockingham County	Unknown	F2
Tornado	July 2, 1961	Rockingham County	Unknown	F2
Tornado	June 9, 1963	Rockingham County	Unknown	F2
Downburst	July 6, 1999	Stratham, NH	Major tree damage, power outages	Microburst - $2,498,974 in damages, Five fatalities, eleven injuries.
Tornado	May 21, 2006	Rockingham County	Unknown	F2
Tornado	July 24, 2008	Rockingham, Merrimack, Belknap, Strafford, Carroll	Unknown	F2
Severe Winter Storm Ice Storm	December 17-20, 1929	NH	Telephone, telegraph and power disrupted.	

[1] For a complete description of the Saffir/Simpson Hurricane Scale see Appendix C.

[2] For a complete description of the Fujita Tornado Damage Scale see Appendix D

Severe Winter Storm Ice Storm	December 29-30, 1942	NH	Unknown- Typically damage to overhead wires and trees.	Glaze storm; severe intensity
Severe Winter Storm Ice Storm	December 22, 1969	Parts of NH	Power disruption	Many communities affected
Severe Winter Storm Ice Storm	January 17, 1970	Parts of NH	Power disruption	Many communities affected
Severe Winter Storm Ice Storm	January 8-25, 1979	NH	Major disruption of Power and transportation	
Severe Winter Storm Ice Storm	March 3-6, 1991	Southern NH	Numerous power outages in southern NH	Numerous in Southern NH
Severe Winter Storm Ice Storm	January 7, 1998	Rockingham County	Power and phone disrupted, communication tower collapsed.	$17,000,000 in damages to PSNH equipment.
Severe Winter Storm Ice Storm	December 12, 2008	New England,	Severe ice storm that caused major damage to private and public utilities.	PSNH states cost of restoration effort Estimated at $75 million for NH alone
Severe Winter Event Ice Jam	Feb 29, 2000	Brentwood, NH Epping River	Unknown	Discharge 570 cfs
Severe Winter Event Ice Jam	Mar 29, 1993	Epping, NH Lamprey River	Road flooding	
Severe Winter Storm	February 4-7, 1920	New England	Disrupt transportation for weeks	Boston 37-50cm of sleet , ice and snow
Severe Winter Storm	February 15, 1940	New England	Paralyzed New England	30cm of snow with high wind.
Severe Winter Storm	February 14-17, 1958	Southern NH	Unknown	20-33” of snow
Severe Winter Storm	March 18-21, 1958	South central NH	Unknown	22-24”of snow
Severe Winter Storm	March 2-5, 1950	Southern NH	Unknown	25”of snow
Severe Winter Storm	January 18-20, 1961	Southern NH	Unknown	Blizzard Conditions; 50cm of snow
Severe Winter Storm	February 8-10, 1969	Southeastern NH	Paralyzing snow	27”of snow and high winds
Severe Winter Storm “Blizzard of’78”	February 5-7 1978	Statewide	Trapped commuters on highways, businesses closed	Hurricane force winds; 25-33”of snow. People disregard warnings due to series of missed forecasts
Severe Winter Storm	April 5-7, 1982	Southern NH	Unknown	Late season with thunderstorms, 18-22” of snow
Severe Winter Storm Snow Emergency	March 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford	Unknown	FEMA-3166-EM $4,500,000
Severe Winter Storm Snow Emergency	March 11, 2003	Cheshire, Hillsborough, Merrimack, Rockingham and Strafford	Unknown	FEMA-3177-EM $3,000,000

Severe Winter Storm Snow Emergency	March 30, 2005	Belknap, Carroll, Cheshire, Grafton, Hillsboro, Merrimack, Rockingham, Strafford and Sullivan	Unknown	FEMA-3207-EM $4,654,738
Severe Winter Storm Snow Emergency	April 28, 2005	Carroll, Cheshire, Hillsboro, Rockingham and Sullivan	Unknown	FEMA-3211-EM $2,677,536
Severe Winter Storm	December 1959	Portsmouth		A Nor'easter brought tides exceeding maximum tidal flood levels in Portsmouth. Damage was heaviest along the coast
Severe Winter Storm	February 1972	NH Coast		Coastal NH was declared a National Disaster Area as a result of the devastating effects of a severe coastal storm. Damage was extensive.
Severe Winter Storm	October 1991	NH Coast		"The Perfect Storm" – Tidal surge approximately 3.5 feet
Severe Winter Storm	December 11, 2008	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan	Unknown	FEMA-1812-DR $19,789,657
Severe Winter Storm	February 23, 2010	Merrimack, Rockingham, Strafford, and Sullivan	Unknown	FEMA-1892-DR
Severe Winter Storm	March 14, 2010	Rockingham and Hillsborough Counties	Unknown	FEMA-1913-DR
Sever Winter Storm	October 29-30, 2011	Rockingham and Hillsborough Counties	Unknown	FEMA-4049-DR
Earthquake	December 20, 1940	Ossipee		Richter Magnitude Scale: 5.5
Earthquake	December 24, 1940	Ossipee	Ground cracks and damage over a broad area	Richter Magnitude Scale: 5.5; Felt over 550 KM away.
Earthquake	December 28, 1947	Dover		Richter Magnitude Scale: 4.5
Earthquake	January 19, 1982	West of Laconia		Richter Magnitude Scale: 4.5
Wildfire	1915	Most of NH		29,480 acres
Wildfire	1963	Kensington-Exeter		760 acres
Drought	1929-36	Statewide	Unknown	Regional
Drought	1939-44	Statewide	Unknown	Severe in southeast NH
Drought	1947-50	Statewide	Unknown	Moderate
Drought	1960-69	Statewide	Unknown	Longest recorded continuous period of below normal precipitation
Drought (Warning)	June 6, 1999	Most of State	Unknown	Governor's declaration; Drought Index indicates "moderate drought" statewide.
Drought	2001-2002	Statewide	Unknown	Third worst on record, exceeded only by the drought of 1956-1966 and 1941-1942

Sperry–Piltz Ice Accumulation Index

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

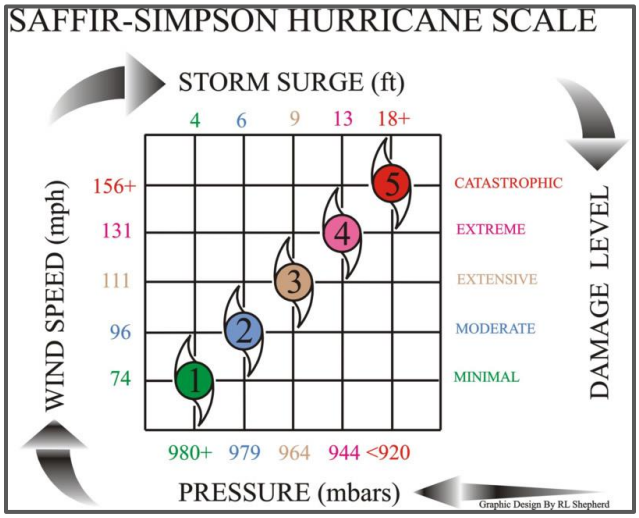
ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	< 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

The Sperry–Piltz Ice Accumulation Index, or SPIA Index, is a forward-looking, ice accumulation and ice damage prediction index that uses an algorithm of researched parameters that, when combined with National Weather Service forecast data, predicts the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. It is a tool to be used for risk management and/or winter weather preparedness. The SPIA Index is to ice storms what the Enhanced Fujita Scale is to tornadoes, and what the Saffir–Simpson Scale is to hurricanes. Previous to this hazard scale development, no such 'forward-looking' ice accumulation and ice damage index had ever been utilized to predict – days in advance – the potential damage to overhead utility systems, along with outage duration possibilities, from freezing rain and/or ice storm events.

Saffir-Simpson Hurricane Wind Scale

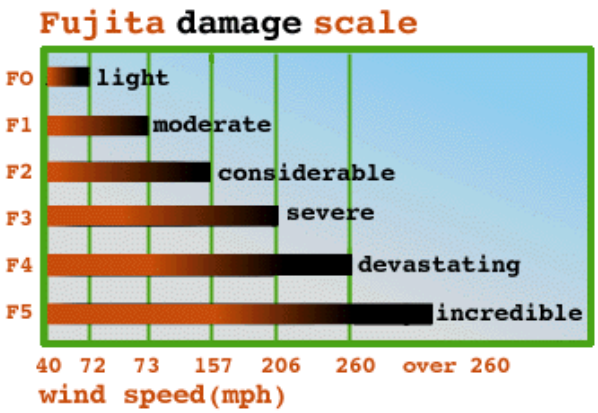
The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.[3]



[Source: Graphic by RL Shepherd]

[3] NOAA National Hurricane Center website at http://www.nhc.noaa.gov/aboutsshws.php

Fujita Tornado Damage Scale



Dr. T. Theodore Fujita developed the Fujita Tornado Damage Scale (F-Scale) to provide estimates of tornado strength based on damage surveys. Since it's practically impossible to make direct measurements of tornado winds, an estimate of the winds based on damage is the best way to classify a tornado. The new Enhanced Fujita Scale (EF-Scale) addresses some of the limitations identified by meteorologists and engineers since the introduction of the Fujita Scale in 1971. The new scale identifies 28 different free standing structures most affected by tornadoes taking into account construction quality and maintenance. The range of tornado intensities remains as before, zero to five, with 'EF-0' being the weakest, associated with very little damage and 'EF-5' representing complete destruction, which was the case in Greensburg, Kansas on May 4th, 2007, the first tornado classified as 'EF-5'. The EF scale was adopted on February 1, 2007.[4]

Below is a brief description of the Enhanced Fujita Scale compared with the old Fujita Scale with descriptions of associated damage.

EF-Scale	Old F-Scale	Typical Damage:
EF-0 (65-85 mph)	F0 (65-73 mph)	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF-1 (86-110 mph)	F1 (73-112 mph)	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF-2(111-135 mph)	F2 (113-157 mph)	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF-3 (136-165 mph)	F3 (158-206 mph)	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF-4 (166-200 mph)	F4 (207-260 mph)	Devastating damage. Whole frame houses Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF-5 (>200 mph)	F5 (261-318 mph)	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yd); high-rise buildings have significant structural deformation; incredible phenomena will occur.
EF No rating	F6-F12 (319 mph to speed of sound)	Inconceivable damage. Should a tornado with the maximum wind speed in excess of EF-5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc.will create serious secondary damage on structures.

[4] http://www.wunderground.com/resources/severe/fujita_scale.asp

Appendix C. Summary of the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014

On March 21, 2014, President Obama signed the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014 into law. This law repeals and modifies certain provisions of the Biggert-Waters Flood Insurance Reform Act, which was enacted in 2012, and makes additional program changes to other aspects of the program not covered by that Act. Many provisions of the Biggert-Waters Flood Insurance Reform Act remain and are still being implemented. Below is a summary of the Senate Menendez/Grimm Bill that amended the 2012 Act which then became the HFIAA. [Source: Insurance Journal, By Andrew G. Simpson, March 13, 2014]

Controls on Rate Increases

- *Creates a firewall on annual rate increases* – Prevents FEMA from raising the average rates for a class of properties above 15% and from raising rates on individual policies above 18% per year for virtually all properties.
- *Repeals the property sales trigger* – Repeals the provision in Biggert-Waters that required homebuyers to pay the full-risk rate for pre-FIRM properties at the time of purchase. This provision caused property values to steeply decline and made many homes unsellable, hurting the real estate market. Under the Menendez/Grimm Bill, homebuyers will receive the same treatment as the home seller.
- *Repeals the new policy sales trigger* – Repeals the provision in Biggert-Waters that required pre-FIRM property owners to pay the full-risk rate if they voluntarily purchase a new policy. This provision disincentivizes property owners from making responsible decisions and could hurt program participation. The Menendez/Grimm Bill allows pre-FIRM property owners to voluntarily purchase a policy under pre-FIRM conditions.
- *Reinstates grandfathering* – Repeals the provision in Biggert-Waters that would have terminated grandfathering. If grandfathering was terminated, property owners mapped into higher risk would have to either elevate their structure or have higher rates phased in over 5 years. The Menendez/Grimm Bill allows grandfathering to continue and sets hard caps on how high premiums can increase annually.
- *Refunds homeowners who overpaid* – Requires FEMA to refund policyholders for overpaid premiums.
- *Affordability goal* – Requires FEMA to minimize the number of policies with annual premiums that exceed one percent of the total coverage provided by the policy.

FEMA Transparency and Outreach Requirements

- *Reimburse successful appeals* – Allows FEMA to utilize the National Flood Insurance Fund to reimburse policyholders and communities that successfully appeal a map determination. Making appeal reimbursement an eligible expense of the NFIF would give FEMA the incentive to "get it right the first time" and repay homeowners and communities for contributing to the body of flood risk knowledge, according to backers.
- *Flood insurance advocate* – Establishes a Flood Insurance Advocate within FEMA to answer current and prospective policyholder questions about the flood mapping process and flood insurance rates..
- *Urban mitigation fairness* – Requires FEMA to establish guidelines on alternative mitigation methods for urban structures where tradition mitigation efforts such as elevation are impractical (i.e. row houses, townhouses). This section makes clear that such alternative forms of mitigation shall be taken into account in the calculation of risk premium rates.
- *Clear communication* – Requires FEMA to clearly communicate full flood risk determinations to policyholders even if their premium rates are less than full risk. This helps to inform policyholders as to their true flood risk.
- *Fairness for small businesses, houses of worship, non-profits and low-income homes* – Requires FEMA to report to Congress on the impacts of rate increases on small businesses, non-profit entities, houses of worship, and residences with a value equal to less than 25% of the area median home value.
- *Mapping accuracy* – Requires FEMA to certify its mapping process is technologically advanced and to notify and justify to communities that the mapping model it plans to use to create the community's new flood map are appropriate. Also requires FEMA to send communities being remapped the data being used in the mapping process.
- *Notification* – Requires FEMA, at least 6 months prior to implementation of rate increases as a result of this Act to make publicly available the rate tables and underwriting guidelines that provide the basis for the change, providing consumers with greater transparency.

Appendix D Map NHZ1 Extent of the 100-year and 500-year flood zones in the coastal area.

Map NHZ1 is attached on the following page.

CLIMATE CHANGE CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Climate Change

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Cover photo credits: Highest tide of the year, Portsmouth, Steve Miller, NH Fish & Game Department (top left).

Climate Change

Introduction

Changes in New Hampshire's climate are well documented in local records of sea level, growing seasons, range of flora and fauna, precipitation and temperature. Similar to national trends and projections of previous climate models, the state has experienced more extreme weather events including floods, drought and rising tides.

Some degree of future impact will be influenced by changes to the atmosphere and warming of land, atmosphere and oceans already in progress. Longer term impacts will reflect decisions made today that influence how climate may change further into the future. Such decisions include energy choices such as fossil based versus renewable sources, land use and environmental protection, and transportation systems.

New Hampshire and its municipalities have many opportunities and time to prepare and adapt to a changing climate. This effort will require understanding of recent climate projections and assessments, applying technology and data to solve problems, and learning from other states and communities that have successfully implemented effective strategies and solutions.

What Changes Are Projected For the Region?

- ***Sea Level Rise and Higher Coastal Storm Surge***
- ***Increased Precipitation During Extreme Events***
- ***Increased Winter and Summer Temperatures***
- ***Changes in Snow and Rainfall Patterns***
- ***Shifts in Flora and Fauna Ranges***

This chapter will provide an overview of climate change, regional and statewide activities, describe existing conditions, and discuss key challenges in planning for the future.

Climate Assessments

Climate projections contained in reports prepared by the Intergovernmental Panel on Climate Change (IPCC AR, 2014) and the National Climate Assessment (NCA, 2014) as well as regional and local studies yield valuable information to guide today's decisions and those we will make into the future. The report Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future (Wake et al 2011) details projected changes in the environmental parameter of climate for southeast New Hampshire, including sea level rise, precipitation and temperature. In 2013, the City of Portsmouth contracted with researchers from the University of New Hampshire and Rockingham Planning Commission (RPC) to prepare a vulnerability assessment documenting the potential impacts of climate change, such as sea level rise and storm surge, on buildings, roads, infrastructure and saltmarshes. As part of the Granite State Future Regional Master Plan update project, climate assessments were also completed for the northern and southern regions of N.H.

However, with the exception of these studies, detailed analyses of potential impacts remain largely unmeasured across the state. Several regional and local efforts are currently underway in southeast and coastal areas to fill these knowledge gaps as described later in this chapter. These efforts were funded by grants from various federal agency programs including NOAA, EPA, and FEMA, and state, regional and non-profit organizations including the Gulf of Maine Council, NH Coastal Program and Kresge Foundation.

Enabling Statutes

How our state and region will respond to climate change depends largely on local municipal decisions and state level guidance, existing state statutes, and legislative actions. Long-standing statutes such as RSA 674:2 have addressed natural hazards through municipal master plans by allowing them to include

> "a natural hazards section which documents the physical characteristics, severity, frequency, and extent of any potential natural hazards to the community. It should identify those elements of the built environment at risk from natural hazards as well as extent of current and future vulnerability that may result from current zoning and development policies."

However, RSA 674:2 does not consider a future where environmental conditions may differ and natural hazards may change in frequency and intensity.

In 2013 legislation enabled coastal municipalities to include in their master plans "a coastal management section which may address planning needs resulting from projected coastal property or habitat loss due to increased frequency of storm surge, flooding, and inundation."

In 2013 legislation enabled formation of the Coastal Risks and Hazards Commission which is charged with evaluating the present and future impacts of climate change in the coastal watershed and preparing recommendations to address them. [Refer to the Existing Conditions Section for more detailed information about the Coastal Risks and Hazards Commission.]

A number of state agencies are taking steps to address climate change by evaluating their policies, regulations and standards with respect to mitigating and minimizing impacts and coordinating inter-agency strategies and programs. Future actions by state agencies including Department of Transportation, Department of Environmental Services, Division of Resources and Economic Development, Department of Health and Human Services, and Fish and Game and federal agencies including Fish and Wildlife, NOAA, EPA, HUD, USDA and FEMA may influence future responses to climate change within the region and by municipalities.

RPC Work in the Region

The RPC has lead and participated in many efforts to raise awareness and develop technical tools and guidance about climate change in the region. Efforts have covered a wide geography, reaching many municipalities and stakeholders interested in the issues surrounding climate change both present and future. Following is a brief summary of these efforts (specific details can be found later in this Chapter).

- Member of the New Hampshire Coastal Adaptation Workgroup (ongoing)
- Member of the state's Coastal Risks and Hazards Commission (ongoing)
- Outreach and engagement projects through grants from the NH Coastal Program (ongoing)
- Tides to Storms Coastal Vulnerability Assessment funded by NH Homeland Security and Emergency Management through a grant from FEMA (ongoing)
- Project Manager for City of Portsmouth Coastal Resilience Initiative project (2013)
- Pilot project funded by the NH Coastal Program - *Adaptation Strategies to Protect Areas of Increased Risk From Coastal Flooding Due to Climate Change in Seabrook* (2009)

While these collective efforts demonstrate substantial interest, further research, assessments and strategic planning will be needed to achieve a more climate resilient future for the region.

Challenges and Impacts

As a result of climate change both present and future, New Hampshire municipalities are and will continue to be confronted by land use, environmental and public health and safety concerns. Natural hazard management issues associated with climate change include extreme weather events, storm surge, flooding, erosion, and damage to key ecosystems and habitats. These issues are only intensified by recent increases in the frequency and intensity of extreme storm events and increases in annual average precipitation and the amount of rainfall associated with storm events. Increased flooding has the potential to place riverine floodplain and coastal populations at risk, threaten infrastructure, and ultimately disrupt or cause damage to homes, businesses, public infrastructure, drinking water supplies, recreation areas, public space, wetlands and

ecosystems. As experienced in recent decades, storm-related impacts to the "built environment" can be significant and will likely continue in high risk areas unless actions are taken to protect assets and investments. In addition, rising temperatures may bring health impacts including heat and respiratory related illness, and diseases transmitted by insects such as mosquitoes and ticks.

Map CC1 shows areas influenced by daily tides in the six coastline municipalities and five inland tidal municipalities in the region.

Coastal Communities

New Hampshire coastal municipalities are confronted by a particularly challenging set of land use and hazard management concerns that include extreme weather events, storm surges, flooding, coastal erosion, and loss of key coastal habitats. These issues are exacerbated by changes in climate that result in an increase in the frequency and intensity of storms and an increasing rate of sea level rise. These effects are compounded by growth and development through increasing stormwater runoff and flooding. Sea level rise has the potential to displace coastal populations, threaten infrastructure, intensify coastal flooding and ultimately lead to the loss of homes, businesses, public infrastructure, recreation areas, public space, coastal wetlands and salt marsh. Residential and commercial structures, roads, and bridges may be more prone to flooding. Sea level rise may also reduce the effectiveness and integrity of existing seawalls, which have been designed for historically lower water levels.

New Hampshire Climate Action Plan

In 2009, the Governor's Climate Change Policy Task Force released the NH Climate Action Plan, containing 10 overarching strategies necessary to meet the states greenhouse gas reduction and climate change related goals. Goal 9 states "Plan for how to address existing and potential climate change impacts". Chapter 3 Adapting to Climate Change describes in greater detail the benefits of planning for and adapting to climate change and how this may be achieved to minimize impacts to the economy, human health, natural systems, and infrastructure. The plan was intended to act as a broad guide to examine projected future conditions and needs, and adjust our actions as needed to maintain a high quality of life in our state.

The NH Climate Action Plan has helped guide many research and planning initiatives, policy decisions, and audits of the existing regulatory standards and procedures by state agencies to address climate change. Currently, there is limited funding and staff at the state level to assist with implementing the recommendations of the plan. The plan envisions that all stakeholders throughout the state would contribute to implementation of its recommendations. Organizations like the NH Coastal Adaptation Workgroup and others have made progress toward implementing recommendations from the Climate Adaptation Chapter of the Plan.

What the Region Said About Natural Hazards and Preparedness

The outreach events and surveys conducted as part of RPC's Regional Master Plan update did not specifically address climate change and its impacts over the long term. Given that only a handful of municipalities in the region have begun discussions and evaluations of the potential impacts of climate change, it is difficult to anticipate the impacts such changes may have to municipal and private assets, infrastructure, resources and populations over time without specific data and analyses to quantify and depict them.

However questions oriented toward natural hazards in the recent past and their impacts to the region shed light on what people are most concerned about during natural hazard events, their frequency and severity, and the risk such events pose to communities today. Following is a summary of input about these issues collected from regional outreach events and the statewide and regional surveys.

Statewide and Regional Surveys

Questions about Emergency Preparedness

Nearly three-quarters of residents (74%) are concerned (34% "very concerned" and 40% "somewhat concerned") with snow or ice storms in their community followed by power outages (73%), wind damage (61%), flooding (48%), drought (30%), and wildfires (23%).

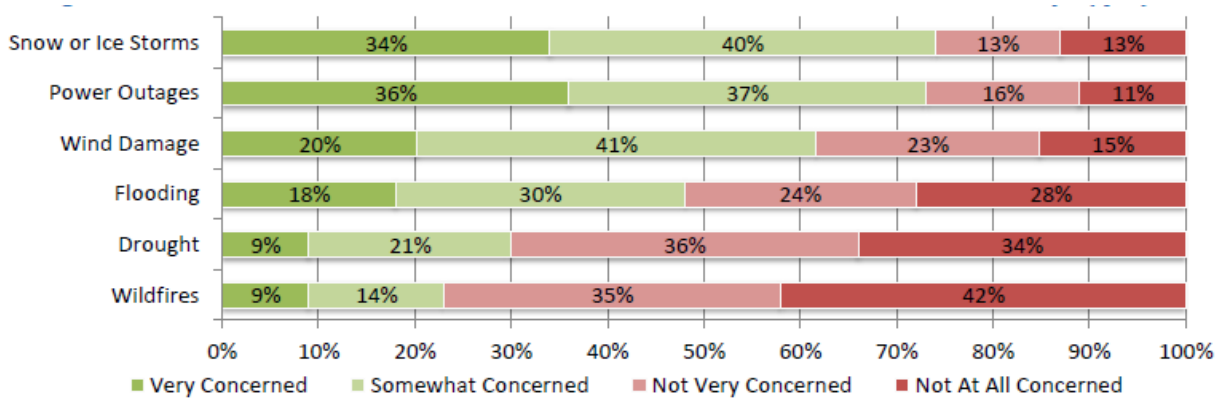


Figure CC 1. Question - Concern About Weather Related Events In Your Community? (q14)

Only 12% of residents are very concerned about their community's level of preparedness in weather-related situations, while 35% are somewhat concerned, 35% are not very concerned, 17% are not at all concerned and 1% said they don't know.

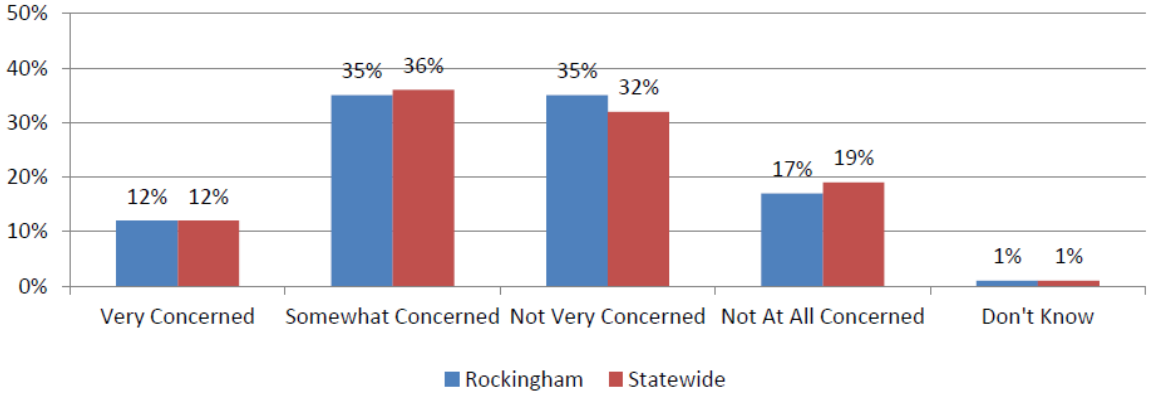


Figure CC 2. Question - Concern about Your Community's Level of Preparedness? (q15)

RPC Online Survey Results

Respondents expressed a mixture of concern for community emergency preparedness and most respondents indicated they were concerned with power outages and snow storms more than flooding, drought, wind damage, or wildfires.

Regional Visioning Sessions

The table below summarizes common ideas and concerns expressed at topical listening sessions held throughout the region in 2013 about the occurrence of hazards and hazard preparedness.

Table CC1. Report of public input about the impact of hazards and hazard preparedness in the region.

Question *– Have you or your community been affected recently by severe weather events or changes in seasonal weather patterns?*

- Damage to trees, power lines, buildings and private property. - Flooding near rivers and in areas not typically prone to flooding. - Road damage from undersized culverts, drainage infrastructure. - Flooding caused from inadequate drainage infrastructure. - Changes to crop production/harvest and growing seasons. - Increased frequency and intensity of severe weather events. - Prolonged dry periods between storms. - More extended periods of power outages over wide areas. - More residents and businesses are equipped with generators.
Question – *How could your community be better prepared to respond to and adapt to changes in seasonal weather patterns, extreme weather and more frequent storm events?*
- More community based emergency centers and shelters. - Inventory municipal infrastructure and prioritize improvements for under-performing sites. - Invest in new infrastructure that is more resilient. - Improve drinking water management to increase storage capacity. - Improve business resilience and continuity planning. - Educate public, citizens, decision makers and land use boards/commissions. - Improve power distribution systems, create back-up systems.
Question *– What investments, assets, resources or populations are most at risk due to changes in seasonal weather patterns, extreme weather and more frequent storm events?*
- High risk, vulnerable populations and need for services. - Damage to coastal shorelands and structures. - Fisheries, winter recreation, agriculture. - Flood damage to infrastucture and buildings in floodplains. - Water quality and water pollution. - Increase in tick and mosquito borne diseases and cases in NH.

Climate Change Goals

Goal 1

Municipalities and regional partners plan and prepare for, and effectively respond to climate change.

Goal 2

Actions are taken that reduce risk and vulnerability, enhance community resiliency, and protect critical infrastructure and natural resources.

Goal 3

Potential future impacts from climate change are better understood through regional and local assessments.

Goal 4

Climate-focused collaborative partnerships and networks of professionals, practitioners, and researches are maintained and supported.

Goal 5

Adaptation to climate change is integrated across all planning for the region.

Climate Change 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
CC Goal 1	S	S	TBD	S	S
CC Goal 2	S	S	TBD	S	S
CC Goal 3	S	S	TBD	S	S
CC Goal 4	S	S	P	S	S
CC Goal 5	S	S	S	S	S

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.

Climate Change Goals	**NH Livability Principles**					
	Traditional Settlement Patterns & Development Design	Housing Choices	Transportation Choices	Natural Resources Function & Quality	Community & Economic Vitality	Climate Change & Energy Efficiency
CC Goal 1	S	P	P	S	S	S
CC Goal 2	S	P	P	S	S	S
CC Goal 3	S	P	S	S	S	S
CC Goal 4	P	P	P	S	S	S
CC Goal 5	S	S	S	S	S	S

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

Climate Change Past and Present

Over the last 20 years, southeast NH has experienced extreme events related to changes in environmental conditions and the regional climate of the northeast U.S. These events include drought, severe precipitation/storms, coastal flooding, and warmer temperatures particularly increases in the hottest temperatures of summer and decreases in the coldest temperatures in winter. While many of these events did not result in long-lasting impacts to human and natural systems, small-scale changes have been observed such as changes in lake ice-out dates, shifts in growing seasons, increase in ticks and Lyme disease, shifts in peak foliage season, and rising sea level. In the short term some effects – such as the effects of sea level rise - may pose limited risk today, however in the long term the risk becomes greater as sea level continues to rise and impacts from storm surge and severe storm events become more frequent and damaging to coastal communities and natural systems.

Atmospheric Carbon Dioxide Levels

The graph below is a record of carbon dioxide concentrations dating back 800,000 years before present. The data is a compilation of air samples collected from ice cores from the Antarctic ice sheet as reported from NOAA's National Climate Data Center and carbon dioxide levels based on continuous measurements taken at the Mauna Loa Observatory in Hawaii. At 395.6 PPM, the amount of carbon dioxide currently in the atmosphere is unprecedented within the record shown. The amount of carbon dioxide in the atmosphere is strongly correlated to temperature and glaciation. When the concentration is below 240 ppm, extensive glaciers covered most of Europe, Canada and northern United States. (Planet For Life, 2014)

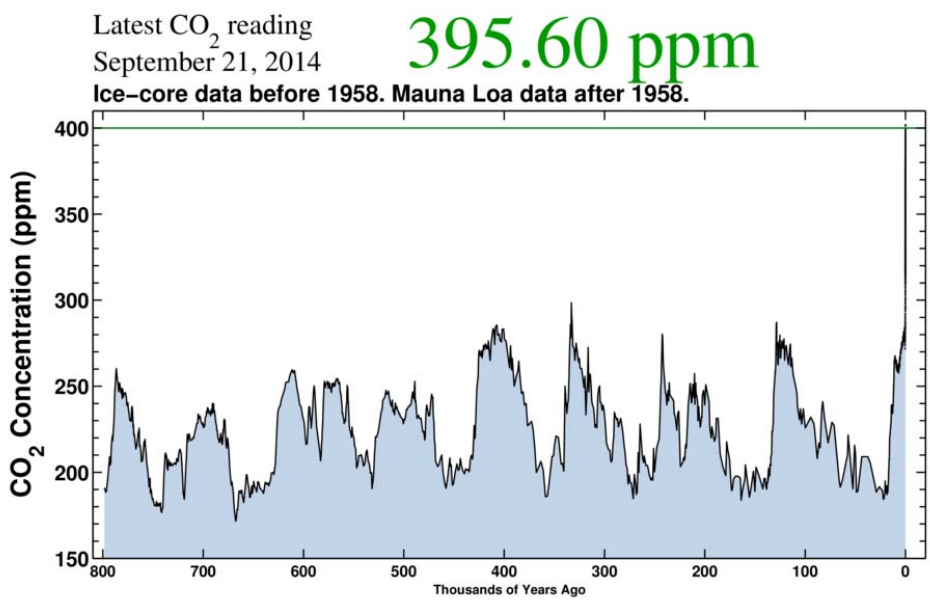


Figure CC3. Global record of carbon dioxide concentrations from ice core data and Mauna Loa Observatory, Hawaii. [Source: Scripps Institution of Oceanography at https://scripps.ucsd.edu/programs/keelingcurve/]

The vast majority of climate scientists are concerned that the most recent dramatic rise in carbon dioxide is causing warming of our atmosphere, oceans and land. As a result, changes in future environmental conditions may include sea level rise, shifting precipitation patterns, expansion of areas affected by drought, increasing numbers of severe heat waves, and more intense precipitation events. Scientists are also concerned that carbon dioxide absorbed by the ocean from the atmosphere is increasing the acidity of seawater. This change in ocean chemistry interferes with the ability of marine plants and animals to build their shells which comprises the health of marine ecosystems and could lead to extinctions of marine species in certain areas or worldwide. (National Oceanic and Atmospheric Administration, Understanding Climate)

Historical and Current Trends

The environmental parameters used to evaluate changes in climate over time are well documented. Clear trends are established indicating a steady increase in the severity of weather, rising seas and increased variability in seasonal temperatures. Refer to the following graphics showing past and future changes in temperature, sea level, and precipitation (rainfall and snowfall). The graphics below show increases in storm-related frequency and damages that illustrate the magnitude of change in our climate as experienced in New Hampshire since the mid 1900's.

Sea Level Rise

As reported by Wake (2011), relative sea level has been recorded at the Portsmouth Harbor (Seavey Island) tidal gauge only since 1926 (NOAA 2011). For the period 1926 to 2001, sea level rose nearly half a foot (5.3 inches), at a rate of about 0.693 inches per decade.

The annual values reported in the graph represent the annual mean of the monthly mean sea level data. The dashed blue line is the linear trend (regression) applied to the time series data. The gaps represent years with missing data. [Source: Sea Level Rise chapter from Wake et al. (2011) *Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future]*

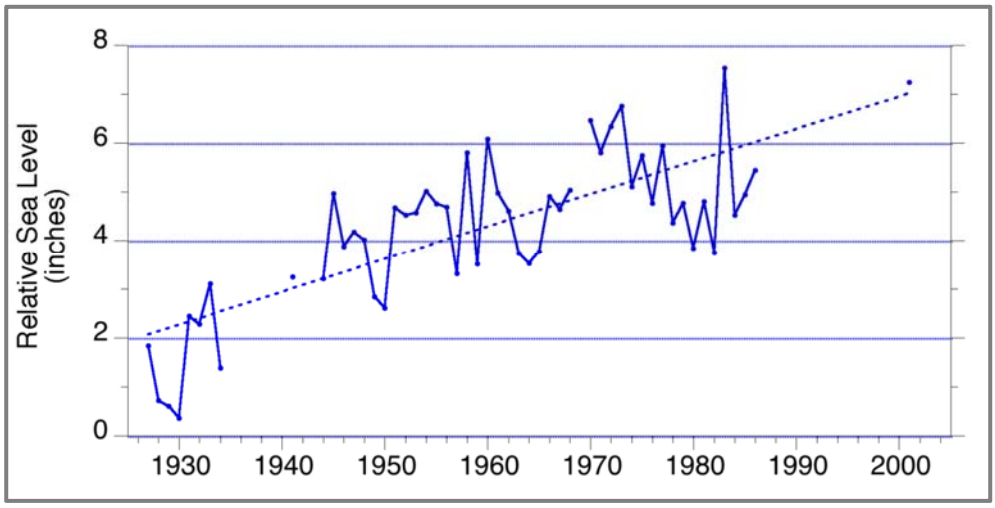


Figure CC4. Annual mean sea level measured at the Seavey Island, Portsmouth Harbor tidal gauge, 1927-2001 (NOAA 2011).

Precipitation

Since the 1990's the magnitude and frequency of extreme precipitation events have increased compared with the historical trends since 1950. The graph shows these trends based on data collected from stations located in Lawrence, MA, Portland, ME and Durham, NH. Although data analyses from these stations show no significant trends for the one-inch and two-inch precipitation events, when four-inch events are summed by decade, it becomes clear that four inch precipitation events are occurring more frequently in the past two decades than in the previous four decades (from Wake et al, 2011).

Northeast Regional Climate Center (NRCC)

Established in 1983 and funded by National Oceanic and Atmospheric Administration, the Northeast Regional Climate Center (NRCC) is located in the Department of Earth and Atmospheric Sciences at Cornell University. The mission of the NRCC is to facilitate and enhance the collection, dissemination and use of climate data and information, as well as to monitor and assess climatic conditions and impacts in the twelve-state, northeastern region of the United States: Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and West Virginia. The NRCC works cooperatively with the National Climatic Data Center, the National Weather Service, state climate offices, and other interested scientists to acquire and disseminate accurate, up-to-date climate data and information. The NRCC has published new extreme precipitation data for New Hampshire which shows for the southeast region substantial increases in the amount of rain associated with large precipitation events (i.e. the 25-, 50-, and 100-year storms). The NRCC online database is available online at: http://precip.eas.cornell.edu/.

