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Piscataqua Region Environmental Planning Assessment 2015

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PISCATAQUA REGION ENVIRONMENTAL PLANNING ASSESSMENT

2015

An evaluation of environmental planning efforts and land use regulations for the 52 communities in the Piscataqua Region.

PREP
Piscataqua Region Estuaries Partnership

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www.prepestuaries.org

Executive Summary

This is the second assessment of land use regulations and planning practices in our watershed, and provides an important understanding of how we are managing our community's natural resources. Although progress in protecting water quality has been made, management actions are inconsistent across the watershed and even within sub watersheds. In order to protect the places we live, and accommodate growth. It is clear that purposeful coordination and consistency is critical to success in improving water quality and minimizing community costs associated with pollution and impacts from intensifying weather events.

Conserving Land Protecting and managing land in its natural state is the easiest, cheapest and most effective action all communities can take. Conserving land and keeping it natural contributes the most to reducing pollution and the associated costs of treating impaired water. It is clear from this assessment that most important region-wide action needed is to conserve land and increase and manage buffers and setbacks along waterbodies.

Stormwater Management All communities can reduce their treatment costs by working to limit impervious cover in new building and redevelopment projects. Municipalities can begin by placing a cap of no more than 10% on impervious cover for any development efforts coming before town planning boards. Secondly, it is critically important to adopt the model storm water ordinance developed by the Southeast Watershed Alliance and UNH Stormwater Center. Communities also need to begin considering and enacting local regulations requiring water quality assessments for all new proposed development, based on a consistent measurement tool currently being developed by DES and UNH SWC.

PREP's Promise To work with partners in continuing to build the toolbox for communities to accomplish these important efforts, and to support efforts to adopt and implement best practices. Dealing with the issues of water pollution, stormwater, climate change and growth is an on-going challenge, but done together in a targeted and purposeful way, we can accomplish gains in improving water quality, keeping costs down and maintaining what is truly special about our region.

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Purpose and Methodology

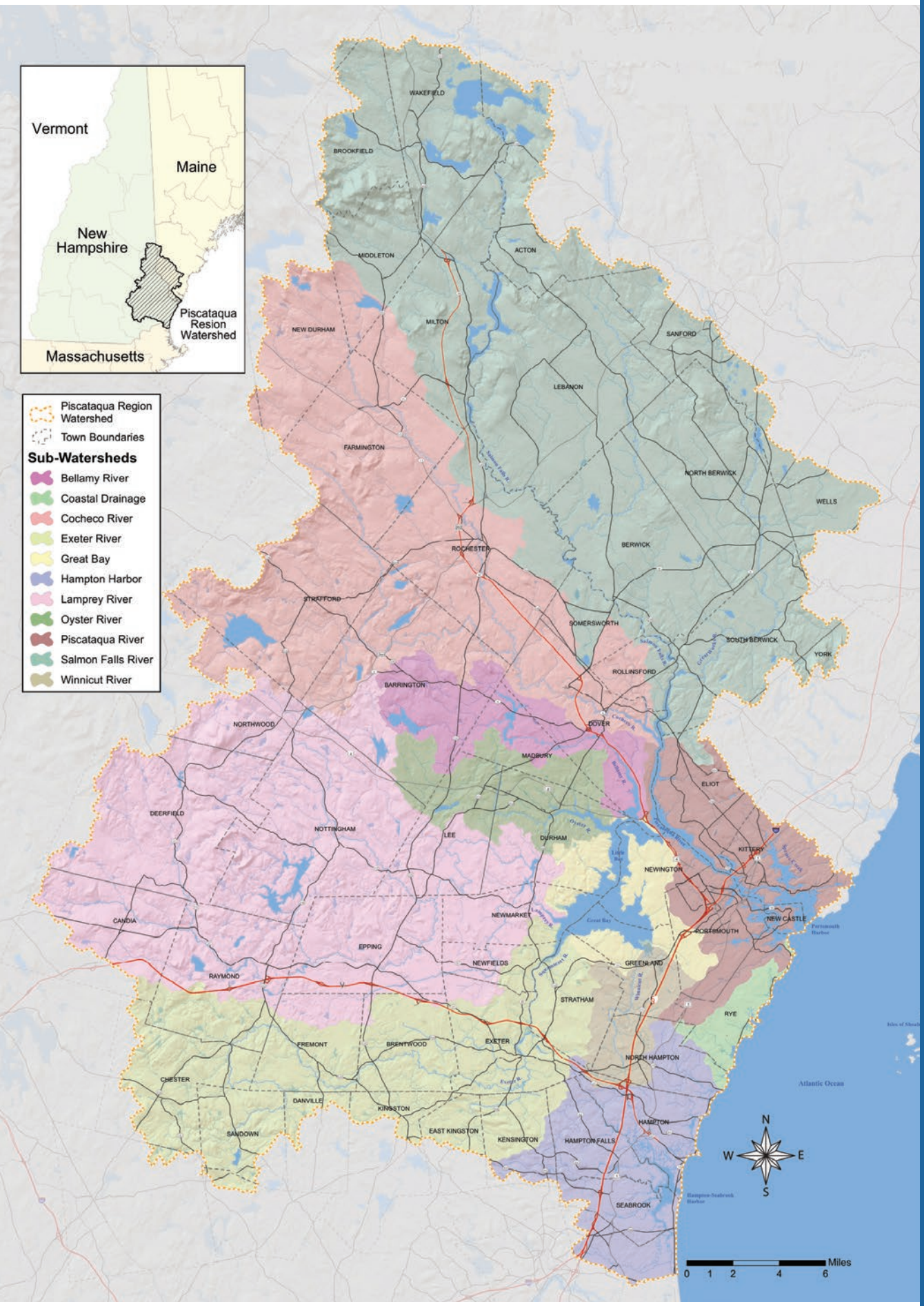
The initial Piscataqua Region Environmental Planning Assessment (PREPA) was first completed in 2010 (http://scholars.unh.edu/prep/36/) to document the current status of environmental planning efforts and land use regulations for each of the 52 municipalities (city and town governments) in the Piscataqua Region watershed. The assessment involved the analysis of questions associated with both regulatory and non-regulatory approaches to resource management.

The 2015 PREPA is designed to provide an updated information base to inform ongoing and emerging planning and environmental protection efforts, and to identify gaps and inconsistencies in the standards of environmental protection reflected in the current ordinances, development regulations, and natural resource protection strategies in each of the 52 municipalities. The 2015 PREPA also gathered information on municipal land use policies and adaptation planning strategies designed to mitigate the impacts of climate change on the Piscataqua Region watershed. Data were collected and are current as of Fall 2014.

The 2015 PREPA builds on the database of information collected from the first assessment in 2010. PREP, NH Department of Environmental Services, and four regional planning commissions in New Hampshire and Maine developed an updated questionnaire to collect information on local programs, policies, and regulations designed to protect water quality and ecosystems, and prepare for the impacts of climate change in the Piscataqua Region.

Staff from Southern Maine Regional Planning Commission, Strafford Regional Planning Commission, Rockingham Planning Commission and Southern NH Regional Planning Commission worked with local officials in the 52 communities to complete the questionnaire. Municipal master plans, zoning ordinances, subdivision and site plan review regulations, natural hazard mitigation plans, open space plans, natural resource inventories, and climate change vulnerability assessments were reviewed to gather information. PREP staff worked with analysts from Truslow Resource Consulting and the planning commissions to ensure the information collected was as accurate as possible and then compiled it into a database and analyzed for regional trends.

To present the overall findings for each of the major themes report cards were created. Each report card is calculated based on the responses to the topic associated questions, and what percentage of those responses attained the minimum protective standards suggested by NHDES or PREP. Answers to all of the questions from the assessment forms can be found online at www.prepestuaries.org/prepa.



PISCATAQUA REGION WATERSHED

Rivers flowing from 52 communities in New Hampshire and Maine converge with the waters of the Atlantic Ocean to form the Great Bay and Hampton-Seabrook estuaries. The watershed covers 1086 square miles. These bays provide critical wildlife habitat, nurseries for seafood production, buffering from coastal flooding, recreational enjoyment, and safe harbor for marine commerce. Our estuaries are part of the National Estuary Program, and recognized broadly as exceptional natural areas in need of focused study and protection.

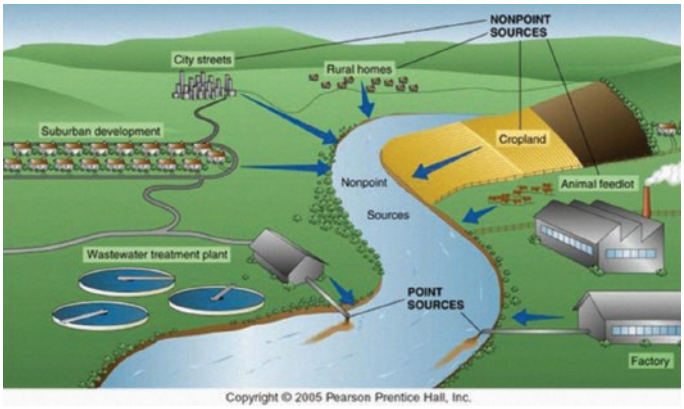
Glossary

Great Bay Estuary

The body of water beginning at the confluence of the Piscataqua River with the Atlantic Ocean and extending to the head-of-tide dams on Winnicut, Squamscott-Exeter, Lamprey, Oyster, Bellamy, Cocheco, Salmon Falls, and Great Works Rivers. The Great Bay Estuary covers approximately 13,440 acres (21 square miles).

