BARRINGTON-PALMER-WARREN RIVERS WATERSHED PLAN

Barrington, Bristol, East Providence, and Warren, RI
Rehoboth, Seekonk, and Swansea, MA

November 2012

Table of Contents

List of Figures

List of Tables

Appendices

Appendix A: Detailed Watershed Maps

A-1: Detailed Base Map for the BPW Watershed

A-2: Detailed Land Use map for the BPW Watershed

A-3: Potential Nonpoint Agricultural Sources within the Limits of the Palmer and Kickemuit River Watersheds

Appendix B: Water Quality Summaries

B-1: Data Summary for the Runnins River

B-2: Data Summary for the Barrington River

B-3: Data Summary for the Palmer River

B-4: Data Summary for the Warren River

Appendix C: Public Meetings and Response to Public Comments

C-1: Summary of the Public Meeting for the DRAFT BPW Watershed Plan

C-2: Summary of Public Comments Received for the DRAFT BPW Watershed Plan

C-3: Action Item Handouts for the Prioritization Group Exercise at the Public Meetings in May 2012

Acknowledgements:

FB Environmental Associates of Portland, Maine was the US EPA contractor responsible for working with RIDEM in the development of this Plan. Staff of the RIDEM Office of Water Resources Nonpoint Source and TMDL Programs supervised and contributed to the development of this Plan.

Photos provided by:
Barrington Land Conservation Trust; Betsy Dake; Bernadette DeBlander; Butch Lombardi; City of East Providence; Planning Department; FB Environmental; Flickr; Gocapecod.org; hearldnews.com; John Foraste; RI NRCS; RIDEM; Town of Bristol; Town of Seekonk; University of Vermont.

A. Executive Summary

i. Project Overview

Development of a **watershed-based plan** is a key step in watershed management, leading to restoration of polluted or otherwise impaired waterbodies and protection for unpolluted waterbodies. Their strength lies in addressing specific sources of pollution, especially **nonpoint sources**, with the ultimate goal of reducing or removing the pollutants, so the waterbodies can meet their **water quality standards.** At the same time, other environmental resource issues within the watershed can be addressed to protect the long-term health of the watershed.

Watershed – is the total area of land where all the water that is under it or drains off it goes to the same waterbody. Topography is the key element to establishing watershed boundaries.

Watershed-Based Plan – is a strategy and a work plan for achieving water resource goals in a watershed. It includes a description of the existing water quality conditions, identifies and prioritizes problems, and outlines what needs to be done to restore and protect the water resources.

Nonpoint Source Pollution – is polluted runoff that cannot be traced to a single origin, but accumulates from overland flow from many small, dispersed watershed sources.

Water Quality Standards– define the goals for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect waterbodies from pollutants. **Designated uses** for a specific waterbody can include drinking water supply, habitat for fish and wildlife (known as aquatic life uses), recreation (swimming and boating), fish consumption, and shellfish consumption.

This plan for the Barrington-Palmer-Warren Rivers watershed was developed using a watershed approach, which organizes a study area based on natural drainage divides rather than municipal or state boundaries. Using a watershed approach to restore or protect a waterbody is beneficial because it addresses problems in a holistic manner. Planning encompassed a broad array of stakeholders from Rhode Island and Massachusetts, including municipalities, non-profit and conservation organizations, and state agencies. Through a series of meetings, stakeholders had the opportunity to provide input in the development of this plan. The development of the plan is the result of collaboration among these groups and the U.S. Environmental Protection Agency (USEPA), Rhode Island Department of Environmental Management (RIDEM), Massachusetts Department of Environmental Protection (MADEP), and local citizens. Collaboration among these groups was crucial in characterizing existing watershed conditions, identifying and prioritizing problems, and recommending management solutions. The following statement captures the vision and goals expressed throughout the public process:

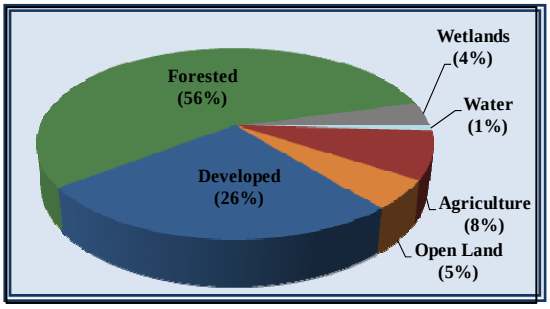
> *"Residents of the Barrington-Palmer-Warren Rivers Watershed recognize that good stewardship of water is essential for the long-term vitality of the community. The water resources in the watershed are a central feature of the landscape and provide quality drinking water, habitat for wildlife and waterfowl, recreation opportunities such as swimming, birding, and boating, and economic activities such as shellfishing and tourism. It is important to protect and restore the quality of these waters for these uses, while maintaining the rural character of much of the*

watershed and allowing for the sustainable development of other areas to enhance economic progress in the watershed."

ii. Watershed Planning Area Description

The Barrington-Palmer-Warren Rivers (BPW) watershed is located in southeastern Massachusetts and eastern Rhode Island, and it is one of 24 watershed planning areas in RI designated by RIDEM. The majority of the watershed is in Massachusetts (85%), including parts of the towns of Rehoboth, Seekonk, and Swansea. In Rhode Island, the watershed includes portions of the municipalities of Barrington, East Providence, Warren, and Bristol. The major waterbodies include the Runnins, Palmer, Barrington, and Warren Rivers. The BPW watershed ultimately discharges to Upper Narragansett Bay and use within the watershed is highly varied, including developed, forested, agriculture, open lands, and wetlands.

The Barrington River



Land Use in the BPW Watershed

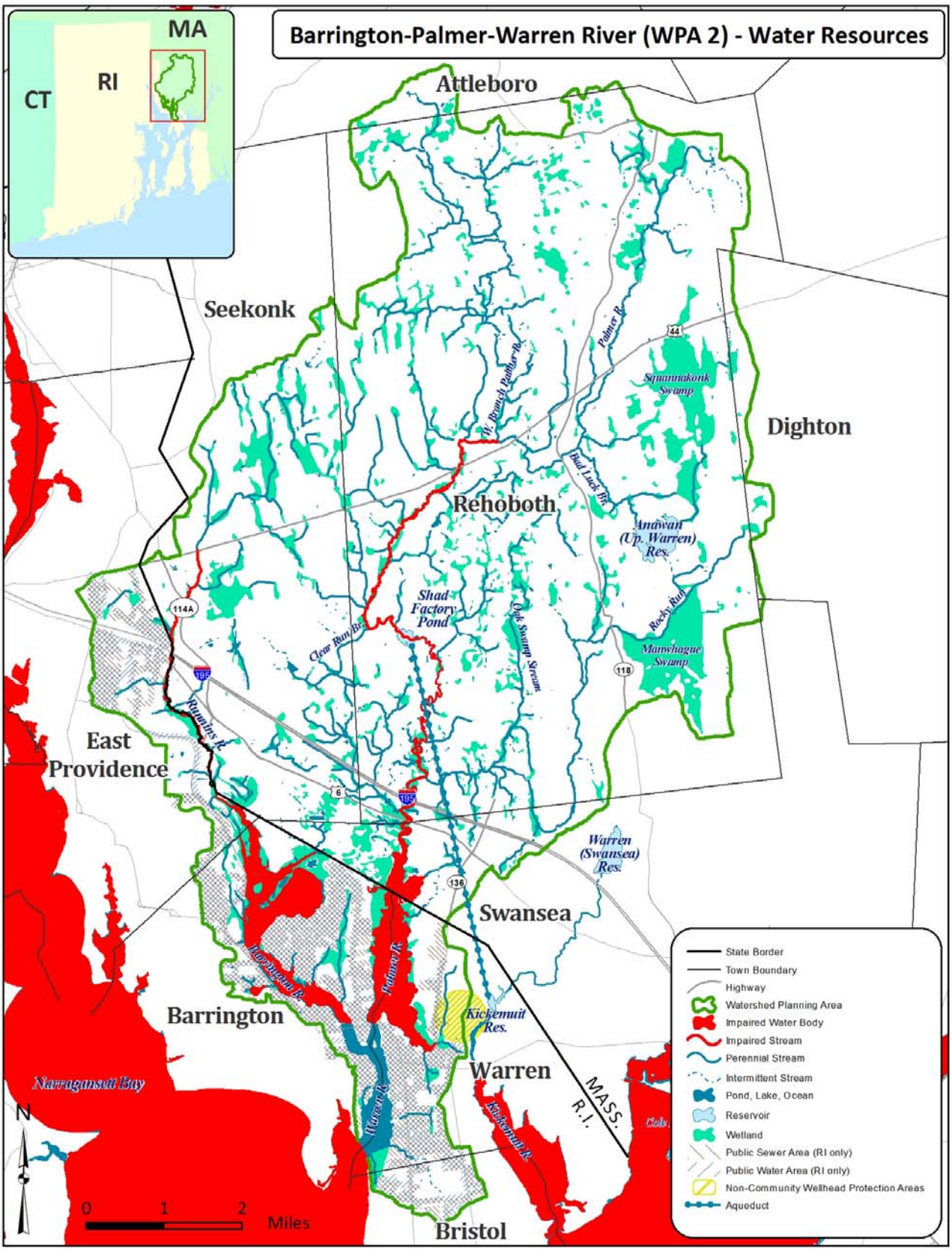
iii. Existing Water Quality Conditions and Other Concerns in the BPW Watershed

Under the Federal Clean Water Act, all waterbodies have been assigned a classification defined by the designated uses which it is intended to protect. Waterbodies that do not meet their Water Quality Standards (designated uses and the criteria to protect those uses) are considered impaired and placed on the state's List of Impaired Waters, known as the 303(d) List. This list identifies the impaired waterbodies and provides a scheduled time frame for development of water quality restoration plans, also known as **Total Maximum Daily Loads** (TMDLs). The TMDL describes the water quality impairments and identifies the measures needed to restore water quality. The goal is to set the pollutant reductions needed for all waterbodies to comply with the state's water quality standards.

Total Maximum Daily Load (TMDL) – represents the total amount of a pollutant (e.g. bacteria, nutrients) that a waterbody can receive while still meeting water quality standards. A TMDL must be developed for all waterbodies on the state's 303(d) List

In the BPW watershed, multiple waterbodies are considered impaired and are listed on Rhode Island and Massachusetts's 303(d) lists (see Figure A-i). Although the BPW watershed has a few point sources of pollution (e.g., wastewater treatment plants), its impairments mostly stem from nonpoint sources of

Figure A-i: Barrington-Palmer Warren River Water Resources



pollution[1]. TMDLs and monitoring data have documented that these include urban stormwater (polluted runoff), malfunctioning onsite wastewater treatment systems, agricultural runoff, and wildlife waste. Sediments entering surface waters from stormwater and agricultural runoff have documented impacts on aquatic life and stream condition, especially from activities that disturb soil such as construction and plowing. These pollution sources and the resulting water quality are directly related to priority issues identified by stakeholders, including compromised drinking water supplies, shellfish bed and beach closures, protecting fish and wildlife habitat, and maintaining the cultural identity and character of the watershed.

Table A-i: BPW Watershed Shellfish Harvesting Closures (RIDEM, 2011a) and Beach Closures (HEALTH, 2011)

Waterbody	Shellfish Area Closure	Beach Closures
Runnins River	--	--
Barrington River	Growing Area 2-1 (prohibited)	--
Palmer River	Growing Area 2-1 (prohibited)	--
Warren River	--	Warren Town Beach (21 beach closures since 2006)

iv. The BPW Watershed Action Plan – Restoration and Protection

TMDLs identify the pollutant reductions needed to restore waterbodies to meeting water quality standards, but achieving those reductions often requires many steps. This plan includes a discussion of water quality conditions and recommends a variety of actions, referred to as Best Management Practices (BMPs**)** that include specific improvements, primarily in the areas of stormwater management, onsite wastewater management, and low impact development. The plan also outlines responsible parties and approximate costs for priority actions, lists potential funding sources, and provides examples of successful similar efforts. While recommendations are most detailed for the Rhode Island portion of the watershed, the plan offers opportunities for communities in both states to work together on common priorities.

The complete BPW Watershed Plan is available online at:

http://www.dem.ri.gov/programs/benviron/water/quality/index.htm

[1] Stormwater is considered in this plan a nonpoint source of pollution. However, as described later in this plan, municipalities are subject to point source permitting programs for managing stormwater in urban areas since once stormwater is collected in a conveyance system, it is discharged to surface waters as a "point source."