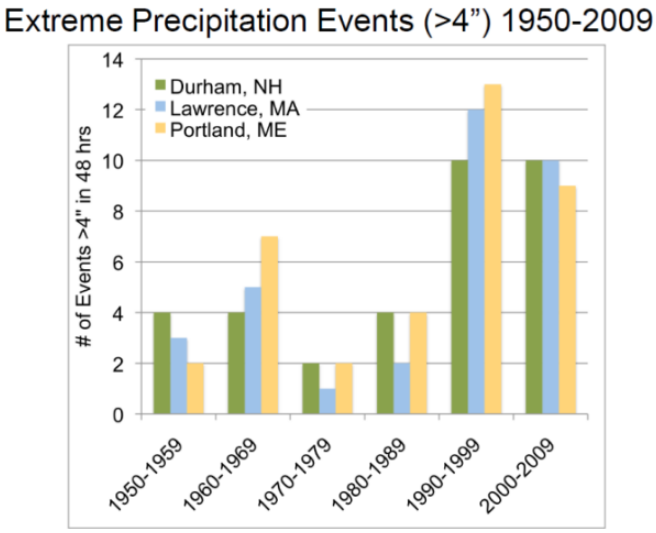


Figure CC5. Total number of events with greater than four inches of precipitation in 48 hours per decade since 1950 (Wake et al, 2011).

In 2014, the Department of Environmental Services incorporated NRCC's new precipitation data as part of its Alteration of Terrain permit program, requiring site development and stormwater management plans to design infrastructure to account for increased rainfall and runoff. Some municipalities in the region are using this data in the design and planning of road and stormwater infrastructure improvement projects.

Below is a comparison of rainfall data interpolated from Technical Review Paper No. 40 (TP40) Rainfall Frequency Atlas of the Easter United States (previous atlas comprised of data collected prior to 1957) and the current Atlas of Precipitation Extremes for the Northeastern United States by Cornell University, Northeast Regional Climate Center (2013). The 2014 National Climate Assessment reports that heaviest precipitation (1% chance event) has increased in the Northeast by 71 percent from 1958 to 2012.

Location	50-year storm Precipitation (old)	50-year storm Precipitation (2013)	100-year storm Precipitation (old)	100-year storm Precipitation (2013)
Portsmouth	5.8	7.39	6.5	8.85
Seabrook	5.8	7.64	6.5	9.19
Exeter	5.8	7.5	6.4	9.0
Sandown	5.7	7.10	6.4	8.52
Epping	5.2	7.21	6.4	8.64
Precipitation reported in inches				

Figure CC6. Comparison of previous and current extreme precipitation data for the region.

Impacts of Severe Storm Events

The graph at right shows the frequency and related costs of declared disasters and emergency declarations have increased since the late 1990's.

Although the specific factors for such increases in costs related to such events have not been determined, certain trends can certainly play a role including increased population in floodplains, increased investment and infrastructure in high risk areas, increased precipitation across the region, and the frequent occurrence of extreme weather events in the past decade.

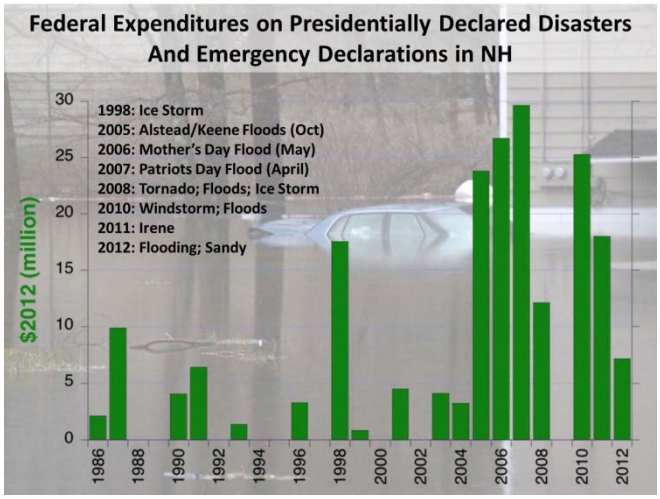


Figure CC7. Frequency and costs associated with past extreme weather events. [Source: Data compiled from the NH Multi-Hazard Mitigation Plan (2012, 2009)].

Riverine and Coastal Flooding

Nearly all communities in RPC's region have experienced significant flood events since 2000 in both riverine and coastal areas. Of these 26 municipalities, 18 are influenced by daily tides and 6 contain coastline bordering the Atlantic Ocean. The 6 coastline communities often experience both upland freshwater flooding and coastal storm flooding in the same event. The table below reports statistics of coverage, losses, and payments under FEMA's National Flood Insurance Program for properties located in the regulatory freshwater and coastal floodplains in the region.

FEMA reports that the RPC region has 3,414 NFIP policies and nearly $6.6 million in insured private assets. Given changes in sea level and the frequency and intensity of flood events, it is not surprising that coastal and tidal communities hold the most number of NFIP policies in the region. These statistics show that significant assets lie in high risk areas that with time could become more vulnerable and experience greater damages due to future changes in sea level rise, coastal storms and other types of flooding. Refer to the complete table as presented in the Natural Hazards Chapter.

Table CC2. FEMA National Flood Insurance Program Disaster Report – National Flood Insurance Program (NFIP) policy summary for municipalities in RPC's region.

Municipality	# of Policies	Insurance $ In Force	Total # Paid Losses	Total $ Paid	Repetitive Loss Buildings	Repetitive Loss Payment $
Totals	3,414	677,081,800	1,467	13,369,316	119	6,592,543

Note FEMA NFIP information does not reflect insurance coverage and damage to municipal assets. Properties that have a lien or other form of loan or mortgage attached to them are almost always required to have flood insurance. Individuals owning property outright make their own choice about whether to have flood insurance.

Taking Action on Climate Change

Over the last five or so years, discussions have become more common place here in New Hampshire and among the northeast states about the potential consequences of climate change. With this increased awareness has also come funding by federal agencies, non-profits and other groups to assist states, regional planning commissions, municipalities and other practitioners to better understand how climate change could alter human and natural systems, and how best to adapt to these changes.

Municipal Actions

Many municipalities in RPC's region have partnered with federal agencies, researchers and planners to evaluate how, when and where climate change could impact their municipal infrastructure and assets, the local economy, property and business owners, at risk populations, and natural systems. These initiatives represent a confident step by municipalities to plan for their current investments and decisions as well as their long-term futures. The table below summarizes the work being done by municipalities to address current and future impacts of climate change.

Table CC3. Summary of municipalities in the region who have previously or are currently engaged in climate assessment and/or adaptation projects.

Municipality	Date	Project/Study	Action
Seabrook	2009	Adaptation Strategies to Protect Areas of Increased Risk From Coastal Flooding Due to Climate Change in Seabrook, NH	High-risk areas considered priority for land conservation
Hampton-Seabrook Estuary communities (Hampton, Hampton Falls, Seabrook)	2012	*COAST** in Action: Projects from Maine and New Hampshire	Municipal education and awareness about the economic implications of impacts from sea level rise and storm surge to municipal infrastructure and critical facilities
Newfields	2013	Completed the NOAA Roadmap engagement process to identify short-term actions to address climate change impacts	Town made a bulk purchase of generators which were made available for purchase by residents. Planning Board adopted updated stormwater regulations to address local flooding issues.
Portsmouth	2013	Coastal Resilience Initiative	*Ongoing Project.* Informing update of the City's Master Plan, infrastructure management, and public outreach
Exeter	2013	Climate Adaptation Plan for Exeter (CAPE)	*Ongoing Project*
Rye	2014	Preparing For Climate Change in Rye: Gaining Insights and Charting a Course	Steering Committee and workshops participants identified key issues to work on relating to stormwater management, economic continuity and health
Seabrook-Hamptons Estuary Alliance	2014	Resilient New Hampshire Coasts: Assistance With Planning for Coastal Flood Hazards and Climate Change Impacts	*Ongoing Project*

* COAST is the Coastal Adaptation to Sea Level Rise modelling tool.

New Hampshire Coastal Adaptation Workgroup

The New Hampshire Coastal Adaptation Workgroup (NHCAW) is a collaboration of 20 partners and organizations working to help communities in southeastern New Hampshire prepare for the effects of extreme weather events and other effects of long term climate change. Since inception in 2010, CAW has led numerous projects and events that have elevated discussions about climate preparedness at municipal, state, and regional levels. CAW partners have received 18 grants totaling over $2.75 million dollars to conduct research, analyses, develop tools and implement outreach in the coastal watershed including municipalities, decision makers and practitioners. CAW projects are typically multi-faceted, incorporating science-based research, development of tools and guidance, and stakeholder outreach and engagement. NHCAW helps communities learn about and utilize existing resources and locate additional assistance to better prepare for the effects of a changing climate in order to protect their social, economic, human and environmental health. NHCAW provides communities with education, facilitation and guidance. NHCAW's yearly workshop series *Water, Weather, Climate and Community* focus on information to help communities acquire technical knowledge, gain access to resources, and learn from each other's experiences in order to prepare for the impacts of climate change.

RPC has been a participating member of NH CAW for over five years, providing staff time, technical resources and regional collaboration. RPC has partnered with member agencies and organizations to implement workshops, apply for funding, prepare advisory and guidance documents, and give presentations at national, state, regional and local events. For more information refer to CAW's website on the Storm Smart Coasts network at http://nh.stormsmart.org/.

Tides to Storms - Coastal Vulnerability Assessment and Hazard Mitigation Planning Project

New Hampshire coastal municipalities are confronted by land use and hazard management concerns that include extreme weather events, storm surges, flooding, coastal erosion, and damage to key assets. These issues are only intensified by recent increases in the frequency and intensity of extreme storm events and increases in sea level. Increased flooding has the potential to place coastal populations at risk, threaten infrastructure, intensify coastal hazards and ultimately damage homes, businesses, public infrastructure, recreation areas, public space, coastal wetlands and salt marsh.

To better understand the future of our coast, Rockingham Planning Commission received funding from NH Homeland Security and Emergency Management through FEMA to evaluate the potential impacts of climate change on New Hampshire's coastal municipalities. The project called Tides to Storms will provide the following products to coastal New Hampshire communities:

- Maps and Data - Detailed maps, risk and impact analyses, mitigation strategies, and recommendations for municipal Hazard Mitigation Plans.
- Informational Materials - Informational outreach materials and tools to help plan future actions and inform public and private investments.
- Coastal Vulnerability Assessment - A regional-scale vulnerability assessment report and map set for NH coastal communities.
- Town Vulnerability Assessment Summary - A report for each community summarizing the impacts of climate change on land, natural resources and infrastructure based on projections of future of sea level rise and storm surge.

The vulnerability assessment will quantify and map impacts to three broad themes which include multiple assets and resources as described below. The project will provide a regional assessment of impacts and municipal profiles of impacts based on the three themes and six flood scenarios.

Natural Resources	Transportation
Surface Water Aquifers, Well Protection Areas Wetlands (freshwater, tidal) Wildlife Habitat Conservation Lands Agricultural Soils State and Municipal Parks	Roads, Highways Bridges, Culverts, Dams Transit Routes and Facilities Bike Paths Ports, Harbors, Marinas Long Range Transportation Plan Projects
Infrastructure - Utilities - Critical Facilities	
Water, Wastewater Wells (public) Utilities (electric, gas, telecom) Historic and Cultural Landmarks and Structures	Emergency Shelters Emergency Services Evacuation Routes Hospitals, Healthcare Centers High Risk Areas and Populations

Table CC4. List of elements to be mapped and analyzed with respect to flood elevations depicting sea level rise scenarios and 100-year/1% chance storm surge: Natural Resources, Transportation and Infrastructure-Utilities-Critical Facilities.

The three themes will be evaluated under three global sea level rise scenarios and flooding associated with coastal storm surge projected to 2100. The project will also apply the Sea Level Affecting Marsh Migration Model (SLAMM) tool to evaluate the potential for inland marsh migration resulting from sea level rise. The analysis will be performed by the New Hampshire Fish and Game Department (NHFG). Refer to the section *Estuarine and Coastal Watershed Tools* for more information on SLAMM and marsh migration.

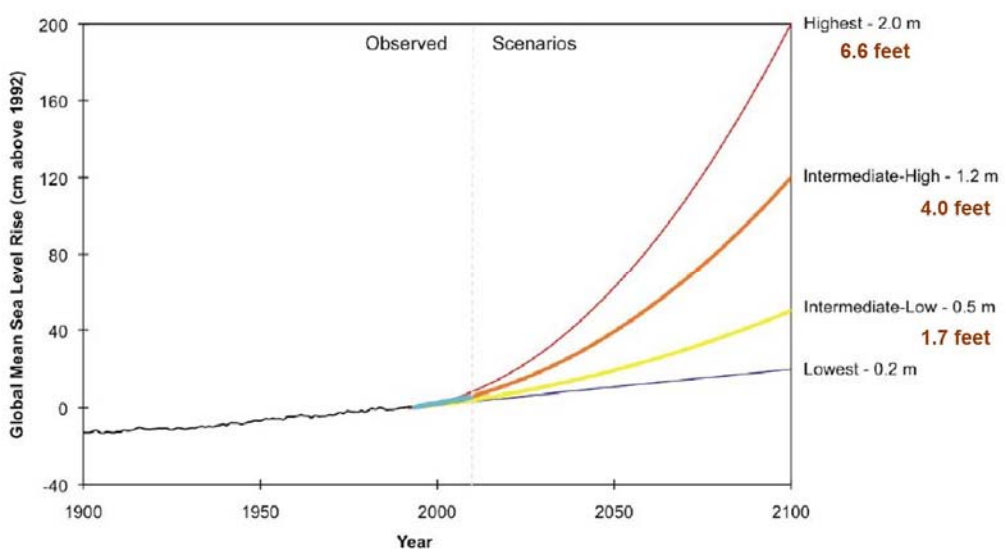


Figure CC8. Past and Projected Changes in Global Sea Levels (Parris, et al., 2012)

FLOOD SCENARIOS

Sea Level Rise

1.7 feet Intermediate Low
4.0 feet Intermediate High
6.3 feet Highest

Sea Level Rise + Coastal Storm Surge (CSS)

1.7 feet + storm surge
4.0 feet + storm surge
6.3 feet + storm surge

Note: Height of 100-year 1% chance coastal storm surge varies throughout the coastal region.

Refer to Appendix B Maps CC1 and CC2 for (draft) sample depictions of sea level rise and coastal storm surge flood potential and its impact on roads, upland and the coastal region.

This project will raise awareness across many sectors about the broad spectrum of impacts that coastal municipalities might encounter in the future. The project is intended to assist coastal NH communities to take actions to prepare for increase flood risk, including:

- Enhance preparedness and raise community awareness of future flood risks.
- Identify cost-effective measures to protect and adapt to changing conditions.

- Improve resiliency of infrastructure, buildings and investments.
- Protect life, property and local economies
- Protect services that natural systems provide
- Preserve unique community character

With support from the NH Coastal Adaptation Workgroup, RPC will work closely with the seven coastal municipalities to evaluate their risk and vulnerability to flooding from sea level rise and storm surge, and identify practical approaches to protecting municipal and private assets, public safety and natural resources. This information will be used to prepare a draft Climate Change and Adaptation Chapter for their local hazard mitigation plans.

Hamptons-Seabrook Estuary Coastal Adaptation to Sea Level Rise Project

Background

Emergency managers and community leaders need to understand the risks associated with these threats and develop local, practical solutions aimed at ensuring public safety, properly locating critical infrastructure, and conserving sensitive natural areas. Given that coastal hazard risks are increasing, community leaders require science-based evaluation of management options that incorporates the economic costs and benefits of various community planning choices. New Hampshire coastal communities have experienced widespread flooding events in recent years. Some low lying areas along the NH coast are flooded by seasonal high tides.

Project Overview

In 2011 the Hamptons-Seabrook Estuary Coastal Adaptation to Sea Level Rise Project was funded by the Piscataqua Region Estuaries Partnership through a grant from EPA's climate Ready Estuaries Program. The project goal was to evaluate impacts of future sea level rise and storm surge using the Coastal Adaptation to Sea Level Rise Tool (COAST) in a stakeholder driven process.

Lack of Necessary Information	- Current floodplain maps are inaccurate - Need maps of projected sea level rise and storm surge at regional and local scales
Project Purpose	- Examine the potential economic impacts from coastal storms - Evaluate measures to reduce risk and vulnerability
Project Benefits and Results	- A "decision tool" to weigh different courses of action against time and level of risk -
Next Steps	- Evaluate results against existing policies, plans and regulatory requirements – are changes necessary?

Staff from the New England Environmental Finance Center worked with the NH Coastal Adaptation Workgroup, municipal staff, elected officials, and other stakeholders to select specific locations, vulnerable assets, and adaptation actions to model using COAST. Applying the COAST model tools, representatives from the three towns – Hampton, Hampton Falls and Seabrook – selected a resource or asset to evaluate, in this case municipal facilities. The facilities modelled include:

Hampton:	Sewage Pump Station, Police Station, Wastewater Treatment Plant, High School
Hampton Falls:	No municipal facilities located in coastal areas.
Seabrook:	Wastewater Treatment Plant, Middle-Elementary School

Other high priority concerns identified by stakeholders in the three towns focused on: neighborhoods, roads and evacuation routes, emergency response facilities, energy utilities and infrastructure, environment and natural resources, businesses and real estate value.

Outputs of the COAST model showed which municipal facilities were vulnerable to flooding and what timeframe action might be needed to protect them. Results of the analysis found that:

- Implementation of adaptation actions (construction of berms in all cases) in every flood scenario modeled for Seabrook, Hampton and Hampton Falls has at least a 2:1 benefit to cost ratio.
- In the least-flooded scenario of low sea level rise, adaptation actions provide an 8:1, 3:1 and 10:1 benefits to costs ratio for Hampton, Seabrook and Hampton Falls, respectively, providing savings of nearly $260 million between the three towns by 2100 compared to "No Action" scenarios.
- Protection of public assets resulted in benefit to cost ratios as high as 10:1 for Hampton and 25:1 for Seabrook.
- Nowhere in the models, where the adaptation actions are implemented, do costs of adaptation outweigh benefits in dollars of damage avoided.
- Not all facilities require adaptation actions today and most can delay protective action to the 2050 or beyond timeframe.

State Plans and Initiatives

NH Climate Action Plan

In 2009, the Governor's Climate Change Policy Task Force released the N.H. Climate Action Plan, containing 67 overarching strategies necessary to meet the states greenhouse gas reduction, economic, environmental, and climate change related goals. The Plan's Task Force recommended that New Hampshire strive to achieve a long-term reduction in greenhouse gas emissions of 80 percent below 1990 levels by 2050.

The recommended strategies are organized into the following 10 overarching plan goals:

1. Maximize energy efficiency in buildings.
2. Increase renewable and low CO_2-emitting sources of energy in a long-term sustainable manner.
3. Support regional and national actions to reduce greenhouse gas emissions.
4. Reduce vehicle emissions through state actions.
5. Encourage appropriate land use patterns that reduce vehicle-miles traveled. Reduce vehicle-miles traveled through an integrated multi-modal transportation system.
6. Protect natural resources (land, water and wildlife) to maintain the amount of carbon fixed or sequestered.
7. Lead by example in government operations.
8. Plan for how to address existing and potential climate change impacts.
9. Develop an integrated education, outreach and workforce training program.

New Hampshire's Climate Action Plan presents an opportunity to:

- Avoid the significant costs of responding to a changing climate to the state's infrastructure, economy, and the health of our citizens; and
- Preserve the unique quality of life that makes New Hampshire an outstanding place to live, work, and raise a family.

Specifically Chapter 3 Adapting to Climate Change recommends statewide actions to address existing and future challenges relating to economics, human health, natural systems, and infrastructure.

> "The state will need to plan for these impacts with the best understanding of the resources that are available to address the issue at the state, regional and national level. This would require more comprehensive and integrated planning with a variety of stakeholders and should begin immediately and continue into the future."

Coastal Risks and Hazards Commission

The Coastal Risks and Hazards Commission was created effective July 2, 2013 through adoption by the Legislature of RSA 483-E. The commission is charged with recommending legislation, rules, and other actions to prepare for projected sea level rise and other coastal and coastal watershed hazards such as storms,

increased river flooding, and storm water runoff, and the risks such hazards pose to municipalities and state assets in New Hampshire. The commission will review National Oceanic and Atmospheric Administration (NOAA) and other scientific agency projections of coastal storm inundation, and flood risk to determine the appropriate information, data, and property risks. The Commission is required to submit annual reports of its findings and any recommendations for proposed legislation to the speaker of the House of Representatives, the president of the senate, the house clerk, the senate clerk, the governor, and the state library on or before November 1 of each year through its conclusion in 2016.

The Commission's membership includes representatives from the House of Representatives, state agencies, regional planning commissions, municipalities, University of New Hampshire, NH Coastal Adaptation Workgroup, and other private sector and non-profit stakeholders from the coastal watershed. Cliff Sinnott, RPC's Executive Director, currently serves as Chair of the Commission. In the fall of 2013, the Commission formed three workgroups – Coastal, Inland/Great Bay and State Agency/Legislative - to capture the needs and issues of specific geographic areas and state and legislative functions and jurisdictions. The workgroups will evaluate information and prepare recommendations for deliberation by the full Commission and inclusion in their interim and final reports.

For more information refer to the CRHC website hosted by the NH Coastal Adaptation Workgroup website on the Storm Smart Coast network at http://nhcrhc.stormsmart.org/.

NH Homeland Security and Emergency Management – N.H. Multi-Hazard Mitigation Plan

For the first time the 2009 update of New Hampshire's Multi-Hazard Mitigation Plan incorporates new goals about addressing climate change including technical support, planning, assessment of risk and vulnerability, and adaptation statewide. RPC staff in collaboration with NH CAW members and the Coastal Program assisted with preparation of climate change goals and recommendations for the Plan update. Below are key goals and objectives from the NH Multi-Hazard Mitigation Plan relating to climate change.

Table CC5. Goals supporting climate change planning and adaptation from the N.H. Hazard Mitigation Plan (2013).

Goal	Objective / Action
Goal #2. Reduce the potential impact of natural and human caused disasters on New Hampshire's Critical Support Services, Critical Facilities and Infrastructure.	Objective H: Develop strategies to address coastal flooding and protection of infrastructure against storm surge. Action 1. Sustain the NHDES Coastal Program's participation and support of the Coastal Adaptation Workgroup to address hazard and mitigation needs relative to state and community infrastructure.
Goal #7. Address the challenges posed by climate change as they pertain to increasing risk to the State's infrastructure and natural environment.	Objective A. Support efforts to characterize and identify risks posed by climate change especially as it relates to changing precipitation patterns, storm event frequency, and sea level rise. Objective B. Support strategies for adaptation to climate change. Objective C. Encourage coastal communities to incorporate mitigation planning in master plans, zoning, land use and resource regulations and other planning studies and initiatives that address the existing and potential future threats related to climate change and sea level rise.

The N.H. Multi-Hazard Mitigation Plan and a link to Federal Mitigation Resources are available on the Department of Safety, Homeland Security and Emergency Management website at: http://www.nh.gov/safety/divisions/hsem/HazardMitigation/planning.html.

N.H. Department of Environmental Services - Environmental Planning

The Department of Environmental Services (DES) has incorporated climate change into its 2010-2015 Strategic Plan and launched a two-year effort, "the Department Climate Initiative" (DCI), to engage agency leadership, middle management and key staff in a strategic review of DES's programs and activities. The goals of the DCI are to make changes to its outreach activities, grants, and regulatory programs that: account for changing climate and environmental conditions; and reduce DES's energy use while promoting the reduction in fossil-fuel consumption by others. This internal effort complements DES efforts to collaborate with other state agencies as well as other northeast states and eastern Canadian provinces to reduce the causes and prepare for the effects of climate change.

Public Health

Climate change affects human health and well-being in many ways, including impacts from increased extreme weather events, rising temperatures in both cold and warms months, wildfire, decreased air quality, threats to mental health, and illnesses transmitted by food, water, and disease-carriers such as mosquitoes and ticks. Human health impacts are intensified with increasing levels of exposure which are likely to worsen with climate variability and change. (Melillo, Richmond, & Yohe, 2013) For example, changes in the hydrologic cycle with increasingly variable precipitation and more frequent drought may lead to increases of airborne dust, which will trap ozone and other airborne pollutants near the ground causing exacerbations of respiratory disease. Increasing exposure to environmental pollutants and atmospheric emissions in recent decades has caused concern over its effect on public health, environmental ecosystems and climate worldwide. (Center for Disease Control and Prevention: Airway Diseases)

Table CC6. Possible health effects resulting from climate change impacts to air, water and exposure levels.

Potential Climate Change Health Effects		
Environment/Weather	**Air and Water**	**Toxic Exposure**
Heat Stress Illness and Mortality Extreme Weather-Related Injury, Illness, Mortality	Respiratory/Airway Disease Asthma and Allergies Vectorborne and Zoonotic Diseases	Foodborne Disease due to safety and availability of food and water supplies Neurological Disease/Disorder Cancer
Mental Health and Stress-Related Disorders, Cardiovascular Disease, Stroke Nutrition, Human Developmental Effects		

[Source: Summarized from the Centers for Disease Control and Prevention: Climate and Health Effects at http://www.cdc.gov/climateandhealth/effects/default.htm]

The most vulnerable populations - children, elderly people, those living in poverty, people with underlying health conditions, people living in certain geographic areas - are at increased health risk from climate change. The table below summarizes the linkages between human health impacts and changes in climate.

Heat Stress

Heat exposure has a range of mild to severe health effects and can aggravate chronic diseases, including cardiovascular and respiratory disease. Heat also increases ground-level ozone concentrations, causing direct lung injury and increasing the severity of respiratory diseases such as asthma and chronic obstructive pulmonary disease. Higher temperatures and heat waves increased demand for electricity and thus combustion of fossil fuels, generating airborne particulates and indirectly leading to increased respiratory disease. (Center for Disease Control and Prevention: Climate and Health)

Asthma and Respiratory Disease

Climate change will affect air quality through several pathways including production and impact of airborne allergens such as pollen and mold spores and increases in regional ambient concentrations of ozone, fine

particles, and dust. Some of these pollutants can directly cause respiratory disease or exacerbate respiratory disease in susceptible individuals. (Center for Disease Control and Prevention: Climate and Health)

As reported by the N.H. Department of Health and Human Services in the NH State Asthma Plan 2009-2014, New Hampshire data consistently show statistically significant increasing trends in adult asthma from 2000 to 2008, and it appears asthma is increasing faster in some groups than in others, further explaining health disparities:

- 13.8 times faster among adult women than men
- 4.7 times faster among individuals whose household income is less than $25,0000
- 4.7 times faster among the uninsured times faster among those with less than a high school education

Additional statistics about asthma reported include:

- Among New Hampshire children less than 18 years old, age and household income are the most important factors affecting higher asthma prevalence.
- 45% of adults and 34% of children with current asthma in New Hampshire have 'not well' or 'very poorly' controlled asthma
- Nearly 1/3 of adults and over 2/3 of children with asthma do not meet recommended guidelines for physical activity

CDC's Building Resilience Against Climate Effects (BRACE) Framework

The CDC's Building Resilience Against Climate Effects (BRACE) framework is a five step process that supports the development and implementation of a unified climate and health adaptation strategy to more effectively anticipate, prepare for and respond to climate sensitive health impacts. (Centers for Disease Control)

5 steps in the BRACE Framework:

Step 1: Forecasting Climate Impacts and Assessing Vulnerabilities

Step 2: Projecting the Disease Burden

Step 3: Assessing Public Health Interventions

Step 4: Developing and Implementing a Climate and Health Adaptation Plan

Step 5: Evaluating Impact and Improving Quality of Activities

Lyme Disease in New Hampshire

How Climate Effects Distribution of Deer Ticks

The first cluster of disease was recognized in Connecticut in the mid-1970s; health experts estimate that there are now around 300,000 cases of Lyme disease annually in the United States. Historically, deer ticks (*Ixodes scapularis)* and incidents of Lyme disease were present in southern portions of the Northeast and are now heavily present throughout the region due to its moderate climate. (Mole, March 19, 2014)

Climate change have the following effects on Lyme disease: an acceleration of the tick's developmental cycle, a prolonged developmental cycle, increased egg production, increased population density, and a broader range of risk areas. An adult tick may become active on warm winter days, yielding a larger nymph population the following year. (Mole, March 19, 2014)

With an earlier winter thawing, nymph stage ticks will become active sooner. The warmer winters will also allow for a higher survival rate of the white-footed mouse, a popular host for the ticks, meaning an increased tick population in the spring and summer. (National Association of Geoscience Teachers)

Occurrence of Lyme Disease in New Hampshire

According to the Centers for Disease Control and Prevention, New Hampshire and specifically Rockingham County have one of the highest occurrences of Lyme's Disease in the country and among the New England states. Lyme disease, is transmitted by the bite of the black-legged tick (*Ixodes scapularis*), formerly known as the deer tick. (NH Department of Health and Human Services)

The most effective way to protect against the disease is through education and awareness, and implementing precautionary measures such as wearing appropriate clothing, applying repellent, and carefully checking for ticks on clothing and body. Other measures include properly removing ticks when bitten, screening for possible infections, and getting proper treatment when infected. (NH Department of Health and Human Services)

Reported Cases of Lyme Disease in New Hampshire, 2008-2013

	2008		2009		2010		2011		2012		2013	
County¶	Cases	Rate*	Cases	Rate*	Cases	Rate*	Cases	Rate*	Cases	Rate*	Cases	Rate*
Belknap	23	38.2	20	33.2	34	56.6	42	69.7	29	48.1	47	78.1
Carroll	16	33.3	19	39.8	35	73.2	53	111.2	48	100.9	60	126.3
Cheshire	36	46.5	36	46.6	29	37.6	61	79.3	43	56.0	72	94.0
Coos	2	*	3	*	5	15.1	10	30.6	5	15.6	2	*
Grafton	18	20.3	19	21.4	45	50.5	40	45.0	43	48.2	78	87.0
Hillsborough	451	112.9	438	109.5	425	106.1	388	96.6	429	106.5	499	123.5
Merrimack	103	70.0	90	61.3	110	75.1	108	73.7	125	85.2	147	100.1
Rockingham	681	230.9	585	198.2	498	168.7	422	142.5	550	184.7	526	175.8
Strafford	263	214.8	191	155.2	139	112.9	155	125.1	172	138.6	212	170.2
Sullivan	15	34.3	23	52.6	22	50.3	22	50.6	16	37.1	39	90.7
Total Cases	**1,615**	**122.7**	**1,425**	**108.3**	**1,342**	**101.9**	**1,301**	**98.7**	**1,460**	**110.5**	**1,689**	**127.6**
Confirmed	1,222		1,002		834		887		1,009		1,323	
Probable	393		423		508		414		451		366	

* Rate per 100,000 persons. Rates calculated on events <20 are considered statistically unreliable and should be interpreted with caution. Rates not calculated for counties with 1-4 cases due to instability of the rate calculation.

Note: Data beginning with 2008 include confirmed and probable cases to be consistent with the 2008 Lyme Disease case definition adopted by CDC and CSTE. Data beginning in 2012 are based on the latest 2011 Lyme Disease case definition. Changes in case definition over time make it difficult to compare incidence across years as it is unclear how these changes altered the number of reported cases classified as probable or confirmed in New Hampshire.

¶ Data on county of residence are incomplete or not available for 7 cases in 2008, 1 case in 2009 and 7 cases in 2013.

Figure CC9. Statistics of reported cases of Lyme disease in N.H. by county.

Environment and Ecosystems

NH Wildlife Action Plan

IN 2013, The N.H. Wildlife Action Plan was updated to include evaluation of climate change impacts on ecosystems and habitats. (Ecosystems and Climate Change Adaptation Plan, 2013) N.H.'s coastal habitats are expected to be the most immediately affected by climate change due to sea level rise, which will inundate habitat, change salinities and increase the damaging effects of storm surge. For freshwater habitats, more precipitation occurring in stronger storms, and longer summer droughts will change stream flooding and wetland recharge. Increasing temperature will also affect marine and aquatic species ranges and reproductive cycles. In terrestrial habitats, species composition will shift as species track their preferred temperature and moisture ranges, potentially resulting in altered food webs and other natural process. The Plan identifies critical action-oriented strategies necessary to address impacts of climate change on wildlife, habitats and ecosystems.

- Conserve Areas for Habitat Expansion and/or Connectivity
- Habitat Restoration and Management
- Restore Watershed Connectivity
- Protect Riparian and Shoreland Buffers
- Invasive Species Plan
- Comprehensive Planning
- Stormwater Policy and Flood Response
- Revise Water Withdrawal Policies
- State Energy Policy
- Funding
- Modeling, Research and Monitoring
- Technical Assistance and Outreach

Three broader themes outlined in the plan encompass commonalities among actions that otherwise apply more specifically to individual habitats or vulnerabilities, and that also address some of the most pressing current needs related to climate change.

Short-term Implementation (short-term, small scale): Despite the need for further assessment and ongoing planning, there are things that can be done now to minimize the effects of climate change on both ecosystems and humans.

Landscape Assessment and Conservation (long-term, large scale): Any response to climate change should take advantage of existing and emerging knowledge to identify areas that are more resilient, more likely to adapt, or that are at highest risk.

Partnerships: Because climate change occurs at a large scale, it is imperative that agencies, NGOs, planners, researchers and municipalities work together towards common solutions. (Ecosystems and Climate Change Adaptation Plan, 2013)

Estuarine and Coastal Watershed Tools

Sea Level Affecting Marshes Model (SLAMM)

In the summer and fall of 2014 New Hampshire Fish and Game Department (NHFG) conducted modelling of inland marsh migration in response to sea level rise for all of coastal New Hampshire. As the sea level changes, coastal dynamics and ecosystems change with it. Under the right conditions, marshes have the capacity to migrate inland with a rising sea level.

NHFG used the Sea Level Affecting Marshes Model (SLAMM), a tool that simulates the processes that affect how coastal ecosystems naturally change over time and where natural and man-made barriers will inhibit these changes. This tool can help users visualize and understand how coastal ecosystems will likely shift and adapt over time under a range of projected sea level rise conditions. These model outputs will be accessible through the New Hampshire Coastal Viewer by 2015. NHFG staff worked with four communities, Hampton, Hampton Falls, Seabrook, and Portsmouth to explore how SLAMM can aid local decision making. Possible applications of SLAMM include supporting decision about citing future infrastructure, habitat restoration, land conservation, and the development of land use regulations (e.g. buffers and setbacks).

Following are additional resources about marsh migration:

Marshes on the Move, by NOAA Coastal Services Center and the Nature Conservancy at http://www.csc.noaa.gov/publications/Marshes_on_the_move.pdf

Ecosystems and Wildlife Climate Change Adaptation Plan Chapter, New Hampshire Fish and Wildlife Action Plan, New Hampshire Fish and Game at http://www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/climate_change/Eco_Wildlife_CC_Adapt_Plan.pdf

Coastal Viewer Web-Based Tool

With funding support from NOAA, NH GRANIT has worked with the NH Department of Environmental Services and a team of partners to develop the NH Coastal Viewer, a web-based mapping tool that provides access to geospatial data sets focused on coastal climate change adaptation. Priority data layers incorporated into the Viewer include projected sea level rise inundation layers, floodplain data, fluvial erosion hazards data sets, culvert assessments, land use data, and marsh migration model outputs. These are supplemented by a suite of data sets that provide geographic context for the Coastal Viewer data series, including standard base map layers (town boundaries, road centerlines, surface waters, etc.) and topographic and aerial image products. Tools to view and interact with the data allow users to navigate the map layers to select specific geographic areas, query individual data sets, show custom buffers from features (e.g. surface waters, wetlands), upload and display local data formatted as GIS files, and export maps for local printing. The Viewer provides a tool for New Hampshire's coastal communities and regional planning agencies to assist them in visualizing and understanding coastal resources, current and potential coastal climate change impacts and vulnerabilities, and options for coastal adaptation strategies. The Coastal Viewer Tool will be available on the GRANIT website in 2015.

Water Management

In 2012, the New Hampshire Water Sustainability Commission issued its report highlighting the most important issues that we need to address and identifying those strategic goals and recommendations that will chart a course toward ensuring the long-term sustainability of our water resources.

Everyone in the state relies on water to meet basic needs, while others need water for commercial uses, production of food, recreational and tourism businesses, and as a commodity that is mined and sold. Water is the resource that allows us to live, recreate and enjoy a high quality of life.

Ultimately, a future oriented toward climate change adaptation will present challenges to attaining the seven goals identified by the Water Sustainability Commission.

Refer to the Natural Resources Chapter for more detailed information about drinking water, groundwater resources, surface water resources, and stormwater.

7 Strategic Goals from the New Hampshire Water Sustainability Commission Report (2012)

1. The people of New Hampshire will be **knowledgeable, engaged, and careful consumers and stewards** of our water resources.
2. Flexible and coordinated **water management programs and practices** will be designed and implemented to ensure that New Hampshire has an **adequate quantity and quality of water** to support ecological and human health and economic activity.
3. Management and planning for New Hampshire's **water quality and quantity will be integrated** at appropriate state, watershed and sub-watershed levels.
4. The infrastructure for delivering our **drinking water, cleaning our wastewater, and managing storm water and water storage** will protect human and environmental health and safety in an affordable manner.
5. **Runoff from rain and snow**, and the pollution it carries, will be minimized and effectively managed.
6. Our **watersheds, communities, and built infrastructure** will be robust, resilient, and able to adapt to changing weather patterns.
7. Adequate public and private funding will be available for managing water resources effectively and efficiently.