Piscataqua Region Watershed

The area of land where all of the water that drains off of it goes into either Great Bay Estuary or the Hampton-Seabrook Estuary. Piscataqua Region Watershed contains 42 towns in New Hampshire and 10 towns in Maine and covers 1,086 square miles. **(See map on previous page)**



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Point source pollution

Pollution that comes from a single drainage pipe and enters into a water body. Point source pollution is commonly associated with wastewater treatment plants that release effluent into a river or other water body. **(See pages 6-7)**

Non-point source pollution

Pollution that generally results from land runoff, precipitations, atmospheric deposition, drainage, seepage, or hydrologic modification. Pollution running off a landscape increases as impervious cover/development increases. **(See pages 6-7)**

Impervious Cover

Hard surfaces that cover the ground and prevent rain and melting snow from soaking into the soil, such as the roofs of houses and buildings, roads, and parking lots. Increased impervious cover within a community allows more pollutants, sediments, and organic matter to reach neighboring water bodies. Effective Impervious Cover (EIC) refers to those surfaces directly connected to waterbodies. **(See pages 8-9)**

Atmospheric Deposition

The process by which a pollutant in the atmosphere falls to land or surface waters through either wet or dry deposition. Wet deposition occurs when the pollutant is contained in rain or snow. Dry deposition occurs when the pollutant is attached to aerosols that fall to the earth.

Buffers

A strip of vegetated land between a water body and adjacent upland maintained in permanent vegetation (trees, shrubs, and/or grasses) and free from agricultural or urban encroachment. **(See pages 14-15)**

- **Vegetated buffer:** areas of natural or established vegetation allowed to grow with minimal to no maintenance. These are the most protective buffers.
- **Managed buffer**: managed areas may allow tree thinning, landscaping, and some accessory structures (sheds, swing sets), but should support a well distributed cover of trees, shrubs, and groundcover within the buffer area.

Illustration by Ellis, J.H. (2008)

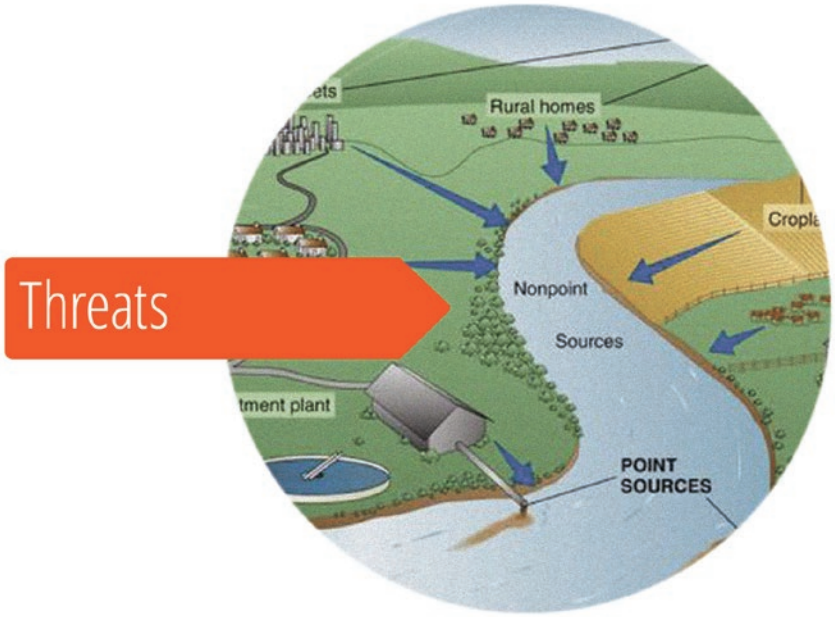
Setbacks

A municipal regulatory tool used to protect existing and potential lands from future encroachment. Setbacks and buffers should be used in conjuction to achieve necessary protections for clean, healthy watersheds. **(See pages 18-19)**

Stream Order

Stream size is organized in a numbered order. Streams of a higher number order are larger than those of a lower number order. Rivers are examples of higher order streams, typically 3rd or 4th order.

PISCATAQUA REGION ENVIRONMENTAL PLANNING ASSESSMENT



This section explores PREP's and partners' research and data about the threats facing the Piscataqua Region estuaries.

Nitrogen Loading

What & Why Nitrogen is a nutrient that is essential to life in the estuaries. However, scientific understanding of estuaries is that high levels of nitrogen may cause problems like the excessive growth of plants and algae. When the plants die, oxygen needed by fish is pulled out of the water by decomposers and can cause fish to suffocate. The rapid plant growth can also shade or smother underwater eelgrass meadows and other important habitats, limiting important functions such as providing food and shelter and cleaning the water. Excess nitrogen is a problem across the US and around the world.

How It Happens

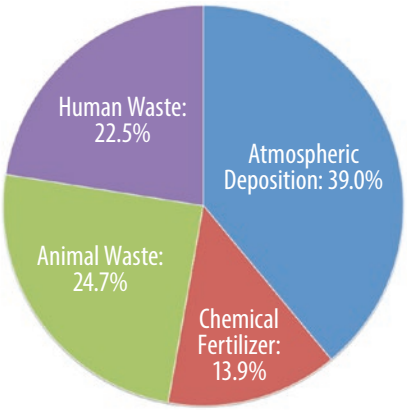
NON-POINT SOURCE POLLUTION Nitrogen enters the bay primarily in two ways. First, nitrogen from fertilizers from lawns and farms, septic systems, animal wastes, and air pollution or atmospheric deposition from the whole watershed is carried into the bay through rain and snowmelt runoff, river flow, and groundwater flow, this is called Non-Point Source Pollution. These sources account for 70% of the nitrogen entering our system.

When the plants die, oxygen needed by fish is pulled out of the water and can cause fish to suffocate.

POINT SOURCE POLLUTION Second, there are 18 municipal sewer treatment plants that discharge treated wastewater out through pipes either into the bay or into rivers that flow into the bay, this is called point-source pollution.

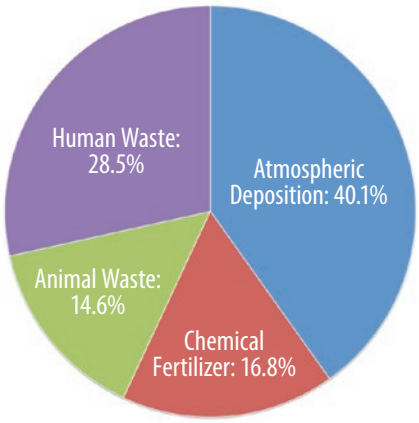
The graphs from the recently released Great Bay Nitrogen Non-Point Source Study from NHDES (pg. 7), break down Nitrogen loading to the bay from non-point sources by subwatershed. For more detailed graphs of non-point source pollutant loads by town, source and pathway visit **http://des.nh.gov/organization/divisions/water/wmb/coastal/documents/gbnnpss-report.pdf**

THREATS: NITROGEN LOADING



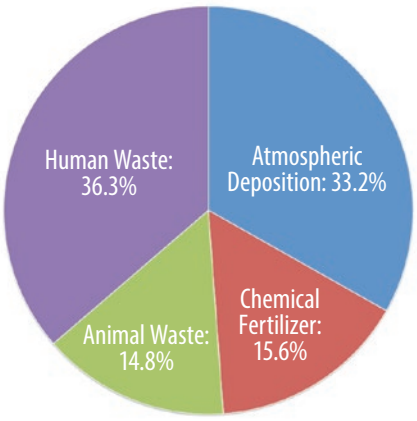
OYSTER & BELLAMY RIVERS WATERSHEDS

Figure 1.1 Breakdown of nitrogen inputs to the Oyster River/Bellamy River Watersheds.



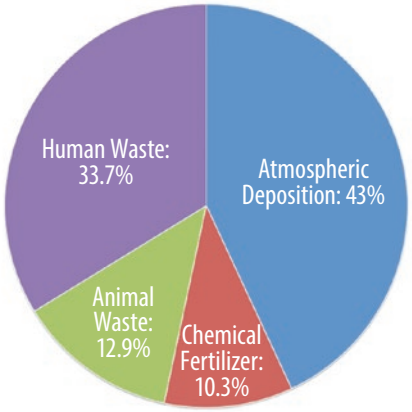
COCHECO RIVER WATERSHED

Figure 1.2 Breakdown of nitrogen inputs to the Cocheco River Watershed.



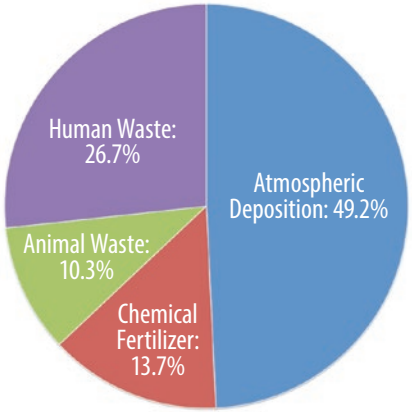
EXETER & SQUAMSCOTT RIVERSWATERSHED

Figure 1.4 Breakdown of nitrogen inputs to the Exeter-Squamscott River Watershed.



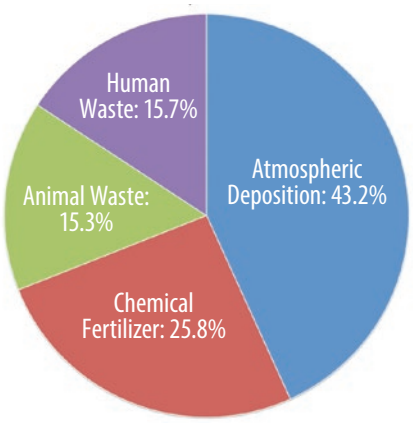
LAMPREY RIVER WATERSHED

Figure 1.3 Breakdown of nitrogen inputs to the Lamprey River Watershed.



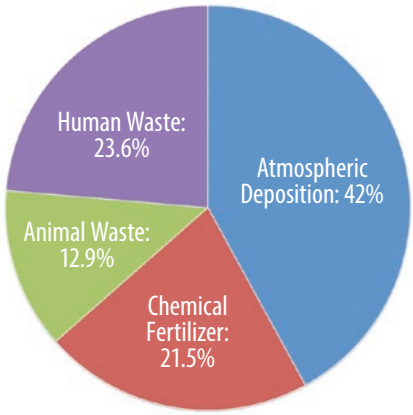
SALMON FALLS RIVER WATERSHED

Figure 1.5 Breakdown of nitrogen inputs to the Salmon Falls River Watershed.



