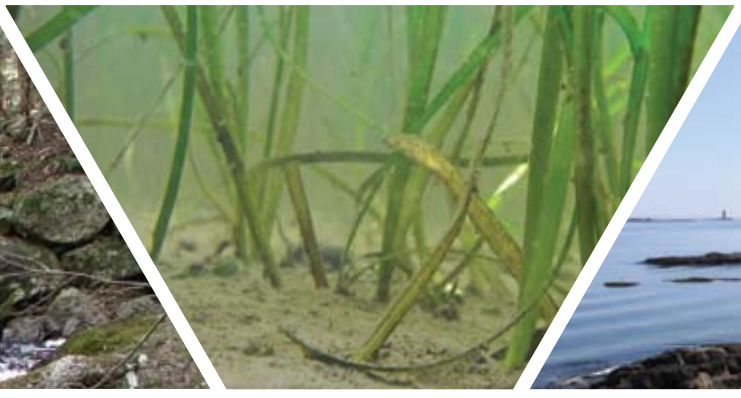
2010

2010 Piscataqua Region Comprehensive Conservation and Management Plan (CCMP)

Piscataqua Region Estuaries Partnership

Piscataqua Region

2010 Comprehensive Conservation and Management Plan



PISCATAQUA REGION
Estuaries
Partnership

2010 Piscataqua Region Comprehensive Conservation and Management Plan

Prepared by

PISCATAQUA REGION Estuaries Partnership

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Abstract

The 2010 Piscataqua Region Comprehensive Conservation and Management Plan (CCMP) is an update of the 2000 CCMP that addresses current and emerging issues impacting the water quality and environmental health of estuaries in the Piscataqua Region. The 10-year plan includes seven goals, 35 objectives, and 82 action plans that were developed through an extensive 18-month process involving 159 stakeholders representing federal and state resource management agencies, non-government organizations, industry, legislators, and the 52 communities of the Piscataqua Region. Action plans are categorized by critical theme areas, including water resources, land use and habitat protection, living resources and habitat restoration, and watershed stewardship.

Piscataqua Region Coastal Watersheds (PREP Focus Area)

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INTRODUCTION

ABOUT THE PISCATAQUA REGION ESTUARIES PARTNERSHIP (PREP)

PREP was formed in 1995 as the New Hampshire Estuaries Project (NHEP), when the USEPA designated New Hampshire's Great Bay Estuary and Hampton-Seabrook Estuary as "estuaries of national significance". PREP is one of 28 programs within the USEPA National Estuary Program.

PREP is governed by a 28-person Management Committee comprised of representatives from municipalities, planning commissions, natural resource agencies, watershed groups, conservation organizations, energy producers, researchers and anglers (Appendix A). Originally administered through New Hampshire state agencies, PREP moved to the University of New Hampshire in 2005.

THE PISCATAQUA REGION ESTUARIES PARTNERSHIP (PREP) 2010 CCMP BUILDS ON THE PREVIOUS 2000 CCMP AND DESCRIBES THE ORGANIZATION'S PROGRAMMING, OUTREACH, ENVIRONMENTAL MONITORING, STAKEHOLDER AND PARTNER SUPPORT OVER THE NEXT 10 YEARS.

NHEP originally only included the New Hampshire watershed area of Great Bay, the Hampton-Seabrook Estuary and other New Hampshire coastal watersheds. At the end of 2007, the PREP Management Committee voted unanimously to expand the program's focus area to include the Maine portion Great Bay Estuary watershed (10 communities / 24% of the Great Bay Estuary watershed). This expansion was a critical step toward achieving the program's watershed-wide goals of improving water quality and protecting and restoring important habitats. The organization began expanding some of its programs and collaborating with Maine organizations in 2008 and NHEP changed its name to PREP in 2009 to better represent the entire focus area.

Forty-two New Hampshire and 10 Maine municipalities have significant land area (≥ 5%) located in the Great Bay Estuary watershed, the Hampton-Seabrook Estuary watershed or smaller Atlantic Coast watersheds in New Hampshire. Collectively these areas are referred to as the Piscataqua Region or simply the Region in the 2010 CCMP and other PREP documents. The geographic extent of the watershed and estuaries are shown in Figure 1 and the sub watersheds are delineated in Figure 2.

The Estuaries

The Great Bay Estuary drainage area is 1,023 square miles, with 242 square miles located in Maine. The total tidal shoreline is 204 miles from the mouth of Portsmouth Harbor to the head of tide of all the tributary rivers at high tide. The tidal estuary has a surface area of 21 square miles (Trowbridge, 2007).

The mean tidal range in the Great Bay Estuary varies from 8.6 ft in Portsmouth Harbor to 6.4 ft at Dover Point. The phase of the tide lags significantly from the ocean, with slack tides as much as 2.5 hours later in the Squamscott River than at the mouth of Portsmouth Harbor. It can take up to 39 tidal cycles, or 20 days, for a parcel water in Great Bay to completely move to the ocean.

The Great Bay Estuary receives effluent from 18 wastewater treatment facilities. It is a popular location for kayaking, birdwatching, commercial lobstering, recreational oyster harvesting, and sportfishing for rainbow smelt, striped bass, and winter flounder. Other estuaries with similar watershed drainage areas in the same ecoregion are Passamaquoddy Bay, Englishmans Bay, Blue Hill Bay, and Casco Bay.

Hampton-Seabrook Estuary drainage area is 46 square miles with 8 square miles located in Massachusetts (upstream reaches of the Blackwater River). The tidal shoreline of the estuary is 131 miles at high tide and the surface area at high tide is 2 square miles, excluding salt marsh covered by water during a spring tide. Local residence time of water can not be determined with available data.

The estuary receives effluent from two wastewater treatment facilities. Hampton-Seabrook Estuary is a popular location for birdwatching, recreational harvest of soft-shelll clams, and sport fishing for striped bass and winter flounder. Similar size estuaries in the same classification and ecoregion are Wells Estuary and Waquoit Bay.

The relatively small Atlantic coast estuaries between Great Bay and Hampton-Seabrook estuaries drain the immediate coastal upland in Rye, North Hampton and Hampton. Significant areas include Rye Harbor, Little Harbor, and extensive saltmarshes between the upland and barrier beaches of the coast.

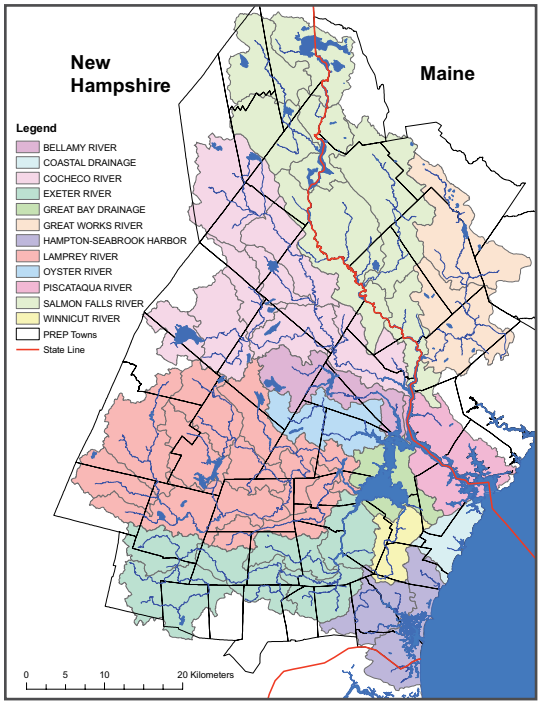
STATE OF THE ESTUARIES

In 2009, PREP published its fourth State of the Estuaries Report, showing that the environmental quality of the Piscataqua Region estuaries is declining (Piscataqua Region Estuaries Partnership, 2009). Eleven of the twelve environmental indicators established by PREP show negative or cau-

Figure 1: The Piscataqua Region Watershed Area in New Hampshire and Maine

THE PISCATAQUA REGION ENCOMPASSES 1,086 SQUARE MILES AND INCLUDES 52 TOWNS IN MAINE AND NEW HAMPSHIRE. ABOUT 14% OF THE COMBINED POPULATION OF NEW HAMPSHIRE AND MAINE LIVE IN THE REGION.

Figure 2: Subwatersheds of the Piscataqua Region



tionary trends (Table 1). In the previous State of the Estuaries Report released in 2006, only seven of the twelve indicators were classified this way. There have been many successful land conservation and restoration projects, but these projects have not been able to keep pace with development and habitat loss. The most pressing problems for the estuaries relate to population growth and associated increases in nutrient loads and nonpoint source pollution.

THE ENVIRONMENTAL QUALITY OF THE PISCATAQUA REGION ESTUARIES IS DECLINING.

2009 State of the Estuaries Report

- As the population of the watershed has grown, development has created new impervious surfaces at an average rate of nearly 1,500 acres per year. In 2005, there were 50,351 acres of impervious surfaces in the watershed, which is 7.5% of the watershed's land area. Nine of the 40 sub-watersheds contained more than 10% impervious cover, which indicates the potential for degraded water quality and altered stormwater flow in these sub-watersheds. Land consumption per person, a measure of sprawling growth patterns, continues to increase.

- The total nitrogen load to the Great Bay Estuary increased by 42% in the past five years, largely due to greater stormwater runoff and nonpoint source pollution loads during recent high rainfall years. In Great Bay, the concentrations of dissolved inorganic nitrogen, a major component of total nitrogen, have increased by 44% in the past 28 years. The negative effects of the increasing nutrient loads are evident. Water clarity has declined as shown by increasing concentrations of suspended solids and chlorophyll-a. Eelgrass habitat in the estuary has disappeared from the tidal rivers, Little Bay, and the Piscataqua River.

The negative or cautionary trends for other indicators also are troubling:

- Oyster and clam populations have increased from historic lows a few years ago but are still depressed compared to historic abundance.
- Toxic contaminants affect nearly one-quarter of the estuarine sediments and concentrations of compounds associated with petroleum products are increasing in the tissues of shellfish from the Piscataqua River. The concentrations of other contaminants in shellfish tissue are declining.

Table 1: PREP Environmental Indicators Summary, 2009

Indicator	Question	Answer	Implication/ Trend
Dry weather bacteria concentrations	Have fecal coliform bacteria levels in the Great Bay Estuary changed over time?	Yes. Fecal coliform bacteria concentrations in Great Bay decreased significantly in the 1990s, but have not changed in the past 10 years. Water quality standards for swimming and shellfishing are not being met in all areas.	⚠
Toxic contaminants in shellfish tissue	Have concentrations of toxic contaminants in the tissues of shellfish changed over time?	Yes. The concentrations of polycyclic aromatic hydrocarbons, a component of petroleum products, have increased by 51% and 218% in Portsmouth Harbor and the Piscataqua River, respectively, over the past 16 years. The concentrations of other contaminants are declining.	⚠
Toxic contaminants in sediment	Do sediments in the estuaries contain toxic contaminants that might harm benthic organisms?	Yes. Contamination was found in 24% of estuarine sediment. However, organisms living in the sediments might be adversely affected by toxic contaminants in only 2.8% of the estuaries.	⚠
Nitrogen in Great Bay	Have nitrogen concentrations in Great Bay changed significantly over time?	Yes. The total nitrogen load to the Great Bay Estuary increased by 42% in the past five years. Dissolved inorganic nitrogen concentrations have increased in Great Bay by 44% in the past 28 years.	⊖
Dissolved oxygen	How often do dissolved oxygen levels in the Great Bay Estuary fall below state standards?	Rarely in the bays and harbors, but often in the tidal rivers.	⚠
Eelgrass	Has eelgrass habitat in the Great Bay Estuary changed over time?	Yes. Eelgrass cover in the Great Bay itself has declined by 37% between 1990 and 2008 and has completely disappeared from the tidal rivers, Little Bay, and the Piscataqua River.	⊖
Oysters	Has the number of adult oysters in the Great Bay Estuary changed over time?	Yes. The number of adult oysters fell by 95% in the 1990s. The population has increased slowly from a low point in 2000.	⊖
Clams	Has the number of adult clams in Hampton-Seabrook Harbor changed over time?	Yes. The current number of adult clams is 64% of the average level from 1971 to 2000.	⚠
Anadromous fish	Has the number of anadromous fish returning to Piscataqua Region coastal rivers changed over time?	Returning anadromous fish populations are limited by various factors including water quality, passage around dams, and flooding.	⚠
Habitat restoration	Are habitats being restored?	Yes for salt marsh, though oyster and eelgrass habitats have been restored at a slower rate.	⚠
Impervious surfaces	How much of the Piscataqua Region watershed is covered by impervious surfaces?	In 2005, 7.5% of the land area of the entire watershed was covered by impervious surfaces, and 9 subwatersheds had greater than 10% impervious surface cover.	⊖
Land conservation	How much of the Piscataqua Region watershed is protected from development?	At the end of 2008, 76,269 acres in the Piscataqua Region watershed were protected, which amounted to 11.3% of the land area.	⊕

Key to Implication/Trend Classifications:

⊕ **Positive**

The trend or status of the indicator demonstrates improving conditions, generally good conditions, or substantial progress relative to the management goal.

⚠ **Cautionary**

The trend or status of the indicator demonstrates possibly deteriorating conditions; however additional information or data are needed to fully assess the observed conditions or environmental response.

⊖ **Negative**

The trend or status of the indicator demonstrates deteriorating conditions, generally poor conditions, or minimal progress relative to the management goal.

- Anadromous fish, those that live in salt water and travel to freshwater to spawn, are limited by various factors including water quality and lack of passage due to restrictions, such as dams and flooding.
- Bacteria concentrations are no longer declining. Water quality standards for swimming and shellfishing are not being met in some areas of the watershed, especially in Hampton-Seabrook Estuary.

In an attempt to counteract these trends, PREP and others have worked to conserve land, restore habitats, and eliminate pollution sources in the coastal watershed. Good progress has been made toward the PREP goals of land conservation and salt marsh restoration. By the end of 2008, 76,269 acres, comprising 11.3% of the coastal watershed, had been permanently protected from development, and 280 acres of salt marsh had been restored. The PREP goals for these two indicators were 15% of the coastal watershed permanently protected and 300 acres of salt marsh restored by 2010. Despite significant efforts, the PREP restoration goals for submerged habitats, such as oyster reefs and eelgrass, are not being achieved.

The Piscataqua Region estuaries have many positive attributes and serve important ecological functions. Continued restoration of habitat and improved water quality are still possible. The increasing pressures of development in the watershed will need to be matched with increasing efforts and awareness to reduce pollutant loads, minimize development impacts, and protect habitats.

John Carroll

Eelgrass has dramatically declined in Great Bay and has disappeared in the tidal tributaries.

UPDATING THE COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN (CCMP)

Between 1998 and 2000, the NHEP developed the first CCMP, called the NHEP Management Plan, that guided work for a decade (New Hampshire Estuaries Project, 2000). In this plan NHEP goals and actions focused on five themes:

- Water Quality (20 action plans)
- Land Use, Development and Habitat Protection (36 action plans)
- Shellfish Resources (15 action plans)
- Habitat Restoration (6 action plans)
- Outreach and Education (5 action plans)

In 2005, five action plans were substantially updated and two were added for a total of 85 CCMP action plans (New Hampshire Estuaries Project, 2005). These changes addressed challenges recognized or anticipated prior to the more substantial 2010 update. For the 2010 CCMP, several existing actions have been modified and updated but most of the actions presented in this updated plan are newly crafted, based on the input from 159 stakeholders contributing to the update.

For nearly 10 years, NHEP/PREP and its partners implemented CCMP actions, making progress in the areas of water quality improvement, land conservation, habitat restoration and environmental monitoring. From 2000 to 2009, NHEP/PREP directed over $4 million to projects to improve, protect and monitor the health of the region's estuaries.

The revised Piscataqua Region Comprehensive Conservation and Management Plan (CCMP) represents an 18-month long process of working with stakeholders to understand current and future issues, establish goals and objectives, create action plans, and set priorities for the Region. It lays the foundation for work over the next decade to protect and restore the Region's estuaries and coastal watersheds, so that they continue to sustain our economy, environment and quality of life.

THE 2010 UPDATED PLAN IS CALLED THE "PISCATAQUA REGION COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN (CCMP)", BECAUSE IT IS TO BE IMPLEMENTED BY ALL STAKEHOLDERS IN THE REGION, NOT JUST PREP.

At the beginning of the CCMP update process, PREP staff prepared preliminary goals and objectives for the new plan. The goals focused on four theme areas:

- Water Resources (WR)
- Living Resources and Habitat Restoration (LR)
- Land Use and Habitat Protection (LU)
- Watershed Stewardship (WS)

The Water Resources theme area focuses on water quality and quantity in the watershed. The Living Resources and Habitat Restoration theme emphasizes assessing and restoring habitats that support freshwater and estuarine species within the watershed. The focus of the Land Use and Habitat Protection theme is developing and promoting land use practices that protect watershed resources. The broader Watershed Stewardship theme centers on education and outreach to key stakeholders, working with organizations, municipalities, state and federal governments on policies and regulations that protect estuarine and watershed resources.

More than 159 people, representing 82 organizations, provided input during the 18-month process that included nine stakeholder meetings in New Hampshie and Maine and three draft reviews.

STAKEHOLDER INVOLVEMENT IN THE CCMP

A primary goal in developing the 2010 CCMP was to obtain substantial stakeholder input. PREP used a variety of means to recruit stakeholders, solicit feedback on drafts, and engage new people in the process. Besides announcing stakeholder meetings through the existing PREP email contact lists used for monthly news (approximately 800 email addresses), the PREP Management Committee was asked to recommend additional stakeholder names, and PREP established a wiki to publish meeting materials, post attendance lists, and collect input. Stakeholders used the site to comment on existing materials or provide new information for use in the process. In addition, stakeholders were contacted directly for additional information and clarification.

A series of three meetings were planned and held for the Water Resources, Land Use and Habitat Protection, and Living Resources and Habitat Restoration theme areas for a total of nine stakeholder meetings (Table 2). The first meeting on a theme area, was an introduction to the CCMP update process and included review of draft goals and objectives. Through guided small group dis-

Table 2: Stakeholder meetings held during the CCMP development process

Theme Area	Meeting 1	Meeting 2	Meeting 3
Water Resources	1/7/2009, 9am – 12 pm NHDES Coastal Office Portsmouth, NH	2/19/2009, 9 am – 12 pm Urban Forestry Center Portsmouth, NH	4/1/2009, 1 – 4 pm NH Fish & Game Office Durham, NH
Living Resources and Habitat Restoration	4/4/2009, 9am – 12 pm Rockingham County Cooperative Extension Brentwood, NH	3/19/2009, 9am – 12 pm NHDES Coastal Office Portsmouth, NH	4/29/2009 1 – 4 pm Urban Forestry Center Portsmouth, NH
Land Use and Habitat Protection	3/5/2009, 9am – 12 pm Exeter Public Library Exeter, NH	4/1/2009, 1 – 4 pm Great Bay NERR Greenland, NH	5/21/2009,9am – 12 pm Laudholm Farm Wells, ME

Stakeholder Agency Meetings	Meeting Date and Location
New Hampshire Department of Environmental Services	May 27, 2009, NHDES Office – Concord, NH
New Hampshire Fish and Game Department	June 2, 2009, NHFG Office – Durham, NH
Maine Resource Agencies	July 14, 2009, Hallowell, Maine

cussions, participants developed issues and indicators for each them and provided comments and suggestions on the goals and objectives that PREP proposed. The second meeting for each theme area focused on development of relevant actions and further refinement of goals and objectives. Participants in the third theme meeting prioritized actions developed during Meetings 1 and 2, as well as those suggested on the wiki site, from the PREP Management Committee, and through direct solicitation of actions by PREP and the consulting team.

The prioritization process developed numerical rankings of each action, which were then in turn ranked in order of descending importance as Highest, High, and Priority, based on the mean and range of rankings in each theme area. The "Priority" ranking was later changed to "Moderate" as the term was more appropriate to the meaning intended.

In addition to stakeholder meetings, three meetings were held with various Maine and New Hampshire environmental agencies that are critical to CCMP implementation (Table 2). The Commissioner and seven program managers within New Hampshire Department of Environmental Services (NHDES) attended the NHDES meeting. At the New Hampshire Fish and Game Department (NHFGD) meeting, the Marine Division Director and staff, including the New Hampshire Fish and Game Department - Great Bay National Estuarine Research Reserve (NHFGD-GBNERR), attended. Staff from Maine Department of Environmental Protection (MDEP), Maine Center for Disease Control, Maine Department of Inland Fisheries and Wildlife (MDIFW), Maine Department of Marine Resources (MDMR), Casco Bay Estuaries Partnership, and Maine State Planning Office attended the Maine agency meeting.

A total of 159 people representing 82 stakeholder organizations contributed to the development of the CCMP (Appendix A). Ninety-seven unique stakeholders attended the nine stakeholder meetings. Volunteers from municipal conservation commissions and planning boards, watershed association members, citizen interest and monitoring groups, municipal employees, representatives from regional and national land trusts and conservation organizations, commercial fisherman, consultants, and state and federal agency representatives were among the attendees (Truslow, 2009).

The Land Use and Habitat Protection theme meetings had the highest attendance, 68; followed closely by Water Resources, 64; Living Resources and Habitat Restoration, 34. In addition to the stakeholders included in the meeting process, many other stakeholders and organizations were contacted to provide further background and input on actions after the meetings.

CCMP DEVELOPMENT SUMMARY

STAKEHOLDER INPUT PROCESS TOOK 18 MONTHS TO COMPLETE

A TOTAL OF 159 PEOPLE PROVIDED INPUT

82 ORGANIZATIONS WERE REPRESENTED

3 DRAFTS WERE REVIEWED BY STAKEHOLDERS

CCMP GOALS AND OBJECTIVES ARE SUPPORTED BY ALL LEAD ORGANIZATIONS

2010 CCMP GOALS AND OBJECTIVES

After establishment of the four theme areas, PREP staff developed associated goals and objectives. Refinements to these goals and objectives were made throughout the development process to reflect PREP Management Committee and stakeholder comments. Significant additions and modifications were in the areas of climate change impacts, indicator species and habitats, nutrient loading, flooding and fluvial erosion, and the importance of small streams and wetlands. The final seven goals are listed below with corresponding management objectives for each goal. The order of the goals and objectives does not reflect a ranking by importance. Additional background on the goals and objectives is included in the action plans for each theme area.

Water Resources Goal 1: Water quality in the Piscataqua region watersheds supports shellfish harvesting, recreation, wildlife, aquatic life, and drinking water consistent with the Clean Water Act, and existing high quality waters are maintained at 2010 conditions.

Objective WR 1.1 - Improve water quality and identify and mitigate pollution sources so that additional estuarine areas meet water quality standards for bacteria for shellfish harvesting.

Objective WR 1.2 - Minimize coastal beach closures due to failure to meet water quality standards for bacteria in the estuaries and the ocean.

Objective WR 1.3 - Reduce nutrient loads to the estuaries and the ocean so that adverse, nutrient-related effects do not occur.

Objective WR 1.4 - Reduce sediment loads to the estuaries and the ocean so that adverse, sediment-related effects do not occur.

Objective WR 1.5 - Monitor and reduce loading of toxic contaminants and emerging contaminants to the estuaries and the ocean.

Objective WR 1.6 - Improve the water quality in streams, rivers, lakes and groundwater to support recreation, aquatic life, and drinking water throughout the watersheds and maintain high quality fresh waters at 2010 conditions.

Water Resources Goal 2: Quantities of freshwater in rivers and aquifers throughout the Piscataqua Region watersheds are appropriate for humans, aquatic species, riparian wildlife, and riparian vegetation.

Objective WR 2.1 - Maintain instream flows and groundwater levels that support aquatic life and recreation, human populations, and the hydrologic integrity of coastal streams and rivers.

Objective WR 2.2 - Minimize catastrophic flooding risks due to development and climate change, and restore or maintain geomorphologic balance in river and stream systems.

Living Resources and Habitat Restoration Goal: Ecological function, connectivity, resilience, biodiversity, and ecosystem services of habitats are maintained and restored throughout the Piscataqua Region watersheds.

Objective LR 1.1 - Increase the abundance of adult oysters at the six documented beds in the Great Bay Estuary to 10 million oysters and restore 20 acres of oyster reef habitat by 2020.

Objective LR 1.2 - Increase the number of adult clams in the Hampton-Seabrook Estuary to 5.5 million clams by 2020.

Objective LR 1.3 - Increase the areal extent of eelgrass cover to 2900 acres and restore connectivity of eelgrass beds throughout the Great Bay Estuary by 2020.

Objective LR 1.4 - Restore native diadromous fish access to 50% of their historical mainstem river distribution range by 2020, and improve habitat conditions encountered throughout their life cycle.

Objective LR 1.5 - Document existing populations of native Eastern brook trout and protect or restore the integrity of the sub-watersheds that support them.

Objective LR 1.6 - Maintain a stable and diverse population of shorebirds and saltmarsh breeding birds in Piscataqua region estuaries.

Objective LR 1.7 - Inventory, evaluate, and restore natural vegetative buffers along degraded reaches of tidal shorelands, riparian zones of all stream orders, and wetlands.

Objective LR 1.8 - Identify and address stream and shoreline modifications that have significant negative impacts on the physical, chemical, or biological integrity of waterways.

Objective LR 1.9 - Identify vulnerabilities of upland and aquatic habitats to anticipated climate change impacts and take appropriate actions to mitigate or adapt to impacts.

Objective LR 1.10 - Restore or enhance an additional 300 acres of salt marsh by 2020 through removal of tidal restrictions or invasive species management.

Objective LR 1.11 - Monitor and control the extent of invasive nuisance species throughout the Piscataqua Region watershed and estuaries.

Objective LR 1.12 - Minimize impacts to benthic habitat from direct alterations to submerged lands.

Objective LR 1.13 - Restore degraded natural freshwater wetlands and priority upland habitats.

Objective LR 1.14 - Improve implementation capacity for restoration projects.

Land Use and Habitat Protection Goal 1: Development patterns and practices protect watershed and estuarine water quality and quantity.

Objective LU 1.1 - Promote sustainable land use practices in both new development and redevelopment of existing sites.

Objective LU 1.2 - Promote regional strategies for consistent use of ecologically protective planning, regulation, development, and enforcement standards.

Land Use and Habitat Protection Goal 2: Ecosystem functions and services provided by tidal and freshwater wetlands, floodplains, and shorelands are maintained.

Objective LU 2.1 - Protect floodplains, wetlands, shorelands and associated fluvial erosion hazard zones to maintain their function and value.

Objective LU 2.2 – Promote improved protections for low order streams.

Land Use and Habitat Protection Goal 3: Critical upland areas sustain viable plant and animal communities and provide watershed services to maintain aquatic habitats and water quality.

Objective LU 3.1 - Implement the Land Conservation Plan for New Hampshire's Coastal Watersheds and Land Conservation Plan for Maine's Piscataqua Region Watersheds and protect 75% of lands identified as Conservation Focus Areas by 2025.

Objective LU 3.2 - Implement strategies from the NH Wildlife Action Plan, NH Wildlife Connectivity Model and Maine's Beginning with Habitat Program to protect and manage key species at risk and critical habitats identified in those plans.

Objective LU 3.3 – Support land stewardship and land management actions for conservation lands and key areas that maximize quality habitat and watershed services.

Objective LU 3.4 - Protect the quality and quantity of current and future drinking water supplies through land protection and land use regulation.

Watershed Stewardship Goal: Legislative, resource management, and land use planning decisions and processes affecting the Piscataqua Region watersheds support Piscataqua Region Comprehensive Conservation and Management Plan goals and objectives.

Objective WS 1.1 - Promote the use of economic valuation of ecosystem services and functions by coastal watershed decision-makers.

Objective WS 1.2 - Provide access to science-based information about Piscataqua Region estuaries and watersheds to coastal watershed decision-makers.

Objective WS 1.3 - Improve state and local capacity to develop and enforce measures that protect and restore aquatic habitats in PREP focus area.

IMPLEMENTING THE 2010 CCMP

Implementing the CCMP is the responsibility of not only PREP, but all agencies and stakeholder groups that work in the Region. The CCMP helps every organization see how their actions fit into the mosaic of activities needed to protect, restore, and enhance the estuaries of the Piscataqua Region in the next ten years. PREP will promote action, coordinate effort, and, when possible, fund projects to implement the plan, however, all stakeholders need to contribute to fully implement the CCMP.

Some of the 2010 CCMP action plan activities are new efforts, while many are a continuation of current activities conducted by PREP or partnering organizations. The inclusion of these "continued activities" highlight their importance and effectiveness and therefore should be protected during periods of budget reduction or organizational restructuring. PREP and partners are encouraged to seek out additional funding sources to implement CCMP activities, especially in the highest priority action plans.

Accountability

Several mechanisms provide accountability during CCMP implementation, including the PREP Monitoring Plan, Annual Work Plans, Progress Reports, and the Strategic Communication Plan.

For nearly all of the Management Objectives in the CCMP (30 of 33), at least one implementation metric has been defined. Implementation metrics are tangible measures of implementation progress. These metrics must meet the four criteria for effective environmental indicators: Conceptual relevance, feasibility of implementation, response variability, and interpretation utility. The PREP Monitoring Plan defines data sources, calculations, and numeric targets for each of the implementation metrics in the CCMP. PREP will publish the environmental or land use indicators for each metric every three years. The indicator data are reviewed by the PREP Technical Advisory Committee for accuracy and by the PREP Management Committee to assess implementation progress.

Each year, PREP staff develop an Annual Work Plan that outlines proposed tasks and funding allocations for the coming year. It addresses ongoing programs and new initiatives according to action plan start dates, priority ratings, and available funding. Work Plans are reviewed and approved by the Management Committee which keeps the program focused on CCMP priorities.

Every CCMP action plan includes well-defined outputs which are used to evaluate the implementation status of an action plan. Periodically PREP prepares a Progress Report, which summarizes the status of all action plan implementation and environmental indicator results. The review allows PREP to determine if significant progress is being made on its priorities and goals set forth in the CCMP and the Annual Work Plans. This information allows PREP to re-direct resources to action plans that lack significant progress.

The PREP Strategic Communication Plan includes measurable outreach objectives and provides guidance on implementing and evaluating the outreach and advocacy activities from all of the theme areas. This Plan ensures that outreach campaigns are effective, efficient, and produce measurable results.

Flexibility

In order to accommodate shifts in priorities and new issues that may face the watershed over the next ten years, many actions are framed so that current focus issues, such as nutrient management and sedimentation, can be addressed effectively, but also so that emerging issues can be evaluated and addressed as needed using the same framework. For instance, regional approaches to nitrogen loading are the primary focus of the Southeast Watershed Alliance, an organization referenced in Action Plan WR-14, but the framework created by this and similar strategies can be employed for other regional issues as they emerge.

CURRENT AND EMERGING ISSUES IN THE PISCATAQUA REGION

The following section provides succinct summaries of the pressing issues that need to be addressed over the next decade to improve or maintain the environmental health of the Piscataqua Region watershed. Problematic issues, such as diminished water quality and nutrient loading, are challenging to address because they involve a range of inter-related trends. Each of the issue summaries that follow identify the issue, describe related past and present work, and indicate the number of management objectives and action plans in the 2010 CCMP that address the issue.

WATER QUALITY

Addressed by 11 management objectives, 37 action plans

A core function of PREP and each National Estuary Program (NEP) is the improvement and protection of water quality in estuaries of national significance. The NEP relies on a watershed-based approach to address water quality issues and protect estuarine ecosystems, upstream freshwater systems, and uplands within estuarine watersheds. Therefore, efforts to maintain or restore water quality are prominent throughout the Piscataqua Region CCMP.

Like many coastal watersheds along the Eastern Seaboard, Piscataqua Region watersheds are significantly impacted by land use. Primary water quality issues affecting the watershed are:

- Nutrients (nitrogen and others)
- Sedimentation and Water Clarity
- Bacteria
- Salt from road de-icing
- Low levels of dissolved oxygen
- Toxic contaminants, especially mercury and polycyclic aromatic hydrocarbons (PAHs)
- Hazardous constituents in groundwater

Contaminants enter streams, rivers and estuaries via a number of pathways originating from both point and nonpoint sources. Wastewater treatment plant effluent, other National Pollutant Discharge Elimination System (NPDES) discharges, septic systems, and illicit discharges introduce nutrients, bacteria, pathogens, and household chemicals to surface and groundwater. Stormwater runoff from developed areas carries nutrients, sediment, bacteria, road salt, rubbish, petroleum compounds, fertilizers, and pesticides. Agricultural runoff can carry bacteria, nutrients, agricultural chemicals, and sediment. Groundwater contaminated by septic system discharges, petroleum spills, and hazardous materials may also enter streams and rivers.

The quality of water in an estuary depends greatly on the environmental health of its headwaters.

Low-impact land development approaches, stormwater treatment and management, and improved wastewater treatment can all benefit water quality. Hard to manage but important to improving water quality are the practices of individual homeowners and businesses, especially those located near or adjacent to streams, rivers, and shoreland.

Improving water quality in the Region requires a broad range of activities such as,

- Establishing Region-wide cooperation to improve nutrient management
- Expanding stormwater management and treatment
- Enhancing nutrient removal at wastewater treatment plant and nonpoint sources
- Researching sediment sources and erosion control methods
- Restoring and protecting shoreland and riparian buffers to sequester nutrients, mitigate thermal range, and minimize erosion and sedimentation
- Adopting improved septic system design and maintenance standards
- Detecting and eliminating illicit discharges to surface waters
- Improving identification and elimination of bacterial sources to shellfish areas and beaches
- Improving household hazardous waste disposal practices
- Training and licensing de-icing chemical applicators and landscape contractors
- Improving landscape scale water supply protection

"WATER QUALITY, AN IMPORTANT INDICATOR OF ENVIRONMENTAL HEALTH, HAS A PROFOUND INFLUENCE ON THE CONDITION OF NEARLY ALL ESTUARINE HABITATS, PLANTS AND ANIMALS."

- New Hampshire Estuaries Project Management Plan, 2000

CRITICAL ISSUE

NUTRIENT LOADING

Addressed by 11 management objectives, 33 action plans

"THE MOST PRESSING PROBLEMS FOR THE ESTUARIES RELATE TO POPULATION GROWTH AND THE ASSOCIATED INCREASES IN NUTRIENT LOADS AND NONPOINT SOURCE POLLUTION."

. - PISCATAQUA REGION ESTUARIES PARTNERSHIP STATE OF THE ESTUARIES REPORT, 2009

Nitrogen, a common nutrient, is a major chemical component of all living things. It is found in human and animal waste, decomposing plant materials, fossil fuels, and products derived from these sources such as fertilizer, exhaust, and cleaning products. Nitrogen is used by plants and animals for nutrition and growth. However, the excess nitrogen that plants and animals cannot consume may become a pollutant in groundwater and surface water. In freshwater systems, increased levels of nitrate and nitrite in drinking water can cause health risks, especially for infants and children, and high levels in surface waters can cause problems for fish and other aquatic species.

Excess nitrogen in estuaries can lead to eutrophication, a process characterized by an increase in primary productivity due to an abundance of nutrients. In estuaries, this may lead to proliferation of nuisance macroalgae and increased phytoplankton growth, which may decrease water clarity. The excess algae and phytoplankton that is not consumed may cause low dissolved oxygen levels as these organisms die and decompose. The combination of decreased water clarity and low dissolved oxygen significantly impacts ecosystems. Eelgrass habitat, which supports many estuarine species, is impaired by reduced water clarity.

Recent increases in nitrogen in the Great Bay Estuary threaten the overall quality of the system. The total nitrogen load and dissolved inorganic nitrogen load to the Great Bay Estuary has showed increases over the past five years. The increase may be as high as 43% and 44% respectively. (Piscataqua Region Estuaries Partnership, 2009). To better understand how nitrogen levels have changed over time, researchers must next normalize the data for precipitation to determine the actual percent increase for each nutrient component.

The Great Bay Estuary is at the most risk of impacts from nitrogen loading due to increased population growth and development within the watershed, the relatively low rate of estuary water exchange in the bay, and finally, the loss of the assimilative capacity previously provided by eelgrass as well as oysters and other filter feeders. At this time, the Hampton-Seabrook Estuary is at low risk for eutrophication due to the rapid ocean flushing in this estuary.

PREP and NHDES estimate that approximately one-third of the nitrogen load to the Great Bay Estuary comes from wastewater treatment plant discharge. The majority of other nitrogen load comes from nonpoint sources including stormwater, septic system discharge, agricultural and lawn runoff, groundwater, ocean water, and atmospheric deposition. Much of the nonpoint source load is delivered to the estuary via the major tributary systems.

Reducing nitrogen loading in the Region requires a broad range of activities, such as:

- Reducing nitrogen loads from WWTFs through permit limits and improved treatment technologies
- Improving watershed management and regional control of nutrient loads
- Protecting and restoring riparian and shoreland buffers
- Promoting use of Low Impact Development (LID) techniques and innovative stormwater controls to improve treatment of stormwater
- Initiating outreach and training to local decision makers and watershed residents on the impacts of nitrogen loading to estuarine waters and habitats
- Reducing impervious surfaces and their impacts
- Reduce or eliminate illicit connections to stormwater drains and leaky sewer pipes
- Minimizing growth of impervious surface cover in small and undeveloped watersheds
- Improving septic system treatment and maintenance
- Obtaining a better understanding of the nitrogen cycle in the Piscataqua Region watershed
- Increasing health and abundance of the existing oyster population and promote aquaculture of oysters and other filter feeders that help reduce water clarity and sequester nutrients in fresh and estuarine waters

STORMWATER RUNOFF & MANAGEMENT

Addressed by 9 management objectives, 27 action plans

Stormwater runoff is generated when rain or melting ice and snow flows over land surface to natural or man-made channels and water bodies. In a natural setting, storm flow can be slowed, filtered, or absorbed by vegetation and soil materials before it enters wetlands, ponds, streams, or rivers.

Land development typically changes the natural patterns of hydrologic flow and adds impervious surfaces, such as pavement, buildings and hardscaping, which prevent infiltration of water into the soil and increases the volume and rate of stormwater runoff. Stormwater runoff from developed areas carries trash and pollutants such as fertilizers, pesticides, de-icing chemicals and sand, eroded sediments, automobile fluids, and pet waste, which build up on developed surfaces between precipitation events until they are carried into the nearest storm drain and water body. Conventional site development practices – large roofs, parking lots and lawns, plus drainage ditches and pipes discharging directly into streams – dramatically increase the volume and rate of stormwater leaving a site, as well as the pollution load to the adjacent waterway. The cumulative impacts of conventional development techniques can affect the hydrology of entire watersheds by increasing the intensity and destructive potential of flood events, decreasing groundwater infiltration and recharge (which reduces resilience of aquatic systems to drought events), eroding and de-stabilizing river channels, reducing water clarity and filling stream and rivers with silt and sediment, and increasing water temperatures in streams.

Based on work completed in 2005, the total area of impervious surface in the entire Piscataqua Region watershed was calculated at 7.5%, almost doubling since the year 2000 (Justice D, Rubin F, 2006). Nine of the 40 sub-watersheds in the Piscataqua Region watershed have impervious areas greater than 10%; these sub-watersheds are mostly located along the Piscataqua River and the Atlantic coast. Where impervious cover reaches more than 10% as it does in developed areas, water quality is further degraded due to increased stormwater volume and pollutant loading. However, water quality impacts often are observed below 10% impervious cover.

In small and less developed watersheds, impervious cover should be maintained below five percent (5%) to sustain the quality of headwater streams and riparian habitat, as well as support wildlife species that are particularly sensitive to the impacts of development and land conversion, such as Eastern brook trout.

In the 1990s, managing stormwater from large municipalities was a focus of the U.S. Environmental Protection Agency's Phase I program under the Clean Water Act. Phase II of the program began in 1999 and addressed stormwater issues in smaller urbanized municipalities that need to separate storm and sewer systems. These communities are known as Municipal Separate Storm and Sewer Systems (MS4). Phase II stormwater EPA regulations, along with changes in development patterns and practices, are meant to reduce the water quality impacts of stormwater on freshwater and estuary systems. Controlling the volume and peak rates of stormwater runoff will decrease the threat of flooding and increase the volume of water available to recharge groundwater.

Improving stormwater management in the Region requires a broad range of activities such as,

- Raising public awareness about the impacts of stormwater
- Decreasing amount of fertilizer in stormwater runoff by changing agricultural practices and homeowner behaviors
- Improving buffer zones
- Improving and providing training on best management practices (BMPs)
- Decreasing or limiting impervious surfaces using Low Impact Development (LID) methods
- Improving municipal regulations/standards that apply to new development or redevelopment projects
- Supporting implementation of the EPA MS4 stormwater program in regulated communities

"THE KEY TO EFFECTIVE MANAGEMENT OF STORMWATER RUNOFF IS TO REDUCE THE AMOUNT OF STORMWATER GENERATED IN THE FIRST PLACE BY MAINTAINING AND WORKING WITH THE HYDROLOGY OF A SITE AND MANAGING STORMWATER AT THE SOURCE."

- New Hampshire Stormwater Manual: Volume I, 2008

RIPARIAN & SHORELAND BUFFERS

Addressed by 5 management objectives, 9 action plans

"THE SIMPLEST AND MOST EFFECTIVE WAY TO PROTECT STREAMS, RIVERS, LAKES AND ESTUARIES IS TO LEAVE AN AREA OF UNDISTURBED NATIVE VEGETATION ADJACENT TO THE WATER BODY. THESE UNDISTURBED AREAS ACT AS BUFFERS BY PERFORMING FUNCTIONS THAT PROTECT WATER QUALITY AND ENHANCE WILDLIFE HABITAT. PRESERVING AND RESTORING RIPARIAN BUFFERS IS ESSENTIAL TO SURFACE WATER QUALITY PROTECTION."

- New Hampshire Innovative Land Use Planning Guide, 2009

A naturally vegetated shoreland buffer (often referred to as a "riparian" buffer) provides shade, habitat, nutrient retention, water filtration, groundwater recharge, and flood attenuation capacity. Buffers also stabilize soil, thereby preventing erosion. A buffer typically includes the natural floodplain of a stream or river, and may encompass upland and wetland areas.

Development and other land use practices can negatively impact natural buffers and decrease the capacity for sediment and pollutant filtration and storm water retention. Erosion of unvegetated or sparsely vegetated buffers can increase the sediment load of streams and rivers. As wetland boundaries – both marsh and coastal – change and as storm surges increase with climate change, shoreland buffer protection is increasingly important.

The New Hampshire Comprehensive Shoreland Protection Act (NHCSPA), updated in 2008, regulates land uses in shoreland buffer zones for lakes, tidal waters, designated river segments protected under the NH Rivers Management and Protection Program, and larger rivers that are classified as fourth order and higher. The Mandatory Shoreland Zoning Act of Maine, updated in 2006, carries similar protections for shorelands adjacent to second order and higher streams, tidal waters, and great ponds, and includes protections for freshwater and saltwater wetlands. Maine municipalities must adopt local protections at least as protective as the standards in the Shoreland Zoning Act but may enact more stringent buffer protections at their discretion.

Shorelands adjacent to smaller streams (first, second, and third order) are not regulated under the NHCSPA unless they are designated river segments under the NH Rivers Management and Protection Program. Shorelands adjacent to first-order headwater streams are not regulated under Maine's Mandatory Shoreland Zoning Act. First-order streams can be permanent or intermittent (only flowing for part of the year). While these streams are small, cumulatively they typically make up a large percentage of the total stream miles in a watershed. Protecting buffers along these small streams is equally important as protections for larger streams because pollution from small streams drain directly to larger rivers and ultimately to the estuaries. Small streams have greater soil-to-water ratios compared to larger stream systems: an important factor in nutrient removal and moderation of stream flows, during both high and low conditions.

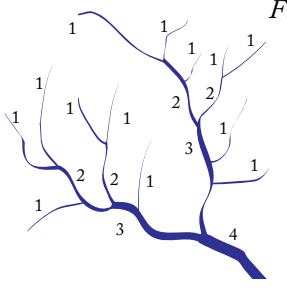


Figure 3: Stream Order

Stream order is a classification system used to define stream size. First order streams are the smallest size and are synonymous with headwater streams.