Agriculture

Department of Agriculture

The Climate Change Program Office (CCPO) coordinates USDA's responses to climate change, focusing on implications of climate change on agriculture, forest ecosystems, grazing lands, and rural communities. The USDA Climate Change Adaptation Plan presents strategies and actions to address the effects of climate change on key mission areas including mitigation of greenhouse gas emissions, agricultural production, food security, rural development, and forestry and natural resources conservation. The Plan provides a detailed vulnerability assessment, reviews the elements of USDA's mission that are at risk from climate change, provides specific actions and steps being taken to build resilience to climate change, and integrates climate change adaptation planning into the actions of the Department. (U.S. Department of Agriculture: Office of the Chief Economist)

USDA Regional Climate Hub in New Hampshire

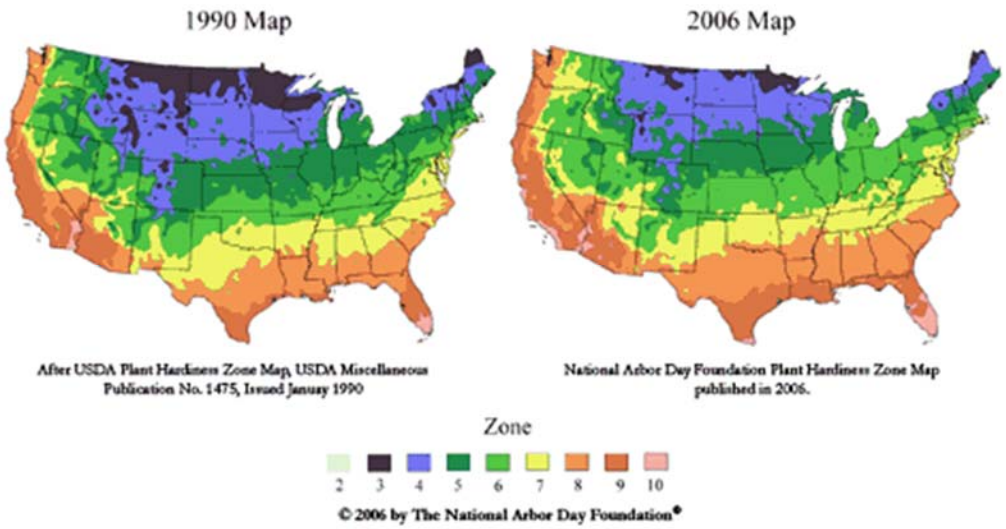
In 2014, the USDA created regional hubs to deliver information to farmers, ranchers and forest landowners to help them adapt to climate change and weather variability at regional and local scales. The Northeastern Regional Climate Hub (NERCH)in Durham, N.H. This multi-agency effort (Agricultural Research Service, Forest Service, and Natural Resources Conservation Service) is being led by David Hollinger, Plant Physiologist at the Forest Service Northern Research Station. The Hub will deliver science-based knowledge and practical information to farmers, ranchers, and forest landowners that will help them to adapt to climate change by coordinating with local and regional partners. The Hub will provide:

- Technical support for land managers to respond to drought, heat stress, floods, pests, and changes in growing season.
- Regional assessments and forecasts for hazard and adaptation planning.

- Outreach and education for land managers on ways to mitigate risks and thrive despite change. (U.S. Department of Agriculture: Regional Climate Hubs)

U.S. Plant Hardiness Zones

Compared with the 1990 version, zone boundaries in this edition of the map have shifted in many areas. The new PHZM is generally one half-zone warmer than the previous PHZM throughout much of the United States, as a result of a more recent averaging period (1974–1986 vs. 1976–2005). However, some of the changes in the zones are the results of the new, more sophisticated mapping methods and greater numbers of station observations used in this map, which has greatly improved accuracy, especially in mountainous regions. These changes are sometimes to a cooler, rather than warmer, zone.



Climate changes are usually based on trends in overall average temperatures recorded over 50-100 years. Because the USDA PHZM represents 30-year averages of what are essentially extreme weather events (the coldest temperature of the year), changes in plant hardiness zones alone are not conclusive evidence of widespread warming.

Figure CC10. Maps showing changes to plant hardiness zones in the U.S. from 1990 to 2006.

The recent climate assessment for southeastern New Hampshire(Wake et al, 2012) reports regional changes in climate change across in a wide range of indicators that include increases in temperature (especially in winter), increase in overall precipitation, an increase in the rain-to-snow precipitation ratio, a decrease in snow cover days, earlier ice-out dates, and earlier spring runoff. Combined these changes have resulted in longer growing seasons for native plants - earlier spring bloom dates for lilacs - and agricultural crops.

Key Issues and Challenges

One of the key issues and challenges with respect to climate change revolves around making sound decisions today that consider potential future conditions and what impact they may have on natural and human systems. We can observe today our existing challenges with respect to a changing climate as well as historical trends; however predicting future conditions poses far more challenges due to limitations of technology and the multitude of economic and societal conditions that may or may not occur.

Historic flooding risk is not a good predictor of the level of risk communities will face moving into the future: there is a need to plan proactively for more flooding.

Projecting Future Conditions

Climate science provides insight into future conditions through complex models that produce "climate projections". Projections are based on scientists' understanding of how the climate system works and on computer models designed to simulate Earth's climate. A climate projection is a statement about the likelihood that something will happen several decades to centuries in the future if certain environmental and behavioral/societal conditions occur. Climate projections specifically allows for evaluating a range of conditions, such as an increase in greenhouse gases, which might influence the future climate. For projections extending well out into the future, scenarios are developed of what could happen given various assumptions and judgments regarding fossil fuel use and greenhouse gas emissions. (World Meteorological Organization) (National Oceanic and Atmospheric Administration: Climate.gov)

National Climate Assessment

The Intergovernmental Panel on Climate Change (IPCC's) Fifth Assessment Report or AR5 (2014) and the National Climate Assessment – Northeast Chapter (NCA, 2014) provide knowledge on the scientific, technical and socio-economic aspects of climate change based on a range of greenhouse gas emission scenarios.

See Climate Change Impacts in the United States: Northeast Chapter, The Third National Climate Assessment. U.S. Global Change Research Program –(NCA, 2014) at http://nca2014.globalchange.gov/report/regions/northeast and the 2014 IPCC AR5 report and other resources at http://www.ipcc.ch/.

The National Climate Assessment (2014) and recent assessments conducted in New Hampshire project our state may be affected by future changes in climate across many sectors.

The recent climate assessment for southeastern New Hampshire *Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future* (Wake, et al., 2011) reports historical trends and future projections for temperature, sea level, rain and snowfall resulting from climate change. Such changes may include warmer winters and hotter summers, more frequent and severe upland and coastal flooding, more extreme precipitation events, and less snow and more rain. Refer to Figure CC13 on page 27 for a summary from the Wake et al (2011) report.

NH Coastal Risks and Hazards Commission, Science and Technical Advisory Panel Report

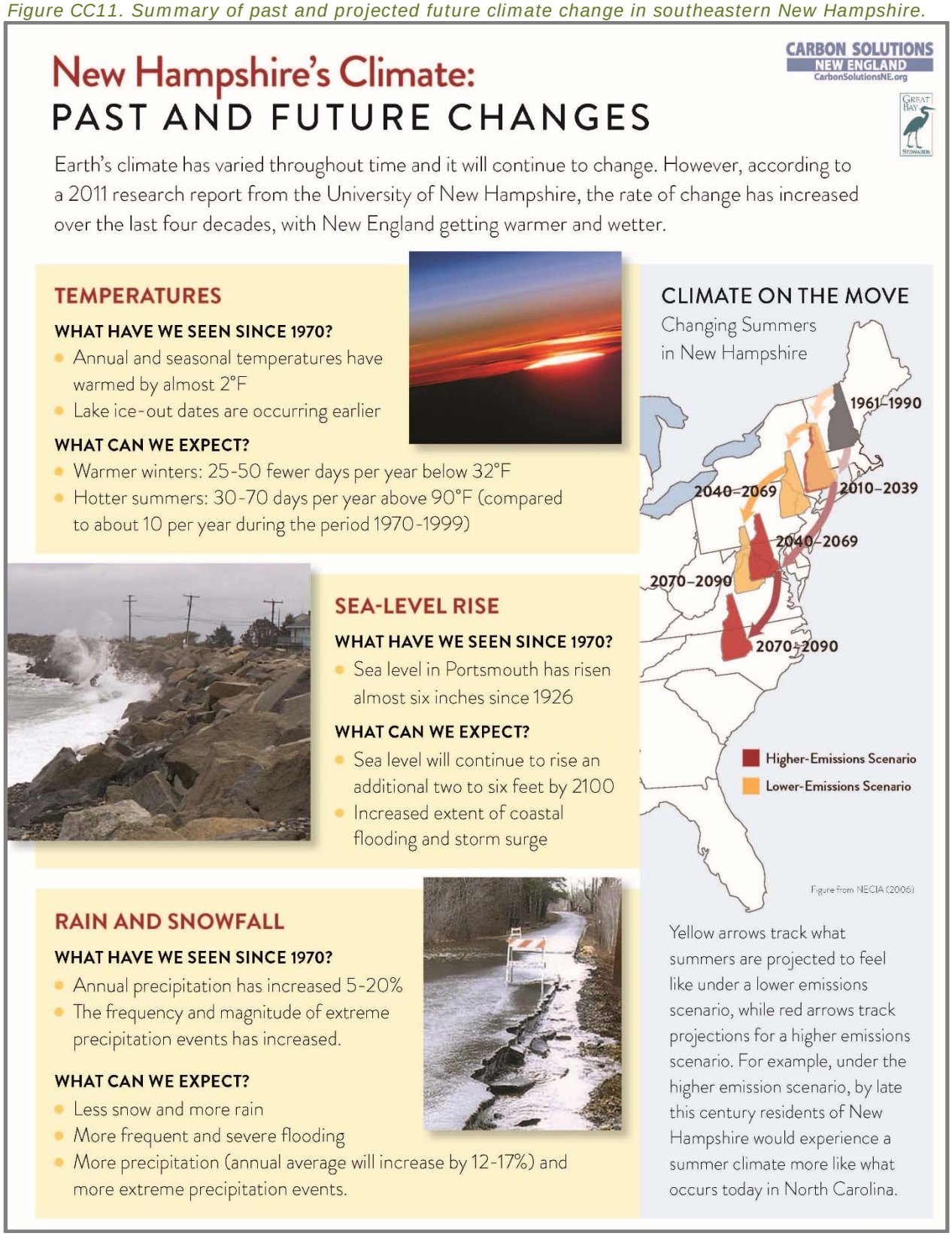
The NH Coastal Risks and Hazards Commission, Science and Technical Advisory Panel reviewed scientific literature, reports and assessments on climate change to identify likely conditions New Hampshire should prepare for by 2050 and 2100. The report "outlines the projected impacts likely to be experience in the next few decades and out into the end of the century and recommends a number of assumptions and projections for the Commission to use. It is intended to specifically advise the Commission which will in turn develop specific recommendations to assist in planning and preparation for the changing climatic conditions." The Science Advisory Panel's report (July 2014) offers the following projections of future climatic conditions for the region (Kirshen, Wake, Huber, Knuuti, & Stampone, 2014).

<table>
<tr><th>Conditions</th><th>Projections</th></tr>
<tr><td>Sea Level Rise</td><td>The range that best covers plausible sea-level rise increases to 2050 and 2100 are those prepared for the US National Climate Assessment and include the “Highest”. “Intermediate High”, “Intermediate Low” and “Lowest” scenarios based on varying greenhouse gas emissions and other climate responses:
<table>
<tr><th>Time Period*</th><th>Lowest</th><th>Intermediate Low</th><th>Intermediate High”</th><th>Highest</th></tr>
<tr><td>2050</td><td>0.3 feet</td><td>0.6 feet</td><td>1.3 feet</td><td>2.0 feet</td></tr>
<tr><td>2100</td><td>0.7 feet</td><td>1.6 feet</td><td>3.9 feet</td><td>6.6 feet</td></tr>
</table>
*using mean sea level in 1992 as a reference (Parris et al., 2012)

Source: Table ES.1. Sea-Level Rise (in feet) provided for the National Climate Assessment, 2014. (Parris, et al., 2012)</td></tr>
<tr><td>Storm Surge</td><td>Given the uncertainties associated with future storm surge changes, recommend that projects continue to use the present frequency distributions for 100-year and 500-year storms (as depicted in the 2014 FEMA Flood Insurance Rate Maps for Rockingham and Strafford Counties).</td></tr>
<tr><td>Precipitation</td><td>Projected increases in annual precipitation are uncertain but could be as high as 20% in the period 2071-2099 compared to 1970-1999, with most of the increases in winter and spring with less increase in the fall and perhaps none in the summer.</td></tr>
<tr><td>Extreme Precipitation</td><td>While unable at present to assign with confidence future changes in extreme precipitation events, recommend at a minimum that all related infrastructure be designed with storm volumes based on the current Northeast Regional Climate Center (Cornell) precipitation atlas to represent current conditions and be designed to manage a 20% increase in extreme precipitation events after 2050 and that a review of these projections be continued.</td></tr>
</table>

Table CC7. Projected climatic conditions to 2100 for sea level, storm surge, precipitation and extreme precipitation for the region. Source: (Kirshen, Wake, Huber, Knuuti, & Stampone, 2014)

Figure CC11. Summary of past and projected future climate change in southeastern New Hampshire.



Source: Information flyer for the publication Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future (2011). (Wake, et al., 2011)

Change Through Mitigation

Climate change mitigation centers on reduction of greenhouse gas (GHG) emissions achieved through energy efficiency and conservation, use of renewable and alternative energy sources, and CO_2 sequestration in biomass. In order to be effective and result in positive changes, mitigation must be performed by all sectors at the state, regional and local levels including individuals, businesses and municipalities. In order to move toward the long-term GHG reductions goals outlined in the NH Climate Action Plan and provide the greatest economic opportunity to the state of New Hampshire, the Plan recommends 67 actions to:

> With respect to climate change, ***mitigation*** is the reduction of greenhouse gas (GHG) emissions achieved through energy efficiency and conservation, use of renewable and alternative energy sources, and CO_2 storage in forests and biomass.

- Reduce emissions from buildings, electric generation, and transportation.
- Protect our natural resources to maintain the amount of carbon capture and storage (sequestration).
- Support regional and national initiatives to reduce greenhouse gases.
- Develop an integrated education, outreach and workforce training program.
- Adapt to existing and potential climate change impacts

At the regional level, RPC can directly mitigate GHG emissions through implementation of strategies in its transportation planning activities including the Long-Range transportation Plan, Transportation Improvement Plan, and use of federal and state funding programs to implement alternative transportation and roadway improvement projects. RPC also offers technical assistance and grants to municipalities to implement local studies and projects that can be geared toward GHG emissions reductions. RPC can also assist municipalities with amending land use zoning and regulations to reduce GHG emission through subdivision and site development practices, providing property with incentives to build structures and select utilities with energy efficiency in mind, and aligning land conservation goals to maximize carbon sequestration.

Refer to the Transportation section below for more information about how transportation can help achieve mitigation goals for greenhouse gas emissions reductions.

Regional Greenhouse Gas Initiative (RGGI)

Regional Greenhouse Gas Initiative, Inc. (RGGI, Inc.) is a 501(c)(3) non-profit corporation created to support development and implementation of the Regional Greenhouse Gas Initiative (RGGI) in the northeast. RGGI is a cooperative effort among nine states – Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont – to reduce greenhouse gas emissions. RGGI, Inc.'s exclusive purpose is to provide administrative and technical services to support the development and implementation of each RGGI State's CO_2 Budget Trading Program. RGGI, Inc.'s activities include:

- Development and maintenance of a system to report data from emissions sources subject to RGGI, and to track CO_2 allowances
- Implementation of a platform to auction CO_2 allowances
- Monitoring the market related to the auction and trading of CO_2 allowances
- Providing technical assistance to the participating states in reviewing applications for emissions offset projects
- Providing technical assistance to the participating states to evaluate proposed changes to the States' RGGI programs

Refer to the Energy Efficiency and Green Building Chapter for more detailed information about RGGI.

Transportation

The largest single contributor to greenhouse gas emissions in New Hampshire is derived from the transportation sector. However, many other external factors influence transportation emissions including land development patterns, land cover conversion, individual preferences and behavior, convenience and pricing. All of these factors combined must be considered in the context of climate change and the degree to which emissions will drive human behaviors and environmental change.

Continued and sustained efforts toward reducing greenhouse gas contributions across all sectors must be made to keep atmospheric emissions at safe limits. Examples such as those at right provide a coordinated framework from which to achieve this goal.

Reduce Greenhouse Gas Emissions in All Sectors

Reduce Vehicle Miles of Travel

Produce More Low-Emission Energy in New Hampshire

Encourage Energy Efficiency and Conservation to Reduce Consumption

Expand Renewable Energy Choices and Availability

Support Efficient Growth and Development Patterns

Implement Adaptation Measures That Protect Infrastructure and Property

Adopt Climate Adaptation Measures to Sustain Natural Resource Services

Reduce Vehicle Miles of Travel

The transportation sector contributes roughly 28 percent of the total U.S. greenhouse gas emissions each year. As of 2012, transportation accounts for 43 percent of greenhouse gas emissions in New Hampshire (Skoglund), which is significantly higher than the national average.

New Hampshire has had consistently declining per capita Vehicle Miles of Travel **(**VMT) since 2007 and current levels are below those seen in 2004. The main reasons for sustained decline in VMT are:

- Fuel prices continue to fluctuate and on average have remained high since the early 2000's. (Note: As of the publication of this Chapter, fuel prices have recently trended downward.)
- Technology is replacing the need for some trips (e.g. digital services and internet access).
- Youth, as a group, are choosing more cost effective ways to travel over single occupancy vehicles.

Reduce Greenhouse Gas Emissions

The NH Climate Action Plan recommends that New Hampshire strive to achieve a long-term reduction in greenhouse gas emissions of 80 percent below 1990 levels by 2050. This goal is based on the reductions that climate scientists believe are necessary to stabilize greenhouse gases in the atmosphere at or below 450 parts per million of carbon dioxide. Stabilizing the concentrations of greenhouse gases at this level may keep environmental conditions below critical thresholds thus minimizing the most severe potential impacts of climate change.

Refer to the Existing Conditions section of the Energy Chapter for more detailed information about VMT, greenhouse gas emissions and energy use in New Hampshire.

In addition to carbon dioxide and other greenhouse gases, ozone and particulate matter have a significant warming effect on the atmosphere, and pose serious public health implications. ***Refer to the Public Health section of this Chapter for additional information on the health impacts of greenhouse gas emissions.***

Implementation of State Plans

Additional reductions in greenhouse gas emissions may be achieved by aligning existing transportation program activities with goals from the N.H. Climate Action Plan and State Energy Strategy. Transportation planning is featured as a critical component of both of these plans. These plans focus broadly on what is referred to as the "3-legged stool" linking climate change to emissions, fuel choice and efficiency (travel less using less fuel and creating fewer emissions) with the goal of reducing greenhouse gas emissions.

Alternative Fuels	Access to electric vehicle charging stations, alternative fuels and fueling stations, clean vehicle technology
Energy Efficiency	Expand open road tolling, congestion management planning, advanced roadway technology (intelligent systems management)
Transit and Multi-Modal	Maximize use of alternative modes by creating transportation *choices* that are *accessible* to the majority of commuters, *affordable* for everyone and *convenient* to and from employment and services
Compact Growth and Development	Significantly decrease VMT and GHG emissions by adopting compact land use and development standards

RPC's Role as a Metropolitan Planning Organization

As part of its function as a Metropolitan Planning Organization (MPO), the RPC implements the federal and state transportation planning process in the 27 municipalities in the region. The RPC coordinates local, state and federal plans ensuring that local and regional transportation needs are accounted for in the statewide transportation and project planning process and in the prioritization of federally funded projects. The RPC strives to utilize guidance from the Federal Highways Administration (FHWA), Federal Highway Administration (FHA) and other sources to incorporate climate change data and analyses in future project and programmatic initiatives including coordination between the transportation, land use and environmental planning sectors.

Refer to the Key Issues and Challenges section of the Transportation Chapter for more detailed information about VMT, greenhouse gas emissions climate related issues in New Hampshire.

Planning and Program Tools

Several existing programs administered under the MPO can actually help achieve further reductions in vehicle miles of travel and greenhouse gas emissions by implementing efficiency measures and alternative choices in the region's transportation systems. These programs allow transportation planning to address many of the cross-cutting issues stated previously by establishing linkages between transportation, land use and energy.

Congestion Management

Traffic congestion is one of the many issues affecting the economic vitality and quality of life of the region. Environmental impacts from traffic congestion include air quality, ecological concerns and climate change. The Congestion Management Process (CMP) is a planning and project programming tool that aids in the effective management of the transportation system through development and implementation of operational and travel demand management strategies. It also provides system performance information to decision-makers to assess the effectiveness of implemented strategies as well as identify system investment priorities. A direct environmental benefit of the CMP is improved coordination between transportation, land use, economic development, and environmental planning.

Transportation Alternatives Program

The Federal Highways Administration (FHWA) funds state administration of the Transportation Alternatives Program (TAP). The TAP replaced the funding from pre-MAP-21 programs including the Transportation Enhancement Activities, Recreational Trails Program, and Safe Routes to School Program. The TAP program offers a wide range of options to implement local projects that reduce VMT and emissions. TAP projects include on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental

mitigation; recreational trail projects; safe routes to school projects; and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former divided highways.

Intelligent Transportation Systems

The SRPC and RPC ITS Strategic Plan provides an overall framework for ITS implementation to enhance the regions' transportation safety, security, mobility, and performance. The Plan goal is to apply advanced technologies and systems to improve interagency coordination and create opportunities for seamless integration of transportation services, both within the region and with adjacent regions."

Planning for Climate Change

Because climate change affects our entire state, regional collaborative approaches that address common infrastructure, natural resources, economies and services are needed to effectively address the future. RPC has been a leader in bringing resources, technical expertise and funding to our municipalites and other regional stakeholders for the purpose of better understanding of how climate change may affect the region. Given limited resources and capacity, RPC places particular focus on fostering regional and municipal collaboration around this critical issue.

New Hampshire has many state and municipal assets and resources that may be impacted in the future by climate change. State and municipalities with assets and resources in coastal and riverine floodplains have a distinct and pressing need to comprehensively address existing and future impacts, including sea level rise, land and natural resource protection, public health, and sustainability of local and regional economies. Without proactive solutions to address the expected impacts of climate change, coastal communities in particular face a multitude of challenges to ensure the security, health and welfare of its citizens and provide for a stable and viable economic future. However, actions to prepare and make sound choices will allow coastal communities to adapt to a changing climate and thrive with fewer economic, social, and environmental impacts.

Local Implementation

Many municipalities view climate change as a response activity focused on emergency management, public health and safety, and disaster or hazard based preparedness. Fewer municipalities address climate change and its future impacts in planning and policy documents such as their Capital Improvement Plans, Master Plans, infrastructure and/or road maintenance plans, or land and open space conservation plans.

> The "climate change lens" can be used to comprehensively fold targeted strategies into existing processes including policies, plans, regulatory frameworks, voluntary/advocacy initiatives, and private sector actions.

At the municipal level, implementation strategies to address current and potential future impacts from climate change can be incorporated into existing frameworks and mechanisms that can be modified by evaluating them under the "climate change lens" (i.e. consideration of short-term, sustained and long-term changes in environmental conditions).

Municipalities need help developing and implementing policies and regulations to plan for and adapt to the impacts of climate induced changes. Important first steps include: identifying areas most at risk from flooding and sea level rise; incorporating climate change adaptation and mitigation strategies in local hazard mitigation plans; putting regulations in place that decrease the vulnerability of buildings and infrastructure in areas subject to higher risk of flooding, particularly in the next 20 to 50 years (or within the life cycle of most existing facilities); and leveraging existing institutional practices - such as master plans, and capital improvement plans – to maximize use of available funds and implement comprehensive strategies to minimize and prevent impacts, and protect public and private investments.

Actions and strategies to address impacts from climate change can be incorporated into existing frameworks including:

- Zoning and Regulations
- Planning and Policy
- Funding Mechanisms and Plans
- Asset and Infrastructure Management
- Education, Outreach, Raising Awareness
- Natural Resource and Environmental Services Management

Refer to the detailed list Adaptation Strategies in Appendix A of this chapter.

Long-Term Planning and Collaborative Decision Making

The National Climate Assessment (NCA, 2014) report prepared by the U.S. Global Research Change Program (http://ncadac.globalchange.gov/) provides detailed climate information for the northeast region of the U.S as well as recommendations to address future conditions. Coordinated planning at all levels and across all sectors will be necessary to protect our quality of life and the safety and well-being of human and natural environments. "Key Messages" from the NCA Report, which focus on long-term planning and collaborative decision making, are summarized below.

- Create well-structured, transparent, and collaborative decision processes involving researchers and stakeholders is as important to effective decision-making as having good scientific information and tools. An effective process will better enable decision-makers to apply complex information to decisions, consider uncertainties associated with climate variability and change, assess the wide range of possible human responses, and engage institutions and individuals who are potentially affected.

- Utilize successful model decision frameworks and tools available to support and improve decision-making on climate change adaptation and ways to reduce future climate change.

- Steps to improve collaborative decision processes could include training more "science translators" to help bridge science and decision-making; integrating development of decision support tools into fundamental scientific research; and supporting practitioners who work to advance climate science and decision-making.

Adapting to Future Conditions

Solutions and opportunities to address climate change lie first in assessing current and potential future impacts across all sectors, and second in implementing sustained and long-term planning across all sectors. The goal of developing maps and other predictive tools – such as depicting the extent and magnitude of potential impacts of sea level rise, storm surge and severe storm events - is to reduce the amount of risk and vulnerability associated with future development and investments, both public and private, and minimizing impacts to natural systems. These tools can also inform adaptation and mitigation strategies that can help reduce risk and vulnerability of existing development and investments through structural improvements, protective measures, and advance planning for resource management, future growth, reconstruction or relocation.

Solutions and opportunities to address climate change lie first in assessing current and potential future impacts across all sectors, and second in implementing sustained and long-term planning across all sectors.

State and regional actions to address climate change will likely focus on response, mitigation by emissions reductions, and adaptation activities. Such actions will be designed to:

- Enhance preparedness and raise community awareness of future flood risks.
- Identify cost-effective measures to protect and adapt to changing conditions.

- Improve resiliency of infrastructure, buildings and investments.
- Protect life, property and local economies.
- Protect services that natural systems provide.
- Preserve unique community character.

Refer to Append B for a comprehensive list and descriptions of adaptation strategies.

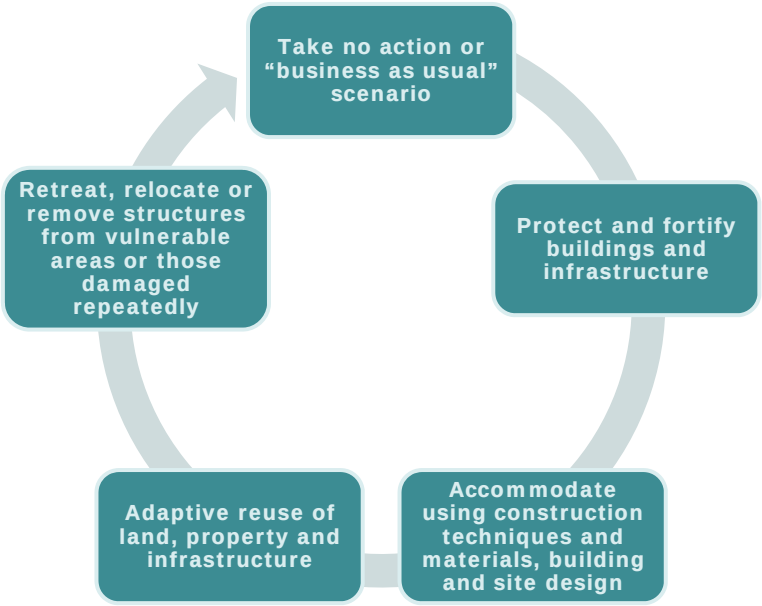
Adaptation

Adaptation is the deliberate and considered action taken to avoid, manage or reduce the consequences of a changing climate and to take advantage of the opportunities that such changes may generate. Successful adaptation requires several important elements:

- Flexibility in process, response and timeframes.
- Routine evaluation and adjustment of strategies of actions.
- Knowledge and application of the best available data and guidance.
- Clear short term and long term goals and objectives.
- Multi-phase implementation strategies.

Human and Built Environment

Adaptation actions that protect the human/built environment can be organized into five general categories:



There is no prescribed series of actions that will meet all needs, circumstances or conditions. Rather the actions taken to manage assets and resources at the federal, state and local levels will be site specific, dependent upon many factors including risk, cost, and capacity to implement, and weigh societal and environmental benefits.

Actions may follow a non-linear progression to reach an identified goal and may be revised or eliminated over time, as factors change and decisions that influence climate change unfold.

Figure CC12. Five general categories of adaptation actions that protect both the human and natural environments.

Natural Environment

Climate adaptation and conservation actions that protect the natural environment and ecosystems rely on human action and intervention. Below are conservation strategies recommended in the Wildlife Action Plan, Ecosystems and Wildlife Climate Adaptation Plan. (Ecosystems and Climate Change Adaptation Plan, 2013)

Ecological Approaches	Planning and Regulatory Approaches
Land Conservation for Habitat Expansion and/or Connectivity Ecosystem-Based Conservation Strategies (ecosystem services) Habitat Restoration and Management Invasive Species Management Plan	Watershed Connectivity and Restoration Riparian and Shoreland Buffer Protection Comprehensive Planning (land use and natural resources) Stormwater Policy and Flood Response Water Withdrawal Policies (protect aquatic habitats)

Table CC8. Approaches to climate adaptation and conservation of the natural environment and ecosystems.

Phased Adaptation

In preparing a phased adaptive management strategy, policy and decision makers must recognize the "tradeoffs" between selecting one action over another such as investing now to protect for the long term versus cost over time and risk associated with delaying such action. Sustained actions and investment need to be weighed against the probability of changing conditions over the long term with incremental investment to protect and accommodate changing conditions in the short-term. Economic benefit and cost effectiveness are not always the bottom line when "tradeoffs" are needed, particularly with respect to assets that are irreplaceable such as natural resources, ecosystems, and cultural and historical resources. Actions that build upon on another to cumulatively increase resiliency and decrease risk and vulnerability are preferred.

Adaptation often provides both co-benefits and no-regrets actions.

Co-Benefits – Integrated efforts to address climate change impacts through proactive actions and mitigation that result in building capacity, resiliency and protection of assets and resources that can also meet economic, societal and environmental needs.

No Regrets – Actions that by definition have negative net costs, because they generate direct or indirect benefits that are large enough to offset the costs of implementing the options (i.e. incorporating climate considerations in institutional practices, engineering and site designs and equipment purchases or greenhouse gas emissions reduction).

Adaptation actions may be implemented immediately or as iterative or delayed actions:

Here and Now Actions - Actions taken now to improve existing systems or construct new systems that are robust and resilient to a range of conditions, as well as preparation of plans to implement future anticipated actions (though action may delayed until necessary).

Prepare and Monitor Actions – Options are identified to preserve assets, and the climate and other conditions are monitored so that action can be taken when necessary (i.e. adaptive management).

Collaborative Multi-Sector Approaches

In order to achieve this level of integration, it is important to recognize the full spectrum of partners critical to ensuring the long-term stability and resiliency of our region, its resources and its municipalities. Key regional and municipal partners to include in the climate change discussion include members of and practitioners responsible for:

- Natural Resource Planning and Managers
- Land and Resource Conservation (Land Trusts)
- Historical and Cultural Resource Management
- Recreation and Tourism
- Economic Development (Chambers of Commerce, Rotary Clubs)
- Non-Profit and Advocacy Groups

Because ecosystems are bound by complex interactions and the built environment is superimposed on natural systems, the natural and built environments are inextricably linked. To incorporate climate change and adaptation planning into existing policy, planning, regulatory and non-regulatory frameworks in the region, a multi-sector approach of collaborative planning and decision making is key. The table below illustrates the cross-cutting issues surrounding climate change and describes the potential future impacts across all sectors of the human and natural environments.

Table CC9. Summary of planning sectors and their associated assets and resources most affected by a changing climate.

Sector	Potential Impacts and changes
Transportation	State and local roadway networks including flooding and heat impacts; infrastructure (bridges, culverts and drainage); emergency and evacuation routes; access to emergency services and facilities; movement of goods and services; access to employment centers; mitigation through reduction of greenhouse gas emissions.
Built Environment	Storm, flood and heat damage to private property, utilities, and municipal and state infrastructure; erosion and physical changes to riverine systems; periodic flooding, erosion and permanent inundation of tidal/coastal areas (particularly upland, dunes and beaches); increased seasonal cooling costs; reduction in tax revenue for damaged/vulnerable property; disruption to regional and local economy and business; increase in cost of property/flood insurance.
Land Use	Conversation to impervious surfaces; increases in stormwater management; loss of forests and natural vegetation for carbon sequestration and pollutant removal (water quality); development in high risk and vulnerable areas (land subject to flooding, fires, extreme heat); design of infrastructure and buildings without consideration of future changes in conditions/environment; stormwater management.
Natural Resources and Ecosystems	Conversion of saltmarsh to open water; conversion of freshwater wetlands to brackish/tidal systems; water-dependent habitats and species; shifts in plant and animal species and habitats; recreational and commercial fisheries and shellfish industries; tourism loss from environmental degradation; changes in commercial forestry and other harvested resources.
Water Resources	Flooding and erosion of river systems and coastal/tidal areas; water quality (drinking water and aquatic habitats); water quantity issues due to drought (drinking water, commercial/industrial uses, irrigation for crops); non-point source pollution.
Human Health	Air quality and respiratory illnesses, vector born disease (Lyme, EEE), heat stress, clean and adequate drinking water supply, contamination of property due to flooding.
Food Security	Agricultural production across the state; impacts to other parts of the U.S. and internationally can affect local food supply and security; loss of valuable agricultural lands to development; increased costs for production and consumers.
Cultural and Historical Resources	Coastal and riverine areas subject to flooding and erosion; place-based resources that may be compromised if relocated; diminished recreation and tourism; cost of relocating and/or archiving physical resources.

Climate Change Recommendations and Implementation

Recommendation 1

Strengthen state, regional and municipal capacity to understand risks and vulnerability to potential future impacts of climate change.

Actions

- Assist municipalities with application of assessments, data and technical guidance about climate change planning and climate adaptation strategies.
- Partner with federal and state agencies, regional partners and local organizations to apply for funding and technical support.
- Partner with federal and state agencies, regional partners and local organizations to expand resources and improve coordination.
- Support implementation of state, regional and local research, assessments and initiatives that fill gaps in climate change data, resources and tools.
- State agencies and municipalities commit resources and capacity to plan for climate change.

Recommendation 2

A. Encourage coastal municipalities to incorporate a Coastal Flood and Hazards Chapter in their Master Plan.

B. Encourage all municipalities to incorporate a Climate Adaptation Chapter in their Hazard Mitigation Plan.

Actions

- Seek new funding sources and align future RPC program funds to support municipal efforts.
- Assist municipalities with adopting the draft Climate Change Chapters from RPC's Tides to Storms project in updates to their Hazard Mitigation Plans.

Recommendation 3

Continue membership in the NH Coastal Adaptation Workgroup and other regional and statewide climate adaptation initiatives.

Actions

- Continue to partner with NH Coastal Adaptation Workgroup and its members to apply for funding and technical support for climate change initiatives.
- Continue support of collaborative partnerships and networks of professionals, practitioners, and researches that provide technical assistance and build capacity for municipal actions.

Recommendation 4

Adopt standards for management of state and municipal infrastructure with safety margins that consider future risk and vulnerability due to climate change.

Actions

- Incorporate benefit to cost analyses in new construction, replacement rehabilitation and reconstruction projects.

- Municipalities utilize FEMA pre- and post-disaster mitigation funds to protect existing infrastructure over its expected life cycle.

- Apply science-based projections of future sea level, storm surge, precipitation and temperature changes to state, regional and municipal policies, programs and regulations.

Recommendation 5

Provide guidance and recommendations to incorporate climate adaptation strategies and actions in municipal and regional policy, planning and regulatory sectors.

Actions

- Utilize existing funds and seek additional funding sources to support integration of climate change in RPC work program.

- Incorporate climate adaptation strategies and actions in RPC projects and plans.

- Work with municipalities to incorporate climate change strategies in hazard mitigations plans, open space and land conservation plans, zoning ordinances and land development regulations.

- Assist municipalities to implement climate change actions and adaptation strategies including adoption of policy, planning and regulatory measures.

- Encourage comprehensive land use planning, environmental planning and floodplain management that prevents and minimizes impacts.

Recommendation 6

Integrate protection of natural and constructed systems, social services, and historic and cultural resources into engineering and regulatory frameworks of shoreline management.

Actions

- Improve shoreline management to address the intensifying challenges posed by climate change, including management of development in high risk areas.

- Improve shoreline management to include measures that minimize coastal and floodplain erosion, and loss of natural resources that protect against flooding.

- Retain and expand dunes, beaches, wetlands, forests and natural vegetation to protect against coastal and riverine flooding.

- Discourage hardening of shorelines in favor of protecting existing natural shorelines and restoring them when feasible.

- Apply hard and engineered shoreline techniques only to protect essential infrastructure and evaluate the benefit to cost of maintaining these techniques in the future.

Recommendation 7

Apply results from the Tides to Storms Coastal Vulnerability Assessment to climate adaptation actions at the state, regional and local levels.

Actions

- Incorporate data, reports and maps from the Tides to Storms Coastal Vulnerability Assessment in state, regional, and municipal climate adaptation efforts.

- Assist municipalities with incorporating collaborative strategies to address regional resources, assets, and impacts identified in Tides to Storms assessment.

- Apply project information and findings to ongoing and future climate change projects by RPC and in collaboration with others.

- Provide access to Tides to Storms information and products through NH GRANIT database and Coastal Viewer (under development).

Recommendation 8

Integrate climate mitigation actions across all sectors of planning, transportation, land development and infrastructure projects.

Actions

- Attain reduction in vehicle miles travelled and overall greenhouse gas emissions in the region.

- Protect areas that serve as carbon storage such as forests, wetlands and other natural landscapes.

- Facilitate increase in use of low-carbon energy sources and installation and use of renewable energy sources.