HAMPTON-SEABROOK WATERSHED

Figure 1.6 Breakdown of nitrogen inputs to the Hampton-Seabrook Watershed.



WINNICUT & COASTAL WATERSHED

Figure 1.7 Breakdown of nitrogen inputs to the Winnicut/Coastal Watershed.

"The purpose of the study was to "open up the box" and estimate both from where and from what activities does the 70% non-point source nitrogen originate. The intended use of this study is for planning purposes. The results of the model may be useful for towns or watershed groups for prioritizing nitrogen reduction efforts or as a starting point for more detailed studies of non-point sources. So far, I am quite pleased by how the report has been received and used. It is generating the conversation that we hoped it would."

Ted Diers, Watershed Management Bureau
NH Department of Evironmental Services

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Data source: NHDES Great Bay Nitrogen Non-Point Source Study, 2014. Nitrogen measured in pounds per year.

Impervious Cover

What & Why Impervious surfaces are paved parking lots, roadways, and roofs. During rain storms and snow melt, water running off of impervious surfaces carries pollutants and sediments into streams, rivers, lakes and estuaries. To keep waters clean, impervious surfaces should be a low percentage of the total amount of land area of the watershed basin.

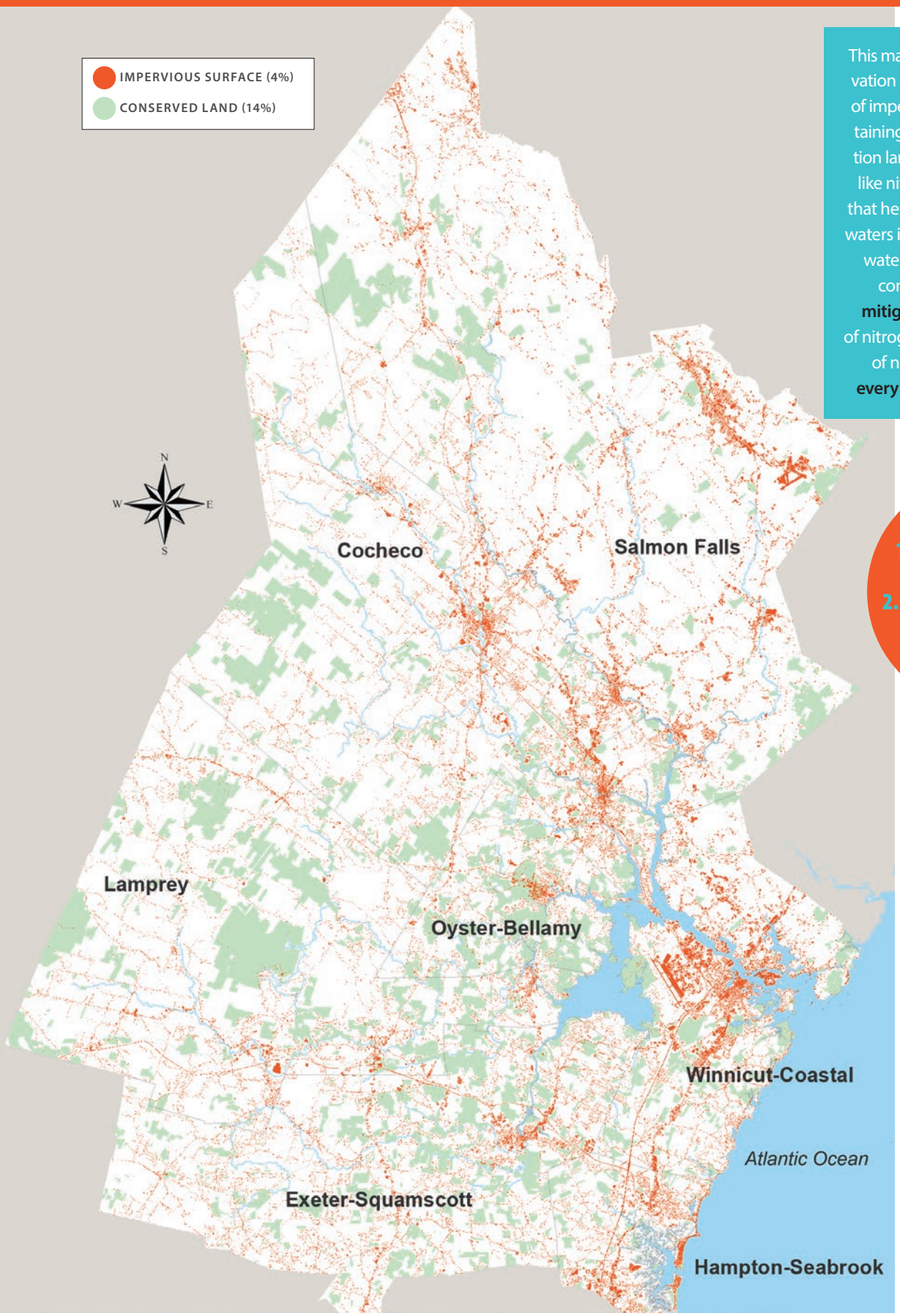
Why It Matters

Pollutants like lawn fertilizers, road salts, pet waste, car fluids and litter end up on impervious surfaces. When it rains, instead of soaking in like it might in a forest, the rain runs off and it picks up all the polllutants and delivers them to the nearest waterbody. Impervious cover can also increase the velocity and volume of water during rain and snowmelt events leading to flash flooding. With the projections of increased rains due to climate change, this is a great concern. PREP has been tracking impervious surfaces in the Piscataqua Region since 1995.

Within the last 20 years impervious surface covering the Great Bay Watershed has increased from 28,695 acres in 1990 to 63,241 acres in 2010. Overall, the population for the 52 municipalities in the watershed has grown by 19% from 316,404 in 1990 to 377,427 in 2010. During this same period, the total impervious surfaces within the towns grew by 120%. **Therefore, the rate of increasing impervious surfaces has been six times the rate of population growth.**

A great deal of research has shown that when 10% or more of the land area of a watershed is covered with impervious surfaces, water quality becomes impaired.

THREATS: IMPERVIOUS COVER



This map shows the acreage of conservation land (in green) and the acreage of impervious cover (in orange). Maintaining a balance between conservation land that can **soak up pollution**, like nitrogen, and impervious cover that helps **deliver pollution** to surface waters is essential to maintaining clean water in our estuaries. In addition, conservation land can help to **mitigate atmospheric deposition** of nitrogen which is the primary source of non-point source nitrogen in **every subwatershed in our region.**

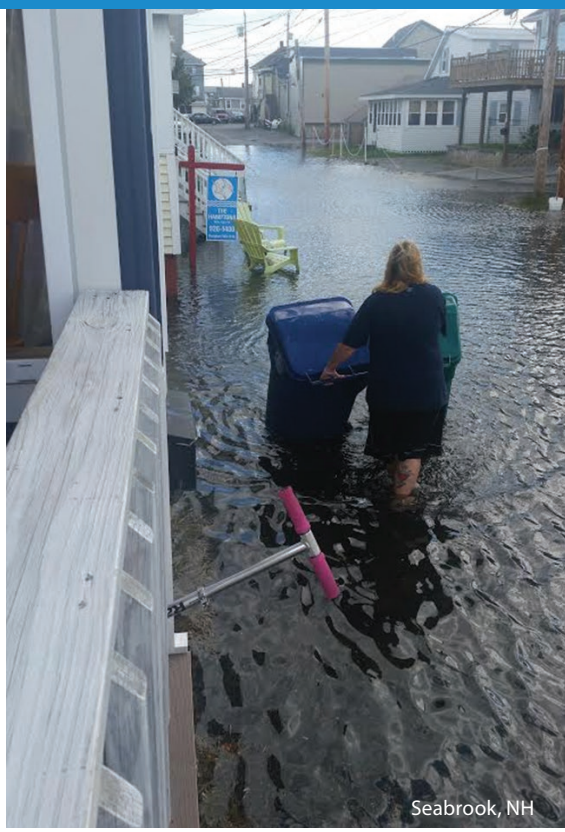
PREP'S GOALS

1. Conserving 20% of the watershed by 2020.
2. No increase in the number of watersheds & towns with >10% impervious cover.

Note: High resolution impervious surface mapping was not available for Brookfield and Wakefield, New Hampshire and communities in Maine. Lower resolution mapping was used for these communities.

Climate Change


Seabrook, NH, photo by Maren-Bhagat


Seabrook, NH

What & Why New England's climate is changing, and the best available scientific information indicates that climate change impacts such as sea level rise, increasing temperatures, and more frequent severe storm events are likely to increase throughout the next century. These major changes to climate and weather events will substantially affect water quality, wildlife habitat, and human communities in unprecedented ways.

Why It Matters

New Hampshire's coastal climate, specifically, is expected to continue warming as a result of increasing carbon emissions from human activities. With warming comes increased precipitation and frequency of precipitation events, rapid and increasing snowmelt, coastal flooding, and relative sea level rise (Wake et al., 2011).

These major changes to climate and weather events will substantially affect water quality, wildlife habitat, and human communities in unprecedented ways. An additional challenge associated with changing weather patterns includes PREP's ability to collect and interpret data to understand the health and changes in our estuaries. As we experience more 'unusual' weather events, the following are a few examples of what may become more difficult to understand and plan management strategies for

- Increasing precipitation events that wash higher levels of pollutants and nitrogen into the system,
- Observing changes in salt marsh migration and how our marshes are responding to these events,
- Warming of waters that allow for the growth of vibrios and possibly other diseases such as MSX and Dermo (both oyster diseases),
- Appearance and growth of invasive species such as nuisance macroalgaes

Climate change impacts are likely to contribute additional stress to coastal habitats that we are working to conserve and restore.