1. Introduction

1.1 Purpose of the Plan

Development of a watershed-based plan is a key step in watershed management, leading to restoration of polluted or otherwise impaired waterbodies and protection for unpolluted waterbodies. A watershed-based plan describes the environmental impairments of a waterbody, due to conditions in the surrounding watershed, and indicates steps that can be taken to improve, restore, and protect the waterbody. The plan's strength lies in addressing specific sources of pollution, especially nonpoint sources, with the ultimate goal of reducing or removing the pollutants so the waterbodies can meet their water quality standards. At the same time, other environmental resource issues within the watershed can be addressed to protect the long-term health of the watershed.

A watershed-based plan describes the environmental impairments of a waterbody due to conditions in the surrounding watershed, and indicates steps that can be taken to improve, restore, and protect the waterbody. This document is a plan for restoration and protection of the BPW watershed that outlines actions needed to meet established water quality goals and objectives. Long-term management and financing options for water quality improvement are discussed. This plan is intended as a guide for the Rhode Island and Massachusetts municipalities and stakeholder groups within the BPW watershed. Much has already been accomplished by all levels of government, private groups and individuals to protect and restore water quality. But to no one's surprise, more needs to be done. Building a strong, lasting base of stakeholder commitment is crucial in order to take action when opportunities arise. Regular review and updates to this watershed plan will be necessary to account for progress made in the watershed, as well as new goals as they are identified.

Watershed – is the total area of land where all the water that is under it or drains off it goes to the same waterbody. Topography is the key element to establishing watershed boundaries.

Watershed-Based Plan – is a strategy and a work plan for achieving water resource goals in a watershed. It includes a description of the existing water quality conditions, identifies and prioritizes problems, and outlines what needs to be done to restore and protect the water resources.

Nonpoint Source Pollution – is polluted runoff that cannot be traced to a single origin, but accumulates from overland flow from many small, dispersed watershed sources.

Water Quality Standards– define the goals for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect waterbodies from pollutants. **Designated uses** for a specific waterbody can include drinking water supply, habitat for fish and wildlife (known as aquatic life uses), recreation (swimming and boating), fish consumption, and shellfish consumption.

1.2 How was the Plan Developed?

The Warren River near the confluence of the Barrington and Palmer Rivers

This plan was developed using a watershed approach, which organizes the study area based on natural drainage divides where practicable, rather than municipal or state boundaries. As a result, this watershed planning area encompasses a broad array of stakeholders from two states, several towns, many non-profit organizations, and various state agencies. The development of this plan is the result of collaboration between the US Environmental Protection Agency (USEPA), Rhode Island Department of Environmental Management (RIDEM), Massachusetts Department of Environmental Protection (MADEP), local municipalities, non-governmental organizations, watershed associations, and local citizens. Their collaboration was crucial in characterizing existing conditions, identifying and prioritizing problems, and selecting management strategies to solve problems in the watershed. A series of meetings provided a forum to all stakeholders to provide input in the development of this plan, and these efforts are outlined in **Section 6**.

1.3 Watershed Vision and Goals

As part of the watershed planning process, it is important to collect the ideas and priorities of local stakeholders when establishing guiding principles for future management activities. The following statement is based on meetings with local stakeholders in the watershed and suggests an overall vision for the future of the BPW watershed.

> *"Residents of the Barrington-Palmer-Warren Rivers Watershed recognize that good stewardship of water is essential for the long-term vitality of the community. The water resources in the watershed are a central feature of the landscape and provide quality drinking water, habitat for wildlife and waterfowl, recreation opportunities such as swimming, birding, and boating, and economic activities such as shellfishing and tourism. It is important to protect the quality of these waters for these uses, while maintaining the rural character of much of the watershed and allowing for the sustainable development of other areas to enhance economic progress in the watershed."*

1.4 Compelling Issues in the BPW Watershed

Management of water resources should focus on issues central to the long-term vision of the watershed. In the BPW watershed, these issues include protecting drinking water sources, reducing closures of shellfish beds and beaches, protecting fish and wildlife habitat, maintaining the cultural identity of the watershed, and managing the impacts of population growth. Watershed boundaries often span multiple municipal and state borders which can result in difficulties in recognizing this vision. Interstate and inter-municipal cooperation is essential to protect and restore water quality within watershed boundaries.

1.4.1 Protecting Drinking Water Sources

Residents in Bristol, Barrington, and Warren are provided public water from the Bristol County Water Authority, which receives its water supply primarily from the Scituate Reservoir in Scituate, RI. These residents may also receive water from four separate reservoirs maintained by the Water Authority. In this system, water from Anawan Reservoir flows into Shad Factory Pond in Rehoboth and then a portion of this water is piped outside of the watershed to the Kickemuit Reservoir in Warren, which also receives flow from the Swansea Reservoir in Swansea. Water from the Kickemuit Reservoir is then treated for distribution. Due to the poor quality and insufficient quantity of drinking water, and need for rehabilitation of the aging BCWA water treatment plant, statewide approval and funding was provided for construction of the cross bay pipeline bringing Scituate Reservoir water to the East Bay communities of East Providence, Warren, Barrington, and Bristol beginning in December 1998.

The Kickemuit Reservoir is currently not meeting water quality standards due to high levels of phosphorus and bacteria. Restoring and protecting the quantity and the quality of the Kickemuit Reservoir now will ensure its suitability as a drinking water source in the future.

The Swansea Water District recently finished an $18 million dollar brackish seawater desalination plant that will use Palmer River estuary as the source for drinking water. The project received $1.15 million from the state revolving fund program through the Massachusetts Department of Environmental Protection. The desalination plant is vital to the Swansea Water District because the District has experienced chronic water shortages with demand often outstripping supply, especially during the summer months. The plant itself is complete, but it is not yet fully operational. A pipeline will carry approximately four million gallons per day of brackish water from the Palmer River to the plant. The desalination plant is expected to be fully operational in early 2013.

Once in operation, the desalination plant will produce 1.2 million gallons of drinking water and return 2.8 million gallons of reject water daily to the Palmer River. The raw brackish water from the Palmer River will be pretreated with membrane filtration, followed by reverse osmosis. Brackish water will be withdrawn from the Palmer River at low tide when salinity levels are low and will discharge the reject water at high tide. The Swansea Water District's desalination plant will eventually serve a regional capacity, which could help nearby towns, such as Rehoboth, that do not currently have a water treatment facility. Protecting the water quality of the Palmer River now will ensure its continued suitability as a drinking water source in the future.

1.4.2 Reducing Shellfish Bed Closures

In New England, shellfish such as clams, quahogs, oysters, and mussels are an important economic resource. However, many areas historically harvested for shellfish currently suffer from the impacts of water pollution and are closed to the harvest of shellfish. As shellfish are filter-feeders, many pollutants, including bacteria, viruses, and toxic compounds may become concentrated in the shellfish. In Rhode Island, the RIDEM Office of Water Resources Shellfish Monitoring Program is responsible for ensuring

waters designated for shellfish consumption meet the water quality standards for this use. In the BPW watershed, many waterbodies historically used for shellfishing are currently closed on either a permanent, seasonal, or conditional basis. Improving the water quality in these waters could result in a re-opening of these shellfish beds, providing a sustainable economic resource to the residents of the BPW watershed. More information on shellfish closures and the Shellfish Monitoring Program can be found in **Sections 3** and **6**.

Historic image of a Conservation Officer checking the shellfish harvest

1.4.3 Reducing Beach Closures

Beaches in the watershed attract both local residents and tourists. However, poor water quality has resulted in the closing of beaches to swimming in the watershed for several days at a time every year. The Rhode Island Department of Health (HEALTH) oversees water quality monitoring at all public beaches and is responsible for closing beaches if water quality fails to meet the water quality standards for primary contact recreation (swimming). In the BPW watershed, there have been 21 beach closures at the Warren Town Beach since 2006 (see **Appendix B**, Table B-6). Improving the water quality in these waters would prevent or limit beach closures, which would encourage more residents and tourists to visit the beaches each year. More information on beach closures and the HEALTH Monitoring Program can be found in **Section 6**.

1.4.4 Protecting Fish and Wildlife Habitat

Habitat for native fish and wildlife becomes degraded as pollution increases from development and agriculture. Threats include loss of habitat due to erosion and sedimentation in waterbodies, removal of natural vegetation which buffers streams, changes to the pH and temperature of streams, reduced streamflow resulting from decreased infiltration of precipitation and increased runoff, disconnection of natural fish habitat due to the presence of dams, and the cumulative effects of harmful pollutants such as pesticides and other toxic substances. All waters of the state are designated for fish and wildlife habitat, commonly referred to as aquatic life use. Improving the water quality to protect this designated use will improve opportunities for fishing and wildlife viewing, encourage other outdoor recreation in the watershed, and ensure there is adequate habitat for wildlife.

1.4.5 Maintaining the Cultural Identity of the Watershed

Aquatic resources and natural lands within the BPW watershed play a key role in defining residents' cultural identity and provide a vital link to the region's history. For generations, residents have relied on water resources for their livelihood, including shellfishing, fishing, agriculture, and more recently, to drive industrial and economic development. Despite the increased development of the past century, the

watershed maintains a rural character that many residents wish to protect. By restoring and protecting the water quality of waterbodies in the BPW watershed, residents can re-establish this identity and maintain it for future generations.

1.4.6 Managing the Impacts of Population Growth

Currently, the Rhode Island communities in the BPW watershed are more developed than the Massachusetts communities. However, population growth in Rehoboth, Seekonk, and Swansea, MA has increased in the past 30 years, while growth in the Rhode Island communities has slowed or decreased as most of these communities are at or near capacity. Rehoboth, MA has the greatest potential for growth over the next decade as it has more additional capacity than other towns in the watershed. Managing the impacts of for this population growth in Massachusetts through the regulation of new developments is essential to protect water quality. In Rhode Island, though population growth has slowed, there is potential for property re-development. Properly managing re-development projects in the more developed portions of the watershed will also be an important step to protect the quality of the waters in the BPW watershed.

1.5 How to Use the Plan

This watershed plan is designed to provide municipalities and other stakeholders with the information and resources necessary to work together or individually to protect and restore waterbodies in the BPW watershed. This plan is organized as follows:

- **Section 2: Watershed Description**

  This section provides a description of the BPW watershed, including major waterbodies and land uses.

- **Section 3: Water Quality**

  This section provides a summary of the water quality of the waterbodies in the BPW watershed including identification of which waterbodies are not meeting water quality standards. Shellfish closures are discussed in detail in this section.

- **Section 4: Current Activities in the BPW Watershed to Restore and Protect Water Quality**

  This section provides a summary of current activities being conducted by municipalities to restore and protect water resources in the BPW watershed. This section includes a summary of the stormwater, onsite wastewater treatment system, and land development programs in Rhode Island and Massachusetts and detailed summaries and evaluations of these programs in all municipalities in the BPW watershed.

- **Section 5: Actions to Restore and Protect Water Quality**

  This section provides an action plan for restoration and protection of waterbodies in the BPW watershed at the watershed, municipal, and individual level. Each action identified includes a responsible party, suggested timeframe, and rough approximation of cost.

- **Section 6: Implementation Tools**

  This section provides a series of tools for stakeholders to implement the actions proposed in Section 5. These tools include a summary of funding sources, public involvement, current water quality monitoring efforts in the watershed, and indicators of progress to assess the success of actions taken towards restoration and protection.

- **Section 7: List of Relevant Plans**

  This section provides links to relevant plans, documents, and studies that have been completed in the BPW watershed.

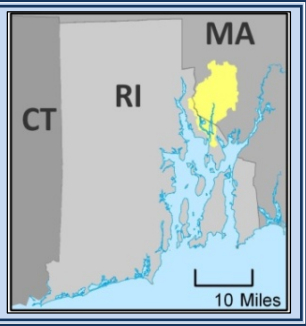
- **Call-Out Boxes**

  Throughout the plan, a series of case studies are used to demonstrate actions that municipalities and other organizations are taking to positively affect water quality. Some of these projects lie outside of the BPW watershed boundaries though are included in this plan as they provide excellent examples of actions initiated at the municipal level.

2. Watershed Description

General Watershed Facts

- **Direct Watershed Area**: 67.8 square miles (85% in MA, 15% in RI)
- **MA Towns**: Rehoboth , Seekonk, and Swansea
- **RI Towns:** East Providence, Barrington, Warren, and Bristol
- **Major Rivers**: Runnins, Palmer, Barrington, and Warren



2.1 General Watershed Description

- The Barrington-Palmer-Warren Rivers watershed (BPW watershed) is located in southeastern Massachusetts and eastern Rhode Island.

- The major waterbodies located in the watershed are the Runnins, Palmer, Barrington, and Warren Rivers. The waters ultimately flow into Upper Narragansett Bay.

- The headwaters of the Runnins River begin in Rehoboth, MA, and flow south approximately 7.5 miles to the Mobil Dam (Figure 2-1).