With respect to climate change, ***mitigation*** is the reduction of greenhouse gas (GHG) emissions achieved through energy efficiency and conservation, use of renewable and alternative energy sources, and CO_2 storage in forests and biomass.

Recommendation 9

Implement outreach and engagement measures to raise regional and community-based awareness about climate change.

Actions

- Work with regional partners to promote and encourage land and resource conservation in high risk areas such as coastal and riverine floodplains and to protect surface and groundwater resources.

- State, regional and municipal decision makers work together to protect critical services and the health and safety of the public.

- Disseminate climate change informational resources through RPC staff and circuit riders, website, Commission meetings and other partners.

- Educate municipalities and property owners regarding options for protecting properties from flooding and erosion.

Climate Change Goals and Recommendations Matrix

	CC Goal 1	CC Goal 2	CC Goal 3	CC Goal 4	CC Goal 5
Recommendation 1	P	S	S	P	P
Recommendation 2	P	S	S	TBD	S
Recommendation 3	S	S	P	S	S
Recommendation 4	P	S	P	P	S
Recommendation 5	S	S	S	P	P
Recommendation 6	S	S	P	PS	P
Recommendation 7	S	S	S	S	S
Recommendation 8	PS	PS	S	PS	S
Recommendation 9	S	S	S	S	S

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

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Appendices

Appendix A: Summary of Climate Adaptation Strategies

Adaptation Strategies

The following adaptation strategies were adapted from FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013) and the Georgetown Climate Center Sea Level Rise Toolkit (2011).

ZONING AND REGULATIONS

FLOODPLAIN STANDARDS	Adopt floodplain standards beyond the minimum FEMA requirements and consider or sea level rise projections. Prohibit or limit floodplain development (i.e. density, scale, loss of flood storage) through regulatory and/or incentive-based measures. Require and maintain FEMA elevation certificates for all pre-FIRM, post-FIRM and new and improved buildings in the floodplain. Apply open space requirements for development to floodplains to preserve flood storage areas, and track acreage preserved.
FLOOD HAZARD OVERLAY DISTRICTS	Designate high-risk areas that are already subject to flooding or projected to flood in the future. Require a larger percentage of open space preservation and less impervious coverage in high risk areas.
STORMWATER MANAGEMENT	Adopt comprehensive stormwater management standards for all new and redevelopment. Design to retain or reduce natural runoff or zero discharge of runoff. Collect runoff for use as reclaimed water. Reduce volume of runoff generated from developed sites using techniques such as Low Impact Development and green infrastructure. Link flood hazard mitigation objectives with EPA Stormwater Phase II and MS4 permit requirements. Adopt a community-wide stormwater management plan. Implement an inspection and enforcement program to help ensure proper function and continued integrity of private stormwater management faciltities.
SITE DESIGN STANDARDS, DIMENSIONAL REQUIREMENTS AND BUILDING CODES	Retain trees and natural vegetation in flood hazards areas. Adopt ASCE 24-05 Flood Resistant Design and Construction (a referenced standard in the International Building Code) that specifies minimum requirements and expected performance design and construction in flood hazard areas. Adjust maximum building height requirements to accommodate elevation of structures above the base flood elevation or sea level rise projection. Adopt "freeboard" requirements (feet above base flood elevation or sea level rise projection) in the flood damage ordinance. Prohibit first floor enclosures below base flood elevation or sea level rise projection for all structures in flood hazard areas. Require standard tie-downs of fuel tanks.
AQUIFER AND GROUNDWATER PROTECTION	Infiltrate treated stormwater runoff to recharge groundwater, aquifers and surface waters
BUFFERS AND DEVELOPMENT	Require buffers to preserve flood storage areas adjacent to surface waters and wetlands. Require development setbacks to protect against flooding and erosion. Setbacks can be

SETBACKS	based on erosion rates/trends, sea level rise projections, 500-year floodplain and fluvial erosion hazard zones.

PLANNING AND POLICY

MASTER PLANS	Adopt a climate change and natural hazards chapter in the master plan. Insert specific adaptation recommendations in other parts of the master plan for municipal facilities, transportation and natural resources.
HAZARD MITIGATION PLANS	Participate in the FEMA's Community Rating System (CRS), or at minimum adopt CRS strategies where appropriate.
FEMA COMMUNITY RATING SYSTEM (CRS) AND NATIONAL FLOOD INSURANCE PROGRAM	Conduct NFIP workshops to provide information and identify incentives for property owners to acquire flood insurance. Designate a floodplain manager and/or CRS coordinator with Certified Floodplain Manager certification. ***Note: All municipalities in the RPC region participate in the NFIP.***
EMERGENCY RESPONSE PLANS	
RECOVERY PLANS	
ASSESSMENTS	Track cumulative impacts from flood events (high water marks, stormwater flooding, infrastructure damage, repetitive loss). Complete a hydrologic watershed based analysis of culverts, crossings and drainage infrastructure (based on buildout and climate change conditions).
FUNDING MECHANISMS AND PLANS	Use taxes, bonds and/or block grants to support a regulatory system of floodplain and infrastructure management and improvements. Use impact fees from development to help fund public projects including new and upgraded infrastructure. Create special tax districts to finance maintenance and improvements to drainage systems and capital improvements in high hazard areas. Create a community-wide stormwater utility to finance maintenance and improvements to drainage systems.

ASSET AND INFRASTRUCTURE MANAGEMENT

INFRASTRUCTURE PLANS (ROADS, UTILITIES, DRAINAGE, BUILDINGS, WASTEWATER)	Conduct regular inspections and maintenance of drainage systems and flood control structures to ensure proper function. Elevate structures with the lowest floor including the basement raised above the base flood elevation or sea level rise projection. Small berms or floodwalls can also be constructed. Relocate utilities and other electrical/mechanical systems above the base flood elevation or sea level rise projection. Install back-up generators for electrical systems. Flood proof (wet and dry) buildings containing critical materials and equipment. Elevate roads and bridges to accommodate flood levels (e.g. the 100-year and 500-year storm or projected sea levels).
CAPITAL IMPROVEMENT PLANS	Incorporate iterative infrastructure improvements to minimize impacts from natural hazards and climate change. Periodically revise strategies to respond to existing and projected conditions.
DRINKING WATER MANAGEMENT PLANS	Incorporate iterative management strategies, infrastructure improvements, and public education and conservation programs to minimize impacts from natural hazards and

	climate change.
REMOVAL OF STRUCTURES	Municipalities may remove structures from high hazard areas to minimize future loss and damage by relocating structures to more secure locations.

NATURAL RESOURCE AND ENVIRONMENTAL SERVICES MANAGEMENT

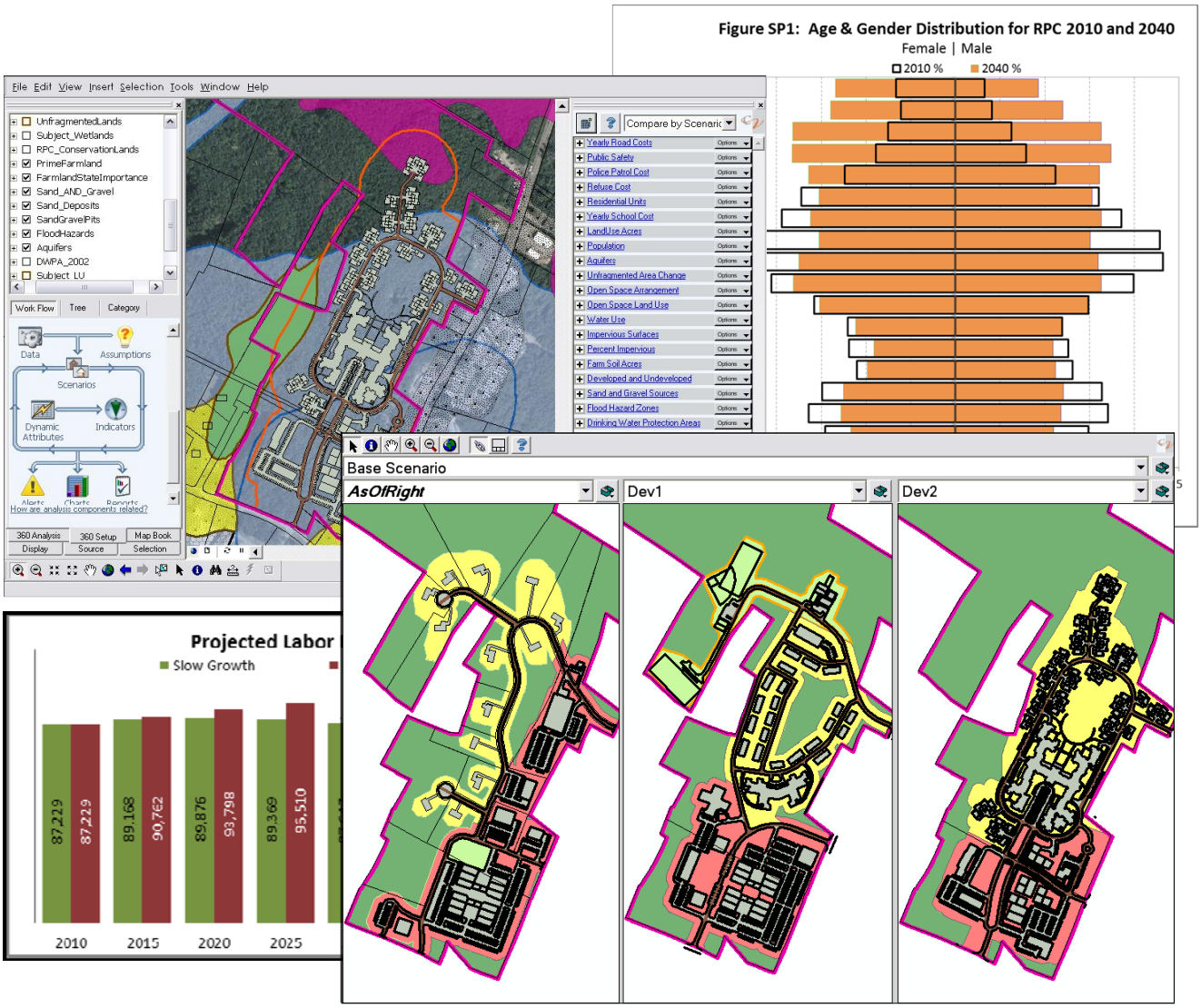
WATER MANAGEMENT PLAN	Adopt watershed-based plans that apply iterative water management strategies, water protection actions, and public education and conservation programs to minimize impacts from natural hazards and climate change.
OPEN SPACE AND LAND CONSERVATION PLANS	Adopt open space and land conservation plans that protect resources and environmental services while minimizing impacts from natural hazards and climate change. Include land acquisition, reuse and preservation in high hazard/risk areas. Secure conservation easements for land in high hazard/risk areas.
HABITAT PROTECTION PLANS	Adopt habitat protection plans that protect critical habitats and lands while minimizing impacts from natural hazards and climate change.
ENVIRONMENTAL SERVICES MANAGEMENT PLAN	Adopt plans that protect services provided by natural systems such as flood storage, recreation, tourism, commercial fish and shellfish. Implement restoration projects to enhance dunes and wetlands.

EDUCATION, OUTREACH, RAISING AWARENESS

STEWARDSHIP PROGRAMS	Encourage voluntary conservation easements on land in riverine and coastal floodplains.
DEMONSTRATION PROJECTS	Install demonstration projects on municipal lands and buildings to inform the public about flood protection and climate adaptation strategies.
INFORMATIONAL MATERIALS AND EVENTS	Encourage homeowners in high hazard/risk areas to purchase flood insurance. Distribute flood safety informational materials to home owners in flood prone areas. Educate residents and businesses about natural hazard preparedness and safety planning, flood-proofing and elevating buildings, and elevating electric systems and utilities above the base flood elevation.

Appendix B Maps CC1, CC2, CC3 and CC4. Maps of coastal flooding potential from Tides to Storms project.

Maps CC1, CC2, CC3 and CC4 are attached on the following pages.



SCENARIO PLANNING CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Scenario Planning

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Scenario Planning

Introduction to Scenario Planning

Scenarios, in the realm of transportation and land use planning, are organized sets of assumptions that explore the ways in which a region might change and grow (USDOT, 2011). They provide a structure to envision potential needs as well as possible future policy and investment options. Scenario planning is a process that planners utilize to create this framework for looking into the future. By analyzing various community and regional demographic and land-use changes, stakeholders can better understand how these forces may potentially impact the overall scale and distribution of development in a region; through that, the impacts on transportation networks, housing needs, and the environment. There are many ways to implement scenario planning, however, there are several key elements that should be included in all cases:

- Use of scenarios to compare and contrast interactions between multiple factors, such as transportation, land use, and economic development.
- Analysis of how different land-use, demographic, or other types of scenarios could impact transportation networks or other systems.
- Identification of possible strategies that lead toward achieving desired elements of the future conditions examined.
- Public engagement throughout the process.

Vision and Objective

The regional vision for the future, as established in the Regional Master Plan, indicates a desire for a strong regional economy, preservation of community character, and maintenance of the region's natural and recreational resources. Further, the regional vision states a desire to strengthen community centers and maintain traditional landscapes, provide a variety of housing choices, invest in supportive infrastructure, and provide improved services for residents and businesses. Scenario planning supports the regional vision by identifying and comparing the benefits and impacts of multiple, differing futures. It also can help decision-makers understand how policy choices may impact achieving a desired future condition. In this case, the RPC is utilizing three related planning and forecasting tools to gauge two prospective alternatives for the magnitude of growth in the region (slow or strong growth), and two alternatives for the pattern of that change on the landscape (dispersed or concentrated growth).

Scenario planning supports the regional vision by identifying and comparing the benefits and impacts of multiple differing futures.

Basis in Projections

Independently developed population and employment projections, shown in ***Table SP 1***, offer different visions of change over the next 30 years in the region. The population is expected to remain relatively flat with a growth rate of about 0.27 percent per year. However, employment has a different trajectory, growing at slightly over 1 percent per year. Examining these different expectations of growth, as well as where people live and work around the region, can help decision makers understand what it means for each of those projections to be an accurate prediction of the future. From that understanding, recommendations can be developed that point the communities and region towards achieving the desired outcomes, or in some cases, away from unwanted outcomes.

Population Projections

The New Hampshire Office of Energy and Planning (OEP) is responsible for producing population projections at the state, county, regional planning commissions, and community levels every five years. The most recent set of projections was completed in 2013 utilizing 2010 census data as the basis. OEP worked directly with the regional planning commissions to deriving planning commission and community level projections from estimates completed at the county and state level. These projections show a very low growth rate (0.27 percent per year) with the region increasing from 178,000 to 193,000 residents. This is primarily due to slowing natural population growth (slightly more births than deaths) and continued small positive migration into the region. ***Table SP 1*** shows how the distribution of the population by age and gender is expected to change between 2010 and 2040. It is expected that the population aged 65 and over will be increasing substantially while decreases are expected in most other younger age groups over that period. This has implications for the labor force in that even though the population is increasing, most of this increase is in the portion of the population that does not participate in the labor force in large numbers.

Labor Force

Labor force size is calculated based on the current composition of the population by gender and five year age cohorts using labor force participation rates from the Bureau of Labor Statistics (BLS, 2013). The 2010 labor force is approximately 92,800 workers, of which about 46 percent are female and 54 percent are male. The bulk of the labor force is between 25 and 64 (84 percent). As the population ages and changes between now and 2040 it is expected there will be shifts in the labor force composition as well. Overall this means a shrinking labor force as the aging "Baby Boomers" begin to enter retirement age in large numbers, and the cohorts of younger residents entering the labor force are much smaller than those leaving it (***Figure SP1***). The expectation is there will be a substantial increase in the number of individuals aged 65 and older that remain in the labor force. This is offset by smaller groups in younger cohorts, particularly the 45-54 age group which is significantly smaller in size in 2040 than the current group that age. While this demographic shift is important for many different reasons, it is used in this analysis only to help derive the overall size of the regional labor pool.

Table SP 1: Summary of Population and Employment projections used as the basis for scenario planning exercise. Source: See table footnotes.

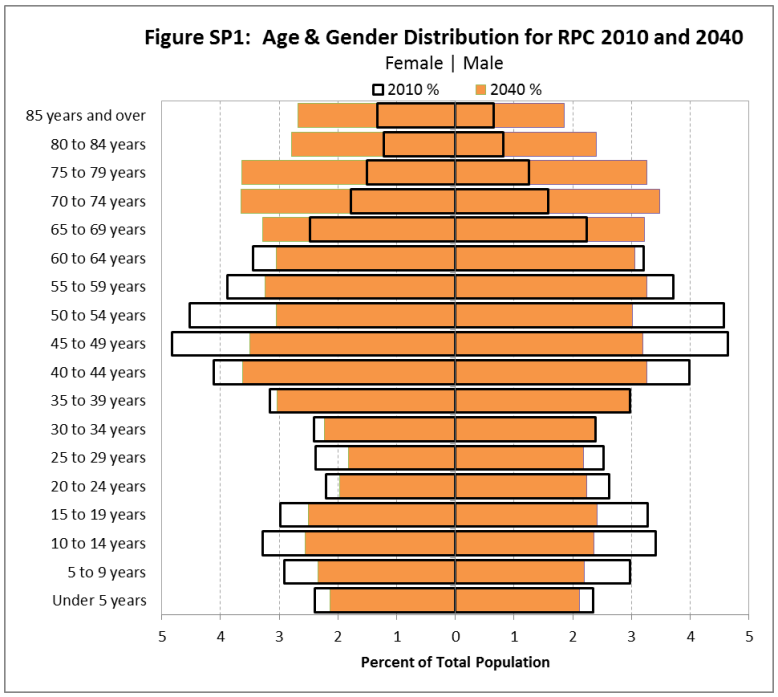
	2010	2020	2030	2040	CAGR[1]
Projected Population (OEP)[2]	178,383	184,646	191,986	193,290	0.27%
Estimated Labor Force[3]	92,794	95,313	93,271	90,467	-0.08%
Employed Labor Force[4]	87,229	89,876	87,647	85,402	0.07%
Live & Work in Region[5]	48,358				
Work outside of Region[5]	38,871				
Estimated Employment (ELMI)[6]	112,612	125,054	139,279	155,981	1.09%
Live in Region[5]	48,358				
Commute from Outside Region[5]	64,254				

1 – Compound Annual Growth Rate (% per year)
2 – Regional totals derived from State and County Estimates
3- Estimated from NH Employment Security Quarterly Employment & Wages, Bureau of Labor Statistics projections for labor force participation
4 – Based on NH Employment Security Quarterly Employment & Wages Data
5 – Based on American Community Survey 5-Year Estimates
6 – From NH Employment Security 2010-2020 RPC 10 Year Projections

Commuting Patterns

Of the nearly 93,000 workers residing in the RPC region, it is assumed that 6 percent are currently unemployed based on recent employment data from NH Employment Security (NH Employment Security, 2014), and that for future years, the unemployment rate has declined to 5 percent by 2020. The remaining labor force is split into those that work within the region (55 percent) and those that work elsewhere (45 percent), based on Journey to Work data from the American Community Survey five year data (US Census Bureau, 2013).

Currently, 43 percent of employment in the RPC region is filled by workers who also live within the region. The remaining 57 percent of employees commute into the region from other areas, predominately Strafford County, Southern Maine, and the Manchester and Nashua regions. For the purposes of this analysis, this distribution is assumed to remain constant at the 43/57 percent rate for all future scenarios.



Employment Projections

Long-term (ten year) employment projections are developed on a biennial basis by the New Hampshire Department of Employment Security Economic and Labor Market Information Bureau (ELMI) for the state, counties, and regional planning commissions (ELMI, NHES, 2014) and are provided (categorized by industry). The latest set of projections available for the RPC region anticipates steady growth in overall employment (about 1 percent per year) between 2010 and 2020. This ten year projection is extended to the 2040 planning horizon and this increases total employment in the region by approximately 43,000 jobs over that 30 year timeframe (See ***Table SP1***). Individual industry growth rates were utilized at the regional level to tabulate employment increases (or decreases) for each. Employment was then distributed to each community based on the historic share of each industry. Industries were then summed to estimate total employment for each community and checked against available data for reasonableness. It should be noted that these are estimates of employment and should be considered as such as some data is not available at the community level and is inferred from regional totals or other information. For additional detail, community level employment estimates by industry can be seen in ***Appendix A*** of this section.

Scenarios

Assuming that current commuting patterns remain the same, employment gains as projected to 2040 using the growth rate developed by Employment Security (taller bars in ***Figure SP2***) are greater than can be supported by the regional labor force that is anticipated based on the OEP/RPC population projections (shorter bars in ***Figure SP2***). This difference presents two potential pictures of the future RPC region based around economic and population growth. One assumes that the population projections are the accurate gauge of the region's future, and the smaller labor force predicted would support a smaller increase (or even a decrease) in employment in the region (slow growth). The other assumes that the employment projections are the accurate gauge of the future region and that the population would need to increase much faster to provide the labor force to fill the jobs (strong growth). While there are many different variations of this analysis that could be considered, for the purpose of this exercise, the scenarios have been limited to these two overall visions of growth in the region.

At the same time as the magnitude of growth is considered, the distribution of that growth can be examined as well. The modern pattern of development in the region has shown population increases occurring primarily in the more rural communities in the region while the majority of job growth remains in the larger centers. The impacts and benefits of continuing the current pattern or shifting into a more concentrated growth model are examined as part of the strong growth scenarios. All of these are considered against the 2010 baseline data that is available for the region of a starting population of 178,000, an employed labor force of 87,229, and 112,612 jobs as shown in ***Figure SP1***. The paragraphs that follow describe the general vision presented by each scenario and this is supplemented by ***Figures SP2*** and ***SP3***. ***Figure SP2*** shows the change in population, labor force, and employment for the slow growth vs strong growth scenarios while ***Figure SP3*** is a more detailed look at the specifics of each scenario.

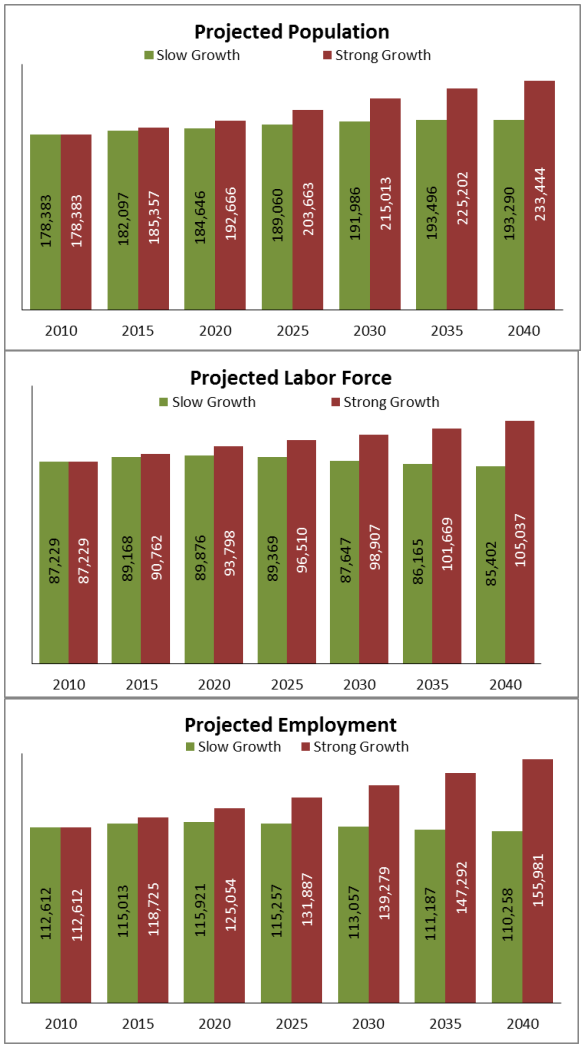


Figure SP2: Population, Labor Force, and Employment Change for slow growth vs strong growth scenarios.

Scenario: Slow Growth

A future of slow population growth is anticipated by the population projections and the work force and employment are sized to fit that slow change (the shorter, lighter bars in ***Figure SP2***). Under this scenario, the population projections from OEP and the RPCs are utilized and employment growth is reduced to levels supported by the expected available labor force. In this scenario, there is little land use growth and so the distribution and amount stay generally the same as exists in the 2010 baseline.

Scenario: Strong, Dispersed Growth

This concept moves towards the Regional Vision with strong population and economic growth. For this scenario NH Employment Security projections provide the employment growth rate and the population is increased to the point where the labor force is large enough to support the larger number of jobs. This scenario continues the current dispersed residential growth pattern and more rural communities grow faster than more urbanized ones. Employment is slowly diffused in some industry categories such as retail following current trends. In this growth pattern each community maintains roughly the percentage of regional population and employment that it currently has.

Scenario: Strong, Concentrated Growth

The final alternative that is compared to the 2010 baseline has similar population and employment as the dispersed growth scenario. It differs in that it concentrates residential growth into the largest employment centers in the region and further focuses employment growth in those same areas. These areas currently host just under 50 percent of the population in the region and 74 percent of the employment. To facilitate a change in distribution, 80 percent of the new population and 90 percent of new jobs are directed to the regional employment centers of Portsmouth/Newington, Salem, Exeter, Hampton, and Seabrook.

The Analysis Tools

The Planning Commission utilized three different tools to examine the future region scenarios from a land use perspective, an economic impact perspective, and from a transportation perspective. Each of these analyses was conducted independently but in a coordinated manner that allowed each to inform the others.

Regional Buildout

A buildout is a tool that allows planners to estimate future development potential based on current or proposed zoning and in this case, is an analysis of existing adopted municipal policies. The buildout method can allow for the testing of single or multiple alternative land use regulation, open space planning, and major development scenarios. Comparing various scenarios allows planners to test the effects and consequences of new zoning ordinances as changing setbacks, densities, building restrictions, and other policy adjustments can significantly alter a buildout results. Questions that can be answered by a buildout scenario testing include:

The buildout analysis shows the maximum growth that could occur in a community under current land use regulations (zoning).

- Where do I want my community to be at buildout?
- How much open space will there be? What will the traffic patterns look like?
- What will the quality of our environmental resources be like?
- Where will people live and what will the development patterns look like?

This buildout was conducted using Geographic Information Systems (GIS) software. RPC primarily uses the industry standard of ArcGIS for GIS analyses. The CommunityViz program, developed by the Orton Family Foundation in order to provide communities with an affordable tool for community based GIS, is used in this instance to specifically perform some of the mundane data calculation tasks of the buildout process. The GIS data used in this study originates from several sources. The base shapefiles (road centerlines, conservation lands, wetlands, etc.) were provided by GRANIT, the official New Hampshire GIS data provider. The land use polygons were created through a prior CTAP project and is very detailed showing over 50 uses, using 2010 aerial images provided by the NH Department of Transportation. The current building points were also determined using the 2010 aerial images. Steep slopes were derived by the RPC using the recent 2011 LiDAR dataset for our region.

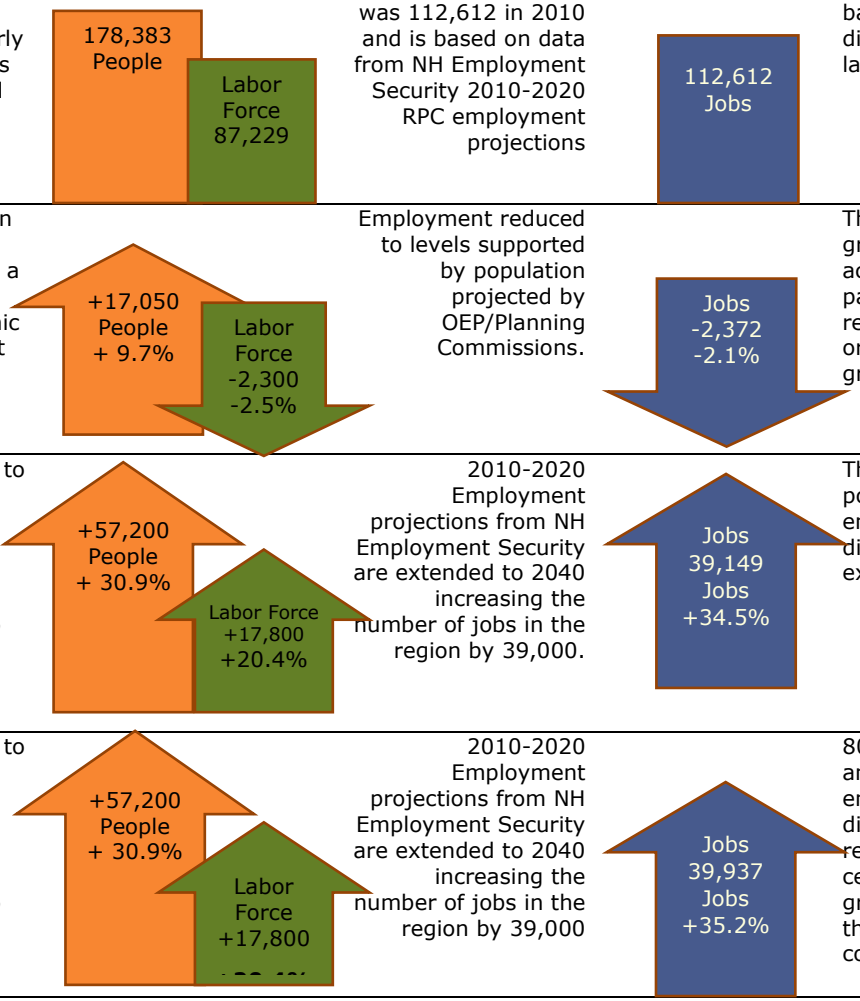
New Hampshire Econometric Model

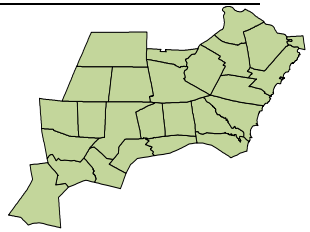
An impact analysis was conducted using the Economic and Labor Market Information Bureau's New Hampshire Econometric Model – A Regional Economic Models Inc. (REMI) Policy Insight+ software model. This is a structured economic forecasting and analysis tool that utilizes economic, demographic, and policy data and statistics to describe economic behavior and change. In this case, the model was utilized to estimate the impacts on gross domestic product, personal income, population, and secondary job loss related to differing levels of future employment in the region.

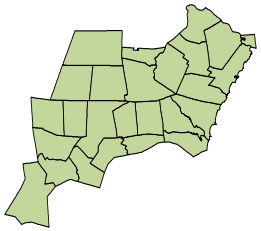
This analysis began with the assumption that the employment projections for 2020 generated by NH Employment Security and extended to 2040 by the RPC are the default. The alternative scenario examined is assessing the economic impact of not being able to fill the *projected demand* for workers at that level of employment in the region. This scenario estimates the value of 21,500 jobs, which is equivalent to the region being unable to meet the future demand for workers from the regional labor force. This employment gap can be alleviated by improving the transportation system in order to enhance commuting from outside the region however that analysis is not being considered as a scenario at this time. By showing the economic value of sustaining 21,500 jobs within the region, the return on investment that an average job generates in the local economy can be assessed in the context of what public investment in infrastructure and housing generates, with the goal of alleviating a future shortage of available local labor.

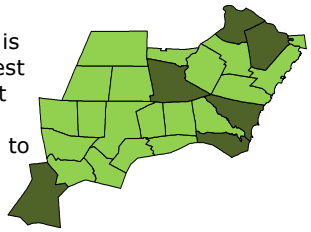
Figure SP3: Summary of 2040 Scenario Attributes

Scenario	Population	Employment	Distribution
Baseline	Population from 2010 Census. Labor Force calculated from Quarterly Employment and Wages data as well as age and gender 5 year cohorts from the Census.	Regional employment was 112,612 in 2010 and is based on data from NH Employment Security 2010-2020 RPC employment projections	The figure shows the baseline for the distribution of future land use
Slow Growth	The OEP/RPC population projection is utilized in this scenario leading to a small increase in population. Demographic changes lead to a slight shrinking of the labor force.	Employment reduced to levels supported by population projected by OEP/Planning Commissions.	The small population growth is distributed according to existing patterns and shows no real change in intensity or distribution of growth.
Strong, Dispersed Growth	Population is increased to levels that support NH Department of Employment Security based Employment Projection. This adds about 57,000 people to the region by 2040 and almost 18,000 to the labor force.	2010-2020 Employment projections from NH Employment Security are extended to 2040 increasing the number of jobs in the region by 39,000.	The substantial population and employment are distributed according to existing patterns.
Strong, Concentrated Growth	Population is increased to levels that support NH Department of Employment Security based Employment Projection. This adds about 57,000 people to the region by 2040 and almost 18,000 to the labor force	2010-2020 Employment projections from NH Employment Security are extended to 2040 increasing the number of jobs in the region by 39,000	80% of new population and 90% of new employment growth is distributed to 5 largest regional employment centers. Remaining growth is distributed to the other 20 communities.









These 21,500 jobs were reduced from the REMI employment baseline in Rockingham County and distributed across industries based on the employment shares in the Rockingham Planning Commission Region using annual average covered employment data for 2013 (NH Employment Security, 2014). The covered employment data were adjusted to correspond to the REMI model's NAICS-based industry categories. NAICS is the North American Industry Classification System, used to classify business establishments according to type of economic activity (process of production) in Canada, Mexico and the United States. An establishment is typically a single physical location, though administratively distinct operations at a single location may be treated as distinct establishments. Each establishment is classified to an industry according to the primary business activity taking place there.

Regional Travel Demand Model

The RPC uses a four step Transportation Model based on TransCad and utilizes a set of macros and routines prepared by Resource Systems Group to tailor the process to the region. The region is organized into more than 500 Traffic Analysis Zones (TAZ) into which land use inputs (employment and housing) are allocated. This is essentially loading each TAZ with housing units organized by size and number of vehicles available, and employment organized into 19 industry groupings. Spreadsheet models are utilized to derive community and TAZ housing and employment totals based on information from the Census Bureau, the Office of Energy and Planning (OEP), New Hampshire Employment Security, and the Bureau of Labor Statistics. This information then forms the basis for trip productions and attractions (population produces trips, jobs attract them) in the travel demand model and are used to generate traffic volumes, travel times, trip distances, and patterns based on the land use activity. Outputs of the model include overall numbers of trips by trip type, peak hour volume, and delay statistics, total vehicle miles of travel, congestion statistics for different types of roadways, number of non-motorized trips, and other data.

Model Analyses and Results

The results of each analysis are included below with some basic conclusions reached regarding the impacts of different amounts and distribution of growth on the region over the next 30 years.

Regional Buildout Results

The analysis of available land in the region leads to the conclusion that, given existing zoning restrictions and without considering the additional land made available through redevelopment of existing parcels, there is space for approximately 51,300 new housing units, defined as houses, apartments, and mobile homes intended as individual living quarters, in the region. The region currently has approximately 65,500 units and is built out to approximately 56 percent of capacity. Depending on the future scenario, the percent of residential land built on will increase to between 61 percent (slow growth scenario) and 74 percent (strong growth scenarios) in both the dispersed and concentrated patterns. In both strong growth scenarios there are communities that approach and exceed the calculated limit of housing units that are potentially available. However, the model does not account for the ability to redevelop properties at higher densities. Map SP5 shows the current level of buildout in the RPC, while map SP6 shows the remaining land suitable to build.

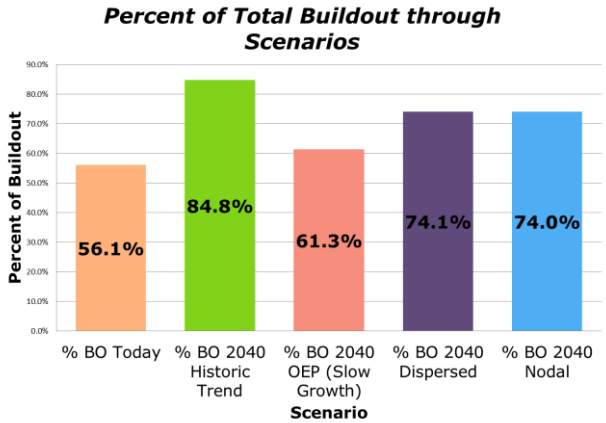


Figure SP4: Percentage Buildout under each Scenario

New Hampshire Econometric Model Results

The following summarizes the results of an assessment of the value of 21,500 jobs in the RPC region. The full analysis conducted by NH Employment Security is documented as ***Appendix B*** and provides additional information about the assumptions and results from the New Hampshire Econometric Model. The analysis discusses the impacts of both direct job growth as well as the secondary (indirect and induced) jobs dependent on the presence of the approximately 21,500 jobs in the region that differentiate the slow and strong growth scenarios. It is important to note that while the *future employment gap* is being modeled by removing 21,500 jobs from the REMI model baseline, the results are expressed in positive terms of value added to the region. Applying statistical analysis to a model of the regional economy indicates that:

- In 2015, total impact in the RPC region would be 827 fewer jobs, including direct, indirect and induced employment. By 2040, the total value of 21,500 jobs left unfilled (in other words, not meeting the future employment gap) would be 34,972 direct, indirect and induced jobs.

- In 2015, the total value of the jobs to the local economy expressed in terms of Gross Domestic Product (GDP) would be $91.7 million (in fixed 2005 dollars). This impact would grow over time and by 2040, GDP in the region would be impacted by $4.2 billion (in fixed 2005 dollars).

- The economic activity created by the 827 jobs would account for 0.6 percent of total GDP in RPC in 2015. By 2040, the value of the 21,500 jobs would represent 14.0 percent of the region's GDP.