With these unusual weather events and patterns growing more regular, the significant impacts associated with them make the data inconsistent from year to year (less stable and more varied). That in turn makes it harder to identify trends and changes.

Predicted Impacts

Beyond changing the climate in the Piscataqua Region, climate change impacts are likely to contribute additional stress to coastal habitats that we are working to conserve and restore. For instance, increased frequency and intensity of precipitation events will in turn transport additional non-point source pollution to our waterways negatively affecting water quality, eelgrass beds, and oyster reefs. Communities have an opportunity to begin—or continue—planning for these predicted changes through local zoning laws or other town legislation (Wake et al., 2011).

PREDICTED IMPACTS	
Precipitation (Frequency and Intensity)	↑
Snowmelt	↑
Snow accumulation	↓
Coastal flooding (frequency and intensity)	↑
Sea Level Rise	↑

King Tide at Seabrook Beach, NH photo by Ron Sher

Climate Change and New Hampshire's Economy

Climate change is fundamentally changing what it means to live in New England. Increased coastal flooding and extreme weather events are going to stress not only the natural resources in the Seacoast, but also infrastructure. Seacoast residents are all too familiar with increased flooding, and this trend is expected to continue.

In addition to flooding risks, the increased temperatures and precipitation are expected to negatively impact winter tourism in New England. In a study conducted by the Natural Resource Defense Council in December 2012 it was estimated that during the 2010 season the winter tourism industry in New Hampshire supplied jobs for nearly 8,000 employees and $259 million in wages adding a value of $451 million to the New Hampshire economy[1].

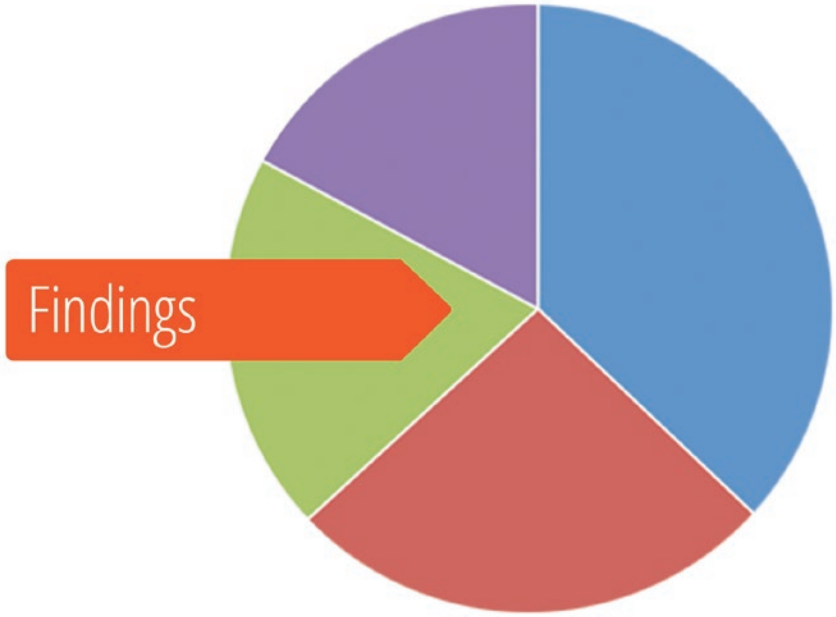
"Most seacoast area businesses have no plans for how they'd rebound from the impacts of a natural disaster, yet admit they'd lose their customer base in as little as three weeks if they remained down. Given 25 percent of New Hampshire's workforce lives in the Seacoast region and given the prospect for sea level rise and more frequent and severe flooding , a bright future for people, property and prosperity depends on moving from response to resilience. If its not on paper, you don't have a plan."

Roger Stephenson,
PREP Management Committee

1 Natural Resource Defense Council and Protect Our Winters December 2012
http://protectourwinters.org/climate_report/report.pdf

Hampton-Seabrook Marsh, NH

PISCATAQUA REGION ENVIRONMENTAL PLANNING ASSESSMENT



This section features a series of report cards that are calculated based on the responses to the assessment questions regarding the topics of freshwater wetlands, shoreland protection, stormwater management and climate change and what percentage of those responses attain the minimum protective standards suggested by NHDES or PREP.

Freshwater Wetlands

Freshwater ducklings photo by Kristin Burchsted

Freshwater Wetland The quality of shoreline habitat may be the single biggest influence on the abundance and variety of wildlife that live in or around a water body. High quality shoreland buffers are characterized by bushes, trees, sedges, and other plants rooted in the soil abutting water bodies. Freshwater wetlands are the most threatened habitats in our watershed.

What Freshwater Wetlands Do for Us

STORAGE	Store large quantities of water for low flow periods in rivers during droughts
HABITAT	For wildlife, birds & plants
FOOD	For wildlife, birds, insects & invertebrates
PROTECTION	Provide flood storage during heavy rains and rapid snow melt
FILTRATION	Filters and traps polluted sediments to help maintain clean, drinkable, fishable and swimmable waters
DRINKING WATER	Releases water in low flow periods into rivers to allow for sustainability of drinking water sources

The Islinglass River runs from Strafford through Barrington and Rochester to meet the Cocheco River in Dover, NH

NO VEGETATION DISTURBANCE BUFFERS

The most protective. Undisturbed natural forest cover provides maximum water quality filtering and wildlife benefits.

Photo by Luca Barone

MANAGED BUFFERS

These managed areas may allow limited tree thinning, landscaping, and some accessory structures (sheds, swingsets), but should support a well distributed cover of trees, shrubs, and groundcover within the buffer area.

What's at Risk

Filling, ditching and changing hydrology to allow for buildable land is still quite prevalent and leaves these wetlands vulnerable to degradation. Polluted stormwater runoff from developed areas such as lawns, parking lots, driveways and buildings adjacent to wetlands can impact the hydrology, plant community and habitat of freshwater wetlands.

What Can Help

Enacting an enforced **buffer of vegetated, undisturbed land surrounding the wetland** is the best way to protect water bodies from pollution and degradation and to allow for the wetlands to continue to filter water, store water and provide food and habitat for wildlife. Given the abundance of wetlands in many Seacoast communities, a full 100' minimum disturbance buffer on all wetlands may be difficult to achieve, especially in the developed areas. However, even a 25' or 50' buffer provides significant environmental benefit as opposed to a lawn or parking lot immediately adjacent to a wetland. Recent research conducted in the PREP region shows strong support by residents and homeowners for towns to increase buffers in order to protect and improve water quality and wildlife habitat (Johnston 2013).

Identifying and designating the highest functioning wetlands as **Prime Wetlands** in a community is important to help protect those areas of greatest ecological health and significance. Prime wetlands have greater protections under RSA 482-A:15[1]

What Science Says

The New Hampshire Wildlife Action Plan, UNH Cooperative Extension and the NH Department of Environmental Services suggest that a 300 foot buffer of upland, unimpacted by development (no paved roads, buildings, driveways, etc.) protects water resources and habitat for many species. However, New Hampshire Fish and Game suggests that the highest-quality wetlands are typically at least 1000 feet from houses, roads, driveways and trails and surrounded by intact vegetation.[2]

"Buffers are a critical conservation practice that the Natural Resources Conservation Service (NRCS) actively promotes. Buffers provide many benefits including; streambank stabilization, slow water runoff, trap sediment, reduce noise and odors, trap fertilizers and pesticides, provide food and nesting for wildlife, among others. Buffer installation, in conjunction with land protection, provides significant resource improvement for New Hampshire's lands, waters, and wildlife."

Rick Ellsmore
State Conservationist, USDA - NRCS

[1] http://des.nh.gov/organization/divisions/water/wetlands/prime_wetlands.htm
[2] http://extension.unh.edu/Marsh-and-Shrub-Wetlands

Freshwater Wetlands Report Card

Assessment Questions About Freshwater Wetlands

Does the municipality have designated "prime" wetlands (NH) or "significant" wetlands (ME), and adopted local regulations to protect these wetlands? Note: If the municipality does not have any of these types of wetlands then the question is not counted in the overall score.

Do municipal regulations offer explicit protection of vernal pools?

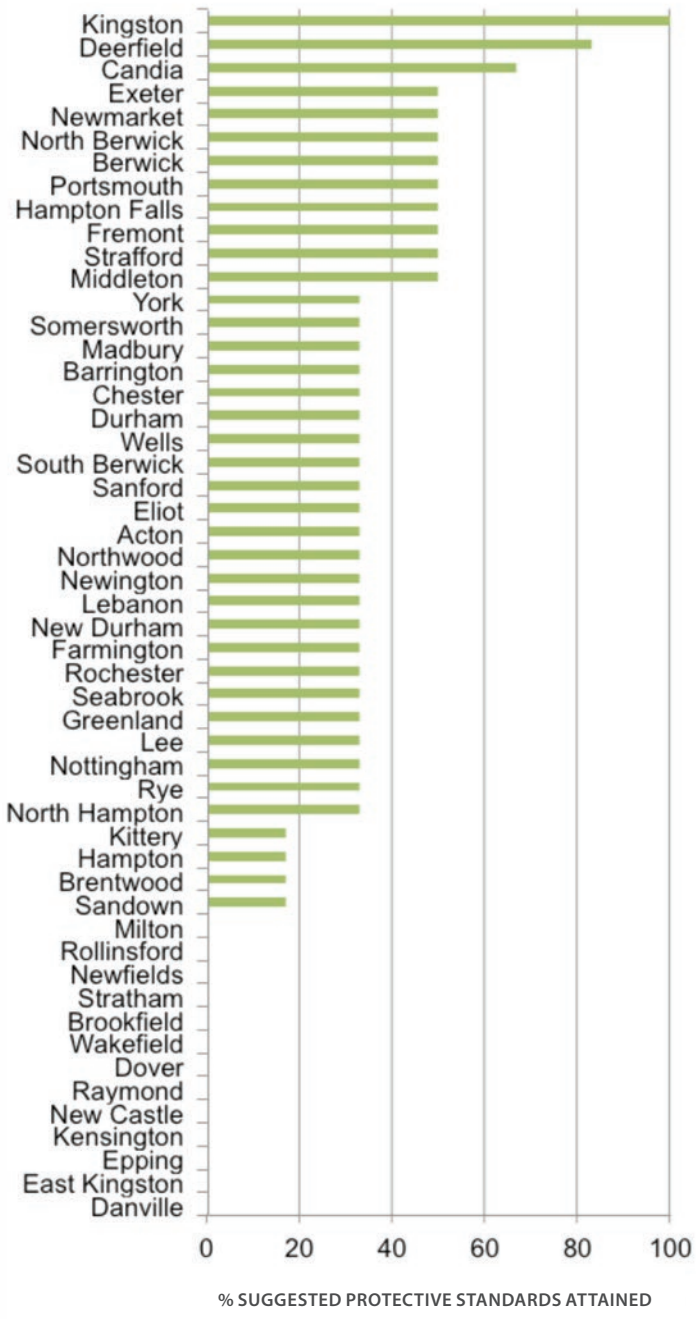
Does the municipality have a No soil disturbance or No Vegetation Disturbance buffer requirement that is >= 100 feet?