- At the Mobil Dam, the Runnins River becomes the Barrington River. The Barrington River continues southeast to its confluence with the Palmer River at Tyler Point in Barrington, RI. The Barrington River is tidally influenced from its mouth to the Mobil Dam (Figure 2-1).

- The upper freshwater reaches of the Palmer River begin in Rehoboth, MA, with smaller reaches (East and West Branches) of the river extending into Seekonk and Swansea, MA. The saltwater portion of the Palmer River begins at the outlet of the Shad Factory Pond Dam and continues into RI. Water from the Shad Factory Pond Dam is piped into the Kickemuit Reservoir, which is outside this watershed, for drinking water for the residents of Barrington, Bristol, and Warren, RI. The Palmer River joins with the Barrington River at Tyler Point to form the Warren River (Figure 2-1).

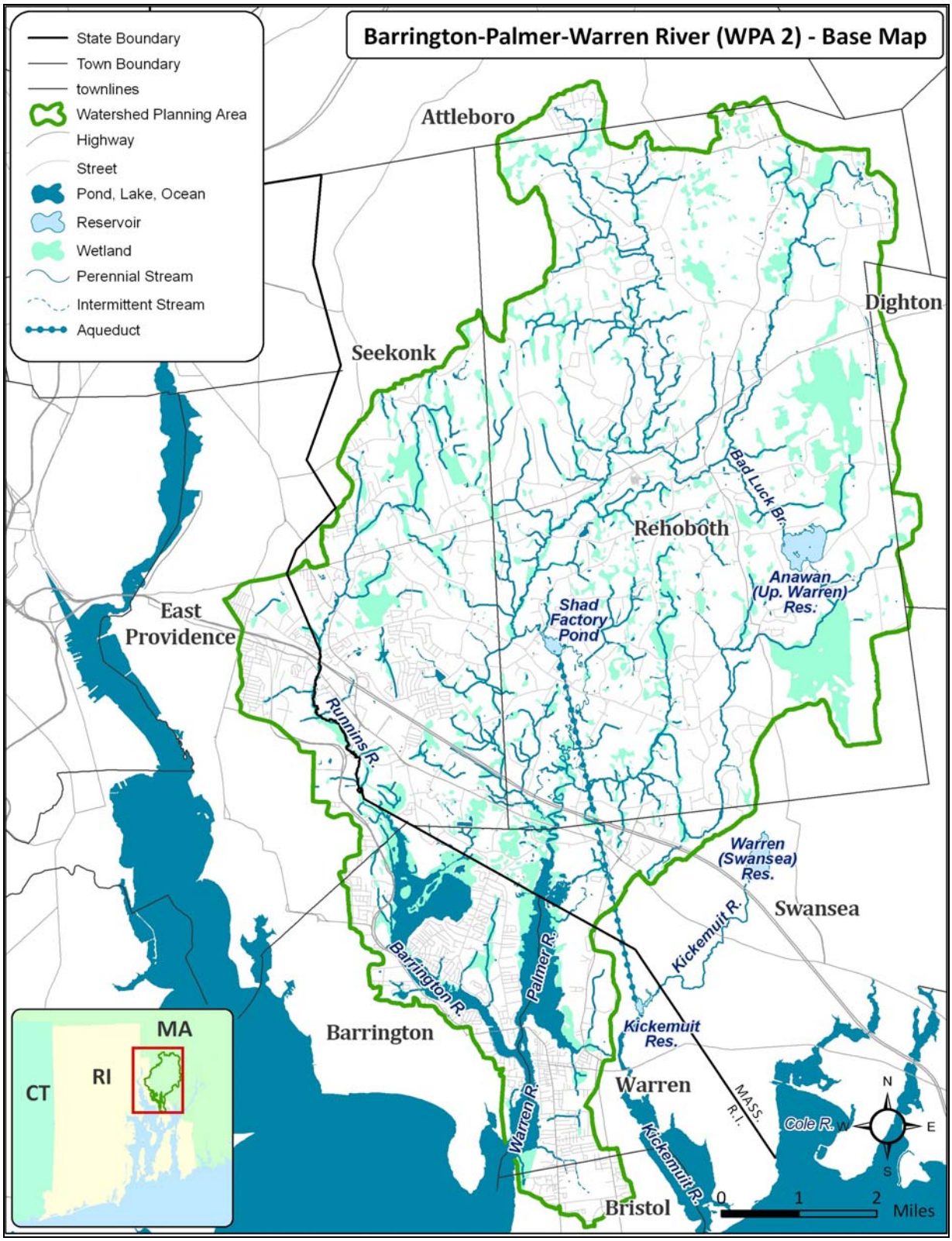
- The Warren River begins at the confluence of the Barrington and Palmer Rivers. The Warren River flows south past Barrington, Warren, and Bristol, RI, and discharges directly to Upper Narragansett Bay (Figure 2-1).

- As reflected on the land use maps, the watershed becomes increasingly urbanized near the Bay, transitioning from a pastoral landscape in the Palmer and upper Runnins sub-watersheds to a more industrial setting along the Warren River.

- The portion of the BPW watershed located in RI is predominately sewered. The vast majority of RI residents in the watershed are served by the Bristol County Water Authority.

Crabbing on the Palmer River

Figure 2-1: The Barrington-Palmer-Warren Rivers Watershed (a more detailed map located in Appendix A)



2.2 Land Use

The type of land use in a watershed has a direct effect on water quality (USEPA, 2011a). In an undeveloped watershed, natural processes, such as soil infiltration and plant uptake of water and nutrients occur, providing reduced runoff and groundwater recharge. As watersheds become more developed with commercial, residential, and industrial land uses, the amount of stormwater runoff increases due to increasing areas of impervious surfaces, such as rooftops, roads and parking lots. This stormwater carries pollutants such as bacteria, nutrients, metals, oils, sediment and chemicals that negatively affect nearby waterbodies. Agricultural land use activities, such as fertilizer and pesticide application and manure from livestock, can also increase pollutants in nearby waterbodies (USEPA, 2011a).

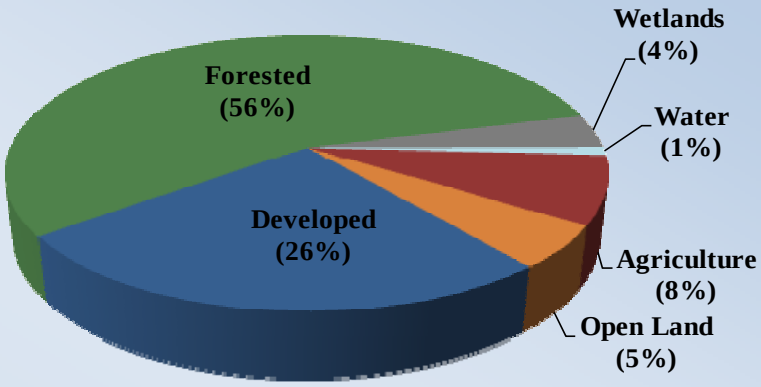
Overall Land Use in the BPW Watershed

MA-portion

- 61% forested
- 20% developed
- 9% agriculture

RI-portion

- 56% developed
- 24% forested
- 10% wetlands



Forested: coniferous and deciduous forests, including forested wetlands
Developed: commercial, industrial, and residential
Wetlands: marshes and other wetland areas (not including forested wetlands)
Water: open waterbodies
Agriculture: fields and pasture
Open Land: open developed areas such as ball fields and parks

The BPW watershed is predominately forested (56%) and is characterized by a mix of coniferous and deciduous forests. Approximately 26% of the watershed is considered developed, and includes residential, commercial, and industrial uses. Other land uses in the watershed include agriculture (8%), open land, which includes open developed areas such as ball fields and parks (5%), wetlands (5%), and water (1%). A detailed map of land use within the entire BPW watershed is located in **Appendix A**. Land use and impervious surface data for Massachusetts is based on digital images captures in 2005. The data are available online at http://www.mass.gov/mgis/lus2005.htm and at

http://www.mass.gov/mgis/imperviousssurface.htm. Land use and impervious cover data for Rhode Island are based on digital imagery from 2003-2004. The data are available online at http://www.edc.uri.edu/rigis/data/all.aspx .

Most of the forested areas of the watershed are located in the northern portion of the watershed in Rehoboth, MA. This area is also characterized by agricultural land uses. The developed areas are concentrated near the MA-RI border.

Developed areas are often characterized by relatively high levels of impervious cover, areas such as roofs and roads that prevent water from infiltrating into the soil. In the BPW watershed, impervious surfaces cover 11% of the total land area. Past studies have shown a link between the amount of impervious area in a watershed and a decrease in water quality (RIDEM, 2011c). Data suggests that water quality impacts can occur when impervious surfaces are as low as 10% of a watershed; at 25% impervious cover, significant water quality degradation is almost assured.

Sub-Watersheds Description and Land Use

The BPW watershed has been divided into four sub-watersheds to allow for a more in-depth identification of potential pollutant sources based on land use. These sub-watersheds are associated with the Runnins River, Barrington River, Palmer River, and Warren River. Land use and impervious cover values for each sub-watershed can be found in Table 2-1. Maps of each sub-watershed are provided below. A detailed land use map for the entire BPW watershed can be found in **Appendix A**. Note: In all of the land use maps that follow, impervious surfaces are shown as part of the "Developed" land use category.

Table 2-1: Land Use for the Runnins, Palmer, Barrington, and Warren River Sub-Watersheds (square miles and percent of total land cover)

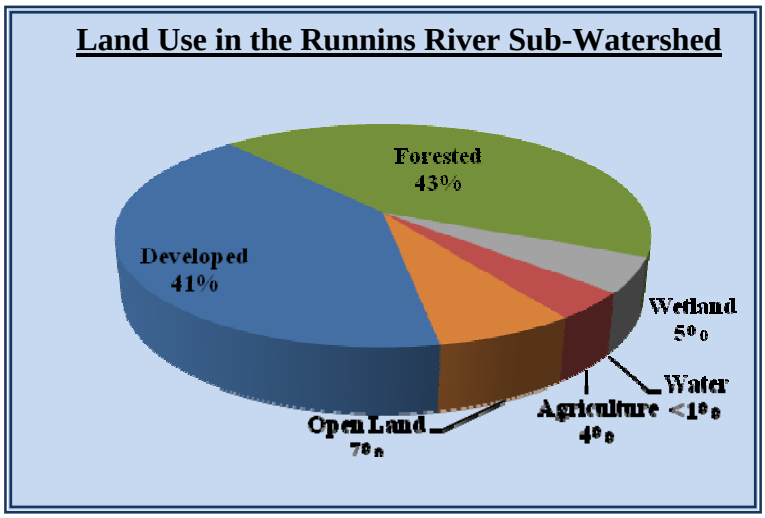
Land Use Category*	Runnins (sq. mi.)	Runnins (percent)	Palmer (sq. mi.)	Palmer (percent)	Barrington (sq. mi.)	Barrington (percent)	Warren (sq. mi)	Warren (percent)
Developed	3.94	41%	9.77	19%	2.57	49%	1.18	67%
Forested	4.22	43%	31.61	62%	1.42	27%	0.36	20%
Agriculture	0.41	4%	4.87	10%	0.44	8%	0.03	2%
Open Land	0.68	7%	2.15	4%	0.17	3%	0.09	5%
Water	0.03	0%	0.66	1%	0.08	2%	0.00	0%
Wetland	0.44	5%	1.94	4%	0.60	11%	0.11	6%
Total	**9.71**	100%	**51.00**	100%	**5.28**	100%	**1.77**	100%
Impervious Cover	2.18	**23%**	3.92	**8%**	1.05	**20%**	**0.53**	**30%**
Watershed Area in MA	7.47	77%	48.8	96%	1.49	28%	0.00	0%
Watershed Area in RI	2.24	23%	2.2	4%	3.79	72%	1.77	100%

***Land use category definitions may vary slightly between Rhode Island and Massachusetts.**

Runnins River Sub-Watershed

- The Runnins River sub-watershed (Figure 2-2) is approximately 9.71 square miles in area. Approximately 77% of the Runnins River sub-watershed is located in MA and 23% of the sub-watershed is located in RI.

- Although several tributaries flow into the Runnins River, only Aitken Brook and Luthers Brook are named.