- The impact of the 827 jobs on total real personal income would be $40 million (in fixed 2005 dollars) in 2015. By 2040, the full impact on total real personal income from not meeting the future demand for 21,500 workers would have grown to $2.5 billion (in fixed 2005 dollars).
- In 2015, 827 direct jobs sustain 201 persons in the region's population. In 2040, the 21,500 jobs would directly or indirectly sustain the region's population with close to 35,000 persons, representing 8.6 percent of the projected population baseline for the county.

Regional Travel Demand Model Results

The future growth scenarios have been analyzed utilizing the regional travel demand model and the results are available showing the impacts of growth and development patterns on travel in the region. There are a number of factors to consider when looking at the results and the most important are the following:

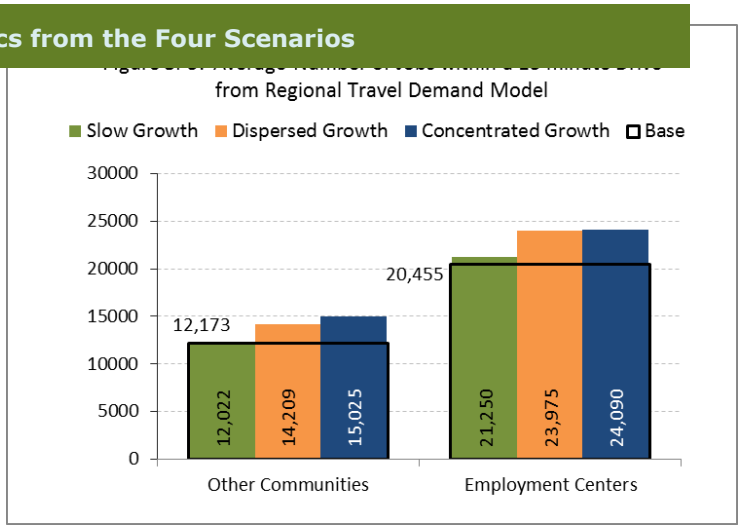
1. Shifts in employment or population distribution are only accounted for at the community level. Land use is allocated to each community and then derived to the zone level based on historic amounts of housing and employment.

2. The Transit Network is not changed for the future year analysis, which limits the shift of trips from cars to transit to only locations where it is currently available. Future analyses will attempt to modify the transit network and estimate viability of expanded systems.

3. The percentage of non-motorized trips is held constant and the values for 2010 are utilized in all scenarios. This likely under-reports the number of non-motorized trips in high density areas, especially in the concentrated growth scenario.

Given the caveats, there is still information that can be extracted based on the various scenarios. ***Tables SP2, SP3***, and Figure SP5 detail the land use and transportation measures that have been examined and the differences between the 2010 baseline and the three different future year scenarios. The differences between the Dispersed and Concentrated growth patterns is particularly interesting as it indicates that growth in a more concentrated manner will have transportation benefits for the region.

Table SP2: Population and Employment Statistics from the Four Scenarios



Land Use and Employment

The land use related outputs from the travel demand model show much that would be expected and at least one counter-intuitive outcome as well. As expected, the slow growth scenario has the lowest population and employment levels and due to the net loss of employment over the 30 years, has a lower employment density than the 2010 baseline. This scenario des result in further distribution of the population to more rural areas of the region but the overall population change is very small. Also as expected, the concentrated growth pattern shows the highest population and employment densities for the employment centers while the dispersed pattern shows the highest densities for all other communities.

An unexpected outcome from this analysis is the indication that the concentrated growth pattern locates more jobs within a 15 minute drive of more people and communities in the region than the dispersed pattern. While the dispersed growth scenario places a greater number of jobs directly into more communities, the concentrated pattern produces a higher regional average for employment available within that 15 minute commute. ***Figure SP5*** indicates that the Slow Growth scenario has a slightly higher employment accessibility than the 2010 baseline overall for the regional employment centers but that other communities see a slight drop in the number of jobs available close by. The dispersed growth scenario shows increased accessibility for both centers and other communities over the baseline. The concentrated growth pattern shows the greatest employment accessibility for both the employment centers and the other communities however the difference is most striking for the other communities who see a much greater increase than the centers. ***Figure SP6*** takes this analysis to the individual community level and indicates that under almost all communities see employment gains over the baseline in the concentrated development scenario while most communities see a loss under the slow growth scenario compared to 2010 values. The dispersed growth scenario also shows employment accessibility gains however they tend to be somewhat less than those seen in the concentrated growth scenario in most cases.

Transportation Impacts

The transportation related outputs from the scenario models are shown in ***Table SP3*** as well as in ***Maps SP1 through SP4 l***ocated at the end of this document. The data in ***Table SP3*** points to increased travel times and distances for all growth scenarios over the current baseline condition. Some of the interesting data from this comparison are:

- The slow growth scenario has the longest work trip distances and times, followed by the dispersed growth scenario. The Concentrated development pattern, capitalizes on both the focus of employment and housing as well as the geographic distribution of the employment centers to produce the shortest work trips.
- The dispersed development pattern produces the longest shopping trips in both time and distance.
- The concentrated development pattern produces the shortest "Other" trips (recreational for instance) as well as trips that are not home based (such as from work to a restaurant). This indicates that this type of growth configuration places destinations in closer proximity to origination points than other patterns.
- The slow growth pattern produces the least increase in Vehicle Miles of Travel (VMT) and the lowest VMT per capita of all scenarios. This is likely due to the reduced level of activity in the region from the small population increase and decrease in the work force and employment.

Measure	2010 Baseline	Low Growth	Dispersed Growth	Concentrated Growth
Population	*176,241*	*193,291*	*233,442*	*233,442*
Population in Regional Employment Centers	87,257	92,811	112,784	132,878
Population in All Other Communities	88,984	100,480	120,658	100,565
Percent Pop in Regional Centers/All Other Communities	*49.5%/50.5%*	*48.0%/52.0%*	*48.3%/51.7%*	*59.9%/43.1%*
Population Density (persons/mi^2)	*489.1*	*536.4*	*647.8*	*647.8*
Population Density in Regional Centers	882.5	938.6	1,140.6	1,343.9
Population Density in All Other Communities	340.3	384.3	461.4	384.6
Housing Units (estimated based on persons/household)	*71,926*	*78,594*	*94,992*	*96,327*
Housing Density in Regional Centers (units/acre)	6.4	6.8	8.3	9.8
Housing Density in All Other Communities (units/acre)	2.15	2.4	2.9	2.4
Employment	*113,393*	*111,021*	*152,542*	*153,330*
Employment in Regional Employment Centers	83,915	82,214	112,919	120,152
Employment in All Other Communities	29,478	28,807	39,623	33,178
Percent Employment in Regional Centers/All Other Communities	*74.0%/26.0%*	*74.1%/25.9%*	*74.0%/26.0%*	*78.4%/21.6%*
Employment Density (employees/mi^2)	*314.7*	*308.1*	*423.3*	*423.3*
Employment Density in Regional Employment Centers	848.7	831.5	1142.0	1215.2
Employment Density in All Other Communities	112.7	110.2	151.5	126.9
Labor Force	*87,229*	*85,402*	*105,037*	*105,037*
Average Employment within 15 minute auto commute	14,084	14,152	16,463	17,117
Regional Employment Centers	20,455	21,250	23,975	24,090
All other Communities	12,173	12,022	14,209	15,025

- Strong growth will increase traffic over the volumes seen today and result in moderate increases in travel times in most cases. Aggregate delay, or total delay experienced by all drivers during peak travel times will increase significantly.

Overall, results indicate that the concentrated development pattern provides significant efficiency gains compared to the dispersed pattern. Shorter automobile trip lengths and times are seen for all trip purposes when compared to the dispersed development scenario indicating that more desired destinations are closer to where people live when land use is more concentrated into urban centers. Vehicle Miles of Travel statistics help to support that notion, as travel under congested conditions is decreased both in volume and in hours of delay during both the morning and evening peak periods when comparing the concentrated pattern to the dispersed pattern.

The Maps showing congestion on the regional roadways indicate that despite efficiency gains, the concentrated growth pattern does not significantly change the location or magnitude of congestion compared to the dispersed development pattern. ***Map SP1*** shows the baseline conditions of congestion during the AM

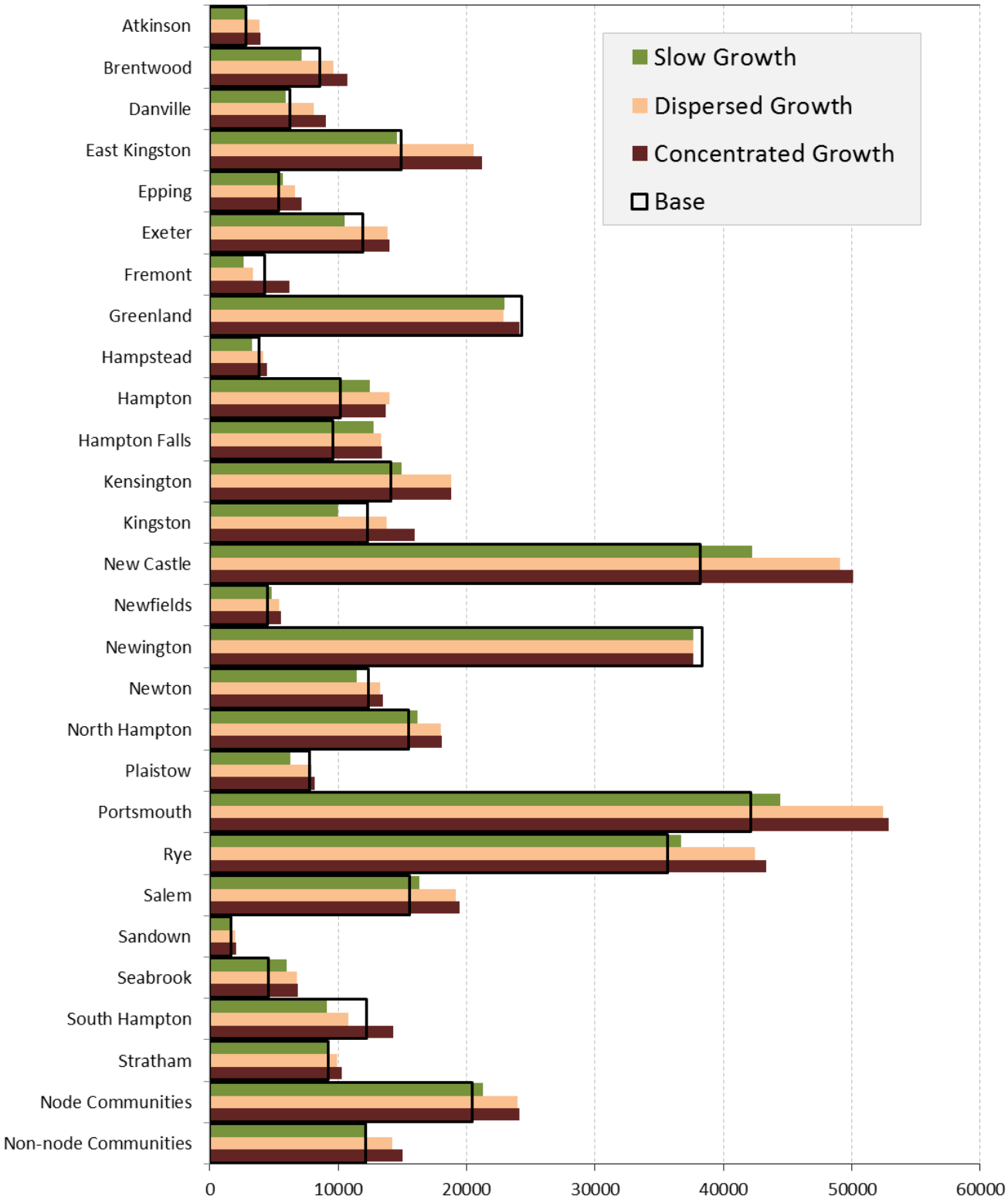
and PM peak periods in the region and this was discussed in the Transportation Chapter as well. ***Map SP2***, ***SP3, and SP4*** show the modelled 2040 condition for the slow growth, dispersed growth, and concentrated growth scenarios respectively and each of those shows an increase in congested driving over what is being experienced currently. ***Map SP2*** shows increased congested roadways during the AM peak period and specifically on NH 125, NH 11 and other roadways in the central and western portion of the region. ***Map SP3*** indicates greater impact during the PM peak period and shows a jump in traffic on the roadways in Map SP2 as well as I-95, US Route 1, and NH 108 in the eastern portion of the region. ***Map SP4*** shows very similar impacts as Map SP3 with slightly less impact on NH 111 and NH 125, especially during the AM peak.

The differences between the growth scenarios in terms of impacts on congestion may be understated as the model currently relies on static transit routes and proportions of non-motorized trips. Further efforts in scenario planning will investigate the impacts of additional transit routes and increased non-motorized trip percentages for more densely settled areas.

Table SP3: Transportation Network Statistics from the Four Scenarios

Measure	2010 Baseline	2040 Slow Growth	*Change from 2010*	2040 Dispersed Growth	*Change from 2010*	2040 Nodal Growth	*Change from 2010*	*Nodal vs. Dispersed Growth*[1]
Daily Vehicle Miles of Travel (VMT)	6,374,567	6,681,490	*4.8%*	8,590,876	*34.8%*	8,525,502	*33.7%*	*-0.8%*
Per Capita VMT	36.2	34.6	*-4.4%*	36.8	*1.7%*	36.5	*1.0%*	*-0.8%*
Home-Work Ave Trip Time (min)	28.4	34.6	*22.1%*	32.9	*16.1%*	31.0	*9.1%*	*-5.8%*
Home-Work Trip Ave Length (mi)	11.8	12.6	*6.8%*	12.0	*1.6%*	11.7	*-0.9%*	*-2.5%*
Home-Shopping Trip Time	14.2	15.2	*6.7%*	17.2	*20.7%*	15.9	*12.1%*	*-7.6%*
Home-Shopping Ave Length	5.7	5.7	*-0.2%*	6.1	*7.4%*	5.8	*3.0%*	*-4.9%*
Home-Other Ave Time	13.8	18.0	*30.2%*	17.8	*29.3%*	16.2	*17.1%*	*-9.0%*
Home-Other Ave Length	5.9	6.6	*11.9%*	6.5	*9.6%*	6.1	*3.4%*	*-6.2%*
Non-Home Based Ave Trip Time	8.1	9.1	*11.2%*	8.7	*6.3%*	8.3	*1.8%*	*-4.6%*
Non-Home Based Ave Length	3.9	4.0	*2.6%*	3.8	*-2.3%*	3.7	*-5.4%*	*-2.6%*
AM VMT	497,610	520,026	*8.4%*	665,645	*38.8%*	658,755	*37.4%*	*-1.0%*
AM VMT with V/C>.80	118,110	156,523	*32.5%*	283,056	*139.7%*	278,207	*135.5%*	*-1.7%*
AM VMT with V/C>1.2	50,393	56,271	*11.7%*	129,199	*156.4%*	119,010	*136.2%*	*-7.9%*
AM Delay (hours)	14,504	16,294	*12.3%*	51,167	*252.8%*	49,680	*242.5%*	*-2.9%*
PM VMT	631,378	666,551	*5.6%*	894,408	*41.7%*	889,937	*41.0%*	*-0.5%*
PM VMT with V/C>.8	294,579	304,753	*3.5%*	296,056	*0.5%*	292,040	*-0.9%*	*-1.4%*
PM VMT with V/C>1.2	91,664	99,116	*8.1%*	405,992	*342.9%*	396,909	*333.0%*	*-2.2%*
PM Delay (hours)	24,490	25,247	*3.1%*	107,094	*337.3%*	105,970	*332.7%*	*-1.0%*

SP Figure 6: Average Employment Accessable within 15 Minute Commute



Support of the Regional Vision and Goals

As this exercise is intended to examine how policies and development patterns impact the future of the region, the support of the regional vision and goals can be looked at as an outcome of the different scenarios. Instead of looking at individual policy and action recommendations however we look at what each scenario does in relation to the regional vision and goals. ***Table SP4*** provides a matrix showing how each scenario relates to the Livability Principles and ***Table SP5*** relates the scenarios to different aspects of the regional goals. The strong, concentrated growth scenario shows the most consistent support for each while the slow growth scenario shows the least.

The Slow Growth scenario implies a "status quo" situation with stagnant employment and very slow population growth. It helps to maintain the traditional settlement pattern and high quality natural environment by minimizing new growth and development. At the same time, this also seems to indicate a region that might be economically stagnant which will suppress the opportunities for greater housing and transportation choices. The unchanged settlement pattern does little to reduce risk for climate related disasters and does not indicate that energy would be conserved more than today however, because of the very small amount of growth, it doesn't make them any worse either.

The Dispersed Growth scenario expects strong employment and population growth which helps to support economic vitality however the continuation of a sprawling development pattern challenges traditional settlement patterns, transportation choices, the quality of natural resources, and does not aid in reducing natural hazards risks or improve energy efficiency. Community character is partially supported in that the dispersed growth places pressure on smaller communities, but is not so great as to transform any community into something different than it is now.

Table SP4 - Scenarios in Relation to New Hampshire Livability Principles

	New Hampshire Livability Principles					
Scenario	Traditional Settlement Patterns & Development Design	Housing Choices	Transportation Choices	Natural Resources Function and Quality	Community and Economic Vitality	Climate Change and Energy Efficiency
Slow Growth	P	P	TBD	P	TBD	P
Strong, Dispersed Growth	P	P	TBD	P	S	P
Strong, Concentrated Growth	S	S	S	S	S	P

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

The Concentrated Growth scenario is similar to the dispersed growth scenario, in that this alternative supports economic vitality. However, the more focused development pattern supports maintaining community character more fully as well as maintaining the natural resources in the region by keeping most development in already urbanized areas. Each community grows in population and employment and overall access to employment is improved and traffic congestion and delay reduced. The more concentrated pattern supports transportation choices by enabling more trips to be made by foot or bicycle as well as providing a basis for expanded transit. Additional housing in urbanized areas provides more opportunity for housing choice, the ability to live close to where you work which in turn all aids in improving energy efficiency.

Table SP5– Scenarios in Relation to the Regional Goal

Scenario	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
Slow Growth	P	P	TBD	P	P
Strong, Dispersed Growth	S	P	P	P	P
Strong, Concentrated Growth	S	S	S	S	S

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

Conclusions

This scenario planning exercise is an initial effort at looking at potential regional futures and is intended to provide a structure through which needs can be identified and options explored. It is not intended to cover all possible outcomes or to select a desired alternative. Instead, this should be used as a tool to inform policy decisions at the local and regional levels and to consider how the amount and location of development in the region impacts the transportation system, housing and employment needs, as well as environmental resources. That being said, there are some conclusions that can be drawn from this effort.

In most measures, the "low growth" scenario produces the smallest impacts on the transportation system with the lowest delay and amounts of congestion. However, the economic implications of that scenario would also indicate that it is not a desired future for the region. Some of those impacts by 2040 are:

- Overall lower employment than 2010
- Smaller work force than in 2010.
- The NH Econometric model suggests that there would be $4.2 billion per year less in the regional economy due to the smaller amount of employment in the region compared to the higher growth scenarios.
- $2.5 billion less in personal income in the region.
- Fewer jobs within a 15 minute commute than exists now in many communities.

The two scenarios that measure substantial growth were not compared directly in the econometric model as it looks at the level of economic activity at a regional level and not the geographic distribution within the region. However, the concentrated population and employment pattern results in the best outcomes in terms of efficient use of land and the transportation system as modelled in the Regional Buildout and the Regional Travel Demand Model.

- The concentrated development scenario fits generally within densities and development levels allowed by current zoning standards in the region.
- The concentrated development scenario produces population and population densities in both the regional employment centers and in all other communities that are higher than they are today.

- The concentrated development scenario shows modest growth in the more rural communities which allows them to better maintain their character without sacrificing economic growth.
- Focusing 90 percent of all new employment into the five employment centers increases the share of regional employment that those areas have by only four percent (74 to 78 percent).
- Focusing 80 percent of the new residential growth to the employment centers substantially increases the share of population that those communities have from 49.5 percent to almost 60 percent. This may have further benefits for the region from expanded services and economies of scale.
- Benefits of concentrated employment and housing as compared to a dispersed growth pattern:
    - Less Vehicle Miles of Travel overall.
    - Decreased Vehicle Miles of Travel on a per capita basis
    - Shorter trips of all purposes in both time and distance
    - Increased numbers of non-motorized trips
    - Less congestion and delay during peak hours

Future efforts will look to refine the tools available for the region, primarily the buildout model and regional travel demand model, to enable a more complete understanding of what different alternative growth scenarios imply for change. An expanded set of metrics will be utilized to better translate the results of the models into applicable measures and a more dynamic land use allocation modelling effort will be undertaken.

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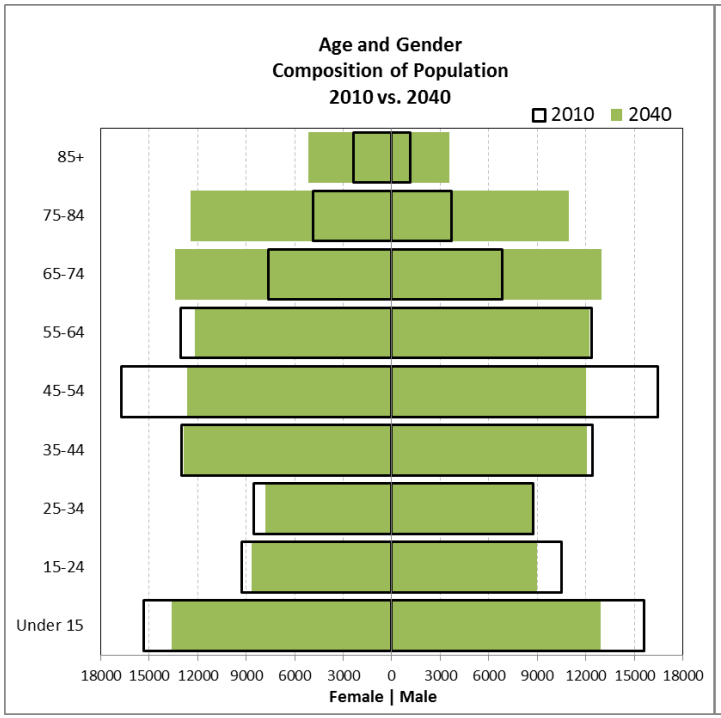
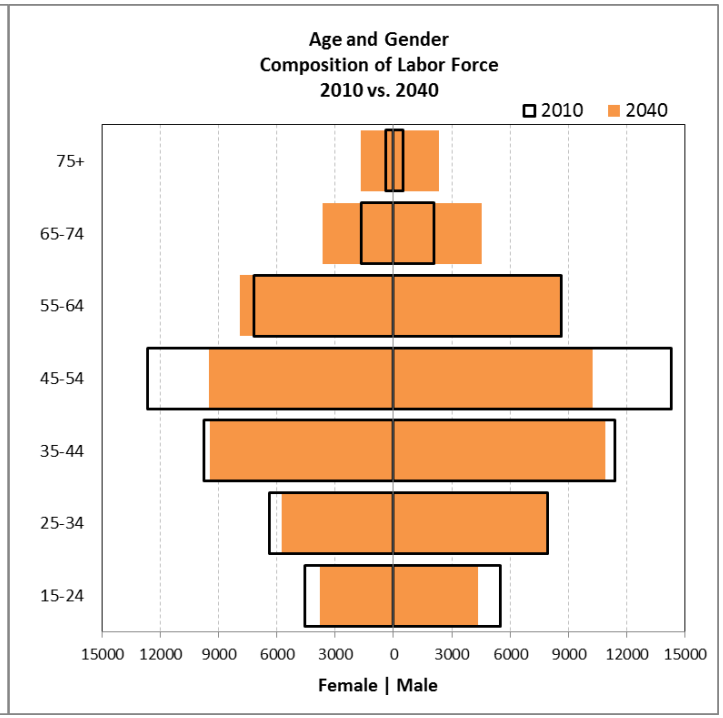
Appendix A

Labor Force Calculation

Labor force, the people in a region 16 and older who are working or are willing to work, is calculated based on age and gender cohort distribution of the population as delineated in the 2010 Census and as projected by the OEP/RPC 2040 Population Projections. Labor force participation rates developed by the Bureau of Labor Statistics and projected rates for 2022 as shown in the table below are applied to the population to determine the number of workers in the region. BLS is projecting that overall participation in the labor force will continue to decline for younger workers as well as those in prime age groups. At the same time, older worker participation is projected to increase but still remain substantially lower than the prime age groups. For the purposes of this analysis, BLS participation rates were utilized for the future year analysis.



Comparing the age and gender distribution for 2010 (black outline) with the projected age and gender distribution in 2040 (shaded bars). Much larger groups of citizens aged 60+ are anticipated.



Comparing the composition of the labor force in 2010 to that projected for 2040. There is a marked growth in the number of workers older than 65 but this is offset by smaller younger cohorts in the 15-29 years and 45-54 for a smaller total workforce in 2040 (90,500 vs 92,800 in 2010)

Labor Force Distribution

Utilizing the Journey to Work data developed from the American Community Survey (ACS), the distribution of the labor force to jobs inside and outside the region was derived. The ACS data is a 5 year sample set (2006-2010) and is aggregated to determine the percent of workers from each community that are employed within their community, within the RPC region, in other areas of New Hampshire, within the States of Massachusetts and Maine, and any other areas outside of those

follow are

Labor Force Participation Rates by Age/Gender Cohort

	Female							Male						
	2010	2015	2020	2025	2030	2035	2040	2010	2015	2020	2025	2030	2035	2040
15 to 19 years	0.350	0.346	0.267	0.267	0.267	0.267	0.267	0.349	0.340	0.278	0.278	0.278	0.278	0.278
20 to 24 years	0.683	0.674	0.647	0.647	0.647	0.647	0.647	0.745	0.745	0.699	0.699	0.699	0.699	0.699
25 to 29 years	0.747	0.741	0.734	0.734	0.734	0.734	0.734	0.903	0.895	0.888	0.888	0.888	0.888	0.888
30 to 34 years	0.747	0.741	0.734	0.734	0.734	0.734	0.734	0.903	0.895	0.888	0.888	0.888	0.888	0.888
35 to 39 years	0.752	0.748	0.733	0.733	0.733	0.733	0.733	0.915	0.907	0.904	0.904	0.904	0.904	0.904
40 to 44 years	0.752	0.748	0.733	0.733	0.733	0.733	0.733	0.915	0.907	0.904	0.904	0.904	0.904	0.904
45 to 49 years	0.757	0.747	0.749	0.749	0.749	0.749	0.749	0.868	0.861	0.851	0.851	0.851	0.851	0.851
50 to 54 years	0.757	0.747	0.749	0.749	0.749	0.749	0.749	0.868	0.861	0.851	0.851	0.851	0.851	0.851
55 to 59 years	0.584	0.673	0.733	0.733	0.733	0.733	0.733	0.785	0.780	0.778	0.778	0.778	0.778	0.778
60 to 64 years	0.507	0.504	0.556	0.556	0.556	0.556	0.556	0.600	0.605	0.643	0.643	0.643	0.643	0.643
65 to 69 years	0.270	0.276	0.354	0.354	0.354	0.354	0.354	0.365	0.371	0.416	0.416	0.416	0.416	0.416
70 to 74 years	0.147	0.154	0.198	0.198	0.198	0.198	0.198	0.220	0.242	0.288	0.288	0.288	0.288	0.288
75 to 79 years	0.053	0.079	0.116	0.116	0.116	0.116	0.116	0.104	0.159	0.190	0.190	0.190	0.190	0.190
80 to 84 years	0.053	0.050	0.080	0.080	0.080	0.080	0.080	0.104	0.113	0.139	0.139	0.139	0.139	0.139
85 years +	0.053	0.050	0.080	0.080	0.080	0.080	0.080	0.104	0.113	0.139	0.139	0.139	0.139	0.139

Source: Bureau of Labor Statistics 2010 Labor Force Participation Rates and Projections for 2022. 2022 values extended to 2040.
http://www.bls.gov/opub/mlr/2013/article/labor-force-projections-to-2022-the-labor-force-participation-rate-continues-to-fall.htm

categories. The assumptions that that:

1. 55.4 percent of the current employed labor force works within the region while the remaining 44.6 percent commute to other parts of New Hampshire, Maine, Massachusetts, and elsewhere. This translates to approximately 48,000 resident workers staying within the region and about 39,000 residents that commute elsewhere.

Population, Labor Force, and Employment Calculations for Strong Growth Scenarios

	2010	2020	2030	2040
Projected Employment (Employment Security Rate)	112,612	125,054	139,279	155,981
Labor Force from within region	48,358	49,779	48,549	47,347
Commuting into region at current rate (57%)	64,254	71,353	79,470	88,999
Gap in Labor Force	-	3,922	11,260	19,635
Additional RPC Residents to fill labor force gap	-	8,020	23,027	40,154
Resident labor Force to fill growth in jobs	48,358	53,701	59,809	66,982
Projected Population w/ Add. Growth	178,383	192,666	215,013	233,444
Employment supported by low growth	112,612	115,921	113,057	110,258

Commuters with Low Growth	64,254	66,142	64,508	62,911

2. The workers living within the region fill approximately 43 percent of the jobs available in the region. The rest are employees that live outside of the RPC region and currently comprise approximately 64,250 individuals from New Hampshire, Maine, Massachusetts and other areas.

3. For the purpose of this analysis, the rate of commuting into the region is being held constant at the current value of 57 percent. Holding that rate constant identifies the number of jobs that can be filled by the labor force residing in the region, assuming that it is large enough to do so.

4. Holding the population projections constant and adjusting the employment levels to what can be supported by the 57 percent of workers commuting into the region plus the 43 percent of workers that reside in the region creates the "slow growth" scenario. This shows a substantially different region with some

5. population growth and employment growth until 2020 when the labor force begins to decline in size to the point where in 2040 there is less employment than there was in 2010.

Population, Labor Force, and Employment Calculations for Low Growth Scenario

	2010	2020	2030	2040
Projected Population (OEP)	178,383	184,646	191,986	193,290
Estimated Employed Labor Force	87,229	89,876	87,647	85,402
Labor Force living and working in Region at current rate (55% of regional labor force & 43% of employment	48,358	49,779	48,549	47,347
Commuters with slow growth (57% of employment)	64,254	66,142	64,508	62,911
Employment supported by low growth	112,612	115,921	113,057	110,258

6. The employment projections indicate the need for a larger labor force than anticipated by the population projections. Once the number of employees needed is identified, the population growth necessary to support a work force of that size is calculated. Given existing population and employment, there are slightly over 2 persons in the region for each member of the labor force. Applying this value to the gap in the labor force identifies the increased population necessary to support the number of jobs and to maintain the 43 percent of regional employment filled by residents.

7. Under both future year growth scenarios, Pease Tradeport will be built out to full employment. Current employment is approximately 8,300 employees and with limited land remaining for commercial development, the Pease Development Authority estimates that buildout under current land use will result in approximately 11,300 employees. In the slow growth scenario, employment is expected to drop slightly similar to the remainder of the RPC region.

Buildout Inputs

The outputs of the Buildout are only as accurate as the inputs. While GIS affords the user the ability to zoom in to site level or even more refined we have to remember that the input data is often created at a regional scale. This means the most refined we should look at outputs is at the town level. The base input to this Buildout is 2010 land use data, not parcels. This Buildout does not look at or consider redevelopment, if a lot is developed in 2010, it will remain developed to that same level into the future. The actual locations of future development from this Buildout are approximate; they will be located in the correct zoning district and in accord to zoning setbacks and dimensional requirements. From a modeling perspective, Communities in our region over-zone for non-residential, this leads to very unrealistic approximations of those uses.

Data Inputs:

- Land-use (RPC - 2010)
- Zoning (RPC -2011)
- 2010 Building locations (RPC – 2010)
- Roads (NHDOT -2011)
- Soils and slopes (NH Natural Resource Conservation Service)
- Conservation lands (GRANIT 2012)
- National wetlands inventory (US Fish and Wildlife)
- Hydric A soil set (NH NRCS)
- Well-head protection areas (NH DES)

	Existing HU	New Dwelling Units @ BO	Total Units @ BO	% BO Today	Historic Annual Growth Rate[1]	Historic BO Year	Units @ 2040 Based on Historic BO	Total Units @2040 Slow	Total Units @ 2040 Dispersed	Total Units @ 2040 Nodal
Atkinson	2616	875	3491	74.94%	1.44%	2030	3491	2919	3508	2934
Brentwood	1154	1651	2805	41.14%	2.72%	2043	2583	1755	2047	1457
Danville	1492	1570	3062	48.73%	4.09%	2028	3062	1664	1999	1675
East Kingston	850	1343	2193	38.76%	2.47%	2049	1765	1105	1296	954
Epping	2035	3707	5742	35.44%	2.08%	2060	3771	2416	2874	2284
Exeter	4317	2927	7244	59.59%	0.87%	2070	5602	4591	5586	6636
Fremont	1377	2392	3769	36.53%	3.97%	2036	3769	1707	2020	1561
Greenland	1259	1865	3124	40.30%	1.72%	2063	2099	1433	1718	1423
Hampstead	3055	2282	5337	57.24%	2.74%	2031	5337	3205	3893	3429
Hampton	6622	2821	9443	70.13%	1.19%	2040	9451	6861	8373	10084
Hampton Falls	791	1276	2067	38.27%	1.64%	2069	1289	954	1132	889
Kensington	731	1526	2257	32.39%	1.59%	2081	1174	836	1001	820
Kingston	2128	6213	8341	25.51%	1.28%	2117	3119	2235	2715	2390
New Castle	450	66	516	87.21%	0.11%	2132	465	436	537	505
Newfields	552	724	1276	43.26%	2.43%	2045	1135	611	736	619
Newington	295	443	738	39.97%	0.17%	2556	310	295	362	335
Newton	1488	1466	2954	50.37%	1.36%	2061	2232	1633	1967	1669
North Hampton	1886	1329	3215	58.66%	0.76%	2080	2368	1943	2368	2118
Plaistow	2181	993	3174	68.71%	1.02%	2047	2959	2176	2667	2448
Portsmouth	5357	1251	6608	81.07%	0.7%[2]	2040	6604	5825	7082	8384
Rye	2345	1196	3541	66.22%	0.54%	2087	2756	2475	3009	2661
Salem	9670	2851	12521	77.23%	0.59%	2054	11535	10140	12325	14566
Sandown	2185	3735	5920	36.91%	3.62%	2038	5920	2582	3073	2452
Seabrook	3109	1514	4623	67.25%	1.29%	2041	4568	3451	4146	4628
South Hampton	314	1216	1530	20.52%	0.70%	2237	387	307	377	353
Stratham	2397	1360	3757	63.80%	3.61%	2023	3757	2785	3324	2689
Windham	4872	2704	7576	64.31%	2.96%	2025	7576	5324	6434	6525
RPC	**65528**	**51296**	**116824**	**56.09%**	**1.47%**	**2081**	**99085**	**71661**	**86571**	**86486**

1 Growth rate is calculated using census data from 1980-2010

2 Portsmouth actually has a negative growth curve, we manually adjusted this to a 1/10 absolute value of the negative growth pattern.