Does the municipality have a Building Setback requirement that is >= 100 feet?

Does the municipality have a Fertilizer Application Setback requirement that is >= 100 feet?

Visit www.prepestuaries.org/PREPA/ to see all results

RESULTS BY TOWN



This report card is calculated based on the responses to six questions regarding freshwater wetland protection, and what percentage of those responses attain the minimum protective standards suggested by NHDES or PREP.

FINDINGS: FRESHWATER WETLANDS

46% OF MUNICIPALITIES IN THE PREP REGION HAVE NO REGULATIONS RESTRICTING THE DISTURBANCE OF VEGETATED BUFFERS ALONG WETLANDS.

75% OF MUNICIPALITIES HAVE NO REGULATIONS RESTRICTING OR PREVENTING THE APPLICATION OF FERTILIZERS ALONG WETLANDS.

71% OF MUNICIPALITIES ALLOCATED FUNDS COLLECTED FROM THE LAND USE CHANGE TAX TO LAND CONSERVATION. THE PERCENT OF THESE COLLECTED FUNDS ALLOCATED ANNUALLY FOR CONSERVATION RANGES FROM 13-100%.

Painted Turtle in a wetland photo by Chris Keeley

See Glossary on page 4 to learn the difference between Buffers and Setbacks.

2% OF MUNICIPALITIES IN THE WATERSHED HAVE ADOPTED REGULATIONS RESTRICTING THE APPLICATION OF FERTILIZER ADJACENT TO WATERBODIES, AND ONLY HALF OF THESE COMMUNITIES REQUIRE A 100' BUFFER.

Did You Know?

The State of New Hampshire has a statute that enables towns to designate wetlands as **PRIME WETLANDS** and as such they are subject to greater protections. Learn more here: http://des.nh.gov/organization/divisions/water/wetlands/prime_wetlands.htm

Shoreland Protection

Durham Point, Durham NH, Photo by John Carroll

Vegetated Shorelands A naturally vegetated shoreland buffer (often referred to as a "riparian" buffer) typically includes the natural floodplain of a stream or river, and may encompass upland and wetland areas. Shorelands also include those areas adjacent to beaches, ponds and lakes.

What Shorelands Do for Us

SHADE	Keep rivers and streams cool to protect habitat for colder fish species like brook trout
HABITAT	For birds, wildlife & plants, they are important breeding grounds for fish, turtles and insects and nesting grounds for birds.
NUTRIENT RETENTION	The plants, shrubs and trees alongside a stream or river can take up and use excess nitrogen and phosphorus before it reaches the water.
STABILIZATION	Of soil, sediment and small plants to prevent erosion. It helps keep lakes, ponds and rivers clean and not muddy.
DRINKING WATER	The plants and ground soak up water, filter it and refill underground aquifers for drinking water
PROTECTION	Of property, life and lands from floods, storm surges and polluted waters
ENJOYMENT & PROPERTY VALUES	From the land, it allows a natural and quiet place to view the water, to fish, to walk. From the water it allows for views of natural shoreland surrounded by trees and solitude. Waterfront properties are worth more with pristine waters than with muddy, degraded waters.

What's at Risk

From ponds to lakes, to streams and rivers, and salt marshes, bays and beaches, strong local land use regulations protecting shorelands are critical to protecting the long-term water quality of the Piscataqua Region's surface waters. Salt marshes have been shown to be critical carbon sinks and capable of adjusting to gradual changes in sea level. Coastal salt marshes have been proven to be critical in protecting communities from coastal storms and surges. Building, development and other land use practices can impact natural buffers and decrease their ability to hold back sediment and floodwater, filter pollution and help soak up storm water. Erosion of unvegetated or sparsely vegetated buffers can increase the sediment and cloudiness of lakes of rivers. As wetland boundaries – both marsh and coastal – change and as storm surges increase with climate change, shoreland buffer protection is increasingly important.

What Can Help

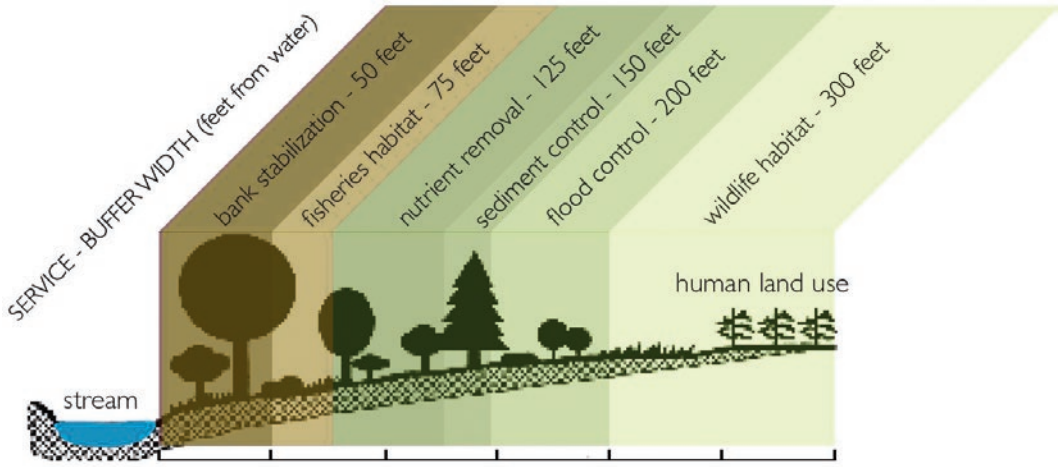
Enacting an enforced setback of all buildings, septic systems and fertilizer application from all ponds, lakes, streams, rivers and coastlines. Allowing for undisturbed, vegetated buffers of at least 100 feet on all water bodies, big or small have the best impact. **Small stream tributaries usually make up the majority of stream miles in a watershed and have a direct impact on the water quality of the larger river segments and are the most vulnerable due to lack of local protection regulations.**

Illustration by Ellis, J.H. (2008)

What Science Says

There is no one magic number at which a shoreland buffer is "wide enough" to meet all environmental objectives - generally speaking, bigger is better when it comes to protecting water quality and maintaining wildlife habitat. Buffers of less than 35 feet have not been found to sustain long-term protection of aquatic communities. A fertilizer application setback of 100 feet is the surest way to keep the nutrients from leaching into waterbodies and causing algae growth. The figure below provides a summary of the environmental services provided by different buffer widths.

See Glossary on page 4 to learn the difference between Buffers and Setbacks.



Source: adapted from Connecticut River Joint Commission, 2000.

Shoreland Protection Report Card

Assessement Questions About Shoreland Protection 1st Order Streams (see glossary on page 4 for definition)

Does the municipality have a No Vegetation Disturbance or Managed buffer requirement that is >= 75 feet?

Does the municipality have a Septic Setback requirement that is >= 100 feet?

Does the municipality have a Primary Structure Setback that is >= 100 feet?

Does the municipality have a Fertilizer Application Setback requirement that is >= 100 feet?

Assessment Questions About Shoreland Protection 2nd-4th Order Streams and Lakes/Ponds (see glossary on page 4 for definition)

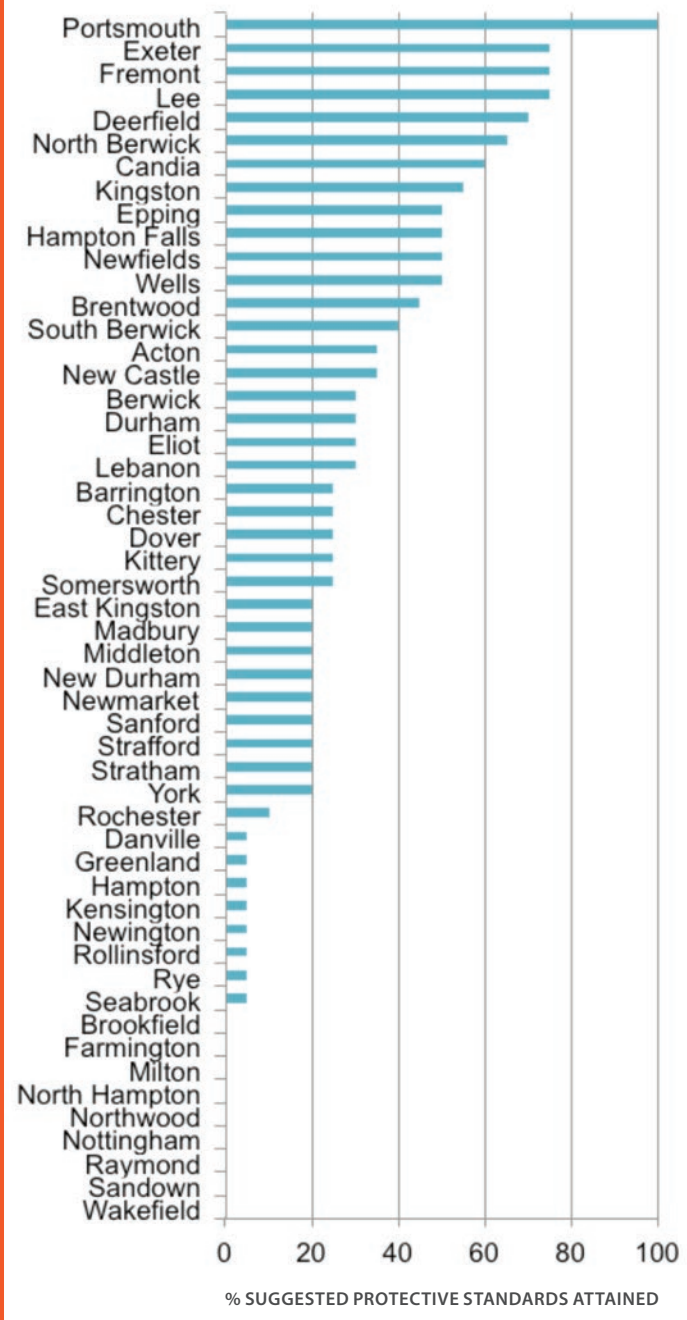
Does the municipality have a No Vegetation Disturbance or Managed buffer requirement that is >= 100 feet?