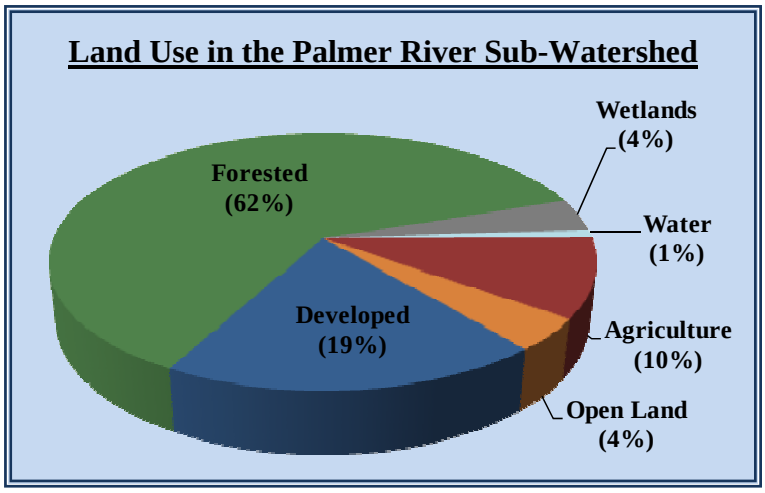


Land use in the Runnins River watershed is predominately forested (43%), but most of this is in the northern section of the watershed, whereas the southern portion of the watershed is heavily developed. Impervious surfaces cover 23% of the total land area.

Palmer River Sub-Watershed

- The Palmer River sub-watershed, the largest sub-watershed, (Figure 2-3) is approximately 51 square miles in area. Approximately 96% of the Palmer River sub-watershed is located in MA and only 4% of the sub-watershed is located in RI.

- Several tributaries feed into the Palmer River, including Mine Brook, Bliss Brook, Wolf Plain Brook, Carpenter Brook, Roaring Brook, Bad Luck Brook, Rumney Marsh Brook, Fullers Brook, Rocky Run, and Torrey Creek.



- Land use in the Palmer River sub-watershed is predominately forested (62%), particularly in the northern portion of the watershed. Developed land uses occupy 19% of the total land area and impervious surfaces cover 8% of the total land area. Agricultural land uses occupy approximately 10% of the watershed.

Figure 2-2: Land Use in the Runnins River Sub-Watershed

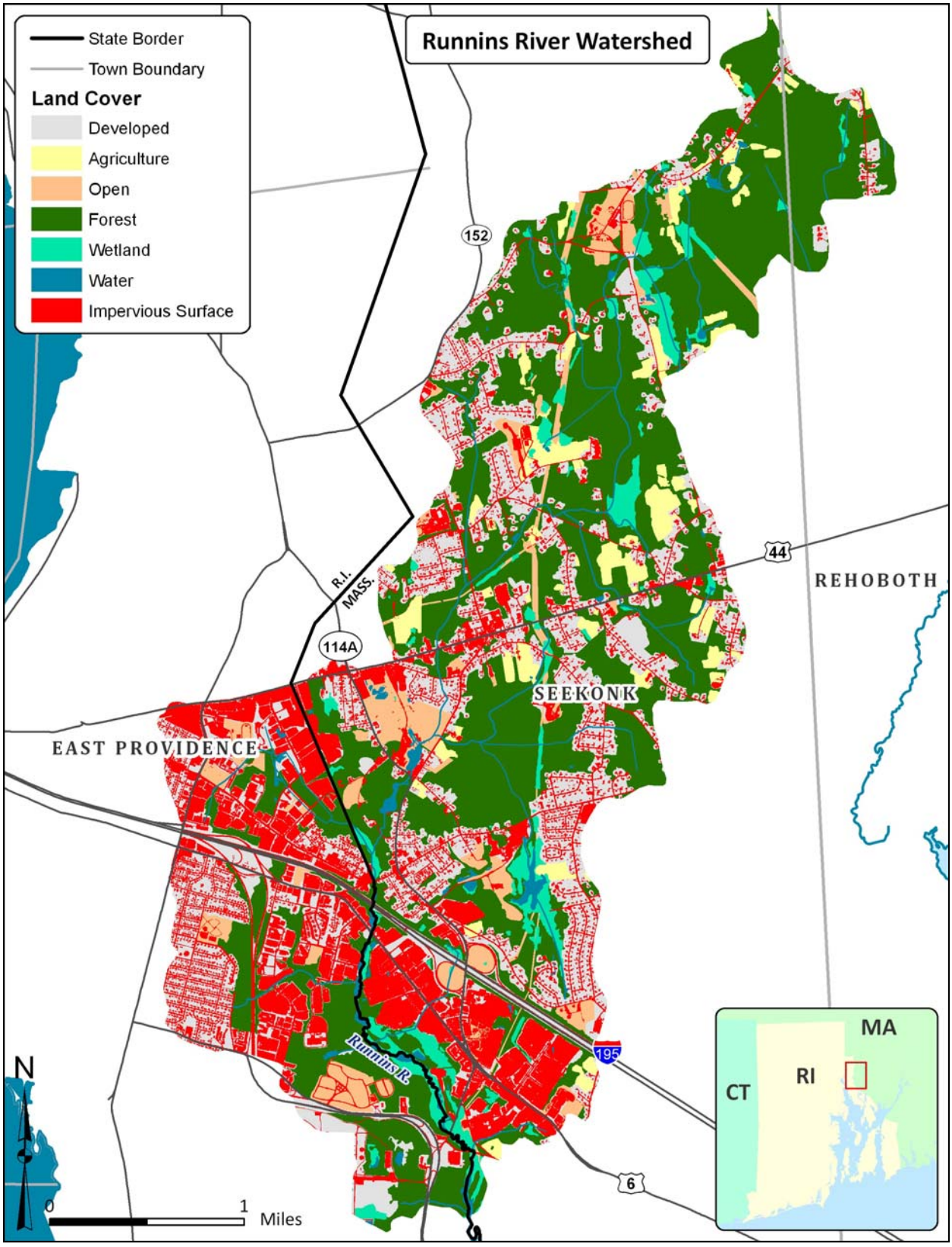
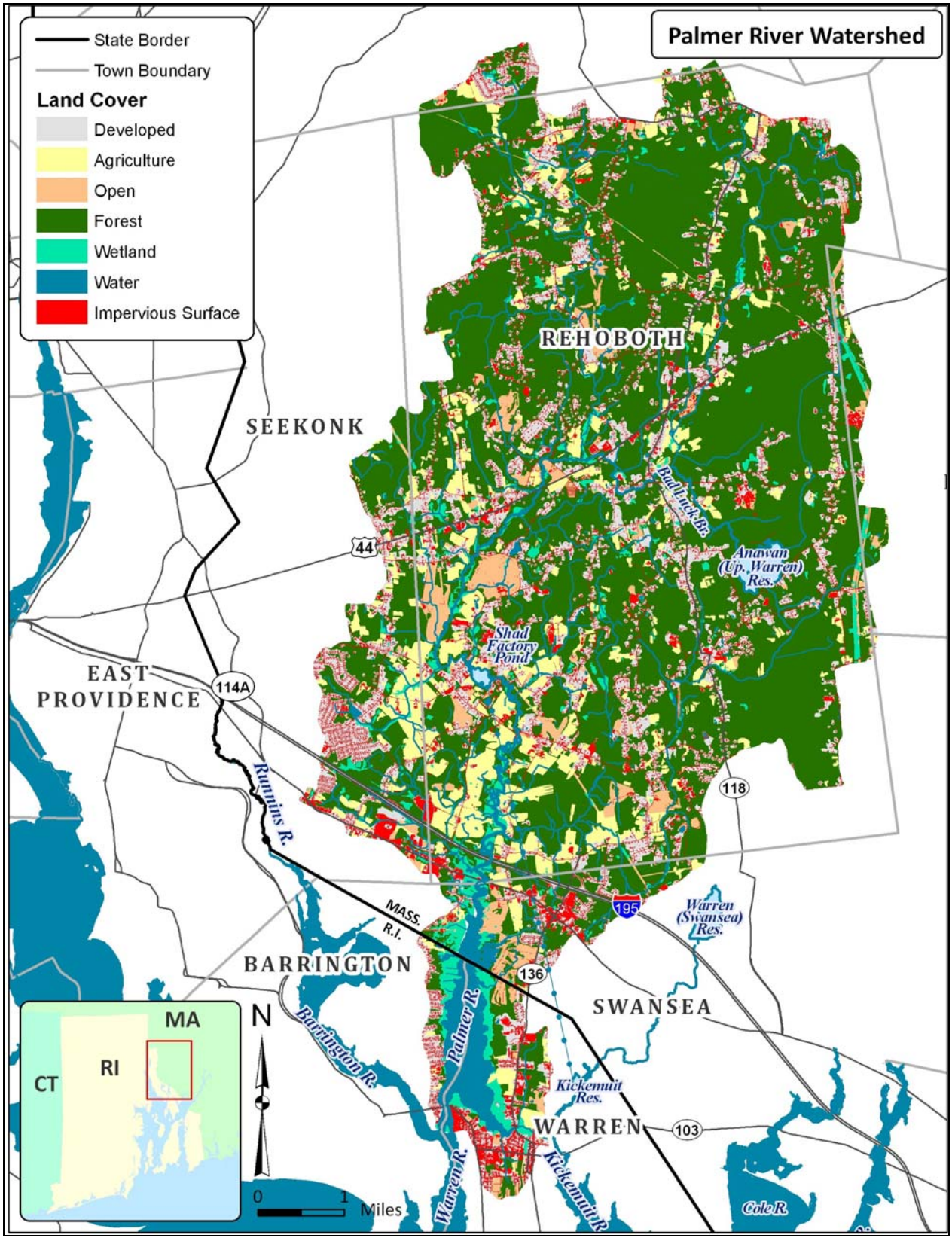
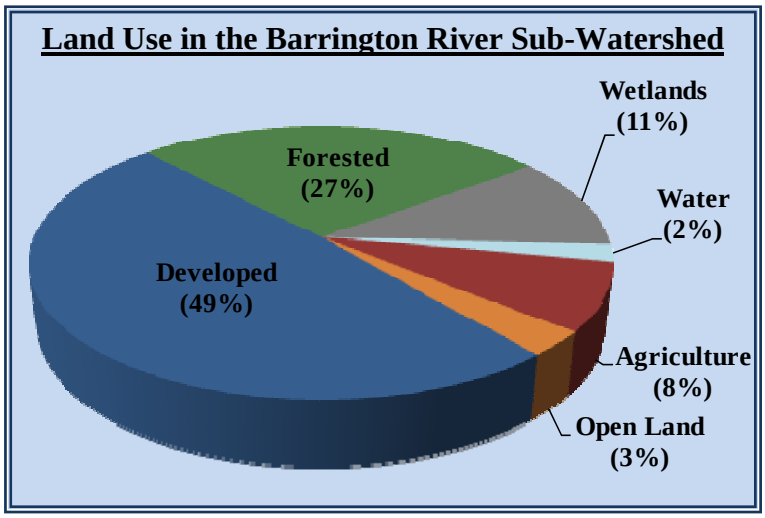


Figure 2-3: Land Use in the Palmer River Sub-Watershed



Barrington River Sub-Watershed

- The Barrington River sub-watershed (Figure 2-4) is approximately 4 square miles in area. Approximately 28% of the Barrington River sub-watershed is located in MA and 72% of the sub-watershed is located in RI.

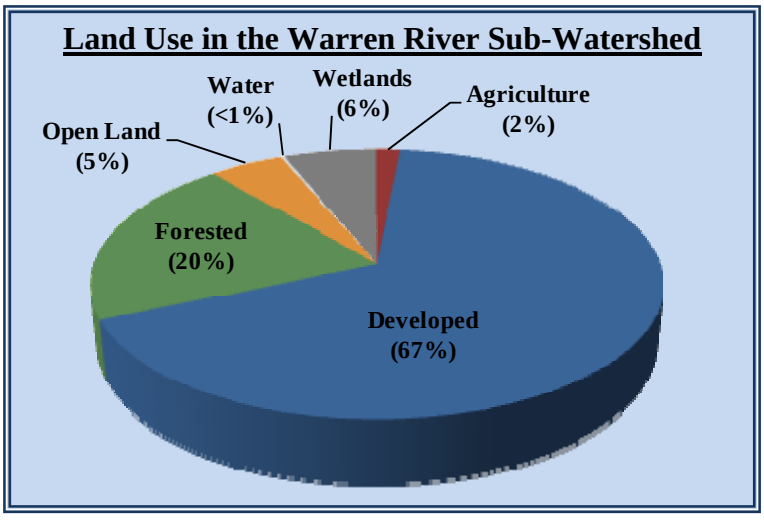


- Upstream of the Tongue, a peninsula that juts out into the river to form One Hundred Acre Cove, the river narrows to about 10 to 200 yards wide and is less than two feet deep. Opening to the east of the river channel, One Hundred Acre Cove is similarly shallow.

- Land use in the Barrington River sub-watershed is predominately developed (49%). Impervious surfaces cover approximately 20% of the total land area. Forested land occupies 27% of the total land area. Wetlands occupy approximately 11% of the watershed.

Warren River Sub-Watershed

- The Warren River sub-watershed (Figure 2-5) is approximately 1.77 square miles in area. The entire Warren River sub-watershed is located within Rhode Island.