2010 Estimated Employment by Industry and Community[1]

Community	Agriculture	Business, Legal, Personal	Communications	Construction	Eating & Drinking Establishments	Educational Services	Financial Insurance Real Estate (FIRE)	Government	Health Services	Hotels & Lodging	Manufacturing	Mining	Non Classifiable	Retail Trade	Service (general)	Social Services	Transportation	Utilities	Wholesale Trade	Community Total
Atkinson	12	58	5	245	39	56	36	61	38	-	163	-	101	118	188	78	-	4	76	**1,278**
Brentwood	15	133	3	126	36	212	11	657	104	-	199	-	185	70	3	4	253	-	294	**2,305**
Danville	16	34	-	12	-	57	13	43	-	1	22	-	21	10	3	12	11	-	1	**256**
East Kingston	14	26	-	9	5	60	5	48	5	-	24	-	22	6	6	-	11	5	23	**269**
Epping	15	151	94	96	369	264	44	142	19	-	21	5	222	1,089	65	44	29	23	123	**2,815**
Exeter	10	619	89	153	490	2,017	369	244	2,797	89	1,291	-	865	735	155	173	254	-	655	**11,005**
Fremont	18	32	1	33	19	128	4	44	110	-	70	-	48	13	-	25	25	-	40	**610**
Greenland	29	283	20	148	58	103	13	54	64	-	202	-	161	453	84	13	75	-	284	**2,044**
Hampstead	12	179	-	144	231	86	70	95	403	1	238	-	189	419	10	79	11	-	230	**2,397**
Hampton	17	855	36	99	889	303	303	575	251	289	631	-	455	399	168	57	74	14	332	**5,747**
Hampton Falls	37	59	4	19	13	90	35	34	5	26	20	-	45	83	8	40	12	-	39	**569**
Kensington	18	34	-	16	12	44	3	27	-	-	18	-	27	58	12	-	23	33	18	**343**
Kingston	15	133	-	74	123	221	31	89	31	3	33	5	127	144	43	121	195	-	215	**1,603**
New Castle	5	17	-	-	-	21	4	25	-	215	-	-	27	5	19	-	-	-	6	**344**
Newfields	10	51	-	22	10	64	4	29	-	-	246	-	47	23	-	29	-	-	72	**607**
Newington	8	302	57	47	728	20	105	75	76	-	879	-	375	1,639	38	83	1	59	274	**4,766**
Newton	12	23	-	16	11	141	4	76	1	-	88	-	45	30	-	54	4	-	59	**564**
North Hampton	11	337	11	167	232	121	115	78	81	-	33	-	216	703	45	19	258	-	308	**2,735**
Plaistow	26	311	18	215	269	480	223	103	100	-	227	4	359	1,679	22	69	179	-	280	**4,564**
Portsmouth	18	5,470	1,453	449	2,647	1,106	3,485	1,232	3,664	642	1,813	4	2,503	3,724	411	698	609	156	1,714	**31,798**
Rye	10	242	-	34	111	143	34	109	95	30	-	-	110	149	222	14	33	-	55	**1,391**
Salem	17	3,763	567	523	1,711	1,293	753	419	1,264	60	1,577	-	1,825	6,598	836	109	266	15	1,630	**23,226**
Sandown	12	17	-	35	29	87	-	62	19	5	11	-	32	6	3	17	25	-	39	**399**
Seabrook	12	438	8	370	563	131	125	382	13	49	689	-	519	1,894	218	6	86	699	380	**6,582**
South Hampton	12	8	-	26	-	24	4	17	-	-	18	-	12	10	-	-	5	-	10	**146**
Stratham	14	1,081	83	103	131	464	61	67	138	-	425	-	334	741	40	150	36	-	381	**4,249**
Industry Total	**395**	**14,656**	**2,449**	**3,181**	**8,726**	**7,736**	**5,854**	**4,787**	**9,278**	**1,410**	**8,938**	**18**	**8,872**	**20,798**	**2,599**	**1,894**	**2,475**	**1,008**	**7,538**	**112,612**

Source: NH Employment Security 2010-2020 RPC Employment Projections by Industry, Quarterly Employment and Wages, Community Profiles

1 - Very small employment totals (<5), or locations where a single business provides 70% or more of a total industry within a community, are not provided and employment numbers are estimated based on regional indusry totals

Population, Housing Units, and Employment by Scenario

	2010 Baseline						2040 Slow Growth					
	Pop	HU	Area	Pop/mi^2	Empl	Empl/mi^2	Pop	HU	Area	Pop/mi^2	Empl	Empl/mi^2
Atkinson	6,753	2,668	11.3	596.5	1,278	112.9	7,536	2,977	11.3	665.6	1,377	121.6
Brentwood	3,985	1,322	17.0	235.1	2,303	135.9	6,060	2,010	17.0	357.5	2,124	125.3
Danville	4,384	1,569	11.8	371.2	255	21.6	4,888	1,749	11.8	413.9	241	20.4
East Kingston	2,357	862	10.0	236.8	270	27.1	3,063	1,120	10.0	307.8	246	24.7
Epping	6,409	2,466	26.2	244.9	2,815	107.6	7,609	2,928	26.2	290.8	2,635	100.7
Exeter	13,965	6,114	20.0	699.4	11,080	554.9	14,851	6,502	20.0	743.8	11,284	565.2
Fremont	4,239	1,510	17.4	243.9	610	35.1	5,255	1,872	17.4	302.4	623	35.8
Greenland	3,522	1,371	13.3	263.9	2,045	153.2	4,008	1,560	13.3	300.3	2,037	152.6
Hampstead	8,519	3,396	14.1	605.9	2,398	170.6	8,938	3,563	14.1	635.7	2,478	176.2
Hampton	14,759	6,821	14.2	1,042.9	5,744	405.9	15,291	7,067	14.2	1,080.5	5,427	383.5
Hampton Falls	2,231	832	12.6	177.1	570	45.3	2,690	1,003	12.6	213.6	546	43.3
Kensington	2,124	761	12.0	177.7	343	28.7	2,430	871	12.0	203.3	313	26.2
Kingston	6,019	2,285	21.0	286.9	1,604	76.5	6,322	2,400	21.0	301.4	1,569	74.8
New Castle	968	449	2.1	459.8	344	163.4	937	435	2.1	445.0	310	147.2
Newfields	1,680	575	7.3	231.5	606	83.5	1,861	637	7.3	256.5	551	75.9
Newington	732	289	11.1	65.7	4,726	424.2	731	289	11.1	65.6	4,298	385.8
Newton	4,603	1,667	9.9	463.6	508	51.2	5,050	1,829	9.9	508.7	487	49.1
North Hampton	4,297	1,760	14.0	306.7	2,821	201.4	4,427	1,813	14.0	316.0	2,822	201.4
Plaistow	7,604	2,911	10.6	718.0	4,522	427.0	7,586	2,904	10.6	716.3	4,293	405.3
Portsmouth	20,368	10,026	18.0	1,128.7	32,563	1,804.4	22,146	10,901	18.0	1,227.2	32,532	1,802.7
Rye	5,238	2,244	13.2	396.9	1,390	105.3	5,528	2,368	13.2	418.9	1,374	104.1
Salem	28,669	11,145	25.8	1,109.2	23,222	898.5	30,063	11,687	25.8	1,163.1	22,677	877.4
Sandown	5,984	2,072	14.4	415.5	399	27.7	7,070	2,448	14.4	491.0	390	27.1
Seabrook	8,764	3,750	9.7	901.1	6,580	676.5	9,729	4,163	9.7	1,000.3	5,996	616.5
South Hampton	813	315	8.0	101.3	147	18.3	794	308	8.0	98.9	147	18.3
Stratham	7,255	2,746	15.5	469.4	4,250	275.0	8,428	3,190	15.5	545.3	4,244	274.6
RPC	176,241	71,926	360.4	11,949.6	113,393	7,031.4	193,291	78,594	360.4	13,069.1	111,021	6,835.8

Population, Housing Units, and Employment by Scenario

	2040 Dispersed Growth						2040 Nodal Growth					
	Pop	HU	Area	Pop/mi^2	Empl	Empl/mi^2	Pop	HU	Area	Pop/mi^2	Empl	Empl/mi^2
Atkinson	9,056	3,578	11.3	799.9	1,897	167.6	7,573	2,992	11.3	668.9	1,452	128.3
Brentwood	7,070	2,345	17.0	417.1	2,923	172.4	5,032	1,669	17.0	296.9	2,515	148.4
Danville	5,875	2,103	11.8	497.5	333	28.2	4,921	1,761	11.8	416.7	282	23.9
East Kingston	3,594	1,314	10.0	361.1	333	33.5	2,644	967	10.0	265.7	293	29.4
Epping	9,052	3,483	26.2	345.9	3,627	138.6	7,192	2,767	26.2	274.8	3,102	118.5
Exeter	18,071	7,912	20.0	905.1	15,503	776.5	21,468	9,399	20.0	1,075.2	16,375	820.1
Fremont	6,219	2,215	17.4	357.8	851	49.0	4,805	1,712	17.4	276.5	721	41.5
Greenland	4,807	1,871	13.3	360.1	2,801	209.9	3,981	1,550	13.3	298.3	2,305	172.7
Hampstead	10,856	4,328	14.1	772.1	3,412	242.7	9,561	3,811	14.1	680.0	2,860	203.4
Hampton	18,662	8,625	14.2	1,318.7	7,465	527.5	22,474	10,387	14.2	1,588.0	7,933	560.5
Hampton Falls	3,193	1,191	12.6	253.5	756	60.0	2,508	935	12.6	199.1	635	50.4
Kensington	2,908	1,042	12.0	243.2	429	35.9	2,383	854	12.0	199.3	362	30.3
Kingston	7,678	2,915	21.0	366.0	2,149	102.4	6,759	2,566	21.0	322.2	1,774	84.6
New Castle	1,155	536	2.1	548.6	426	202.3	1,086	504	2.1	515.8	369	175.3
Newfields	2,239	766	7.3	308.6	757	104.3	1,885	645	7.3	259.8	656	90.4
Newington	898	354	11.1	80.6	5,966	535.5	832	329	11.1	74.7	6,296	565.1
Newton	6,086	2,204	9.9	613.0	715	72.0	5,164	1,870	9.9	520.1	608	61.2
North Hampton	5,395	2,210	14.0	385.1	3,727	266.0	4,825	1,976	14.0	344.4	3,088	220.4
Plaistow	9,299	3,560	10.6	878.0	6,017	568.1	8,536	3,268	10.6	806.0	5,085	480.1
Portsmouth	26,927	13,255	18.0	1,492.1	44,501	2,465.9	31,876	15,691	18.0	1,766.3	47,117	2,610.9
Rye	6,721	2,879	13.2	509.3	1,895	143.6	5,943	2,546	13.2	450.4	1,599	121.2
Salem	36,540	14,205	25.8	1,413.7	31,229	1,208.2	43,183	16,787	25.8	1,670.7	33,407	1,292.5
Sandown	8,417	2,914	14.4	584.5	536	37.2	6,715	2,325	14.4	466.3	446	31.0
Seabrook	11,686	5,000	9.7	1,201.5	8,255	848.7	13,045	5,582	9.7	1,341.2	9,024	927.8
South Hampton	977	379	8.0	121.7	204	25.4	913	354	8.0	113.7	162	20.2
Stratham	10,061	3,808	15.5	650.9	5,835	377.5	8,139	3,081	15.5	526.6	4,864	314.7
RPC	233,442	94,992	360.4	15,785.7	152,542	9,399.1	233,443	96,327	360.4	15,417.7	153,330	9,322.8

Employment Projections by Industry Classification

Industry Classification	2010	2020 ELMI	2040 ELMI
Agriculture/Forestry/Fishing	395	417	466
Mining	18	17	16
Construction	3,181	4,302	7,917
Manufacturing	8,938	9,175	9,782
Utilities	1,008	943	836
Wholesale Trade	4,410	4,877	6,100
Retail Trade	20,798	22,610	26,821
Transportation and Warehousing	2,475	2,621	2,943
Information	2,449	2,628	3,039
Finance and Insurance	4,639	4,991	5,748
Real Estate and Rental and Leasing	1,215	1,378	1,784
Professional and Technical Service	6,138	7,512	11,151
Management of Companies/Enterprises	1,812	1,912	2,111
Administrative and Waste Services	6,706	7,951	11,012
Educational Services	7,736	8,276	9,388
Health Care and Social Assistance	11,172	13,842	21,044
Arts, Entertainment, and Recreation	2,599	2,865	3,489
Accommodation and Food Services	10,136	10,884	12,856
Other Services Except Public Admin	3,128	3,420	4,251
Unclassified Establishments	8,872	9,140	9,642
Total Government	4,787	5,058	5,585
	112,612	124,819	155,981

Appendix B - Maps

Map SP1: 2010 Base Year Congestion

Map SP2: 2040 Slow Growth Congestion

Map SP3: 2040 Dispersed Growth Congestion

Map SP4: 2040 Concentrated Growth Congestion

Map SP5: 2010 Percent Buildout

Map SP6: Remaining Buildable Area From Regional Buildout

Appendix C – REMI Report

The Economic Impact of a Potential Employment Gap in the Rockingham Planning Commission Region of New Hampshire

prepared by

Economic and Labor Market Information Bureau
New Hampshire Employment Security

for

Rockingham Planning Commission

Granite State Future

October 2014

Assessing the impact of not meeting the future demand for workers, or employment gap, in the Rockingham Planning Commission Region

This impact analysis was conducted using the Economic and Labor Market Information Bureau's New Hampshire Econometric Model – a REMI Policy Insight + ® model.[1]

By using this econometric model, we are able to estimate both the number of direct jobs reduced in Rockingham County as well as the indirect and induced jobs dependent on those direct jobs.

The inputs used were provided by Glenn Greenwood, Associate Director at the Rockingham Regional Planning Commission. With this scenario, the regional planning commission wanted to assess the economic impact of not being able to fill the *projected demand* for workers.

This scenario will estimate the value of 21,500 jobs, which is equivalent to the region being unable to meet the future demand for workers. This employment gap can be alleviated by improving the transportation system in order to enhance commuting from outside the region. Another option is to support measures to create more affordable housing. Lack of affordable housing in the seacoast area is viewed as an obstacle to younger workers' ability to live and work within the Rockingham Planning Region.[2] [See description on Workforce Demographics on page 8.] By showing the economic value to the region of sustaining 21,500 jobs within the region, the return on investment that an average job generates in the local economy can be assessed in the context of what public investment in infrastructure and housing generates, with the goal of alleviating a future shortage of available local labor.

These 21,500 jobs were reduced from the REMI employment baseline in Rockingham County and distributed across industries based on the employment shares in the Rockingham Planning Commission Region using annual average covered employment data for 2013.[3] The covered employment data were adjusted to correspond to the REMI model's NAICS-based industry categories.[4]

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[1] Product of Regional Economic Models, Inc. of Amherst, MA.

[2] According to the Center for Housing Policy, the Rockingham-Strafford, NH ranked 20 for most expensive Metro Area for Renting in Fiscal Year 2014, up from 30th place in FY2013. Please see http://www.nhc.org/MosttoLeastExpensiveRental1Q2014.pdf.

[3] Quarterly Census of Employment and Wages by Planning Commissions, 2013 Annual Average, http://www.nhes.nh.gov/elmi/statistics/documents/plancomm2013.pdf.

[4] NAICS is the North American Industry Classification System, used to classify business establishments according to type of economic activity (process of production) in Canada, Mexico and the United States. An *establishment* is typically a single physical location, though administratively distinct operations at a single location may be treated as distinct establishments. Each establishment is classified to an industry according to the primary business activity taking place there.

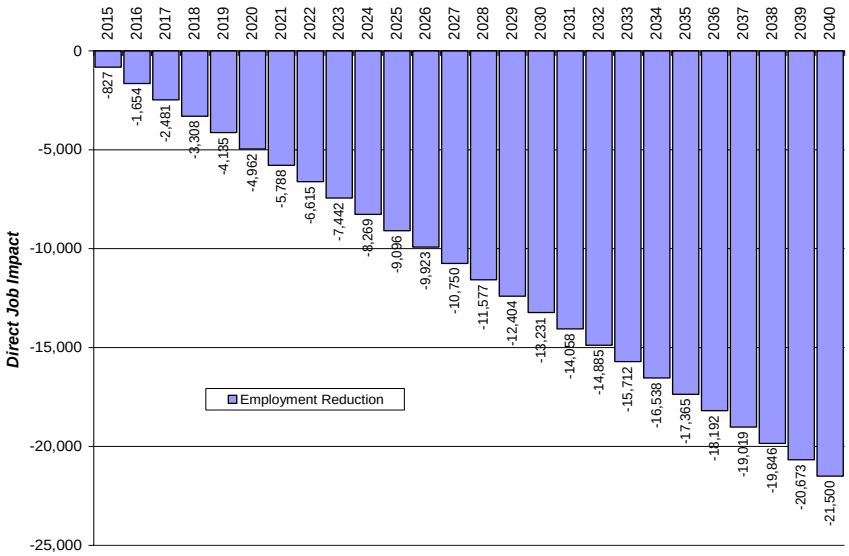
The scenario result will include both the direct jobs reduced in Rockingham County as well as the secondary (indirect and induced) jobs lost due to the ripple effect. The results include impacts on the region in terms of added gross domestic product, personal income, and population.

The economic impact to the regional economy of being unable to meet the future demand for workers

Inputs and assumptions

The estimated 21,500 jobs (*future employment gap*) were removed from the REMI baseline employment for Rockingham County, phased in over a time period from 2015 to 2040. This method of removing baseline employment in order to measure the value of jobs is called a counterfactual scenario.

Figure 1: Removal of jobs from the projected employment baseline in Rockingham County to measure the value of these jobs to the regional economy



Top 30 REMI industries with largest direct jobs reduction	Employee Gap in 2040
Retail trade	-4,362
Food services and drinking places	-1,922
Local Government	-1,645
Wholesale trade	-898
Hospitals	-662
Employment services	-653
Offices of health practitioners	-632
Construction	-618
Amusement, gambling, and recreation industries	-417
Computer systems design and related services	-395
Nursing and residential care facilities	-387

Educational services	-371
Monetary authorities, credit intermediation, and related activities	-366
Business support services; Investigation and security services; Other support services	-321
Accommodation	-303
Insurance carriers	-293
Management of companies and enterprises	-290
Services to buildings and dwellings	-283
Agencies, brokerages, and other insurance related activities	-275
Individual and family services; Community and vocational rehabilitation services	-270
Semiconductor and other electronic component manufacturing	-270
State Government	-238
Architectural, engineering, and related services	-220
Accounting, tax preparation, bookkeeping, and payroll services	-203
Transit and ground passenger transportation	-200
Electric power generation, transmission, and distribution	-184
Software publishers	-179
Personal care services	-175
Child day care services	-175
Telecommunications	-169
All Other REMI industries	-4,126
Total Employment Reduction	**-21,500**

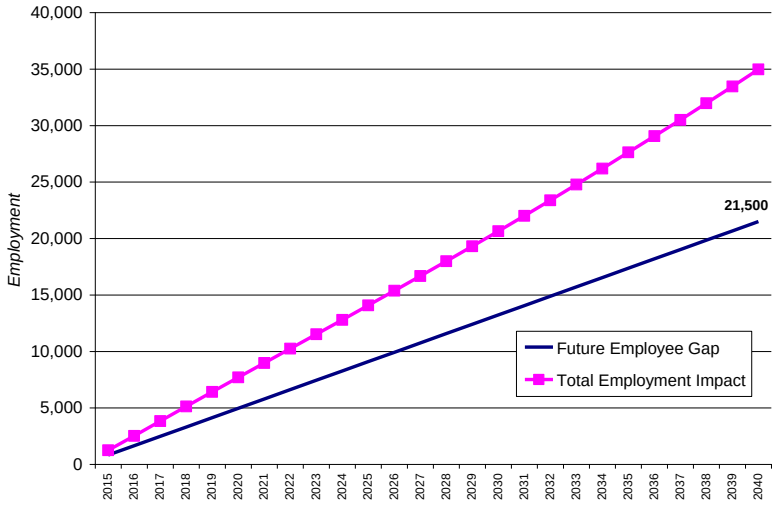
The reduction of 21,500 jobs was spread out over 119 REMI industries as well as government according to the 2013 employment share by industry in the Rockingham Planning Commission Region. Top industries with employment reduced were *Retail* and *Wholesale trade*, and *Food services and drinking places*. *Retail trade* and *Food services and drinking places* are industries with a high share of younger workers. *Health care* and *Local government* workers were also reduced in large numbers.

Scenario Results: Economic value of 21,500 future jobs in Rockingham County

The following results are an assessment of the value of 21,500 jobs in Rockingham County. The results include both direct jobs currently located in the region as well as the secondary (indirect and induced) jobs depending on the presence of the 21,500 jobs in Rockingham County. [Despite that the *future employment gap* is being modeled by removing 21,500 jobs from the REMI model baseline, the results are expressed in positive terms of value added to the region.]

Employment Impacts

In 2015, total impact on Rockingham County would be 827 jobs, including direct, indirect and induced jobs.5 By 2040, the total value of 21,500 jobs left unfilled (in other words, not meeting the future employment gap) would be 34,972 direct, indirect and induced jobs. The REMI model is dynamic in the sense that migration responds to economic opportunities over time. If there are more economic opportunities, positive net migration into the region occurs and similarly, if economic opportunities decline, a net loss of residents occurs due to migration.



Direct and total employment impact on Rockingham County due to the future worker gap

In 2040, the distribution of the secondary jobs impacted would be as follows: 3,837 jobs would be impacted in Construction and 1,462 jobs would be impacted in Retail trade. Accommodation and food services and Health care and social assistance would be impacted by close to the same amount of secondary jobs; 1,375 and 1,359 secondary jobs, respectively. Another 1,798 jobs in *State and local government* would be impacted

	2040	
Table 1. Direct and Secondary Job Losses by Sector	**Direct Job Loss**	**Total Job Losses**
Retail Trade	4,362	5,824
Construction	618	4,455
Health Care and Social Assistance	2,346	3,705
Accommodation and Food Services	2,225	3,600

[5] The direct jobs are jobs that have been entered or removed from the regional economy in the REMI Model. The indirect jobs are those created from the ripple effect of the direct jobs from inter-industry purchases (business-to-business services). The induced jobs are those generated from an increase in consumer spending and from the increase in population. Indirect and induced jobs, combined are also referred to as secondary jobs. Jobs in the REMI model are based on Bureau of Economic Analysis (BEA) definition of employment. The BEA estimates of employment and wages differ from covered employment data because BEA makes adjustments to account for self-employment. So the employment count in the REMI model is larger than what is reported by the Economic and Labor Market Information Bureau (ELMIB), New Hampshire Employment Security. The REMI model does not distinguish between full-time and part-time jobs.

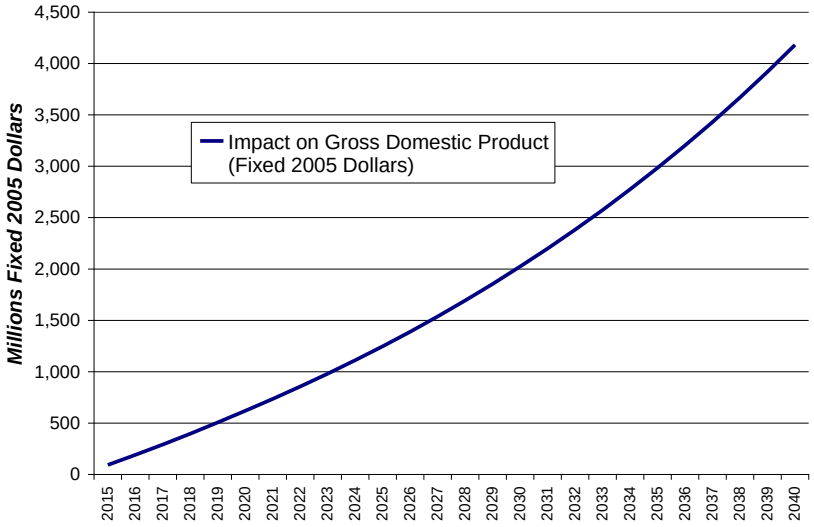
Administrative and Waste Management Services	1,417	2,461
Manufacturing	2,109	2,148
Professional, Scientific, and Technical Services	1,349	1,799
Wholesale Trade	898	1,667
Other Services, except Public Administration	536	1,097
Finance and Insurance*	1,051	1,026
Arts, Entertainment, and Recreation	518	886
Information	585	613
Real Estate and Rental and Leasing	214	601
Educational Services	371	493
Transportation and Warehousing*	360	291
Management of Companies and Enterprises	290	249
Utilities	200	217
Mining	4	4
State and Local Government	1,883	3,681
Federal Civilian	158	158

* As the REMI model tries to simulate the efficiencies obtained in the real economy, some substitution of labor occurs when a simulation is produced. This is why direct jobs losses in Finance and insurance and Transportation and warehousing, in this scenario, are larger than total losses to the region

Gross Domestic Product

- In 2015, the total value of the jobs to the local economy expressed in terms of Gross Domestic Product (GDP) would be $91.7 million (in fixed 2005 dollars). This impact would grow over time and by 2040, GDP in the region would be impacted by $4.2 billion (in fixed 2005 dollars).

- The economic activity created by the 827 jobs would account for 0.6 percent of total GDP in Rockingham County in 2015. By 2040, the value of the 21,500 jobs would represent 14.0 percent of the county's GDP.



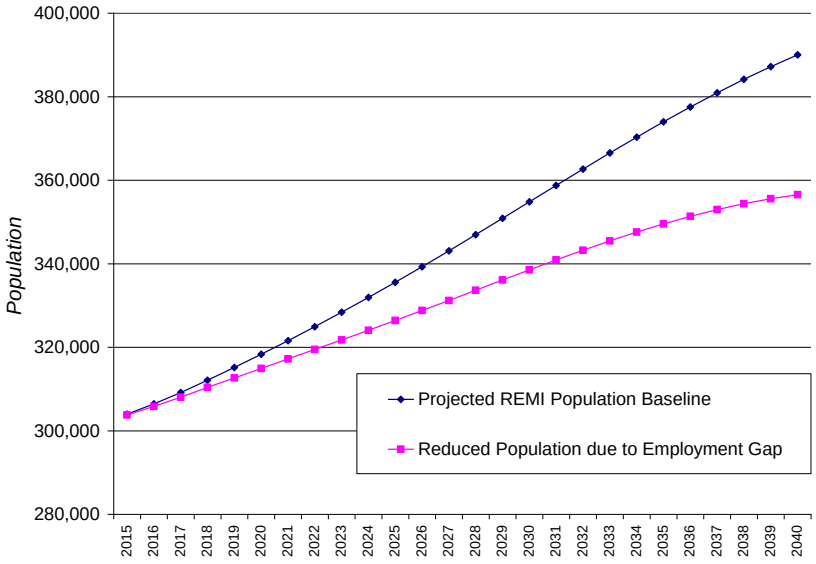
The impact on GDP in Rockingham County due to not meeting the future employment demand

Personal Income

- The impact of the 827 jobs on total real personal income would be $40 million (in fixed 2005 dollars) in 2015. By 2040, the full impact on total real personal income from not meeting the future demand for 21,500 workers would have grown to $2.5 billion (in fixed 2005 dollars).

Population

- In 2015, 827 direct jobs sustain 201 persons in Rockingham County's population. In 2040, the 21,500 jobs would directly or indirectly sustain Rockingham County's population with close to 35,000 persons, representing 8.6 percent of the projected population baseline for the county.



The impact on total population in Rockingham County due to *not* meeting the future demand for workers

Job Multiplier

- The multiplier effect on Rockingham County of each job in this current scenario is between 1.5 and 1.6 jobs[6] — including the direct job created — annually over the entire simulation period.

Summary

While this scenario of not meeting the future demand for workers is based on somewhat hypothetical assumptions, the results give insight into how *not* meeting the demand for workers in any industry have a negative impact on the overall economy.

What this scenario also describes is how there is an interdependency between the ability to attract or grow population, the supply of workers, and the ability to grow the local economy in terms of jobs, personal income and Gross Domestic Product (GDP) for the region.

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[6] A job multiplier of more than one indicates that the new job created in the local economy have a ripple effect that generates more employment in the region. A multiplier of less than one indicates that some of the current employment in the region would be eliminated due to the competition from the expanding businesses.

In this scenario, removing 21,500 direct jobs by 2040 from the Rockingham Planning Commission Region had an impact of approximately 35,000 jobs in the region, would reduce GDP by $4.2 billion (in fixed 2005 dollars), and reduce personal income by $2.5 billion (in fixed 2005 dollars) for Rockingham County. This scenario created a job multiplier effect of 1.5 to 1.6 jobs (including the job originally removed), with the largest impact on jobs in *Retail trade* and *Construction*.

Workforce Demographics

Quarterly Workforce Indicators depict a high concentration of younger workers in the Rockingham Planning Commission Region, employed in Retail trade and Accommodation and food services.

The Rockingham Planning Commission is concerned about the high median age in the region, as many businesses rely on the availability of younger workers. Businesses related to hospitality and tourism depend upon younger workers filling job vacancies in Retail trade and Accommodation and food services.

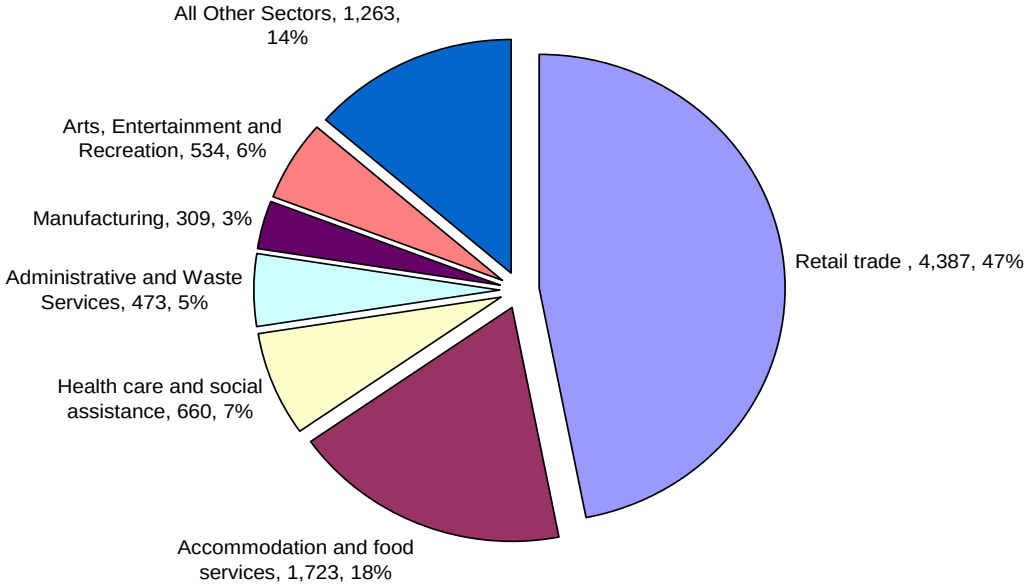
To evaluate the share of younger workers in Rockingham Planning Commission, workforce demographic data7 was extracted for two Local Office Areas —Portsmouth and Salem (Workforce demographic data for Rockingham Planning Commission is not available.) These two Local Office Areas were selected as they resemble the geographic area represented by the Rockingham Planning Commission better than county data. The map above depicts the RPC and the cities and towns in Portsmouth and Salem Local Office Areas.

Quarterly Workforce Indicators8 for the Portsmouth Local Office Area show that there is a high concentration of workers age 14-24 in Retail trade and Accommodation and food services. In the Salem Local Office Area, nearly half of all workers age 14-24 are employed in Retail trade.

[7] US Census Bureau, Local Employment Dynamics Program, Quarterly Workforce Indicators, 2012 Q3 -2013 Q2 Average.

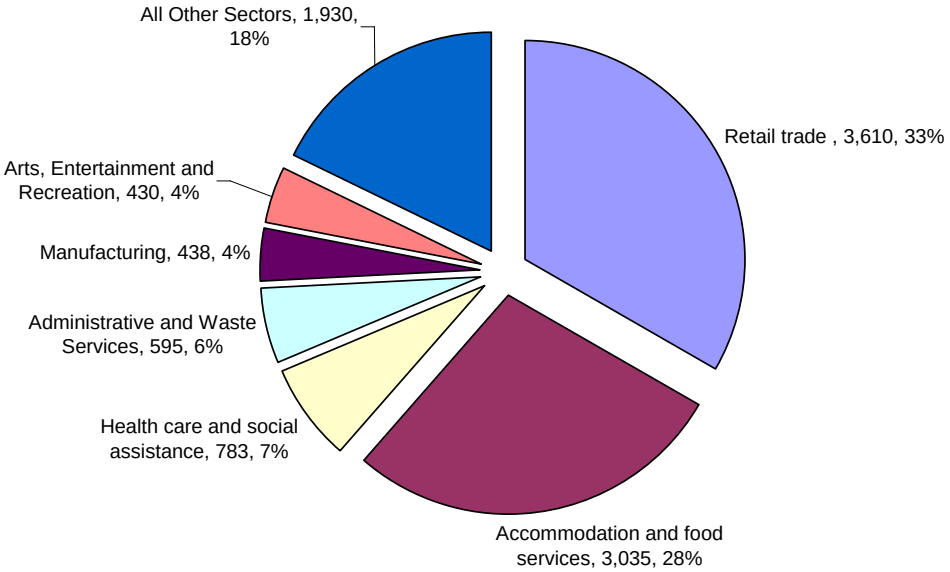
[8] Quarterly Workforce Indicators (QWI), a product of the U.S. Census Bureau's Local Employment Dynamics (LED) Partnership, are possible because of an innovative system that merges data already collected from various sources. The state Labor Market Information (LMI) agencies supply key data from unemployment wage records and from businesses each quarter. The Census Bureau merges the data from state LMI agencies with current demographic information to produce the data found in LED. By combining data from different administrative sources, censuses and surveys, the Census Bureau is able to produce local employment information.

Younger workers (ages 14-24) in the Salem Local Office Area are mainly employed in *Retail trade* and *Accommodation and food services*



Source: 2012Q3-2013Q2 Quarterly Workforce Indicators, Local Employment Dynamics (Partnership between states and Census). Data extracted May 2014

Younger workers (ages 14-24) in the Portsmouth Local Office Area are mainly employed in *Retail trade* and *Accommodation and food services*



Source: 2012Q3-2013Q2 Quarterly Workforce Indicators, Local Employment Dynamics (Partnership between states and Census). Data extracted May 2014

LAND USE

Implementation Plan

Recommendation #	Topic Recommendation	Actions	Implementation Timeframe	Implemented By Who?	Level of feasibility or impact (feasibility/impact)	Level of action	Topic Recommendations Relationship to Topic Goals							
	S = Recommendation supports Topic Goal P = Recommendation partially supports Topic Goal N/A = Recommendation does not apply to the Topic Goal TBD = Unknown if the recommendation applies to the Topic Goal due to lack of information or unknown future conditions.		**(0=immediate implementation, 25 years = 2040)**		**(high, medium, low)**	**(federal, state, regional, local)**	**Topic Goal 1**	**Topic Goal 2**	**Topic Goal 3**	**Topic Goal 4**	**Topic Goal 5**	**Topic Goal 6**	**Topic Goal 7**	**Topic Goal 8**
LU Recommendation 1	Support compact development with state, regional, and local planning efforts and investments in integrated, efficient and accessible infrastructure systems.	• Infrastructure management plans consider life cycle costs including retrofits and design for energy efficiency. • Explore opportunities to expand existing municipal water and/or sewer systems to serve compact development, including development located in adjacent and nearby municipalities. • Transportation infrastructure is designed to accommodate non-motorized travel for individuals of all ages and physical abilities. • Adopt design standards that improve conditions and minimize negative impact to the community and natural resources.	0-25 years	State agencies, RPC, regional and local stakeholders, municipalities and individuals	high/medium	State, regional, and local	S	S	P	P	P	P	P	S
LU Recommendation 2	Encourage compact development where integrated transportation systems, services and infrastructure are available.	• Compact development accessible by walking, bicycling and public transit is supported by zoning and regulation. • Municipalities site and design community facilities for efficiency and accessibility by all users. • New development and redevelopment occur in a manner that supports and facilitates an efficient transportation system, including: o an interconnected and redundant street network; o a balanced, multimodal transportation system including access to transit and freight services o 'complete' streets with appropriate facilities for all users • Municipality allow for development of diverse housing opportunities, especially those that are close to existing employment centers and future employment opportunities. • Maximize the use of existing developed lands and buildings through redevelopment. • Guide growth into areas with existing infrastructure and away from undeveloped areas. • Make adequate public and private investments in infrastructure to support additional growth.	0-25 years	State agencies, RPC, regional and local stakeholders, municipalities, and service and infrastructure providers	high/medium	Federal, state, regional and local	S	S	S	P	P	P	P	S
LU Recommendation 3	Locate new residential development and amenities mostly in or near downtowns, village centers and neighborhoods that include a mix of uses.	• Residential development is sited to accommodate the needs of a variety of life stages and different income levels. • Municipalities meet their statutory requirements for an adequate affordable housing supply to meet the needs of the region's economy, its workforce, young families and the elderly.	0-25 years	RPC and municipalities	medium/high	State, regional, and local	S	S	S	S	P	P	S	S
LU Recommendation 4	Coordinate regional and local land use planning with open space, land conservation and habitat protection efforts.	• Regional and local transportation planning integrates open space, land conservation and habitat protection efforts. • Encourage land patterns that employ mixed use, compact design to reduce the rate of land consumption for new development. • Conserve large continuous areas of open space, farmland, river corridors and critical environmental areas, and establish connection between those areas.	0-25 years	State agencies, RPC, regional and local stakeholders, and municipalities	medium	State, regional, and local	S	S	P	S	P	S	S	S
LU Recommendation 5	Protect the built environment and natural resources from impacts of natural hazards and climate change through responsible policies and regulations.	• Municipalities incorporate climate adaptation actions in land use plans and regulations. • Identify and protect high-risk areas that provide critical environmental services. • Adopt zoning and land use regulations that minimize damage to existing development from flooding and erosion. • Infrastructure management plans consider the short to long-term cost of implementing incremental climate adaptation actions, including retrofits, protection or relocation. • Transportation plans identify and address the impacts of climate change and natural hazards on the transportation system, including emergency evacuation and response requirements.	0-25 years	Federal and state agencies, RPC, and municipalities	medium/high	Federal, state, regional and local	S	P	P	S	S	P	P	S
LU Recommendation 6	Prepare a regional management plan that identifies strategies to protect agricultural heritage, local food protection, and working landscapes.	• Municipalities adopt regulations that prioritize protection of important agricultural resources soils. • Encouragement and technical assistance for local agricultural committees and commissions. • Establish collaborative efforts between regional food advocacy efforts, local governments, farmers, and businesses. • Leverage open space and land conservation efforts to protect critical fisheries habitats.	2-5 years	State agencies, RPC, regional and local stakeholders, municipalities, and agricultural operation owners.	high/low	State, regional, and local	S	S	P	S	P	S	S	S
LU Recommendation 7	Routinely consider historic resources as part of the state and municipal development review process in order to preserve historic buildings and community character.	• Utilize historic preservation strategies to maintain traditional downtowns, village centers and neighborhoods. • Incorporate historic styles and traditional patterns in to local land use regulations.	0-25 years	State agencies, RPC, and municipalities.	high/medium	Regional and local	P	S	P	S	N/A	P	S	S
LU Recommendation 8	Analyze and report cumulative and interrelated impacts of land use change to inform decisions on broad planning efforts and individual development projects.	• Municipalities and water systems develop comprehensive drinking source water protection plans. • Local land use regulations protect surface water and groundwater resources by: o Requiring pollution prevention plans for commercial and industrial development o Stormwater management that provide for treatment, infiltration and reuse of runoff. o Adopting buffer areas to protect water quality and critical habitats. • Strive to minimize impacts of land use change as a significant source of non-point source pollution. • Land use and development goals are achieved utilizing education, economic incentives and flexible regulations.	0-25 years	Federal and state agencies, RPC, and municipalities	low/high	Federal, state, regional and local	S	S	S	S	S	S	S	S