Does the municipality have a Septic Setback requirement that is >= 100 feet?

Does the municipality have a Primary Structure Setback that is >= 100 feet?

Does the municipality have a Fertilizer Application Setback requirement that is >= 100 feet?

RESULTS BY TOWN



Visit www.prepestuaries.org/PREPA/ to see all results

This report card is calculated based on the responses to twenty questions regarding Shoreland Protection on 1st through 4th order streams and lakes/ponds, and what percentage of those responses attains the minimum protective standards suggested by NHDES or PREP. Note: Tidal Shoreland Protection was not included in this report card because not all towns have tidal shoreland.

FINDINGS: SHORELAND PROTECTION

63% OF MUNICIPALITIES HAVE NOT ADOPTED REGULATIONS REQUIRING NO DISTURBANCE OF VEGETATED BUFFERS ALONGSIDE STREAMS, PONDS, AND LAKES.

83% OF MUNICIPALITIES REQUIRE SETBACKS FOR SEPTIC SYSTEMS FROM WATERBODIES; 52% OF MUNICIPALITIES REQUIRE SEPTIC SYSTEMS TO BE SETBACK AT LEAST 100' FROM WATERBODIES.

THE PERCENTAGE OF LAND CONSERVED IN EACH TOWN RANGES FROM 2-30%.

[Note: PREPA indicates Durham has 43% land conserved but this is not accurate because the figure includes UNH lands which are not permanently conserved.]

57% OF MUNICIPALITIES HAVE ADOPTED REGULATIONS TO MANAGE AND PROVIDE LIMITED PROTECTION FOR VEGETATED BUFFERS ALONG SHORELAND.

Stonehouse Pond, Barrington, NH

"One thing we have learned over the past several decades since the Clean Water Act was passed is that what we do on land profoundly affects water quality. If we are to preserve and protect our fresh, estuarine and marine waters (and by extension the animals and plants that live in them), we need to separate our activities on land from receiving waters using buffers. A gentle slope of well-vegetated upland 100 feet away from an open water body or wetland will capture much of the potential pollutants running off our developed areas. "

Dr. David Burdick,
University of New Hampshire

87% OF MUNICIPALITIES REQUIRE SETBACKS FOR PRIMARY STRUCTURES FROM WATERBODIES; 27% REQUIRE THESE STRUCTURES TO BE SETBACK AT LEAST 100'.

Stormwater Management

Treebox filter and erosion control at UNH Jackson Estuarine Lab, on the shores of Great Bay

Stormwater Management Stormwater contributes to over 90% of the surface water quality impairments in New Hampshire. Increased regulations and permitting at the federal level are quickly bringing stormwater management to the forefront in many Piscataqua Region communities. Local efforts can make a big difference when combating the impacts from stormwater pollution.

What's in Stormwater

SOILS	Rain and snowmelt run off and pick up dirts and soils along their way
OILS	From oil leaks in cars and spills around the house or gas station
NUTRIENTS	Nitrogen from the atmosphere comes in the form of rain and snow.
BACTERIA	Waste from pets, livestock and wildlife as well as failing septic systems contains bacteria and when rain and snowmelt run across the ground it picks up waste left behind.
CHLORIDES	Found in road salts and other deicing materials that are applied to roads, highways, parking lots and driveways, what's left behind can get picked up by stormwater and cause a salinity increase in rivers and streams.
TOXIC CONTAMINANTS	Motor oil, gasoline, pesticides and herbicides are picked up by runoff and delivered to area streams and rivers.

What's at Risk

As more and more acres of forest and farmland are converted to impervious surfaces (roads, parking lots, roofs, etc.), rain and snow melt is much more likely to pick up contaminants and transport them directly to streams, rivers, lakes, and estuaries. Conventional development practices and patterns have increased the volume and pollution load of stormwater runoff in Piscataqua Region watersheds. As the population of the watershed has grown dramatically in the last 20 years, development has created new impervious surfaces at an average rate of nearly 1,500 acres per year. Many stormwater management systems designed to control some runoff are not always able to handle the large storm events that New Hampshire has experienced over the last several years and communities are facing increasing costs from failures of these systems (e.g. culverts, bridges, swales, etc.)

Additional stormwater pollution effects:

- Muddy streams from erosion and increased soils and sediments.
- Fish kills and harm to aquatic life, like eelgrass and oysters from increased nutrients and cloudy waters.
- Cloudy, discolored water, surface sheens and build-up from toxic contaminants.
- Algae blooms from excess nutrients.

What Can Help

Undeveloped land in a natural state provides excellent protection of water quality so land conservation is the best and most effective tool to helping reduce stormwater pollution. Adopting ordinances and regulations for new development that mandates the use of stormwater filtration practices to clean runoff, and infiltration practices to reduce runoff is another very effective thing communities can do. In addition requiring improved stormwater controls for reducing runoff for redevelopment projects or other significant construction.[3]

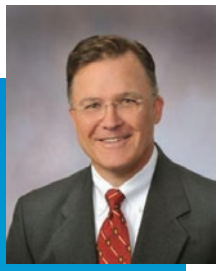
If communities can make a long-term commitment to fund and maintain stormwater controls along with an accounting mechanism to track long-term benefits of strategies they can plan better and be more proactive. Consider innovative funding mechanisms such as impacts fees, exaction fees and stormwater utilities to help build funding in a community.

What Science Says

Replicating nature wherever possible is the best action. Instead of paving with impervious surfaces, creating spaces and places that allow the stormwater to soak in and filter is the best way to combat stormwater pollution. Implementing low impact development and green infrastructure standards in a community is a cost-effective way to keep more water on site, remove pollutants and help alleviate flooding. Green infrastructure uses natural "green" methods to help reduce problems associated with stormwater runoff. Examples include shrub and tree buffers along streams, engineered systems that treat runoff by infiltrating or filtering the water on site, incentives or education to encourage homeowners to protect soil and water, or regulations that require better stormwater control for new construction.

[3] http://southeastwatershedalliance.org/wp-content/uploads/2013/05/Final_SWA_SWStandards_Dec_20121.pdf

[4] http://southeastwatershedalliance.org/green-infrastructure



"We possess the tools and know-how to address the technical issues [of stormwater]; however, the greater challenge is in educating the public about the role individual properties play in the stormwater runoff problems, and the responsibility that each property owner has in managing the discharge of unwanted substances from their properties. Developing public outreach and education programs and encouraging practical public participation projects that engage individuals and municipal leaders in innovative and creative ways will over time make the biggest difference by modifying behavior and attitudes about our individual impacts on the environment."

David Cedarholm
Tighe and Bond Engineering

Stormwater Management Report Card

Assessment Questions About Stormwater Management

Does the municipality have stormwater management regulations?

Does the municipality have less than or equal to 9% Impervious Cover?

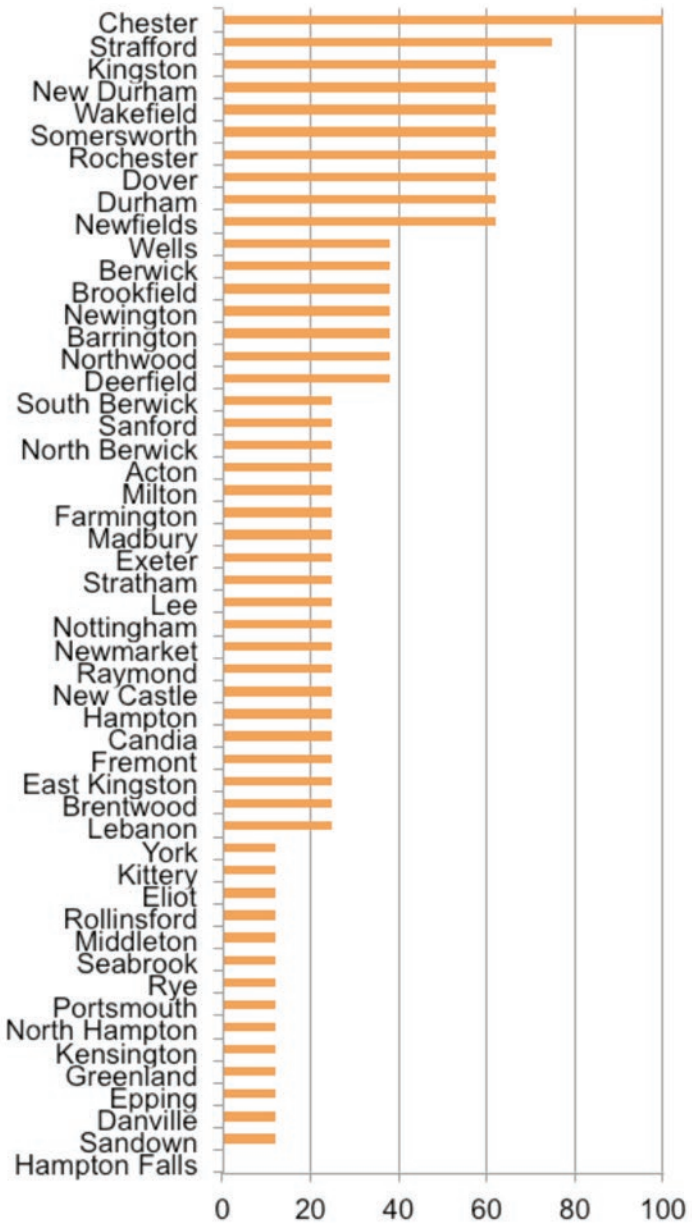
Is the minimum area of soil disturbance that "triggers" application of the municipality's stormwater management regulations less than or equal to 20,000 sqft?