Smaller streams with intact, undeveloped floodplains and buffers provide the following functions:

- Maintenance of cool water temperatures
- Wood and leaf debris for invertebrate species and channel formation
- Retention and transformation nutrients to protect water quality
- Connectivity and habitat
- Recharge and discharges zones for groundwater
- Flood storage
- Erosion and sedimentation

Managing riparian and shoreline buffers in the Region requires a broad range of activities, such as:

- Protecting small streams and their buffers
- Identifying and restoring impacted buffers
- Protecting shoreland
- Encouraging more consistency in protective buffer regulations throughout the watershed.

Studies have shown that if impervious cover is greater than 5% of land area in the watersheds of small streams, it can degrade downstream water and habitat quality from stormwater runoff and associated impacts (USGS, 2007).

CRITICAL SPECIES

Addressed by 9 Management Objectives, 11 action plans

The critical species targeted in this CCMP include soft-shell clams, American oysters, Eastern brook trout, diadromous fish, shorebirds, salt marsh breeding birds, and eelgrass. Robust populations of these species are good indicators of estuarine, marsh, and watershed health.

Oysters are a keystone species in the Great Bay Estuary because they provide many benefits. As filter feeders, they play important roles in nutrient cycling, contaminant sequestration, and water clarity. Based on conservative estimates, past oyster populations in the Great Bay Estuary filtered 15 billion gallons of water each day or 27% of the typical mid-tide volume of the bay (Odel, 2006). Oysters reefs provide solid substrate and a microhabitat for many estuarine organisms. Recent oyster numbers have relatively low relative compared to early 1990 populations. The pathogens MSX and Dermo, habitat destruction, harvest pressure on a diminished population, and water pollution contribute to varying degrees to a decline of oysters in Great Bay and other Mid-Atlantic states. In 1993, NHFGD started monitoring Great Bay Estuary oyster populations. The highest recorded total was in 1993. The population dropped sharply when monitored again in 1995. For the next decade oyster numbers were very low compared with the 1993 data. The 2008 levels are well below PREP's interim management goal of 10 million adult oysters, however strong spat sets in 2006 and 2007 have contributed to increasing numbers of juvenile and adult oysters in the estuary.

Reef restoration, strong spat sets, and maturing oysters suggest that conditions may be improving, but numbers are still far below 1993 levels. Activities that are important for oyster recovery are improving water clarity, decreasing sediment loads, increasing reef restoration, enhancing disease-resistant populations, understanding diseases cycles, and limiting harvest impacts.

Soft-shell clam beds are primarily found in the Hampton-Seabrook Harbor, although they exist in the Great Bay Estuary. Predators (primarily green crabs), diseases, and recreational harvest pressures have adversely impacted clam populations. Periodically, harvesting is limited by the presence of red tide toxins and high bacteria counts.

Many species of migratory fish are in decline due to a number of factors such as water quality and habitat degradation, barriers to aquatic connectivity caused by dams and road crossings, as well as overharvest. The construction of dams and road-crossing culverts has fragmented and blocked the vast majority of the freshwater stream habitat historically used by diadromous fish. Removal of passage obstructions is essential to restore diadromous fish access to suitable habitat and revive sustainable populations. Common anadromous fish in the Region include blueback herring and alewives (collectively called "river herring"), rainbow smelt, American shad, striped bass and sea lamprey. Once abundant, populations of anadromous Atlantic salmon and Atlantic sturgeon are now virtually extirpated in the Region. American eel is a threatened catadromous species.

Eastern brook trout is the New Hampshire state fish and requires high quality, coldwater streams for spawning and juvenile growth. Development impacts in the headwater and first-order streams increase water temperatures and degrade water quality, resulting in conditions that do not support native Eastern brook trout. Through the efforts of MDIFW, NHFGD, Trout Unlimited and the Eastern Brook Trout Joint Venture, suitable stream reaches for brook trout are being mapped and restoration opportunities are being identified. Improving stream connectivity, protecting low-order streams and their buffers, limiting impervious surfaces and removing pollutants from stormwater runoff will improve the habitat and survivability of this critical species.

The Hampton-Seabrook Estuary - and to a lesser extent Great Bay and the smaller coastal marshes – are critical stopover sites for migratory shorebirds in spring and fall. During these periods, birds roost and feed on tidal flats and marshes, which are impacted by habitat loss and other human disturbances. As such, conservation actions in the region will need to consider the annual cycles of important species. The saltmarsh sparrow is a species of special concern in Maine and New Hampshire. Saltmarsh sparrows require tidal wetland habitat that is dominated by *Spartina patens* for nesting and foraging. Ninety percent of the bird's breeding range is in the Northeast. Preserving the existing habitat and restoring degraded saltmarsh will benefit the saltmarsh sparrow.

Decreased nutrient loading, buffer protection and restoration, minimizing impacts from impervious surfaces and improved stormwater treatment will support key species by improving habitat.

"THE PRIMARY CHALLENGES AFFECTING WILDLIFE DIVERSITY IN SOUTHERN AND COASTAL MAINE ARE CONVERSION AND FRAGMENTATION OF HABITATS. THIS AREA HAS THE HIGHEST LEVEL OF PLANT AND WILDLIFE DIVERSITY IN THE STATE, YET IS ALSO ONE OF THE MOST DESIRABLE AREAS FOR DEVELOPMENT."

- MAINE'S WILDLIFE ACTION PLAN, 2009

CRITICAL HABITATS & RESTORATION

Addressed by 9 management objectives, 16 action plans

"THE GOAL OF ESTUARINE RESTORATION SHOULD THEREFORE BE TO ABATE THE THREATS THAT DEGRADE AND SIMPLIFY THE ESTUARY ECOSYSTEM AND AT THE SAME TIME TAKE ACTIONS THAT HELP TO BUILD ECOLOGICAL RESILIENCE – THE ABILITY OF AN ECOSYSTEM TO REBOUND FROM DISTURBANCES INSTEAD OF SHIFTING INTO NEW, OVERSIMPLIFIED STATES."

- GREAT BAY ESTUARY RESTORATION COMPENDIUM, 2006

Habitats that are particularly critical to the health of the Piscataqua Region estuaries include freshwater wetlands, streams, eelgrass beds, oyster reefs (see page 21) and saltmarsh. These habitats are threatened by rapid human population expansion, declining water quality, invasive species, encroachment by development and climate change. Efforts are underway to assess these impacts, restore habitats, and modify regulations to improve protection.

Freshwater wetlands store large quantities of water and provide habitat and food for a multitude of wildlife species. They provide a storage basin for precipitation and runoff and can be effective at removing pollutants and maintaining water quality. Water from wetlands is slowly released to streams and rivers and helps sustain these systems in periods of low flow. While land protection or local regulations protect some wetland systems from encroaching development, filling and associated degradation, most wetlands remain vulnerable. Polluted stormwater runoff from developed areas adjacent to wetlands can negatively impact the hydrology, plant community and habitat value of freshwater wetlands.

Salt marshes perform many of the same functions as freshwater marshes and are a fundamental part of the estuarine food web. Salt marshes have been shown to be critical carbon sinks and capable of adjusting to gradual changes in sea level. Although based on different data sets and interpreted by different methods, evaluations of saltmarsh area loss illustrate the degree of habitat degradation in salt marshes. Since the early 1900's, an estimated 431 acres of salt marsh area has been lost in Great Bay Estuary, and in the Hampton-Seabrook Estuary, 614 acres or 12% of the historic salt marsh has been lost. Some of this loss is due to direct development and is unlikely to be returned to salt marsh. In New Hampshire nearly 300 acres of salt marsh over the past 10 years has been restored or enhanced by re-establishing or improving tidal flows and removing invasive species.

Actions needed to protect and restore freshwater and tidal wetlands include:

- Evaluating flooding and inundation due to climate change and protecting lands for marsh migration with rising sea levels.
- Promoting municipally designated high value or prime wetland areas and increasing their protection
- Tracking wetland restoration and in-lieu fee programs to determine their success in sustaining ecosystem services
- Restoring additional saltmarsh and evaluate success of previous restoration efforts
- Conducting invasive species survey and implement species control projects
- Evaluating and protecting shorebird and salt marsh breeding bird populations

Eelgrass (*Zostera marina*) is a rooted vascular plant that can form dense sub-tidal meadows in estuarine waters. Eelgrass beds provide valuable habitat for estuarine species, are a critical component of the estuarine food web, and reflect the overall health of estuarine water quality. Eelgrass filters nutrients and suspended particles from water and stabilizes sediments.

Eelgrass wasting disease had a major impact throughout the Great Bay Estuary in the late 1980s. More recently, increased nutrient levels have decreased water clarity and sunlight penetration, which has impacted the growth and health of eelgrass. Eelgrass beds are in decline in Great Bay, Portsmouth Harbor and connective corridors and are no longer found in the tidal rivers or in Little Bay or in the Piscataqua River. Improved water quality and clarity will be necessary throughout the estuary to recover eelgrass since it has been lost or is in decline everywhere.

Actions needed to protect and restore eelgrass involve:

- Identifying and implementing eelgrass restoration projects
- Implementing best management practices through state and local land use regulations and reducing pollution sources to improve water clarity
- Promote improved practices and monitor impacts to eelgrass from moorings, docks, and other structures
- Promote partnerships and funding opportunities for eelgrass monitoring restoration projects

To site and coordinate estuarine restoration activities identified in the CCMP, restorationists and resource managers should compile spatial data on the current and potential locations for habitat restoration and other estuarine uses (i.e. mooring fields, marinas, port facilities, etc.) and actively participate in estuarine spatial planning efforts.

STREAM CONNECTIVITY, STREAM STABILITY, & FLOODPLAIN PROTECTION

Addressed by 5 management objectives, 11 action plans

Rivers and streams in the Piscataqua Region watershed are crossed by multiple roads and are restricted by large and small dams. Where roads cross waterways, their accompanying infrastructure, culverts and bridges can inhibit aquatic passage by fish, reptiles, amphibians and mammals, as well as restrict streamflow, resulting in ponding (water backup behind restrictions) or perching (outflow enters above stream level). These physical restrictions may lead to water quality degradation, road flooding and unintended hydrologic alteration upstream and downstream of the crossing. Stream crossing guidelines issued by New Hampshire and Maine agencies recently have been updated to accommodate appropriate designs that allow passage of aquatic organisms and help to retain or restore stream connectivity.

Dams can prevent diadromous fish from moving between saltwater and freshwater habitats critical to their migratory lifecycles and prevent movement of freshwater fish between river reaches. Alewives, American shad, rainbow smelt, striped bass, blueback herring, sea lamprey and American eels are the most common diadromous fish that enter the Piscataqua Region watersheds. Freshwater fish affected by dam restrictions include Eastern brook trout, American brook lamprey, and blacknosed dace, among many others. Impoundments created by dams often have water quality problems as a result of dams slowing down water movement and increasing the residence time for sediments, nutrients and other pollutants. Low dissolved oxygen levels and higher temperatures of impoundments may be problematic for many migratory fish, native coldwater fish species, and freshwater mussels. Dams also alter the transport of sediment and nutrients through the stream network and cause upstream and downstream impacts to stream channel structure and function.

There are 17 head-of-tide dams in the New Hampshire seacoast blocking most major and minor tributaries to the estuaries and ocean. These dams have eliminated a natural transition zone between saltwater and freshwater and have thereby almost completely eliminated important brackish marsh habitats. There are fish ladders on only seven head-of-tide dams that provide upstream passage for some diadromous fish species and two of those that additionally allow downstream passage. While fish ladders make passage possible some of the time for some species, most experts believe that existing ladders are not effective at passing most migratory fish species most of the time. In 2009, removal of the head-of-tide dam on the Winnicut River re-established the only free-flowing tributary to the Great Bay.

Another important issue related to rivers and streams is flooding. Historic alteration of floodplains and crossings can worsen flood impacts. Rivers and streams adjust their shape and flow characteristics based on channel materials, topography, storm intensity and duration, and nearby land use. River and stream shapes can be broadly categorized, and the tendency for rivers to change (stability) can be assessed. A stream or river's shape and stability provide valuable information about flooding potential and stream migration.

Increased storm frequency and intensity have caused serious flooding on many Piscataqua Region rivers and streams, most notably the "100-year" flood events in 2006 and 2007. A 100-year flood is defined as a storm where the level of floodwater is equaled or exceeded every 100 years on average. This recent flooding highlights the vulnerability of roads and other development in floodplain areas to damage and catastrophic loss. The State of Vermont responded to its flooding problems by conducting geomorphic assessments of rivers to determine their stability. This was followed by stream restoration and flood zone protection activities. A similar approach is being undertaken in New Hampshire for those rivers that have experienced catastrophic flooding over the past several years. Portions of the Exeter River and Isinglass River have been evaluated, and other coastal rivers will be surveyed in coming years.

Once the fluvial geomorphology – the study of stream patterns and properties – is understood, fluvial erosion hazard (FEH) zones can be identified along river segments. Identification and adoption of FEH zones and floodplain development restrictions are needed for flood-prone areas.

Beginning in 2009, New Hampshire towns were granted the authority to adopt FEH zoning. FEH zoning is an effective mechanism to keep development out of harm's way and allow natural channel adjustment processes to take place.

DAMS, DIKES, PERCHED CULVERTS, AND OTHER STREAM BARRIERS HAVE THE POTENTIAL TO LIMIT OR COMPLETELY RESTRICT ACCESS TO SPAWNING HABITAT AND OTHER HABITATS FOR VARIOUS LIFE STAGES OF NATIVE RESIDENT … AND ANADROMOUS SPECIES."

GULF OF MAINE COUNCIL ON THE MARINE ENVIRONMENT, STREAM BARRIER REMOVAL MONITORING GUIDE, 2007

"IF A RIVER CANNOT ACCESS ITS FLOODPLAIN, WHICH SERVES THE ESSENTIAL PURPOSE OF SLOWING FLOODWATERS AND STORING SEDIMENT, STREAM BANKS ARE SUBJECTED TO THE FULL POWER OF FLOOD FLOWS, LEADING TO EXTENSIVE FLUVIAL EROSION."

VERMONT RIVER MANAGEMENT PROGRAM, MUNICIPAL GUIDE TO FLUVIAL EROSION HAZARD MITIGATION, 2008

INVASIVE SPECIES ASSESSMENT & CONTROL

Addressed by 3 management objectives, 5 action plans

"STUDIES SHOW THAT INVASIVES CAN REDUCE NATURAL DIVERSITY, IMPACT ENDANGERED OR THREATENED SPECIES, REDUCE WILDLIFE HABITAT, CREATE WATER QUALITY IMPACTS, STRESS AND REDUCE FOREST AND AGRICULTURAL CROP PRODUCTION, DAMAGE PERSONAL PROPERTY, AND CAUSE HEALTH PROBLEMS."

- GUIDE TO INVASIVE UPLAND PLANT SPECIES IN NEW HAMPSHIRE, 2005

The Piscataqua Region watershed is experiencing increased invasion by terrestrial, freshwater and marine exotic species. Humans through shipping, trade, overland travel, and importation of non-native host species have introduced some of these plants and animals, while others have migrated due to changes in habitat temperatures and storm patterns. Many have the capacity to opportunistically and quickly invade disturbed habitats. Invasive species can be thought of as non-indigenous species that adversely affect the habitats they invade economically, environmentally or ecologically. For instance, research funded by PREP has documented significant native clam mortality from abundant populations of non-native green crabs. Another example is the invasion of local marshes with the non-native invasive variety of common reed (*Phragmites australis*), which forms dense monoculture stands that displace native vegetation and reduce the quality of the habitat for most wildlife.

The NH Coastal Watershed Invasive Plant Partnership (CWIPP) was formed to coordinate regional invasive plant management activities between federal and state agencies and land conservation organizations. Target invasive species include common reed, purple loosestrife, bittersweet, buckthorn, Japanese knotweed, burning bush, pepperweed and Japanese barberry. These plants displace native species and can alter coastal habitats. Soil disturbance and road impacts aid the spread of these invasives, so the rapidly developing Piscataqua Region is particularly at risk.

At present, CWIPP includes all 42 New Hampshire communities in the Piscataqua Region watershed. Several projects are underway in New Castle, Rye, and North Hampton and in the Crommett Creek watershed in Newmarket and Durham. The 10 watershed communities in Maine work with the Maine Department of Conservation and the University of Maine Cooperative Extension on invasives control. Coordination of these programs across the full watershed area would be valuable.

Common freshwater nuisance species are milfoil, water chestnut, fanwort, and didymo (rock snot). These organisms degrade lake, pond and river habitats and affect aquatic recreation and fisheries. Boaters that move from lake to lake can easily carry these plants from place to place. Zebra mussels may pose a threat to rivers and lakes in the future. Both Maine and New Hampshire have active programs to control the spread of these species through volunteer lake monitoring and through the "Lake Host" program where volunteers check boats at landings and inform boaters about aquatic invasive plants.

Invasive marine plants and animals include the Chinese mitten crab, green crab, Asian shore crab, tunicates, and disease causing parasites, such as MSX and Dermo. These invaders are harmful to shellfish, eelgrass habitats and the overall native biodiversity of estuarine and marine habitats. Research to evaluate the susceptibility of estuaries to these invaders suggests that temperature and salinity are important factors in survivability. Development of a marine invasive management plan will highlight the most effective measures to minimize impacts on existing habitats.

C. Coletti - NH Coastal Program

Perennial pepperweed (Lepidium latifolium) is an aggressive non-native plant of the mustard family that creates dense stands, out-competing native plant species, and destroying habitat for many species of animals. Through its pepperweed patrol program, the NH Coastal Program has managed the small pepperweed population in New Hampshire through early detection surveys and control using targeted hebicide treatment and hand-pulling.

LAND PROTECTION

Addressed by 10 management objectives, 26 action plans

Protection of critical habitat and large contiguous blocks of conservation land can help to safeguard water resources, critical species and landscape connections. In the Piscataqua Region, land protection efforts have been robust. By the end of 2008, over 76,000 acres of land in the Region (11.3% of total area) were protected from development. Significant parcels have been protected around Great Bay, in the Mount Agamenticus region, the Great Works River watershed, and in the Pawtuckaway area.

Regional land protection planning efforts have established conservation focus areas (CFAs) at the coastal watershed scale. The Land Conservation Plan for New Hampshire's Coastal Watersheds, completed in 2006, was partially funded by PREP and identifies 75 CFAs. The Land Conservation Plan for Maine's Piscataqua Region Watershed is a similar effort in 10 Maine communities in the Region that identified 15 CFAs. At this time, 25% of the 167,000 acres that comprise these CFAs has been protected.

National, regional and local land protection organizations and municipalities have been active in land protection efforts in the Region. The Great Bay Resource Protection Partnership, a coalition of nine agencies and conservation organizations, has successfully secured conservation easements and acquired lands in critical areas around Great Bay. The Mount Agamenticus to the Sea Conservation Initiative has collaborated to protect substantial areas of its conservation focus area. Successful in protecting large habitat blocks as part of their conservation efforts, local and regional land trusts and conservation organizations include the Society for the Protection of New Hampshire Forests, The Nature Conservancy, Trust for Public Lands, Strafford Rivers Conservancy, Moose Mountains Regional Greenways, Southeast Land Trust of New Hampshire, Bear-Paw Regional Greenways, Three Rivers Land Trust, Great Works Regional Land Trust, Kittery Land Trust, and the York Land Trust. Citizens in watershed cities and towns have voted for sizeable land protection bonds to assist with these regional conservation efforts. In New Hampshire, 69% of the Region communities allocate some or all of the Land Use Change Tax to a conservation fund.

PREP currently supports land conservation efforts by funding and participating in regional land protection planning, supporting natural resource inventories and conservation on a local level and providing grants to fund transaction costs associated with permanent land protection projects. Continued support of land protection organizations and municipalities to keep pace with changing legal requirements and other technical training is needed. With more lands under conservation, resources and training are needed to ensure proper stewardship. Coordinated land management practices are important to ensure that the watershed network of protected lands provide critical ecological services.

Additionally, both Maine and New Hampshire have completed Wildlife Action Plans that identify critical habits and species for protection. The New Hampshire Audubon and the NH Fish and Game Department (NHFGD) have also developed a habitat connectivity model, which helps to identify least-cost connectivity paths for wildlife movement between protected lands. Maine's Beginning with Habitat (BwH) program has developed a similar connectivity model. NHFGD and BwH are encouraging communities to work together to incorporate Wildlife Action Plan goals into natural resource inventories and local and regional land protection priorities.

Since water demand is growing in the Region, protection of current and future water supply lands and associated watersheds is critical to preserve water quality and replenish both groundwater and surface water sources. Where water supplies cross town boundaries, regional watershed protection approaches are needed. Evaluation of the potential for saltwater intrusion into freshwater aquifers from sea level rise and groundwater extraction may also be required.

Activities needed to address land protection include:

- Increasing land protection through compact development and innovative land use development practices and controls
- Protecting Piscataqua Region conservation focus areas
- Protecting wetland, riparian zone and shoreland
- Identifing and protecting state species of concern and their habitat
- Assessing current and future water supply land protection

"THE OVERARCHING GOAL … IS TO FOCUS CONSERVATION ON THOSE LANDS AND WATERS THAT ARE MOST IMPORTANT FOR CONSERVING LIVING RESOURCES - NATIVE PLANTS, ANIMALS, AND NATURAL COMMUNITIES - AND WATER QUALITY IN THE COASTAL WATERSHEDS."

-THE LAND CONSERVATION PLAN FOR NEW HAMPSHIRE'S COASTAL WATERSHEDS, 2006

DEVELOPMENT & LAND USE REGULATIONS

Addressed by 10 management objectives, 26 action plans

"THE GOAL OF LOW IMPACT DEVELOPMENT (LID) IS TO REDUCE THE VOLUME AND FLOWS OF RUNOFF FROM THE DEVELOPED SITE AND TO TREAT AND RECHARGE PRECIPITATION IN A WAY THAT MIMICS THE NATURAL HYDROLOGY OF THE SITE. LID HELPS TO MANAGE THE IMPACTS THAT STORMWATER RUNOFF HAS ON WETLANDS, STREAMS, LAKES AND COASTAL ENVIRONMENTS, AND HELPS TO RECHARGE NATURAL GROUNDWATER AQUIFERS."

- LID Guidance Manual for Maine Communities, 2007

Population and land development have slowed in recent years (New Hampshire Office of Energy and Planning, 2006), however, development continues to have significant negative impacts on water quality in the Piscataqua Region. Conventional development practices have rapidly increased impervious surfaces throughout the Region at an average rate of 1,500 acres per year over the last 15 years (Justice and Rubin, 2006). The resulting increase in stormwater runoff has had significant negative impacts on the channel stability of the Region's streams and the quality of water resources. Sprawling development patterns also fragment the integrity and connectivity of the remaining high quality wildlife habitats in the Region. An emphasis of the Land Use and Habitat Protection theme involves promoting land use practices that better protect critical "green infrastructure" needed to maintain the ecosystem services that sustain healthy human and wildlife communities.

In 2009, PREP completed the Piscataqua Region Environmental Planning Assessment (PREPA); a comprehensive survey of existing municipal regulations and management efforts aimed at protecting the Piscataqua Region estuaries. PREPA results provide a valuable snapshot of communities' current practices and serve as a baseline for evaluating successes over the next 10 years from implementing land use and conservation initiatives. Based on the assessment results, PREP has developed strategic targets for improving the quality and consistency of environmental protection throughout the Piscataqua Region (Appendix B).

In addition to the PREPA results, guidance on smart growth land development patterns, low-impact development (LID) techniques, stormwater management, and green building practices (LEED) have been developed nationally and locally. The 2009 New Hampshire Innovative Land Use Planning Guide provides background and model language for ordinances that minimize environmental impacts from development patterns, site development practices, transportation patterns and energy usage. Maine agency model guidance and ordinances for LID and green development practices include Maine State Planning Office LID guidance, Maine DEP land use regulations, Maine Centers for Disease Control water-supply protection guidance, and the Beginning with Habitat wildlife and land protection toolbox.

In 2009, the UNH Stormwater Center and UNH Cooperative Extension released an outreach and training guide for municipal officials entitled Protecting *Water Resources and Managing Stormwater.* Under a contract from the New Hampshire Fish & Game Department, New Hampshire Audubon developed a process to assess municipal land-use planning documents for wildlife habitat and natural resources protections.

Examples of innovative land use and low-impact development include compact development, conservation subdivisions and techniques to control and treat stormwater while minimizing changes to on-site hydrology. Compact development which maximizes open space and reduces changes to site hydrology will help protect remaining open space and sensitive lands from development impact. Stormwater Best Management Practices (BMPs) and LID techniques are designed to reduce peak stormwater runoff volumes/rates and at least partially treat the water quality of stormwater runoff before it leaves a developed site.

At the municipal level, adoption of compact development strategies and LID techniques, along with permanent land protection of essential wildlife habitat, will slow the consumption of remaining open lands and protect the region's green infrastructure that provides important ecological services, such as pollutant removal, infiltration and slowing of floodwaters, clean drinking water and resilient wildlife populations.

In order for land use regulations to be effective they must be consistently applied and enforced. When environmental protections are frequently waived in the site plan and subdivision approval process or through variances granted by Zoning Boards of Adjustment (ZBAs), the original intent of a community's regulations are lost and the cumulative effect is significant, contributing to degradation of habitats and water resources. Similarly, without vigilant enforcement of existing ordinances, town regulations are relegated to "paper protections" with little on-the-ground effect. Assisting communities with prioritization of regulations for enforcement and providing training and environmental information to ZBAs, planning boards, and conservation commissions will help focus limited resources.

CLIMATE CHANGE

Addressed by 5 management objectives, 11 action plans

The 2010 CCMP action plans were created with the awareness that climate change impacts must be factored into all aspects of watershed management activities. While recognizing that aggressive reductions in emissions are critical to avoid severe climate change impacts, it is also clear that climate change currently is underway and significant impacts are inevitable.

The primary guiding principle behind PREP's climate adaptation planning work is to identify and implement actions that maintain or increase the resiliency of the Region's ecosystems and human communities to cope with climate change impacts. PREP's approach emphasizes that the most sustainable and cost-effective adaptation options are those that work in partnership with natural processes and recognize the dynamic nature of coastlines, estuaries, and river systems. Thus, proactive measures are emphasized over reactive measures, and strategies to keep infrastructure out of harm's way are encouraged over highly engineered responses to climate change threats.

Climate change research suggests the Region will experience increased rainfall and severe storms, rising sea levels, lower snowfall amounts, and warming average air temperatures in the New England region (New Hampshire Climate Change Policy Task Force, 2009). The impacts on resources may include:

- Changes in saltmarsh and wetland footprints due to sea level rise and increased rainfall
- Changes in low flows and peak flows in rivers and streams
- Accelerated geomorphic changes to streams, rivers and shorelines and failure of associated infrastructure due to flooding
- Increased impacts from stormwater runoff due to extreme rainfall events
- Increased average and seasonal temperature of water- and land-based ecosystems
- Modification of habitat due to changing salinity, streamflow, temperature and inundation patterns
- Increased susceptibility of environments to invasive species
- Increased demand for drinking water and irrigation water
- Increased vulnerability of developed areas to inundation and saltwater intrusion into fresh groundwater due to sea level rise

In order to respond to these potential impacts, the New Hampshire Climate Change Task Force recommends not only reducing energy use and greenhouse gas emissions and increasing carbon sequestration, but also adapting to climate change to reduce social and environmental impacts and costs. The Maine Climate Action Plan recommends a similar suite of measures aimed at reducing greenhouse gas emissions. The Maine State Planning Office is in the process of leading an effort to develop specific climate change adaptation strategies that the state and local municipalities should pursue. The Nature Conservancy recommends strategic protection of susceptible lands and ecosystems, regional planning which integrates climate change impacts into land use strategies, and decreasing anthropogenic stressors that can exacerbate ecosystem changes brought about by climate change (Grubin, et al, 2009).

As the above agencies recommend, the CCMP recognizes the need for adaptation strategies that anticipate and account for predicted climate change in the Piscataqua watershed. Reducing the impact of climage change in the Region requires a broad range of activities such as,

- Evaluating coastal inundation and flooding risks
- Identifing vulnerable road/stream crossing infrastructure
- Identifing and protecting areas that allow for marsh migration
- Implementing changes in land use planning and regulation to respond to these risks
- Protecting in-stream flows during droughts
- Protecting forestlands and marsh lands that sequester carbon
- Protecting migration routes for species whose habitat may shift.

Other actions that indirectly further adaptation to anticipated climate change impacts include removal of hydrologic restrictions, land protection, buffer protection and restoration, wetland restoration, low-impact development and impervious surface limitations.

"...THE TYPES OF HEAVY RAINFALL EVENTS THAT HAVE OCCURRED IN THE NORTHEAST IN RECENT YEARS WILL BECOME INCREASINGLY COMMON... RAISING THE RISK OF FLOODS."

-NORTHEAST CLIMATE IMPACTS ASSESSMENT CLIMATE CHANGE REPORT, 2006

WATER USE

Addressed by 4 management objectives, 9 action plans

"SIMULATED EFFECTS ON THE SEACOAST HYDROLOGIC SYSTEM FROM PROJECTED INCREASED FUTURE WATER USE INCLUDE DECLINING BASE FLOWS; DECLINING FRESH GROUND-WATER DISCHARGES TO TIDAL BAYS, ESTUARIES AND THE OCEAN; AND LOWERED GROUNDWATER LEVELS."

USGS Assessment of Ground-Water Resources in the Seacoast Region of New Hampshire, 2008

Water resources are under increasing pressure from population growth, increased water use per capita, and changes in temperature and rainfall patterns due to climate change. Water use is also no longer viewed only from a human consumption standpoint. Flows needed to sustain aquatic environments are now considered in evaluating and regulating instream flows and withdrawal limits.

Both New Hampshire and Maine have recently evaluated water resource pressures by estimating water use and water requirements by watershed. In 2008, the US Geological Survey (USGS) released a technical report estimating current water use in New Hampshire seacoast region and predicting water use increases through 2025. The report estimates that from 2010 to 2025, domestic water demand will increase 54% and non-domestic water demand will increase 62%.

The New Hampshire Stressed Basins Project, conducted by the NH Geological Survey (NHGS), developed a water balance index that evaluated total withdrawal to summer streamflow. The Maine Geological Survey completed a similar program called Watersheds at Risk. This program highlights the areas most vulnerable to declining stream baseflows due to surface water and groundwater resource demands.

In order to assess water resource needs, accurate hydrologic baseline information is required. Some water level and streamflow data are regularly collected but a larger network would allow for more accurate predictions and a stronger scientific basis for regulations. Data collection can be cooperatively funded and collected by federal, state and local entities in order to make the best use of limited resources.

Water resource management plans are being developed for designed river reaches under the NH Rivers Management and Protection Program (RMPP). The Lamprey River Management Plan was updated in 2007, the Isinglass River Management Plan was developed in 2008 and the Exeter River Corridor and Watershed Management Plan was developed in 1999. A Protected Instream Flow Study was conducted for the designated portion of the Lamprey River in 2009. Similar plans also are encouraged for source water protection through the NHDES Drinking Water and Groundwater Program. At present, no water management plans are being developed in Maine communities within the Great Bay Estuary watershed.

New nominations continue. The Lamprey River Nominating Committee has submitted a nomination for the undesignated portion of the upper and tidal portions of the Lamprey River as well as the North Branch River, Pawtuckaway River, North River, Little River and Piscassic River. The Exeter River Local Advisory Committee has submitted a nomination for the undesignated portion of the Exeter River and the Squamscott River. Lastly, the Oyster River Watershed Association has submitted a nomination for the Oyster River. If successful, these rivers would be designated into the RMPP in the summer of 2011. Once enrolled, management plans would be developed for these rivers as well.

A pilot "Consumptive Water Use Capacity Plan" is being developed by NHDES that jointly assesses surface and groundwater use and sustainability. Coordination of these efforts going forward will protect water resources and maximize resources for protection efforts.

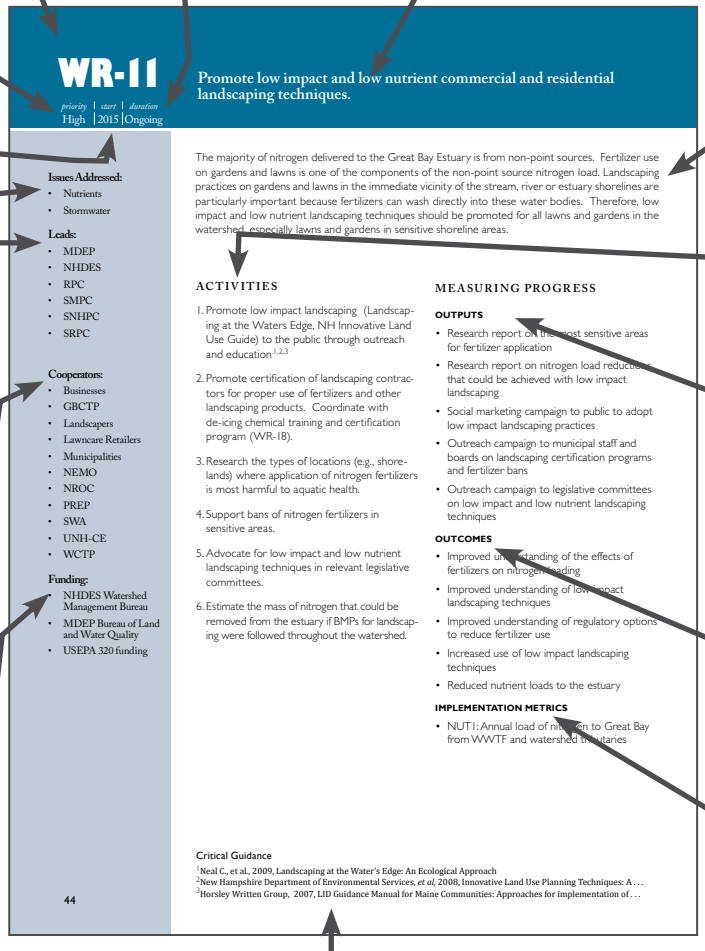
Stratified drift aquifers are localized sand and gravel deposits that currently provide drinking water, or may serve as future supplies. These aquifers also provide valuable recharge and discharge areas for underlying bedrock groundwater and streams and rivers that cross these deposits. Aquifers often extend beyond town boundaries and can supply multiple towns with water. Protecting these water supplies by applying consistent land use regulations and retaining forested land cover can help protect water quality and the drinking water resource these aquifers provide.

Addessing water use involves a broad range of activities that include:

- Protecting instream flows
- Promoting sustainable land-use practices
- Pursuing source water protection

CCMP ACTION PLANS PROVIDE SYSTEMATIC GUIDANCE TO PREP AND ALL STAKEHOLDERS TO ADDRESS CRITICAL ISSUES AFFECTING ESTUARINE HEALTH

Figure 3: Anatomy of an Action Plan



Action Plan Number
Sequential number assigned to action plans in one of four areas: Water Resources (WR); Living Resources and Habitat Restoration (LR); Land Use and Habitat Protection (LU); and Watershed Stewardship (WS). The order of these plans does not imply implementation priority.

Priority
Based on each action plan's relative environmental benefits, probability of success, window of opportunity, and potential implementation costs.

Start
Year when the first activity is initiated.

Issues Addressed
Cross-cutting topics related to the action plan that will help users identify multiple actions throughout the entire plan related to their specific interest or area of expertise.

Leads
Organizations that likely will be primarily responsible for leading the action due to their statutory authority, expertise, or related work activities.

Cooperators
Organizations or groups that can assist or will be directly impacted by the action plan.

Funding
Organizations or programs that are potential sources of funds or resources for implementation.

Duration
Indicates when action plan is completed, either "Finite" or Ongoing".

Action Title
Concise description of the action plan.

Background
A brief description of current status or statement of need.

Activities
Specific, actionable tasks needed to implement the action plan.

Outputs
Products or services resulting from the action, such as a reports, ordinances, training programs, Outreach campaigns. Outputs are tracked by PREP to help determine the implementation status of the CCMP.

Outcomes
Changes in characteristics, behavior, or condition of resources that result or occur from this action.

Implementation Metrics
Tangible measures of implementation progress for the action. These metrics must meet the basic components of an environmental indicator: Conceptual relevance; feasibility of implementation, response variability, and interpretation utility. Metrics that begin with a code, such as BAC6 or NR5, correspond with environmental indicators in the PREP Monitoring Plan. Not all actions will have implementation metrics associated with them.

Critical Guidance
Management plans, methodologies, standards, or guidance required to complete action plan activities. Full citations of critical guidance documents are provided in Appendix C.

CLARIFICATION OF ELEMENTS IN CCMP ACTION PLANS

The Role of Leads and Cooperators

In all action plans, one or more organizations are identified as "Leads" and are designated as such based on their statutory authority, technical expertise, or organizational mission. "Cooperators" are organizations or groups that can assist Leads or will be directly impacted by the action plan. It is important to note that activities of some action plans have not been incorporated into the work plan process of lead organizations and thus implementation may initially be limited by funding or staffing capacity. Leads should, however, be committed to be actively engaged in the stakeholder-driven process and work with funders, Cooperators, and other partners to implement action plans over the next 10 years to be best of their ability.

The Role of PREP

Many of the 78 action plans can only be completed by a coalition of organizations or by a few agencies with statutory authority to manage a particular resource. Therefore, the primary role of PREP is to facilitate action plans using collaborative approaches and to take the lead when no other stakeholder group can be identified.

Some action plans identify a need for advocacy for specific changes to established policy at a state or municipal level that will improve the ecological integrity of the Region. Because some partners in PREP have regulatory or other responsibilities that may conflict with some advocacy activities, PREP may at times not participate in advocacy campaigns that jeopardize the Partnership, as determined by the Management Committee. It is important to note, however, that advocacy identified in the CCMP is based on sound environmental data, best watershed management approaches, and broad-based stakeholder input.

Funding for Activities

In some cases, funding for activities in an action plan may not currently be available, however, PREP and Leads will continually pursue appropriate funding to implement activities. This issue is also address in action plan WS-9.

Implementation Metrics

Implementation metrics listed in the action plans reference environmental or land use indicators that are detailed in the PREP 2010 Monitoring Plan.

Organizational Groupings

To keep the action plans concise, organizations that provide a similar resource management function are designated by a group term. For example, the term "Land Protection Organizations" includes any organization that conducts land protection activities such as land trusts. Appendix E defines organizational groupings used in the CCMP.

Implementation Time Frame

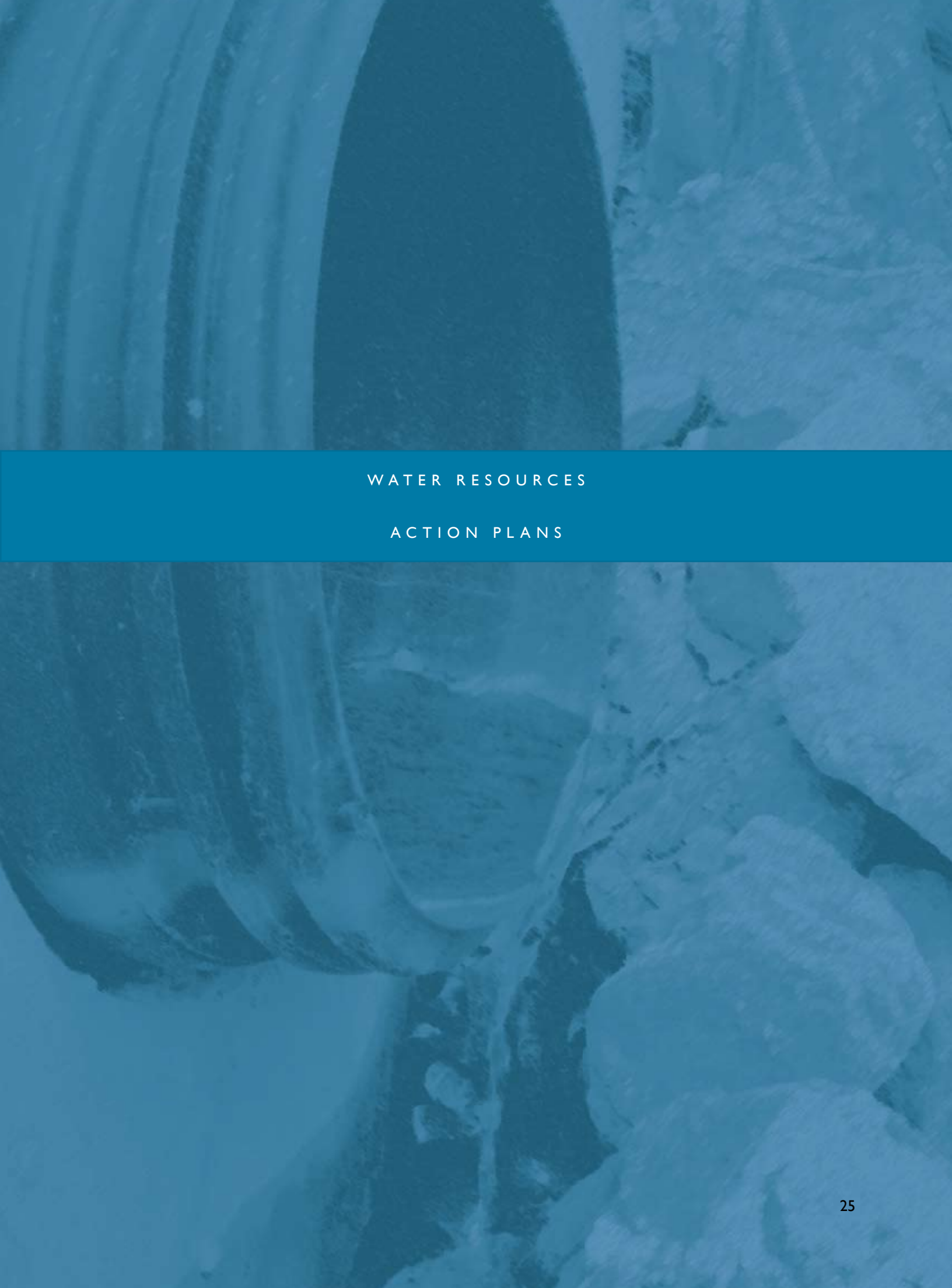
During CCMP development, action plan activities were included that could be started in the next ten years and in many cases could produce a discrete output. Some activities are ongoing. For some of the more complicated or rigorous activities identified in the plan, completed outputs may not be realized in ten years, however, progress toward completion can be tracked in PREP Progress Reports.

Communication Campaigns

The CCMP identifies targeted communication campaigns that are systematic approaches rooted in community-based social marketing method (NOAA Coastal Services Center, 2009). The degree to which campaigns utilize established social marketing approaches depends on the type of campaign. CCMP outreach campaigns are intended to raise awareness of concepts, programs, or resources. Social marketing campaigns are intended to illicit measurable behavior change in a target audience and typically require significantly more time and resources than outreach campaigns. Lastly, advocacy campaigns are intended to cause a policy change at a state, municipal, or organizational level and involve activities such as providing testimony at legislative hearings. These three types of campaigns reflect the overall need for a spectrum of effort, from awareness to action, that is required for societal change. Education techniques are used in all three strategies. The PREP Strategic Communication Plan outlines approaches to efficiently implement CCMP communication campaigns and measure their effectiveness.

CCMP Objectives and Action Plans

Appendix F includes a table that lists all CCMP management objectives and associated action plans. Each objective has multiple related actions and most action plans apply to multiple objectives - clearly illustrating the inter-relationship of all theme areas.



WATER RESOURCES

ACTION PLANS

The water quality and quantity of water in headwater streams, rivers and groundwater ultimately affects the quality of the estuary it enters. The recognition of the importance of the whole watershed to both Great Bay and Hampton Seabrook Estuary is an essential component of the updated CCMP and is addressed in the 36 water resource actions. The critical issues of nutrient loading, sedimentation, stormwater, stream connectivity and stability, flooding, water use and climate change all factor significantly into Water Resources action plans.

Water quality objectives and actions address reducing bacteria that affects both shellfish and recreation, nutrient loading which effect water quality and living resources, sediment loading which decreases water clarity and geomorphology, the presence of toxic contaminants which affect the entire food chain, and improving or maintaining good quality water across the watershed. Water quantity objectives and actions include maintenance of surface water flows and groundwater levels that sustain watershed health, understanding and maintaining balanced river and stream systems.