Implementation Plan

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NATURAL RESOURCES	**NR 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.	• 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.	0-15 years	State agencies, RPC, municipalities, and private landowners	medium	State, regional, and local	S	S	S	S	S	N/A	P	N/A	N/A	S
	NR 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.	• 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. (For more detail see Recommendation 1 Action Items.)	1-10 years	NHDES, RPC, municipalities	medium	State, regional, and local	S	S	P	S	S	P	P	N/A	N/A	S
	NR 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.	• 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. • 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.	0-25 years	NHDES, RPC, municipalities and private water infrastructure owners	high	State, regional, local and private	P	S	P	P	S	S	P	N/A	N/A	S
	NR 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	• 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.	0-5 years	NHDAMF, RPC, municipalities	medium	State, regional, local, and private	P	P	S	S	P	P	S	P	S	S
	NR 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.	• Municipalities adopt open space plans that include recommendations for protection of high priority areas identified in conservation and open space plans, including: o Land Conservation Plan for New Hampshire's Coastal Watersheds o Merrimack River Valley Land Conservation Plan Coastal Conservation Priority Plan o Lamprey River and Exeter-Squamscott River Management Plans • Municipalities without cluster or open space subdivisions adopt such regulations to help protect open	0-5 years	RPC and municipalities	medium	Regional and local	S	S	S	S	P	P	P	P	P	S
	NR 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.	• 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.	0-10 years	State agencies, RPC, and municipalities	medium	State, regional, and local	S	S	S	S	S	P	P	P	P	S
	NR Recommendation 7	Municipalities manage solid waste generated in the region as a sustainable material in order to find cost savings and conserve natural resources.	• 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.	5-15 years	State agencies, RPC and municipalities	medium	State, regional, and local	N/A	N/A	N/A	P	S	P	N/A	S	S	N/A
	NR 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.	• 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.	0-25 years	State, RPC and municipalities	medium	State, regional, and local	S	S	S	S	S	P	P	S	P	P

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ECONOMIC DEVELOPMENT	**ED Recommendation 1**	Fund, maintain, upgrade and expand the region's infrastructure (transportation, sewer, water, energy, telecommunications and broadband) to address current and future needs of the region.	• Encourage future development expansion in locations already served by adequate infrastructure. • Utilize cooperative and coordinated regional approaches in addressing infrastructure needs. • Ensure that modern asset management principles, including life cycle cost accounting, is used in setting user fees to maintain & replace infrastructure. • Work with state and federal policy makers to seek full funding of revolving loan programs for the region's water and wastewater facility upgrades. • Undertake a feasibility study of connecting and consolidating multiple small water systems in the Southern Rockingham region. • Update the Southern New Hampshire Water Supply study to evaluate adequacy of water supply sources through 2040. • Promote changes at the Federal and State levels that ensure competition among internet service providers or that redefines broadband infrastructure as a public utility. • Work with communities and appropriate state and federal agencies to facilitate development of broadband access to underserved pockets of the region.	0-25 years	State agencies, local and private sector stakeholders	medium	State and local	P	S	P	N/A	N/A	N/A	P	S
	ED Recommendation 2	Develop service models and governing capacity to enable municipalities to share and consolidate municipal services where efficiencies and outcomes would be improved.	• Pursue regional cooperation in planning for infrastructure and financing. • Identify services where interest and potential benefits for cooperation are highest. • Develop capacity within the RPC to facilitate regional cooperation and services sharing. • Facilitate cooperative regional approaches in addressing water quality infrastructure needs, including development of shared planning and implementation components of MS4 permit requirements.	5-10 years	RPC, regional and local stakeholders, and municipalities	high	Regional and local	N/A	S	S	N/A	N/A	N/A	P	P
	ED Recommendation 3	Develop the skills and education in the workforce at all levels (high school, vocational/technical, community college, university) to match the needs of the region's employers.	• Use the model of the advanced manufacturing partnership (AMPed) to establish active collaboration between educational institutions and companies with specific workforce needs • Target the specific employee skill sets and training most needed by the industries and industry clusters developing in the region. • Support the REDC efforts and those of educational institutions in regional workforce development, including funding to address retaining of displaced workers	1-10 years	Great Bay Community College, REDC, and Seacoast School of Technology	high	State and regional	S	N/A	N/A	S	P	N/A	N/A	N/A
	ED Recommendation 4	Protect the region's high quality of life and cultural and natural amenities.	• Enact policies and incentives that favor redevelopment of existing developed land (i.e. 'brownfields') over the development on previously undeveloped land ('greenfields') and around existing town centers, or other development nodes. • Address water quality impairments in the region by working collaboratively on a watershed basis to address both point and non-point pollution sources. • Protect, through easements and other means, the remaining forest and agricultural resources in the region to support the resurgent agricultural economy. • Encourage and assist communities in the identification and preservation of their natural and historic resources. • Leverage the region's amenities and overall high quality of environment to recruit new businesses, tourism and a skilled, educated labor force.	0-25 years	State agencies, regional and local stakeholders, and municipalities	medium	State, regional, and local	P	P	P	N/A	P	S	P	P
	ED Recommendation 5	Eliminate unnecessary barriers to the development of workforce-affordable housing in all parts of the region.	• Work with communities to ensure that their land use polices create realistic opportunities for private development of workforce-affordable housing. • Create collaboration among employers, housing and development entities, banks and private developers to ensure adequate access to financing for workforce housing development. • Ensure that adequate workforce housing opportunities exist in proximity to the region's major employment centers. • Include commuting distances and transportation costs in policies, programs related to housing affordability.	0-5 years	RPC, regional and local stakeholders, and municipalities	medium	Regional and local	S	P	N/A	N/A	S	P	N/A	N/A
	ED Recommendation 6	Take "no-regrets" actions beginning immediately to reduce future vulnerabilities and costs associated with climate change.	• Develop detailed assessments regarding specific vulnerabilities related to climate change and guidance to communities to plan for increased flood risk and extreme weather • Develop and implement updated, zoning, building and infrastructure design standards to improve general resiliency to natural hazards and account for increased flood risk, especially in areas vulnerable to sea level rise. • Establish business continuity plans to better cope with service disruptions resulting from natural disasters. • Periodically reassess climate changes assumptions to determine if greater or lessor actions may be needed to reduce vulnerabilities.	0 years	Federal and state agencies, municipalities, and private sector entities.	high	Federal, state, and local	N/A	S	S	N/A	P	P	S	P
	ED Recommendation 7	Implement regional strategies for transportation, land use and the built environment that improve energy efficiency, increase cost effective renewable energy production and utilization.	• Provide guidance and technical assistance to municipalities to retrofit energy conservation measures in municipal buildings, infrastructure and other facilities to reduce costs and energy consumption. • Promote effective utilization of available RGGI and Renewable Energy funds to municipalities and business to subsidize investments in energy conservation measures. • Expand natural gas distribution systems and access to services in the more densely developed areas of the region.	0-10 years	State agencies, RPC, municipalities, and utilities.	high	State and regional	P	P	P	N/A	N/A	P	S	S
	ED Recommendation 8	Coordinate state, regional and local infrastructure and development project priorities to maximize funding & investment opportunities	• Utilize existing CEDS, MPO TIP and other similar processes to identify and prioritize the region's top development project priorities. • Facilitate joint economic development efforts between communities.	0-5 years	REDC, RPC, CDFM, and NH HEM	high	State and regional	S	S	S	S	P	P	P	P

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HOUSING	**HOU Recommendation 1**	Encourage the availability of diverse housing opportunities for all citizens of the region. Work toward growth in housing to match growth in employment, and advocate for the allowance of a balance of housing styles, densities, and a distribution of prices that are affordable to a range of income levels.	• Encourage the development and adoption of zoning and subdivision regulations which allow for a wide variety of housing types, sizes and costs. • Establish and maintain residential design review standards, as appropriate to different residential development types, which incorporate, as appropriate, minimum impact development principles, traditional neighborhood and/or village design elements, and desired architectural features. • Encourage open space development combined	0-5 years	RPC, non profit housing advocacy groups, municipalities	high	state, regional local	S	S	P	P	S	N/A	N/A	S
	HOU Recommendation 2	Develop programs to educate the public about the economic effects of local regulations and the importance and value of adequate affordable housing for a sustainable economy.	• Provide member communities with guidance documents regardeing affordable housing • Prepare for and hold information training sessiojns regarding the provision of work force housing.	0-5 years	RPC, municipalities	high	regional, local	S	S	P	N/A	P	N/A	N/A	S
	HOU Recommendation 3	Encourage communities to consider areas of town suited for mixed-use and incorporate land use ordinances and regulations that will allow this. The concepts included in these ordinances would include allowances for higher densities, more diverse permitted uses, reduced setbacks, etc.	• Assist communities in participating in design charettes to consider appropriate areas in town for mixed use development • Prepare model zoning ordinances that encourage mixed use • Prepare design guidelines and subdiviision regualtion that support mixed use development patterns	0-25 years	RPC, state -wide planning professionals (Plan NH)	high	state, regional, local	S	N/A	S	N/A	S	P	N/A	S
	HOU Recommendation 4	Encourage the construction of single family homes and multi-family dwellings which are energy efficient in their design and use construction materials that are energy efficient in their design.	• Prepare and provide member communities with guidance documents regarding energy efficient construction materials	0-5 years	RPC, municipalities	medium	state regional local	P	N/A	N/A	S	N/A	N/A	N/A	N/A
	HOU Recommendation 5	Encourage municipalities to consider expanding existing water and sewer service areas. Encourage communities without such systems to consider constructing them. Alternatively, municipalities should consider allowing community water or septic systems in appropriate areas of town. These are small systems, often development-based and maintained by an association of home owners that allow the project developer to realize a diminished land development cost thereby	• Assist communities in evaluating expansion of waste water and or water infrastrucutre. • Provide municipalities with guidance regarding innovative and small waste and water facilities	0-25 years	RPC, municipalities	low	regional, local	P	P	S	N/A	P	S	N/A	N/A
	HOU Recommendation 6	Balance the need for additional housing development with the need to preserve open space and identify and protect green belts, wildlife habitats and other linkages with existing open space and conservation lands.	• Prepare and provide member communities with guidance documents regarding the realtionship between new housing and the existing natural environment • Coordiante actions with state and regional natural resource specialists when preparing guiidance materials	0-25 years	RPC, municipalities, regional private and public stakeholders	medium	regional, local	P	N/A	S	P	P	S	N/A	N/A
	HOU Recommendation 7	Provide visual examples of a range of alternative, affordable housing developments, highlighting quality architecture, design and integration into the community.	• Research and create the affordable housing image library • Meet with local planning boards regarding this information	0-25 years	RPC, municipalities	high	regional, local	S	N/A	N/A	N/A	N/A	N/A	N/A	P
	HOU Recommendation 8	Promote the development of infill housing and, where appropriately sited, the redevelopment of brownfield sites for residential and supporting land uses.	• Make member municipalities aware of the benefits of in-fill development with guidance materials and presentations. • Provide member municipalities with guidance materials regarding the parameters of the National Brownfields program • If funding is available continue the RPC's Brownfeilds program	0-25 years	RPC, municipalities	high	regional , local	P	P	P	P	P	S	N/A	S
	HOU Recommendation 9	Collaborate with not-for-profit housing organizations, government agencies, developers and builders in pursuing options and solutions for meeting the housing needs of the region.	• prepare and present guidance information regarding housing opportunity in our region • Coordinate with state and regional housing advocates to provide outreach regarding housing opportunity to member communities	0-5 years	RPC, not-for-profit housing organizations, government agencies, private developers and builders	high	State, regional, local	S	S	S	P	P	P	S	S
	HOU Recommendation 10	Promote the development of mixed-income multi-family housing at appropriate locations along major corridors and near employment centers.	• prepare and present guidance information regarding housing opportunity in our region • Coordinate with state and regional housing advocates to provide outreach regarding housing opportunity to member communities	0-25 years	RPC, not-for-profit housing organizations, government agencies, private developers and builders	medium	state, regional, local	S	P	S	N/A	S	P	S	P

	HOU Recommendation 11	Encourage communities to use incentive programs such as low income or historic preservation tax credits to support the development of workforce housing.	• prepare and present guidance information regarding low income or historic preservation tax credits to encourage the creation of workforce housing • Increase staff capability in-house in support of these incentive programs	0-5 years	RPC, not-for-profit housing organizations, government agencies	medium	state, regional, local	S	S	P	N/A	P	N/A	P	P
	HOU Recommendation 12	Encourage the creation of residential use of downtown second and third story spaces above commercial.	• Assist communities in participating in design charettes to consider appropriate areas in town for downtown second and third story residential use above commercial. • Prepare model zoning ordinances that encourage this kind of mixed use • Prepare design guidelines and subdiviision regualtion that support mixed use development patterns	0-5 years	RPC, municipalities	high	regional, local	S	N/A	S	S	S	P	S	P
	HOU Recommendation 13	Evaluate the potential for zoning ordinance models that support the preservation or replacement of affordable housing affected by redevelopment.	• Prepare and present guidance information regarding the preservation or replacement of affordable housing affected by redevelopment. • Coordinate with state and regional housing advocates to provide outreach regarding the preservation or replacement of affordable housing affected by redevelopment.	0-5 years	RPC, municipalities, not-for-profit housing organizations	medium	state, regional, local	S	2	N/A	N/A	N/A	N/A	S	S
	HOU Recommendation 14	Work with larger communities and the New Hampshire Housing Finance Authority to help preserve affordability in existing subsidized rental housing by monitoring the expiration of subsidy commitments and income or rent limitations in the developments.	• prepare and present guidance information regarding the preservation of affordability in existing subsidized rental housing by monitoring the expiration of subsidy commitments and income or rent limitations in the developments. • Increase staff capability in-house in support of this activity	0-5 years	RPC, municipalities, NH Housing Finance Authority	medium	state, regional, local	S	S	P	N/A	N/A	P	N/A	N/A
	HOU Recommendation 15	Encourage and facilitate the use of Community Development Block Grant (CDBG)and other funds to rehabilitate and improve housing stock serving low to moderate income homeowners and renters.	• Prepare and present guidance information regarding the use of Community Development Block Grant (CDBG)and other funds to rehabilitate and improve housing stock serving low to moderate income homeowners and renters. • Increase staff capability in-house in support of this activity	0-10 years	RPC, not-for-profit housing organizations, government agencies, private developers and builders	medium	state, regional, local	S	S	P	N/A	P	P	P	P
	HOU Recommendation 16	Assist communities in evaluating their compliance with state statutes regarding workforce housing and continue to maintain and update the regional housing needs assessment per RSA 36:47 II.	• Prepare guidance information for our member communities regarding state requirements for the provision of work force housing • Keep the RPC's Housing needs assessment current as a tool to help member communities determine the level of activity they need to comply with the State law regarding Workforce housing	0-5 years	RPC, municipalities	high	state, regional, local	S	S	P	N/A	N/A	P	N/A	N/A
	HOU Recommendation 17	Encourage and support the Pease Development Authority to consider amending its land use plan to allow mixed residential use in appropriate locations.	• Coordinate with the Pease DevelopmentAuthority to encouage an evaluationn of their existing Mater Plan to incorporate an element of on-site housing.	0-5 years	RPC, Peaase Development Authority	low	state, regional, local	S	N/A	S	P	P	N/A	S	S

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NATURAL HAZARDS	**NHZ Recommendation 1**	Incorporate information on future hazards and climate change in municipal planning documents (e.g. Hazard Mitigation Plans, Master Plans, capital improvement plans, and open space and land conservation plans).	• Prepare multi-hazard and climate change vulnerability assessments for coastal and Great Bay municipalities. • Support municipalities in adopting a Climate Change Chapter in their local hazard mitigation plans. • Adopt natural hazards and climate adaptation measures in municipal infrastructure and facilities management plans. • Adopt long term goals in local Master Plans to reduce risk and exposure to natural hazards and climate change impacts based on recommendations from vulnerability assessments and local Hazard Mitigation Plans. • State and regional partners (such as NH HSEM, Coastal Adaptation Workgroup, NH Coastal Program and RPC) secure funding for regional and local hazard mitigation planning and climate adaptation projects.	0-10 years, then ongoing	RPC, regional stakeholders, and municipalities	high	Regional and local	P	S	S	S	S	S	S	S
	NHZ Recommendation 2	Implement strategies to minimize impacts to people, property, and infrastructure.	• Work with state agencies, utilities and municipalities to plan for future use of lands in high risk areas served by state and municipal infrastructure, considering adaptive reuse, relocation, and retreat strategies. - Assess risk and level of exposure of key regional and local infrastructure and facilities. - Identify strategies to implement phased and iterative adaptation measures through the life cycle of infrastructure and facilities in high hazard areas. - Plan for future relocation or replacement of infrastructure and facilities in high risk areas. • Create local multi-sector planning committees to identify and integrate key cross-cutting issues and recommendations into municipal policies and programs, regulations and building codes. - Committees may consist of elected officials, department heads and staff, land use boards and commissions and water/sewer utilities. • Adopt standards in local zoning and land development regulations that protect and minimize impacts to public and private investments, and critical resources.	0-25 years	Federal and state agencies, RPC, regional stakeholders, municipalities and nonprofit organizations.	medium/high	Federal, state, regional, and local	S	S	S	P	P	S	S	S
	NHZ Recommendation 3	Implement strategies to conserve and minimize impacts to ecosystems, natural resources and historical and cultural resources.	• Assess risk and level of exposure of critical ecosystems, environmental services, and historical and cultural resources to natural hazards and climate change. • Collaborate with natural resource and environmental agencies and organizations to prepare resource based plans (natural, historical, cultural) at the (sub)watershed scale that consider existing hazards and future impacts of climate change. • Collaborate with natural resource and environmental agencies and organizations to conserve and protect environmental services provided by natural landscapes. • Develop technical assessment tools to guide planning and regulatory decisions that consider both the human and natural environments.	0-25 years	Federal and state agencies, RPC, regional stakeholders, and municipalities	high	Federal, state, regional, and local	S	S	S	P	P	S	S	S
	NHZ Recommendation 4	Local emergency response and planning officials develop regional and/or local disaster response and recovery plans.	• Encourage municipalities to participate in the New Hampshire Public Works Municipal Aid program. • Coordinate federal, state and municipal regulatory and permitting standards following a disaster or extreme event. - Determine what types of structures may be rebuilt and to what standards. - Identify lands where rebuilding is not feasible or able to be supported by infrastructure. - Identify restoration opportunities for natural systems. • Integrate response and recovery plans with local Hazard Mitigation Plans, Master Plans, zoning and land development regulations.	0-25 years	RPC, regional stakeholders, municipalities, and Climate Adaptation Workgroup	high	State, regional, and local	S	S	S	P	P	S	S	S
	NHZ Recommendation 5	Municipalities proactively communicate and provide resources to residents and businesses about the impacts of natural hazards and how to better prepare for such events.	• Provide informational materials and guidance to property owners about the FEMA National Flood Insurance Program, ways to reduce exposure and risk, and manage costs of insurance premiums. • Provide information to residents and businesses on ways to improve preparedness before and after hazardous events. • Require information about existing and potential future hazards be provided to prospective property buyers. • Communicate the level of municipal costs associated with declared disasters and other hazardous events and ways these costs might be minimized or avoided through changes to municipal decisions and regulatory requirements. • Coastal Adaptation Workgroup provides technical resources and guidance to municipalities, residents and businesses in the region.	0-25 years	RPC, regional stakeholders, and municipalities	high/medium	State, regional, and local	P	P	S	P	TBD	S	P	S

CLIMATE CHANGE

Implementation Plan

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CC Recommendation 1	Strengthen state, regional and municipal capacity to understand risks and vulnerability to potential future impacts of climate change.	• Facilitate access and application of assessments, reports, data and planning resources about climate change planning and climate adaptation strategies. • Partner with federal and state agencies, regional partners and local organizations to apply for funding and technical support. • Partner with federal and state agencies, regional partners and local organizations to expand resources and improve coordination. • Support implementation of state, regional and local research, assessments and initiatives that fill gaps in climate change data, resources and tools. • State agencies and municipalities commit resources and capacity to plan for climate change.	0-25 years	State agencies, RPC, regional and local stakeholders	high	State, regional, and local (with Climte Adaptation Workgroup)	P	S	S	P	P
CC Recommendation 2	A. Encourage coastal municipalities to incorporate a Coastal Flood and Hazards Chapter in their Master Plan. B. Encourage all municipalities to incorporate a Climate Adaptation Chapter in their Hazard Mitigation Plan.	• Seek new funding sources and align future RPC program funds to support municipal efforts. • Assist municipalities with adopting the draft Climate Change Chapters from RPC's Tides to Storms project in updates to their Hazard Mitigation Plans.	0	RPC, regional and local stakeholders, and municipalities	high	Regional and local	P	S	S	TBD	S
CC Recommendation 3	Continue membership in the NH Coastal Adaptation Workgroup and other regional and statewide climate adaptation initiatives.	• Continue to partner with NH Coastal Adaptation Workgroup and its members to apply for funding and technical support for climate change initiatives.	0	Federal and state agencies, RPC, regional and local stakeholders, municipalities, academic institutions, and non-profits.	high	State, regional, and local	S	S	P	S	S
CC Recommendation 4	Adopt standards for management of state and municipal infrastructure with safety margins that consider future risk and vulnerability due to climate change.	• Incorporate benefit to cost analyses in new construction, replacement rehabilitation and reconstruction projects. • Municipalities utilize FEMA pre- and post-disaster mitigation funds to protect existing infrastructure over its expected life cycle. • Apply science-based projections of future sea level, storm surge, precipitation and temperature changes to state, regional and municipal policies, programs and regulations.	2 -25 years (with ongoing modifications)	State agencies and municipalities.	medium/high	State and local	P	S	P	P	S
CC Recommendation 5	Provide guidance and recommendations to incorporate climate adaptation strategies and actions in municipal and regional policy, planning and regulatory sectors.	• Utilize existing funds and seek additional funding sources to support integration of climate change in RPC work program. • Incorporate climate adaptation strategies and actions in RPC projects and plans. • Work with municipalities to incorporate climate change strategies in hazard mitigations plans, open space and land conservation plans, zoning ordinances and land development regulations. • Assist municipalities to implement climate change actions and adaptation strategies including adoption of policy, planning and regulatory measures. • Encourage comprehensive land use planning, environmental planning and floodplain management that prevents and minimizes impacts.	0-25 years	Coastal Adaptation Workgroup	high	State and regional (with Climate Adaptation Workgroup)	S	S	S	P	P
CC Recommendation 6	Integrate protection of natural and constructed systems, social services, and historic and cultural resources into engineering and regulatory frameworks of shoreline management.	• Improve shoreline management to address the intensifying challenges posed by climate change, including management of development in high risk areas. • Improve shoreline management by coastal and floodplain erosion, and loss of natural resources that protect against flooding. • Retain and expand dunes, beaches, wetlands, forests and natural vegetation to protect against coastal and riverine flooding. • Discourage hardening of shorelines in favor of protecting existing natural shorelines and restoring them when feasible. • Apply hard and engineered shoreline techniques only to protect essential infrastructure and evaluate the benefit to cost of maintaining these techniques in the future.	0-25 years	Federal and state agencies, and municipalities	medium/high	Federal, state, regional, and local (with Climate Adaptation Workgroup)	S	S	P	P	P
CC Recommendation 7	Apply results from the Tides to Storms Coastal Vulnerability Assessment to climate adaptation actions at the state, regional and local levels.	• Incorporate data, reports and maps from the Tides to Storms Coastal Vulnerability Assessment in state, regional, and municipal climate adaptation efforts. • Assist municipalities with incorporating collaborative strategies to address regional resources, assets, and impacts identified in Tides to Storms assessment. • Apply project information and findings to ongoing and future climate change projects by RPC and in collaboration with others. • Provide access to Tides to Storms information and products through NH GRANIT database and Coastal Viewer (under development).	0-25 years	State agencies, RPC, regional stakeholders, and local municipalities.	medium/high	State, regional, and local	S	S	S	S	S
CC Recommendation 8	Integrate climate mitigation actions across all sectors of planning, transportation, land development and infrastructure projects.	• Attain reduction in vehicle miles travelled and overall greenhouse gas emissions in the region. • Protect areas that serve as carbon storage such as forests, wetlands and other natural landscapes. • Facilitate increase in use of low-carbon energy sources and installation and use of renewable energy sources.	0-25 years	State agencies, RPC, regional stakeholders, and local municipalities.	medium/high	Federal, state, regional, and local	P	P	S	P	S
CC Recommendation 9	Implement outreach and engagement measures to raise regional and community-based awareness about climate change.	• Work with regional partners to promote and encourage land and resource conservation in high risk areas such as coastal and riverine floodplains and to protect surface and groundwater resources. • State, regional and municipal decision makers work together to protect critical services and the health and safety of the public.	0-5 years (initial work), 5-25 years (long-term efforts)	State agencies, RPC, regional stakeholders, local municipalities, and private businesses and residents.	medium	State, regional, and local (with Climate Adaptation Workgroup)	S	S	S	S	S

HISTORIC RESOURCES

Implementation Plan											
Recommendation #	**Topic Recommendation**	**Actions**	**Implementation Timeframe**	**Implemented By Who?**	**Level of feasibility or impact (feasibility/impact)**	**Level of action**	**Topic Recommendations Relationship to Topic Goals**				
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HIST Recommendation 1	Include a chapter on historic and cultural resources in municipal master plans that: recognizes community character; includes provisions for updating resource inventories; and considers the economic and community development potential of protecting local heritage.	• Update and maintain historic resources data in the RPC Geographic Information System. • Encourage the NH Division of Historic Resources to prioritize digitalization of their historic resources inventory data and make these data available to municipalities, regional planning commissions and other state agencies. • Assist communities as resources allow with development of local Master Plan historic resources chapters.	0-5 years, ongoing	NHDHR, RPC and municipalities	high/medium	State,regional and local	S	P	P	P	P
HIST Recommendation 2	Establish Heritage Commissions and/or Historic District Commissions as local champions for the identification, recognition, protection, and management of historic and cultural resources.	• Assist communities on request with the process of establishing Heritage Commissions and/or Historic District Commissions. • Develop Town-Wide Area Forms in those communities that currently lack them, that address historic resources extending into the 20th century.	0-10 years, ongoing	RPC, local historic societies, and municipalities	medium/medium	Local	S	S	S	S	S
HIST Recommendation 3	Expand and promote local and regional educational initiatives focusing on local history to further public understanding of and appreciation for historic resources.	• Encourage collaboration between schools and heritage education organizations, particularly efforts making use of local historic resources as teaching tools, as part of 4th grade New Hampshire history or other curricula. • Utilize local access cable, town websites, mobile applications, markers and other media to convey information on local history and historic resources to residents and visitors	3-5 years, ongoing	RPC, historic societies, and municipalities	medium/medium	Local	P	P	S	P	P
HIST Recommendation 4	Expand local use of innovative land use policies to promote rehabilitation and continued use of historic properties, and ensure new development and redevelopment complement community character.	• Support communities in the implementation of policies such as demolition delay and review ordinances, preservation easements, or form based code. • Support inclusion of allowances for traditional agricultural use in land conservation easements.	3-5 years, ongoing	RPC, regional and local stakeholders, and municipalities	medium/high	Local	S	S	P	S	P
HIST Recommendation 5	Promote local and regional efforts to use historic and cultural resources as economic development tools, including Scenic Byways and local Main Street programs and other heritage tourism initiatives.	• Continue technical assistance to Scenic Byway initiatives in the region, including the NH Coastal Scenic Byway, American Independence Byway, and Robert Frost/Old Stage Coach Scenic Byway. • Assist communities as requested with development of Main Street Programs.	0-25 years	RPC and municipalities	high/medium	Regional and local	P	P	P	P	S
HIST Recommendation 6	Encourage expansion of funding available for historic resources inventory, conservation, rehabilitation, and education initiatives.	• Be proactive in seeking federal, state and private sector funding to support efforts to protect and promote historic and cultural resources and community character. • Advocate at the state level for maintaining and expanding funding for the NH Land and Community Heritage Investment Program (LCHIP). • Encourage local initiatives to dedicate proceeds from the Land Use Change Tax (LUCT) to conservation and preservation purposes.	0-25 years	RPC, regional and local stakeholders, historical societies, and municipalities	low/high	State and local	P	P	S	S	S
HIST Recommendation 7	Build capacity at the Rockingham Planning Commission to assist communities with historic and cultural resources planning	• Educate RPC staff and commissioners on historic and cultural resource issues; designate one staff planner as a historic preservation coordinator. • Participate in biennial regional networking meetings of local Heritage Commissions • Maintain contact with identified historic preservation organizations by membership in order to keep abreast of workshops, conferences and publications. • Maintain close communication with the New Hampshire Division of Historic Resources (DHR) and disseminate materials as developed for and by DHR to communities involved.	0-25 years	RPC	high/medium	Regional	S	S	S	S	S
HIST Recommendation 8	Build community level capacity for the protection and management of historic and cultural resources.	· Encourage and help publicize public program and workshops on issues related to historic preservation directed at both municipalities and private property owners.	3-5 years, ongoing	RPC and municipalities	high/medium	Local	S	S	S	S	S

Implementation Plan

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ENERGY	**ENG Recommendation 1**	Regional strategies for transportation, land use and environment improve energy efficiency, increase renewable energy production and decrease emissions.	• Incorporate cross-cutting energy issues and recommendations from the Transportation, Land Use and Environment Chapters of the Regional Master Plan in RPC's Long Range Transportation Plan. • Work with regional stakeholders and municipalities to align existing and future funding sources to implement cross-cutting energy issues and recommendations from the Regional Master Plan.	0-25 years	State agencies, RPC, regional stakeholders, and municipalities	medium/high	Federal, state, regional, and local	S	P	P	S	P	S	TBD
	ENG Recommendation 2	Evaluate and develop recommendations, in collaboration with the N.H. Coastal Adaptation Workgroup, to incorporate energy planning (sources, availability, efficiency and cost) as a climate change adaptation strategy.	• Evaluate ways municipal zoning, land development regulations and plans might incorporate standards that result in reduction of greenhouse gas emissions. • Identify measures that incorporate energy efficiency and renewable energy sources when retrofitting buildings and infrastructure for purposes of adaptation and resiliency. • Collaborate with state agencies to identify policies and standards to reduce greenhouse gas emissions and vehicles miles travelled, protect lands that provide carbon storage, retrofit buildings and facilities, and improve access to public transportation options in the	0-5 years	State agencies, RPC, regional stakeholders, municipalities, and Climate Adaptation Workgroup	high	State, regional, and local (with support from Climate Adaptatation Workgroup)	P	TBD	S	P	P	S	S
	ENG Recommendation 3	Provide guidance and technical assistance to municipalities to implement energy conservation measures in municipal investments, policies and plans.	• Apply successful strategies and actions from the Energy Technical Assistance Partnership (ETAP) program to municipal investments, policies and plans. • Inform municipalities of federal, state, and non-profit programs to fund energy retrofits and installations for buildings and infrastructure, and development of long range policy and planning actions. • Coordinate with utility companies to provide information to municipalities, residents and businesses on cost-saving and energy efficiency measures. • Prepare Energy Chapters for local Master Plans.	0-25 years	State agencies, RPC, regional stakeholders, and municipalities	high/medium	Federal, state, regional, and local	S	P	S	P	S	P	TBD
	ENG Recommendation 4	Municipalities enable installation of renewable energy sources through zoning, land development regulations and plans	• Engage residents and businesses in discussions about the benefits of renewable energy sources, and challenges in managing their buildings and infrastructure. • Complete an audit of zoning, land development regulations and plans to identify barriers and create incentives for development of local renewable energy sources.	0-5 years	Municipalities	high/medium	State, regional, and local	S	P	P	S	S	P	TBD
	ENG Recommendation 5	Support municipalities to adopt zoning and land use regulations requiring site design and construction methods that maximize energy efficiency in homes, buildings and infrastructure.	• Engage residents and businesses in discussions about energy efficiency and conservation options, cost and availability of energy sources, and challenges in managing their buildings and infrastructure. • Inform municipalities of energy efficiency standards and energy incentives applied successfully in zoning and land use regulations at the local level. • Facilitate collaboration between municipalities and the site design, construction, and renewable energy sectors.	0-5 years	Municipalities	high/medium	State, regional, and local	P	S	S	P	S	P	TBD
	ENG Recommendation 6	Implement recommendations relating to energy from the State Climate Action Plan and 2014 N.H. State Energy Strategy.	• Collaborate with state, regional and non-profit practitioners to implement recommendations that meet goals of the State Climate Action Plan and N.H. State Energy Strategy (2104). • Implement recommendations from the Regional Master Plan that meet goals of the State Climate Action Plan and N.H. State Energy Strategy (2014). • Incorporate goals from the State Energy Strategy in RPC's Long Range Transportation Plan.	0-25 years	State agencies, RPC, regional stakeholders, and municipalities	medium/high	State, regional, and local	S	S	S	S	S	S	S

Implementation Plan

NATURAL RESOURCES

Recommendation #	Topic Recommendation	Actions	Implementation Timeframe	Implemented By Who?	Level of feasibility or impact (feasibility/impact)	Level of action	Topic Recommendations Relationship to Topic Goals									
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NR 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.	• 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.	0-15 years	State agencies, RPC, municipalities, and private landowners	medium	State, regional, and local	S	S	S	S	S	N/A	P	N/A	N/A	S
NR 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.	• 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. (For more detail see Recommendation 1 Action Items.)	1-10 years	NHDES, RPC, municipalities	medium	State, regional, and local	S	S	P	S	S	P	P	N/A	N/A	S
NR 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.	• 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. • 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.	0-25 years	NHDES, RPC, municipalities and private water infrastructure owners	high	State, regional, local and private	P	S	P	P	S	S	P	N/A	N/A	S
NR 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	• 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.	0-5 years	NHDAMF, RPC, municipalities	medium	State, regional, local, and private	P	P	S	S	P	P	S	P	S	S
NR 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.	• Municipalities adopt open space plans that include recommendations for protection of high priority areas identified in conservation and open space plans, including: o Land Conservation Plan for New Hampshire's Coastal Watersheds o Merrimack River Valley Land Conservation Plan Coastal Conservation Priority Plan o Lamprey River and Exeter-Squamscott River Management Plans • Municipalities without cluster or open space subdivisions adopt such regulations to help protect open	0-5 years	RPC and municipalities	medium	Regional and local	S	S	S	S	P	P	P	P	P	S
NR 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.	• 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.	0-10 years	State agencies, RPC, and municipalities	medium	State, regional, and local	S	S	S	S	S	P	P	P	P	S
NR Recommendation 7	Municipalities manage solid waste generated in the region as a sustainable material in order to find cost savings and conserve natural resources.	• 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.	5-15 years	State agencies, RPC and municipalities	medium	State, regional, and local	N/A	N/A	N/A	P	S	P	N/A	S	S	N/A
NR 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.	• 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.	0-25 years	State, RPC and municipalities	medium	State, regional, and local	S	S	S	S	S	P	P	S	P	P

Implementation Plan

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ECONOMIC DEVELOPMENT	**ED Recommendation 1**	Fund, maintain, upgrade and expand the region's infrastructure (transportation, sewer, water, energy, telecommunications and broadband) to address current and future needs of the region.	• Encourage future development expansion in locations already served by adequate infrastructure. • Utilize cooperative and coordinated regional approaches in addressing infrastructure needs. • Ensure that modern asset management principles, including life cycle cost accounting, is used in setting user fees to maintain & replace infrastructure. • Work with state and federal policy makers to seek full funding of revolving loan programs for the region's water and wastewater facility upgrades. • Undertake a feasibility study of connecting and consolidating multiple small water systems in the Southern Rockingham region. • Update the Southern New Hampshire Water Supply study to evaluate adequacy of water supply sources through 2040. • Promote changes at the Federal and State levels that ensure competition among internet service providers or that redefines broadband infrastructure as a public utility. • Work with communities and appropriate state and federal agencies to facilitate development of broadband access to underserved pockets of the region.	0-25 years	State agencies, local and private sector stakeholders	medium	State and local	P	S	P	N/A	N/A	N/A	P	S
	ED Recommendation 2	Develop service models and governing capacity to enable municipalities to share and consolidate municipal services where efficiencies and outcomes would be improved.	• Pursue regional cooperation in planning for infrastructure and financing. • Identify services where interest and potential benefits for cooperation are highest. • Develop capacity within the RPC to facilitate regional cooperation and services sharing. • Facilitate cooperative regional approaches in addressing water quality infrastructure needs, including development of shared planning and implementation components of MS4 permit requirements.	5-10 years	RPC, regional and local stakeholders, and municipalities	high	Regional and local	N/A	S	S	N/A	N/A	N/A	P	P
	ED Recommendation 3	Develop the skills and education in the workforce at all levels (high school, vocational/technical, community college, university) to match the needs of the region's employers.	• Use the model of the advanced manufacturing partnership (AMPed) to establish active collaboration between educational institutions and companies with specific workforce needs • Target the specific employee skill sets and training most needed by the industries and industry clusters developing in the region. • Support the REDC efforts and those of educational institutions in regional workforce development, including funding to address retaining of displaced workers	1-10 years	Great Bay Community College, REDC, and Seacoast School of Technology	high	State and regional	S	N/A	N/A	S	P	N/A	N/A	N/A
	ED Recommendation 4	Protect the region's high quality of life and cultural and natural amenities.	• Enact policies and incentives that favor redevelopment of existing developed land (i.e. 'brownfields') over the development on previously undeveloped land ('greenfields') and around existing town centers, or other development nodes. • Address water quality impairments in the region by working collaboratively on a watershed basis to address both point and non-point pollution sources. • Protect, through easements and other means, the remaining forest and agricultural resources in the region to support the resurgent agricultural economy. • Encourage and assist communities in the identification and preservation of their natural and historic resources. • Leverage the region's amenities and overall high quality of environment to recruit new businesses, tourism and a skilled, educated labor force.	0-25 years	State agencies, regional and local stakeholders, and municipalities	medium	State, regional, and local	P	P	P	N/A	P	S	P	P
	ED Recommendation 5	Eliminate unnecessary barriers to the development of workforce-affordable housing in all parts of the region.	• Work with communities to ensure that their land use polices create realistic opportunities for private development of workforce-affordable housing. • Create collaboration among employers, housing and development entities, banks and private developers to ensure adequate access to financing for workforce housing development. • Ensure that adequate workforce housing opportunities exist in proximity to the region's major employment centers. • Include commuting distances and transportation costs in policies, programs related to housing affordability.	0-5 years	RPC, regional and local stakeholders, and municipalities	medium	Regional and local	S	P	N/A	N/A	S	P	N/A	N/A
	ED Recommendation 6	Take "no-regrets" actions beginning immediately to reduce future vulnerabilities and costs associated with climate change.	• Develop detailed assessments regarding specific vulnerabilities related to climate change and guidance to communities to plan for increased flood risk and extreme weather • Develop and implement updated, zoning, building and infrastructure design standards to improve general resiliency to natural hazards and account for increased flood risk, especially in areas vulnerable to sea level rise. • Establish business continuity plans to better cope with service disruptions resulting from natural disasters. • Periodically reassess climate changes assumptions to determine if greater or lessor actions may be needed to reduce vulnerabilities.	0 years	Federal and state agencies, municipalities, and private sector entities.	high	Federal, state, and local	N/A	S	S	N/A	P	P	S	P
	ED Recommendation 7	Implement regional strategies for transportation, land use and the built environment that improve energy efficiency, increase cost effective renewable energy production and utilization.	• Provide guidance and technical assistance to municipalities to retrofit energy conservation measures in municipal buildings, infrastructure and other facilities to reduce costs and energy consumption. • Promote effective utilization of available RGGI and Renewable Energy funds to municipalities and business to subsidize investments in energy conservation measures. • Expand natural gas distribution systems and access to services in the more densely developed areas of the region.	0-10 years	State agencies, RPC, municipalities, and utilities.	high	State and regional	P	P	P	N/A	N/A	P	S	S
	ED Recommendation 8	Coordinate state, regional and local infrastructure and development project priorities to maximize funding & investment opportunities	• Utilize existing CEDS, MPO TIP and other similar processes to identify and prioritize the region's top development project priorities. • Facilitate joint economic development efforts between communities.	0-5 years	REDC, RPC, CDFM, and NH HEM	high	State and regional	S	S	S	S	P	P	P	P