Does the municipality have a cap of 10% effective impervious cover (EIC) for new development in residentially zoned lots of 1 acre or more?

Do the municipality's existing regulations require the use of Low Impact Development (LID) techniques to the maximum extent practicable for new development and re-development?

Do the municipality's stormwater management regulations reflect the minimum design criteria for water quality (a) volume/flow (WQV/WQF), (b) groundwater recharge volume (GRV), and (c) peak flow control defined in the NH Stormwater Management Volume 2?

RESULTS BY TOWN



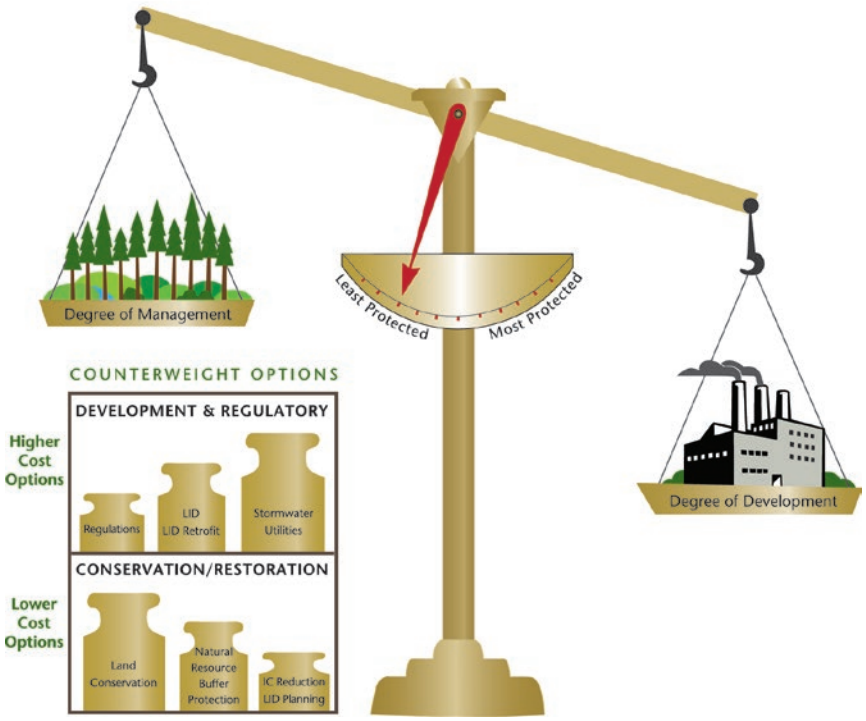
Visit www.prepestuaries.org/PREPA/ to see all results

This report card is calculated based on the responses to eight questions regarding Stormwater Management and what percentage of those responses attains the minimum protective standards suggested by NHDES or PREP.

ONLY 9 OUT OF 52 MUNICIPALITIES HAVE ADOPTED A STORMWATER MANAGEMENT ORDINANCE, AS RECOMMENDED BY PREP.

28 OUT OF 42 ELIGIBLE NH COMMUNITIES HAVE REPRESENTATION ON THE SOUTHEAST WATERSHED ALLIANCE.

3 OUT OF 52 TOWNS HAVE A CAP OF 10% EFFECTIVE IMPERVIOUS COVER (EIC) FOR NEW DEVELOPMENT IN RESIDENTIALLY ZONED LOTS OF 1 ACRE OF MORE.



Counterbalancing Development with Management Strategies
Credit: UNH Stormwater Center

"The Southeast Watershed Alliance, which is a body politic made up of the 42 communities in the NH coastal watershed, is poised to provide regional solutions to assist communities in meeting the new stormwater requirements and realizing savings through economies of scale and minimizing duplication of efforts. As a first step, the Alliance developed model stormwater regulations under a grant with partners. Those regulations are available on the SWA website at no cost for communities to incorporate into their regulations and achieve credit towards meeting the pending MS4 permit requirements."

Mike Trainque
Southeast Watershed Alliance

UNH Stormwater Center Guidance

This graphic scale represents the relative complexity and costs when trying to counter-balance the negative impacts of land development on water quality. It is well established by scientific research that more intense development increases stormwater and impairs water quality. The weights represent management strategies through conservation and restoration efforts as well as management measures like regulations and utilities.

Climate Change

Seabrook, NH, Photo credit: King Tide Photo Contest winner Mike Barron

What & Why Communities throughout the Piscataqua Region Watershed are already seeing the effects of climate change and more changes are expected in the future. Learning what resources and infrastructure in your town are vulnerable to climate change is the first step in preparing for changing climate and building a more resilient community.

Climate Change Predictions

INCREASING TEMPERATURE	Temperatures are expected to increase in the Piscataqua/Great Bay region and extreme heat is expected to become more frequent while extreme cold is expected to become less frequent reducing annual snow cover.
SEA-LEVEL RISE	Sea level has been steadily increasing since 1926 and we can expect that sea level will continue to rise further increasing the extent of coastal flooding and storm surge.
INCREASING PRECIPITATION/ FLOODING	Increased precipitation as well as increased frequency and magnitude of extreme precipitation events are expected to continue resulting in more frequent and longer periods of flooding.

What's At Risk

- Greater stress on routine and emergency services
- Property loss leading to tax revenue loss
- Impacts on coastal historical resources and culture
- Species loss and change including more invasive species
- Loss of pollinators
- Changes in wildlife habitat
- Risks to drinking water supply from increased runoff during precipitation events
- Changes in groundwater flow to wetlands

For a more complete list of risks associated with climate change please review Carbon Solutions New England, "New Hampshire's Climate: Past and Future Changes"[1]

What Can Help

The first step in preparing for a changing climate is to conduct a climate vulnerability assessment within your community . A climate vulnerability assessment will provide valuable information on why and how a town should adapt existing plans, policies, and regulations to become more resilient. For communities who have completed a climate vulnerability assessment the next step is to draft and adopt an adaptation planning strategy for your community.

What Science Says

Temperatures are expected to increase in the Piscataqua/ Great Bay region resulting in more extreme heat events during the summer and less extreme cold events during the winter. Warmer winters and increasing precipitation suggests a greater portion of winter precipitation will fall as fain reducing snow cover across the region.

Projected Sea-Level Rise

Sea-level rise is an impact of climate change unique to coastal communities and communities with tidal rivers. According to the Coastal Risks and Hazards Commission Science and Technical Advisory Panel (STAP) sea level is expected to rise between 0.6 feet and 6.6 feet by 2050 depending on the scenarios chosen by the National Climate Assessment in 2012.

Time Period*	Intermediate Low	Intermediate High	Highest
2050	0.6 ft.	1.3 ft.	2.0 ft.
2100	1.6 ft.	3.9 ft.	6.6 ft.

*Using mean sea level in 1992 as a reference (Parris et al., 2012)
Data source: Science and Technical Advisory Panel, NHCRHC, 2014.

STAP recommends coastal communities plan for the "Intermediate High" scenario, but urges communities to be prepared to manage and adapt to the "Highest" scenario if necessary. Given sea-level rise projections, it is estimated that today's 100-year flood storm surge will occur more frequently by 2050. Combined with more frequent and intense storms communities could be facing more frequent and longer durations of flooding.[2]

Hampton Beach photo by Chris Keeley

1 https://www.climatesolutionsne.org/sites/climatesolutionsne.org/files/greatbayreport_online.pdf

2 Sea-level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire: Analysis of Past and Projected Future Trends. http://nhcrhc.stormsmart.org/files/2013/11/CRHC_SAP_FinalDraft_09-24-14.pdf

Climate Change Report Card

Assessment Questions about Climate Change

Has the municipality completed some form of climate change vulnerability assessment?

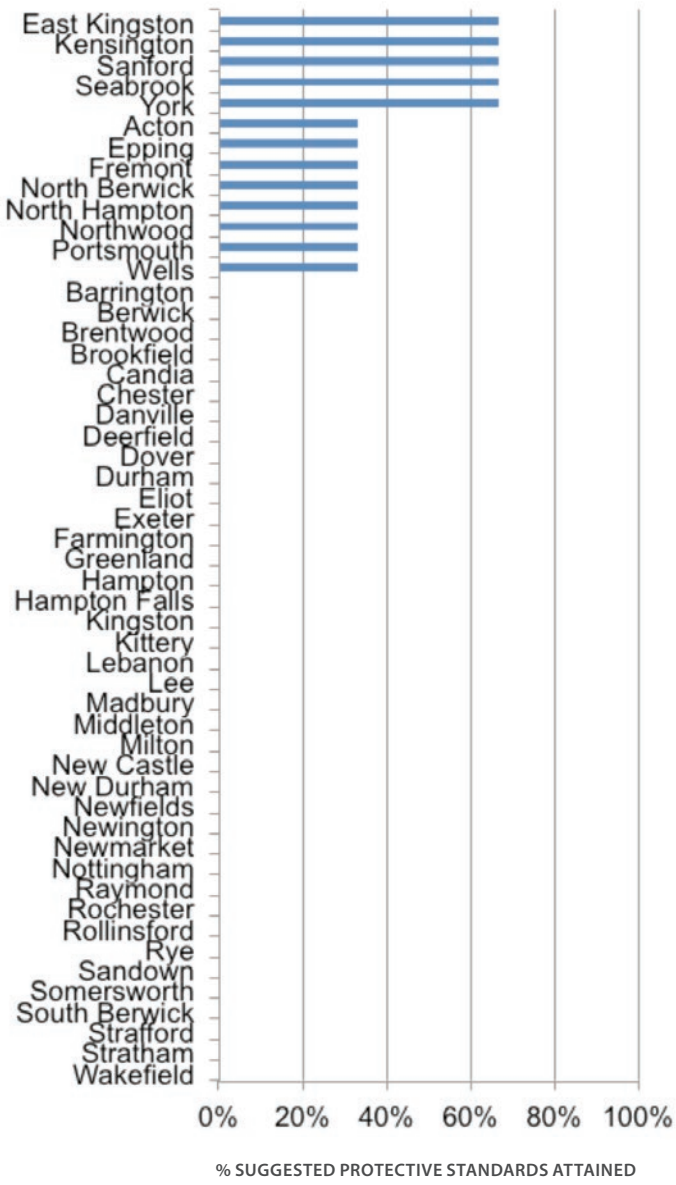
Has the municipality completed some form of climate change adaptation planning effort?