Goal 1: Water quality in the Piscataqua region watersheds supports shellfish harvesting, recreation, wildlife, aquatic life, and drinking water consistent with the Clean Water Act, and existing high quality waters are maintained at 2010 conditions.

Objective WR 1.1 - Improve water quality and identify and mitigate pollution sources so that additional estuarine areas meet water quality standards for bacteria for shellfish harvesting.

Objective WR 1.2 - Minimize coastal beach closures due to failure to meet water quality standards for bacteria in the estuaries and the ocean.

Objective WR 1.3 - Reduce nutrient loads to the estuaries and the ocean so that adverse, nutrient-related effects do not occur.

Objective WR 1.4 - Reduce sediment loads to the estuaries and the ocean so that adverse, sediment-related effects do not occur.

Objective WR 1.5 - Monitor and reduce loading of toxic contaminants and emerging contaminants to the estuaries and the ocean.

Objective WR 1.6 - Improve the water quality in streams, rivers, lakes and groundwater to support recreation, aquatic life, and drinking water throughout the watersheds and maintain high quality fresh waters at 2010 conditions.

Goal 2: Quantities of freshwater in rivers and aquifers throughout the Piscataqua Region watersheds are appropriate for humans, aquatic species, riparian wildlife, and riparian vegetation.

Objective WR 2.1 - Maintain instream flows and groundwater levels that support aquatic life and recreation, human populations, and the hydrologic integrity of coastal streams and rivers.

Objective WR 2.2 - Minimize catastrophic flooding risks due to development and climate change, and restore or maintain geomorphologic balance in river and stream systems.

Table 3: Water Resources action plan identification number, title, and priority ranking.

Action ID #	Action Title	Ranking
WR-1	Eliminate sewer and storm drain illicit connections and illegal discharges to surface water.	Highest
WR-2	Collect and monitor shellfish tissue samples as appropriate for toxic contaminants and biotoxins.	High
WR-3	Implement National Shellfish Sanitation Program guidance to maintain a USFDA-certified shellfish program.	High
WR-4	Educate and improve outreach to boaters about "No Discharge Area" designations and requirements in NH and ME coastal waters.	Moderate
WR-5	Improve management of agricultural lands to minimize nutrients, bacteria and sediment loading.	High
WR-6	Monitor water quality at tidal beaches for indicators of human and animal wastes and pollution sources.	High
WR-7	Develop and implement watershed based management plans that address pollution at tidal beaches.	High
WR-8	Research and promote stormwater best management practices that remove nutrients.	Highest
WR-9	Identify and prioritize locations with high nonpoint source and stormwater nutrient loads for restoration and retrofit opportunities. Implement measures to significantly reduce nutrient loading from source areas.	Highest
WR-10	Support research to develop a better understanding of nutrient (nitrogen) cycling, geochemistry, and nutrient removal in the Piscataqua Watershed.	High
WR-11	Promote low impact and low nutrient commercial and residential landscaping techniques.	High
WR-12	Improve nutrient removal technology at municipal wastewater treatment facilities in the Piscataqua Region watersheds and support system upgrades and expansions.	Highest
WR-13	Reduce watershed nutrient loading from on-site septic systems.	Highest
WR-14	Support inter-municipal and interstate coordination to find and implement effective solutions for reducing nutrient or other pollutant loads throughout the Great Bay Estuary watershed	Highest
WR-15	Improve erosion and sedimentation controls at construction sites in the Piscataqua Region watershed.	High
WR-16	Research the sources, fate and transport of sediment in the Great Bay Estuary and Hampton-Seabrook Harbor.	High
WR-17	Identify sources of toxic contaminants in the coastal watershed.	Moderate
WR-18	Promote development and implementation of innovative means to reduce application of chemical de-icers on surfaces within the Piscataqua watershed.	High
WR-19	Support the oil spill preparedness and response activities of the Piscataqua River Cooperative.	Moderate
WR-20	Increase implementation of household hazardous waste and pollution prevention programs in the Piscataqua Region watershed and include pharmaceutical and personal care product disposal.	High
WR-21	Develop and implement a monitoring program for pharmaceuticals and personal care products in surface waters, public water supplies and wastewater effluent.	Moderate
WR-22	Identify known groundwater point source contamination sites that threaten surface water quality and aquatic habitat and prioritize for clean-up.	Moderate
WR-23	Encourage watershed-based permitting for NPDES discharges	Moderate
WR-24	Promote the development of TMDL studies for all impaired water bodies in the Piscataqua Region watershed.	High
WR-25	Support municipal implementation of Phase II stormwater requirements for MS4 communities and BMP outreach and education for municipal staff in communities that are not required to comply with Phase II regulations.	High
WR-26	Improve and support inclusion of biological monitoring in NHVRAP and similar NH volunteer programs.	High
WR-27	Complete instream flow studies and establish protected instream flow for Piscataqua Watershed designated river reaches in the NH Rivers and Protection Program.	Highest
WR-28	Support the development and implementation of water management plans in sub watersheds to maintain sustainable groundwater and surface water use in the coastal watershed.	Highest
WR-29	Develop high quality information on the spatial extent of water use for public drinking water systems.	Moderate
WR-30	Establish baseline data and a coordinated monitoring program for groundwater, stream flow, and river geomorphology within the Piscataqua Region watershed.	Moderate
WR-31	Develop a three-dimensional model of groundwater flow paths in the coastal watershed.	Moderate
WR-32	Update the rainfall model for flood forecasting and stormwater design in the Piscataqua Region watershed to reflect current rainfall estimates and future estimates under climate change and land use scenarios.	High
WR-33	Assess the geomorphic conditions of all coastal rivers to identify fluvial erosion hazards (FEH) and encourage the adoption of FEH Ordinances and floodplain protection.	Highest
WR-34	Develop a high-resolution digital elevation model and impervious surface data set for the Piscataqua Region watershed to use for modeling hydrology and land use impacts.	High
WR-35	Promote adoption of bridge and culvert design guidelines that accommodate aquatic passage, hydrologic connectivity, and increased stormflows due to climate change.	Highest

WR-1

priority | *start* | *duration*
Highest | 2012 | Ongoing

Improve water quality and identify and mitigate pollution sources so that additional estuarine areas meet water quality standards for bacteria for shellfish harvesting.

Issues Addressed:
- Bacteria
- Discharges
- Nutrients
- Stormwater
- Water Quality

Leads:
- MDMR
- NHDES

Cooperators:
- Municipalities
- Businesses
- MDEP
- GBCW
- MSTP
- MVRMP
- NHVRAP
- SWA
- UNH-JEL
- Watershed Organizations

Funding:
- Municipalities
- NHDES-Clean Water State Revolving Fund
- PREP

Cross connections between sanitary sewers and storm sewers allow discharge of untreated waste directly to surface water. This situation creates point sources of bacteria, nutrients, and chemical pollution. Other illegal point discharges from homes and businesses can cause similar sources of contamination to surface waters. Identification and correction of these cross connections have been ongoing for many years but unrecognized problems still exist in the PREP watershed area. Correcting these discharges is an important component of minimizing nutrient and bacterial loading to the estuaries.

MS-4 communities, those that are required to comply with the USEPA Phase II Municipal stormwater regulations, are required to perform Illicit Discharge Detection and Elimination (IDDE) in order to comply with stormwater permits. Communities not required to comply are encouraged to complete IDDE to reduce these contaminant sources. PREP Action WR-25 is designed to provide assistance to MS-4 and non-MS-4 communities to comply with these requirements.

Surveys and water quality sampling conducted through NHEP, NHVRAP, MEVRMP, GBCW, MDMR Shellfish Sanitation Program, and other agency programs can provide valuable monitoring data for detecting illicit connections and discharges. These data are also valuable for long term analysis of water quality trends.

ACTIVITIES

1. Inventory NHDES, MDEP, municipalities, and watershed organizations that have completed illicit connection and discharge surveys and prepare brief compilation report.
2. Work closely with NH and ME shellfish and beach sampling programs to define contamination sources detected in shoreline surveys, sampling and modeling efforts.[1]
3. Support and refine ongoing training and support for municipal personnel in monitoring storm drainage systems for illicit connections.
4. Utilize the most efficient and cost-effective bacterial and microbial source tracking techniques to determine sources of bacterial contamination.
5. Increase state and local capacity to identify, map, and repair connections and eliminate point sources of contamination.
6. Maintain a GIS layer of wastewater and storm water drainage systems to assist with monitoring and troubleshooting.
7. Provide incentives, such as cost-share funding, to fix or eliminate illegal direct discharges such as grey water pipes and failing septic systems.

MEASURING PROGRESS

OUTPUTS
- Inventory of completed IDDE surveys in watershed
- Research reports on microbial source tracking
- GIS layer of wastewater and stormwater drainage systems
- Training for municipal staff on IDDE
- IDDE repair projects

OUTCOMES
- Improved understanding of untreated sewage sources
- Increased state and local capacity for IDDE projects
- Reduced number of untreated discharges

IMPLEMENTATION METRICS
- BAC1: Acre-days of shellfish harvest opportunities in estuarine waters
- BAC2: Trends in dry-weather bacteria indicator concentrations
- BAC6: Violations of *enterococci* standard in estuarine waters

Critical Guidance

[1] US Environmental Protection Agency, 2009, National Pollutant Discharge Elimination System (NPDES) Regulations

Collect and monitor shellfish tissue samples as appropriate for toxic contaminants and biotoxins.

WR-2

priority | *start* | *duration*
Highest | 2012 | Ongoing

Toxic chemicals are monitored in the Piscataqua watershed through the Gulfwatch shellfish monitoring program. This includes sampling for trace metals, PCBs, PAHs, and chlorinated pesticides.

NHDES and PREP also coordinate efforts to sample for biotoxins in blue mussels in three fixed estuarine areas and in two other rotating sites in the Piscataqua Region.

Other important areas for shellfish toxic chemical and biotoxin monitoring are in shellfish beds to determine impacts on harvestable resources and near marinas and oil depots to determine impacts from petroleum contamination.

NHDES Shellfish Program recently undertook efforts to increase paralytic shellfish poisoning (PSP) sampling as part of a Red Tide Disaster Relief program initiated due to the widespread red tide blooms in 2005, which severely restricted shellfish harvesting in the Gulf of Maine and estuaries. This includes additional marine biotoxin monitoring for diarrhetic shellfish poisoning (DSP) and amnesic shellfish poisoning (ASP).

ACTIVITIES

1. Continue blue mussel toxic contaminant monitoring at Gulf of Maine sites in the Piscataqua Region.
2. Sample additional shellfish sites for petroleum compounds on a rotating basis near marinas and petroleum depots.
3. Sample oysters in Great Bay and clams in Hampton-Seabrook Harbor every three years to determine concentrations of toxic chemicals and biotoxins in these species in harvestable areas.
4. Add additional biotoxin monitoring on a rotating basis in ME and NH waters.
5. Coordinate between NHDES and MDEP on expanded sampling.

MEASURING PROGRESS

OUTPUTS

- Annual reports of Gulfwatch shellfish tissue monitoring
- Annual reports of NHDES and MDEP shellfish biotoxin monitoring

OUTCOMES

- Improved understanding of toxin and biotoxin concentrations in shellfish tissues in Piscataqua Region estuaries

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Critical Species
- Discharges
- Shellfish
- Water Quality

Leads:

- MDMR
- NH Shellfish Program
- PREP

Cooperators:

- Maine Shellfish Program
- NHFGD
- UNH-JEL

Funding:

- GOMC
- NHDES-Healthy Tidal Waters & Shellfish Protection Fund
- MDEP-Bureau of Land & Water Quality
- MDMR- Division of Shellfish Management
- NOAA – Center for Coastal Monitoring & Assessment

WR-3

priority | *start* | *duration*
High | 2012 | Ongoing

Implement National Shellfish Sanitation Program guidance to maintain a USFDA-certified shellfish program.

Issues Addressed:
- Bacteria
- Critical Species
- Discharges
- Shellfish
- Water Quality

Leads:
- MDMR
- NH Shellfish Program

Cooperators:
- GBCW
- MDEP
- NextEra Energy
- NHFGD
- NHDHHS
- USFDA

Funding:
- NHDES-Healthy Tidal Waters and Shellfish Protection Fund
- MDMR – Division of Shellfish Management

New Hampshire achieved compliance with the USFDA National Shellfish Sanitation Program (NSSP) in February 2002 This certification allows for commercial harvesting and aquaculture in coastal and estuarine waters. Maine is also USFDA certified for its NSSP through MDMR.

Water quality monitoring for bacterial pollution and shoreline sanitary surveys in NH and ME waters will continue under the supervision of the NHDES and MDMR Shellfish Program as per the certification requirements.

Information on detected sources during shoreline sanitary surveys is passed on to other NHDES and MDEP programs and provided to municipalities for source elimination activities.

ACTIVITIES

1. Continue sanitary surveys of shoreline areas to detect bacterial pollutions sources.
2. Continue water quality sampling for bacteria as required for USFDA certification.[1]
3. Work to fill additional shellfish program and watershed assistance staff positions so that source identification and elimination efforts can be re-established.
4. Coordinate with NHFGD and MDMR on shellfish bed contamination issues and enforcement of shellfish bed closures.

MEASURING PROGRESS

OUTPUTS
- NHDES and MDEP Shellfish Program Sanitary Survey reports
- NHDES and MDEP Shellfish Program annual reports

OUTCOMES
- Continued USFDA certification for commercial shellfish harvesting in NH and ME

IMPLEMENTATION METRICS
- None

Critical Guidance

[1] US Food and Drug Administration, 2007, National Shellfish Sanitation Program: Guide for the Control of Molluscan . . .

Educate and improve outreach to boaters about "No Discharge Area" designations and requirements in NH and ME coastal waters.

WR-4

priority | *start* | *duration*
Moderate | 2012 | Ongoing

A No Discharge Area (NDA) is a designated body of water where the discharge of treated and untreated boat sewage is prohibited. Unless waters are formally designated as a NDA it is permissible to discharge treated sewage however, under the federal Clean Water Act it is still illegal to discharge raw sewage from a vessel in US waters. The No Discharge Areas are approved by the U.S. EPA through an application requesting the federal designation. New Hampshire's coastal NDA consists of all tidal and estuarine waters, including all bays and rivers to the tidal dams, and all ocean waters within three miles of the New Hampshire shoreline and the Isles of Shoals. Currently NDAs in Maine include Casco Bay, Boothbay Region, Kennebunk Wells, Southern Mount Desert and West Penobscot Bay.

The Federal Clean Vessel Act (CVA) authorized a competitive grant program for states to provide funding for the construction, renovation, operation, and maintenance of stationary pumpout facilities for the removal of recreational boater sewage. Since 2002, New Hampshire's coastal waters have also had the added support of a mobile pumpout boat service. Federal CVA funds can be used to account for up to 75 percent of all approved project costs with the remaining 25 percent provided by non-federal organizations.

The coastal pumpout boat operates from May to November within coastal NH waters, up to Cape Neddick ME. The service may be requested by phone or on site for a $10 fee. To date, approximately 68,000 gallons of sewage have been removed by this service. Outreach efforts concerning the NDA continue through the NH DES CVA program, pumpout boat staff and marina owners. In addition, the US Power Squadron, a volunteer auxiliary program of the US Coast Guard, provides non enforcement vessel safety checks at which time they incorporate information on proper boater sewage disposal.

ACTIVITIES

1. Support outreach to marinas, public landings, and boating facilities about NDA guideline in the Piscataqua estuaries region.[1,2]
2. Continue use of NH pump out boat and marina pump out facilities in both NH and ME waters.
3. Continue outreach with the US Power Squadron on waste discharge as part of safety checks and boater education.
4. Re-establish program with NH Marine Patrol and Maine DMR to incorporate "No Discharge" education into outreach materials.

MEASURING PROGRESS

OUTPUTS

- Outreach campaign to marinas, public landings, and boating facilities on NDA
- Outreach campaign to US Power Squadron on NDA
- Outreach campaign to NH Marine Patrol on NDA
- Operation of pump out facilities in the Piscataqua Region estuaries
- Pump out facilities and mobile pumpout boat service in the Piscataqua Region estuaries

OUTCOMES

- Improved understanding of NDA requirements
- Increased use of sewage pump out facilities
- Increased use of stationary pumpout facilities and continued use of mobile pumpout service

IMPLEMENTATION METRICS

- Volume of sewage collected by pump out boat and dock pump out facilities in the Piscataqua Region estuaries

Issues Addressed:

- Bacteria
- Discharges
- Nutrients
- Shellfish
- Water Quality

Leads:

- MDMR
- Maine Coastal Program
- NH Coastal Program
- NHDES

Cooperators:

- Boaters
- Marine Facilities
- NH Marine Patrol
- US Power Squadron

Funding:

- Boaters
- MDEP Pump Out Program
- Marinas
- NHDES Clean Vessel Act Program
- USFWS

Critical Guidance

[1]NHDES-Watershed Management Bureau, 2010, New Hampshire's Clean Vessel Act Program
[2]Maine Department of Environmental Protection, 2010, Pump-out Program, MDEP

WR-5

priority | *start* | *duration*
Highest | 2012 | Ongoing

Improve management of agricultural lands to minimize nutrients, bacteria and sediment loading.

Issues Addressed:
- Bacteria
- Nutrients
- Sedimentation
- Water Quality

Leads:
- Maine Department of Agriculture
- NRCS
- NH Department of Agriculture
- RCCD
- SCCD
- YCSWCD

Cooperators:
- Agribusiness
- Local Agricultural Commissions
- MDEP
- NHDES-WMD

Funding:
- NRCS-Conservation Stewardship Program, Agricultural Management Assistance, and Environmental Quality Incentives Program
- NH Department of Agriculture-Nutrient Management Grant Program
- Finanace Authority of Maine-Nutrient Management Loan Program
- Farmers

Across the Region, NRCS and county conservation districts routinely engage in programs to identify and correct agricultural practices that introduce sediments, bacteria and nutrients into streams, rivers and wetlands. In New Hampshire, the New Hampshire Department of Agriculture, Markets and Food (NHDAMF) publishes a BMP manual for agricultural operations and administers an Agricultural Nutrient Management Grant Program to prevent water quality impairments caused by manure, fertilizer, and compost. Grants also assist with nutrient management education programs. NHDAMF agricultural inspectors respond to complaints and enforcement issues. NHDES-Waste Management Division provides solid waste technical assistance for manure management for small farms and is part of the Northeast Recycling Council.

In Maine, the MDAFRR has a Natural and Rural Resources Program that houses an Agricultural Compliance Program to respond to complaints and coordinate the use of BMPs on farms, as well as a Nutrient Management Program, authorized by the Nutrient Management Law passed in 1998. This law bans manure spreading between December-March 15, and requires many farms to develop a nutrient management plan. The development and implementation of a plan results in a more efficient use of nutrients on agricultural land, thus reducing nonpoint source pollution associated with agricultural operations and its impact on water quality. Maine farmers can get financial assistance from the Nutrient Management Grant Program, and a Loan Program administered by Finance Authority of Maine.

ACTIVITIES

1. Determine agricultural practices in need of correction.
2. Identify and prioritize farms where practices are impacting estuarine resources.
3. Develop and implement bacteria, nutrient, and sediment management plans with landowners to improve practices and minimize impacts.[1,2,3,4]
4. Identify match sources for corrective action and practice modification.

MEASURING PROGRESS

OUTPUTS
- Report on agricultural practices that discharge the most sediments, bacteria, or nutrients
- Inventory of farms where practices are impacting estuarine resources
- Management plans at priority farms to reduce discharges
- Corrective actions at priority farms to reduce discharges

OUTCOMES
- Increased understanding of best management practices for farms
- Decreased discharges of sediments, bacteria, and nutrients from farms in the watershed

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]Northeast Recycling Council, 2009, Manure Management Education Information
[2]NHDES - Watershed Management Bureau, 2010, Solid Waste Technical Assistance Section
[3]New Hampshire Department of Agriculture, Markets, and Food, 2008, Manual of Best Management Practices (BMPs). . .
[4]Maine Department of Agriculture, Food, and Rural Resources, 2010, Nutrient Management Program

Monitor water quality at tidal beaches for indicators of human and animal wastes and pollution sources.

WR-6

priority | *start* | *duration*
High | 2012 | Ongoing

The NHDES beaches program and UM-CE Healthy Beaches program both sample or coordinate sampling at tidal beaches in the Piscataqua watershed for enterococci to determine beach safety. NHDES samples 17 coastal beaches during the beach season and MDEP samples three beaches in five locations in Kittery. In the off-season non-profit organizations sample water quality at selected surfing beaches. A cooperative program can be established with volunteers to monitor other beaches not currently on the list.

Recent analyses of enterococci bacteria levels show that enterococci continue to be a contaminant at tidal beaches in NH and public beach advisories at beaches continues to climb. In Maine enterococci exceeded 104 organisms/100 ml occasionally at all beaches.

Microbial source tracking has successfully identified potential sources of bacteria and aided in source reduction and will continue to be used for this purpose.

ACTIVITIES

1. Continue monitoring of tidal beaches as part of NHDES and MDEP Beach programs.[1,2]
2. Use monitoring results to assist in illicit discharge identification in accordance with WR-1.
3. Coordinate sampling results with watershed organizations to assist with source tracking and optimization of sampling programs.
4. Use recommendations from existing watershed management plans to target additional sample collection as needed.

MEASURING PROGRESS

OUTPUTS

- Annual reports of monitoring at tidal beaches by NHDES, MDEP, UM, and others
- Compilation of state beach monitoring results to be shared with watershed organizations
- Recommendations for additional monitoring based on watershed management plans

OUTCOMES

- Improved understanding of monitoring programs at tidal beaches
- Increased efficiency of tidal beach monitoring

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Bacteria
- Beaches
- Water Quality

Leads:

- Maine Healthy Beaches
- NH Beach Inspection Program

Cooperators:

- Maine Stream Teams
- MDMR
- MEVRMP
- Municipalities
- NHDRED
- NHVRAP
- Surfriders - Maine
- Surfriders - NH
- USEPA Beach Program
- Watershed Organizations

Funding:

- Maine Healthy Beaches Program
- NH Beach Inspection Program
- USEPA BEACH Act Funds

Critical Guidance

[1]University of Maine Cooperative Extension/Sea Grant, et al, 2010, Maine Healthy Beaches Program
[2]New Hampshire Department of Environmental Services, 2008, Beach Inspection Program

WR-7

priority | *start* | *duration*
Highest | 2012 | Ongoing

Develop and implement watershed based management plans that address pollution at tidal beaches.

Issues Addressed:
- Water quality
- Bacteria
- Beaches

Leads:
- NH Beach Inspection Program
- Maine Healthy Beaches
- Municipalities

Cooperators:
- Watershed Organizations
- Land Owners
- NHDPR
- MDOC

Funding:
- NHDES Beach Program
- Maine Healthy Beaches Program
- USEPA BEACH Act Funds"
- USEPA Nonpoint Source Management Program - Clean Water Section 319

A study conducted to determine contaminant sources at all mainland tidal beaches was completed by FB Environmental for NHDES in 2009. The NHDES Beach Inspection program is now developing sub-watershed based bacteria management plans for Wallis Sands Beach in Rye and North Hampton State beach. The plans will identify pollutant sources, determine loading reductions needed to meet water quality standards and recommend actions to reduce pollutant loads. Municipalities will work with the beach programs on these pollutant reduction programs. The results of these plans may also help in identifying other pollutant sources and pathways.

ACTIVITIES

1. Identify pollution sources and severity of pollution at tidal beaches. Use stormwater modeling and detailed sampling to understand source of contamination to coastal beaches.

2. Identify upstream drainage areas for tidal beaches.

3. Complete bacteria loading studies for all beaches that close due to bacteria pollution.

4. Develop and implement bacteria management plans that reduce beach pollution after source identification is complete. These management plans should contain specific recommendations regarding septic systems, pet waste, and other sources depending on the primary cause of the bacteria pollution at the beach.

MEASURING PROGRESS

OUTPUTS
- Bacteria loading studies for tidal beaches that close due to bacteria sources
- Bacteria management plans for tidal beaches
- Corrective actions to reduce bacteria loads at tidal beaches

OUTCOMES
- Improved understanding of bacteria sources at tidal beaches
- Improved understanding of management actions needed to reduce bacteria at tidal beaches
- Improved water quality at tidal beaches

IMPLEMENTATION METRICS
- BAC4: Tidal bathing beach postings

Research and promote stormwater best management practices that remove nutrients.

WR-8

priority | *start* | *duration*
Highest | 2012 | Ongoing

Nonpoint source pollution is thought to contribute two-thirds of the nitrogen entering Great Bay. Much of this load is from stormwater. Reducing the volume of stormwater, reducing the nitrogen sources to stormwater (atmospheric deposition, fertilizer, animal and human waste, and trash), and using conveyance and treatment methods that help reduce nitrogen are all important components of a stormwater nutrient reduction program.

Continued research to document existing techniques and practices and development of new practices that maximize nutrient removal is an important component of ongoing nutrient reduction programs.

ACTIVITIES

1. Support research on stormwater management techniques that reduce or remove nitrogen from stormwater.
2. Identify stormwater BMPs that most efficiently remove nitrogen.
3. Promote adoption of these techniques by municipalities and developers at the state and local level through guidance documents and outreach.
4. Revise BMP's and other guidance documents as appropriate with new research results.[1,2,3,4]
5. Monitor nitrogen concentrations at selected sites where BMPs are employed to verify research results and on-site removal efficiency.

MEASURING PROGRESS

OUTPUTS

- Research reports on stormwater management techniques that remove nitrogen
- Monitoring results from sites where stormwater management techniques have been installed
- Outreach campaign for municipal staff and boards and developers on stormwater management techniques that reduce or remove nitrogen from stormwater

OUTCOMES

- Improved understanding of stormwater management techniques that remove nitrogen
- Increased use of stormwater management techniques to remove nitrogen
- Decreased nitrogen loading from developed sites

IMPLEMENTATION METRICS

- NUT1: Annual load of nitrogen to Great Bay from WWTF and watershed tributaries

Issues Addressed:
- BMPs
- Nutrients
- Stormwater
- Water Quality

Leads:
- MDEP
- NHDES
- UNH-SC

Cooperators:
- Businesses
- Municipalities
- NEMO
- NPDES Permit Holders
- NROC
- PREP
- SWA
- Watershed Organizations

Funding:
- Municipalities
- NEMO
- NPDES permit holders
- NROC
- PREP
- Watershed Organizations

Critical Guidance

[1]New Hampshire Department of Environmental Services, 2010, New Hampshire Stormwater Manual
[2]Horsley Written Group, 2007, LID Guidance Manual for Maine Communities: Approaches for implementation of . . .
[3]Peterson J, Stone A, Houle J., 2009, Protecting Water Resources and Managing Stormwater: A Bird's Eye View for . . .
[4]University of New Hampshire, Stormwater Center,

WR-9

priority | *start* | *duration*
Highest | 2015 | Finite

Identify and prioritize locations with high nonpoint source and stormwater pollutant loads for restoration and retrofit opportunities. Implement measures to significantly reduce pollutant loading from source areas.

Issues Addressed:
- Stormwater
- Water Quality

Leads:
- MDEP
- NHDES

Cooperators:
- Businesses
- MEVRMP
- MSTP
- Municipalities
- NHVRAP
- SWA
- UNH-SC
- Watershed Organizations

Funding:
- USEPA Water Pollution Control Program Grants - Clean Water Act Section 106
- USEPA Nonpoint Source Management Program - Clean Water Section 319
- NOAA Coastal Nonpoint Pollution Control Program - Coastal Zone Act Reauthorization Amendments Section 6217
- NHDES Watershed Management Bureau
- MDEP Bureau of Land and Water Quality
- PREP

Assessing stormwater retrofit needs and using BMPs and LID to replace infrastructure will help in long range planning and measurement of stormwater impacts. Once identified, appropriate corrective actions and stormwater treatment approaches can be implemented . Finally, monitoring the results of corrective action will encourage adaptive management of the stormwater system and provide important data for future corrective actions and retrofits.

ACTIVITIES

1. Using sampling data collected by NHDES, MDEP, UNH and others, identify areas contributing higher than average nonpoint source pollutant loads.
2. Conduct a stormwater/combined sewer overflow study in Hampton-Seabrook Estuary to identify pollution point sources.
3. Identify areas for additional water quality sampling, if needed, to further define source areas.
4. Support development of a database of groundwater quality monitoring data to evaluate nutrient impacts to groundwater.
5. Work with NHDES and MDEP to obtain water quality data from private wells sampled by agency labs.
6. Analyze well water quality data and determine suitable restoration or retrofit approaches where high pollutant levels exist (hotspots).
7. Rank hot spots according to need and opportunity.
8. Research the effectiveness of innovative stormwater treatment technologies and communicate results to developers and communities.[1,2]
9. Identify funding and complete restoration on the identified projects.
10. Conduct pre and post sampling to assess the success of retrofit or restoration activity.

MEASURING PROGRESS

OUTPUTS
- Research report that prioritizes "hot spots" of stormwater pollution for restoration and retrofit opportunities
- Research report on stormwater management restoration and retrofit techniques
- Database of groundwater quality monitoring data to evaluate nutrient impacts to groundwater
- Outreach campaign to municipal staff and developers on innovative stormwater treatment technologies and resources
- Monitoring results from restored sites

OUTCOMES
- Improved understanding of priority hot spots of stormwater discharges
- Improved understanding of stormwater management restoration and retrofit techniques
- Increased use of stormwater management restoration and retrofit techniques
- Decreased stormwater discharges of pollutants

IMPLEMENTATION METRICS
- None

Critical Guidance

[1] New Hampshire Department of Environmental Services, 2010, New Hampshire Stormwater Manual
[2] Peterson J, Stone A, Houle J., 2009, Protecting Water Resources and Managing Stormwater: A Bird's Eye View for . . .

Support research to develop a better understanding of nutrient cycling, geochemistry, and nutrient removal in the Piscataqua Watershed.

WR-10

priority | *start* | *duration*
High | 2012 | Ongoing

Nitrogen cycles through the aquatic and terrestrial environment in multiple forms. Nitrogen from human and animal wastes and fertilizer changes its chemical state due to biogeochemical reactions.

Nitrogen can remain in the terrestrial environment, dissolve and become part of the aquatic environment or transform to gas and be released into the atmosphere. Understanding the behavior and concentration of nitrogen in soils, streams, rivers, groundwater, and estuaries is essential to controlling excess nitrogen, which ultimately harms estuarine health.

ACTIVITIES

1. Support research on the physical and chemical properties of nutrient cycling in freshwater and estuarine environments.
2. Support research on nitrogen attenuation through watershed processes.
3. Support research on the nutrient sources, deposition rates, fate, and transport of atmospheric nitrogen.
4. Research the impacts of septic systems on water quality in the estuaries.
5. Research the impacts of fertilizers used for agriculture and residential landscaping on water quality in the estuaries.
6. Research the sources, fate and transport of nitrogen in groundwater of the PREP watershed.
7. Study link between water chemistry and phytoplankton type and abundance to growth of oysters and clams.
8. Promote cooperation and collaborative research between state research institutions and among the regulatory community.
9. Research and pursue innovative methods for nutrient reduction in Piscataqua estuaries such as aquaculture of filter feeders and algae production for bio-fuels.

MEASURING PROGRESS

OUTPUTS

- Research reports on nutrient cycling

OUTCOMES

- Improved understanding of nutrient cycling in the watershed
- Improved management decision-making

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Nutrients
- Water Quality

Leads:

- UME
- UNH

Cooperators:

- Lamprey River Hydrologic Observatory
- MDEP
- NERRS-SC
- NH Water Resources Research Center
- NHDES
- USEPA
- USGS

Funding:

- MDEP Bureau of Land and Water Quality
- NHDES Watershed Management Bureau
- NOAA Coastal Nonpoint Pollution Control Program - Coastal Zone Act Reauthorization Amendments Section 6217
- PREP

WR-11

priority | *start* | *duration*
High | 2015 | Ongoing

Promote low impact and low nutrient commercial and residential landscaping techniques.

Issues Addressed:
- Nutrients
- Stormwater

Leads:
- MDEP
- NHDES
- RPC
- SMPC
- SNHPC
- SRPC

Cooperators:
- Businesses
- GBCTP
- Landscapers
- Lawncare Retailers
- Municipalities
- NEMO
- NROC
- PREP
- SWA
- UNH-CE
- WCTP

Funding:
- NHDES Watershed Management Bureau
- MDEP Bureau of Land and Water Quality
- USEPA 320 funding

The majority of nitrogen delivered to the Great Bay Estuary is from nonpoint sources. Fertilizer use on gardens and lawns is one of the components of the nonpoint source nitrogen load. Landscaping practices on gardens and lawns in the immediate vicinity of the stream, river or estuary shorelines are particularly important because fertilizers can wash directly into these water bodies. Therefore, low impact and low nutrient landscaping techniques should be promoted for all lawns and gardens in the watershed, especially lawns and gardens in sensitive shoreline areas.

ACTIVITIES

1. Promote low impact landscaping (Landscaping at the Waters Edge, NH Innovative Land Use Guide) to the public through outreach and education.[1,2,3]
2. Promote certification of landscaping contractors for proper use of fertilizers and other landscaping products. Coordinate with de-icing chemical training and certification program (WR-18).
3. Research the types of locations (e.g., shorelands) where application of nitrogen fertilizers is most harmful to aquatic health.
4. Support bans of nitrogen fertilizers in sensitive areas.
5. Advocate for low impact and low nutrient landscaping techniques in relevant legislative committees.
6. Estimate the mass of nitrogen that could be removed from the estuary if BMPs for landscaping were followed throughout the watershed.

MEASURING PROGRESS

OUTPUTS
- Research report on the most sensitive areas for fertilizer application
- Research report on nitrogen load reductions that could be achieved with low impact landscaping
- Social marketing campaign to public to adopt low impact landscaping practices
- Outreach campaign to municipal staff and boards on landscaping certification programs and fertilizer bans
- Outreach campaign to legislative committees on low impact and low nutrient landscaping techniques

OUTCOMES
- Improved understanding of the effects of fertilizers on nitrogen loading
- Improved understanding of low impact landscaping techniques
- Improved understanding of regulatory options to reduce fertilizer use
- Increased use of low impact landscaping techniques
- Reduced nutrient loads to the estuary

IMPLEMENTATION METRICS
- NUT1: Annual load of nitrogen to Great Bay from WWTF and watershed tributaries

Critical Guidance

[1] Neal C., et al., 2009, Landscaping at the Water's Edge: An Ecological Approach
[2] New Hampshire Department of Environmental Services, *et al,* 2008, Innovative Land Use Planning Techniques: A . . .
[3] Horsley Written Group, 2007, LID Guidance Manual for Maine Communities: Approaches for implementation of . . .

Provide data and information to improve nutrient removal technology at municipal wastewater treatment facilities in the Piscataqua Region watersheds and support system upgrades and expansions.

WR-12

priority | *start* | *duration*
Highest | 2012 | Ongoing

Excessive nutrients, such as nitrogen, in river and estuarine environments create algal blooms which then reduce water clarity and dissolved oxygen concentrations. Wastewater treatment facilities (WWTFs) represent more than 30% of the total nitrogen load to the Great Bay Estuary. The USEPA is placing nutrient discharge limits on WWTF and other NPDES discharges to reduce nitrogen loading into the Great Bay Estuary. Improved technologies and WWTF upgrades are needed to meet the revised nutrient loading standards. Where feasible, failed septic systems that cannot be remedied with on-site septic technology (See WR-13) should be connected to public sanitary sewer systems. In many areas WWTF upgrades will be required to accommodate new sewer connections.

ACTIVITIES

1. Continue monitoring concentrations of nutrients and other eutrophication parameters in rivers and estuaries to track trends. Monitor nutrient loads from WWTFs.
2. Support research to determine the appropriate permit limits for WWTFs in the Region.
3. Support the addition of nutrient limits to NPDES permits for WWTFs in the Region.
4. Research and fund innovative and effective nutrient removal at WWTFs.
5. Provide operation and maintenance training to operators to maximize nutrient removal.
6. Develop data products which can be used to prioritize WWTF upgrades based on nutrient/bacterial loading.
7. Develop data products which can be used to improve bio-solids management in the Region.
8. Increase funding for public sewer extensions to reduce the number of existing on-site septic systems contributing to water quality problems.
9. Incorporate research findings on nitrogen cycling as appropriate (WR-10).

MEASURING PROGRESS

OUTPUTS

- Monitoring reports on nutrient concentrations in rivers and the estuary and loads from WWTFs
- NPDES permits with nutrient discharge limits
- Research reports on nutrient removal technologies for WWTFs
- Training for municipal WWTF operators
- Research reports on WWTF upgrade priorities
- Research reports on bio-solids management
- Sewer extension projects

OUTCOMES

- Improved understanding of nutrient loads from WWTFs and other sources
- Reduced nutrient loads from WWTFs
- Improved understanding of nutrient removal technologies and operations at WWTFs
- Expanded sewer service areas to reduce septic system loads
- Decreased nitrogen and chlorophyll-a concentrations in the estuary
- Decreased number of exceedences of dissolved oxygen standard

IMPLEMENTATION METRICS

- NUT1: Annual load of nitrogen to Great Bay from WWTF and watershed tributaries
- NUT2: Trends in estuarine nutrient concentrations
- NUT3: Trends in estuarine particulate concentrations
- NUT5: Exceedences of instantaneous dissolved oxygen standard
- NUT6: Exceedences of the daily average dissolved oxygen standard
- NUT8: Percent of estuary with chlorophyll-a concentrations greater than state criteria

Issues Addressed:

- Bacteria
- Nutrients
- Water Quality
- WWTFs

Leads:

- MDEP
- NHDES
- USEPA

Cooperators:

- NERRS-SC
- UME
- UNH
- WWTFs

Funding:

- MDEP Maine State Revolving Loan Fund
- Municipalities
- NHDES Clean Water State Revolving Loan Fund
- USEPA Clean Water State Revolving Fund

WR-13

priority | *start* | *duration*
Highest | 2015 | Ongoing

Reduce watershed nutrient loading from septic systems.

Issues Addressed:
- Water Quality
- Nutrients
- Septic Systems

Leads:
- MDEP
- MDMR
- NHDES

Cooperators:
- Homeowners
- Muncipalities
- RPC
- SMRPC
- SNHPC
- SRPC
- SWA
- UME
- UNH
- USEPA

Funding:
- NHDES Watershed Management Bureau
- MDEP Bureau of Land and Water Quality
- NERRS-SC Grants

Many rural and suburban towns in the Piscataqua region have on-site septic systems as the primary means of human waste treatment. Some of these systems are failing or operate inefficiently with regard to nutrient removal.

Nitrogen removal and attenuation technology for on-site septic systems is available and should be used in new and replacement systems. Additional research to improve on-site septic system designs should continue.

Other regions, such as Cape Cod, are experiencing similar nitrogen loading problems and have increased septic system standards in sensitive areas such as shorelands and wetlands. A similar regulatory system could be implemented that builds on the approached used in Cape Cod.

In Maine, MDMR engages in mapping and septic system inspections as part of shoreline survey efforts in some key shellfish watersheds.

ACTIVITIES

1. Research new technologies for on-site septic systems, which could be used in the Piscataqua Region watershed.
2. Work with state resource agencies and RPC's to develop and advocate for more protective septic system requirements for shoreline/ riparian systems and wetlands such as the Cape Cod model.
3. Improve inspection of on-site septic systems by municipal and state officials and strengthen authority for enforcement.
4. In sensitive areas consider mandatory inspections by professional inspector to certify septic system operation.
5. In areas of closely spaced failed septic systems, require replacement with a community septic system with a licensed operator.
6. Develop a financial assistance program (i.e. low interest loans) for qualified homeowners to fund septic system upgrades or replacements.
7. Encourage proper care and maintenance of septic systems, including routine inspections and pumping.
8. Require inspection and upgrades of septic systems when homes change ownership.

MEASURING PROGRESS

OUTPUTS
- Research reports on septic system technologies that remove nutrients
- Advocacy campaign to state regulators and municipal staff and boards to improve septic system regulations associated with shoreline/ riparian systems and wetlands
- Research reports on financial assistance programs for qualified homeowners
- Outreach campaign to septic system owners on state septic system maintenance recommendations

OUTCOMES
- Improved understanding of septic system technologies
- Improved understanding of regulatory updates for septic systems
- Strengthened septic system regulations for sensitive areas Reduced nutrient loads from septic systems
- Improved understanding of septic system maintenance

IMPLEMENTATION METRICS
- NUT1: Annual load of nitrogen to Great Bay from WWTF and watershed tributaries

Support inter-municipal coordination and interstate cooperation to find and implement effective solutions for reducing nutrient or pollutant loads throughout the Great Bay Estuary watershed

WR-14

priority | *start* | *duration*
Highest | 2012 | Ongoing

Individual municipalities and landowners must all work to reduce wastewater and nutrient loading, but a regional approach is required for this regional issue. In New Hampshire, the newly formed Southeast Watershed Alliance is poised to evaluate and offer regional solutions to wastewater and nutrient control and management.

NHDES and MDEP also plan to meet in late 2009 to begin cooperative efforts to control nutrient loading. PREP will help facilitate these cooperative efforts as nutrient loading directly affects the water quality and ecosystems of the Piscataqua estuaries.

Although nutrient management and reduction may be the initial topic for coordination, other regional pollutant issues can also be coordinated through similar mechanisms.

ACTIVITIES

1. Support and participate in the work of the SWA. Use lessons learned from the SWA process to guide other regional approaches to permitting and water quality issues.
2. Facilitate inter-municipal and interstate dialogue and permit coordination through outreach organizations.
3. Explore a nitrogen trading program between WWTFs in Maine and New Hampshire and potentially other entities to promote cost-effective nitrogen removal.
4. Coordinate this other regional nutrient management activities.
5. Periodically evaluate and report on the regional nutrient or pollutant reduction activities to all stakeholders.
6. Participate in the Great Waters - Gulf of Maine planning and development process

MEASURING PROGRESS

OUTPUTS

- Outreach campaign to municipal staff and boards on the benefits of coordinated action to reduce nutrient or pollutant loads on a watershed scale
- Research reports on nutrient reduction activities in the watershed

OUTCOMES

- Improved understanding of inter-municipal cooperation options and benefits
- Improved understanding of nutrient reduction best management practices and effective methods in the watershed

IMPLEMENTATION METRICS

- None

Issues Addressed:
- Nutrients
- Water quality

Leads:
- MDEP
- NHDES
- SWA

Cooperators:
- Homeowners
- Municipalities
- NEMO
- NROC
- PREP
- RPC
- SMRPC
- SNHPC
- SRPC

Funding:
- MDEP Bureau of Land and Water Quality
- Municipalities
- NHDES Watershed Management Bureau
- PREP

Critical Guidance

[1]New Hampshire Statutes, 2009, NH RSA Chapter 485-E: Southeast Watershed Alliance
[2]Southeast Watershed Alliance, 2010, Southeast Watershed Alliance

WR-15

priority | *start* | *duration*
High | 2015 | Ongoing

Improve erosion and sedimentation controls at construction sites in the Piscataqua Region watershed.

Issues Addressed:
- Sedimentation
- Development
- Nutrients

Leads:
- MDEP
- NHDES

Cooperators:
- Businesses
- Construction Contractors
- Developers
- MDOT
- Municipalities
- NEMO
- NHDOT
- NROC
- PREP
- UNH-CE
- UNH-SC

Funding:
- NHDES Watershed Management Bureau
- MDEP Bureau of Land and Water Quality
- PREP

Development and conversion of land from field and forest to commercial or residential development, damages soil structure, removes ground cover that stabilizes soil and increases the possibility of erosion. Runoff from these sites carries sediment-laden waters to stream, rivers and wetlands. The sediment reduces water clarity, adds silt and sand to bed loads and introduces nitrogen and other chemical constituents previously bound up in the soils.

As the Piscataqua watershed continues to develop increasing emphasis on reducing runoff and associated negative impacts from erosion remains an important activity. PREP has initiated a study of existing controls in the Piscataqua Region, status of permit enforcement, barriers to state and local enforcement, and comparisons of successful erosion and sediment programs in other states. This study will enhance understanding and help in developing new approaches to enforcement and sedimentation control.