- The Warren River begins at the confluence of the Barrington and Palmer Rivers along the Barrington-Warren town line. The Barrington River and Palmer River are the two major tributaries feeding into the Warren River, but there is one small unnamed tributary stream in Barrington and two small unnamed tributary streams in Warren that feed into the Warren River.

- Land use in the Warren River sub watershed is predominately developed (67%). Forest land occupies approximately 20% of the total land area. Impervious surfaces cover 30% of the total land area.

Figure 2-4: Land Use in the Barrington River Sub-Watershed

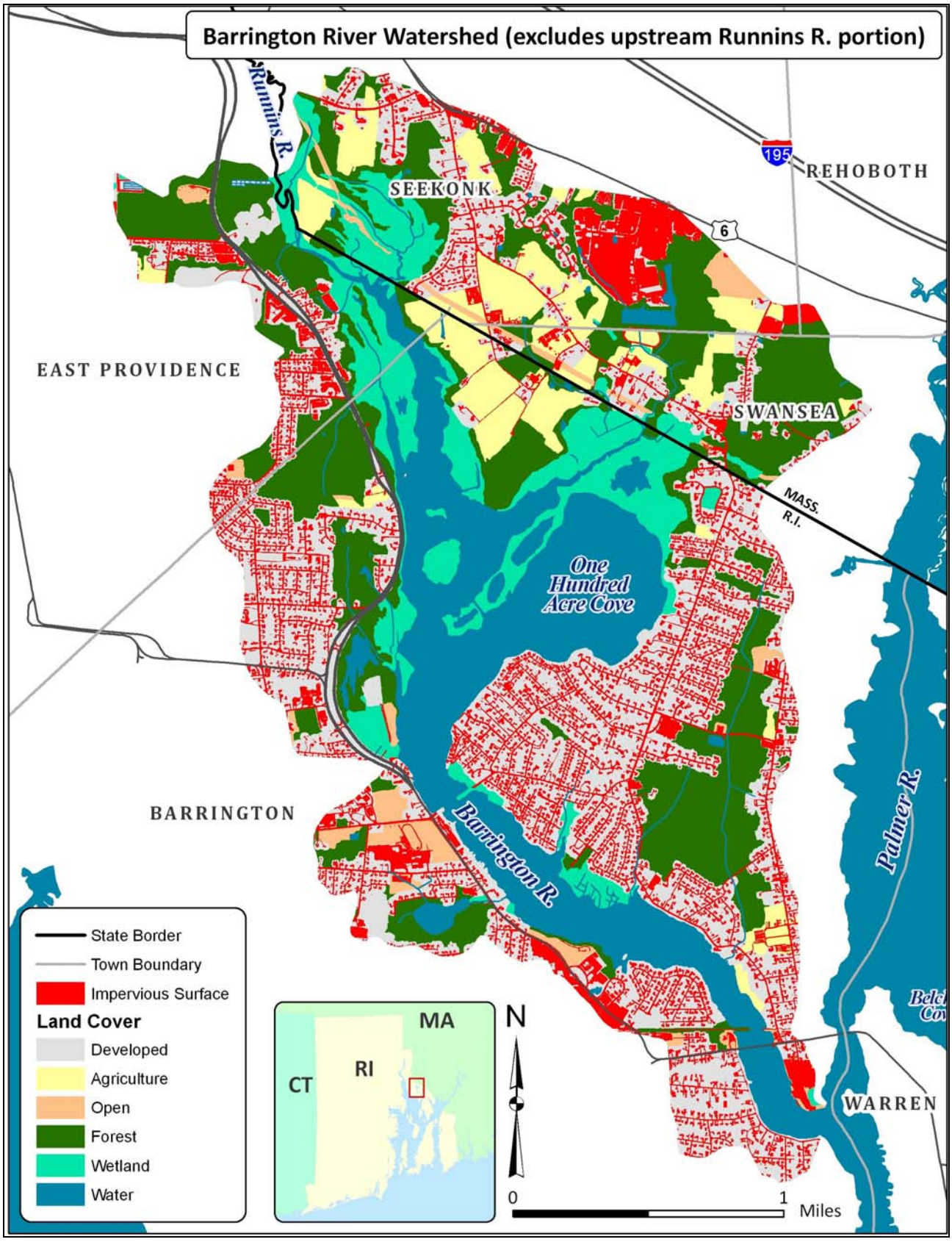
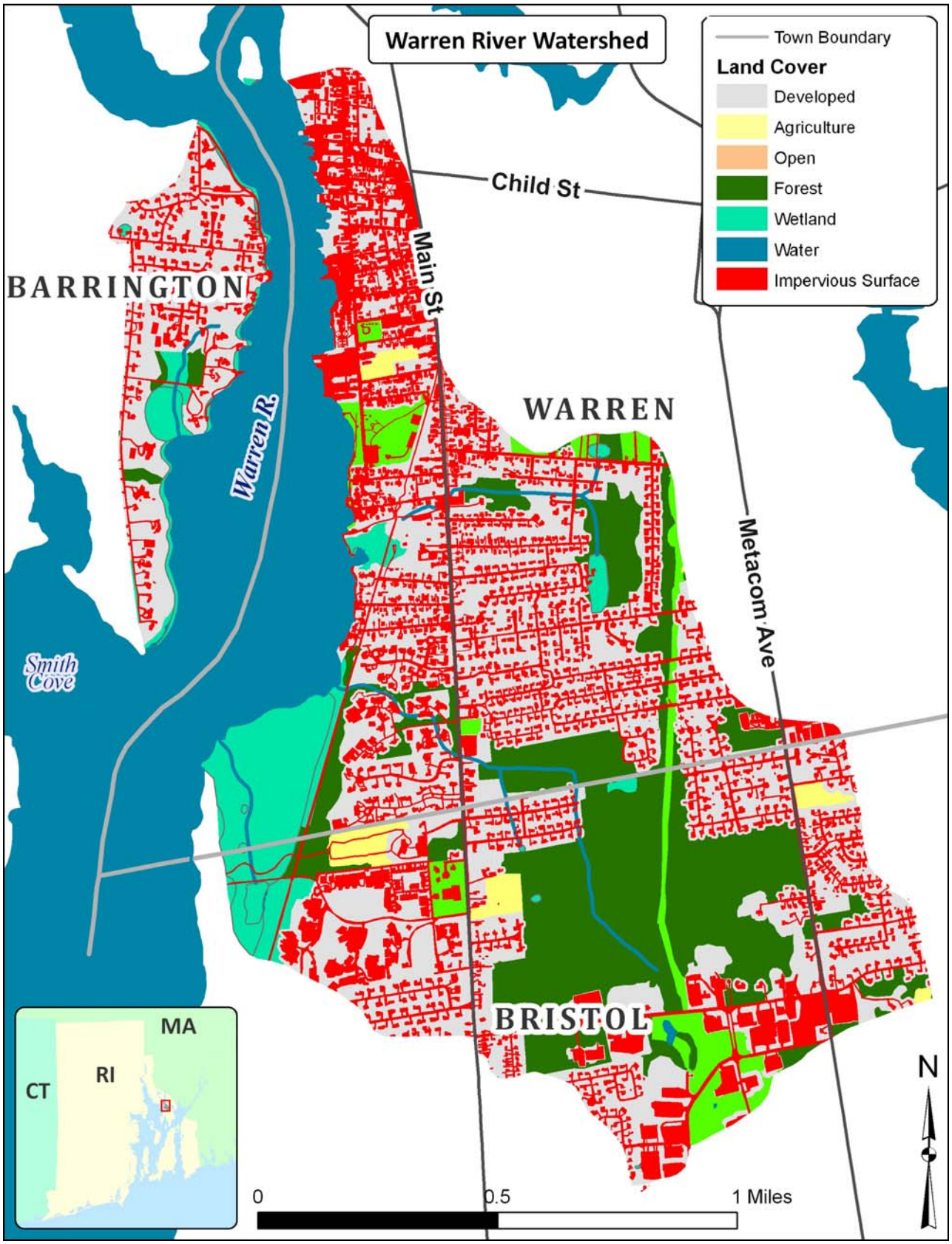


Figure 2-5: Land Use in the Warren River Sub-Watershed



2.3 Additional Resources

For additional visual resources, see the Rhode Island Digital Atlas, which is an online mapping initiative lead by the University of Rhode Island Geospatial Extension Program, in partnership with the URI Environmental Data Center. This website features simple, easy-to-use maps that tap into the wealth of information available from the Rhode Island Geographic Information System (RIGIS). Maps are organized by municipality and by watershed, and may be viewed directly on the RI Digital Atlas website, on Google Earth, or imported into GIS software.

An index of maps is available online at: http://www.edc.uri.edu/atlas/maps/mapIndex.aspx.

The land use maps contained in the detailed map in **Appendix A** indicate a 100 foot riparian buffer distance from streams as a thin black line. To view this area in more detail, the Rhode Island Digital Atlas contains a series of maps which shows *only* land use within 100 feet of either side of streams. Riparian buffer map series at the RI Digital Atlas: http://www.edc.uri.edu/atlas/maps/map.aspx?MAP=019.

Hundred Acre Cove on the Barrington River

3. Water Quality Issues in the Watershed

In order to focus management actions for improving and protecting water quality in the BPW watershed, it is necessary to understand the current water quality conditions. This section provides a summary of the water quality of the waterbodies in the BPW watershed, including identification of which waterbodies are not meeting water quality standards.

3.1 Water Quality Impairments

The waters in Rhode Island and Massachusetts are assigned to an assessment unit, which refer to a specific waterbody or segment of a larger waterbody. Each of the major waterbodies in the BPW watershed has been divided into more than one assessment unit segment. Each assessment unit has been given a water quality classification with the associated designated uses for that class. Waterbodies where water quality does not support their designated uses are deemed "impaired." A water quality restoration plan, also known as a Total Maximum Daily Load report (TMDL), is required to be developed for each impaired water body.

Following the Integrated Reporting format and assessment and listing methodology described in each state's Consolidated Assessment and Listing Methodology, each assessment unit is assessed and placed into one of five Categories (see box at right). Categories 4 and 5 list waters that are considered impaired for at least one designated use. Category 4 waters are considered impaired for one or more designated uses but do not require development of a TMDL (including because a TMDL has already been completed). Category 5 is the list of waters that are impaired for one or more designated uses by a pollutant and which require a TMDL - the Section 303(d) List of Impaired Waters. Through the TMDL development process, water quality conditions are more thoroughly characterized and pollution sources are identified providing the technical basis for the pollution abatement actions specified in the water quality restoration plans. More information about RIDEM's TMDL Program is available online at

Water Quality Impairment

Once every two years, all states are required to report to the USEPA on the quality of their surface waters and to provide a list of those waters that do not meet water quality standards. Waterbodies not meeting standards are deemed "impaired" and require a TMDL. These impaired waters are placed in Category 5 the "303(d) List of Impaired Waters."

Category 1: Waters are considered to be "fully supporting" all designated uses;

Category 2: Some designated uses are "fully supporting" however more data are needed to assess other uses;

Category 3: More monitoring is needed to assess any designated use; associated waters are considered to have insufficient data or no data to be assessed;

Category 4: Impaired or threatened for one or more designated uses but does not require development of a TMDL because;

A. TMDL has been completed;

B. Other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future; or

C. Impairment is not caused by a pollutant.

Category 5: Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL.

http://www.dem.ri.gov/programs/benviron/water/quality/rest/ and the MADEP TMDL Program at: http://www.mass.gov/dep/water/resources/tmdls.htm.

As shown in Figure 3-1 and summarized in each sub-watershed description, multiple waterbodies in the BPW watershed are considered "impaired" for at least one pollutant. These specific impairments are discussed in detail below. Note that although the Warren River and the lower segments of the Barrington and Palmer Rivers have water quality that has been impacted (e.g., shellfishing is not a designated use), they are not listed as "impaired" because the water quality standards for these waters are not as stringent as in the other waterbody segments.

At the confluence of the Palmer and Warren Rivers, runoff from a large parking lot at the old Samsonite factory, the East Bay Bike Path and RI Route 103 directly enters the river.