Has the municipality adopted regulatory changes intended to reduce the municipality's vulnerability to potential climate change impacts?

The Bellamy River in winter

Visit www.prepestuaries.org/PREPA/ to see all results

RESULTS BY TOWN



This report card is calculated based on the responses to the three major questions regarding Climate Change preparedness and what percentage of climate change preparedness actions have been completed by each municipality.

A culvert in Portsmouth's South End is close to overflowing during King Tide, October 2014. Photo by Cindy Jupp Jones.

ONLY 11% OF MUNICIPALITIES HAVE COMPLETED VULNERABILITY ASSESSMENTS.

10% OF MUNICIPALITIES HAVE IDENTIFIED INFRASTRUCTURE IN NEED OF RELOCATION DUE TO THE IMPACTS OF CLIMATE CHANGE.

NO COMMUNITIES HAVE UPDATED DESIGN STANDARD REQUIREMENTS FOR NEW PUBLIC INFRASTRUCTURE THAT ACCOUNTS FOR THE IMPACTS OF CLIMATE CHANGE.

"Starting today, if all new or rebuilt homes, other buildings and infrastructure are designed with future flood levels in mind we will be far less vulnerable when the day comes when sea level really is four feet higher than today. The additional cost of designing-in that adaptation is small compared to the loss and damage that would otherwise result. We need to take a "no-regrets" approach to planning and design by building in resiliency to our communities starting now. That approach is essential in the event of a worst case scenario, more than necessary in a best case scenario, but a good thing either way."

Cliff Sinnott,
Executive Director, Rockingham Planning Commission

Durham Town Landing on the Oyster River, Durham, NH, Photo by Bill Arcieri

PISCATAQUA REGION ENVIRONMENTAL PLANNING ASSESSMENT

This section contains region-wide recommended actions that are based upon the findings of the assessment. Town-by-town action plans can be found in the Subwatershed PREPA reports.

Actions: Region-Wide

Salt Marsh, Durham NH

Taking Action Now The 2015 PREPA provides a comprehensive review of the current state of municipal environmental regulations in place in the 52 communities in the Piscataqua Region watershed. The results of the review show that although communities value their natural resources and have taken steps to manage those resources, there are critical protections still needed in most communities throughout the watershed.

The time to act is now. The Piscataqua Region is a very special place, that is being recognized in many ways as one of the top areas in the country to live. As a result the region is experiencing unprecedented growth that will continue into the future. To grow thoughtfully and retain what is special in our communities and our estuaries we must take action now.

All 52 towns in the Piscatqua Region need to do the 6 critical actions.

The following actions are critical:

1. **Increase naturally vegetated buffers** adjacent to all streams, rivers, lakes, ponds, estuaries, and wetlands to a minimum of 100' from the water resource.
2. **Increase setback requirements** for septic systems and primary structures to at least 100' from all streams, rivers, lakes, ponds, estuaries, and wetlands.
3. **Adopt regulations** preventing the application of fertilizer within 100' of all streams, rivers, lakes, ponds, estuaries, and wetlands.
4. **Adopt model stormwater management regulations.**[1]
5. **Conduct a climate vulnerability assessment** to prepare for community impacts resulting from more frequent storm events and associated flooding.[3]
6. **Increase land conservation efforts.** Work with landowners interested in voluntary land conservation. Many communities in the watershed complete an Open Space Plan and/or Natural Resource Inventory that identifies town-specific conservation priorities.[2]

Freshwater Wetlands & Shoreland Protection

BUFFERS are still inconsistent region-wide. Enacting comprehensive, cohesive buffer regulations on all streams, rivers, wetlands and shorelands is the most essential thing communities can do. For guidance see Buffers for Wetlands and Surface Waters: A Guidebook for NH Municipalities.[4]

SETBACKS for septic systems and primary structures: Septic systems and primary structures (houses, buildings) located along shorelands and wetlands impact water quality due to the leaching of polluting nutrients from leach fields and runoff from yards, driveways, roofs, and roads. PREP recommends both septic systems and primary structures be setback at least 100' from waterbodies. **Setbacks are also one of the easiest, cheapest and most effective ways to limit pollution entering our water systems.**

Fertilizer application regulations – Every community in the watershed needs to address the problem of too much nitrogen entering waterbodies from abutting uplands. Lawn fertilizer, and to a smaller extent, fertilizer applied by agricultural operations, are sources of nitrogen.

KEY RESOURCES FOR ACTION:

Southeast Watershed Alliance's Model Stormwater Ordinance[1]

Land Conservation Plans for NH and Maine[2]

NH Climate Adaptation Workgroup Resources[3]

Stormwater Management

Stormwater management encompasses the following activities: 1) controlling non-point source pollution from future development; 2) mitigating and reducing non-point source and stormwater pollution from existing development; 3) and managing the quality and quantity of surface water and groundwater resources. **All communities in the PREP region need a cost effective way to manage stormwater.**

Communities are strongly encouraged to use the model developed by the watershed-based Southeast Watershed Alliance (SWA) available on the SWA website.[1]

Land Conservation

Permanently protecting land from development is a critical tool used by most municipalities to protect water resources and wildlife habitat. **It is the least expensive and most effective action to preventing water pollution and supporting healthy ecosystems.** Conserved land provides critical ecosystem services, including flood storage and food production. It enhances land values in a community and meets the increasing need for recreational opportunities. As of 2015 municipalities have conserved 14% of land in the region.

The development of a town-specific **Natural Resources Inventory (NRI)** is an important first step to enable local decision makers to identify and prioritize land for conservation.

Allocating funds through town bonds is the best way to accomplish conservation.

Secondly, allocating funds collected via the land use change tax to costs associated with land conservation provides municipalities with an exisisting pool of funds.

For more information, visit www.prepestuaries.org/PREPA/

[1] http://southeastwatershedalliance.org/wp-content/uploads/2013/05/Final_SWA_SWStandards_Dec_20121.pdf
[2] http://prepestuaries.org/initiatives/conservation-restoration
[3] http://nhblog.stormsmart.org/links-to-resources-for-adaptation-to-climate-change
[4] https://www.nh.gov/oep/planning/resources/documents/buffers.pdf

Climate Change Vulnerability & Adaptation

The PREPA asked several questions about municipal actions regarding climate change, and our region has a ways to go in this important area.

Municipalities are acknowledging and planning for the effects of increasing and intensifying storm events that are causing flooding, erosion, and property damage. Local decision makers need to assess and plan for how these impacts will affect their communities. An assessment should help inform land use decisions, and identify areas most at risk. "Sandy-sized storms" are going to continue to happen more frequently, and it is critically important that our communities are prepared.

The New Hampshire Coastal Adaptation Workgroup (NHCAW) is a collaboration of 19 organizations working to help communities in New Hampshire's seacoast prepare for the effects of extreme weather events and associated implications. The NHCAW website provides links to many resources for municipalities to help learn more about the impacts of climate change in the region, **http://nhblog.stormsmart.org/links-to-resources-for-adaptation-to-climate-change/**. The NHCAW also hosts periodic workshops inviting all town boards, leaders and decision makers to come and learn about the issues facing the seacoast and develop tools and action plans to help communities move forward in addressing the impacts from a changing climate.

Use Municipal Natural Hazard Mitigation Plans to Support Climate Adaptation Planning and Water Quality Protection!

The Federal Emergency Management Agency (FEMA) requires every municipality in the country to develop a Natural Hazard Mitigation Plan, and to update the Plan every 5 years. The purpose of these Plans is to protect citizens and their property from exposure to natural hazards such as flooding, storm surges, winter storms, extreme heat, etc. Plans are researched and written by municipal staff, including the Emergency Management Director, Road Agent, Police Chief and Fire Chief, with assistance from consulting planners and staff from NH Homeland Security and Emergency Management.

Because flooding is the most common natural hazard New Hampshire and Maine experience, Natural Hazard Mitigation Plans can provide town-specific information on water quality protection, such as areas prone to erosion and sedimentation, areas prone to flooding and in need of stormwater management and conservation, and areas at risk of storm surge and rising sea levels. Consult with your town's Emergency Management Director for more information.

See our Subwatershed Reports for town-by-town Action Plans. Visit www.prepestuaries.org/PREPA/ for more information

Acknowledgements & References

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Rick Ellsmore, USDA-NRCS
Roger Stephenson, Stephenson Strategic Communications
Ted Diers, NH Department of Environmental Services

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Look for our Subwatershed publications

Visit www.prepestuaries.org/PREPA/ for more information, to download a PDF or order a printed booklet.

Take Action

Resources for implementing these actions can be found on the website **www.PREPestuaries.org** or contacting PREP at **prep.assistance@unh.edu**

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