ACTIVITIES

1. Determine successes and failures of erosion and sediment controls at construction sites in the region.
2. Prioritize problem areas and determine means to address failures.
3. Update BMPs as needed.[1,2]
4. Offer training to contractors on rules and regulations, BMPs and the importance of erosion and sediment control.
5. Support enforcement of erosion and sedimentation control at the municipal and regional level. Promote site inspections for development sites as recommended by the NHDES model ordinance.
6. Track progress of erosion and sediment control measures at construction sites.

MEASURING PROGRESS

OUTPUTS
- Research report on erosion and sedimentation control regulations at the national, state, and local levels
- Outreach campaign for state resource agencies and municipal staff and boards on ways to improve erosion and sedimentation regulation
- Erosion and sedimentation control training for contractors

OUTCOMES
- Improved understanding of weaknesses of Erosion and sedimentation regulation
- Improved erosion and sedimentation regulations
- Improved compliance with erosion and sedimentation and stormwater regulations
- Increased number of municipalities with adequate site visits
- Reduced erosion and sediment loads to rivers, lakes, and estuaries

IMPLEMENTATION METRICS
- R9: Municipalities require site inspections of development sites for compliance with stormwater/E&S requirements as recommended by the NHDES model ordinance
- Sediment loads from Piscataqua Region watersheds

Critical Guidance

[1]New Hampshire Department of Environmental Services, 2010, New Hampshire Stormwater Manual
[2]Maine Department of Environmental Protection, 2003, Maine Erosion and Sediment Control BMPs

Research the sources, fate and transport of sediment in the Great Bay Estuary and Hampton-Seabrook Harbor.

WR-16

priority | *start* | *duration*
High | 2015 | Finite

In 2008, the New Hampshire Legislature created a study commission to research siltation in the Great Bay Estuary. There have been observations of shoaling in tidal rivers and increased suspended sediments in estuarine waters. The Siltation Commission gathered all readily available information related to this subject. One of the data gaps identified was a lack of a credible sediment budget for the Great Bay Estuary. This would include sources of sediment, especially hotspots, and areas of deposition.

ACTIVITIES

1. Using similar studies in the region as a guide, develop a scope of work and select research group to conduct study.
2. Select representative tributaries and near shore areas that experience excess sedimentation for sampling and sediment analysis. Determine optimal study period for evaluation.
3. Extract sediment cores and evaluate sediment distribution and rate of accumulation. Measure rate of sediment accumulation at each sampling site over the study period.
4. Conduct bed load sampling and analysis on several tributaries.
5. Conduct fluvial erosion assessments in coastal rivers and streams to identify sediment reduction opportunities, including floodplain access restoration.
6. Complete evaluation and report on results of sediment analyses.
7. Communicate significance of research findings to policy makers.

MEASURING PROGRESS

OUTPUTS

- Research report on sediment accumulation rates and sources
- Outreach campaign to policy makers on sediment accumulation rates and sources in Great Bay and Hampton-Seabrook estuaries

OUTCOMES

- Improved understanding of sediment sources and rates

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Development
- Critical Habitats and Restoration
- Critical Species
- Sedimentation

Leads:

- UNH-JEL
- UNH-SC

Cooperators:

- MDEP
- MDOT
- Municipalities
- NHDES
- NHDOT
- PREP

Funding:

- MDEP Bureau of Land and Water Quality
- NERRS-SC Grants
- NHDES Watershed Management Bureau
- NOAA Coastal Nonpoint Pollution Control Program - Coastal Zone Act Reauthorization Amendments Section 6217

Critical Guidance

[1]Great Bay Siltation Commission, 2010, Great Bay Siltation Commission Website

WR-17

priority | *start* | *duration*
High | 2015 | Finite

Identify sources of toxic contaminants in the coastal watershed.

Issues Addressed:
- Water Quality
- Sediments
- Toxic contaminants

Leads:
- UME
- UNH-JEL

Cooperators:
- MDEP
- NHDES
- PREP
- USFWS

Funding:
- USEPA Water Pollution Control Program Grants - Clean Water Act Section 106
- NOAA Center for Coastal Monitoring and Assessment
- NHDES Watershed Management Bureau
- MDEP Bureau of Land and Water Quality
- Gulf of Maine Council

Toxic contaminants in Piscataqua estuaries have been sampled in shellfish tissue, sediments, water, and benthic organisms as part of ongoing sampling programs.

Identifying sources of some contaminants could largely be completed through further evaluation of existing data and through modifications to sampling locations and analyses if needed. This knowledge could help with identifying continuing sources, source reduction and cleanup and reduce toxic chemical buildup in sediments and organisms.

ACTIVITIES

1. Identify toxic contaminants of greatest concern for source identification.
2. Use existing data to map contaminant concentrations and trends to determine potential source areas.
3. Propose new and modify regular sampling locations, if necessary, to provide additional source delineation.
4. Prepare maps and reports describing analysis and results
5. Promote source reduction and cleanup of priority toxic contaminants.
6. Communicate significance of maps, data, analysis, and reports to policy makers.

MEASURING PROGRESS

OUTPUTS
- Research report on the distribution and potential sources of toxic contaminants
- Outreach campaign for state resource managers on toxic contaminant source reduction and cleanup

OUTCOMES
- Improved understanding of sources of toxic contamination
- Improved monitoring design for toxic contaminants
- Reduced toxic contaminant concentrations due to source reduction and cleanup

IMPLEMENTATION METRICS
- TOX5: Sediment contamination concentrations relative to NOAA guidelines
- TOX7: Benthic community impacts due to sediment contamination
- TOX1: Shellfish tissue concentrations relative to FDA standards
- TOX3: Trends in shellfish tissue contaminant concentrations

Promote development and implementation of innovative means to reduce the application of chemical de-icers from surfaces in the Piscataqua watershed.

WR-18

priority | *start* | *duration*
High | 2015 | Ongoing

Road de-icers are generally made up of sand and unrefined salt (NaCl) that impact water quality. Sodium, chloride and salt impurities can pose health risks while sand increases sedimentation.

Chloride is likely the best indicator of the impact of road de-icing chemicals. Chloride contamination has increased in rivers and streams since the 1940s and is tightly correlated with road and impervious surface density in associated watersheds. Chloride is not assimilated or attenuated in aquatic systems and can accumulate in soils adjacent to treated areas, remaining as a source of runoff contamination. The concentration of chloride in groundwater increases in areas of salt application, leading to more saline groundwater discharge to surface waters. Recent research also suggests that denitrification can be inhibited by increased chloride concentrations. Chloride is toxic to freshwater aquatic species above 230 mg/L and likely influences aquatic health at lower concentrations.

Since chloride is of increasing concern, this parameter or a surrogate (specific conductance) should be tracked in freshwater water quality sampling programs. Chloride concentrations are not a concern in the estuary because of the high salinity of these waters. Improved management of salt during deicing by municipalities, contractors, and DOT's will moderate salt increases in water bodies. Research into other de-icing materials is also needed.

ACTIVITIES

1. Work with DPW's on optimizing application amounts during winter storms. Enforce "reduced salt zones" where designated.
2. Improve stormwater discharges near surface waters to prevent direct runoff from roadways.
3. Encourage street, parking lot, and roadway sweeping at the end of the winter season to remove excess de-icers between winter storms.
4. Continue outreach to municipalities, homeowners and business owners on responsible application of chemicals to landscapes and hardscapes.
5. Promote a certification program for road agents and private contractors who apply de-icing. Use proceeds from certification to further fund activities.
6. Research efficacy of other de-icing materials with lower chloride content.
7. Research the role of chloride in nutrient cycling and denitrification.
8. Promote the use of pervious pavements and smart growth as infrastructure options that require the use of less de-icing agents.

MEASURING PROGRESS

OUTPUTS

- Outreach campaign for municipal staff and boards and Maine and New Hampshire DOTs on salt application rates and best management practices
- Outreach campaign for public on landscaping and salt application
- Outreach campaign for state resource managers on salt applicator certification programs
- Outreach campaign to public on responsible application of chemicals to landscapes and hardscapes
- Research reports on alternatives to road salt
- Research reports on the effects of chloride on the environment

OUTCOMES

- Improved understanding of best management practices for reducing road salt use
- Reduced road salt application rates
- Improved understanding of applicator certification programs
- Improved understanding of road salt alternatives
- Improved understanding of the effects of chloride in the environment

IMPLEMENTATION METRICS

- Trends in chloride concentrations in watershed streams

Issues Addressed:

- Stormwater
- Water quality

Leads:

- MDEP
- NHDES
- UNH-SC

Cooperators:

- Businesses
- Lamprey River Hydrologic Observatory
- Landscapers
- Municipalities

Funding:

- Federal Highway Administration
- MDOT
- Municipalities
- NHDOT Bureau of the Environment
- Salt Applicators
- USEPA Nonpoint Source Management Program - Clean Water Section 319

WR-19

priority | start | duration
Moderate | 2010 | Ongoing

Support the oil spill preparedness and response activities of the Piscataqua River Cooperative.

Issues Addressed:
- Toxic Contaminants
- Water Quality
- Discharges

Leads:
- PREP
- PRC

Cooperators:
- Boaters
- MDEP
- MDIFW
- Municipalities
- NERRS-SC
- NHDES

Funding:
- MDEP Oil Spill Response Program
- NHDES Oil Spill Response Program
- NOAA Emergency Response Program
- PRC
- USCG

The Piscataqua River Cooperative (PRC) is a consortium of businesses that transport and store petroleum products along the lower Piscataqua River. The Portsmouth Naval Shipyard is a mutual aid partner and provides equipment training and support with spills if needed. The essential function of the PRC is to prevent oil spills and be prepared for oil spill response if needed along the Piscataqua River.

ACTIVITIES

1. Continue ongoing relationship with the PRC and communicate on a quarterly basis.
2. Assist with activities of the PRC as appropriate.
3. Participate in oil spill preparedness and shore data.
4. Educate PRC on PREP and NEP resources, such as community engagement and data dissemination, that could be useful in the event of an oil spill.

MEASURING PROGRESS

OUTPUTS
- Reports on PRC-PREP activities for oil spill prevention
- Reports on joint PRC-PREP projects
- Outreach campaign to PRC on PREP/NEP resources

OUTCOMES
- Improved understanding of oil spill contingency planning
- Improvements in oil spill response preparedness

IMPLEMENTATION METRICS
- None

Increase implementation of household hazardous waste and pollution prevention programs in the Piscataqua Region watershed and include pharmaceutical and personal care product disposal.

WR-20

priority | *start* | *duration*
High | 2015 | Ongoing

Pharmaceuticals and personal care products (PPCPs) in surface and groundwater can be hazardous to human health and the environment. NHDES offers guidance on excess medicine disposal (New Hampshire Department of Environmental Services, 2009) and supports establishment of a statewide drug disposal program recently proposed in the NH House of Representatives (HB 607).

A household hazardous waste (HHW) collection program is in place in most Piscataqua communities or is offered regionally. This program is sponsored in part by NHDES or MDEP and by municipalities. It offers guidance on alternatives to hazardous products in households as well as disposal. In New Hampshire, all municipal HHW grant recipients are required to conduct a survey and document materials collected. Currently, the HHW grant program does not address most PCPPs and pharmaceuticals. Health care facilities and some municipalities conduct pharmaceutical disposal programs, however, these often involve controlled substances and thus must involve law enforcement.

In 2009, NHDES began offering a Household Hazardous Waste Special Project Grant Program with the primary goals of reducing the volume or toxicity of household hazardous wastes and creating permanent HHW collection and management infrastructure. Eligible grantees include conservation commissions, solid waste management districts, regional planning commissions, and not-for-profit organizations.

ACTIVITIES

1. Evaluate citizen participation in household hazardous waste programs in area towns.
2. Support inclusion of pharmaceutical and personal care product disposal as part of the HHW programs.[1,2]
3. Increase outreach to homeowners and foreclosure professionals about pharmaceutical disposal and HHW programs.[1,2]
4. Increase outreach to PCPP retailers on HHW programs.[1,2]
5. Support utilization of NHDES Household Hazardous Waste Special Project Grant Program.
6. Advocate for establishment of pharmaceutical drug disposal programs.

MEASURING PROGRESS

OUTPUTS

- Research report on HHW participation rates in PREP watershed towns
- Outreach campaign to state agencies on PCPPs and HHW programs
- Outreach campaign to homeowners and foreclosure professionals on HHW programs
- Outreach campaign to PCPP retailers on HHW programs
- Outreach campaign to eligible grantees on NHDES Household Hazardous Waste Special Project Grant Program
- Advocacy campaign for legislators to establish pharmaceutical drug disposal programs

OUTCOMES

- Improved understanding of HHW participation rates in towns and best management practices
- Increased capacity for PCPP disposal
- Increased awareness of HHW programs
- Increased use of HHW programs for disposal of HHW and PCPPs

IMPLEMENTATION METRICS

- Amount of HHW collected in Region towns

Issues Addressed:

- Hazardous Waste
- PPCPs
- Water Quality

Leads:

- Municipalities
- NHDES
- NHDHHS
- MDEP

Cooperators:

- RPC
- SRPC
- SMRPC
- SNHPC
- Citizens
- Departments of Public Works

Funding:

- MDEP Bureau of Remediation and Waste Management
- Municipalities
- NHDES Drinking Water and Groundwater Bureau
- NHDES Household Hazardous Waste Program
- NHDES Household Hazardous Waste Special Project Grant Program

Critical Guidance

[1]Maine Department of Environmental Protection, 2005, Household Hazardous Waste Information
[2]New Hampshire Department of Environmental Services, 2008, Household Hazardous Waste Program

WR-21

priority | *start* | *duration*
Moderate | 2015 | Ongoing

Develop and implement a monitoring program for pharmaceuticals and personal care products in surface waters, public drinking water supplies and wastewater effluent.

Issues Addressed:
- Water Quality
- PPCPs

Leads:
- MDEP
- NHDES
- UME
- UNH-JEL

Cooperators:
- Municipalities
- Watershed Organizations
- PREP

Funding:
- NHDES Drinking Water and Groundwater Bureau
- Maine Department of Health and Human Services, Drinking Water Program
- NHDES Watershed Management Bureau
- MDEP Bureau of Land and Water Quality
- USEPA Water Quality Cooperative Agreements/Grants - Clean Water Act Section 104(b)(3)

Pharmaceuticals and personal care products (PPCPs) can be hazardous to human health and the environment. When disposed in drains or toilets or incorporated in human waste, PPCPs appear in septic system effluent, wastewater treatment plant effluent, and streams and rivers where these wastes are discharged.

Future PPCP monitoring in the Piscataqua watershed should be guided by the results of recent NH sampling and sampling programs established in other regions of the US.

ACTIVITIES

1. Research accurate and cost-effective monitoring techniques for PPCPs.[1]
2. Research objective, risk-based standards for PPCPs in the environment.
3. Work with NHDES and MDEP to include PPCP indicator constituents in WWTF and river monitoring programs.
4. Add PPCP indicator constituent monitoring to PREP monitoring program based on WWTF and tributary monitoring results, as needed.
5. Track concentrations and report in State of Estuaries Reports.
6. Communicate significance of data and monitoring program to relevant policy makers.

MEASURING PROGRESS

OUTPUTS
- Research report on PPCP monitoring methods
- Research report on PPCP standards
- Advocacy campaign for state resource managers to add PPCPs to state monitoring programs
- Data on PPCP concentrations in environmental media
- Outreach campaign to relevant policy makers on significance of data and monitoring

OUTCOMES
- Improved understanding of PPCP monitoring methods
- Improved understanding of PPCP interpretation methods
- Increased data collection for PPCPs
- Increased understanding of PPCP concentrations in the PREP watersheds

IMPLEMENTATION METRICS
- None

Critical Guidance

[1] U.S. Environmental Protection Agency, 2009, Pharmaceuticals and Personal Care Products as Pollutants (PPCPs)

Identify known point source groundwater contamination sites that threaten surface water quality and aquatic habitat and prioritize for clean up.

WR-22

priority | *start* | *duration*
Moderate | 2015 | Ongoing

Both NHDES and MDEP maintain databases and GIS layers which identify groundwater contamination from petroleum and hazardous wastes. Cleanup of these sites is coordinated through programs at each department. In order to protect surface water quality and impacts to aquatic ecosystems in the estuaries and tributaries, groundwater contamination sites should be prioritized based on risk of migration to the estuary and toxicity of the contaminant.

ACTIVITIES

1. Query NHDES and MDEP databases to determine what sites have documented discharges to freshwater or estuarine waters.
2. Evaluate contaminant levels and contaminants at each identified site and determine relative aquatic impacts using existing data and GIS co-occurrence with wildlife habitat protection, restoration and land protection plans.
3. Prioritize sites for further study or cleanup based on evaluations.
4. Work with NHDES and MDEP to accelerate cleanup of prioritized sites.

MEASURING PROGRESS

OUTPUTS

- Research reports on sites in the Piscataqua Region watersheds with contaminated groundwater
- Outreach campaign for state resource managers on groundwater cleanup projects

OUTCOMES

- Improved understanding of priority sites for groundwater cleanup
- Increased rate of groundwater cleanup projects
- Reduced discharges of contaminated groundwater to rivers, lakes, and estuaries

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Groundwater
- Water Quality

Leads:

- NHDES
- MDEP

Cooperators:

- Land Protection Organizations
- MDIFW
- Municipalities
- NHFGD
- Owners of Contaminated Land

Funding:

- MDEP Bureau of Remediation and Waste Management
- Municipalities
- NHDES Waste Management Division
- Owners of Contaminated Land
- USEPA

WR-23

priority | *start* | *duration*
Moderate | 2012 | Ongoing

Provide data and information to facilitate watershed-based permitting for NPDES discharges.

Issues Addressed:
- Water quality
- Discharges

Leads:
- MDEP
- NHDES

Cooperators:
- Municipalities
- SWA
- USEPA
- Watershed Organizations

Funding:
- MDEP
- NHDES

The USEPA has developed guidance for preparing NPDES permitting on a watershed basis. In this way total loading of a given substance to a watershed can be assessed each time a permit is issued.

The Great Bay watershed is impacted by nutrients and new nitrogen allocation guidelines have recently been developed. The Southeast Watershed Alliance (SWA) has recently been formed to help tackle water resource issues on a regional basis. This may result in setting permit limits based on watershed water quality. This approach will also allow consideration of nitrogen trading and cost benefit evaluations to determine the most efficacious N reduction approaches. New Hampshire is a non-delegated state for NPDES, which means that permits are issued by USEPA Region 1. NHDES provides relevant data and limits but USEPA ultimately issues NPDES permits.

Maine is delegated for NPDES and issues its own permits. Watershed based permitting is used in Maine and has been used as the basis for regional water quality actions in the Portland area. Maine will utilize this approach if needed in the Piscataqua region as well.

ACTIVITIES

1. Develop data products related to watershed-based permitting[1] with participation from SWA and other regional organizations.
2. Facilitate interstate cooperation on NPDES permitting for the Great Bay Estuary.

MEASURING PROGRESS

OUTPUTS
- Research reports on watershed based permitting options and benefits
- Outreach campaign for state resource managers and municipal staff and boards on interstate cooperation for NPDES permitting

OUTCOMES
- Increased understanding of watershed based permitting options and benefits
- Increased interstate cooperation

IMPLEMENTATION METRICS
- None

Critical Guidance

[1] US Environmental Protection Agency, 2007, Watershed-Based NPDES Permitting

Promote the development o f TMDL studies for all impaired water bodies in the Piscataqua Region watershed.

WR-24

priority	*start*	*duration*
High	2015	Ongoing

Water bodies that do not meet NH or ME water quality standards are listed in USEPA 303(d) and 305(b) reports. A study to reduce pollutant loading so that water quality is met is referred to as a TMDL study.

Broadly, a TMDL study refers to a detailed plan that identifies the pollutant reductions needed to meet New Hampshire or Maine water quality standards in a given water body. This includes the basic calculation of pollutant loads from point and nonpoint sources and the reduction of pollutant levels needed to meet water quality standards. The TMDL study also develops a strategy to restore the water quality. The general process by which TMDLs are developed includes:

- Identifying the problem pollutant,
- Establishing the water quality goals or target values needed to achieve water quality standards,
- Identifying the specific sources contributing the pollutant of concern,
- Assigning a specific load allocation to each of the sources.

Regional TMDLs may be pursued in the Piscataqua region due to the regional nature of the nutrient, bacteria, and toxic contaminant issues.

Nitrogen in Great Bay is being managed using waste load allocation, approach a slightly different approach from a standard TMDL. This process is described in Numeric Nutrient Criteria for the Great Bay Estuary, 2009.

ACTIVITIES

1. Prioritize TMDL completion based on 303(d) and 305(b) lists.[1,2]
2. Support completion of TMDL studies based on priority list. Pursue regional TMDLs if appropriate for some contaminants.
3. Periodically review priority list and revise priorities if applicable.
4. Monitor compliance and impacts of TMDL on Piscataqua water quality.

MEASURING PROGRESS

OUTPUTS

- Research reports on impaired waters, TMDL priorities, and options for regional TMDLs
- Completed TMDLs

OUTCOMES

- Improved understanding of priorities for TMDL studies
- Improved understanding of contaminant sources and loading limits
- Improved water quality

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Water Quality

Leads:

- MDEP
- NHDES

Cooperators:

- USEPA

Funding:

- MDEP Bureau of Land and Water Quality
- NHDES Watershed Management Bureau
- USEPA Water Pollution Control Program Grants - Clean Water Act Section 106
- USEPA Water Quality Cooperative Agreements/Grants - Clean Water Act Section 104(b)(3)

Critical Guidance

[1]Maine Department of Environmental Protection, 2008, Integrated Water Quality Monitoring and Assessment Reports
[2]New Hampshire Department of Environmental Services, 2008, Surface Water Quality Assessment Program

WR-25

priority | *start* | *duration*
Highest | 2015 | Ongoing

Support municipal implementation of Phase II stormwater requirements for MS4 communities and BMP outreach and education for municipal staff in communities that are not required to comply with Phase II regulations.

Issues Addressed:
- Stormwater
- Water Quality

Leads:
- MDEP
- NHDES

Cooperators:
- Municipalities
- NEMO
- NROC
- PREP
- RPC
- SMRPC
- SNHPC
- SRPC
- SWA
- UNH-CE
- UNH-SC

Funding:
- NHDES Watershed Management Bureau
- MDEP Bureau of Land and Water Quality
- USEPA Water Pollution Control Program Grants - Clean Water Act Section 106

MS4 communities are those that are required to maintain a Municipal Separate Storm Sewer System (MS4) General Permit. These are urbanized or partially urbanized communities. All but 21 of the 52 Piscataqua watershed communities are considered MS4 communities.

The permit requires that communities implement the Phase II stormwater regulations. These regulations require communities to implement six minimum control measures:

- Public education and outreach about stormwater quality.
- Public participation and involvement in implementing the stormwater management program.
- Illicit discharge to storm sewers detection and elimination (IDDE).
- Enforcement of erosion and sediment control at construction sites.
- Control of post-construction runoff.
- Pollution prevention and good housekeeping.

PREP will work with municipalities and watershed organizations to support implementation of these measures in MS4 communities. For communities not required to obtain a permit, PREP and cooperators will work to implement these measures based on the scale and needs of the community.

ACTIVITIES

1. Track implementation progress of stormwater requirements in MS4 communities.[1,2]
2. Offer technical assistance to communities via the PREP's CTAP program and UNH-SC.
3. For non-MS4 communities provide outreach, training and technical assistance on IDDE, stormwater BMPs and LID practices.
4. Secure additional grant funding to support stormwater planning at community level.

MEASURING PROGRESS

OUTPUTS

- Research reports on implementation of MS4 programs by municipalities in the Piscataqua region
- CTAP grants to MS4 communities
- Outreach campaign for non-MS4 municipal staff and boards on IDDE, stormwater BMPs, and LID practices
- Stormwater planning grants program, if activity #4 is achieved

OUTCOMES

- Improved understanding of MS4 implementation and best management practices among communities
- Improved MS4 programs in communities
- Improved stormwater management in non-MS4 communities
- Reduced nonpoint source runoff to rivers, lakes, and estuaries

IMPLEMENTATION METRICS

- None

Critical Guidance

[1]Maine Department of Environmental Protection, 2005, Municipal Separate Stormwater Sewer Systems (MS4s)
[2]US Environmental Protection Agency, 2010, Stormwater Discharges From Municipal Separate Storm Sewer Systems. . .

Improve and support inclusion of biological monitoring in NHVRAP and similar New Hampshire volunteer programs.

WR-26

priority | *start* | *duration*
High | 2012 | Ongoing

Through the collection and identification of organisms, such as aquatic insects, and assessment of supportive habitat conditions, biological monitoring is used to establish reference locations for "least disturbed" conditions in the New Hampshire and identify biologically impaired waterways.

NHVRAP (New Hampshire Volunteer River Assessment Program) is a coordinated effort between NHDES and watershed and citizen led environmental organizations. A biological monitoring program (VBAP) similar to NHVRAP was initiated and successful but discontinued due to funding constraints. Collecting biological information is crucial to assessing water quality and watershed health. Additional efforts should be made to re-establish this program.

Due to departmental quality assurance requirements, MDEP conducts all biological monitoring in the Piscataqua watershed. They are monitoring multiple sites on the Salmon Falls River and the Great Works River in Maine. Biological monitoring will not be added to their MEVRMP program.

ACTIVITIES

1. Prepare documentation on the value of biological monitoring to water quality assessment.
2. Develop list of priority sampling sites for biological data and seek funding for program implementation.
3. Determine biological sampling methods most valuable and effective for the sites that are compatible with state biomonitoring programs in Maine and New Hampshire.
4. Coordinate biomonitoring with other water quality parameter monitoring at chosen biological sites.
5. Train volunteers in biological sampling techniques.

MEASURING PROGRESS

OUTPUTS

- Research reports on methods for biological monitoring by volunteers
- Research reports on priority locations for biological monitoring
- Training for volunteers in biological monitoring
- Biological monitoring data collected along with water quality data

OUTCOMES

- Improved understanding of biological monitoring methods and priority locations
- Increased data on biological parameters

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Water Quality

Leads:

- MDEP
- NHDES
- NHFGD

Cooperators:

- MDIFW
- Municipalities
- Watershed Organizations

Funding:

- MDEP Bureau of Land and Water Quality
- NHDES Watershed Management Bureau
- USEPA Water Pollution Control Program Grants - Clean Water Act Section 106
- USEPA Water Quality Cooperative Agreements/Grants - Clean Water Act Section 104(b)(3)

WR-27

priority | *start* | *duration*
Highest | 2015 | Ongoing

Complete instream flow studies and establish protected instream flows for Piscataqua Watershed designated river reaches in the NH Rivers Management and Protection Program.

Issues Addressed:
- Instream Flow
- Water Use

Leads:
- MDEP
- MGS
- NHDES
- NHGS

Cooperators:
- Municipalities
- Permitted Water Users
- USFWS
- Watershed Organizations

Funding:
- NHDES Watershed Management Bureau
- NOAA
- USEPA

NHDES must establish protected instream flows for designated river reaches in the NH Rivers Management and Protection Program. In setting protected instream flows, NHDES considers many factors including the natural flow paradigm of the reach, existing permitted water withdrawals for drinking water or hydropower, and relationships between flow and habitat for aquatic species. A pilot study of protected instream flows in the Lamprey River is being completed by NHDES. There are three other rivers in the Piscataqua Region watershed which are part of the NH Rivers Management and Protection Program. Protected instream flow studies can be completed on these rivers, and any other rivers that are added to the program in the future.

ACTIVITIES

1. Promote the completion of protected instream flow studies for all designated river reaches in the NH Rivers Management and Protection Program in the Piscataqua Region watershed. [1,2]
2. For rivers that are not part of the NH Rivers Management and Protection Program, evaluate water use needs based on the NH Stressed Basins or ME Watersheds at Risk program to identify priority rivers for the NH Rivers Management and Protection Program.
3. Promote and assist with the nomination of additional rivers to the NH Rivers Management and Protection Program.
4. Support the establishment of protected instream flows for all designated river reaches in the NH Rivers Management and Protection Program in the Piscataqua Region watershed.
5. Research how a rivers management and protection program could be established in Maine.

MEASURING PROGRESS

OUTPUTS
- Research reports on instream flow and water use needs
- Nominations of river segments to the NH Rivers Management and Protection Program
- Protected instream flows for designated rivers
- Research report on rivers management programs for Maine

OUTCOMES
- Improved understanding of instream flows and water use needs
- Increased number of designated rivers
- Protection for instream flows in designated rivers
- Increased understanding of rivers management strategies in Maine

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]New Hampshire Department of Environmental Services, 2008, Instream Flow Protection Pilot Program
[2]New Hampshire Department of Environmental Services, 2008, Rivers Management and Protection Program,. . .

Support the development and implementation of water management plans in sub watersheds to maintain sustainable groundwater and surface water use in the coastal watershed.

WR-28

priority | *start* | *duration*
Highest | 2012 | Ongoing

Water resources are under increasing pressure due to population increases, increased water use per capita and changes in temperature and rainfall patterns due to climate change.

Impacts on water resources as a whole are being studied in both NH and ME. The NH Stressed Basins Project being conducted by the New Hampshire Geological Survey develops a water balance index that evaluates total withdrawal to summer streamflow and is being conducted for all geographic units (0.5 square miles) in the state. In Maine a similar program entitled Watersheds at Risk is underway at the Maine Geological Survey. This will provide guidance on the watershed areas most vulnerable to declining stream baseflows due to surface water and groundwater resource needs.

Water management plans which estimate surface water needs and evaluate surface water withdrawal limits are being developed by NHDES for designated river reaches on the Soughegan and Lamprey rivers under Env-Wq 1900 in the NH Rivers Management and Protection Program. Plans are also encouraged for source water protection under the NHDES Drinking Water and Groundwater program. A pilot "Consumptive Water Use Capacity Plan" is now being developed that jointly assesses surface and groundwater use and sustainability is also under development by NHDES. Coordination of these efforts going forward will protect water resources and maximize resources for protection efforts.

ACTIVITIES

1. Review results from NHGS Stressed Basins Project and MGS Watersheds at Risk Project to identify priority watersheds for water management plans.[1,2]
2. Encourage development of water management and water use plans for subwatersheds within the Piscataqua watershed.
3. Encourage integration of water management plans at the state level to maximize efficiency and resources.
4. Provide technical assistance on developing water management plans to municipalities and watershed organization through CTAP program.
5. Advocate for a coordinated and proactive process for permitting new water withdrawls.
6. Coordinate with state programs to assure compatibility of state water management plans with PREP objectives.[3]

MEASURING PROGRESS

OUTPUTS

- Research reports on priority watersheds for water management plans
- CTAP grants to municipalities to develop water management plans
- Water management plans
- Outreach campaign for state resource managers on integrating local water management plans and to achieve PREP objectives
- Advocacy campaign to NHDES and MDEP to create a coordinated and proactive process for permitting new water withdrawls

OUTCOMES

- Improved understanding on priority watersheds for planning
- Increased understanding of planning priorities
- Increased number of local water management plans
- Coordinated management of water resources at regional and state level

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Drinking Water
- Instream Flow
- Water Use

Leads:

- MDEP
- NHDES

Cooperators:

- Granite State Rural Water Association
- Maine CDC
- Maine Rural Water Association
- MGS
- Municipalities
- NHCAW
- NHGS
- NROC
- RPC
- SMRPC
- SNHPC
- SRPC
- UNH-CE
- Water Districts
- Watershed Organizations

Funding:

- MDEP Bureau of Land and Water Quality
- Municipalities
- NHDES-WMB
- PREP
- Water Districts

Critical Guidance

[1]New Hampshire Geological Survey, 2008, Stressed Basins Project
[2]Maine Geological Survey, 2007, Watersheds-at-risk Analysis
[3]New Hampshire Department of Environmental Services, 2008, Rivers Management and Protection Program

WR-29

priority | *start* | *duration*
Moderate | 2012 | Finite

Develop high quality information on the spatial extent of water use for public drinking water systems.

Issues Addressed:
- Water Use
- Groundwater

Leads:
- Maine Drinking Water Program
- MGS
- NHDES
- NHGS

Cooperators:
- Drinking Water Providers
- GRANIT
- Maine CDC
- RPC
- SMRPC
- SNHPC
- SRPC
- USGS
- Water Districts

Funding:
- Maine Department of Health and Human Services, Drinking Water Program
- Municipalities
- NHDES Drinking Water and Groundwater Bureau
- USEPA Office of Ground Water and Drinking Water
- Water Districts

Credible information on drinking water supplies and use is critical for managing water resources in the Piscataqua Region watershed. Data on the location of drinking water wells, water withdrawals, water returns, and water transfers is collected by different agencies and programs. This information should be integrated into a geospatial database to provide water resource managers with high quality data on drinking water supplies and use.

Agencies in NH and ME are using GIS and other spatial tools to delineate groundwater and surface water supplies and areas of future water use. In addition, wellhead and source water protection areas are mapped as plans are developed and submitted. In New Hampshire, water withdrawals, returns, and transfers are collected in a separate database which is not linked to the GIS coverages.

Refinement of data collection and mapping that ties water use data to mapped areas would be valuable for water resource planning on a state and local basis.

ACTIVITIES

1. Support programs in New Hampshire and Maine agencies that develop GIS layers that map water resources and public drinking water supply information.[1,2,3]
2. Support the integration of New Hampshire and Maine spatial databases through shared metadata (imbedded data information) and data fields.
3. Support the integration of water withdrawal data with spatial databases of water resources and drinking water supply information.

MEASURING PROGRESS

OUTPUTS
- Integrated spatial databases for water use

OUTCOMES
- More accurate information for water resource planning

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]New Hampshire Department of Environmental Services, 2008, Groundwater and Drinking Water Source Protection . .
[2]Maine Department of Human Services, 2000, Maine Public Drinking Water Source Water Assessment Program
[3]New Hampshire Geological Survey, 2008, Water Well Inventory Program

Establish baseline data and a coordinated monitoring program for groundwater, streamflow and river geomorphology within the Piscataqua Region watershed.

WR-30

priority | *start* | *duration*
Moderate | 2015 | Ongoing

In order to assess water resource needs and flooding potential, accurate hydrologic baseline information is required. Some water level and streamflow data are regularly collected but a larger network would allow for more accurate predictions and bases for regulations. Specialized information will be needed for protected instream flow studies. Groundwater data will be needed to calibrate and periodically validate a groundwater flow model. River and stream geomorphic assessments have just been initiated on the Exeter River and future assessments area planned.

The baseline hydrologic data must be compiled and reviewed to determine whether the existing monitoring programs are adequate to support future work. Data gaps in the monitoring programs should be identified. Ultimately, a coordinated monitoring program to collect all of the necessary data should be developed.

Evaluation of current data collection and assessment of data needs should be a cooperative effort between federal and state agencies. Engagement of volunteer and research entities in the process will allow for a larger network and best use of limited resources.

ACTIVITIES

1. Assemble existing sources of groundwater, surface water and geomorphic baseline data.
2. Evaluate data needs for groundwater levels, streamflow monitoring, and fluvial geomorphology.
3. Prioritize data needs and develop interagency plan for data collection.
4. Identify funding sources for data collection programs and advocate for funding from Congressional Delegation.
5. Implement data collection as funding is available. Periodically re-evaluated data needs and redirect funding as needed.

MEASURING PROGRESS

OUTPUTS

- Research report on available hydrologic baseline data
- Plan detailing prioritized data collection needs and funding sources
- Data on hydrologic parameters
- Advocacy campaign to congressional delegation to provide federal funding for data collection programs

OUTCOMES

- Improved understanding of available hydrologic data and data needs
- Improved understanding of hydrologic processes

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Flooding
- Groundwater
- Instream flow
- Stormwater
- Water Use

Leads:

- MDEP
- MGS
- NHDES
- NHGS
- USGS

Cooperators:

- UNH
- Watershed Organizations

Funding:

- FEMA, Pre-Disaster Mitigation Program
- MDEP Bureau of Land and Water Quality
- MDEP of Health and Human Services, Drinking Water Prog.
- Municipalities
- NHDES Drinking Water and Groundwater Bureau
- NHDES Watershed Management Bureau
- USEPA Office of Ground Water and Drinking Water
- USEPA Water Pollution Control Program Grants, CWA Sect. 106
- USEPA Water Quality Cooperative Agreements/Grants, CWA Sect. 104(b)(3)
- USGS Streamflow Monitoring Program
- Water Districts

WR-31

priority | *start* | *duration*
Moderate | 2018 | Finite

Develop a three-dimensional model of groundwater flow in the Piscataqua Region watershed.

Issues Addressed:
- Groundwater
- Instream flow
- Water Use

Leads:
- MGS
- NHGS
- USGS

Cooperators:
- MDEP
- Municipalities
- NHDES
- Water Districts
- Watershed Organizations

Funding:
- Maine Department of Health and Human Services, Drinking Water Program
- MGS
- Municipalities
- NHDES Drinking Water and Groundwater Bureau
- NHGS
- USEPA Office of Ground Water and Drinking Water
- Water Districts

Water resource management plans and protected instream flow studies require credible information on water movement and discharges to rivers and estuaries. Surface water movement and discharges are monitored using a network of stream gages and can be modeled using the geospatial tools for the New Hampshire Hydrography Dataset (which covers the whole Piscataqua Region watershed). For groundwater, however, there is little information besides water level monitoring in wells.

The NHGS and USGS worked together to collect data in preparation for the Seacoast Groundwater Availability Study. A groundwater flow model for the smaller seacoast area was developed based on this data compilation. The model simulated flows in overburden and bedrock aquifers and considers changes due to demand from population increases and climate change.

If the model of the smaller seacoast area proves to be a useful tool in understanding more regional water resource issues, a larger model of the Piscataqua Region watershed should be considered.

ACTIVITIES

1. Evaluate the utility of the existing NH Seacoast Model after it has been available for two to three years.[1,2,3]
2. Support a workshop for NH and ME agencies to develop the conceptual framework for a three-dimensional groundwater model for the Piscataqua Region.
3. Gather available data on groundwater levels and flows in the Piscataqua Region watershed.
4. Support integration of groundwater withdrawal data from WR-29 with surface water data from the New Hampshire Hydrography Dataset.
5. Support the development of a three-dimensional model of groundwater flow and discharge in the Piscataqua Region watershed.

MEASURING PROGRESS

OUTPUTS
- Research report on utility of existing models
- Workshop to develop the conceptual framework for a three-dimensional groundwater model
- Research report on available groundwater level data in the Piscataqua region watersheds
- Integrated model of water withdrawals, groundwater flow, and surface water flow networks

OUTCOMES
- Improved understanding of changes to existing models
- Improved understanding of available groundwater data
- Improved capacity to model protected instream flows and water management plans

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]US Geological Survey, 2009, Groundwater Model: Assessment of Water Resources in the Seacoast Region of New . . .
[2]Horn, M.A., R. B. Moore, L. Hayes, S.M. Flanagan, 2008, Methods for and estimates of 2003 and projected water use. . .
[3]Mack, T. , 2009, Assessment of Groundwater Resources in the Seacoast Region of New Hampshire

Update the rainfall model for flood forecasting and stormwater design in the Piscataqua Region watershed to reflect current rainfall estimates and future estimates under climate change and land use change scenarios.

WR-32

priority | *start* | *duration*
High | 2012 | Finite

Rainfall intensity appears to be increasing based on the repeated flooding in the Piscataqua Region in 2006-2008. Climate change projections also predict increased storm activity and intensity in the Northeast region.

Current stormwater design standards are based on streamflow and rainfall patterns typical of pre-2000 conditions. Regional efforts are underway to update the rainfall design amounts for the Northeastern US through the Northeast Regional Climate Center (NRCC) at Cornell University and through the Atlas-14 program at NOAA. Completion of the NRCC study is expected in 2011.

The University of New Hampshire will be conducting a 2-year project funded by the Cooperative Institute for Coastal and Estuarine Environmental Technology (NERRS-SC) called "Assessing the Risk of 100-year Freshwater Floods in the Lamprey River Watershed of New Hampshire Resulting from Changes in Climate and Land Use." An output of this project will be rainfall amounts forecasted under different climate change and land use change scenarios. These data will be instructive for the entire Piscataqua Region watershed and New England.

ACTIVITIES

1. Support revision of rainfall design amounts being completed for the Northeastern U.S. by NRCC at Cornell University and NOAA.
2. When estimates become available promote adoption of these standards by NHDOT and MDOT.
3. Promote and support updates to stormwater and infrastructure design guidance on a state and local basis using the revised rainfall estimates.

MEASURING PROGRESS

OUTPUTS

- Research reports on changes to rainfall design amounts
- Outreach campaign for state resource managers to adopt new rainfall design amounts and revise infrastructure design guidance

OUTCOMES

- Improved understanding of expected rainfall frequencies
- Revised infrastructure design standards to accommodate increases streamflow and runoff
- Fewer infrastructure failures due to stream-flow and flooding

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Flooding
- Climate Change
- Stormwater
- Stream Connectivity

Leads:

- Maine State Climatologist
- MDOT
- NH State Climate Office
- NHDOT
- NOAA

Cooperators:

- MDEP
- Municipalities
- NHCAW
- NHDES
- Public Engineers
- UNH- SC

Funding:

- USGS Streamflow Monitoring Program
- FEMA, Pre-Disaster Mitigation Program and Emergency Management Performance Grant Funds
- NOAA National Climatic Data Center
- Municipalities
- Water Districts

WR-33

priority | *start* | *duration*
Highest | 2012 | Finite

Assess the geomorphic conditions of all coastal rivers to identify fluvial erosion hazards and encourage the adoption of Fluvial Erosion Hazard Ordinances and floodplain protection.

Issues Addressed:
- Development
- Flooding
- Floodplains

Leads:
- MDEP
- MGS
- NHDES
- NHGS
- RPC
- SMRPC
- SNHPC
- SRPC

Cooperators:
- CTAP
- Environmental Consultants
- Municipalities
- NEMO
- NROC
- UNH-SC
- Watershed Organizations

Funding:
- FEMA, Pre-Disaster Mitigation Program and Emergency Management Performance Grant funds
- Municipalities

Rivers and streams adjust their shape and flow characteristics based on channel materials, topography and nearby land use. The study of stream patterns and properties is termed fluvial geomorphology. River and stream shapes can be broadly categorized and the tendency for river to change (stability) can be assessed. A river's shape and stability provide valuable information about flooding potential and extent.

Once the fluvial geomorphology is understood, fluvial erosion hazards can be identified along river segments. The Town of Raymond experienced pronounced flooding on the Lamprey River. It has evaluated fluvial erosion hazards (FEHs) and identified high hazard areas in close proximity to the Upper Exeter River and Fordway Brook.

The Exeter River also flooded many areas during recent storms and a fluvial geomorphic study has just been completed for this river. FEH zones have been identified. Since increased storm frequency and intensity are predicted with climate change completion of fluvial geomorphologic and FEH mapping should be a priority for all vulnerable rivers and streams in the Piscataqua Watershed.

ACTIVITIES

1. Promote completion of fluvial geomorphology evaluations and FEH mapping of all rivers in Piscataqua watershed.
2. Adopt FEH ordinances, regulations and overlay districts as appropriate based on mapping.
3. Include training on fluvial geomorphology, FEH mapping vulnerability and FEH ordinances in outreach and training.

MEASURING PROGRESS

OUTPUTS
- Outreach campaign for state resource managers and municipal staff and boards on FEH mapping
- Research reports on FEH mapping studies
- Local ordinances for FEH zones

OUTCOMES
- Improved understanding of FEH methods and regulation
- Delineated FEH zones for local regulation
- Improved land use planning around flood hazard areas
- Fewer impacts from flooding

IMPLEMENTATION METRICS
- River Miles in Piscataqua Region watersheds assessed for fluvial erosion hazards

Develop a high-resolution digital elevation model and impervious surface data set for the Piscataqua Region watershed to use for modeling hydrology and land use impacts.