Implementation Plan

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HOUSING	**HOU Recommendation 1**	Encourage the availability of diverse housing opportunities for all citizens of the region. Work toward growth in housing to match growth in employment, and advocate for the allowance of a balance of housing styles, densities, and a distribution of prices that are affordable to a range of income levels.	• Encourage the development and adoption of zoning and subdivision regulations which allow for a wide variety of housing types, sizes and costs. • Establish and maintain residential design review standards, as appropriate to different residential development types, which incorporate, as appropriate, minimum impact development principles, traditional neighborhood and/or village design elements, and desired architectural features. • Encourage open space development combined	0-5 years	RPC, non profit housing advocacy groups, municipalities	high	state, regional local	S	S	P	P	S	N/A	N/A	S
	HOU Recommendation 2	Develop programs to educate the public about the economic effects of local regulations and the importance and value of adequate affordable housing for a sustainable economy.	• Provide member communities with guidance documents regardeing affordable housing • Prepare for and hold information training sessiojns regarding the provision of work force housing.	0-5 years	RPC, municipalities	high	regional, local	S	S	P	N/A	P	N/A	N/A	S
	HOU Recommendation 3	Encourage communities to consider areas of town suited for mixed-use and incorporate land use ordinances and regulations that will allow this. The concepts included in these ordinances would include allowances for higher densities, more diverse permitted uses, reduced setbacks, etc.	• Assist communities in participating in design charettes to consider appropriate areas in town for mixed use development • Prepare model zoning ordinances that encourage mixed use • Prepare design guidelines and subdiviision regualtion that support mixed use development patterns	0-25 years	RPC, state -wide planning professionals (Plan NH)	high	state, regional, local	S	N/A	S	N/A	S	P	N/A	S
	HOU Recommendation 4	Encourage the construction of single family homes and multi-family dwellings which are energy efficient in their design and use construction materials that are energy efficient in their design.	• Prepare and provide member communities with guidance documents regarding energy efficient construction materials	0-5 years	RPC, municipalities	medium	state regional local	P	N/A	N/A	S	N/A	N/A	N/A	N/A
	HOU Recommendation 5	Encourage municipalities to consider expanding existing water and sewer service areas. Encourage communities without such systems to consider constructing them. Alternatively, municipalities should consider allowing community water or septic systems in appropriate areas of town. These are small systems, often development-based and maintained by an association of home owners that allow the project developer to realize a diminished land development cost thereby	• Assist communities in evaluating expansion of waste water and or water infrastrucutre. • Provide municipalities with guidance regarding innovative and small waste and water facilities	0-25 years	RPC, municipalities	low	regional, local	P	P	S	N/A	P	S	N/A	N/A
	HOU Recommendation 6	Balance the need for additional housing development with the need to preserve open space and identify and protect green belts, wildlife habitats and other linkages with existing open space and conservation lands.	• Prepare and provide member communities with guidance documents regarding the realtionship between new housing and the existing natural environment • Coordiante actions with state and regional natural resource specialists when preparing guiidance materials	0-25 years	RPC, municipalities, regional private and public stakeholders	medium	regional, local	P	N/A	S	P	P	S	N/A	N/A
	HOU Recommendation 7	Provide visual examples of a range of alternative, affordable housing developments, highlighting quality architecture, design and integration into the community.	• Research and create the affordable housing image library • Meet with local planning boards regarding this information	0-25 years	RPC, municipalities	high	regional, local	S	N/A	N/A	N/A	N/A	N/A	N/A	P
	HOU Recommendation 8	Promote the development of infill housing and, where appropriately sited, the redevelopment of brownfield sites for residential and supporting land uses.	• Make member municipalities aware of the benefits of in-fill development with guidance materials and presentations. • Provide member municipalities with guidance materials regarding the parameters of the National Brownfields program • If funding is available continue the RPC's Brownfeilds program	0-25 years	RPC, municipalities	high	regional , local	P	P	P	P	P	S	N/A	S
	HOU Recommendation 9	Collaborate with not-for-profit housing organizations, government agencies, developers and builders in pursuing options and solutions for meeting the housing needs of the region.	• prepare and present guidance information regarding housing opportunity in our region • Coordinate with state and regional housing advocates to provide outreach regarding housing opportunity to member communities	0-5 years	RPC, not-for-profit housing organizations, government agencies, private developers and builders	high	State, regional, local	S	S	S	P	P	P	S	S
	HOU Recommendation 10	Promote the development of mixed-income multi-family housing at appropriate locations along major corridors and near employment centers.	• prepare and present guidance information regarding housing opportunity in our region • Coordinate with state and regional housing advocates to provide outreach regarding housing opportunity to member communities	0-25 years	RPC, not-for-profit housing organizations, government agencies, private developers and builders	medium	state, regional, local	S	P	S	N/A	S	P	S	P

	HOU Recommendation 11	Encourage communities to use incentive programs such as low income or historic preservation tax credits to support the development of workforce housing.	• prepare and present guidance information regarding low income or historic preservation tax credits to encourage the creation of workforce housing • Increase staff capability in-house in support of these incentive programs	0-5 years	RPC, not-for-profit housing organizations, government agencies	medium	state, regional, local	S	S	P	N/A	P	N/A	P	P
	HOU Recommendation 12	Encourage the creation of residential use of downtown second and third story spaces above commercial.	• Assist communities in participating in design charettes to consider appropriate areas in town for downtown second and third story residential use above commercial. • Prepare model zoning ordinances that encourage this kind of mixed use • Prepare design guidelines and subdiviision regualtion that support mixed use development patterns	0-5 years	RPC, municipalities	high	regional, local	S	N/A	S	S	S	P	S	P
	HOU Recommendation 13	Evaluate the potential for zoning ordinance models that support the preservation or replacement of affordable housing affected by redevelopment.	• Prepare and present guidance information regarding the preservation or replacement of affordable housing affected by redevelopment. • Coordinate with state and regional housing advocates to provide outreach regarding the preservation or replacement of affordable housing affected by redevelopment.	0-5 years	RPC, municipalities, not-for-profit housing organizations	medium	state, regional, local	S	2	N/A	N/A	N/A	N/A	S	S
	HOU Recommendation 14	Work with larger communities and the New Hampshire Housing Finance Authority to help preserve affordability in existing subsidized rental housing by monitoring the expiration of subsidy commitments and income or rent limitations in the developments.	• prepare and present guidance information regarding the preservation of affordability in existing subsidized rental housing by monitoring the expiration of subsidy commitments and income or rent limitations in the developments. • Increase staff capability in-house in support of this activity	0-5 years	RPC, municipalities, NH Housing Finance Authority	medium	state, regional, local	S	S	P	N/A	N/A	P	N/A	N/A
	HOU Recommendation 15	Encourage and facilitate the use of Community Development Block Grant (CDBG)and other funds to rehabilitate and improve housing stock serving low to moderate income homeowners and renters.	• Prepare and present guidance information regarding the use of Community Development Block Grant (CDBG)and other funds to rehabilitate and improve housing stock serving low to moderate income homeowners and renters. • Increase staff capability in-house in support of this activity	0-10 years	RPC, not-for-profit housing organizations, government agencies, private developers and builders	medium	state, regional, local	S	S	P	N/A	P	P	P	P
	HOU Recommendation 16	Assist communities in evaluating their compliance with state statutes regarding workforce housing and continue to maintain and update the regional housing needs assessment per RSA 36:47 II.	• Prepare guidance information for our member communities regarding state requirements for the provision of work force housing • Keep the RPC's Housing needs assessment current as a tool to help member communities determine the level of activity they need to comply with the State law regarding Workforce housing	0-5 years	RPC, municipalities	high	state, regional, local	S	S	P	N/A	N/A	P	N/A	N/A
	HOU Recommendation 17	Encourage and support the Pease Development Authority to consider amending its land use plan to allow mixed residential use in appropriate locations.	• Coordinate with the Pease DevelopmentAuthority to encouage an evaluationn of their existing Mater Plan to incorporate an element of on-site housing.	0-5 years	RPC, Peaase Development Authority	low	state, regional, local	S	N/A	S	P	P	N/A	S	S

Implementation Plan

	Recommendation #	Topic Recommendation	Actions	Implementation Timeframe	Implemented By Who?	Level of feasibility or impact (feasibility/impact)	Level of action	Topic Recommendations Relationship to Topic Goals					
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TRANSPORTATION	**TR Recommendation 1**	Promote the effective and efficient utilization of existing transportation infrastructure through appropriate maintenance as well as lower cost improvement strategies such as Access Management and Intelligent Transportation Systems (ITS) to minimize the need for roadway widening.	• Promote development of Access Management standards for state highways in communities. (Timeframe: 1-10 Years) • Assist communities and NHDOT with the development of Access Management MOU agreements. (Timeframe: 1-10 Years) • Promote strong Access Management in designs for improvements (publicly and privately financed) along state highways and other corridors. (Timeframe: Immediate and ongoing) • Continue scheduled updates to Regional ITS Architecture and Implementation Strategy and participate in updates to Statewide ITS Architecture. (Timeframe: 2-4 years) • Promote integration of ITS and other efficiency strategies into the design of transportation projects as appropriate. (Timeframe: 1-10 years)	Various - See individual actions timeframe.	NHDOT, RPC and municipalities	high	State, regional, and local	P	S	S	S	S	S
	TR Recommendation 2	Encourage investment in freight infrastructure improvements to promote goods movement and economic development.	• Evaluate intermodal connections on the transportation network and assess the need for maintenance and preservation or improvement projects to maintain freight flows. (Timeframe: 1-5 Years, periodically repeat) • Continue to implement ITS improvements from the regional ITS architecture that will facilitate the movement of goods. (Timeframe: 1-10 Years) • Work with NHDOT on the development of the Statewide Freight Plan (Timeframe 1-2 Years) • Consider freight impacts in the decision-making process for evaluating transportation project proposals. (Timeframe: Ongoing)	Various - See individual actions timeframe.	NHDOT and RPC	high/low	State, regional, and local	P	S	S	S	S	S
	TR Recommendation 3	Increase the funding available for operation, maintenance and modernization of transportation infrastructure and utilize public/private partnerships to facilitate project implementation where appropriate.	• Work with federal, state and regional partners to increase the amount of Federal and State funding available in the region to address project needs. In particular work to establish a dedicated state funding stream for public transportation. (Timeframe: Immediate) • Work directly with communities to expand the options available for local financing of transportation system maintenance, preservation, and improvement. (Timeframe: Immediate and ongoing) • Promote the use of public/private partnerships to spur investment in the transportation system where private development goals facilitate achievement of public priorities. • Assist communities with the development of policies and regulations that aid in securing private development funding appropriate for the amount of impact expected on adjacent transportation facilities. • Work with NH DOT to identify projects that might benefit from non-traditional contracting mechanisms such as design-build to expedite implementation.	Various - See individual actions timeframe.	US DOT and NHDOT, RPC, municipalities, private seacoast coalition	low/high	federal, state, regional, local	P	P	P	S	P	P
	TR Recommendation 4	Establish and implement a project selection and implementation strategy that uses criteria consistent with the State of New Hampshire and other NH MPOs to prioritize projects in the Metropolitan Transportation Plan (MTP), State Ten Year Plan, and the Transportation Improvement Program (TIP).	• Work with NHDOT to ensure that project selection criteria continue to reflect local and regional priorities. (Timeframe: 1-2 Years) • Refine the project development process through early data collection and scoping to better enable the project selection process with more complete information regarding project proposals. (Timeframe: 1-2 Years) • Update the list of prioritized projects in the Long Range Transportation Plan to reflect the latest planning assumptions. (Timeframe: 1-2 Years - cyclical) • Solicit communities, Transit providers, and NH DOT for transportation needs over the short and long-term within the region . (Timeframe: 1-2 Years - cyclical) • Propose projects to be constructed as part of the State Ten Year Plan process. (Timeframe: 1-2 Years - cyclical) • Propose projects to be constructed as part of the Transportation Alternatives and Congestion Mitigation and Air Quality Programs. (Timeframe: 1-2 Years - cyclical)	Various - See individual actions timeframe.	NHDOT and RPC	high/medium	State, regional, and local	S	S	S	P	S	S
	TR Recommendation 5	Employ a context-sensitive, Complete Streets design approach to transportation system planning, operation and maintenance.	• Develop and adopt a Complete Streets policy for the Rockingham Planning Commission MPO. (Timeframe: 1-3 years) • Provide technical assistance to member communities in the development of local Complete Streets policies. (Timeframe: Ongoing) • Work with municipalities and NHDOT to ensure that sidewalks, crosswalks or other pedestrian facilities are not omitted from highway projects due to lack of an entity willing to take responsibility for long term maintenance. (Timeframe: Ongoing) • Use local and regional planning processes such as corridor studies, Safe Routes to School travel plans, and local master plan chapters to promote traffic calming strategies to balance traffic movement with pedestrian and neighborhood safety. (Timeframe: Ongoing) • Provide technical assistance on implementation of Complete Streets policies, such as design solutions on regional transportation facilities	Various - See individual actions timeframe.	NHDOT, RPC, and municipalities	high/medium	State, regional, and local	S	S	S	P	P	S

	TR Recommendation 6	Consider the interaction of land use and transportation investments in the development of plans and program; including preservation of open space and natural/cultural resources, economic development and environmental justice.	• Promote TOD and Mixed Use Development. (Timeframe: Ongoing) • Prioritize transportation investment in the region's already developed areas through weighting of project selection criteria. (Timeframe: Ongoing)	Various - See individual actions timeframe.	NHDOT, RPC, and municipalities	low/high	state, regional, local	S	S	S	S	S	S
	TR Recommendation 7	Employ an integrated approach to increase the share of trips made in the region by bicycling, walking, transit and ridesharing.	• Provide technical assistance to communities in bicycle and pedestrian planning, including development and implementation of Safe Routes to School initiatives, and securing federal funding support through multiple programs. (Timeframe: Ongoing) • Continue to provide technical assistance to COAST, CART and TASC in developing regional community transportation options. (Timeframe: Ongoing) • Continue facilitating regional efforts to better coordinate public transit and human service transportation as a key strategy to expand access to community transportation. (Timeframe: Ongoing) • Work with State and regional partners to develop and sustain expanded inter-city rail and bus transportation options. (Timeframe: Ongoing) • Collaborate with regional and statewide partners on public education and enforcement initiatives to promote safe travel on the region's transportation system for all users, such as the NH PASS program focused on raising awareness of RSA 265:143a, New Hampshire's "three foot" passing distance law. (Timeframe: 1-3 years and ongoing) • Collaborate with regional and statewide partners in development and ongoing implementation of a bicycle and pedestrian counting program to provide a better basis for evaluating bicycle and pedestrian project needs. (Timeframe: 1-3 years and ongoing) • Develop a stand-alone bicycle and pedestrian plan for the RPC region. (Timeframe: 1-3 years) • Collaborate with commuteSMARTseacoast and other regional and statewide partners on initiatives to encourage alternative commutes such as Seacoast Bike/Walk to Work Day and Commute Green New Hampshire (Timeframe: Ongoing)	Various - See individual actions timeframe.	State agencies, RPC, regional stakeholders, and municipalities	high/medium	State, regional, and local	S	S	S	P	P	S
	TR Recommendation 8	Undertake planning studies that can identify safety concerns and begin to address them.	• Identify and track performance measures related to transportation safety (Timeframe: 1-5 Years, Ongoing) • Undertake corridor-wide safety studies on facilities with high accident rates. (Timeframe: Ongoing) • Assist regional transit agencies in the development and implantation of safety plans as necessary. (Timeframe: As needed) • Work with NHDOT and communities to undertake road safety audits at sites of specific concern in the region. (Timeframe: As needed)	Various - See individual actions timeframe.	NHDOT, transportation agencies, RPC and municipalities	medium/high	State, regional, and local	P	P	P	P	S	S
	TR Recommendation 9	Undertake efforts to reduce the vulnerability of the transportation system to natural hazards, storm surge, and the potential impacts of sea level rise and other climate change related concerns.	• Complete the vulnerability analysis that is examining stream crossings on the state highway system and determine where investments can be made to reduce flooding potential and other damage. (Timeframe: 1-5 Years) • Work with state and regional partners to define the MPO role in security planning for the transportation system. This role should provide tangible benefits without adding a level of bureaucracy to the security planning process. (Timeframe: Ongoing) • Incorporate transportation network planning into the current work with FEMA and local communities to develop hazard mitigation plans. (Timeframe: 5-10 Years) • Analyze the transportation system for capacity and safety deficiencies that impact security and disaster planning concerns. (Timeframe: 5-10 Years) • Incorporate security and disaster planning aspects into the project design and prioritization process. (Timeframe: 1-5 Years) • Prioritize projects designed to increase the resiliency of the transportation system to anticipated impacts of climate change (Timeframe: Ongoing)	Various - See individual actions timeframe.	NHDOT and RPC	high/medium	State, regional, and local	P	P	S	P	S	S

Implementation Plan

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NATURAL HAZARDS	**NHZ Recommendation 1**	Incorporate information on future hazards and climate change in municipal planning documents (e.g. Hazard Mitigation Plans, Master Plans, capital improvement plans, and open space and land conservation plans).	• Prepare multi-hazard and climate change vulnerability assessments for coastal and Great Bay municipalities. • Support municipalities in adopting a Climate Change Chapter in their local hazard mitigation plans. • Adopt natural hazards and climate adaptation measures in municipal infrastructure and facilities management plans. • Adopt long term goals in local Master Plans to reduce risk and exposure to natural hazards and climate change impacts based on recommendations from vulnerability assessments and local Hazard Mitigation Plans. • State and regional partners (such as NH HSEM, Coastal Adaptation Workgroup, NH Coastal Program and RPC) secure funding for regional and local hazard mitigation planning and climate adaptation projects.	0-10 years, then ongoing	RPC, regional stakeholders, and municipalities	high	Regional and local	P	S	S	S	S	S	S	S
	NHZ Recommendation 2	Implement strategies to minimize impacts to people, property, and infrastructure.	• Work with state agencies, utilities and municipalities to plan for future use of lands in high risk areas served by state and municipal infrastructure, considering adaptive reuse, relocation, and retreat strategies. - Assess risk and level of exposure of key regional and local infrastructure and facilities. - Identify strategies to implement phased and iterative adaptation measures through the life cycle of infrastructure and facilities in high hazard areas. - Plan for future relocation or replacement of infrastructure and facilities in high risk areas. • Create local multi-sector planning committees to identify and integrate key cross-cutting issues and recommendations into municipal policies and programs, regulations and building codes. - Committees may consist of elected officials, department heads and staff, land use boards and commissions and water/sewer utilities. • Adopt standards in local zoning and land development regulations that protect and minimize impacts to public and private investments, and critical resources.	0-25 years	Federal and state agencies, RPC, regional stakeholders, municipalities and nonprofit organizations.	medium/high	Federal, state, regional, and local	S	S	S	P	P	S	S	S
	NHZ Recommendation 3	Implement strategies to conserve and minimize impacts to ecosystems, natural resources and historical and cultural resources.	• Assess risk and level of exposure of critical ecosystems, environmental services, and historical and cultural resources to natural hazards and climate change. • Collaborate with natural resource and environmental agencies and organizations to prepare resource based plans (natural, historical, cultural) at the (sub)watershed scale that consider existing hazards and future impacts of climate change. • Collaborate with natural resource and environmental agencies and organizations to conserve and protect environmental services provided by natural landscapes. • Develop technical assessment tools to guide planning and regulatory decisions that consider both the human and natural environments.	0-25 years	Federal and state agencies, RPC, regional stakeholders, and municipalities	high	Federal, state, regional, and local	S	S	S	P	P	S	S	S
	NHZ Recommendation 4	Local emergency response and planning officials develop regional and/or local disaster response and recovery plans.	• Encourage municipalities to participate in the New Hampshire Public Works Municipal Aid program. • Coordinate federal, state and municipal regulatory and permitting standards following a disaster or extreme event. - Determine what types of structures may be rebuilt and to what standards. - Identify lands where rebuilding is not feasible or able to be supported by infrastructure. - Identify restoration opportunities for natural systems. • Integrate response and recovery plans with local Hazard Mitigation Plans, Master Plans, zoning and land development regulations.	0-25 years	RPC, regional stakeholders, municipalities, and Climate Adaptation Workgroup	high	State, regional, and local	S	S	S	P	P	S	S	S
	NHZ Recommendation 5	Municipalities proactively communicate and provide resources to residents and businesses about the impacts of natural hazards and how to better prepare for such events.	• Provide informational materials and guidance to property owners about the FEMA National Flood Insurance Program, ways to reduce exposure and risk, and manage costs of insurance premiums. • Provide information to residents and businesses on ways to improve preparedness before and after hazardous events. • Require information about existing and potential future hazards be provided to prospective property buyers. • Communicate the level of municipal costs associated with declared disasters and other hazardous events and ways these costs might be minimized or avoided through changes to municipal decisions and regulatory requirements. • Coastal Adaptation Workgroup provides technical resources and guidance to municipalities, residents and businesses in the region.	0-25 years	RPC, regional stakeholders, and municipalities	high/medium	State, regional, and local	P	P	S	P	TBD	S	P	S

CLIMATE CHANGE

Implementation Plan

Recommendation #	Topic Recommendation	Actions	Implementation Timeframe	Implemented By Who?	Level of feasibility or impact (feasibility/impact)	Level of action	Topic Recommendations Relationship to Topic Goals				
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CC Recommendation 1	Strengthen state, regional and municipal capacity to understand risks and vulnerability to potential future impacts of climate change.	• Facilitate access and application of assessments, reports, data and planning resources about climate change planning and climate adaptation strategies. • Partner with federal and state agencies, regional partners and local organizations to apply for funding and technical support. • Partner with federal and state agencies, regional partners and local organizations to expand resources and improve coordination. • Support implementation of state, regional and local research, assessments and initiatives that fill gaps in climate change data, resources and tools. • State agencies and municipalities commit resources and capacity to plan for climate change.	0-25 years	State agencies, RPC, regional and local stakeholders	high	State, regional, and local (with Climte Adaptation Workgroup)	P	S	S	P	P
CC Recommendation 2	A. Encourage coastal municipalities to incorporate a Coastal Flood and Hazards Chapter in their Master Plan. B. Encourage all municipalities to incorporate a Climate Adaptation Chapter in their Hazard Mitigation Plan.	• Seek new funding sources and align future RPC program funds to support municipal efforts. • Assist municipalities with adopting the draft Climate Change Chapters from RPC's Tides to Storms project in updates to their Hazard Mitigation Plans.	0	RPC, regional and local stakeholders, and municipalities	high	Regional and local	P	S	S	TBD	S
CC Recommendation 3	Continue membership in the NH Coastal Adaptation Workgroup and other regional and statewide climate adaptation initiatives.	• Continue to partner with NH Coastal Adaptation Workgroup and its members to apply for funding and technical support for climate change initiatives.	0	Federal and state agencies, RPC, regional and local stakeholders, municipalities, academic institutions, and non-profits.	high	State, regional, and local	S	S	P	S	S
CC Recommendation 4	Adopt standards for management of state and municipal infrastructure with safety margins that consider future risk and vulnerability due to climate change.	• Incorporate benefit to cost analyses in new construction, replacement rehabilitation and reconstruction projects. • Municipalities utilize FEMA pre- and post-disaster mitigation funds to protect existing infrastructure over its expected life cycle. • Apply science-based projections of future sea level, storm surge, precipitation and temperature changes to state, regional and municipal policies, programs and regulations.	2 -25 years (with ongoing modifications)	State agencies and municipalities.	medium/high	State and local	P	S	P	P	S
CC Recommendation 5	Provide guidance and recommendations to incorporate climate adaptation strategies and actions in municipal and regional policy, planning and regulatory sectors.	• Utilize existing funds and seek additional funding sources to support integration of climate change in RPC work program. • Incorporate climate adaptation strategies and actions in RPC projects and plans. • Work with municipalities to incorporate climate change strategies in hazard mitigations plans, open space and land conservation plans, zoning ordinances and land development regulations. • Assist municipalities to implement climate change actions and adaptation strategies including adoption of policy, planning and regulatory measures. • Encourage comprehensive land use planning, environmental planning and floodplain management that prevents and minimizes impacts.	0-25 years	Coastal Adaptation Workgroup	high	State and regional (with Climate Adaptation Workgroup)	S	S	S	P	P
CC Recommendation 6	Integrate protection of natural and constructed systems, social services, and historic and cultural resources into engineering and regulatory frameworks of shoreline management.	• Improve shoreline management to address the intensifying challenges posed by climate change, including management of development in high risk areas. • Improve shoreline management by coastal and floodplain erosion, and loss of natural resources that protect against flooding. • Retain and expand dunes, beaches, wetlands, forests and natural vegetation to protect against coastal and riverine flooding. • Discourage hardening of shorelines in favor of protecting existing natural shorelines and restoring them when feasible. • Apply hard and engineered shoreline techniques only to protect essential infrastructure and evaluate the benefit to cost of maintaining these techniques in the future.	0-25 years	Federal and state agencies, and municipalities	medium/high	Federal, state, regional, and local (with Climate Adaptation Workgroup)	S	S	P	P	P
CC Recommendation 7	Apply results from the Tides to Storms Coastal Vulnerability Assessment to climate adaptation actions at the state, regional and local levels.	• Incorporate data, reports and maps from the Tides to Storms Coastal Vulnerability Assessment in state, regional, and municipal climate adaptation efforts. • Assist municipalities with incorporating collaborative strategies to address regional resources, assets, and impacts identified in Tides to Storms assessment. • Apply project information and findings to ongoing and future climate change projects by RPC and in collaboration with others. • Provide access to Tides to Storms information and products through NH GRANIT database and Coastal Viewer (under development).	0-25 years	State agencies, RPC, regional stakeholders, and local municipalities.	medium/high	State, regional, and local	S	S	S	S	S
CC Recommendation 8	Integrate climate mitigation actions across all sectors of planning, transportation, land development and infrastructure projects.	• Attain reduction in vehicle miles travelled and overall greenhouse gas emissions in the region. • Protect areas that serve as carbon storage such as forests, wetlands and other natural landscapes. • Facilitate increase in use of low-carbon energy sources and installation and use of renewable energy sources.	0-25 years	State agencies, RPC, regional stakeholders, and local municipalities.	medium/high	Federal, state, regional, and local	P	P	S	P	S
CC Recommendation 9	Implement outreach and engagement measures to raise regional and community-based awareness about climate change.	• Work with regional partners to promote and encourage land and resource conservation in high risk areas such as coastal and riverine floodplains and to protect surface and groundwater resources. • State, regional and municipal decision makers work together to protect critical services and the health and safety of the public.	0-5 years (initial work), 5-25 years (long-term efforts)	State agencies, RPC, regional stakeholders, local municipalities, and private businesses and residents.	medium	State, regional, and local (with Climate Adaptation Workgroup)	S	S	S	S	S

HISTORIC RESOURCES

Implementation Plan											
Recommendation #	**Topic Recommendation**	**Actions**	**Implementation Timeframe**	**Implemented By Who?**	**Level of feasibility or impact (feasibility/impact)**	**Level of action**	**Topic Recommendations Relationship to Topic Goals**				
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HIST Recommendation 1	Include a chapter on historic and cultural resources in municipal master plans that: recognizes community character; includes provisions for updating resource inventories; and considers the economic and community development potential of protecting local heritage.	• Update and maintain historic resources data in the RPC Geographic Information System. • Encourage the NH Division of Historic Resources to prioritize digitalization of their historic resources inventory data and make these data available to municipalities, regional planning commissions and other state agencies. • Assist communities as resources allow with development of local Master Plan historic resources chapters.	0-5 years, ongoing	NHDHR, RPC and municipalities	high/medium	State,regional and local	S	P	P	P	P
HIST Recommendation 2	Establish Heritage Commissions and/or Historic District Commissions as local champions for the identification, recognition, protection, and management of historic and cultural resources.	• Assist communities on request with the process of establishing Heritage Commissions and/or Historic District Commissions. • Develop Town-Wide Area Forms in those communities that currently lack them, that address historic resources extending into the 20th century.	0-10 years, ongoing	RPC, local historic societies, and municipalities	medium/medium	Local	S	S	S	S	S
HIST Recommendation 3	Expand and promote local and regional educational initiatives focusing on local history to further public understanding of and appreciation for historic resources.	• Encourage collaboration between schools and heritage education organizations, particularly efforts making use of local historic resources as teaching tools, as part of 4th grade New Hampshire history or other curricula. • Utilize local access cable, town websites, mobile applications, markers and other media to convey information on local history and historic resources to residents and visitors	3-5 years, ongoing	RPC, historic societies, and municipalities	medium/medium	Local	P	P	S	P	P
HIST Recommendation 4	Expand local use of innovative land use policies to promote rehabilitation and continued use of historic properties, and ensure new development and redevelopment complement community character.	• Support communities in the implementation of policies such as demolition delay and review ordinances, preservation easements, or form based code. • Support inclusion of allowances for traditional agricultural use in land conservation easements.	3-5 years, ongoing	RPC, regional and local stakeholders, and municipalities	medium/high	Local	S	S	P	S	P
HIST Recommendation 5	Promote local and regional efforts to use historic and cultural resources as economic development tools, including Scenic Byways and local Main Street programs and other heritage tourism initiatives.	• Continue technical assistance to Scenic Byway initiatives in the region, including the NH Coastal Scenic Byway, American Independence Byway, and Robert Frost/Old Stage Coach Scenic Byway. • Assist communities as requested with development of Main Street Programs.	0-25 years	RPC and municipalities	high/medium	Regional and local	P	P	P	P	S
HIST Recommendation 6	Encourage expansion of funding available for historic resources inventory, conservation, rehabilitation, and education initiatives.	• Be proactive in seeking federal, state and private sector funding to support efforts to protect and promote historic and cultural resources and community character. • Advocate at the state level for maintaining and expanding funding for the NH Land and Community Heritage Investment Program (LCHIP). • Encourage local initiatives to dedicate proceeds from the Land Use Change Tax (LUCT) to conservation and preservation purposes.	0-25 years	RPC, regional and local stakeholders, historical societies, and municipalities	low/high	State and local	P	P	S	S	S
HIST Recommendation 7	Build capacity at the Rockingham Planning Commission to assist communities with historic and cultural resources planning	• Educate RPC staff and commissioners on historic and cultural resource issues; designate one staff planner as a historic preservation coordinator. • Participate in biennial regional networking meetings of local Heritage Commissions • Maintain contact with identified historic preservation organizations by membership in order to keep abreast of workshops, conferences and publications. • Maintain close communication with the New Hampshire Division of Historic Resources (DHR) and disseminate materials as developed for and by DHR to communities involved.	0-25 years	RPC	high/medium	Regional	S	S	S	S	S
HIST Recommendation 8	Build community level capacity for the protection and management of historic and cultural resources.	· Encourage and help publicize public program and workshops on issues related to historic preservation directed at both municipalities and private property owners.	3-5 years, ongoing	RPC and municipalities	high/medium	Local	S	S	S	S	S

Implementation Plan

	Recommendation #	Topic Recommendation	Actions	Implementation Timeframe	Implemented By Who?	Level of feasibility or impact (feasibility/impact)	Level of action	Topic Recommendations Relationship to Topic Goals						
		S = Recommendation supports Topic Goal **P = Recommendation partially supports Topic Goal** **N/A = Recommendation does not apply to the Topic Goal** **TBD = Unknown if the recommendation applies to the Topic Goal due to lack of information or unknown future conditions.**		**(0=immediate implementation, 25 years = 2040)**		**(high, medium, low)**	**(federal, state, regional, local)**	**Topic Goal 1**	**Topic Goal 2**	**Topic Goal 3**	**Topic Goal 4**	**Topic Goal 5**	**Topic Goal 6**	**Topic Goal 7**
ENERGY	**ENG Recommendation 1**	Regional strategies for transportation, land use and environment improve energy efficiency, increase renewable energy production and decrease emissions.	• Incorporate cross-cutting energy issues and recommendations from the Transportation, Land Use and Environment Chapters of the Regional Master Plan in RPC's Long Range Transportation Plan. • Work with regional stakeholders and municipalities to align existing and future funding sources to implement cross-cutting energy issues and recommendations from the Regional Master Plan.	0-25 years	State agencies, RPC, regional stakeholders, and municipalities	medium/high	Federal, state, regional, and local	S	P	P	S	P	S	TBD
	ENG Recommendation 2	Evaluate and develop recommendations, in collaboration with the N.H. Coastal Adaptation Workgroup, to incorporate energy planning (sources, availability, efficiency and cost) as a climate change adaptation strategy.	• Evaluate ways municipal zoning, land development regulations and plans might incorporate standards that result in reduction of greenhouse gas emissions. • Identify measures that incorporate energy efficiency and renewable energy sources when retrofitting buildings and infrastructure for purposes of adaptation and resiliency. • Collaborate with state agencies to identify policies and standards to reduce greenhouse gas emissions and vehicles miles travelled, protect lands that provide carbon storage, retrofit buildings and facilities, and improve access to public transportation options in the	0-5 years	State agencies, RPC, regional stakeholders, municipalities, and Climate Adaptation Workgroup	high	State, regional, and local (with support from Climate Adaptatation Workgroup)	P	TBD	S	P	P	S	S
	ENG Recommendation 3	Provide guidance and technical assistance to municipalities to implement energy conservation measures in municipal investments, policies and plans.	• Apply successful strategies and actions from the Energy Technical Assistance Partnership (ETAP) program to municipal investments, policies and plans. • Inform municipalities of federal, state, and non-profit programs to fund energy retrofits and installations for buildings and infrastructure, and development of long range policy and planning actions. • Coordinate with utility companies to provide information to municipalities, residents and businesses on cost-saving and energy efficiency measures. • Prepare Energy Chapters for local Master Plans.	0-25 years	State agencies, RPC, regional stakeholders, and municipalities	high/medium	Federal, state, regional, and local	S	P	S	P	S	P	TBD
	ENG Recommendation 4	Municipalities enable installation of renewable energy sources through zoning, land development regulations and plans	• Engage residents and businesses in discussions about the benefits of renewable energy sources, and challenges in managing their buildings and infrastructure. • Complete an audit of zoning, land development regulations and plans to identify barriers and create incentives for development of local renewable energy sources.	0-5 years	Municipalities	high/medium	State, regional, and local	S	P	P	S	S	P	TBD
	ENG Recommendation 5	Support municipalities to adopt zoning and land use regulations requiring site design and construction methods that maximize energy efficiency in homes, buildings and infrastructure.	• Engage residents and businesses in discussions about energy efficiency and conservation options, cost and availability of energy sources, and challenges in managing their buildings and infrastructure. • Inform municipalities of energy efficiency standards and energy incentives applied successfully in zoning and land use regulations at the local level. • Facilitate collaboration between municipalities and the site design, construction, and renewable energy sectors.	0-5 years	Municipalities	high/medium	State, regional, and local	P	S	S	P	S	P	TBD
	ENG Recommendation 6	Implement recommendations relating to energy from the State Climate Action Plan and 2014 N.H. State Energy Strategy.	• Collaborate with state, regional and non-profit practitioners to implement recommendations that meet goals of the State Climate Action Plan and N.H. State Energy Strategy (2104). • Implement recommendations from the Regional Master Plan that meet goals of the State Climate Action Plan and N.H. State Energy Strategy (2014). • Incorporate goals from the State Energy Strategy in RPC's Long Range Transportation Plan.	0-25 years	State agencies, RPC, regional stakeholders, and municipalities	medium/high	State, regional, and local	S	S	S	S	S	S	S