Figure 3-1: The Barrington-Palmer-Warren Rivers Watershed Water Resources and Impairment Classifications (sewered areas indicated in Rhode Island are draft only)

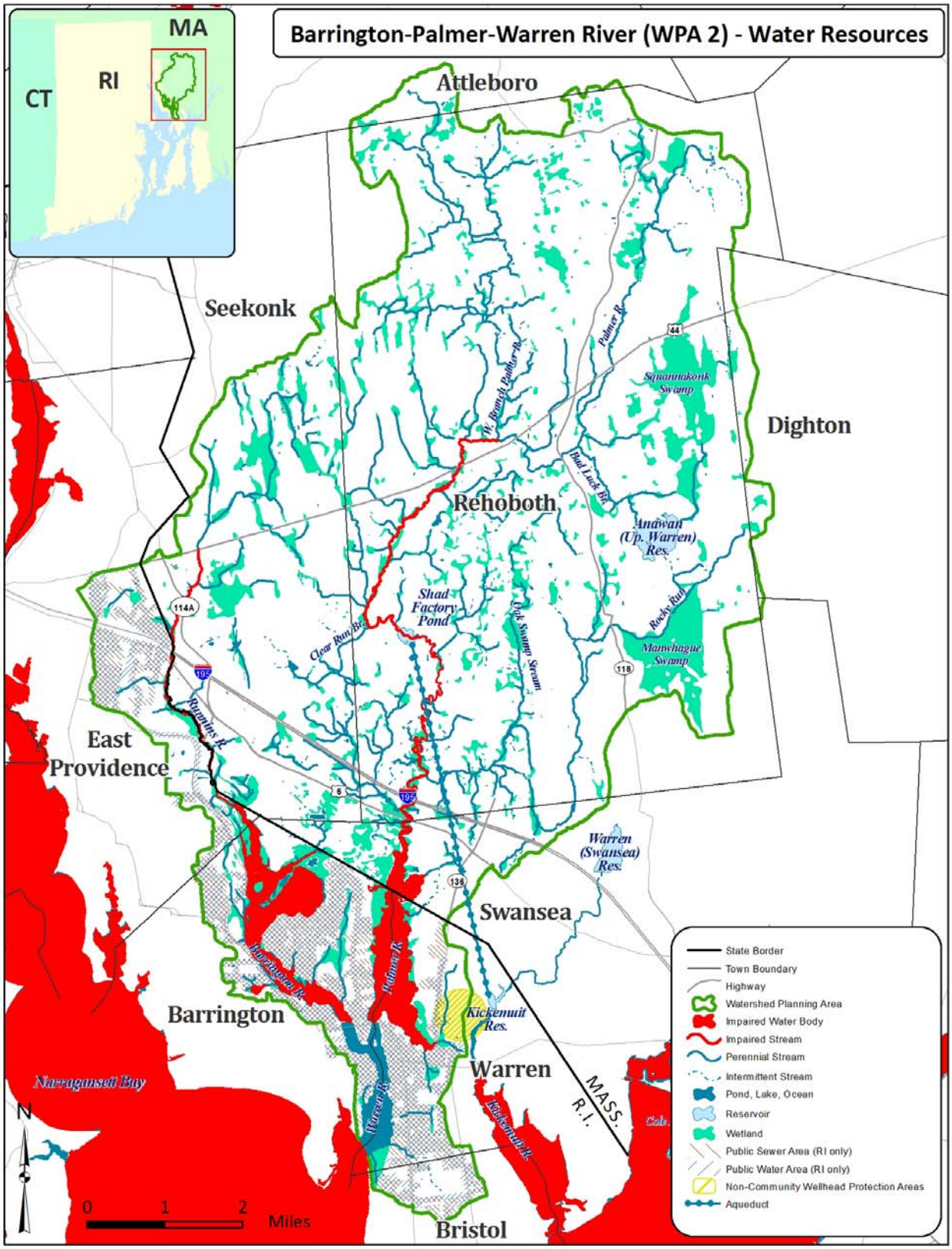


Table 3-1: Waterbody Classification and Impairments in the BPW Watershed from the Rhode Island 2010 303(d) List (RIDEM, 2011b) and the Massachusetts 2010 303(d) List (MADEP, 2010)

Waterbody	Waterbody Classification (State) and Designated Use	Impaired Use (pollutant of concern)
Runnins River	**B (MA)** Designated uses include *habitat for fish and wildlife (aquatic life use), fish consumption, and for recreation (such as swimming and boating).* **B (RI)** Designated uses include *recreation such as swimming and boating, and fish and wildlife habitat (aquatic life use), and fish consumption.*	**Recreation** (*bacteria*) **Fish and Wildlife Habitat (Aquatic Life Use)** (*lead, dissolved oxygen, stream bottom macroinvertebrates* [*i.e. Mussels, aquatic insect larvae, and aquatic worms*])
Barrington River	**SA (RI) –** Mobil Dam to Bike Path Designated uses include *shellfish consumption, recreation (including swimming and boating) fish consumption, and habitat for fish, aquatic life, and wildlife (aquatic life use).*	**Shellfish Consumption** (*fecal coliform*)
	SB1 (RI) – Bike Path to Confluence with Palmer R. Designated uses include *recreation (including swimming and boating), fish consumption, and fish and wildlife habitat (aquatic life use). Primary contact r*ecreational activities may be impacted due to bacteria from approved discharges. However, Class SB water quality criteria must be met.	**No Impairments**
Prince's (Tiffany's) Pond	**SA (RI)** Designated uses include *shellfish consumption, recreation (including swimming and boating), fish consumption and habitat for fish and wildlife (aquatic life use).*	**Fish and Wildlife Habitat (Aquatic Life Use)** (*total phosphorus and dissolved oxygen*)
Palmer River	**B (MA) --** *headwaters to Shad Factory Pond Dam in MA* Designated uses include *habitat for fish and wildlife (aquatic life use), fish consumption, and for recreation (such as swimming and boating).* **SA (MA, RI) --** *below Shad Factory Pond Dam to Bike Path* Designated uses include *shellfish consumption, recreation (including swimming and boating), and habitat for fish and wildlife (aquatic life use).*	**Recreation** (*bacteria*) **Shellfish Consumption** (*bacteria*) **Fish and Wildlife Habitat (Aquatic Life Use)** (*nitrogen and dissolved oxygen*)
	SB1 (RI) –Bike Path to Confluence with Barrington R. Designated uses include *recreation (such as swimming and boating), fish consumption, and fish and wildlife habitat (aquatic life use). Primary contact r*ecreational activities may be impacted due to bacteria from approved discharges. However, Class SB water quality criteria must be met.	**No Impairments**

Table 3-1: Waterbody Classification and Impairments in the BPW Watershed from the Rhode Island 2010 303(d) List (RIDEM, 2011b) and the Massachusetts 2010 303(d) List (MADEP, 2010) (continued)

Waterbody	Waterbody Classification (State) and Designated Use	Impaired Use (pollutant of concern)
Warren River	**SB1 (RI) –** Northern Portion of the River Designated uses include *recreation (such as swimming and boating), fish consumption, and fish and wildlife habitat (aquatic life use). Primary contact r*ecreational activities may be impacted due to bacteria from approved discharges. However, Class SB water quality criteria must be met. **SB (RI)--** Southern Portion of the River to a Line between Adams Point and Jacobs Point Designated uses include *recreation (such as (swimming and boating), fish consumption shellfish harvesting for controlled relay and depuration, and fish and wildlife habitat (aquatic life use).*	**No Impairments**

3.2 Shellfish Closures

RIDEM's Office of Water Resources is responsible for regulating shellfish harvesting by conducting routine bacteriological monitoring and pollution source assessments and inventories of the State's shellfish growing waters. Shellfish harvesting has been divided into two designated uses: shellfish harvesting suitable for direct human consumption (Class SA waters), and shellfish harvesting for controlled relay (Class SB waters). Sanitary conditions of growing areas are re-assessed annually to confirm that the state's shellfish growing areas are appropriately classified. The Office of Water Resources assesses the results of sanitary surveys and ambient water quality monitoring of shellfish growing waters to determine the potential for fecal material, pathogenic microorganisms, or other poisonous or deleterious substances in conducting this annual review of shellfish waters classification. According to the National Shellfish Sanitation Program, a growing area is defined as any site that supports or could support the propagation of shellfish stock by natural or artificial means. Growing areas may be designated as approved, conditionally approved (including seasonal closures), or prohibited. It is important to note that any shellfish area, regardless of classification, may be temporarily closed to all activities when a potential public health emergency emerges as a result of a storm event, flooding, sewage, chemical, or petroleum discharges, or a hazardous algal bloom. The three types of shellfish closure classifications are described in greater detail below:

1. **Prohibited** – Shellfish growing areas that are closed to shellfish harvesting year-round. Any growing area without a current sanitary survey or with consistently high bacteria levels must be classified as Prohibited. Shellfishing is prohibited in the Barrington, Palmer, and Warren Rivers as shown in Figure 4-2 and the Barrington, Palmer, and Warren River Fact Boxes, below.

2. **Conditional** - Shellfish growing areas that are closed periodically to shellfish harvesting during predictable pollution events where high levels of bacteria or other pollutants may reach the growing area. Examples of predictable pollution events include a wastewater treatment facility discharging known levels of effluent and/or stormwater impacts following a rain event. By way of example, the Upper Narragansett Bay Conditional Area A closes for 7 days following either a WWTF bypass of 0.5 million gallons or greater or a 0.8 inch rainfall event (in 24 hours). Those wishing to harvest shellfish from growing areas with conditional closures must first check with RIDEM's Division of Enforcement by calling (401) 222-2900 prior to harvesting.

3. **Seasonal** – Seasonal Closures are put in place for those shellfish growing areas where the sanitary quality may be affected by seasonal populations or seasonal use of a marina, dock or harbor. Unless otherwise noted, seasonal closures begin at sunrise on the Saturday immediately prior to Memorial Day and end at sunrise on the Tuesday immediately following Columbus Day. Sanitary surveys and/or monitoring data in these growing areas indicate that pollutants will reach growing areas in predictably high concentrations during this season.

Shellfish harvesting has a long history in the coastal communities of Rhode Island and Massachusetts, particularly in Narragansett Bay. In order for this strong tradition to continue, restoration of polluted shellfish harvesting areas must be accomplished. Consistent with the state's water quality regulations, it is the goal that SA classified waters be suitable for shellfish harvesting (among other uses) at all times. Water quality restoration efforts should focus on restoring shellfish harvesting in SA waters classified as either prohibited or conditionally approved. SB classified waters are designated for shellfish harvesting for controlled relay. These waters are considered prohibited for shellfish harvesting for direct human consumption and it is not a goal that they be suitable for shellfish harvesting for direct human consumption. As shown in Figures 4-2 and Table 4-1, shellfish harvesting is prohibited from all growing areas in the Barrington, Palmer, and Warren Rivers, which has placed the Barrington and Palmer Rivers on the impaired list for shellfish consumption. Targeted water quality restoration efforts in the Barrington-Palmer-Warren River watershed may help reduce pollutant levels in these waterbodies. If efforts are successful, closures may be lifted for growing areas with prohibited and conditional closures, allowing for the return of shellfish harvesting to these growing areas.

3.3 Runnins River Sub-Watershed

The Runnins River begins in Rehoboth, MA (Figure 3-1). The lower portion of the river forms the border between East Providence, RI, and Seekonk, MA. At its mouth, the Runnins River flows over the Mobil Dam to form the Barrington River.

The Runnins River is listed as Category 5 waterbody in Rhode Island and Massachusetts and assessed as impaired (Figure 3-1). TMDLs have been written for its recreation impairment due to bacteria in both Massachusetts and Rhode Island. However, aquatic life use impairments have not yet been addressed in a TMDL.

Approved Water Quality Reports

- MADEP Final Pathogen (Bacteria) TMDL for the Narragansett Bay Watershed (2010)

Pollutant Reductions Required to Meet Water Quality Standards for Bacteria: 99.2%

- RIDEM Fecal Coliform (Bacteria) TMDLs for the Runnins River, RI (2002)

Pollutant Reductions Required to Meet Water Quality Standards for Bacteria: 99.6%

TMDL Pollutant Load Reductions – are based on the most impaired location in an impaired waterbody. These percent reductions represent a rough estimation of the amount of pollution abatement actions needed to meet water quality standards. Often, these percent reductions are expressed as ranges as each impaired segment of a larger waterbody is assessed individually.

Bacteria Sources Identified in Water Quality Reports

Most residents of the Runnins River watershed rely on onsite wastewater treatment systems (OWTS) (septic systems and cesspools). Malfunctioning or failing OWTS are likely a source of bacteria to the Runnins River, particularly in the area upstream of Pleasant Street, downstream from the Route 6 Bridge, and in the "Triangle" area between Mink Street and School Street in Seekonk, MA, and in East Providence, RI. OWTS in the "Triangle" area, particularly near School Street, are thought to be among the sources of bacteria to the Runnins River.

Runnins River at the Old Grist Mill Tavern in Seekonk, MA

Another primary source of bacteria to the Runnins River is stormwater runoff from the developed areas in Seekonk, MA, including unidentified storm drains in the Triangle area. Other potential sources of bacteria to the Runnins River as identified in the TMDLs include waterfowl in Grist Mill Pond, and pigeons roosting under the overpass at Route 195. RIDEM also observed high levels of bacteria associated with large mats of phragmites from the plants growing along the shoreline of the Runnins River, thought to be serving as a media for bacterial growth. The Wannimoisett Pump Station in East Providence, RI, was previously identified as a potential bacteria source as it periodically discharged untreated sewage to Orange Juice Creek in the late 1990s. However, this source was addressed through renovations and is no longer considered a source of bacteria to the Runnins River.