WR-34

priority	*start*	*duration*
High	2012	Finite

Hydrologic modeling requires detailed information on topography to predict areas where flooding may occur. A high quality digital elevation model (DEM) could be used to predict inundation areas during flooding events, stream crossings which are at risk of failure, and geomorphic instabilities in river systems. Investment in high-resolution topography data for the whole watershed from LiDAR imagery would greatly improve the capacity for hydrologic modeling.

ACTIVITIES

1. Promote investment in LiDAR for the Piscataqua Region watershed to provide a high resolution DEM for multiple applications.
2. Upgrade impervious surface data with new DEM.
3. Develop a digital elevation model for the Piscataqua Region watershed using LiDAR data.
4. Make data and GIS layers available for public and scientific use through GRANIT.
5. Incorporate use of new data in PREP outreach and training.
6. Communicate significance of DEM and resulting maps to relevant policy makers.

MEASURING PROGRESS

OUTPUTS

- Research reports on LiDAR and DEM data layers
- LiDAR coverage for Piscataqua Region watersheds
- DEM layer for Piscataqua Region watersheds
- DEM layers posted on GRANIT
- Outreach campaign to relevant policy makers on significance of DEM and maps to land use policy

OUTCOMES

- Improved understanding of methods and options for data layers
- Significantly improved hydrologic modeling capabilities
- Improved awareness of new data products

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Development
- Flooding
- Stormwater
- Water Quality

Leads:

- UNH-GRANIT
- USGS

Cooperators:

- MDEP
- MGS
- NHCAW
- NHDES
- NHGS
- PREP
- USFWS

Funding:

- American Recovery and Reinvestment Act
- FEMA, Pre-Disaster Mitigation Program and Emergency Management Performance Grant Funds
- Municipalities
- NERRS-SC Grants
- NOAA Coastal Services Center

WR-35

priority | *start* | *duration*
Highest | 2012 | Finite

Promote adoption of bridge and culvert design guidelines that accommodate aquatic passage, hydrologic connectivity, and increased stormflows due to climate change.

Issues Addressed:
- Climate Change
- Flooding
- Stormwater

Leads:
- MDEP
- MDIFW
- MDOT
- NHDES
- NHDOT
- NHFGD
- UNH-ERG

Cooperators:
- DPWs
- NHFGD-GBNERR
- MDOT
- Municipal
- NHCAW
- NHDOT
- PREP
- RPC
- SMRPC
- SNHPC
- SRPC
- UNH-CE
- UNH-ERG
- USFWS
- WNERR

Funding:
- FEMA, Pre-Disaster Mitigation Program and Emergency Management Performance Grant funds
- MDOT
- Municipalities
- NHDOT

There are thousands of stream crossings in the Piscataqua Region watershed. Municipalities need information on which crossings are the highest priority for upgrades and what is the best design for new crossings.

The New Hampshire and Maine stream crossing design guidelines have been updated to accommodate appropriate design that allows passage of aquatic organisms and stream connectivity, as well as sufficient capacity to prevent catastrophic failures during floods. These stream crossing design guidelines should be periodically updated to reflect new scientific findings on aquatic passage and increased storm frequency and duration due to climate change.

ACTIVITIES

1. Prepare information and outreach materials for distribution on new ME and NH culvert and bridge design standards.[1,2]
2. Work with outreach organizations to promote consistent state and local adoption of these standards.
3. Support studies to prioritize stream crossings for repair or redesign.
4. Encourage communities to evaluate existing infrastructure and re-design using standards when infrastructure is upgraded. If communities adopt and implement these design standards, FEMA may approve upgrades to failed culverts if a disaster declaration is made.
5. Evaluate consistency of current sizing standards with the updated rainfall model, in accordance with WR-32.
6. Periodically complete re-sizing guidance based on collected data as needed.
7. Update guidelines as needed to reflect new scientific findings.

MEASURING PROGRESS

OUTPUTS
- Outreach campaign for municipal staff and boards on culvert and bridge design standards
- Research reports on priority stream crossings for repair or redesign
- Research reports on the effect of increased rainfall design models on culvert and bridge design standards
- Revised culvert and bridge design standards

OUTCOMES
- Increased understanding of culvert and bridge design standards
- Increased understanding of priority stream crossings
- Improved culvert and bridge design standards that account for climate change
- Improved culvert and bridge design standards
- Decreased number of stream crossings that do not accommodate aquatic passage, hydrologic connectivity, or increased stormflows

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]University of New Hampshire, 2009, New Hampshire Stream Crossing Guidelines
[2]Maine Department of Transportation, 2008, Waterway and Wildlife Passage Policy and Design Guide 3rd . . .

LIVING RESOURCES AND HABITAT RESTORATION

ACTION PLANS

The living resources of the estuary include aquatic and terrestrial plants and animals and the habitats they create or inhabit. Declining water quality is threatening some of these organisms and terrestrial, freshwater and marine invasive species may degrade or displace others. A total of 21 action plans were modified or newly developed for the updated CCMP. Living resource actions focus on the critical species oysters, soft-shell clams, eelgrass, diadromous fish, eastern brook trout, shorebirds and saltmarsh breeding birds. Actions that will identify and improve habitats that house and support these and other watershed species are also included in this theme area.

Objectives LR-1.1, 1.2 and 1.3 present numerical guidelines for population or habitat improvement. The oyster population values projected for Objective 1.1 were based on the average number of oysters per square foot detected in 1993. This represents the highest population of oysters detected in Great Bay since rigourous surveys were initiated. The clam populations (Objective 1.2) were also estimated based on known clam densities and is based on the greatest population surveyed. Finally, the eelgrass bed extent included in Objective 1.3 is based on the greatest known acreage and connectivity surveyed in the 1980's before wasting diseases severely reduced bed coverage. Recent declines in water clarity may have also eliminated eelgrass in tidal tributaries. LR 1.10 sets a guideline of 300 acres for wetland restoration. A total of 270 acres were restored since the first CCMP was developed so a similar metric was established for the next 10 years.

Goal: Ecological function, connectivity, resilience, biodiversity, and ecosystem services of habitats are maintained and restored throughout the Piscataqua region watersheds.

Objective LR 1.1 - Increase the abundance of adult oysters at the six documented beds in the Great Bay Estuary to 10 million oysters and restore 20 acres of oyster reef habitat by 2020.

Objective LR 1.2 - Increase the number of adult clams in the Hampton-Seabrook Estuary to 5.5 million clams by 2020.

Objective LR 1.3 - Increase the areal extent of eelgrass cover to 2900 acres and restore connectivity of eelgrass beds throughout the Great Bay Estuary by 2020.

Objective LR 1.4 - Restore native diadromous fish access to 50% of their historical mainstem river distribution range by 2020, and improve habitat conditions encountered throughout their life cycle.

Objective LR 1.5 - Document existing populations of native Eastern brook trout and protect or restore the integrity of the sub-watersheds that support them.

Objective LR 1.6 - Maintain a stable and diverse population of shorebirds and saltmarsh breeding birds in Piscataqua region estuaries.

Objective LR 1.7 - Inventory, evaluate and restore natural vegetative buffers along degraded reaches of tidal shorelands, riparian zones of all stream orders, and wetlands.

Objective LR 1.8 - Identify and address stream and shoreline modifications that have significant negative impacts on the physical, chemical, or biological integrity of waterways.

Objective LR 1.9 - Identify vulnerabilities of upland and aquatic habitats to anticipated climate change impacts and take appropriate actions to mitigate or adapt to impacts.

Objective LR 1.10 - Restore or enhance an additional 300 acres of salt marsh by 2020 through removal of tidal restrictions or invasive species management.

Objective LR 1.11 - Monitor and control the extent of invasive nuisance species throughout the Piscataqua region watershed and estuaries.

Objective LR 1.12 - Minimize impacts to benthic habitat from direct alterations to submerged lands.

Objective LR 1.13 - Restore degraded natural freshwater wetlands and priority upland habitats.

Objective LR 1.14 - Improve implementation capacity for restoration projects.

Table 4: Living Resources and Habitat Restoration action plan identification number, title, and priority ranking.

Action ID #	Action Title	Ranking
LR-1	Develop and implement a comprehensive resource action plan for native oyster populations in the Great Bay Estuary and other suitable sites in the Piscataqua region.	Highest
LR-2	Assess and improve soft-shell clam populations in Piscataqua Region estuaries.	High
LR-3	Implement a comprehensive recovery strategy for eelgrass throughout the Great Bay Estuary.	Highest
LR-4	Develop and implement diadromous fish restoration plans for each major tributary river in the Piscataqua Region aimed at restoring historical river distributions to the maximum extent practicable.	Highest
LR-5	Develop a state fund for feasibility studies and dam removals in New Hampshire and Maine to be used as a source to match federal funding for river restoration.	Moderate
LR-6	Identify, protect, and restore existing populations of native Eastern brook trout.	High
LR-7	Establish long term population database for migratory and resident shorebirds and saltmarsh breeding bird species.	High
LR-8	Develop and implement a restoration program to restore Saltmarsh Sparrows to five currently unoccupied sites by 2020.	High
LR-9	Assess, prioritize and restore shoreland and riparian buffers.	Highest
LR-10	Conduct stream/road crossing inventories in all significant estuarine tributaries to identify, prioritize and correct crossings that are aquatic species passage barriers or have significant negative impacts on the physical, chemical, or biological integrity of waterways.	Highest
LR-11	Advocate for the removal of non-essential dams on coastal streams and rivers, with a priority emphasis on dams located within the natural zone of tidal influence.	High
LR-12	Conduct a flooding and inundation mapping analysis based on predicted climate change impacts from increased freshwater flooding, storm surges, and sea level rise to identify vulnerable areas.	Highest
LR-13	Identify and protect undeveloped land adjacent to Piscataqua Region estuaries through purchase, easements, or regulation to allow shoreline and marsh migration in response to sea level rise	Highest
LR-14	Identify and implement salt marsh restoration and enhancement projects.	Highest
LR-15	Support existing programs, initiatives, and partnerships to limit the introduction and control the spread of terrestrial and aquatic nuisance species in the Piscataqua Region watersheds.	High
LR-16	Support the development and implementation of marine aquatic nuisance species management plans for Piscataqua Region estuaries.	High
LR-17	Incorporate environmental standards with rules that govern new tidal moorings, head of tide docks and bridge abutments.	High
LR-18	Work with private retailers and marinas to offer incentives for "conservation moorings" that greatly reduce mooring impacts to eelgrass beds	High
LR-19	Inventory, map and implement restoration of rare habitats and habitats for rare, threatened or endangered species.	High
LR-20	Support the Partnership to Restore New Hampshire's Estuaries.	Highest
LR-21	Streamline historical/cultural and wetland permit requirements for aquatic habitat restoration projects.	High

LR-1

priority | *start* | *duration*
Highest | 2012 | Ongoing

Develop and implement a comprehensive resource action plan for native oyster populations in Great Bay and other suitable sites in the Piscataqua Region.

Issues Addressed:
- Shellfish
- Critical Species
- Habitat Restoration
- Nutrients

Leads:
- MDMR
- NHDES
- NHFGD
- PREP
- TNC-NH
- UNH-JEL

Cooperators:
- Aquaculturalists
- CCA-NH
- Dock Owners
- NOAA
- NRCS
- PRNHE
- Shoreland Owners
- USFWS

Funding:
- CCA
- NHCF
- NOAA
- NRCS
- PREP
- TNC

A comprehensive resource action plan is needed to address the range of factors that have led to the current diminished oyster resource in Great Bay and to garner public and private financial support for restoration efforts. The plan must integrate restoration targets, harvest regulations, oyster reef habitat restoration, disease control methods, shell management, partner organization roles, and monitoring protocols for natural and restored reefs. PREP's objective is to increase the abundance of adult oysters at the six documented beds in the Great Bay Estuary to 10 million oysters and restore 20 acres of oyster reef habitat by 2020. Currently, a lack of sufficient, consist ant funding to support restoration staff and projects is a leading barrier to reaching restoration targets.

ACTIVITIES

1. Convene stakeholders from New Hampshire and Maine to discuss a cooperative management plan for oysters that integrates harvest management, shell management, and habitat restoration objectives.
2. Evaluate existing and potential locations for shellfish spawning sanctuaries.[1]
3. Convene a group of stakeholders and regulators to improve the permitting process for oyster restoration activities.
4. Build operational capacity for long-term oyster reef restoration and shell management activities, such as the Oyster Conservationist Program, shell recycling program and hatchery production.
5. Research opportunities to work with private aquaculture industry on oyster restoration.
6. Synthesize or conduct research on oyster disease resistance and non-native species predation impacts on shellfish and incorporate the findings into oyster conservation and restoration management actions.
7. Continue to encourage recreational harvesters to follow regulations, use best harvest practices, and adopt voluntary measures to aid oyster recovery.
8. Conduct a cost/benefit analysis of establishing oyster reefs to remove nutrients in the Great Bay Estuary, and explore feasibility of funding restoration work with nutrient offset credits.
9. Continue regular monitor of all major natural and created oyster reef areas for areal coverage, oyster density, abundance, age class structure, disease, and mortality.
10. Compile spatial data on current and potential restoration locations to facilitate spatial planning efforts in the Region.

MEASURING PROGRESS

OUTPUTS
- Bi-state oyster restoration study committee
- List of suitable shellfish spawning sanctuaries
- Report on permitting process regarding oyster restoration
- Recycled Shell Program
- Oyster Conservationist Program
- Report on oyster disease, non-native species predation impacts, and nitrogen bioextraction potential of oyster culture
- Outreach campaign to oyster harvesters on following regulations and adopting BMPs and voluntary measures
- Research reports on oyster disease
- Cost/benefit analysis of using oysters to sequester nutrients in Great Bay Estuary
- Restored oyster reefs
- Oyster distribution and abundance reports
- Spatial data for estuarine planning

OUTCOMES
- Coordinated oyster restoration between NHFGD and MDMR
- Greater public understanding of the role of oysters in estuarine health
- Increased oyster population and reef area
- Enhanced filtration of sediments, nutrients and contaminants from tidal waters

IMPLEMENTATION METRICS
- SHL5: Standing stock of adult oysters in Great Bay beds
- SHL11: Prevalence of oyster disease
- SHL9: Recreational harvest of oysters
- RST3: Restored oyster beds

[1] Odell J, Eberhardt A, Burdick D, & Ingraham P, 2006, Great Bay Estuary Restoration Compendium

Assess and improve soft-shell clam populations in Piscataqua Region estuaries.

LR-2

priority | *start* | *duration*
High | 2012 | Ongoing

Clam populations have fluctuated in the Hampton-Seabrook and Great Bay Estuaries due to harvest pressures, invasive predators, and disease. Outreach to harvesters through NHDES Shellfish Program website and NHFG Saltwater Digest and website provide harvest regulations and proper digging methods that minimize incidental damage to unharvested clams.

Annual clam surveys of the Hampton-Seabrook clam flats have been accomplished over the past forty years by Seabrook Station (NextEra Energy) and biological consultants (Normandeau Associates Inc.) as directed by state and federal permits. NHFGD has worked with survers to design sampling and annually review results. Management changes have been made in response to some evidence of drops in clam abundance. Aside from Hampton/ Seabrook monitoring, documentation of calm resource elsewhere is limited.

Previous research funded by PREP has documented significant clam mortality from non-native green crabs. Recent research also suggests that the clam disease "neoplasia" is likely a significant contributor to clam population mortality. Therefore, minimizing predation by non-native species and reducing mortality from clam diseases are important in order to protect sustainable clam populations. PREP's objective is to increase the number of adult clams in the Hampton-Seabrook Estuary to 5.5 million clams by 2020.

ACTIVITIES

1. Continue to encourage public to report illegal clam harvest to Operation Game Thief.
2. Continue to investigate and promote commercial harvest of non-native shellfish predators (i.e. green crabs) for bait or other uses that reduce population.
3. Continue to support research on clam diseases and use results to guide management actions.
4. Continue to promote harvesting methods that minimize negative impacts to juvenile clams and benthic habitat using websites, license sale brochures. Explore use of signs at major bed access points.
5. Continue annual assessments of clam bed area, density and populations (Seabrook Station), and control harvest pressure to ensure increasing trends to clam standing stock.
6. Support research on identifying causes of juvenile clam mortality between spat settlement and age 1 in the Hampton-Seabrook Estuary and identify strategies for reducing mortality.[1]
7. Compile spatial data on current and potential restoration locations to facilitate spatial planning efforts in the Region.

MEASURING PROGRESS

OUTPUTS

- Outreach campaign to public on continued use of Operation Game Thief program to report illegal clam harvest
- Clam harvest information for recreational harvesters
- Clam monitoring reports
- Research on clam diseases and causes of juvenile mortality
- Pilot commercial harvest program for green crabs
- Spatial data for estuarine planning

OUTCOMES

- Increased compliance with clam harvest rules and best practices for harvesting
- Increased clam populations
- Reduced green crab predation and disease incidence in clams

IMPLEMENTATION METRICS

- SHL6: Standing stock of adult clams in major beds of Hampton Seabrook Harbor
- SHL7: Abundance of green crabs on clam flats
- SHL10: Recreational harvest of clams
- SHL12: Prevalence of clam disease

Issues Addressed:
- Critical Species
- Habitat Restoration
- Invasive species
- Nutrients
- Shellfish

Leads:
- NHFGD

Cooperators:
- Commercial Fishermen
- CCA-NH
- MDMR
- Maine Sea Grant
- NH Sea Grant
- NH Shellfish Program
- PREP
- UME
- UNH-JEL

Funding:
- NHFGD
- NOAA

Critical Guidance

[1] Beal, B, 2005, Large-scale, manipulative field tests involving cultured and wild juveniles of the soft-shell clam

LR-3

priority | *start* | *duration*
Highest | 2012 | Ongoing

Implement a comprehensive recovery strategy for eelgrass throughout the Great Bay Estuary.

Issues Addressed:
- Critical Species
- Eelgrass
- Restoration

Leads:
- UNH-Seagrass Ecology Lab

Cooperators:
- CCA-NH
- MDMR
- NHFGD
- PREP
- TNC
- USFWS

Funding:
- Dredging Mitigation Funds
- NOAA
- NRCS
- USFWS

Eelgrass restoration/mitigation efforts in the Great Bay Estuary have had varying degrees of success, with failures likely due in large part to excessive nutrient loading and insufficient water clarity. Restoring large areas of eelgrass will require successful reductions in nutrient and sediment pollution loading, addressed by WR-5, WR-8, WR-9, and WR-16. These pollution abatement actions are essential components of the eelgrass restoration strategy described in this action plan. PREP's objective is to increase the areal extent of eelgrass cover to 2900 acres and restore connectivity of eelgrass beds throughout the Great Bay Estuary by 2020.

Active eelgrass planting and re-seeding efforts should be limited to areas where water quality/clarity would be expected to support self-sustaining eelgrass meadows. UNH-JEL developed a site suitability model and maps for the Great Bay Estuary that identify historic eelgrass meadows and where environmental conditions may support restoration efforts. These maps were incorporated into the Great Bay Restoration Compendium[1]. Potential restoration sites should be evaluated on a case-by-case basis, based on current water quality conditions/trends and small scale test plantings. Sites that show high survival rates of test plantings should be priorities for larger scale restoration efforts.

ACTIVITIES

1. Conduct eelgrass test plantings at potential restoration sites[1,2,3] and where current water quality conditions would support eelgrass.
2. Monitor success rates of test plantings and conduct intensive eelgrass restoration at sites with the best survival rates.
3. Site eelgrass restoration sites in proximity to oyster restoration sites to test synergistic effects.
4. Complete restoration projects in suitable areas to re-establish eelgrass throughout the estuary.
5. Compile spatial data on current and potential restoration locations to facilitate spatial planning efforts in the Region.

MEASURING PROGRESS

OUTPUTS
- Research reports on success rates of test eelgrass plantings
- Restored acres of eelgrass
- Projected list of suitable sites for large-scale eelgrass recruitment
- Spatial data for estuarine planning

OUTCOMES
- Increased areal extent of existing eelgrass beds
- Increased eelgrass biomass
- Re-establishment of eelgrass beds in the Great Bay Estuary
- Improved ecological function of estuarine system

IMPLEMENTATION METRICS
- HAB2: Eelgrass distribution
- HAB12: Eelgrass biomass
- RST2: Restored eelgrass beds

Critical Guidance

[1] Odell J, Eberhardt, Burdick D, & Ingraham P, 2006, Great Bay Estuary Restoration Compendium
[2] Short, F. & D. Burdick, 2005, Interactive GIS-based, Site Selection Model for Eelgrass Restoration on CD-ROM
[3] Short, F.T, R. Davis, B.S. Kopp, J.L. Gaeckle and D.M, Burdick, 2006, Using TERFS and Site Selection for Improved . . .

Develop and implement diadromous fish restoration plans for priority rivers in the Piscataqua Region with the goal of restoring historical river distributions to the maximum extent practicable.

LR-4

priority | *start* | *duration*
Highest | 2015 | Ongoing

Dams and road crossing restrictions can prevent fish passage. A strategy is needed for restoring diadromous fish to the maximum practical extent of their historic habitat range by estimating the production potential of currently blocked habitat and implementing a systematic approach to correcting fish passage barriers and restoring degraded habitat reaches.

Historical distribution of diadromous fisheries and dams on major rivers that block migratory fish in the Region have been defined (Odell, et al, 2006, Burdick, 2009), however, a detailed plan for correcting fish passage at these dams that estimates the population recovery benefits associated with providing access to blocked habitat has not been developed. Without clearly defining goals and a strategy for diadromous fish restoration, it is difficult to communicate the benefits of barrier removal and shoreland protection to the public or potential restoration funders. A plan that identifies restoration targets for each river system, and regional priorities for restoration would be an important resource when building political and financial support to rebuild native diadromous fish stocks.

ACTIVITIES

1. Convene an interagency technical team to oversee plan development.[1,2]
2. Evaluate the production potential of blocked river reaches for various species based on existing or potential habitat condition/area and evaluate cost and ecological benefit of barrier removals or fish passage structures. Consider other wildlife, water quality, cultural, economic, and hydrologic factors.
3. Compile spatial data on current and potential restoration locations to facilitate spatial planning efforts in the Region.
4. Investigate and quantify upstream and downstream efficacy of existing fish passage structures and prioritize improvements.
5. Continue to improve priority fish passage structures as feasible and monitor fisheries population response.
6. Require most mainstem dams to provide upstream and downstream fish passage for a high percentage of resident and migratory fish. Place the CCMP on file with the Federal Energy Regulatory Commission (FERC) to ensure that hydropower licensing is consistent with the CCMP to the maximum extent practicable. Incorporate fish passage requirements and efficiency monitoring into RERC relicensing.
7. Continue to evaluate fish harvest and stocking policies as needed to maximize native fish population recovery in restored river reaches.

MEASURING PROGRESS

OUTPUTS

- Interagency diadromous fish restoration technical team
- Report on production potential of blocked river reaches that evaluates cost and ecological benefit
- Spatial data for estuarine planning
- Report on fish passage efficacy and prioritized improvements
- Improved fish passage (including dam removals and culvert replacements)
- Feasibility study on requiring dams to provide upstream and downstream fish passage and adding efficiency monitoring to hydroelectric dam FERC re-licensing
- 2010 CCMP on file with FERC
- Diadromous fish restoration plans for all major river tributaries

OUTCOMES

- Improved diadromous fish access to habitat
- Restored river habitat/connectivity
- Increased populations of diadromous fish and dependent species

IMPLEMENTATION METRICS

- HAB8: Anadromous fish returns

Issues Addressed:

- Critical Species
- Dam Removal
- Fish Ladders
- Fisheries
- Land Protection
- Stream Connectivity

Leads:

- MDIFW
- MDMR
- NHDES-Rivers Restoration Task Force
- NHFGD
- PRNHE

Cooperators:

- Aquatic Recreationalists
- CCA-NH
- Dam Owners
- Land Owners
- Land Protection Organizations
- Municipalities
- NH Coastal Program
- NHDES
- NRCS
- PREP
- TNC
- TU-GB
- UME
- UNH
- USFWS
- Watershed Organizations

Funding:

- CCA
- NHCF
- NOAA
- NRCS
- PREP
- TNC
- TU

Critical Guidance

[1] Odell J, Eberhardt, Burdick D, & Ingraham P, 2006, Great Bay Estuary Restoration Compendium
[2] Eberhardt, A. & D. Burdick, 2009, Hampton-Seabrook Estuary Habitat Restoration Compendium

LR-5

priority | *start* | *duration*
Moderate | 2018 | Finite

Develop a state fund for feasibility studies and dam removals in New Hampshire and Maine to be used as a source to match federal funding for river restoration.

Issues Addressed:
- Dam Removals
- Fisheries
- Stream Connectivity

Leads:
- CCA-NH
- NH River Restoration Task Force
- PREP
- TU-GB

Cooperators:
- American Rivers
- MDEP
- MDIFW
- NHFGD
- NOAA
- NRCS
- Municipalities
- Dam Owners
- Shoreland Owners

Funding:
- American Rivers
- Conservation Foundations

There are numerous public and private dams in New Hampshire and Maine that require maintenance and permitting. Many of these dams are non-essential and the owners may want to remove them to eliminate maintenance costs and liability risks. Feasibility studies are often needed to assess the costs and benefits of removal versus repair.

Dam removal can be a long and expensive process. Prior to removal, a feasibility study is often needed to evaluate potential positive and negative impacts of removal. While substantial federal funding is available to support dam removal for river restoration, non-federal matching dollars are required in order to access these funds. A state fund to assist with dam removal for priority streams or high hazard dams would speed the dam removal process and increase the likelihood of well managed projects.

ACTIVITIES

1. Review funding needs for feasibility studies and dam removal with state agencies.
2. Research potential funding sources for dam removals in New Hampshire and Maine.
3. Advocate for a state fund for feasibility studies and dam removals.

MEASURING PROGRESS

OUTPUTS
- Report on dam removal feasibility studies that includes review of potential funding sources
- Advocacy campaign to policy makers to create a dedicated state fund for feasibility studies and dam removals
- Dedicated state fund for dam removal feasibility studies and implementation

OUTCOMES
- Increased financial capacity to leverage federal restoration funding into Piscataqua Region for dam removal
- Increase in the successful removal of dams for fisheries and river restoration

IMPLEMENTATION METRICS
- None

Identify, protect, and restore existing populations of native Eastern brook trout.

LR-6

priority | *start* | *duration*
High | 2015 | Ongoing

The Eastern Brook Trout Joint Venture (EBTJV) is a cooperative effort between federal, state and local organizations and entities to survey, protect and restore eastern brook trout populations along the east coast. NHFGD and MDIFW coordinate with the EBTJV's regional effort to assess, protect and restore trout habitats and populations.

The Piscataqua Region has documented populations of native brook trout that appear to be associated with streams significantly fed by groundwater. Brook trout are sensitive indicators of water quality and watershed integrity, and generally disappear from watersheds with increasing impervious cover (even as low as 4%) and decreasing forest cover. While the Piscataqua Region's land cover has an overall average of 7.5% impervious cover, there are subwatersheds with lower impervious cover that should be evaluated for protection potential to maintain brook trout strongholds. Some existing brook trout populations persist in subwatersheds with relatively high impervious cover, which may be due to the close association of those streams being fed by groundwater. Roads and culverts fragment habitat and can warm stream temperatures beyond the tolerance of brook trout. Taking actions to protect brook trout meets numerous CCMP goals by protecting sub-watershed areas with high water quality, low impervious cover, and intact natural landcover.

ACTIVITIES

1. Support and participate in the ongoing efforts of the EBTJV.[1]
2. Identify current native trout populations with intensive field surveys.
3. Collaborate with researchers on coldwater stream models and identify areas for protection.
4. Prioritize low order cold headwater streams based on habitat quality.
5. Work with other partners on stream buffer protection and restoration, correcting fish passage problems (culverts/dams), and stream habitat restoration on priority streams identified in activity #4.
6. Educate towns on the locations of priority streams identified in activity #4 and work with communities in these priority watersheds to maintain low impervious thresholds, minimize roads, and protect aquifers and forested land cover.

MEASURING PROGRESS

OUTPUTS

- Maps of current and potential EBT stream habitat
- Restoration plan for improving or sustaining EBT habitat
- Monitoring plan for long-term habitat evaluation

OUTCOMES

- Habitat protection for EBT
- Greater public awareness of trout habitat threats and restoration opportunities
- Intensive protection of high quality, sensitive sub-watersheds
- Improved database for species and habitat monitoring

IMPLEMENTATION METRICS

- Stream miles of Eastern brook trout habitat

Issues Addressed:
- Buffers
- Critical Species
- Fisheries
- Restoration
- Stream Connectivity

Leads:
- MDIFW
- NHFGD
- TU-GB

Cooperators:
- CCA-NH
- EBTJV
- TU-GB
- US Forest Service
- USFWS

Funding:
- CCA-NH
- EBTJV
- TU-GB
- US Forest Service
- USFWS

Critical Guidance

[1] Eastern Brook Trout Joint Venture, 2010

LR-7

priority | *start* | *duration*
High | 2015 | Ongoing

Establish long term population database for migratory and resident shorebirds and saltmarsh breeding bird species.

Issues Addressed:
- Critical Species
- Shorebirds

Leads:
- Maine Audubon
- MDIFW
- NH Audubon
- NHFGD

Cooperators:
- Municipalities
- Land Owners
- USFWS

Funding:
- Atlantic Coast Joint Venture
- NH Coastal Program
- NHFGD/MDIFW Wildlife Action Plan Grants
- USFWS Survey Assessment and Monitoring Program

Both Great Bay and Hampton-Seabrook estuaries are key components of the Atlantic Flyway for migratory birds, are officially recognized by the National Audubon Society as Important Bird Areas, and provide essential habitat for migratory and resident bird species.

Saltmarshes in these estuaries are used as critical resting and foraging stopover sites during annual latitudinal migrations by migratory shorebirds such as Semipalmated Plovers, Semipalmated Sandpipers, Black-bellied Plovers, Greater and Lesser Yellowlegs, Least Sandpipers, and Short-Billed Dowitchers. Saltmarshes are also used as breeding sites for Saltmarsh Sparrows, Nelson's Sparrows, Seaside Sparrows, Willets, and Common Terns. Saltmarsh Sparrows are listed in the Maine Wildlife Action Plan as a highest priority category species in "Greatest Conservation Need", and in the NH Wildlife Action Plan as a species of special concern. Willets are recognized as "species of high concern" by the North Atlantic Regional Shorebird Plan. NHA has been studying shorebird and salt marsh breeding bird populations and recently released a report describing the observed distribution and abundance of these birds in the Hampton-Seabrook Estuary. Continued monitoring is important to supplement these findings and track annual and long term trends in population. These results will help support restoration efforts and track long-term successes and threats.

ACTIVITIES

1. Implement monitoring program based on the Program for International Shorebird Monitoring (PRISM) or similar shorebird monitoring program.[1] Emphasize collaboration with multiple partners.
2. Train volunteers to assist in monitoring and reporting.
3. Support restoration of shorebird and salt marsh bird habitats in coordination with the Atlantic Coast Joint Venture[2] in accordance with LR-13. Emphasize collaboration with multiple partners.

MEASURING PROGRESS

OUTPUTS
- Shorebird monitoring data
- Trained shorebird monitoring volunteers
- Outreach materials on monitoring for volunteers
- Restored shorebird and salt marsh bird habitats

OUTCOMES
- Development of long-term data on shorebird and salt marsh breeding bird populations
- Improved understanding of coastal bird populations' status and trends

IMPLEMENTATION METRICS
- None

Critical Guidance

[1] Clark, K. & Niles, L., 2000, Northern Atlantic Regional Shorebird Plan
[2] Atlantic Coast Joint Venture, 2009, Atlantic Coast Joint Venture Strategic Plan

Develop and implement a restoration program to restore Saltmarsh Sparrows to five currently unoccupied sites by 2020.

LR-8

priority | *start* | *duration*
High | 2015 | Finite

Saltmarsh Sparrows (*Ammodramus caudacutus*) reside in salt marshes typical of pre-ditched conditions. This species is a national and global conservation priority, and is listed in the Maine Wildlife Action Plan as a highest priority category species in "Greatest Conservation Need", and in the NH Wildlife Action Plan as a species of special concern. The birds tend to breed in grass dominated salt marshes greater than 20 hectares in size, and are indicators of salt marsh health and integrity. Salt marsh restoration projects in suitable areas should increase Saltmarsh Sparrow populations.

As of 2009, the northeast corner of the Hampton-Seabrook Estuary has the highest concentration of Saltmarsh Sparrows, while the northwest region of the estuary appears to offer opportunities for improving/restoring sparrow habitat in the Drakeside Marsh area and Taylor River impoundment.

ACTIVITIES

1. Obtain baseline data on Saltmarsh Sparrow distribution and abundance within the coastal watershed.[1,2,3,4]

2. Evaluate qualities of nesting sites to be re-established and prioritize restoration locations.[5]

Restore tidal flows to the Taylor River upstream of Route 1 and improve tidal connectivity to Drakeside marsh, as priority sites for increasing potential Saltmarsh Sparrow habitat.

Research the efficacy of ditch filling at selected nesting sites in the Hampton-Seabrook Marsh to enhance Saltmarsh Sparrow habitat, in coordination with LR-14.

3. Protect marsh and contiguous upland in restoration areas in coordination with LU-6.

4. Compile spatial data on current and potential restoration locations to facilitate spatial planning efforts in the Region.

5. Monitor populations of Saltmarsh Sparrow annually in coordination with LR-14.

MEASURING PROGRESS

OUTPUTS

- Report with maps of Saltmarsh Sparrow distribution, current and potential habitat
- Restored tidal flows to the Taylor River upstream of Route 1 and improve tidal connectivity to Drakeside marsh flow
- Restoration plan for Saltmarsh Sparrow
- Spatial data for estuarine planning
- Report on efficacy of ditch filling as part of salt marsh restoration

OUTCOMES

- Improved and protected habitat for Saltmarsh Sparrow
- Increase in Saltmarsh Sparrow populations
- Improved salt marsh ecological function

IMPLEMENTATION METRICS

- Population of Saltmarsh Sparrows in Hampton-Seabrook Harbor Estuary

Issues Addressed:

- Critical Species
- Land Protection
- Saltmarsh
- Shorebirds

Leads:

- Maine Audubon
- MDIFW
- NH Audubon
- NHFGD

Cooperators:

- Conservation Commissions
- Land Protection Organizations
- NH Coastal Program
- NHDOT
- RCCD
- UNH-DNR
- USFWS

Funding:

- Atlantic Coast Joint Venture
- NH Coastal Program
- NHFGD/MDIFW Wildlife Action Plan Grants
- NRCS
- USFWS Survey Assessment and Monitoring Program

Critical Guidance

[1]McKinley P, Hunt P, 2008, Avian Use of the Hampton-Seabrook Estuary: 2006-2007, New Hampshire Audubon
[2]Eberhardt, A. & D. Burdick, 2009, Hampton-Seabrook Estuary Habitat Restoration Compendium
[3]New Hampshire Fish and Game Department, 2005, New Hampshire Wildlife Action Plan
[4]Frazer, T. & B. Charry, 2006, Beginning with Habitat: Conserving Wildlife in Maine's Coastal Habitat.
[5]Atlantic Coast Joint Venture, 2009, Atlantic Coast Joint Venture Strategic Plan

LR-9

priority | *start* | *duration*
Highest | 2015 | Ongoing

Assess, prioritize, and restore shoreland and riparian buffers.

Issues Addressed:
- Buffers
- Habitat
- Water Quality

Leads:
- BwH
- MDEP
- NHDES
- PREP

Cooperators:
- Conservation Commissions
- Environmental Consultants
- Land Protection Organizations
- NHFGD
- NRCS
- RCCD
- SCCD
- TNC-NH
- UNH-CE
- Watershed Organizations
- YCSWC

Funding:
- MDEP
- NHDES 319 grants
- NH Coastal Program
- NOAA,
- USEPA
- USFWS

Adequate buffers along rivers, streams and coastlines protect water quality, slow floodwaters and provide and protect habitat for aquatic and riparian plants and animals.

In 2008, PREP and UNH Complex Systems created maps for the 42 communities in the New Hampshire coastal watershed that identified and assessed buffers. Multiple organizations have begun the buffer evaluation and restoration process. This action coordinates the buffer assessment and restoration process on a regional basis.

ACTIVITIES

1. Assemble existing data on riparian buffer conditions.
2. Prepare a standardized buffer assessment methodology.
3. Conduct a high-resolution detailed buffer analysis to identify the status of buffers and the best opportunities for restoration.
4. Prepare watershed-specific prioritized buffer restoration plans and timelines.
5. Restore, monitor, and maintain priority buffers identified in plan.
6. Permanently protect shoreland adjacent to key stream reaches, in accordance with LU-6 and LU-10.

MEASURING PROGRESS

OUTPUTS
- Standardized buffer assessment methodology
- Maps of current buffer conditions
- Watershed-specific prioritized buffer restoration plans
- Restored riparian areas
- Permanently protected shoreland next to key stream reaches

OUTCOMES
- Improved riparian habitat
- Improved water quality

IMPLEMENTATION METRICS
- Stream miles of restored shoreline buffers

Conduct stream/road crossing inventories in all significant estuarine tributaries to identify, prioritize, and correct crossings that are aquatic species passage barriers or have significant negative impacts on the physical, chemical, or biological integrity of waterways.

LR-10

priority | *start* | *duration*
Highest | 2012 | Finite

While limited culvert data has been collected by road managers in the past, comprehensive inventory and assessment efforts are being undertaken by conservation organizations throughout the Piscataqua Region. In 2009, TNC conducted a culvert inventory of the Winnicut River watershed, and consultants for NHDES inventoried culverts along the mainstem reaches of most of the Exeter River. PREP, Durham Public Works, NHFGD, and SRPC completed a comprehensive inventory of all significant culverts in the Oyster River watershed. These assessments used methods directly imported or hybridized from the Vermont Agency of Natural Resources and the Massachusetts Riverways Program.

Efforts are underway to standardize the type of information collected during assessments. In NH, researchers are developing a statewide database repository for all culvert inventory data. Culvert data will be collected on mainstem reaches of the Lamprey, Cocheco, and Isinglass Rivers as part of fluvial geomorphic assessments in 2010. Inventory of the remaining watershed area can be completed by cooperating organizations once the standards are finalized. The results of these inventories can help prioritize stream crossing restoration projects. Restoration will benefit stream habitat quality, stream connectivity/processes, and aquatic organism movement along stream corridors.

ACTIVITIES

1. Finalize and publish stream crossing inventory methodology so that consistent standards are used for all new assessments.
2. Support watershed organizations and municipalities to complete the inventory process.
3. Identify restoration priorities for each watershed based on the inventory results.
4. Continue support for stream crossing restoration projects throughout the Region.
5. Assess the success of restoration efforts through follow up monitoring as needed.

MEASURING PROGRESS

OUTPUTS

- Standardized stream crossing inventory methodology
- Stream/road crossing inventories
- Restoration priority maps and reports
- Stream crossing restoration projects
- Evaluation of stream crossing restoration projects

OUTCOMES

- Greater connectivity for aquatic habitat
- Improved passage for diadromous/resident fish
- Reduced flooding and hydrologic alteration along stream corridors due to road crossings

IMPLEMENTATION METRICS

- Stream miles upstream of obstacles that are connected through dam removal or culvert repair

Issues Addressed:

- Flooding
- Habitat
- Stream Connectivity

Leads:

- NHDES
- NHFGD
- NHGS
- PREP
- PRNHE
- TNC
- Watershed Organizations

Cooperators:

- MDEP
- MDIFW
- MDOT
- Municipalities
- NHDES
- NHDOT
- RCCD
- RPC
- SCCD
- SMRPC
- SNHPC
- SRPC
- USFWS
- YCSWCD

Funding:

- EBTJV
- FEMA (FEH assessments)
- Maine Coastal Program
- MDOT
- NH Coastal Program
- NHDES 319 grants and In-Lieu Fee mitigation funds
- NHDOT
- NOAA
- PREP
- TU
- USFWS

LR-11

priority | *start* | *duration*
Highest | 2011 | Ongoing

Advocate for the removal of non-essential dams on coastal streams and rivers, with a priority on dams located within the natural zone of tidal influence.

Issues Addressed:
- Critical species
- Dams
- Fisheries
- Stream Connectivity

Leads:
- MDIFW
- NH River Restoration Task Force
- NHFGD
- PREP
- PRNHE

Cooperators:
- American Rivers
- CCA-NH
- Conservation Commissions
- Maine Rivers
- MDEP
- Municipalities
- NH Coastal Program
- NH Rivers Council
- NHDES
- Shoreland Owners
- TNC-NH
- TU-GB
- Watershed Organizations

Funding:
- PREP

There are 21 head-of-tide dams or culverts that act as dams in the New Hampshire seacoast blocking most major and minor tributaries to the estuaries and ocean. These dams have eliminated a natural transition zone between saltwater and freshwater and have thereby almost completely eliminated important brackish marsh habitats. There are fish ladders on only seven head-of-tide dams that provide partial upstream passage for some diadromous fish species.

With the 2009 removal of the Winnicut Dam, there is increased momentum for evaluating dam removal to re-establish hydrology and fish passage on tidal rivers. PREP supports dam removal especially for key dams within natural tidal influence.

Outreach to landowners and concerned citizens as well as local decision makers is a high priority. This may be best accomplished by working with watershed associations, conservation commissions and other local opinion leaders. PREP will work with partners and cooperators to encourage local participation in all aspects of the dam removal process.

ACTIVITIES

1. Continue to use the evaluation conducted as part of LR-4, identify the dams within natural tidal influence that would restore the greatest habitat area for anadromous fish passage (priority dams).[1,2]
2. Continue to support municipalities, watershed organizations, LAC's, and agencies to conduct removal feasibility studies of priority dams.
3. Continue to advocate for removal of priority dams.

MEASURING PROGRESS

OUTPUTS
- Prioritized list of dam removal sites
- Feasibility studies for removal of priority dams
- Advocacy campaign to municipal staff and boards, policy makers and the public to remove priority dams. Emphasize ecological and fiscal benefits of removal

OUTCOMES
- Better informed local decision makers and residents
- Cooperative efforts on priority dam removal projects

IMPLEMENTATION METRICS
- Stream miles upstream of obstacles that are connected through dam removal or culvert repair

Critical Guidance

[1]Odell J, Eberhardt A, Burdick D, & Ingraham P, 2006, Great Bay Estuary Restoration Compendium
[2]Eberhardt A & Burdick D, 2009, Hampton-Seabrook Estuary Habitat Restoration Compendium

Conduct a flooding and inundation mapping analysis based on predicted climate change impacts from increased freshwater flooding, storm surges, and sea level rise to identify vulnerable areas.

LR-12

priority | *start* | *duration*
Highest | 2012 | Finite

Sea level rise, flooding and geomorphologic change will impact the limits of freshwater wetlands, shorelines, and fluvial zones.

Completing accurate flooding and inundation mapping based on expected sea level rise and increased storm intensity will provide a foundation upon which infrastructure change, planning, protection and restoration can be based.

Coastal inundation mapping by the Maine Geological Survey, SLAMM (Sea Level Affecting Marshes Model) modeling completed for the Great Bay National Wildlife Refuge, New Hampshire sea level rise inundation maps by Dr. Larry Ward, and flooding analyses of the Oyster River completed under EPA's "Climate Ready Estuaries" program are all project examples that should be used to inform additional efforts throughout the Piscataqua Region.[1,2,3,4,5,6]

Maine Natural Areas Program conducts surveys to identify most vulnerable marshes. Maine's Beginning with Habitat program is leading a climate change vulnerability assessment and is conducting outreach to Maine towns.

ACTIVITIES

1. Obtain LiDAR coverage for the Region.
2. Review past or current work on flooding and inundation mapping in the Region and nearby estuarine areas.
3. Identify Piscataqua Region areas that will be evaluated and mapped.
4. Complete analyses and prepare report and maps of findings.
5. Coordinate with GRANIT to prepare GIS layer of final mapped product.
6. Encourage policy makers, state agencies, and municipalities to reference report when building infrastructure, permitting crossings, creating zoning ordinances, and conducting land protection and restoration activities.