Available Data Addressing Impairments in the Runnins River (Appendix B)

- MADEP Final Pathogen TMDL for the Narragansett Bay Watershed (2010) (Fecal Coliform) (Table B-1)

- RIDEM Fecal Coliform TMDL for the Runnins River, Rhode Island (2002) (Fecal Coliform) (Table B-1)
- Pokanoket Watershed Alliance Data (Fecal Coliform) (Table B-1)
- MADEP Bacteria Source Tracking Data (*E. coli*) (Table B-1)

Other Available Data for the Runnins River

- MADEP Water Quality Assessment Report Program: *E. coli*, total nitrogen, ammonia, total phosphorus, temperature, specific conductivity, total dissolved sediments, and dissolved oxygen (2009 DRAFT data only)
- Pokanoket Watershed Alliance Data: Fecal coliform, Enterococci, *E. coli*, temperature, pH, dissolved oxygen, and salinity (2003-2004; 2006)

3.4 Barrington River Sub-Watershed

The Barrington River continues southeast from the Mobil Dam (Figure 3-1). The river joins the Palmer River at Tyler Point in Barrington, RI, to form the Warren River. The Barrington River is tidally influenced from its mouth at Tyler Point to the Mobil Dam.

In terms of impairment, the Barrington River (Class SA segment) is listed in Category 4A (bacteria TMDL has been completed). Princes Pond, a small pond within the sub-watershed is listed in Category 5 and is impaired for aquatic life uses due to dissolved oxygen and total phosphorus. A TMDL has not yet been written for this pond. Shellfishing is prohibited in all areas of the Barrington River (shellfish growing area 2-1, see Figure 3-2).

Approved Water Quality Reports

- RIDEM Fecal Coliform (Bacteria) TMDL for the Barrington River, Rhode Island (2002)

  Pollutant Reductions Required to Meet Water Quality Standards for Bacteria: 74% - 93%

Bacteria Sources Identified in Water Quality Reports

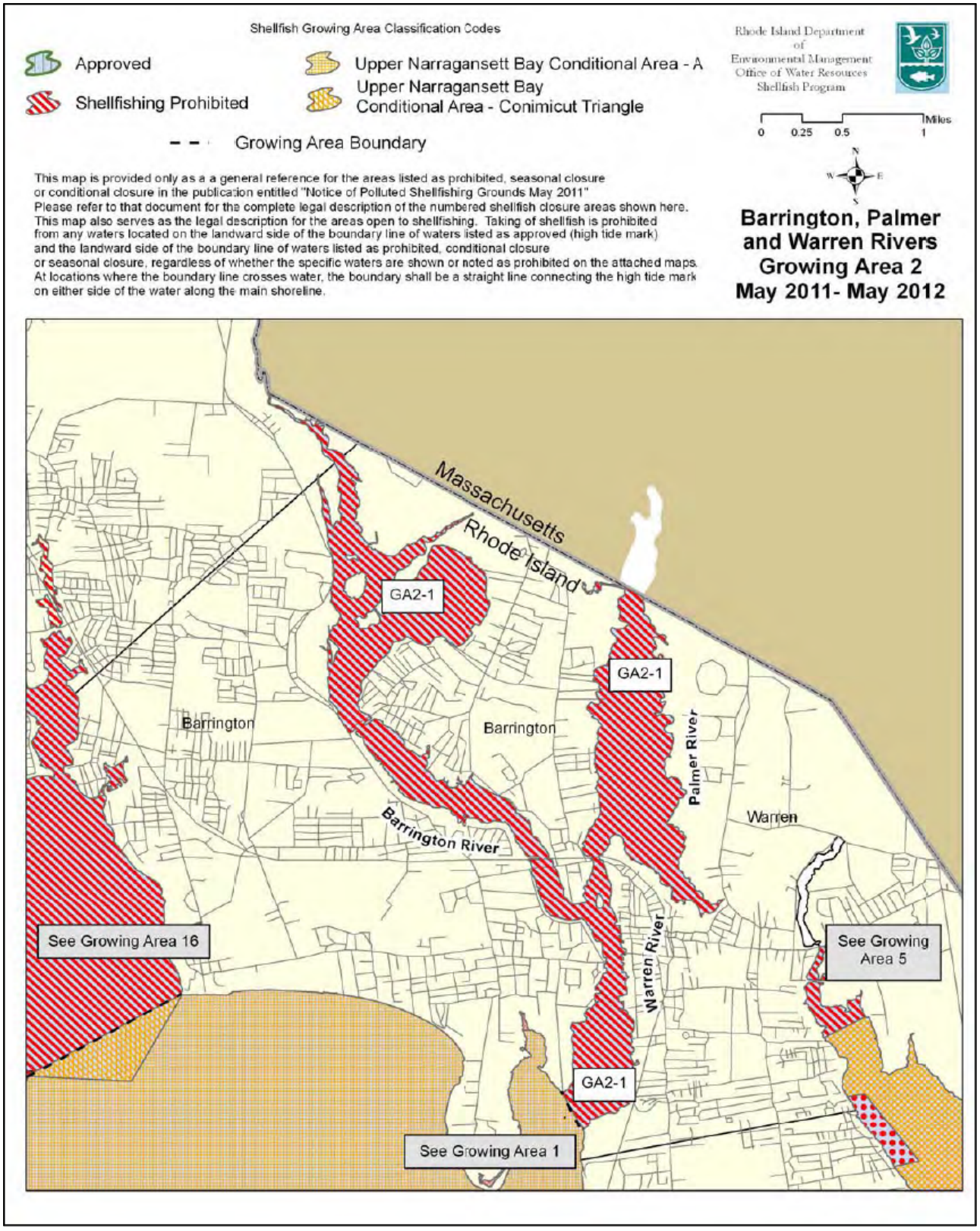
The largest source of bacteria to the Barrington River in dry weather is bacteria from the Runnins River. Other potential sources of bacteria to the Barrington River include stormwater runoff below White Church Bridge. Computer modeling confirmed that stormwater from the Palmer River impacts the Barrington River.

Available Data Addressing Impairments in the Barrington River (Appendix B)

- RIDEM Fecal Coliform TMDL for the Barrington River, RI (Fecal Coliform) (Table B-2)
- RIDEM Shellfish Monitoring Program (Fecal Coliform) (Table B-2)

The Barrington Congregational Church (well known as "The White Church") is an iconic view along the Barrington River, just south of Hundred Acre Cove.

Figure 3-2: Shellfish Growing Areas and Closures for the Barrington, Palmer, and Warren Rivers (Growing Area 2)



3.5 Palmer River Sub-Watershed

The freshwater headwaters of the Palmer River begin in Rehoboth, MA, with smaller reaches extending into Seekonk and Swansea, MA (Figure 3-1). The saltwater portion begins at the outlet of the Shad Factory Pond Dam and continues into RI. Water from the Shad Factory Pond Dam is piped into the Kickemuit Reservoir, which is outside this watershed, for drinking water for the residents of Barrington, Bristol, and Warren, RI.

The Palmer River is a Category 5 waterbody. Although impairments due to bacteria have been addressed in completed TMDLs, other impairments for fish and wildlife habitat (aquatic life uses) due to levels of nitrogen and low dissolved oxygen have not yet been addressed in a TMDL. However, RIDEM has revised the discharge permits for the Warren wastewater treatment facility and Blount Seafood Company on the Warren River (tidally affects the Palmer) establishing more stringent nitrogen limits to address eutrophication in the Palmer River.

Shellfishing is prohibited in all areas of the Palmer River (shellfish growing area 2-1, see Figure 3-2).

Approved Water Quality Reports

- MADEP Fecal Coliform (Bacteria) TMDL for the Palmer River (2004)

  Pollutant Reductions Required to Meet Water Quality Standards for Bacteria: 0 -100%

- RIDEM Fecal Coliform (Bacteria) TMDL for the Palmer River, Rhode Island (2002)

  Pollutant Reductions Required to Meet Water Quality Standards for Bacteria: 67 – 99%

Bacteria Sources Indentified in Water Quality Reports

The major sources of bacteria to the Palmer River are concentrated along the more developed reaches of the river in Massachusetts in the southern portion of the watershed and originate from agricultural sources in the upper portion of the watershed. These sources of bacteria include stormwater runoff, agriculture runoff, failing OWTS, and animal waste. Belcher Cove is also thought to receive high concentrations of bacteria from animal waste and stormwater runoff.

Available Data Addressing Impairments in the Palmer River (Appendix B)

- RIDEM Shellfish Monitoring Program (Fecal Coliform) (Table B-3)
- RIDEM and MADEP Fecal Coliform TMDL for the Palmer River, RI (Fecal Coliform) (Table B-4)

Other Available Data for the Palmer River

MADEP Water Quality Assessment Report Program: *E. coli*, total nitrogen, ammonia, total phosphorus, temperature, specific conductivity, total dissolved sediments, and dissolved oxygen Evaluation of Nitrogen Targets and Load Reductions for the Palmer River, RIDEM (December 2009).

3.6 Warren River Sub-Watershed

The Warren River begins at the confluence of the Barrington and Palmer Rivers in Barrington, RI (Figure 3-1). The Warren River flows south past Barrington, Warren, and Bristol, RI, and discharges directly into Upper Narragansett Bay. For assessment purposes and this Plan, the river downstream of a line between Adams Point in Barrington and Jacobs Point in Warren is considered part of Upper Narragansett Bay. The entire river is tidally influenced.

Shellfishing is prohibited in all areas of the Warren River (shellfish growing area 2-1, see Figure 3-2). The Warren Town Beach has had 21 beach closures since 2006 (see Appendix B, Table B-6).

Areas of Concern Indentified in Water Quality Reports

Although the Barrington and Palmer Rivers, which form the Warren River, are impaired for bacteria, the Warren River is not considered impaired since observed bacteria concentrations do not exceed the applicable criteria for these class SB and SB1 waters. TMDLs have been completed for both the Barrington and Palmer Rivers, which once implemented should reduce bacteria loading to the Warren River.

Other potential sources of pollution to the Warren River include stormwater runoff from the developed areas in Warren, RI.

Available Data addressing Impairments in the Warren River (Appendix B)

- RIDEM Shellfish Monitoring Program (Fecal Coliform) (Table B-5)
- RI HEALTH Beach Monitoring Program for Warren Town Beach (Enterococci) (Table B-6)

3.7 Other Pollutants of Concern

Portions of the waterbodies in the BPW watershed have been sampled for fecal coliform, *E. coli*, ammonia, total phosphorus, dissolved oxygen, temperature, specific conductivity, and total suspended sediments. Based on land use data in the watershed, other pollutants of concern include enterococci bacteria, nutrients, chloride, and sediment,

Enterococci

Like fecal coliform, enterococci are bacterial indicators of water pollution. Bacteria can enter waterbodies from sources such as stormwater, failed OWTS and agricultural runoff, and domestic and wild animal waste. RI has switched to using enterococci as an indicator of bacterial contamination in fresh and salt water to assess primary contact recreation/swimming criteria. Fecal coliform bacteria are still used to assess shellfish consumption use.

The Warren River

Nutrients

Excess nutrients, such as phosphorus and nitrogen, have been shown to cause algal blooms in fresh and salt water, respectively. Nutrients can enter waterbodies from sources such as wastewater treatment facilities, stormwater from residential and agricultural runoff, and from OWTS.

Chloride

Chloride from de-icing salts has been shown to enter surface waters and groundwater. Chloride has the potential to negatively affect aquatic life, as well as threaten drinking water supplies. High levels of chloride in streams can occur year round when adjacent groundwater that supplies streamflow has high levels of chloride.

Salting the roads in the winter leads to an increase in chloride in nearby waterbodies

Sediment

Sediment can enter surface waters from sources such as stormwater and agricultural runoff, especially when activities that disturb soil such as construction and plowing are present. Excess sediment in surface waters can destroy fish spawning beds, reduce useful storage volumes in reservoirs, clog streams, reduce aquatic plant life, and alter stream ecology. Sediment often serves as a carrier of organic matter, animal or industrial wastes, pesticides, chemicals, and nutrients such as phosphorus.

3.8 Unassessed Designated Uses in the Watershed

As described in Section 3.1, all states are required to report to the USEPA on the quality of their surface water every two years. These "Integrated Water Quality Monitoring and Assessment Reports," describe the use attainment status for every designated use on every waterbody. This includes not only which designate uses are impaired, but also which designated uses have no or insufficient data and are therefore not assessed. Unassessed uses in waterbodies in the BPW watershed are shown in Table 3-2.