MEASURING PROGRESS

OUTPUTS

- LiDAR data for the Region
- Report that illustrates the expected changes to coastal and freshwater wetlands, shorelines, and fluvial zones and includes maps and GIS layers
- GIS layer prepared by GRANIT
- Outreach campaign to policy makers, state agencies, and municipalities on the relevance of the report for land use, restoration, and infrastructure planning

OUTCOMES

- High quality set of data and maps that can be used to plan and protect natural and manmade resources from climate change impacts
- Reduced impacts to infrastructure and natural resources from climate change and flooding
- Modified regulations, overlay districts, and guidance that incorporates projected inundation areas

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Climate Change
- Flooding
- Land Protection

Leads:

- BwH
- Maine Natural Areas Program
- NHCAW

Cooperators:

- GRANIT
- NH Coastal Program
- RPC
- SMRPC
- SNHPC
- SRPC
- TNC
- UME
- UNH
- UNH-SC
- USFWS

Funding:

- FEMA
- NOAA
- USEPA Climate Ready Estuaries Program
- USGS

Critical Guidance

[1]Grubin E., A. Hardy, R. Lyons, A. Schmale & T. Sugii, 2009, Conserving Freshwater and Coastal Resources in a ...
[2]USGS, 2009, Tar River Basin Flood-Inundation Mapping, USGS
[3]Watson, C, 2009, Coastal Flood Inundation Mapping and Climate Change, Northeast Arc Users Group (NEARC)
[4]New Hampshire Climate Change Policy Task Force, 2009, New Hampshire Climate Change Action Plan, New . . .
[5]Stack L, Simpson MH, Crosslin T, Roseen R, Sowers D, Lawson C., 2010, Oyster River Culvert Analysis Project:. . .
[6]Ward L, Adams J, 2001, A Preliminary Assessment of Tidal Flooding along the New Hampshire Coast: Past, Present . . .

LR-13

priority | *start* | *duration*
Highest | 2012 | Ongoing

Identify and protect undeveloped land adjacent to Piscataqua Region estuaries through purchase, easements, or regulation to allow shoreline and marsh migration in response to sea level rise.

Issues Addressed:
- Buffers
- Climate Change
- Flooding
- Land Protection

Leads:
- BwH
- Land Protection Organizations
- Maine Natural Areas Program
- RPC
- SMRPC
- SNHPC
- SRPC

Cooperators:
- Conservation Commission
- NHFGD-GBNERR
- NHCAW
- PREP
- RCCD
- SCCD
- Shoreland Owners
- SPNHF
- TNC-NH
- UNH-CE
- USFWS
- WNERR
- YCSWCD

Funding:
- FEMA
- NOAA Coastal Services Center
- PREP
- USFWS

As sea levels rise from climate change, estuarine coastlines and saltmarsh habitat will need to migrate landward. Land protection along these vulnerable shorelines will protect infrastructure, preserve high quality upland buffer areas, and allow coastal marshes to develop or persist in response to sea level rise.

ACTIVITIES

1. Using mapping from LR-12 and similar studies, create a plan to protect priority lands along estuaries and saltmarshes that includes a GIS layer of priority lands, map, model ordinances, and recommendations for land owners and municipalities.
2. Encourage land owners and municipalities to adopt recommendations from plan.
3. Support protection of identified vulnerable lands.
4. Implement land protection efforts on identified lands.
5. Compile spatial data on current and potential restoration locations to facilitate spatial planning efforts in the Region.
6. Advocate for funding of state-funded conservation grant programs, such as LCHIP or NHDES Source Water Protection grants.

MEASURING PROGRESS

OUTPUTS
- Plan, including a GIS layer and map, to protect priority lands from the impacts of sea level rise
- Outreach campaign to land owners and municipalities on plan recommendations and the benefits of protecting lands along estuaries and saltmarshes to minimize impacts of sea level rise
- Protected lands vulnerable to sea level rise (includes purchases, easements, or regulations)
- Spatial data for estuarine planning
- Advocacy campaign to policy makers on funding state-funded land conservation grant programs, such as LCHIP and NHDES Source Water Protection grants

OUTCOMES
- Natural shoreline buffers preserved around future estuarine shoreline
- Protected natural areas to allow for marsh and other estuarine habitat migration in response to sea level rise

IMPLEMENTATION METRICS
- Protected lands vulnerable to sea level rise

Identify and implement salt marsh restoration and enhancement projects.

LR-14

priority | *start* | *duration*
Highest | 2015 | Ongoing

Within the past ten years 290 acres of wetland have been restored or enhanced in New Hampshire through re-establishment and improvement of tidal flows and invasive species removal. Eighteen of 31 areas identified by NRCS in 1994 were restored in this effort. This effort will continue with a focus on re-establishing effective tidal hydrology, researching ditch filling effectiveness, and removing non-native invasive plants. Salt marsh restoration opportunities have largely been identified in Evaluation of Restorable Salt Marshes in New Hampshire (NRCS, 1994),[1] the Hampton-Seabrook Estuary Restoration Compendium (Eberhardt A & Burdick D, 2009)[2] and The Great Bay Estuary Restoration Compendium (Odell, et al, 2006).[3] This information has been supplemented and posted to an online Restoration Partnership webpage for use by PRNHE members.

Additional marsh restoration opportunities in the Maine portion of the Piscataqua watershed are inventoried on the Gulf of Maine Council on the Marine Environment's Habitat Restoration Web Portal.[4]

ACTIVITIES

1. Prioritize and implement salt marsh restoration and enhancement projects identified in the GBERC, HSERC, Evaluation of Restorable Salt Marshes in NH (NRCS, 1994), the Gulf of Maine Council on the Marine Environment's Habitat Restoration Web Portal, and watershed assessments by the Spruce Creek Association.[1,2,3,4] Incorporate inundation and climate change forecasts and Saltmarsh Sparrows (*Ammodramus caudacutus*) habitat needs in design of restoration projects.
2. Research the efficacy of ditch filling as part of salt marsh restoration, in accordance with LR-8.
3. Map areas of current and potentially restorable, low salinity (oligohaline) salt marshes, and pursue restoration when possible.
4. Create a plan with Maine and New Hampshire DOT to coordinate road upgrades with restoration of tidal flows.
5. Compile spatial data on current and potential restoration locations to facilitate spatial planning efforts in the Region.
6. Support the CWIPP's ongoing identification, monitoring, and eradication efforts for invasive plants in seacoast marshes.

MEASURING PROGRESS

OUTPUTS

- Salt marsh restoration plans, permits, and/or projects
- Report on efficacy of ditch filling as part of salt marsh restoration
- Maps of current and potentially restorable low salinity (oligohaline) salt marshes
- DOT plan to coordinate road upgrades with restoration of tidal flows
- Spatial data for estuarine planning
- CWIPP projects in saltmarshes

OUTCOMES

- Increased acreage of salt marsh
- Salt marshes with higher function and value

IMPLEMENTATION METRICS

- RST1: Restored salt marsh
- HAB1: Salt marsh extent and condition

Issues Addressed:

- Climate Change
- Invasive Species
- Saltmarsh
- Wetlands

Leads:

- Maine Coastal Program
- MDEP
- MDIFW
- NH Coastal Program
- NRCS
- RCCD
- SCCD
- UNH-JEL
- USFWS
- YCSWCD

Cooperators:

- Conservation Commission
- Maine Audubon
- MDOT
- NH Audubon
- NHDOT
- PRNHE
- Spruce Creek Association
- WNERR

Funding:

- FEMA
- Maine Coastal Program
- MDEP
- NH & ME Corporate Wetland Restoration Funds
- NH Coastal Program
- NOAA
- NRCS
- USFWS North American Wetlands Conservation Act Grants

Critical Guidance

[1] USDA Natural Resources Conservation Service, 1994, Evaluation of Restorable Salt Marshes in New Hampshire . . .
[2] Eberhardt, A. & D. Burdick, 2009, Hampton-Seabrook Estuary Habitat Restoration Compendium
[3] Odell J, Eberhardt, Burdick D, & Ingraham P, 2006, Great Bay Estuary Restoration Compendium
[4] Gulf of Maine Council on the Marine Environment, 2010, Gulf of Maine Habitat Restoration Web Portal

LR-15

priority | *start* | *duration*
High | 2015 | Ongoing

Support existing programs, initiatives, and partnerships to limit the introduction and control the spread of terrestrial and freshwater aquatic nuisance species in the Piscataqua Region watersheds.

Issues Addressed:
- Habitat
- Invasive species
- Wetlands

Leads:
- CWIPP
- MDEP
- MDIFW
- Maine Natural Areas Program
- NHDES
- NH Coastal Program
- NHFGD
- NHFGD-GBNERR

Cooperators:
- Land Protection Organizations
- Municipalities
- NH Department of Agriculture
- NHDOT
- NHDRED
- NRCS
- RCCD
- SCCD
- Shoreland Owners
- TNC-NH
- UNH-CE
- USFS
- Watershed organizations
- WNERR
- YCSWCD

Funding:
- MDEP
- NHDES
- NOAA
- NRCS
- TNC
- USFWS

Several effective programs have been developed to control terrestrial and freshwater invasive species in Maine and New Hampshire. The Coastal Watershed Invasive Plant Partnership (CWIPP) was formed to coordinate regional invasive plant management in terrestrial and wetland habitats between federal and state agencies and land protection organizations.

Both Maine and NH have active programs to control the spread of these species through volunteer lake monitoring and the Lake Host program where volunteers check boats at landings and inform boaters about aquatic invasives.

ACTIVITIES

1. Support invasive species planning and management projects that coordinate activities of New Hampshire and Maine communities, Maine Natural Areas Program, and CWIPP. Emphasize bi-state coordination.
2. Support development of CWIPP management plan for the Region that prioritize projects in accordance with key resource planning documents, such as the Hampton-Seabrook Estuary Restoration Compendium and the Great Bay Estuary Restoration Compendium.
3. Support research on sustainable control methodologies for aquatic and terrestrial invasives.

MEASURING PROGRESS

OUTPUTS
- Site-specific restoration plans
- CWIPP management plan for the Region that prioritize projects in accordance with key resource planning documents
- Research reports on sustainable control methodologies for aquatic and terrestrial invasives

OUTCOMES
- Reduced invasive plant dominance in key natural areas

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]National Invasive Species Council, 2008, 2008 – 2012 National Invasive Species Management Plan
[2]Coastal Watershed Invasive Plant Partnership, 2008
[3]Lake Monitoring and Assessment, 2005, Invasive Aquatic Species, Maine Department of Environmental Protection

Support the development and implementation of marine aquatic nuisance species management plans for Piscataqua Region estuaries.

LR-16

priority | *start* | *duration*
High | 2018 | Finte

Research that evaluates the susceptibility of estuaries to marine invasive species suggests that temperature and salinity are important factors in survivability. Development of a management plan will highlight the most effective measures to minimize impact on existing habitats and decrease the establishment of additional marine invasives in Piscataqua Region estuaries.

ACTIVITIES

1. Complete rapid assessment surveys for marine invasives in selected estuarine areas.
2. Add marine invasives monitoring to PREP monitoring plan.
3. Support researchers and agencies to develop marine invasive species management plans.
4. Evaluate ballast water control regulations and hull monitoring for seagoing vessels.
5. Support research on marine invasives in Piscataqua Region estuaries.

MEASURING PROGRESS

OUTPUTS

- Rapid assessment surveys for marine invasive species
- Marine invasive species monitoring reports
- Marine invasive species management plan
- Evaluation report of ballast water control regulations and hull monitoring for seagoing vessels
- Marine invasive species research reports

OUTCOMES

- Early warning of spread of marine invasives
- Reduced impact of marine invasives on estuarine habitats
- Reduction in invasion vectors through improved management practices

IMPLEMENTATION METRICS

- Prevalence of marine aquatic nuisance species

Issues Addressed:
- Habitat
- Invasive species

Leads:
- MDEP
- MDMR
- NHDES
- UNH-JEL

Cooperators:
- Boaters
- MMISWG
- Shipping

Funding:
- NOAA
- USEPA

LR-17

priority | *start* | *duration*
High | 2015 | Finite

Incorporate environmental standards with the rules that govern new tidal moorings, head of tide docks and bridge abutments.

Issues Addressed:
- Benthic habitat
- Critical Species
- Regulation

Leads:
- Maine Coastal Program
- NH Coastal Program
- USACOE

Cooperators:
- Boaters
- Land Owners
- Marinas
- Marine Retailers
- MDOT
- Municipalities
- NHDOS
- NHDOT
- PREP

Funding:
- PREP
- State Agencies

As described in LR-18 moorings can be detrimental to or destroy eelgrass beds. Head of tide docks, moorings, and bridge abutments can also impact benthic habitat if improperly built, and can impact spawning reaches for some diadromous species.

Maine has developed head of tide dock guidelines that could be adopted in NH to limit habitat degradation in these critical areas. In Maine, the US Army Corps of Engineers (USACOE) has oversight of municipal mooring programs.

ACTIVITIES

1. Evaluate existing regulations on tidal moorings, docks and bridge abutments for adequacy of benthic habitat protection. Include examination of Maine head of tide and tidal mooring guidelines and regulations. Develop recommendations for New Hampshire.
2. Compile spatial data on current and potential tidal mooring, head of tide docks, and bridge abutment locations to facilitate spatial planning efforts in the Region.
3. Advocate for incorporation of recommended head of tide and tidal mooring guidelines and regulations into Maine and New Hampshire state regulations.

MEASURING PROGRESS

OUTPUTS
- Report on head of tide and tidal mooring guidelines and regulations that includes recommendations for New Hampshire
- Spatial data for estuarine planning
- Advocacy campaign to relevant agencies to adopt recommendations for head of tide and tidal mooring guidelines and regulations for New Hampshire and Maine

OUTCOMES
- Improved benthic habitat in tidal rivers

IMPLEMENTATION METRICS
- None

Work with retailers and marinas to offer incentives for "conservation moorings" that greatly reduce mooring impacts to eelgrass beds

LR-18

priority | *start* | *duration*
High | 2015 | Finite

Mooring blocks and mooring chains, when used in eelgrass and oyster beds scour and degrade the beds and benthic habitat. They can also make these scoured areas susceptible to invasion by exotic species. Finally, these moorings increase turbidity especially in areas of multiple moorings.

Moorings are available that minimize impacts at mooring sites. Studies in mooring fields in Massachusetts demonstrate the effectiveness of these conservation moorings, and has led the state to develop partnerships to address this issue.

ACTIVITIES

1. Identify mooring hardware that minimizes benthic impacts and are suitable for conservation moorings in the Region.
2. Prioritize sites where conservation moorings could improve estuarine habitat.
3. Encourage marine retailers to promote and stock conservation moorings.
4. Create a financial incentive program for marinas and boat owners to use conservation moorings.
5. Encourage marinas and boat owners to use conservation moorings.
6. Consider including information in boating certificate training.
7. Advocate including requirements for conservation mooring installation with mooring re-licensing.
8. Monitor sites where conservation moorings are used to determine efficacy of program.

MEASURING PROGRESS

OUTPUTS

- List of mooring hardware that minimizes benthic impacts and is suitable for conservation moorings in the Region
- Maps indicating priority area sites for conservation moorings
- Outreach campaign to marine retailers on selling conservation moorings
- Conservation mooring incentive program
- Advocacy campaign to relevant state agencies to update mooring requirements to include conservation moorings
- Monitoring report on efficacy of conservation mooring program

OUTCOMES

- Reduced destruction of estuarine habitat at mooring sites

IMPLEMENTATION METRICS

- Number of conservation moorings in Piscataqua Region estuaries

Issues Addressed:

- Benthic habitat
- Critical Species

Leads:

- MDEP
- NH Coastal Program
- NHDRED
- PREP

Cooperators:

- Boaters
- Marinas
- Marine Retailers
- Municipalities
- NH Division of Ports and Harbors
- NHDOS

Funding:

- NOAA

LR-19

priority | *start* | *duration*
High | 2015 | Ongoing

Inventory, map and implement restoration of rare habitats and habitats for rare, threatened or endangered species.

Issues Addressed:
- Critical Species
- Habitat

Leads:
- PRNHE
- TNC-NH

Cooperators:
- Land Owners
- Land Protection Organizations
- Maine Natural Areas Program
- MDIFW
- Municipalities
- NH Natural Heritage Bureau
- NHDES
- NHFGD
- NRCS
- PREP
- RCCD
- SCCD
- USFWS
- YCWCD

Funding:
- Land Owners
- Municipalities
- NOAA
- NRCS
- USFWS

Multiple regional and state-led efforts on wildlife and habitat protection and restoration have been recently conducted in the Piscataqua Region. Key species and habitats of concern have been identified which include rare or exemplary habitats and habitats for rare, threatened or endangered species and species of concern as recognized by state or federal agencies.

These programs and reports include:

- The Land Conservation Plan for NH's Coastal Watersheds[4]
- The Land Conservation Plan for Maine's Piscataqua Region Watersheds[5]
- Great Bay Restoration Compendium[1]
- Hampton Seabrook Restoration Compendium[2]
- Maine's Comprehensive Wildlife Conservation Strategy (MECWCS)[6]
- New Hampshire Wildlife Action Plan (NHWAP)[3]

Many of these evaluations relied on remote imagery and habitat suitability models to determine the presence of species important for protection and restoration. Additional efforts in local surveying and compilation of local knowledge of habitat and species distribution will greatly assist in prioritizing restoration projects. The newly formed Partnership to Restore New Hampshire's Estuaries (PRNHE) and similar organizations in Maine will be valuable in coordinating and bringing needed resources to restoration projects.

ACTIVITIES

1. Support local field-based surveys and mapping of species and habitats of concern to improve effectiveness of conservation efforts.
2. Prioritize habitat restoration implementation using best available data and opportunities.[1,2,3,4,5,6]
3. Compile spatial data on current and potential restoration locations to facilitate spatial planning efforts in the Region.
4. Support implementation of restoration projects at the local and regional level.
5. Support protection of high quality and restored habitats, in accordance with LU-12.

MEASURING PROGRESS

OUTPUTS
- Field-verified maps of rare habitat/species occurrences
- List of prioritized habitat restoration projects
- Spatial data for estuarine planning
- Restoration projects

OUTCOMES
- Restoration and permanent protection of key habitats
- Better coordination of restoration efforts

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]Odell J, Eberhardt A, Burdick D, & Ingraham P, 2006, Great Bay Estuary Restoration Compendium
[2]Eberhardt A & Burdick D, 2009, Hampton-Seabrook Estuary Habitat Restoration Compendium
[3]New Hampshire Fish and Game Department, 2005, New Hampshire Wildlife Action Plan
[4]Zankel M, et al, 2006, The Land Conservation Plan for New Hampshire's Coastal Watershed, New Hampshire . . .
[5]Walker S, et al, 2010, The Land Conservation Plan for Maine's Piscataqua Region Watersheds, Piscataqua Region . . .
[6]Maine Department of Inland Fisheries and Wildlife, 2005, Maine's Comprehensive Wildlife Conservation Strategy,

Support the Partnership to Restore New Hampshire's Estuaries.

LR-20

priority | *start* | *duration*
Highest | 2015 | Ongoing

The Partnership to Restore New Hampshire's Estuaries is a recently formed coalition launched to increase the pace and scale of restoration that improves long-term sustainability of the state's estuaries.

The Partnership's vision is to promote cooperative restoration and conservation activities in New Hampshire's coastal watersheds and to improve the health, productivity, and resiliency of its two major estuaries – Great Bay and Hampton-Seabrook.

Populations of fish, shellfish, crustaceans, eelgrass, waterfowl, birds, and other native species populate the region, but pressures from development and environmental change threaten many of these species and habitats. The Partnership hopes their efforts will allow these species to flourish and help local communities recognize and derive benefits provided by healthy estuary ecosystems – clean water, vibrant fisheries, abundant recreation opportunities, beautiful scenery, stable shorelines, and diverse wildlife populations.

ACTIVITIES

1. Utilize the Partnership to prioritize restoration projects, coordinate restoration funding opportunities, and assist with technical oversight of project implementation.
2. Engage restoration partners in the Maine portion of the Region.
3. Promote the Partnership's[1] work in the media and utilize press to inform/engage the public about restoring Piscataqua Region estuaries.

MEASURING PROGRESS

OUTPUTS

- Estuarine restoration projects
- Outreach campaign to media on Partnership to Restore New Hampshire's Estuaries

OUTCOMES

- Improved estuarine ecosystem function and resiliency
- Improved public awareness of estuarine restoration efforts
- Improved inter-organization collaboration on restoration work

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Critical Species
- Habitat

Leads:

- NHFGD-GBNERR
- NHDES
- NHFGD
- NMFS
- NOAA
- NRCS
- PREP
- TNC
- UNH
- USFWS

Cooperators:

- Land Owners
- Land Protection Organizations
- Municipalities

Funding:

- NHFGD-GBNERR
- NHDES
- NHFGD
- NMFS
- NOAA
- NRCS
- PREP
- TNC
- UNH
- USFWS

Critical Guidance

[1] Konisky R, 2009, Memorandum of Understanding Partnership to Restore New Hampshire's Estuaries

LR-21

priority | *start* | *duration*
High | 2018 | Finite

Streamline historical/cultural and wetland permit requirements for aquatic habitat restoration projects.

Issues Addressed:
- Critical Species
- Habitat
- Wetlands

Leads:
- NHDES-Wetlands Bureau
- NH Division of Historic Resources

Cooperators:
- PRNHE
- USACE

Funding:
- NHDES
- USEPA

Restoration projects must be carefully planned and implemented to avoid negative impacts on cultural resources and the environment. However, restoration of degraded habitats is a top priority for sustaining/increasing ecosystem services and should be easier to receive permits to conduct than development proposals. Bureaucracy, expensive cultural documentation/mitigation requirements, and stringent review processes can greatly hinder the pace and increase the cost of implementing restoration work. Streamlined processes are needed to support aggressive, yet responsible, restoration actions. The purpose of this action is to identify time/cost bottlenecks in regulatory permitting processes associated with restoration activities, and to streamline them to the extent possible. This action was identified as a need in New Hampshire, but opportunities for improvements may also exist in Maine.

ACTIVITIES

1. Secure agency leadership support and approval of streamlining efforts.
2. Convene inter-agency task force to study permitting process (policies, regulations, and procedures) related to habitat restoration and develop recommendations for streamlining the process.
3. Advocate for adoption of streamlining recommendations from task force by relevant agencies.
4. Evaluate streamlined permitting procedures and adjust as needed.

MEASURING PROGRESS

OUTPUTS
- Inter-agency task force to streamline historical/cultural and wetland permitting process
- Streamlining recommendations from task force
- Advocacy campaign to relevant permitting agencies to adopt streamlining recommendations from task force

OUTCOMES
- Reduced time/cost for restoration permitting processes

IMPLEMENTATION METRICS
- None

LAND USE AND HABITAT PROTECTION

ACTION PLANS

The built environment directly impacts water quality, quantity, and the integrity of wildlife habitat. As the human population increases, decisions that are made about how land is used and built on will be increasingly important. Providing adequate shoreland buffers, limiting or reducing impervious cover, using low impact development methods in new and re-developed sites, and permanently conserving a network of natural areas are paramount in maintaining a healthy balance between the built and natural environment.

Three goals were developed for this theme area – using protective development practices, maintaining shoreland and wetland habitat, and maintaining critical natural areas for wildlife habitat and water quality protection. Recently completed, region-wide land conservation plans and statewide wildlife protection plans for both the Maine and New Hampshire watershed areas are referenced in these actions and will help to provide consistency in implementing these actions. A total of eight management objectives and 18 action plans were developed to address the goals.

Goal 1: Development patterns and practices protect watershed and estuarine water quality and quantity.

Objective LU 1.1 - Promote sustainable land use practices in both new development and redevelopment of existing sites.

Objective LU 1.2 - Promote regional strategies for consistent use of ecologically protective planning, regulation, development and enforcement standards.

Goal 2: Ecosystem functions and services provided by tidal and freshwater wetlands, floodplains, and shorelands are maintained.

Objective LU 2.1 - Protect floodplains, wetlands, shorelands and associated fluvial erosion hazard zones to maintain their function and value.

Objective LU 2.2 - Promote improved protections for low order streams.

Goal 3: Critical upland areas sustain viable plant and animal communities and provide watershed services to maintain aquatic habitats and water quality.

Objective LU 3.1 - Implement The Land Conservation Plan for New Hampshire's Coastal Watersheds and The Land Conservation Plan for Maine's Piscataqua Region Watersheds and protect 75% of lands identified as Conservation Focus Areas by 2025.

Objective LU 3.2 - Implement strategies from the NH Wildlife Action Plan, NH Wildlife Connectivity Model and Maine's Beginning with Habitat Program to protect and manage key species at risk and critical habitats identified in those plans.

Objective LU 3.3 - Support land stewardship and land management actions for conservation lands and key areas that maximize quality habitat and watershed services.

Objective LU 3.4 - Protect the quality and quantity of current and future drinking water supplies through land protection and land use regulation.

Table 5: Living Resources and Habitat Restoration action plan identification number, title, and priority ranking.

Action ID #	Action Title	Ranking
LU-1	Promote inclusion of natural resource chapters in municipal Master/Comprehensive Plans, adoption of compact development and conservation subdivisions ordinances, and creation of open space plans.	Highest
LU-2	Employ best management practices and low impact development approaches in new, existing and re-development to minimize stormwater runoff impacts and limit changes to pre-development site hydrology.	Highest
LU-3	Refine and support existing outreach and training programs that promote LID, LEED, and sustainable development practices and adopt relevant ordinances for environmental resource protection.	High
LU-4	Establish a focused program to maintain effective impervious cover below five percent in small and less developed watersheds.	Highest
LU-5	Explore creation of stormwater utility districts to improve municipal stormwater management and to fund stormwater system maintenance and upgrades.	Moderate
LU-6	Promote and implement measures to protect floodplains and riparian shoreland areas from detrimental impacts associated with development.	High
LU-7	Assess and implement adaptive measures to protect and retain resiliency and function of tidal and freshwater wetlands, shorelands, fluvial zones, and watershed areas given the expected impacts of climate change.	Highest
LU-8	Identify and protect highest value wetlands within Piscataqua Region watersheds through land conservation or by enhancing municipally based assessments, zoning and regulation.	Highest
LU-9	Work with MDEP and NHDES to evaluate effectiveness of wetland mitigation policies and in lieu fee programs where applicable.	Moderate
LU-10	Develop and implement consistent municipal ordinances to protect 1st, 2nd and 3rd order streams and buffers throughout the watershed.	Highest
LU-11	Promote collaboration among national, state and local land protection groups to implement landowner education and outreach, provide technical assistance and training, and coordinate land protection and stewardship efforts.	High
LU-12	Assist watershed communities in adopting local land conservation plans and natural resource inventories that incorporate priorities and data from the Land Conservation Plan for NH's Coastal Watersheds, the Land Conservation Plan for Maine's Piscataqua Region Watersheds, NH Wildlife Action Plan, and Maine Beginning with Habitat Program.	High
LU-13	Implement land stewardship and management actions on conserved lands across the watershed to maintain ecosystem services on a landscape scale.	High
LU-14	Work with landowners to permanently protect land and water through conservation easements and fee acquisitions, particularly associated with Conservation Focus Areas (CFAs).	Highest
LU-15	Work with public and private landowners to manage habitat for species in greatest need of conservation by implementing strategies and priorities from the NH Wildlife Action Plan and Maine's Comprehensive Wildlife Conservation Strategy.	High
LU-16	Conduct surveys and monitoring to augment databases on the distribution of species of conservation concern and critical habitats.	Moderate
LU-17	Develop and implement source water protection for current and future community and public water supplies.	High

LU-1

priority | *start* | *duration*
Highest | 2015 | Ongoing

Promote inclusion of natural resource chapters in municipal Master/ Comprehensive Plans, adoption of conservation subdivisions ordinances, and creation of open space plans.

Issues Addressed:
- Buffers
- Development
- Land Protection
- LID
- Nutrients

Leads:
- BwH
- RPC
- SMRPC
- SNHPC
- SRPC

Cooperators:
- Conservation Commissions
- NHFGD-GBNERR
- MSPO
- NEMO
- NROC
- Planning Boards
- Planning Departments
- PREP
- UNH-CE
- WNERR
- Zoning Boards of Adjustments

Funding:
- MDEP
- NHDES
- NOAA
- PREP CTAP
- USEPA

Population and land development continue to increase in the Region and recent land development patterns are typical of sprawl. Adoption of compact development patterns by municipalities will help slow open land consumption and retain the Region's green infrastructure that provides important ecological services such as drinking water protection, nitrogen attenuation, pollutant filtration, wildlife habitat, and floodwater absorption. Communities should conduct a natural resource inventory (NRI) to develop meaningful regulations. Maine towns are required to address BwH elements in plans and adopt minimum strategies for their protection. BwH also reviews all plan drafts for consistency with rules.

As of 2009, thirty-three out of 42 New Hampshire municipalities (79%) had a natural resource chapter in their Master Plan (Sowers, 2010). In Maine, municipalities develop "comprehensive plans" that are roughly analogous to master plans for New Hampshire municipalities. Nine of the 10 Maine communities (90%) have completed comprehensive plans.

As of 2009, thirteen towns (25%) in the Region require the use of conservation subdivisions (Sowers, 2010). Many conservation subdivision ordinances are in need of updating because they are optional (at the discretion of the developer) and the minimum open space as a percent of the lot area varies widely between 0-60%. Ideally at least 50% of a development should be placed in conservation.

As of 2009, thirty-six towns (69%) in the Region have completed open space plans or land protection plans specific to their town (Sowers, 2010). Some of these plans should be updated because they do not reflect conservation priorities from state, regional, or federal conservation plans and focus on cultural values rather than ecological or water quality protection values of land.

ACTIVITIES

1. Periodically review status of each PREP community's Master/Comprehensive Plans, adoption of conservation subdivisions ordinances, and creation of open space plans.
2. Provide technical assistance to municipalities to complete NRIs in accordance with LU-12.
3. Provide technical assistance to municipalities to include natural resource chapters in Master Plans, and revise Maine municipal Comprehensive Plans, in accordance with relevant wildlife action plans.[1,2]
4. Provide technical assistance to municipalities to develop/update conservation subdivisions ordinances for residential and commercial projects.[3,4]
5. Provide technical assistance to municipalities to develop/update open space/conservation plans that incorporate regionally significant Conservation Focus Areas. [5,6]

MEASURING PROGRESS

OUTPUTS
- Report of regulatory and non-regulatory approaches to resource protection
- Completed or updated natural resource inventories
- Adopted, updated, or draft natural resource chapters in municipal Master/Comprehensive Plans
- Adopted, updated, or draft conservation subdivision regulations

OUTCOMES
- Critical habitats are protected from development

IMPLEMENTATION METRICS
- R1: Municipalities require conservation subdivisions.
- R2: Municipalities have conservation overlay districts that include CFAs from regional plans
- NR1: Municipalities have Natural Resource Inventories (NRIs)
- NR2: NH municipalities have a Natural Resource Chapter in their Master Plan

Critical Guidance

[1]New Hampshire Fish and Game Department, 2005, New Hampshire Wildlife Action Plan
[2]Frazer, T. & B. Charry, 2006, Beginning with Habitat: Conserving Wildlife in Maine's Coastal Habitat
[3]New Hampshire Department of Environmental Services,*et al* , 2008, Innovative Land Use Planning Techniques: A . . .
[4]Maine Department of Inland Fisheries and Wildlife, 2003, Beginning with Habitat: Toolbox
[5]Zankel M, et al, 2006, The Land Conservation Plan for New Hampshire's Coastal Watershed, New Hampshire . . .
[6]Walker S, et al, 2010, The Land Conservation Plan for Maine's Piscataqua Region Watersheds, Piscataqua Region . . .

Employ BMPs and LID approaches in new, existing, and re-development to minimize stormwater runoff impacts and limit changes to pre-development site hydrology.

LU-2

priority | *start* | *duration*
Highest | 2012 | Ongoing

Stormwater best management practices (BMPs) and low impact development (LID) techniques are designed to reduce peak stormwater runoff volumes, protect water quality, and limit off-site impacts and changes to existing hydrology caused by development. Limiting the adverse impacts of stormwater is important to maintain clean water and natural resource function. Both NHDES and MDEP have developed LID guidelines, and regional planning commissions assist in training and implementation of these standards and ordinances. Only 12% of towns in the Region currently require LID techniques for new projects and re-development projects (Sowers, 2010).

ACTIVITIES

1. Periodically review status of each PREP community's stormwater regulations and erosion and sediment control regulations.
2. Encourage municipalities to adopt LID technologies and stormwater BMPs in accordance with LU-3 and WR-8 and prioritize in accordance with LU-4. [1,2,5,6]
3. Provide technical support to municipalities to implement stormwater management, erosion and sediment control, and LID programs and regulations.
4. Improve capacity/funding for municipal inspection and maintenance of stormwater treatment systems in accordance with LU-5. Encourage municipalities to adopt a 10% impervious cover cap for new development for residential lots of 1 acre or more.[3, 4]
5. Promote use of NHDES model ordinance criteria for water quality volume/flow, groundwater recharge volume, peak flow control, and erosion and sediment control.[3]
6. Encourage municipalities to establish developer incentives to use LID technology.

MEASURING PROGRESS

OUTPUTS

- Report of regulatory and non-regulatory approaches to resource protection in the Region
- Outreach campaign to municipal staff and boards on adopting LID technologies and stormwater BMPs
- Adopt, update, or draft stormwater management, erosion and sediment control, and/or LID programs and regulations for municipalities
- Participation in UNH-SC workshops for municipal staff and boards
- Stormwater utility feasibility studies
- Outreach campaign to municipal staff and boards on adopting at least 10% impervious surface cap for new development on residential lots ≥ 1 acre
- Outreach campaign to municipal staff and boards on creating developer LID incentive program

OUTCOMES

- Reduced environmental impact from stormwater

IMPLEMENTATION METRICS

- R6: 10% effective impervious cover for new development
- R7: LID techniques for new development and redevelopment
- R8: Municipal stormwater management regulations reflect NHDES model
- R9: Municipalities require site inspections for compliance with stormwater/E&S requirements

Issues Addressed:

- Groundwater
- LID
- Nutrients
- Stormwater

Leads:

- MDEP
- NHDES
- RPC
- SMRPC
- SNHPC
- SRPC
- UNH-SC

Cooperators:

- Businesses
- Departments of Public Works
- Granite State Rural Water Association
- Maine Rural Water Association
- NEMO
- NHCAW
- NHDOT
- NROC
- PREP
- Seacoast Stormwater Coalition
- UNH-CE
- UNH-SC
- Watershed Organizations

Funding:

- MDEP
- NH Coastal Program
- NHDES Regional Environmental Planning Program
- PREP-CTAP
- USEPA

Critical Guidance

[1]New Hampshire Department of Environmental Services, et al, 2008, Innovative Land Use Planning Techniques: A . . .
[2]Horsley Written Group, 2007, LID Guidance Manual for Maine Communities: Approaches for implementation of . . .
[3]New Hampshire Department of Environmental Services, 2010, New Hampshire Stormwater Manual
[4]Peterson J, Stone A, Houle J., 2009, Protecting Water Resources and Managing Stormwater: A Bird's Eye View for . . .
[5]US Environmental Protection Agency, 2007, Reducing Stormwater Costs through Low Impact Development (LID) . . .
[6]US Environmental Protection Agency, 2008, National Menu of Stormwater Best Management Practices

LU-3

priority | *start* | *duration*
High | 2015 | Ongoing

Refine and support existing outreach and training programs that promote LID, LEED, and sustainable development practices and adopt relevant ordinances for environmental resource protection.

Issues Addressed:
- Development
- LEED
- LID
- Stormwater
- Water Use

Leads:
- NHFGD-GBNERR
- NEMO
- NROC
- RPC
- SMRPC
- SNHPC
- SRPC
- UNH-CE
- UNH-SC
- WNERR

Cooperators:
- Conservation Commission
- Developers
- Energy Commissions
- Financial Institutions
- Maine Coastal Program
- MDEP
- MSPO
- NHDES
- Planning Boards
- Planning Departments
- Realtors
- The Jordan Institute
- Zoning Boards of Adjustments

Funding:
- MDEP
- NHDES- Regional Environmental Planning Program
- NOAA
- USEPA

National, regional, and state guidance on Smart Growth development, low impact development (LID), and green building practices or Leadership in Energy and Environmental Design (LEED) have been well developed, however, a need exists to identify appropriate local standards and promote implementation that protects resources in the Piscataqua Region watershed.

ACTIVITIES

1. Identify current LID, LEED, and green development standards in Maine and New Hampshire that adequately protect watershed resources.[1,2,3,4]
2. Provide technical assistance to communities to integrate current LID, LEED (or comparable) performance and green development standards into municipal zoning and development regulations.[1,2,3,4] Prioritize in accordance with LU-4.
3. Encourage the development, real estate, and finance communities to adopt LID guidelines, meet LEED (or comparable) performance and adopt green development standards.[3] Prioritize in accordance with LU-4.
4. Encourage Region municipalities to become certified in the LEED for Neighborhood Development program.[5]

MEASURING PROGRESS

OUTPUTS
- Report of LID, LEED, green development guidance and regulation standards in Maine and New Hampshire
- Adopted, updated, or draft municipal zoning and development regulations that incorporate current LID, LEED, and green development standards
- Outreach campaign for development, real estate, and finance communities to adopt LID guidelines, meet LEED (or comparable) performance and adopt green development standards
- Outreach campaign for municipal staff and boards about the LEED for Neighborhood Development program

OUTCOMES
- Citizens and decision makers that understand sustainable development standards and how to incorporate them into land use and building standards and ordinances
- Zoning ordinances and building codes that are more protective of PREP resources

IMPLEMENTATION METRICS
- LUD1: Impervious surfaces in coastal watersheds
- R6: 10% effective impervious cover for new development
- R7: LID techniques for new development and redevelopment
- R8: Municipal stormwater management regulations in accordance with NHDES model ordinance design criteria
- R9: Municipalities require site inspections in accordance with NHDES model ordinance

Critical Guidance

[1]Peterson J, Stone A, Houle J., 2009, Protecting Water Resources and Managing Stormwater: A Bird's Eye View for . . .
[2]New Hampshire Department of Environmental Services, 2010, New Hampshire Stormwater Manual
[3]US Environmental Protection Agency, 2007, Reducing Stormwater Costs through Low Impact Development (LID) . . .
[4]Horsley Written Group, 2007, LID Guidance Manual for Maine Communities: Approaches for implementation of . . .
[5]US Green Building Council, 2009, LEED for Neighborhood Development Rating System, US Green Building Council

Maintain effective impervious cover below five percent in lightly developed watersheds.

LU-4

priority | *start* | *duration*
Highest | 2012 | Ongoing

Impervious surfaces increase the volume and peak discharge of stormwater runoff and degrade water quality. The percent of impervious cover in many Piscataqua Region subwatersheds is still low. Keeping impervious surfaces below 5 percent will help preserve water quality and decrease the peak flows during storm events. It is important to provide information and training on impervious cover status and impacts to land use boards. Proactively conserving riparian lands and buffers will also contribute to the success of this action.

ACTIVITIES

1. Identify sub-watersheds with current impervious cover of 5% or less using estimates to be developed in 2010. Identify municipalities to target in these ≤ %5 impervious cover watersheds.
2. Provide technical assistance to municipalities to adopt a 10% impervious cover cap for new development for residential lots ≥ 1 acre [1,2]
3. Prioritize targeted municipalities during implementation of action plans that lead to reduced impervious surface cover in accordance with LU-10.
4. Continue updates to the impervious surface data for the entire Region every 5 years and communicate new findings to stakeholders.

MEASURING PROGRESS

OUTPUTS

- Report of sub watersheds with impervious cover ≤ 5% and associated municipalities
- Adopted, updated, or draft municipal land use ordinances with ≤ 10% impervious surface cap for new development for residential lots ≥ 1 acre
- Report on impervious surface cover in the Region

OUTCOMES

- Water quality and hydrology maintained in lightly developed subwatersheds

IMPLEMENTATION METRICS

- LUD1: Impervious surfaces in coastal watersheds
- R6: 10% effective impervious cover for new development

Issues Addressed:

- Development
- Flooding
- Nutrients
- Stormwater

Leads:

- NEMO
- NROC
- UNH-CSRC

Cooperators:

- Conservation Commission
- NHFGD-GBNERR
- Land Protection Organizations
- Maine Coastal Program
- MDEP
- Planning Boards
- Planning Departments
- PREP
- RPC
- SMRPC
- SNHPC
- SRPC
- UNH-CE
- UNH-SC
- Watershed Organizations
- WNERR
- Zoning Boards of Adjustments

Funding:

- USEPA
- PREP

Critical Guidance

[1]Peterson J, Stone A, Houle J., 2009, Protecting Water Resources and Managing Stormwater: A Bird's Eye View for . . .
[2]New Hampshire Department of Environmental Services, 2010, New Hampshire Stormwater Manual

LU-5

priority | *start* | *duration*
Moderate | 2015 | Ongoing

Explore creation of stormwater utility districts to improve municipal stormwater management and to fund stormwater system maintenance and upgrades.

Issues Addressed:
- Nutrients
- Stormwater
- Water Quality
- Water Use

Leads:
- MDEP
- NHDES

Cooperators:
- Municipalities
- NEMO
- NROC
- RPC
- Seacoast Stormwater Coalition
- SMRPC
- SNHPC
- SRPC
- SWA
- UNH-SC
- USEPA

Funding:
- MDEP
- Municipalities
- NHDES
- USEPA

NH House Bill 1581 enables municipalities to establish fees for creation of stormwater utilities, which, like water or sewer utilities, charge for management of stormwater. Fees can be based on impervious surface area or some other metric applied by towns. Fee can be used to pay for stormwater upgrades, street sweeping, drain clean out and other measures that will improve stormwater quality.

NHDES and MDEP are both assisting municipalities to investigate stormwater utilities to improve stormwater quality and management. In Maine, stormwater utilities are being explored in the Portland area and DIMS studies are being completed in several other areas, but not yet in the Piscataqua Region watershed. In New Hampshire, Portsmouth and Dover currently are exploring the creation of stormwater utilities.

ACTIVITIES

1. Evaluate results of pre-feasibility studies for stormwater utilities in Portsmouth, Dover and South Portland to determine applicability to other watershed communities in the Region.
2. Support feasibility studies in the Region at any scale (i.e. watershed, municipal, neighborhood).[1]
3. Establish stormwater utilities where feasible.

MEASURING PROGRESS

OUTPUTS
- Report on feasibility of stormwater utilities in the Region
- Stormwater utility feasibility study(ies)
- Established or proposed stormwater utilities

OUTCOMES
- Improved implementation of stormwater management projects and retrofits leading to improved water quality

IMPLEMENTATION METRICS
- None

Critical Guidance

[1] New England Environmental Finance Center, 2005, Stormwater Utility Fees Considerations & Options for. . .

Promote and implement measures to protect floodplains and riparian shoreland areas from detrimental impacts associated with development.

LU-6

priority | *start* | *duration*
High | 2015 | Ongoing

Recent flood events have increased attention on the need to keep most development out of floodplain areas subject to catastrophic channel changes or frequent inundation. Accurate mapping of fluvial erosion hazard areas, chronic flooding areas, and land use regulations associated with these areas will help municipalities limit future property and environmental damage. Mapping of these hazard zones should incorporate anticipated changes in the frequency and severity of storm events predicted by climate change researchers.

ACTIVITIES

1. Identify shorelands most vulnerable to inundation or flooding.
2. Undertake stream corridor analyses in areas not yet mapped to identify fluvial erosion hazard areas.
3. Encourage adoption of regulations that protect floodplains and shorelands by limiting development in or adjacent to fluvial erosion hazard zones, floodplains and shorelands,[1,2] in accordance with LU-10 and LR-8.

MEASURING PROGRESS

OUTPUTS

- Report on vulnerable shorelands and floodplains including GIS data, maps and associated reports on development of FEH model ordinance
- Stream corridor analysis report(s)
- Advocacy campaign to municipal staff and boards on measures to adopt regulation and policy to protect floodplains and riparian shoreland areas from development. Campaigns should include development of model ordinances

OUTCOMES

- Protected shoreland and fluvial zones
- Reduced damage to infrastructure, property and habitat during storm events

IMPLEMENTATION METRICS

- River miles assessed for fluvial erosion hazards
- R4: 75' wide shoreland buffer protections on first order streams and ≥100' on all others
- R5: Municipalities adopt FEH zone overlays and development restrictions

Issues Addressed:

- Flooding
- Floodplains
- Shorelands

Leads:

- BwH
- MDEP
- NHDES
- NHGS

Cooperators:

- Maine Coastal Program
- Maine Emergency Management Agency
- Municipalities
- NEMO
- NHCAW
- NH Bureau of Emergency Management
- NROC
- RPC
- SMRPC
- SNHPC
- SRPC
- Watershed Organizations

Funding:

- FEMA
- MDEP
- NHDES
- NOAA

Critical Guidance

[1]New Hampshire Department of Environmental Services, *et al* , 2008, Innovative Land Use Planning Techniques: A . . .
[2]Smith, P., Schiff, R., Olivero, A., MacBroom, J., 2008, The Active River Area: A conservation Framework for . . .

LU-7

priority | *start* | *duration*
Highest | 2015 | Ongoing

Assess and implement adaptive measures to protect and retain resiliency and function of tidal and freshwater wetlands, shorelands, fluvial zones, and watershed areas given the expected impacts of climate change.

Issues Addressed:
- Climate Change
- Land Protection
- Shorelands
- Wetlands

Leads:
- BwH
- MGS
- NHCAW
- RPC
- SMRPC
- SRPC

Cooperators:
- NHFGD-GBNERR
- MDEP
- MDOT
- NHDOT
- PREP
- Land Owners
- TNC-NH
- UME
- UNH-EOS
- UNH-GRANIT
- WNERR

Funding:
- FEMA
- NOAA
- USEPA
- USGS

Sea level rise, flooding and geomorphologic change will impact the limits of wetlands, shorelines, and fluvial zones. Assessing adaptive management and restoration strategies and identifying land protection priorities based on inundation mapping and projected areas of flooding will assist in minimizing the impacts of these changes.

The Town of Seabrook is undergoing an assessment of inundation impacts in cooperation with RPC. For the Lamprey River watershed, UNH-EOS and other partners are developing new definitions of where the 100-year flood plain actually is today and what it might be in the future under scenarios of land-use change and climate change. Models from Rhode Island and Massachusetts are being used to estimate climate change impacts and future land use planning and regulations will be based on these assessments. This process can be used as a model for similar assessment work in the Piscataqua Region.

ACTIVITIES

1. Evaluate and rank vulnerable wetlands, shorelands, fluvial zones, and watershed areas in accordance with LR-12. Prepare recommendations for areas that require land conservation, adaptive management and restoration.[1,2,3,4,5]

2. Develop a method to map hardened shoreline. Integrate with mapping developed through inundation modeling of coastal areas. in accordance with LR-12.

3. Create adaptive plans for optimal areas for coastal and fluvial resources and infrastructure.

4. Evaluate and encourage adaptive regulatory and non-regulatory approaches for protection of tidal shoreline and riparian areas in Region communities to accommodate climate change induced changes to hydrology, and limit development in these high-hazard zones.

MEASURING PROGRESS

OUTPUTS
- Vulnerable wetlands, shorelands, fluvial zones, and watershed areas report(s)
- Hardened shoreline mapping method
- Adaptive plans for coastal and fluvial resources and infrastructure
- Report of regulatory and non-regulatory approaches to resource protection in the Region
- Outreach campaign to municipal staff and boards on approaches for protection of tidal shoreline and riparian areas to accommodate climate change induced changes to hydrology, and limit development in these high-hazard zones

OUTCOMES
- Climate change adaptation measures that provide habitat resiliency and avoid high economic and social costs

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]Grubin E., A. Hardy, R. Lyons, A. Schmale & T. Sugii, 2009, Conserving Freshwater and Coastal Resources in a ...
[2]USGS, 2009, Tar River Basin Flood-Inundation Mapping, USGS
[3]Watson, C, 2009, Coastal Flood Inundation Mapping and Climate Change, Northeast Arc Users Group (NEARC)
[4]New Hampshire Climate Change Policy Task Force, 2009, New Hampshire Climate Change Action Plan, New . . .
[5]Stack L, Simpson MH, Crosslin T, Roseen R, Sowers D, Lawson C, 2010, Oyster River Culvert Analysis Project:. . .

Identify and protect highest value wetlands within Piscataqua Region watersheds by improving municipally based assessments, zoning, and regulation or through land conservation.

LU-8

priority | *start* | *duration*
Highest | 2012 | Ongoing

Towns and cities may study and prioritize wetlands within their borders and provide additional regulatory protections to wetlands with exceptional ecological or social functions or values. Protection of wetlands with the highest functions and values will protect habitat, water quality and the hydrologic function of wetlands.

In New Hampshire, municipalities have the option of recognizing certain local wetlands as "prime wetlands" – a designation that provides stronger protection to these wetlands at the state level under the state's wetland permitting program. Maine does not have a prime wetland designation, but does provide special protections for wetlands that are identified as "significant wetlands" by MIFW. Maine's State Planning Office has developed a statewide FVA model that BwH is applying town by town for outreach efforts. Higher value wetlands are required to be addressed in local comprehensive plans.

ACTIVITIES

1. Evaluate and periodically update tracking of municipal wetland inventories, prime wetland designations, and wetland buffer standards.
2. Provide technical assistance to municipalities to complete updated nontidal and tidal evaluation wetland functional assessments.
3. Provide technical assistance to municipalities to protect high value wetlands and sufficient associated upland buffers by adopting or updating local wetland mitigation, buffer, and/or setback ordinances and or regulations.[1,2,3]
4. Encourage local and regional land trusts to incorporate wetland assessment and evaluation data into protection priorities.
5. Encourage municipal boards to designate high value wetlands as Prime Wetlands or significant wetlands.
6. Provide technical assistance to municipalities to designate high value wetlands as Prime Wetlands[4] or significant wetlands.

MEASURING PROGRESS

OUTPUTS

- Report of regulatory and non-regulatory approaches to resource protection in the Region
- Wetland functional assessments
- Adopted, updated, or draft wetland mitigation ordinances
- Adopted, updated, or draft wetland buffer ordinances
- Adopted, updated, or draft setback ordinances
- Outreach campaign to local and regional land trusts on incorporating wetland assessment and evaluation data into protection priorities
- Outreach campaign to municipal staff and boards to designate high value wetlands as Prime Wetlands or significant wetlands
- Adopted, updated, or draft Prime Wetlands or significant wetlands designations

OUTCOMES

- Improved protection of high value wetlands and associated upland buffers

IMPLEMENTATION METRICS

- R3: Municipalities have designated prime/significant wetlands

Issues Addressed:
- Buffers
- Land Protection
- Wetlands

Leads:
- BwH
- MDEP
- Municipalities
- NHDES

Cooperators:
- Land Protection Organizations
- PREP
- RPC
- SMRPC
- SNHPC
- SRPC

Funding:
- MDEP
- MDOT
- NHDES
- NHDOT
- PREP

Critical Guidance

[1]Maine Department of Inland Fisheries and Wildlife, 2003, Beginning with Habitat: Toolbox
[2]Chase, V., Deming, L., Latawiec, F., 1997, Buffers for Wetlands and Surface Waters: a guidebook for New . . .
[3]New Hampshire Department of Environmental Services, *et al* , 2008, Innovative Land Use Planning Techniques: A . . .
[4]New Hampshire Department of Environmental Services, Env-Wt 100-800 Wetlands Rules, New Hampshire . . .

LU-9

priority | *start* | *duration*
Moderate | 2011 | Ongoing

Work with MDEP and NHDES to evaluate effectiveness of wetlands mitigation policies and in-lieu fee programs, where applicable.

Issues Addressed:
- Development
- Flooding
- Stormwater
- Water Quality

Leads:
- MDEP
- NHDES
- RPC
- SMRPC
- SNHPC
- SRPC

Cooperators:
- Land Protection Organizations
- Maine Coastal Program
- Municipalities

Funding:
- MDEP
- NHDES

Permitted wetland impacts sometimes require a permit applicant to either create a wetland, perform wetland restoration to mitigate the permitted impact, or in some cases permanently protect other wetland areas and/or adjacent upland buffers.

In instances where wetland impact is less than one acre in NH and 25 acres in ME, developers or organizations can choose to pay an in lieu fee if a suitable wetland mitigation project cannot be located. This fee is placed in a fund that can be used for larger conservation goals, with preference for projects completed within the watershed where the wetland impact occurs. NHDES and MDEP administer the In-lieu Fee Programs in their respective states.

ACTIVITIES

1. Cooperate with NHDES and MDEP on tracking the extent of wetland mitigation projects and compare function losses to functional gains.
2. Track net permitted wetland loss on a regional basis and evaluate whether the "no net loss" of wetlands goal is being met.
3. Track use of in-lieu fees (in NH) to determine if larger conservation goals are being met and evaluate tradeoffs being made in wetland acreage, type, and function. If conservation goals are not being met or tradeoffs in wetland functions/values is determined to be undesirable, recommend modifying in-lieu fee program rules to implement improvements.

MEASURING PROGRESS

OUTPUTS
- Report on wetland mitigation policies and in-leu fee programs, that includes summaries of wetland mitigation projects, permitted wetland loss, wetlands or other habitat restored or protected, use of in-lieu fees for watershed improvement projects

OUTCOMES
- Improved protection and preservation wetland functions in the Region

IMPLEMENTATION METRICS
- None

Develop and implement consistent municipal ordinances to protect 1st, 2nd and 3rd order streams and buffers throughout the watershed.

LU-10

priority | *start* | *duration*
Highest | 2015 | Ongoing

Small streams (first, second and third order) are the headwaters in a watershed and are the source of water to larger river systems. Development within upland buffers adjacent to these streams degrades these systems and impairs their capacity to protect water quality, provide healthy aquatic habitat, and regulate peak flow volumes. Removing vegetation from shoreland (riparian) buffers and adding impervious surfaces increases downstream flooding hazards and increases the delivery of polluted runoff into the river system.

The NH Comprehensive Shoreland Protection Act protects buffer zones adjacent to streams that are 4th order and higher, not the smaller headwater streams. The Maine Mandatory Shoreland Zoning Act requires that municipalities protect shoreland buffer areas through adopting shoreland zoning maps and ordinances for streams that are second order and higher. Municipalities can protect smaller streams and enact more protective regulations than provided by Maine or New Hampshire laws. Uniform protection of shoreland buffers within a watershed and across town boundaries is important so that all headwater streams continue to provide valuable ecosystem services.

ACTIVITIES

1. Periodically assess the status of existing buffer regulations and ordinances for 1st, 2nd and 3rd order streams in Piscataqua Region communities.
2. Integrate science-based information on the importance of protecting small streams into existing outreach and training programs for municipal decision makers, as needed.
3. Provide outreach to all communities on the importance of small stream and riparian buffer protection, in accordance with LU-4 and communities that have minimal or no low order stream buffer regulations in place.
4. Promote at least a 75' wide buffer on first order streams and 100' buffer on second order and higher streams, rivers, ponds and lakes.
5. Provide technical assistance to communities to adopt small stream buffer ordinances.[1,2,3] Prioritize in accordance with LU-4.

MEASURING PROGRESS

OUTPUTS

- Report of regulatory and non-regulatory approaches to resource protection in the Region
- Adopted, updated, or draft municipal shoreland buffer regulations
- Outreach campaign to natural resource outreach and training program administrators on integrating science-based information on the importance of protecting small streams into existing curriculum
- Outreach campaign to municipal staff and boards on value of low order streams and stream buffers
- Adopted, updated, or draft small stream buffer ordinances

OUTCOMES

- Improved water quality and habitat quality from protected riparian buffers

IMPLEMENTATION METRICS

- R4: 75' wide shoreland buffer protections on first order streams and ≥100' on all others

Issues Addressed:

- Buffers
- Land Protection
- Small Streams

Leads:

- BwH
- MDEP
- Municipalities
- NHDES
- RPC
- SMRPC
- SNHPC
- SRPC

Cooperators:

- Maine Coastal Program
- NEMO
- NERRs
- NH Coastal Program
- NROC
- PREP
- SWA
- UNH-SC

Funding:

- NHDES Regional Environmental Planning Program
- NH Coastal Program
- MDEP
- NOAA
- USEPA

Critical Guidance

[1]New Hampshire Department of Environmental Services, *et al* , 2008, Innovative Land Use Planning Techniques: A . . .
[2]Maine Department of Inland Fisheries and Wildlife, 2003, Beginning with Habitat: Toolbox
[3]Chase, V., Deming, L., Latawiec, F., 1997, Buffers for Wetlands and Surface Waters: a guidebook for New Hampshire . . .

LU-11

priority | *start* | *duration*
High | 2015 | Ongoing

Promote collaboration among national, state and local land protection groups to implement landowner education and outreach, provide technical assistance and training, and coordination on land protection and stewardship efforts.

Issues Addressed:
- Land Protection

Leads:
- Land Trust Alliance
- Maine Land Trust Network
- SPNHF
- TNC
- UNH-CE

Cooperators:
- Land Protection Organizations
- MDIFW
- Maine Coastal Program
- NHFGD
- Municipalities
- RPC
- SMRPC
- SNHPC
- SRPC
- USFWS

Funding:
- Foundations
- Municipalities
- NOAA
- PREP
- State and Federal Grants

Cooperation between national, regional and local land protection organizations is needed to optimize land protection efforts and raise the capacity of all organizations. Regular interaction and training among these groups is essential to keep all organizations informed of new laws, standards and practices, and funding mechanisms.

In New Hampshire, the Center for Land Conservation Assistance provided training/assistance to land trusts throughout the state but was discontinued due to funding constraints. SPNHF will continue some of these functions and UNH-CE plans to continue the annual New Hampshire Saving Special Places land protection conference. The Maine Land Trust Network and Maine Coast Heritage Trust supports Maine land trusts and holds a conference and trainings each year. The national Land Trust Alliance provides support/training to improve land conservation practices and advocate for land protection policies.

The Land Trust Accreditation Commission provides independent verification of 37 indicator practices from Land Trust Standards and Practices that show a land trust's ability to operate in an ethical, legal, and technically sound manner. Accreditation is an effective, methodical approach to promoting well-executed projects in the Region.

The existing coastal conservation plans for the Region represent the only shared vision of land protection priorities; however they do not include all the conservation targets of each town and smaller land protection organizations in the Region. Generating a vision of connecting landscapes with the local community and with cooperating agencies will add to improved recognition and protection of green infrastructure.

ACTIVITIES

1. Provide training to landowners and land protection organizations on best practices, landowner education, and legal issues in land conservation.[2]
2. Encourage further collaboration between local, state and national conservation organizations on land conservation projects through such regular meetings as the Great Bay Resource Protection Partnership meetings and annual Saving Special Places conference.
3. Provide training of land trusts to comply with Land Trust Accreditation.[1]
4. Create a land conservation connectivity plan that supplements the LCP-NH and LCP-ME and ensures conservation focus areas are joined in a welll-buffered network that permanently protects the conservation values and functions of the focus areas, and supports the PREP CCMP.

MEASURING PROGRESS

OUTPUTS
- Training(s) to landowners and land protection organizations on best practices, landowner education, and legal issues in land conservation
- Outreach campaign to local, state and national conservation organizations on land conservation projects
- Trainings to land trusts on complying with Land Trust Accreditation
- Land conservation connectivity plan that links existing CFAs into a regional green infrastructure

OUTCOMES
- Well-informed land trust staff
- Well-informed landowners
- LTA-accredited land trusts
- Improved ecologically functioning conservation land network

IMPLEMENTATION METRICS
- None

Critical Guidance

[1] Land Trust Alliance, 2010, Land Trust Alliance Standards and Practices, Land Trust Alliance
[2] Society for the Protection of New Hampshire Forests, 2007, Protect Your Land: Conservation Options for . . .

Assist watershed communities in adopting local land conservation plans and natural resource inventories that incorporate regional land protection priorities, species and habitat information, and wildlife habitat connectivity concepts.

LU-12

priority | *start* | *duration*
High | 2015 | Ongoing

The LCP-NH and LCP-ME were collaboratively created by several key resource management organizations and utilized resource co-occurrence mapping to identify focus areas for land protection. PREP recognizes these plans as the guiding land protection documents for the Region.

The NHWAP and BwH are state-led natural resources efforts that provide valuable habitat and wildlife information and a blueprint for conducting local natural resource inventories and conservation planning on a landscape scale. PREP recognizes these two plans as the guiding wildlife management documents for the Region. NHFGD and MDIFW have developed habitat connectivity models that can map terrestrial and aquatic habitat and migration corridors. Planning for habitat connectivity can be enhanced by including local knowledge in these connectivity models and by encouraging multi-town planning.

ACTIVITIES

1. Encourage incorporation of the priorities and data from the LCP-NH and LCP-ME into land trust and municipal conservation plans.[1,2]
2. Promote conservation overlay districts that include CFAs.[1,2] Post online maps of overlay districts.
3. Encourage municipalities, watershed organizations, and land protection organizations to access, interpret, and integrate WAP and BwH resources and data into NRIs and land conservation plans.[3,4]
4. Promote collaboration among land protection organizations and multiple adjacent municipalities on WAP and BwH implementation.
5. Promote inclusion of NHFGD and MDIFW habitat connectivity models in development of land conservation plans and delineate wildlife corridors and buffers in land conservation and stewardship plans.
6. Encourage communities to use LCP-NH, LCP-ME, WAP and BwH when developing ordinances and conservation overlay districts.
7. Track municipal adoption of regional plans.
8. Update the LCP-NH and LCP-ME as needed to include new conservation data, connectivity, and local and statewide land protection priorities and progress on focus area protection.

MEASURING PROGRESS

OUTPUTS

- Outreach campaign to municipal staff and boards, watershed organizations, and land protection organizations on incorporating LCP-NH, LCP-ME, WAP and BwH resources and data into land trust and municipal conservation planning
- Regional maps/GIS illustrating habitat connectivity and migration corridors
- Updated LCP-NH and LCP-ME
- Report of regulatory and non-regulatory approaches to resource protection in the Region

OUTCOMES

- Land protection that incorporates local and regional conservation priorities
- Incorporation of habitat connectivity corridors into local and regional conservation plans

IMPLEMENTATION METRICS

- R2: Municipalities have conservation overlay districts that CFAs from regional plans
- NR3: Municipalities have conservation plans that include CFAs from regional plans
- NR5: Municipalities have online maps of NRI features and zoning district overlays

Issues Addressed:

- Habitat
- Land Protection

Leads:

- Beginning with Habitat
- NHFGD-GBNERR
- Land Protection Organizations
- Municipalities
- RPC
- SMRPC
- SNHPC
- SRPC
- UNH-CE
- WNERR

Cooperators:

- GBRPP
- Maine Coastal Program
- NROC
- PREP
- USFWS
- Watershed Organizations

Funding:

- MDIFW
- Municipalities
- PREP
- UNH-CE/ NHFGD Taking Action for Wildlife Community Assistance Program Grants

Critical Guidance

[1]Zankel M, Copeland C, Ingraham P, Robinson J, Sinnott C, Sundquist D, Walker T, and Alford J, 2006, The Land . . .
[2]Walker S, et al, 2010, The Land Conservation Plan for Maine's Piscataqua Region Watersheds, Piscataqua Region . . .
[3]New Hampshire Fish and Game Department, 2005, New Hampshire Wildlife Action Plan
[4]Frazer, T. & B. Charry, 2006, Beginning with Habitat: Conserving Wildlife in Maine's Coastal Habitat

LU-13

priority | *start* | *duration*
High | 2015 | Ongoing

Develop land stewardship and management approaches on conserved lands in a compatible and complementary manner across the watershed to maintain ecosystem services on a landscape scale.

Issues Addressed:
- Land Management
- Land Protection

Leads:
- CWIPP
- SPNHF
- TNC
- UNH-CE

Cooperators:
- NHFGD-GBNERR
- Land Owners
- Land Protection Organizations
- Maine Coastal Program
- MDEP
- MDIFW
- Municipalities
- NH Audubon
- NH Division of Forest and Lands
- NHDES
- NHFGD
- NRCS
- SPNHF
- Timber Harvester
- USFS
- USFWS
- Watershed Organizations
- WNERR

Funding:
- Forest Legacy Program
- Landowners
- MDIFW
- Municipalities
- NHFGD
- NOAA
- NRCS
- PREP
- Timber Industry
- USFWS

Many plans and programs have been developed that focus on regional land and habitat protection and restoration on a landscape scale in the Region (see LU-12), however, land stewardship and management approaches at the individual parcel level are often developed and implemented without consideration of nearby conserved land management and regional conservation objectives.

The purpose of this action plan is not to create a common stewardship and management standard to be applied evenly across all conserved lands in the Region, but to improve the ability of land stewards to develop and implement appropriate management approaches that compliment adjoining managed land and support regional conservation objectives.

Most land trusts and some conservation commissions prepare and implement management plans for their properties, but additional effort is needed to coordinate management of the network of conserved lands across ownerships and jurisdictional boundaries.

ACTIVITIES

1. Review and refine land stewardship practices to maintain ecosystem services. Stewardship should be consistent with LCP-NH, LCP-ME, WAP, BwH, GBERC, HSERC and CWIPP and should incorporate best management practices to protect water resources and wildlife habitat that are identified in state guidance documents[1,3] and stewardship guidelines.[2]
2. Work with conservation land stewards to collaboratively manage networked conservation lands in a compatible and complementary manner, especially in CFAs.
3. Provide municipalities, land protection organizations, and land owners with information on regional land stewardship and management approaches and goals.

MEASURING PROGRESS

OUTPUTS
- Land stewardship and management approaches that maintain ecosystem services on a landscape scale
- Outreach campaign to municipalities, land protection organizations, and land owners on developing management approaches that are compatible and complementary to adjacent and regional conserved lands, especially in CFAs

OUTCOMES
- Sustained ecological services provided by conservation lands
- More efficient stewardship and management on a network on conservation lands

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]New Hampshire Division of Forests and Lands, The Society for the Protection of New Hampshire Forests, 1997, . . .
[2]University of New Hampshire Cooperative Extension, 2008, Habitat Stewardship Brochure Series, University of . . .
[3]University of New Hampshire, 2009, New Hampshire Stream Crossing Guidelines

Work with landowners to permanently protect land and water through conservation easements and fee acquisitions, particularly associated with Conservation Focus Areas (CFAs).

LU-14

priority | *start* | *duration*
Highest | 2012 | Ongoing

As of 2008, a total of 11.3% of Piscataqua Region watershed lands are permanently protected from development. Only 25% of CFA core areas are included within this protected area. Land protection projects in 2009 and 2010 will likely achieve the previous PREP goal of 15% protected land in the Region by 2010, so PREP has adopted a new goal of protecting 20% of the watershed by 2020. Land protection organizations, municipalities, and landowners will need technical assistance, land protection and stewardship planning, and funding for land acquisition, conservation easements and transaction costs.

Additional capacity is needed to assist land protection organizations and conservation commissions to complete due diligence baseline monitoring and documentation, and annual easement and conservation land monitoring to assure easement term compliance. Cost effective means for monitoring could include bundling aerial easement monitoring with state and national groups such as SPNHF and TNC or funding specialized land protection professionals to provide high quality, efficient monitoring services.

ACTIVITIES

1. Foster and implement permanent land protection projects on private and public lands using conservation easements and fee acquisitions. Focus protection efforts on CFAs and land parcels that connect existing protected areas.
2. Provide assistance to land protection organizations and conservation commissions for land stewardship, including baseline and annual conservation easement monitoring.
3. Advocate for using local land use change tax for land conservation, management, and stewardship funding in New Hampshire communities.
4. Provide conservation easement education to current and subsequent owners of lands on which there are conservation easements. Include topics in education and outreach to real estate professionals and municipalities.
5. Inventory and evaluate state and federal land protection funding opportunities and innovative fund raising approaches for land protection projects and stewardship activities.
6. Support implementation of recommendations from activity #4.
7. Provide assistance to land protection organizations and municipalities for land protection transaction costs with a priority for projects within CFAs.
8. Work with landowners to permanently protect land and water through conservation easements and fee acquisitions, with a focus on CFAs.
9. Advocate for funding of state-funded conservation grant programs, such as LCHIP.

MEASURING PROGRESS

OUTPUTS

- Outreach campaigns to private landowners on permanent land conservation options and benefits
- Training(s) for stewardship plan development and implementations
- Advocacy campaign to municipal boards and voters to allocate local land use change tax to land conservation, management, and stewardship funding
- Report on state and federal land protection funding opportunities and innovative fund raising approaches for land protection projects and/or stewardship activities, including recommendations
- Innovative fund raising activity for land protection projects and/or stewardship activities
- Land protected in CFAs
- Advocacy campaign to policy makers on funding state-funded land conservation grant programs, such as LCHIP

OUTCOMES

- Continued land protection efforts in the Piscataqua Region
- Well-executed land protection projects

IMPLEMENTATION METRICS

- HAB5: Protected conservation focus areas in the coastal watershed
- HAB6: Protected conservation lands

Issues Addressed:

- Land Protection

Leads:

- BwH
- Conservation Commission
- Land Trust Alliance
- MEACC
- Municipalities
- SPNHF
- TNC
- UNH-CE

Cooperators:

- Land for Maine's Future
- Land Protection Organizations
- Maine Coast Heritage Trust
- Maine Coastal Program
- MDIFW
- PREP
- TNC

Funding:

- Foundations
- NOAA
- USEPA

LU-15

priority | *start* | *duration*
High | 2012 | Ongoing

Work with public and private landowners to manage habitat for species in greatest need of conservation by implementing strategies and priorities from regional wildlife resource plans.

Issues Addressed:
- Land Management
- Land Protection
- Wildlife

Leads:
- MDIFW
- NHFGD
- UNH-CE

Cooperators:
- NHFGD-GBNERR
- Land Owners
- Land Protection Organizations
- Municipalities
- NEMO
- NHFGD
- NRCS
- NROC
- PREP
- SWOAM
- TNC
- USFWS
- WNERR

Funding:
- Landowner Incentive Program (LIP) Grants (distributed by NHFGD and Maine Natural Areas Program)
- MDEP
- MDIFW
- NHDES
- NHFGD
- NOAA
- NRCS
- USFWS

The WAP, BwH, and Maine's Comprehensive Wildlife Conservation Strategy provide objectives on maintaining and restoring habitat for species of concern. In the Region these habitats include salt marshes, estuarine habitat, coastal islands, grassland, shrubland and early successional communities, urban wildlife habitat, lakes, rivers and streams, floodplain forest, marsh/wet meadow/shrub swamp. The plans also stress land use management priorities including terrestrial invasive control, and maintenance of natural flow regimes. Both NH and ME resource agencies have identified Species of Greatest Conservation Need (SGCN) and habitats most in need of protection.

A coordinated approach between NHFGD, MDIFW and cooperators to work with landowners on protecting and managing habitats will lead to broader landscape-scale benefits to wildlife and their habitats throughout the Piscataqua Region watershed.

Peer-to-peer outreach programs such as the NH Coverts Project, funded primarily by NHFGD and administered by UNH-CE, are an effective tool to reach private landowners. These programs train landowners and community decision-makers to promote wildlife conservation and habitat stewardship in their communities and to other landowners.

ACTIVITIES

1. Determine habitat management needs based on existing resource mapping, survey results and species conservation plans (LU-12 and LU-13), and site-specific conditions.[1,2,3]
2. Identify priority areas (and corresponding landowners) where improved land management would improve wildlife habitat for SGCN.
3. Conduct outreach and training for landowners to maintain or restore habitat and species of concern, based on recommendations from the NHWAP, BwH, MCWCS, and UNH-CE Habitat Stewardship Series. Currently this activity is addresed in New Hampshire by NH Coverts Project.[4]
4. Provide assistance to land owners to develop and implement land stewardship plans in accordance with activity #1 and LU- 13.

MEASURING PROGRESS

OUTPUTS
- Report of habitat management needs, priority areas, and land owners where improved land management would improve wildlife habitat for specific target species
- Outreach campaign to landowners on maintaining or restoring habitat that supports species of concern
- Land stewardship plans

OUTCOMES
- Strategic habitat management and cooperation between landowners, natural resource agencies, and land protection organizations

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]New Hampshire Fish and Game Department, 2005, New Hampshire Wildlife Action Plan
[2]Maine Department of Inland Fisheries and Wildlife, 2005, Maine's Comprehensive Wildlife Conservation Strategy,
[3]Frazer, T. & B. Charry, 2006, Beginning with Habitat: Conserving Wildlife in Maine's Coastal Habitat.
[4]University of New Hampshire Cooperative Extension, 2008, Habitat Stewardship Brochure Series, University of . . .

Conduct surveys and monitoring to augment databases on the distribution of species of conservation concern and critical habitats.

LU-16

priority | *start* | *duration*
Moderate | 2015 | Ongoing

Strategic land protection requires the best available information on wildlife and their habitats. Both NH and ME resource agencies have identified Species of Greatest Conservation Need (SGCN) and habitats most in need of protection. Supplemental monitoring and mapping data is required to further define species and habitat distribution on a local and regional scale.

Additional resources – funding and staff – are needed to conduct wildlife and habitat surveys and monitoring to enhance existing data and to "ground truth" habitat mapped based on broad habitat designations.

ACTIVITIES

1. Identify and prioritize Piscataqua Region watershed areas in need of surveys and monitoring, focusing on SGCN and associated habitats.
2. Develop survey and monitoring programs, or promote existing protocols, in coordination with NHFGD, NHA, and MDIFW to meet their needs.
3. Build local capacity through training of volunteers and funding of professional assistance to identify and survey wildlife habitat for SGCN.
4. Evaluate properties for SGCN and habitats in WAP and CFAs.
5. Incorporate survey data and reports in state resource agency databases, conservation plans, and maps.

MEASURING PROGRESS

OUTPUTS

- Report on Piscataqua Region watershed areas in need of wildlife and habitat surveys and monitoring, with a focus on highest priority species and habitats
- Training materials for volunteer participation in monitoring and mapping
- Survey data and reports on wildlife and habitat distribution

OUTCOMES

- Greater understanding of populations, distribution and habitat for species and habitats of concern

IMPLEMENTATION METRICS

- None

Issues Addressed:

- Land Protection
- Wildlife

Leads:

- Maine Natural Areas Program
- MDIFW
- NH Natural Heritage Bureau
- NHFGD
- UNH-CE

Cooperators:

- NHFGD-GBNERR
- Land Owners
- Land Protection Organizations
- Maine Audubon
- Maine Coastal Program
- Municipalities
- NEMO
- NH Audubon
- NROC
- PREP-CTAP
- TNC
- USFWS
- Watershed Organizations
- WNERR

Funding:

- MDIFW
- Municipalities
- NHFGD
- NOAA
- PREP
- Private Donors
- State Wildlife Grants (Teaming With Wildlife Funds)

Critical Guidance

[1]New Hampshire Fish and Game Department, 2005, New Hampshire Wildlife Action Plan
[2]Frazer, T. & B. Charry, 2006, Beginning with Habitat: Conserving Wildlife in Maine's Coastal Habitat
[3]Maine Department of Inland Fisheries and Wildlife, 2005, Maine's Comprehensive Wildlife Conservation Strategy

LU-17

priority | *start* | *duration*
High | 2012 | Ongoing

Develop and implement source water protection for current and future community and public water supplies.

Issues Addressed:
- Drinking Water
- Groundwater
- Land Protection
- Land Use

Leads:
- Maine CDC
- NHDES- Drinking Water Source Protection Program
- TPL

Cooperators:
- Drinking Water Providers
- Granite State Rural Water Association
- Land Protection Organizations
- Maine Rural Water Association
- Municipalities
- State Legislators
- SPNHF
- Water Districts
- PREP

Funding:
- Maine CDC Drinking Water Program
- Municipalities
- NHDES Local Source Water Protection Grant Program
- Water Districts

Approaches to source water protection include limiting development, minimizing impervious surfaces, removing or managing pollutant sources in water supply buffer areas and wellhead protection areas, properly managing stormwater and nutrient sources, and permanently protecting water supply lands, such as public water supply wells (wellhead protection), specific groundwater aquifers (aquifer protection), and surface waters (watershed protection).

Often water resources span several municipal or state boundaries, therefore coordination is needed to apply consistent protections. New Hampshire and Maine encourage source water protection by providing funding and technical assistance to municipalities and water districts. Twelve percent (12%) of municipalities the Region have identified or adopted source water protection districts (Sowers, 2010).

Some assistance for water supply related land conservation is currently available through the NHDES Water Supply Land Protection Grant program and the Land Acquisition Loan Program from Maine CDC Drinking Water Program. New Hampshire's water supply land protection grant does not have a dedicated funding source and is subject to state budget limitations. Developing a permanent funding source for both NH and ME will better protect current and future water supply lands.

ACTIVITIES

1. Provide assistance to identify likely future water supply sources, analyze current protection status of water supply lands, and prioritize water supply lands (existing and future) in greatest need of protection.
2. Promote integration of priority source water supply lands into local and regional source water protection plans, land conservation plans (LCP-NH and LCP-ME), watershed plans and municipal regulations.[1,4]
3. Provide assistance to develop and implement source water protection plans to owners/operators of community water systems.[2,3,4,5,6]
4. Advocate for funding of state-funded conservation grant programs, such as LCHIP or NHDES Source Water Protection grants.

MEASURING PROGRESS

OUTPUTS
- Report on future water supply sources, current protection status of water supply lands, and current and potential water supply lands in greatest need of protection in the Region
- Outreach campaign to resource management organizations and municipalities on integrating protection of priority source water supply lands in resource management plans, such as LCP-NH and LCP-ME
- Advocacy campaign to policy makers on dedicating state funding for drinking water land protection programs
- Source water protection plans

OUTCOMES
- Sustained water quality and quantity for drinking water supplies in the Piscataqua Region
- Permanent protection of water supply lands
- Preservation of future growth opportunities for the Region by ensuring the availability of additional future water sources

IMPLEMENTATION METRICS
- NR4: Municipalities drinking water source protection plans.

Critical Guidance

[1] Ernst C, Gullick R, Nixon K, 2004, Protecting the Source: Conserving Forests to Protect Water, American Water . . .
[2] New Hampshire Department of Environmental Services, 2010, Source Water Protection Strategy, New Hampshire. . .
[3] New Hampshire Department of Environmental Services, 2010, Drinking Water Source Protection Program
[4] New England Interstate Water Pollution Control Comm., 2004, Water Today...Water Tomorrow?: Protecting . . .
[5] Schmitt C, 2002, Source water protection: Linking surface water quality to the watershed : problems, sources and . . .
[6] Horsley Witten Group, 2007, Benchmark Uniform Minimum Shoreland Buffer Width for the Protection of NH . . .

WATERSHED STEWARDSHIP

ACTION PLANS

The Watershed Stewardship section of the CCMP includes action plans that address issues spanning the Water Resources, Living Resources and Habitat Restoration, and Land Use and Habitat Protection sections, such as determining the economic value of ecosystem services or improving access to science-based information to many different stakeholder groups.

Evaluating and communicating the economic impact and value of the ecosystem services that the watershed provides, effectively communicating science based information, and improving enforcement of environmental protection measures to support the water resource, are the principal objectives of this theme area. Nine comprehensive action plans address the Watershed Stewardship Goal and Management Objectives.

Goal: Legislative, resource management, and land use planning decisions and processes affecting the Piscataqua region watersheds support Piscataqua Region Comprehensive Conservation and Management Plan goals and objectives.

Objective WS 1.1 - Promote the use of economic valuation of ecosystem services and functions by coastal watershed decision-makers.

Objective WS 1.2 - Provide access to science-based information about Piscataqua region estuaries and watersheds to coastal watershed decision-makers.

Objective WS 1.3 - Improve state and local capacity to enforce measures that protect and restore aquatic habitats in PREP focus area.

Table 6: Watershed Stewardship action plan identification number, title, and priority ranking.

Action ID #	Action Title	Ranking
WS-1	Every three years, produce an Environmental Indicators Report and State of the Estuaries Report, and convene a State of the Estuaries conference.	Highest
WS-2	Complete economic impact studies assessing the value of functions and services provided by estuary and coastal watershed resources.	Highest
WS-3	Develop and implement outreach and education programs on natural resource planning issues to Conservation Commissions, Planning Boards, Zoning Board of Adjustments, and municipal staff.	Highest
WS-4	Further develop and promote the Site Screening Tool, a publicly accessible GIS-based web tool, to aid municipal planning officials in identifying the potential impacts of development proposals on various natural resources.	High
WS-5	Support coordinated communication to coastal watershed stakeholders about activities that implement the PREP Management Plan.	Highest
WS-6	Update curricula in existing environmental education programs to include current estuary issues.	Moderate
WS-7	Support collaborative outreach and education efforts on nutrient and other pollutant load reductions and municipal requirements in the Piscataqua region watershed as part of a regional strategy	Highest
WS-8	Improve application and enforcement of state and local land use regulations that protect natural resources.	Highest
WS-9	Support efforts to increase capacity of regulatory agencies that implement the PREP Management Plan	High

Every three years, produce an Environmental Indicators Report and State of the Estuaries Report, and convene a State of the Estuaries conference.

WS-1

priority | *start* | *duration*
Highest | 2012 | Ongoing

Every three years, a State of the Estuaries Report is prepared which summarizes key environmental indicators and reports progress on meeting PREP environmental goals. Prior to developing each State of the Estuaries Report, PREP publishes a technical data report ("indicator report") that illustrates the status and trends, data analysis methods, and data sources for each of the 42 indicators tracked by PREP. Other technical reports are prepared as needed to report on special projects or programs.

PREP also organizes and convenes the State of the Estuaries Conference. Research results and indicator reports are presented that detail the results of the State of the Estuaries Reports. Reports on special projects and timely topics are also presented at this time.

ACTIVITIES

1. Periodically convene PREP TAC to evaluate methodology, measurement, and data trends of environmental indicators.
2. Every three years produce an Environmental Indicators Report on all core environmental indicators tracked by PREP's Monitoring Plan.
3. Produce State of the Estuaries reports every three years (2012, 2015, 2018).
4. Host State of the Estuaries conference every three years (2012, 2015, 2018).
5. Promote use of State of the Estuaries report by reporters and partnering organizations.
6. Monitor use of State of the Estuaries report by municipal staff and boards.[1]

MEASURING PROGRESS

OUTPUTS

- Environmental indicator and State of the Estuaries reports (2012, 2015, 2018)
- State of the Estuaries Conferences (2012, 2015, 2018)
- Outreach campaign to reporters and partners on using information contained in the State of the Estuaries reports
- Survey of municipal staff and boards on use of State of the Estuaries report

OUTCOMES

- Greater understanding of the condition/trends of natural resources in the Piscataqua watershed and PREP programs
- Improved ability to evaluate effectiveness of CCMP strategies in meeting environmental goals/targets

IMPLEMENTATION METRICS

- Percent of planning board members and conservation commissioners who report using information from the PREP State of the Estuaries report

Issues Addressed:

- All Issues

Leads:

- PREP

Cooperators:

- NHDES-WMB
- NH Shellfish Program
- NHFGD
- UNH-CSRC
- TNC-NH
- WNERR
- NHFGD-GBNERR
- NextEra Energy
- Gulfwatch Program
- NH Coastal Program
- UNH-Marine Program
- USEPA

Funding:

- Businesses
- NHCF
- PREP

CriticalGuidance

[1] UNH Survey Center, 2008, Evaluation of NHEP Outreach: A Survey of Planning Boards and Conservation Commissions . . .

WS-2

priority | *start* | *duration*
Highest | 2015 | Finite

Complete economic impact studies assessing the value of functions and services provided by estuary and coastal watershed resources.

Issues Addressed:
- Economic Value
- Green Infrastructure

Leads:
- UNH
- USM

Cooperators:
- PREP

Funding:
- EPA Office of Research and Development
- NHCF
- PREP
- USFWS

In July 2008, PREP completed a report entitled "Indicators of the Economic Value and Impact of New Hampshire's Estuaries" that was the first step in determining economic impact of estuarine resources. This effort was undertaken in part due to the benefits derived from of a similar study on the economic value of New Hampshire lakes and rivers (Shapiro and Kroll, 2003). A recommendation from a 2008 PREP economic indicators report called for the completion of an economic valuation study for estuarine resources in the region (Trowbridge and Hunter, 2008).[1]

ACTIVITIES

1. Create an Economic Impact Study Plan that defines research questions, scope, similar studies, partners, funding sources, and consultant criteria.[1,2,3]
2. Implement Economic Impact Study Plan using a consultant to develop methodology, collect and analyze data, and prepare a report of findings and recommendations.
3. Promote the utilization of the economic valuation data by coastal decision makers, resource managers, reporters, and other audiences not typically involved with natural resource management.

MEASURING PROGRESS

OUTPUTS
- Economic Impact Study Plan
- Economic Impact Study Report
- Outreach campaign to coastal decision makers, reporters, and other audiences not typically involved with natural resource management on using findings and recommendations of the Economic Impact Study Report

OUTCOMES
- Better understanding of natural resource value and green infrastructure services
- Basis for justifying estuarine protection/ restoration in economic terms

IMPLEMENTATION METRICS
- None

Critical Guidance

[1]Trowbridge P, Hunter J, 2008, Indicators of the Economic Value and Impact of New Hampshire's Estuaries, New . . .
[2]Pendleton L, 2008, The Economic and Market Value of Coasts and Estuaries: What's At Stake?, Restore America's . . .
[3]Shapiro L, Kroll H, 2003, Estimates of select economic values of New Hampshire lakes, rivers, streams and ponds: . . .

Develop and implement outreach and education programs on natural resource planning issues to municipal boards.

WS-3

priority | *start* | *duration*
Highest | 2012 | Ongoing

Municipal board members need training in natural resource planning to implement the PREP CCMP. A variety of training programs exist that are provided by RPCs, UNH-SC, land trusts, UNH-CE, CTPs, and NHFGD. NROC provides technical guidance on natural resource planning issues to New Hampshire municipal boards and is part of the national Nonpoint Education for Municipal Officials (NEMO) program. NROC has worked with 23 New Hampshire Region communities. Maine NEMO works with Maine communities and has so far worked with eight in the Region. Another important program is PREP CTAP, which provides assistance to communities on a wide range of regulatory and non-regulatory approaches to natural resources protection. A new effort led by UNH-CE, called the New Hampshire Citizen Planner Collaborative (NHCPC), is a collective effort of multiple state agencies, organizations, and municipal representatives whose purpose it is to provide enhanced training and educational resources to communities in the area of municipal and land use planning.

ACTIVITIES

1. Support municipal board education programs, such as NROC, Maine NEMO, NERR CTPs and New Hampshire Citizen Planner Collaborative, that are consistent with PREPA recommendations.[1]
2. Promote intermunicipal and interstate sharing of information on land use practices that protect natural resources.
3. Promote use of municipal board education programs in activity #1 to municipal staff and boards in the Region.

MEASURING PROGRESS

OUTPUTS

- Technical assistance and/or funding for NROC, Maine NEMO, NERR CTPs, New Hampshire Citizen Planner Collaborative, and other municipal board education programs that are consistent with PREPA recommendations
- Outreach campaign to municipal staff and boards on municipal board education programs that are consistent with PREPA recommendations

OUTCOMES

- Well-informed municipal staff and board members making land use decisions that protect natural resources in the Region

IMPLEMENTATION METRICS

- R1: Require conservation subdivisions
- R2: Conservation overlay districts with CFAs
- R3: Prime Wetlands (NH) or Significant Wetlands (ME)
- R4: 75' wide shoreland buffer protections on first order streams and ≥100' on all others
- R5: Fluvial erosion hazard (FEH) zone overlays & development restrictions
- R6: ≤10% effective impervious cover cap for new development
- R7: LID techniques for new development and redevelopment
- R8: Stormwater management regulations consistent with NHDES model ordinance
- R9: ≥ Four site inspections of development sites for stormwater/E&S compliance
- NR1: Natural Resource Inventories (NRIs)
- NR2: Natural Resource Chapter in Master Plan (NH only)
- NR3: Conservation plans with CFAs
- NR4: Drinking water source protection plans
- NR5: Online NRIs and environmental zoning district overlays

Issues Addressed:
- All Issues

Leads:
- BwH
- NHFGD-GBNERR
- Maine NEMO
- NROC
- PREP
- UNH-CE
- WNERR

Cooperators:
- RPC
- SRPC
- SMRPC
- SNHPC
- UNH-SC
- Land Protection Organizations
- Municipalities
- NHDES-WMB
- NH Coastal Program
- Maine Coastal Program
- MIFW
- NHFGD

Funding:
- USEPA
- NHDES
- MDEP
- NOAA
- NHCF
- NH Coastal Program
- NHOEP
- MSPO

Critical Guidance

[1] Sowers, D (2010). Piscataqua Region Environmental Planning Assessment

WS-4

priority | *start* | *duration*
High | 2015 | 2020

Further develop and promote a site-screening tool that is a publicly accessible GIS-based web tool to aid municipal planning officials in identifying the potential impacts of development proposals on various natural resources.

Issues Addressed:
- Land Use
- Wetlands
- Water Resources

Leads:
- BwH
- NERRS-SC
- UNH-CE
- UNH-GRANIT

Cooperators:
- Maine Office of Geographic Information Systems
- Municipalities
- UNH-CE
- UNH-CSRC

Funding:
- NERRS-SC
- NH Coastal Program
- NHCF
- USEPA

A beta version of a site screening tool has been developed by Applied Geosolutions through a grant from NERRS-SC. The tool was developed in cooperation with UNH-CE, the Town of Exeter and Rockingham Planning Commission. Using data available through GRANIT, the tool can provide policy-makers, local/regional planners, developers, and concerned citizens with baseline information on wetlands, hydric soils, proximity to surface water, hillslope, current and future public water supplies, and water resources using a user-friendly interactive tool. Additional modifications and funding are necessary to optimize the usefulness of the tool and host it on a server that can manage the heavy traffic of a publicly accessible site. Ideally, this tool will be accessible on the GRANIT website. The advantages of this tool over online GIS mapservers is that it produces a custom report about the general environmental attributes of a user-defined site of interest. This type of screening report would be very useful to assist Planning Boards and developers in identifying issues of concern for a proposed development site.

Another useful planning tool available on GRANIT is the Data Mapper. Multiple natural resource and infrastructure layers are available for web users and maps can be prepared and saved in PDF format. Wildlife Action Plan map layers are also available for use with this tool.

In Maine, the central public web-based GIS clearinghouse is hosted by the Maine Office of Geographic Information Systems (MEGIS). MEGIS provides access to environmental data via online mappers with somewhat limited functionality. BwH has developed a pilot map service that will facilitate site screening.

ACTIVITIES

1. Complete beta testing of a site screening and host on publicly-accessible operating platform in association with the GRANIT website. Update base on user feedback.[1]
2. Promote use of a screening tool to municipal officials, developers, and citizens as a means to better utilize existing GIS data when making planning decisions.
3. Provide support for establishing a comparable site screening tool for use in Maine communities in the Region.

MEASURING PROGRESS

OUTPUTS
- Online GIS-based site screening tool for NH
- Outreach plan to municipal officials, developers, and citizens on using screening tool when making planning decisions
- Online GIS-based site screening tool for ME

OUTCOMES
- Better informed planners, local decision makers, and citizens
- Improved protection of natural resources from impacts of development

IMPLEMENTATION METRICS
- NR5: Online NRIs and environmental zoning district overlays

Critical Guidance

[1] Applied Geosolutions, 2009, Site Screening Tool, Applied Geosolutions

Support coordinated communication to coastal watershed stakeholders about activities that implement the PREP CCMP.

WS-5

priority | *start* | *duration*
Highest | 2012 | Ongoing

PREP maintains a website that provides information on current programs and projects, publications, and links to other natural resource sites and program. PREP also provides monthly newsletter updates on PREP programs and activities. In addition, the POET (Public Outreach and Education Team) subcommittee, works to coordinate communication about PREP programs and issues with key audiences and media outlets.

Many organizations regularly communicate to the public about coastal watershed issues and an opportunity exists to coordinate this effort to efficiently achieve desired results of all parties involved. In 2009, the NHCP on behalf of a group of NH legislators, non-profit organizations, and government agencies began a website at www.savegreatbay.org with the intent of providing a clearinghouse for information on issues and events related to the Great Bay Estuary.

Many businesses in the Region have recognized the importance of adopting practices that enhance the Region's ecological integrity and their status in the community. Non-profit organizations, such as Seacoast Local and the Green Alliance, evaluate and educate their business partners to improve environmentally sustainable practices.

ACTIVITIES

1. Develop and implement a PREP Strategic Communication Plan that identifies audiences and approaches to implementing the CCMP, defines natural resource management communication networks in the Region, and establishes evaluation criteria for outreach activity.[1] Emphasize measurement of behavior change.
2. Implement PREP Strategic Communication Plan
3. Develop a recognition program that acknowledges outstanding actions that implement the CCMP, such as a municipality that adopts exemplary nutrient reduction regulations.
4. Promote the adoption of activities from CCMP action plans into established business certification programs, such as Seacoast Local, Green Alliance, and Chambers of Commerce. Examples of appropriate action plans include WR-11, WR-8, WR-18, and LU-2.

MEASURING PROGRESS

OUTPUTS

- PREP Strategic Communication Plan
- Updated PREP outreach materials
- PREP recognition program

OUTCOMES

- Expanded awareness of PREP activities and programs
- Improved implementation of natural resource protection programs

IMPLEMENTATION METRICS

- None

Issues Addressed:

- All Issues

Leads:

- PREP
- Gundalow Co.
- NH Coastal Program
- Seacoast Local
- Green Alliance

Cooperators:

- Businesses
- Watershed Organizations

Funding:

- Businesses
- NHCF
- PREP

Critical Guidance

[1] Hill K, 2008, 2008 Public Communication Plan, Indian River Lagoon National Estuary Program

WS-6

priority | start | duration
Moderate | 2012 | Ongoing

Update curricula in existing environmental education programs to include current coastal watershed and estuary issues.

Issues Addressed:
- All

Leads:
- NHFGD-GBNERR
- NH Sea Grant
- Wells NERR

Cooperators:
- Blue Ocean Society
- Gundalow Co.
- Land Protection Organizations
- MDEP
- MDEP
- MDMR
- Maine Coastal Program
- NHDES
- NHDRED
- NRCS
- Schools
- RCCD
- SCCD
- SSC
- UNH-CE
- UNH-JEL
- UNH-NHSG
- USFWS
- Watershed Organizations
- YCSWCD

Funding:
- USEPA
- USFWS
- NHFGD
- NHCF
- NH Coastal Program
- NHDES
- NHDRED
- USM

Every year, thousands of children and adults are exposed to environmental education programs conducted by many organizations in the Region. These organizations have invested a great deal of money and effort to develop programs and the means through which they are delivered. Improving the existing curricula by providing teaching materials and training will efficiently achieve PREP watershed stewardship goals.

Good examples of robust marine and environmental education programs are the UNH Marine Docents (NH Sea Grant) program that provides volunteer educators at the Seacoast Science Center, the Great Bay Discovery Center at the Great Bay NERR, and the variety of Wells NERR programs targeted at estuarine education in grades k-12, including a new partnership with the Center for Wildlife in York. Many other organizations in the Region provide or support environmental education.

ACTIVITIES

1. Provide teaching materials and training to environmental education programs in the Region to integrate CCMP highest priority issues into existing environmental education programs.[1,2,3]
2. Collect data on the number of people exposed to environmental education programs that address CCMP highest priority issues.

MEASURING PROGRESS

OUTPUTS

- Teaching materials on PREP CCMP highest priority issues
- Teaching trainings PREP CCMP highest priority issues
- Report on number of people exposed to programs dealing with CCMP highest priority issues

OUTCOMES

- Citizenry informed about estuary CCMP highest priority issues
- Improved political support for resource management actions.

IMPLEMENTATION METRICS

- None

Critical Guidance

[1]University of New Hampshire, 2010, UNH Marine Docents
[2]New Hampshire Fish and Game Department, 2010, Education and Training, New Hampshire Fish and Game . . .
[3]Seacoast Science Center, 2010, Education Programs

Develop support for nutrient load reductions in the Piscataqua Region watershed.

WS-7

priority | *start* | *duration*
Highest | 2015 | Ongoing

Nutrient reduction is and will continue to be a major objective for many resource management organizations and will require significant effort and financial investment by communities in the Region for decades. Building long-term support for nutrient reduction throughout the Region will facilitate voter approval of necessary regulatory actions and implementation of nutrient reduction BMPs on private and public lands.

NHDES and MDEP are addressing the nutrient loading problem as a regional issue. Outreach and education on this topic will be approached regionally as municipal cooperation is essential to the success of nutrient reduction efforts. The Southeast Watershed Alliance (SWA) provides a potential forum and mechanism for regional coordination and assistance.

ACTIVITIES

1. Encourage citizens to support regulatory and non-regulatory approaches to nutrient load reductions.[1]
2. Encourage businesses to support regulatory and non-regulatory approaches to nutrient load reductions.
3. Provide assistance to environmental educators to incorporate lessons on the impacts of nutrient loading to estuaries, in accordance with WS-6.
4. Advocate for state regulations and public policy to reduce nutrient loading to Region estuaries.

MEASURING PROGRESS

OUTPUTS

- Outreach campaign to citizens on supporting regulatory and non-regulatory approaches nutrient load reductions
- Outreach campaign to businesses on supporting regulatory and non-regulatory approaches nutrient load reductions
- Supplemental curricula and/or teaching materials for environmental educators
- Advocacy campaign to policy makers to enact regulations and develop public policy to reduce nutrient loading to Region estuaries

OUTCOMES

- Improved municipal, business, and public understanding of nutrient loading issues
- Increased interest and capacity to implement regulatory and nonregulatory activities that reverse negative nutrient loading impacts

IMPLEMENTATION METRICS

- None

Issues Addressed:
- Nutrients
- Stormwater
- Water Quality

Leads:
- MDEP
- NHDES

Cooperators:
- SWA
- NHFGD-GBNERR
- NEMO
- NH Coastal Program
- NROC
- PREP-POET
- WNERR

Funding:
- USEPA
- NOAA
- NHCF
- State Revolving Fund

Critical Resources

[1] Maine NEMO, 2005, Maine Resources Guide for Land Use Planning, Maine NEMO

WS-8

priority | *start* | *duration*
Highest | 2015 | Ongoing

Improve application and enforcement of state and local land use regulations that protect natural resources.

Issues Addressed:
- Enforcement

Leads:
- RPC
- SRPC
- SMRPC
- SNHPC

Cooperators:
- NHFGD-GBNERR
- MDEP
- MDIFW
- MSPO
- Maine Coastal Program
- NEMO
- NHACC
- NHLGC
- NROC
- PREP
- Code Enforcement Officers
- UNH-CE
- WNERR

Funding:
- NHDES
- MDEP
- USEPA

In order for land use regulations to be effective they must be consistently applied and enforced. Assisting communities with prioritization of regulations for enforcement and determining appropriate actions will help focus limited resources.

When environmental protections are frequently waived through variances granted by Zoning Boards of Adjustment (ZBAs), the original intent of a community's regulations are lost and the cumulative effect degrade of habitats and water resources. Providing training and environmental information to ZBAs, planning boards, and conservation commissions will help municipal officials understand the necessity of environmental protections and hopefully reduce unnecessary variances.

ACTIVITIES

1. Research state and local land use regulations in need of improved enforcement, determine causes of problems, (e.g., capacity, interpretation of regulations, inconsistency of application, etc.) and prioritize areas for improvement. Include research on ZBA rulings and estimate potential impacts of variances granted to adjacent communities or subwatersheds.
2. Promote enforcement of regulations that protect water resources to Zoning Boards of Adjustments, Conservation Commissions, Planning Boards, and code enforcement staff.
3. Design and implement New Hampshire land use code certification program that is comparable to Maine certification program.[1]

MEASURING PROGRESS

OUTPUTS
- Report on land use ordinance enforcement shortfalls, including a prioritized list of municipalities in need of assistance, and a list of land use ordinances that need increased enforcement effort
- Outreach campaign to municipal staff and boards on enforcement of regulations that protect water resources
- New Hampshire land use code certification program

OUTCOMES
- Better enforcement of critical regulations in priority areas

IMPLEMENTATION METRICS
- None

Critical Guidance

[1] Maine State Planning Office, 2010, Municipal Code Enforcement Training & Certification

Support efforts to increase capacity of regulatory agencies that implement the Piscataqua Region Comprehensive Conservation and Management Plan (CCMP)

WS-9

priority | *start* | *duration*
High | 2015 | Ongoing

Successful implementation of the CCMP requires the support, cooperation, and enforcement of environmental regulations by state environmental and natural resource agencies. Staff and budget cuts at these agencies greatly reduces the ability of these agencies to fulfill their role in the CCMP implementation. To improve the capacity and stability of these critical partners, work needs to be done to assess agency needs and secure funding and support where possible to increase agency capacity. Funding support may be received, in part, through advocacy to state policy makers to increase agency funding from state resources, foundations, or other federal agencies.

ACTIVITIES

1. Produce a PREP Partner Capacity Report that identifies and prioritizes state agency programs that lack capacity to implement key programmatic activities that support the PREP CCMP.
2. Encourage state legislators to increase state funding to increase capacity of programs identified in the PREP Partner Capacity Report.
3. Encourage state agencies to dedicate or pursue additional resources to increase capacity of programs identified in the PREP Partner Capacity Report.
4. Provide technical assistance to state agencies to apply for grants from foundations or federal sources to increase to increase capacity of programs identified in the PREP Partner Capacity Report.

MEASURING PROGRESS

OUTPUTS

- A PREP Partner Capacity Report
- Advocacy campaign to policy makers to increase funding for state agency programs that implement CCMP
- Advocacy campaign to state agency heads to increase funding for agency programs that implement CCMP

OUTCOMES

- Improved implementation of CCMP

IMPLEMENTATION METRICS

- None

Issues Addressed:
- All

Leads:
- PREP

Cooperators:
- NHDES
- MDEP
- NHFGD
- MDIFW
- MDMR

Funding:
- USEPA
- NHCF
- NOAA

APPENDIX A: CCMP DEVELOPMENT STAKEHOLDER PARTICIPATION LIST

Jeff Andrews, NHDES
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Mark Arenberg, Town of Rochester
Bobbi Atkinson Conservation Commission, Town of Eliot
Jeff Barnum, Coastal Conservation Association NH
Wendy Ryan, Beagen Marine Docents Program, University of NH
Hillary Behr, Natural Resources, University of NH
Christine Bennett Magruder, Great Works Regional Land Trust
Wallace Berg, Town of Greenland
Doug Bogen, Clean Water Action
Curtis Bohlen, Casco Bay Estuary Partnership NEP
Molly Bolster, Gundalow Company
Will Brewster, Spruce Creek Association
Dea Brickner-Wood, Great Bay Resource Protection Partnership
Peter Britz, City of Portsmouth
Jeannie Brochi, Region 1 US EPA
Dave Burdick, Jackson Estuarine Laboratory, University of NH
Steve Burns, Town of York
Gregg Caporossi, The Trust for Public Lands
Sonya Carlson, NHDES
Matt Carpenter, NH Fish and Game Department
Gillian Carter, Kittery Land Trust
Jodi Castallo, Mt. Agamenticus to the Sea
Lorie Chase, Cocheco River Watershed Coalition
Donald Clement, Exeter River Local Advisory Committee
Malin Clyde, COVERTS, UNH Cooperative Extension
Sue Cobler, Spruce Creek Watershed Improvement Program, Town of Kittery
Cathy Coletti, Coastal Program, NHDES
Cynthia Copeland, Strafford Regional Planning Commission
Mel Cote, Region 1, US EPA
Morgan Cottle, Natural Resources, University of NH
Steve Couture, Rivers Management & Protection Program, NHDES
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Dick Dumore, Public Service of New Hampshire
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Tom Fargo, Conservation Commission, City of Dover
Nancy Farron, Community Wellness Coalition (CWC) /KEYS Coalition
Chris Feurt, Wells National Estuarine Research Reserve
Amy Fitzpatrick, Pubic Health Division, MDMR
Sue Foote, Conservation Commission and Planning Board, Town of Seabrook
Phyllis Ford, Spruce Creek Association
Charlie French, Cooperative Extension, University of NH
Walter G. Fries, Southeast Watershed Alliance
Dave Funk, Great Bay Stewards
Patti Gentile, Exeter River Local Advisory Council
Dave Gentile, Exeter River Local Advisory Council
Charles Gilboy, Office of Carol Shea-Porter
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Beverly Hollingworth, NH Executive Council
James Houle, Stormwater Center, University of NH
Pam Hunt, Conservation, NH Audubon
Duane Hyde, The Nature Conservancy
Vanessa Jones, Conservation, NH Audubon
Steve Jones, Jackson Estuarine Laboratory, University of NH
Suzanne Kahn-Eder, Wells National Estuarine Research Reserve
Don Kale, Bureau of Land & Water Quality - Watershed Management, Maine DEP
Mitch Kalter, GB Trout Unlimited & Coastal Conservation Association of NH
Dave Kellam, Piscataqua Region Estuaries Partnership, University of NH
Rachel Kelly, Southern NH Regional Planning Commission
Daniel Kern, Bear-Paw Regional Greenways
Brandon Kernen, NH Geological Survey, NHDES
Cheryl Killam, Conservation Commission & Board of Selectman, Town of Raymond
Ray Konisky, The Nature Conservancy
Julie LaBranche, Rockingham Planning Commission
Peter Lamb, NH Charitable Foundation
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Jonathan Lockman, S. Maine Regional Planning Commission
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Jonathan Pennock, Marine Program, University of NH
Lorna Perry, Spruce Creek Organization
Dean Peschel, Public Works, City of Dover
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Linda Schier, Acton Wakefield Watersheds Alliance
Paul Schumacher, S. Maine Regional Planning Commission
Fred Short, Jackson Estuarine Lab, University of NH
Judy Silverberg, NH Fish and Game Department
Cliff Sinnott, Rockingham Planning Commission
Bruce Smith, Marine Division, NH Fish and Game Department
Tin Smith, Wells National Estuarine Research Reserve
Sally Soule, NHDES
Derek Sowers, Piscataqua Region Estuaries Partnership, University of NH
Michael Speltz, The Forest Society
Justine Stadler, NERR-SC, University of NH
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Amanda Stone, Cooperative Extension/NROC, University of NH
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Phil Trowbridge, Piscataqua Region Estuaries Partnership, NHDES
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Steve Walker, Beginning with Habitat, Maine Dept. of Inland Fisheries and Wildlife
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Connie Weeks, Eliot Conservation Commission
Larua Weit-Marcum, NH River Management and Protection Program, NHDES
Peter Wellenberger, NHFGD-Great Bay National Estuarine Research Reserve
Mark West, West Environmental Inc.
Nicole Whitney, UNH
Tom Willis, Public Works, City of Rochester
Jeffrey Winders, Conservation Commission, City of Rochester
Helen Winebaum, York Land Trust
Rob Wofchuck, Conservation Commission, Town of Brentwood
Matt Wood, NH Coastal Program, NHDES
Don Woodward, Exeter River Co-Op MHP
Mark Zankel, The Nature Conservancy
Deborah Zarta Gier, NHSC Inc.

APPENDIX B: REGULATORY MUNICIPAL PLANNING TARGETS FOR PREP MANAGEMENT PLAN

*Regulatory Municipal Planning Targets**

	Target Description	2020 Goal	Current Status	Implementation Mechanisms	CCMP Action Plans
R1	Municipalities have requirements for conservation subdivisions.	75% (39 towns)	25% (13 towns)	Zoning Ordinances, Subdivision Regulations	LU-1
R2	Municipalities have conservation overlay districts that include Conservation Focus Areas identified in "The Land Conservation Plan for New Hampshire's Coastal Watersheds" or the "Land Conservation Plan for Maine's Piscataqua Region Watersheds".	25% (13 towns)	2% (1 town)	Municipal Zoning Ordinances	LU-12
R3	Municipalities have designated "prime" or "significant" wetlands under NH/ME law, or have comparable local wetland protections.	75% (39 towns)	44% (23 towns)	Local Wetland Assessments, Prime Wetlands Designations (NH), Significant Wetlands (ME)	LU-8
R4	Municipalities have at least 75' wide shoreland buffer protections on first order streams and at least 100' on all second order and higher streams, rivers, ponds, and lakes.*	75% (39 towns)	17% (1st order) 13% (2nd+) 10% both (5 towns)	Municipal Zoning Ordinances	LU-4,LU-6, LU-10
R5	Municipalities have adopted fluvial erosion hazard (FEH) zone overlays and development restrictions.	25% (13 towns)	0%	FEH Studies/Maps, Zoning Ordinances	WR-35
R6	Municipalities have a cap of 10% effective impervious cover for new development in residentially zoned lots of 1 acre or more.***	50% (26 towns)	0%	Zoning Ordinances, Site Plan & Subdivision Regulations	LU-2, LU-4
R7	Municipalities require that Low Impact Development (LID) techniques are used to the maximum extent practicable for new development and redevelopment.**	75% (39 towns)	≈10% (5 towns)	Municipal Zoning/Building Codes, Site Plan & Subdivision Regulations	LU-2 LU-3
R8	Municipal stormwater management regulations reflect the minimum NHDES model ordinance design criteria for water quality volume/flow (WQV/WQF), groundwater recharge volume (GRV), and peak flow control. **	75% (39 towns)	≈8% (4 towns)	Stormwater Ordinance and/or Site Plan & Subdivision Regulations	LU-2
R9	Municipalities require at least 4 separate site inspections of development sites for compliance with stormwater/E&S requirements as recommended by NHDES model ordinance.**	75% (39 towns)	10% (5 towns)	Stormwater/E&S Ordinances and/or Site Plan & Subdivision Regulations	WR-15

** Based on minimum recommended buffer widths from the Center for Watershed Protection*
*** About 60% of towns are considered Phase II communities under the Clean Water Act.*
**** About 40% of towns exceed or will soon exceed 10% impervious cover.*

*Non-Regulatory Municipal Planning Targets**

	Target Description	2020 Goal	Current Status	Implementation Mechanisms	CCMP Action Plan
NR1	Municipalities have completed Natural Resource Inventories (NRIs).	100% (52 towns)	48% (25 towns)	Municipal Natural Resource Inventories	LU-1
NR2	New Hampshire municipalities have a Natural Resource Chapter in their Master Plan.	100% (52 towns	79% (41 towns)	Chapter in Municipal Master Plans	LU-1
NR3	Municipalities have conservation plans that include Conservation Focus Areas identified in "The Land Conservation Plan for New Hampshire's Coastal Watersheds" or the "Land Conservation Plan for Maine's Piscataqua Region Watersheds".	100% (52 towns)	69% have open space plans (CFA overlap unknown)	Municipal Open Space / Conservation Plans	LU-12
NR4	Municipalities have completed and adopted a drinking water source protection plan.	50% (26 towns)	12% (6 towns)	Sourcewater Protection Plans, Zoning Overlays, Land Acquisitions	LU-18
NR5	Municipalities have electronic maps of Natural Resource Inventory features and environmental zoning district overlays that are available to the public.	100% (52 towns)	56% (NRI) 23% (zoning overlays)	GIS Maps, Databases, Web-servers (Municipal and/or Central Repository	LU-1, LU-12

**Tables from Sowers D, 2010, Piscataqua Region Environmental Planning Assessment, Piscataqua Region Estuaries Partnership*

APPENDIX C: REFERENCES AND CRITICAL GUIDANCE

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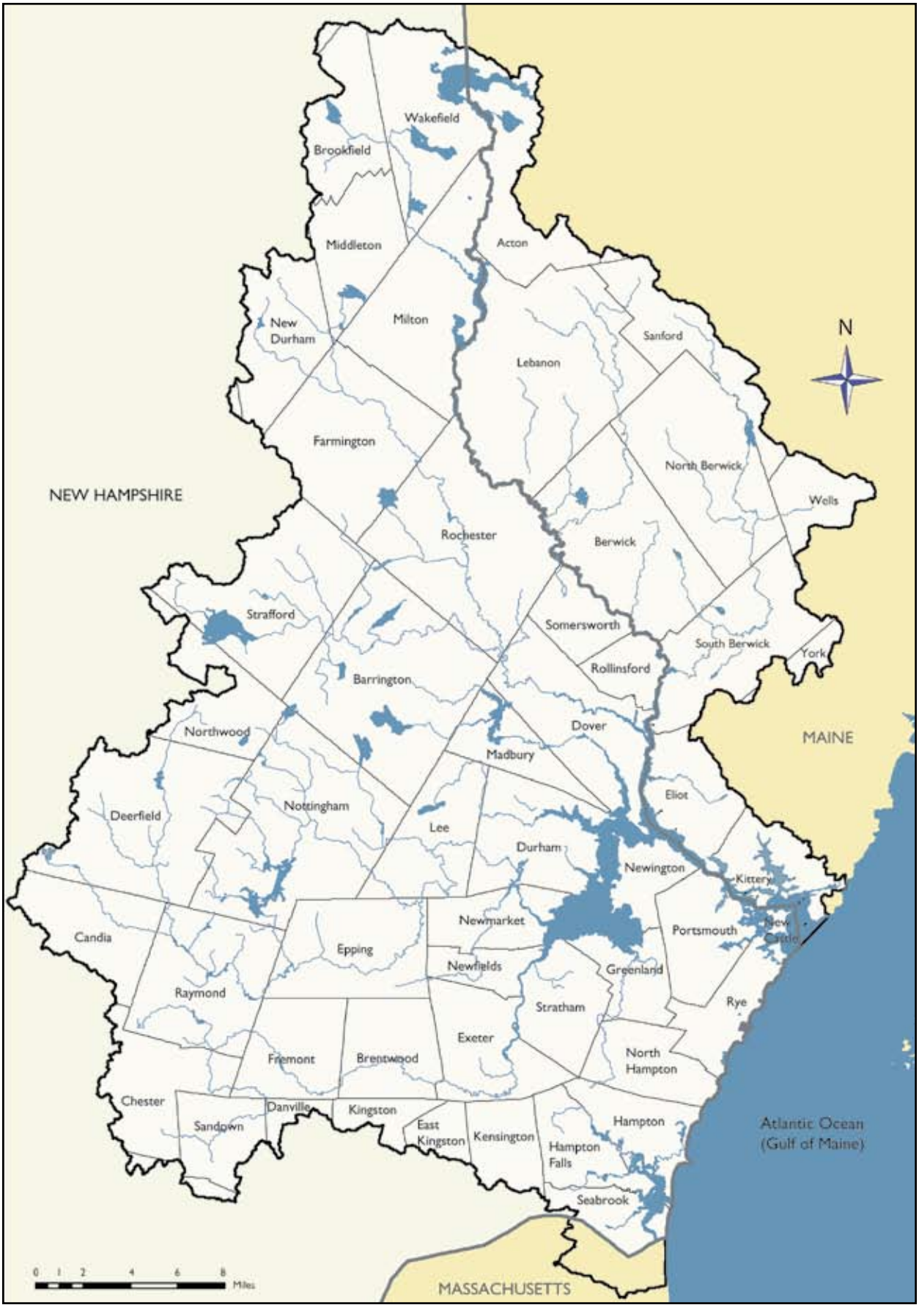
APPENDIX D: MAP OF THE PISCATAQUA REGION (PREP FOCUS AREA)



APPENDIX E - ACRONYMS AND ORGANIZATIONAL GROUPINGS USED IN THE CCMP

BwH = Maine Department of Inland Fisheries - Maine Beginning with Habitat

CCA-NH = Coastal Conservation Association - New Hampshire

CWIPP = Coastal Watershed Invasive Plant Partnership

EBTJV = Eastern Brook Trout Joint Venture

ERLAC = Exeter River Local Advisory Committee

FEMA = Federal Emergency Management Agency

GBCW = Great Bay Coast Watch

GBNWR = Great Bay National Wildlife Refuge

GOMC = Gulf of Maine Council

GWRLT = Great Works Regional Land Trust

HUD = U.S. Department of Housing and Urban Development

Land Protection Organizations = Land Trusts, Municipalities, NHFGD, TNC, TPL, Forest Society, etc

Lawncare Retailers = Businesses - Lawncare Retailersl

LTAC = Land Trust Accreditation Commission

LWCF = Land Water Conservation Fund

Maine CDC = Maine Center for Disease Control

Maine Department of Agriculture = Maine Dept. of Agriculture, Food and Rural Resources

Maine Department of Defense = Maine Department of Defense, Veterans & Emergency Management

MDEP = Maine Department of Environmental Protection

MDIFW = Maine Department of Inland Fisheries and Wildlife

MDMR = Maine Department of Marine Resources

MDMR-SM = Maine Department of Marine Resources-Shellfish Monitoring

MDOC = Maine Department of Conservation

MDOT = Maine Department of Transportation

MEACC = Maine Association of Conservation Commissions

MEVRMP = Maine Volunteer River Monitoring Program

MGS = Maine Geological Survey

MLUC = Maine Land Use Commission

MMISWG = Maine Marine Invasive Species Work Group

MSPO = Maine State Planning Office

MSTP = Maine Department of Environmental Protection - Maine Stream Team Program

MtA2C = Mount Agamenticus to the Sea Conservation Initiative

NEMO = Nonpoint Education for Municipal Officials

NEP = National Estuary Program

NERC = Northeast Recycling Council

NERR = National Estuarine Research Reserve

NERRS-SC = National Estuarine Research Reserve System Science Collaborative

NHACC = New Hampshire Association of Conservation Commissions

NHCAW = New Hampshire Coastal Adaptation Workgroup

NHCF = New Hampshire Charitable Foundation

NHDES = New Hampshire Department of Environmental Services

NHDES-WMB = NH Dept. of Environmental Services - Watershed Management Bureau

NHDES-WMD = NH Dept. of Environmental Services - Waste Management Division

NHDHHS = New Hampshire Department of Health and Human Services

NHDOS = New Hampshire Department of Safey

NHDOT = New Hampshire Department of Transportation

NHDPR = New Hampshire Department of Parks and Recreation

NHDRED = New Hampshire Department of Resources and Economic Development

NHFGD = New Hampshire Fish and Game Department

NHFGD - GBNERR = NHFGD - Great Bay National Estuarine Research Reserve

NHGS = New Hampshire Geological Survey

NHLGC = New Hampshire Local Government Center

NHOEP = New Hampshire Office of Energy and Planning

NHTOA = New Hampshire Timberland Owners Association

NHVRAP = New Hampshire Volunteer River Assessment Program

NMFS = National Marine Fisheries Service

NOAA = National Oceanic and Atmospheric Administration

NPDES = National Pollutant Discharge Elimination System

NRCC = Northeast Regional Climate Center

NRCS = Natural Resources Conservation Service (USDA)

NROC = Natural Resource Outreach Coalition

NSSP = National Shellfish Sanitation Program

PRC = Piscataqua River Cooperative

PREP = Piscataqua Region Estuaries Partnership

PREP-CTAP = Piscataqua Region Estuaries Partnership. Community Technical Assistance Program

PRISM = Program for International Shorebird Monitoring

PRNHE = Partnership to Restore New Hampshire's Estuaries

RCCD = Rockingham County Conservation District

RPC = Rockingham Planning Commission

RPCs = Regional Planning Commissions

SCCD = Strafford County Conservation District

SMRPC = Sourthern Maine Regional Planning Commission

SNHPC = Southern New Hampshire Planning Commission

SPNHF = Society for the Protection of New Hampshire Forests

SRPC = Strafford Regional Planning Commission

SSC = Seacoast Science Center

SWA = Southeast Watershed Alliance

SWOAM = Small Woodland Owners Association of Maine

THJ = The Jordan Institute

TNC = The Nature Conservancy

TPL = Trust for Public Lands

TU = Trout Unlimited

TU-GB = Great Bay Chapter of Trout Unlimited

UM-CE = University of Maine Cooperative Extension

UME = University of Maine

UNH = University of New Hampshire

UNH-CE = University of New Hampshire - Cooperative Extension

UNH-CSRC = University of New Hampshire - Complex Systems Research Center

UNH-DNR = University of New Hampshire - Department of Natural Resources

UNH-EOS = University of New Hampshire, Institute for the Study of Earth, Oceans, & Space

UNH-ERG = University of New Hampshire - Environmental Research Group

UNH-GRANIT = University of NH - Geographically Referenced Analysis & Information Transfer System

UNH-JEL = University of New Hampshire - Jackson Estuarine Laboratory

UNH-Marine Program = University of New Hampshire - Marine Program

UNH-NHSG = University of New Hampshire - New Hampshire Sea Grant

UNH-SC = University of New Hampshire - Stormwater Center

USACOE = United States Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

USFDA = US Food and Drug Administration

USFWS = U.S. Fish and Wildlife Service

USGS = United States Geological Survey

USM = University of Southern Maine

Watershed Organizations = Watershed Organizations

Wells NERR = Wells National Estuarine Research Reserve

WWTFs = Wastewater Treatment Facities

YCSWCD = York County Soil and Water Conservation District

APPENDIX F – MATRIX OF MANAGEMENT OBJECTIVES AND ACTIONS

I = Implementation Metric Defined, X= No Implementation Metric Defined Blank = Action plan does not address objective	TOTAL # OF APs	WR-1	WR-2	WR-3	WR-4	WR-5	WR-6	WR-7	WR-8	WR-9	WR-10	WR-11
Objective WR 1.1 - Improve water quality and identify and mitigate pollution sources so that additional estuarine areas meet water quality standards for bacteria for shellfish harvesting.	26	I		X	I	X	X	I	I			
Objective WR 1.2 - Minimize coastal beach closures due to failure to meet water quality standards for bacteria in the estuaries and the ocean.	22	I			I	X		I		X		
Objective WR 1.3 - Reduce nutrient loads to the estuaries and the ocean so that adverse, nutrient-related effects do not occur.	34	I			I	X	X	I	I	X	X	I
Objective WR 1.4 - Reduce sediment loads to the estuaries and the ocean so that adverse, sediment-related effects do not occur.	24					X						I
Objective WR 1.5 - Monitor and reduce loading of toxic contaminants and emerging contaminants to the estuaries and the ocean.	30	I	X	X	I	X	X	I		X		I
Objective WR 1.6 - Improve the water quality in streams, rivers, lakes and groundwater to support recreation, aquatic life, and drinking water throughout the watersheds and maintain high quality fresh waters at 2010 conditions.	56	I	X	X	I	X	X	I	I	X	X	I
Objective WR 2.1 - Maintain instream flows and groundwater levels that support aquatic life and recreation, human populations, and the hydrologic integrity of coastal streams and rivers.	23											
Objective WR 2.2 - Minimize catastrophic flooding risks due to development and climate change, and restore or maintain geomorphologic balance in river and stream systems.	29											
Objective LR 1.1 - Increase the abundance of adult oysters at the six documented beds in the Great Bay Estuary to 10 million oysters and restore 20 acres of oyster reef habitat by 2020.	33		X	X					I	X	X	
Objective LR 1.2 - Increase the number of adult clams in the Hampton-Seabrook Estuary to 5.5 million clams by 2020.	32	I	X	X	I	X	X	I				I
Objective LR 1.3 - Increase the areal extent of eelgrass cover to 2900 acres and restore connectivity of eelgrass beds throughout the Great Bay Estuary by 2020.	54	I	X	X	I	X	X	I	I	X	X	I
Objective LR 1.4 - Restore native diadromous fish access to 50% of their historical mainstem river distribution range by 2020, and improve habitat conditions encountered throughout their life cycle.	14											
Objective LR 1.5 - Document existing populations of native Eastern brook trout and protect or restore the integrity of the sub-watersheds that support them.	30											
Objective LR 1.6 - Maintain a stable and diverse population of shorebirds and saltmarsh breeding birds in Piscataqua region estuaries.	29	I	X				X	I				
Objective LR 1.7 - Inventory, evaluate and restore natural vegetative buffers along degraded reaches of tidal shorelands, riparian zones of all stream orders, and wetlands.	32					X						I
Objective LR 1.8 - Identify and address stream and shoreline modifications that have significant negative impacts on the physical, chemical, or biological integrity of waterways.	29											
Objective LR 1.9 - Identify vulnerabilities of upland and aquatic habitats to anticipated climate change impacts and take appropriate actions to mitigate or adapt to impacts.	18											
Objective LR 1.10 - Restore or enhance an additional 300 acres of salt marsh by 2020 through removal of tidal restrictions or invasive species management.	11											
Objective LR 1.11 - Monitor and control the extent of invasive nuisance species throughout the Piscataqua region watershed and estuaries.	10											
Objective LR 1.12 - Minimize impacts to benthic habitat from direct alterations to submerged lands.	8											
Objective LR 1.13 - Restore degraded natural freshwater wetlands and priority upland habitats.	8											
Objective LR 1.14 - Improve implementation capacity for restoration projects.	5											
Objective LU 1.1 - Promote sustainable land use practices in both new development and redevelopment of existing sites.	22					X						I
Objective LU 1.2 - Promote regional strategies for consistent use of ecologically protective planning, regulation, development and enforcement standards.	32					X						
Objective LU 2.1 - Protect floodplains, wetlands, shorelands and associated fluvial erosion hazard zones to maintain their function and value.	26											
Objective LU 2.2 – Promote improved protections for low order streams.	12											
Objective LU 3.1 - Implement the Land Conservation Plan for New Hampshire's Coastal Watersheds and Land Conservation Plan for Maine's Piscataqua Region Watersheds and protect 75% of lands identified as Conservation Focus Areas by 2025.	8											
Objective LU 3.2 - Implement strategies from the NH Wildlife Action Plan, NH Wildlife Connectivity Model and Maine's Beginning with Habitat Program to protect and manage key species at risk and critical habitats identified in those plans.	23											
Objective LU 3.3 – Support land stewardship and land management actions for conservation lands and key areas that maximize quality habitat and watershed services.	14											
Objective LU 3.4 - Protect the quality and quantity of current and future drinking water supplies through land protection and land use regulation.	14											
Objective WS 1.1 - Promote the use of economic valuation of ecosystem services and functions by coastal watershed decision-makers.	1											
Objective WS 1.2 - Provide access to science-based information about Piscataqua region estuaries and watersheds to coastal watershed decision-makers.	9											
Objective WS 1.3 - Improve state and local capacity to enforce measures that protect and restore aquatic habitats in PREP focus area.	6											

	VR-12	VR-13	VR-14	VR-15	VR-16	VR-17	VR-18	VR-19	VR-20	VR-21	VR-22	VR-23	VR-24	VR-25	VR-26	VR-27	VR-28	VR-29	VR-30	VR-31	VR-32	VR-33	VR-34	VR-35	LR-1	LR-2	LR-3	LR-4	LR-5	LR-6	LR-7	LR-8	LR-9	LR-10	LR-11
Obj. WR 1.1	I	I	X								X		X		X										I	I	I						I		
Obj. WR 1.2	I	I											X	X	X									X											
Obj. WR 1.3	I	I	X									X	X	X	X									X	I		I						I	I	
Obj. WR 1.4			X	I	X		I							X	X							I		X											
Obj. WR 1.5			X			I		X	I	X	X		X	X		X					X			X									I		
Obj. WR 1.6	I	I	X	I	X	I	I	X	I	X	X	X	X	X	X	X	X	X		X	X	I		X	I								I	I	
Obj. WR 2.1																	X	X	X	X	X		X	X					X				I	I	
Obj. WR 2.2																				X		I	X	X					X				I	I	
Obj. LR 1.1			X	I	X	I		X	I	X	X		X												I		I								
Obj. LR 1.2			X	I		I		X	I			X	X	X										X		I									
Obj. LR 1.3	I	I	X	I	X			X	I			X	X	X	X									X			I		X				I	I	I
Obj. LR 1.4								X	I								X	X		X		I	X	X				I	X				I	I	I
Obj. LR 1.5								X	I								X	X		X		I	X	X				I	X	I			I	I	I
Obj. LR 1.6			X																												X	I	I	I	
Obj. LR 1.7			X	I	X																		X										I	I	
Obj. LR 1.8				I	X															X		I	X	X									I	I	I
Obj. LR 1.9																				X		I	X	X											
Obj. LR 1.10																				X				X											
Obj. LR 1.11																																			
Obj. LR 1.12				I	X																														
Obj. LR 1.13																																			
Obj. LR 1.14																																			
Obj. LU 1.1		I		I																			X												
Obj. LU 1.2			X	I	X		I	X	I	X		X	X				X	X		X	X		X	X					X						I
Obj. LU 2.1																				X		I	X	X									I	I	
Obj. LU 2.2																												I					I		
Obj. LU 3.1																																			
Obj. LU 3.2																									I	I	I	I	X	I	X	I	I	I	
Obj. LU 3.3																																			
Obj. LU 3.4																			X		X			X											
Obj. WS 1.1																																			
Obj. WS 1.2																																			
Obj. WS 1.3			X																																

	LR-12	LR-13	LR-14	LR-15	LR-16	LR-17	LR-18	LR-19	LR-20	LR-21	LU-1	LU-2	LU-3	LU-4	LU-5	LU-6	LU-7	LU-8	LU-9	LU-10	LU-11	LU-12	LU-13	LU-14	LU-15	LU-16	LU-17	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	WS-8	WS-9
Obj. WR 1.1											I	I			X								X							I	I	X			X	X
Obj. WR 1.2											I	I			X	I														I		X		X	X	X
Obj. WR 1.3											I	I	I	I	X	I				I										I	I	X		X	X	X
Obj. WR 1.4											I	I	I	I	X					I			X	I						I	I	X		X	X	X
Obj. WR 1.5											I	I	I	I	X	I																X		X	X	X
Obj. WR 1.6			I							X	I	I	I	I	X	I		I		I			X	I			I			I	I	X		X	X	X
Obj. WR 2.1	I	I	I									I		I		I	X			I			X				I					X			X	X
Obj. WR 2.2	I	I	I								I	I	I	I	X	I	X	I		I	X	I	X	I						I	I	X		X	X	X
Obj. LR 1.1			I		I	X	I	X	X	X	I					I							X	I						I		X	X	X	X	X
Obj. LR 1.2			I		I	X			X	X	I				X	I										X						X	X	X	X	X
Obj. LR 1.3	I		I		I	X	I	X	X	X	I	I	I	I	X	I	X	I	X	I			X			X				I		X	X	X	X	X
Obj. LR 1.4			I																																	
Obj. LR 1.5				X					X	X				I		I	X			I			X		X	X				I	I	X	X		X	X
Obj. LR 1.6			I	X	I			X	X	X	I					I	X	I	X		X	I	X	I	X	X						X	X		X	X
Obj. LR 1.7		I		X				X	X		I	I	I	I		I	X	I		I	X	I	X	I	X	X				I	I	X			X	X
Obj. LR 1.8	I	I	I			X			X	X	I			I		I	X	I	X	I	X	I	X	I								X			X	X
Obj. LR 1.9	I	I	I	X	I				X	X							X						X							I	I	X			X	X
Obj. LR 1.10			I	X				X	X	X							X															X			X	X
Obj. LR 1.11				X	I			X	X	X													X		X	X						X				X
Obj. LR 1.12						X	I																							I		X			X	X
Obj. LR 1.13				X					X	X									X							X						X			X	X
Obj. LR 1.14									X	X																						X			X	X
Obj. LU 1.1	I	I									I	I	I	I		I		I	X	I							I			I	I	X		X	X	X
Obj. LU 1.2	I	I			I											I	X	I	X	I		I								I		X		X	X	X
Obj. LU 2.1	I	I	I	X							I	I		I		I	X	I	X	I	X	I	X	I	X							X			X	X
Obj. LU 2.2														I		I				I			X							I	I	X			X	X
Obj. LU 3.1																					X	I	X	I			I			I		X				X
Obj. LU 3.2		I		X				X													X	I	X	I	X	X				I		X				X
Obj. LU 3.3														I		I	X			I	X		X		X	X	I			I	I	X			X	X
Obj. LU 3.4														I		I	X						X	I			I			I	I	X			X	X
Obj. WS 1.1																													X							
Obj. WS 1.2																												I	X	I	I	X	X	X	X	X
Obj. WS 1.3																														I		I		I	I	I

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PISCATAQUA REGION
Estuaries
Partnership



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