Table 3-2: Unassessed Designated Uses for Waters in the BPW Watershed (RIDEM, 2011b; MADEP, 2010)

Waterbody	State	Classification	Unassessed Uses
Runnins River	RI	B	Fish Consumption
East and West Branches of the Palmer River	MA	B	No uses assessed
Barrington River	RI	SA	Fish and Wildlife Habitat/Aquatic Life Use
Prince's Pond	RI	SA	Fish Consumption Shellfish Consumption

4. Current Management Activities in the BPW Watershed to Restore and Protect Water Quality

The following section summarizes the primary threats to water quality in the BPW watershed and provides a review of current actions for managing these threats, particularly in regards to stormwater, low impact development as it relates to stormwater, and onsite wastewater treatment systems. **Section 6** then provides a detailed action plan.

4.1 Stormwater

Stormwater runoff is most often carried to waterways by publicly owned drainage networks. Historically, these storm drain networks were designed to carry stormwater away from developed land as quickly as possible to prevent flooding with little to no treatment of pollutants. In 1999, the USEPA finalized its Stormwater Phase II rule, which required the operators of small municipal separate storm sewer systems (MS4s) to obtain permits and to implement a stormwater management program as a means to control polluted discharges.

Stormwater runoff entering a storm drain

In developed areas, large areas of natural landscape cover have been replaced with non-porous, or impervious, surfaces (e.g. buildings, streets, and parking areas). Impervious surfaces significantly change both the quality and quantity of runoff. As water is unable to infiltrate into the soil, the volume of stormwater runoff increases and that water picks up pollutants and transports them to nearby lakes, streams, and bays. This greater volume of water also moves much faster, increasing soil erosion, especially where natural vegetation is no longer present.

As noted earlier, impervious surfaces cover approximately 11% of the BPW watershed. The Runnins River and Barrington River sub-watersheds have impervious surfaces that cover approximately 23% and 20%, respectively. In areas with increased impervious cover, water quality impairments from stormwater runoff are more likely.

4.1.1 Summary of RI Stormwater Program

In Rhode Island, the RIDEM Rhode Island Pollutant Discharge Elimination System (RIPDES) Program administers the Phase II program using a General Permit that was established in 2003. Most Rhode Island municipalities (including all 4 in the BPW watershed), the Rhode Island Department of Transportation (RIDOT), and federal, state, and quasi-state agencies serving more than 1,000 people per day (e.g. University of Rhode Island) are regulated under the Phase II program.

The Phase II Program requires MS4 operators to develop a stormwater management program that is based on six minimum measures. Operators develop Stormwater Management Program Plans (SWMPPs) that

detail how their stormwater management programs comply with the Phase II regulations. SWMPPs describe BMPs for the six minimum measures, including measurable goals and schedules. The six minimum measures are listed below (USEPA, 2008).

1. A public education and outreach program to inform the public about the impacts of stormwater on surface waterbodies;
2. A public involvement/participation program;
3. An illicit discharge detection and elimination program;
4. A construction site stormwater runoff control program for sites disturbing 1 or more acres;
5. A post construction stormwater runoff control program for new development and redevelopment sites disturbing 1 or more acres; and
6. A municipal pollution prevention/good housekeeping operation and maintenance program.

The new Rhode Island Stormwater Design and Installation Standards Manual became effective January 1, 2011 and establishes low impact development (LID) as the standard for managing stormwater (see section 4.2 LID). All development and redevelopment projects subject to state permitting must comply with the Stormwater Manual. RI municipalities have the authority to adopt ordinances requiring any new developments to be in compliance with the RI Stormwater Design and installation Standards Manual. The state is also in the process of developing the next round of MS4 regulations which are likely to be more stringent than the existing measures.

Watershed Case Study: Warren Town Beach

The Town of Warren conducts fecal indicator bacteria testing at the Warren Town Beach in accordance with RI Department of Health monitoring standards. These tests have resulted in a number of beach closures. In response to these closures, the Town of Warren is taking action to reduce the amount of stormwater runoff that is currently reaching the beach, based on a feasibility and design study funded by the Clean Water Act Section 319 Grant Program.

Warren Town Beach Parking Lot

The planned project will install porous pavement for the approximately ¾-acre parking lot, plant rain gardens along Water Street between the beach and Burrs Hill Park, and replace the sewer line from Bridge Street to the Warren Sewage Treatment Plant. Warren has obtained $2 million from the RI Clean Water State Revolving Fund and is putting out another referendum bid for the additional $400,000 needed to complete the work.

4.1.2 Stormwater Checklist for Rhode Island Municipalities

The stormwater program for each RI municipality in the watershed has been reviewed based on the six minimum measures and their compliance with TMDL implementation (Table 4-1). In summary, Barrington, Bristol, East Providence, and Warren, RI have all completed mapping of stormwater outfalls, adopted ordinances for addressing illicit discharges and construction and post-construction runoff control, implemented annual street sweeping programs, and installed multiple BMPs not specified in existing TMDLs. No municipality in the BPW watershed has created a Stormwater Utility to finance stormwater management.

Table 4-1: Compliance with the Six Minimum Measures of the MS4 Program for Barrington, Bristol, East Providence, and Warren, RI

Minimum Measure	Barrington	Bristol	East Providence	Warren
1. Public education/outreach program?	Yes	Yes	Yes	No
2. Public involvement/participation program?	Yes	Yes	Yes	No
3. Illicit discharge detection and elimination program				
3a. Outfall map showing the location of all outfalls and names of receiving waters?	Yes	Yes	Yes	Yes
3b. Ordinance to prohibit and enforce illicit discharge to the MS4?	Yes	Yes	Yes	Yes
3c. Inspect catch basins and man holes at least once?	Yes	Yes	Yes	Yes
3d. Conduct a minimum of two dry weather surveys?	Yes	No	No	No
4. Construction site runoff control				
4a. Ordinance to reduce erosion and sediment controls, control of other wastes, and sanctions to ensure compliance?	Yes	Yes	Yes	Yes
5. Post-construction runoff control				
5a. Ordinance to address post-construction runoff from new development and re-development, and sanctions to ensure compliance?	Yes	Yes	Yes	Yes
6. Pollution prevention and good housekeeping				
6a. Annual catch basin cleaning program?	Yes	No	No	Yes
6b. Road sweeping program?	Yes	Yes	Yes	Yes

Table 4-1: Compliance with the Six Minimum Measures of the MS4 Program for Barrington, Bristol, East Providence, and Warren, RI (continued)

Minimum Measure	Barrington	Bristol	East Providence	Warren
SWMPP amended to incorporate a TMDL implementation plan?	Yes	NA	Yes	Yes
Has the town designed or constructed any of the BMPs for restoration as specified in the TMDL?	No	NA	NA	Yes
Has the town designed or constructed any stormwater BMPs (not identified in the TMDL)?	Yes	Yes	Yes	Yes
Has the town created a Stormwater Utility or other means to finance stormwater management?	No	No	No	No

4.1.3 Summary of MA Stormwater Programs

In Massachusetts, the USEPA National Pollutant Discharge Elimination System (NPDES) Program administers the Phase II Program. The Phase II Program requires Massachusetts MS4 operators to develop a Stormwater Management Program Plan (SWMPP) that is based on the same six minimum measures outlined for Rhode Island above. Massachusetts municipalities will be subject to more stringent MS4 requirements with the new draft NPDES permit requirements. These draft requirements for Massachusetts force municipalities to implement stormwater outfall monitoring programs and develop mechanisms to meet bacteria and nitrogen TMDLs.

The stormwater programs for the three municipalities in Massachusetts have been evaluated based on their compliance with NPDES standards.

4.1.4 Summary of Stormwater Programs for Rehoboth, Seekonk, and Swansea, MA

Rehoboth, MA is an MS4 community and as such, is required to comply with the six minimum measures required by the Phase II Program. The Rehoboth Highway Department is responsible for ensuring compliance with the MS4 program. Highlights of Rehoboth's stormwater program are as follows:

- Catch basin cleaning and street sweeping programs are generally completed annually, though budget cuts in the last few years have led to delays in these programs;

Rehoboth, MA Town Hall

- There has been some mapping of stormwater outfalls before the budget cuts, but focus has shifted away from that portion of the MS4 program in order to comply with other sections of the permit;

- Rehoboth has also completed some catch basin stenciling;

- Rehoboth adopted a bylaw in 2007 entitled "Governing Stormwater Discharge, Land Disturbance, & Post-Construction Stormwater Runoff" to address concerns about the health of the environment and the residents of Rehoboth. A Stormwater Management Committee was formed out of this adopted bylaw to address MS4 permit compliance for the town. The ordinance prohibits the illicit discharge of pollutants to MS4s that are connected to waterbodies.

- Rehoboth requires site plan and subdivision permits to submit an Operation and Maintenance Plan for erosion control Best Management Practices (BMPs) as part of the Standards of the Massachusetts Stormwater Management Policy.

- Rehoboth recently appointed a volunteer Stormwater Officer to help enforce the ordinances.

Seekonk, MA is also an MS4 community and as such, is required to comply with the six minimum measures required by the Phase II Program. Seekonk has taken great effort to upgrade the town's stormwater management policies. These efforts are highlighted below:

Seekonk, MA

- The town passed an Illicit Discharge Detection and Elimination (IDDE) by-law in 2006 and a Construction and Post-Construction by-law in 2008;

- Seekonk's Stormwater Advisory Committee (SWAC) has reviewed town policies regarding construction site runoff control and has adopted an Erosion and Sedimentation by-law in 2008 to meet USEPA requirements with construction site inspections;

- Seekonk, in cooperation with Weston & Sampson Engineering, Inc., has mapped all known stormwater structures (i.e. manholes, catch basins, and outfalls). The town is currently mapping pipe connections between structures, illicit discharge connections in catch basins, and catchment areas for each outfall;

- As set forth in their Stormwater Management Plan and as part of the town's BMPs for meeting TMDLs, the Town of Seekonk conducts bi-annual street sweeping and annual cleaning of catch basins, regulates illicit discharge sources, restores waterfowl habitat, and manages water quality of the Runnins River;

- Seekonk has increased public awareness of stormwater issues by mounting a campaign to post brochures and posters around town and to targeted businesses or landowners; and

- Seekonk has also hosted a Household Hazardous Waste Day, Earth Day clean-up, and SWAC public informational meeting several times a year.

Swansea, MA is also an MS4 community and as such, is also required to comply with the six minimum measures required by the Phase II Program. Swansea's stormwater program is headed by the Conservation Commission Agent, the Highway Engineer, and the Town Administrator. Some highlights of their stormwater program are as follows:

- Annual catch basin cleaning and inspecting and street sweeping programs are in place;

- Swansea enlisted a local Boy Scout troop to stencil all catch basins that discharge to salt water in an effort to raise public awareness of stormwater flows;

- Swansea has begun mapping and monitoring outfalls, and these efforts have focused on the town's major shellfishing beds. The town hopes to expand this mapping and monitoring project to all of its stormwater outfalls;

- The Board of Health also checks for pollutant loading on beaches several times over the summer swim season; and

- There is currently a stormwater by-law in process that will address any MS4 permit compliance concerns.

4.2 Low Impact Development

Low Impact Development (LID) is different from conventional stormwater treatment. It is a comprehensive approach to project design to minimize the hydrologic impacts of development or re-development, therefore reducing the need for stormwater treatment infrastructure. In the past, the landscape was altered to fit the style of development. In the LID process, the development is shaped to fit into the landscape. This new approach to site planning and stormwater management focuses on the preservation and use of natural systems to achieve stormwater management objectives where possible (USEPA, 2011b).

Examples of Low Impact Development Projects

4.2.1 Summary of RI LID Programs

In 2007, Rhode Island adopted the *Smart Development for a Cleaner Bay Act* (General Laws Chapter 45-61.2), requiring RIDEM and the Coastal Resources Management Council (CRMC) to update the Rhode Island Stormwater Design and Installations Manual. The update was completed in December 2010, and focuses on using LID techniques as the primary method of stormwater control (http://www.dem.ri.gov/pubs/regs/regs/water/swmanual.pdf). A companion Rhode Island Low Impact Development Site Planning and Design Guidance Manual (March 2011) is also available (http://www.dem.ri.gov/programs/bpoladm/suswshed/pdfs/lidplan.pdf) to provide examples for local officials of how to amend their ordinances to avoid and reduce the impacts from development and encourage more effective implementation of LID practices.

4.2.2 Low Impact Development Checklist for RI Municipalities

The LID program for each municipality has been reviewed following the objectives of the LID Site Planning and Design Guidance Manual (Table 4-2). The manual contains over 45 specific techniques that can be used by communities to avoid and reduce the stormwater impacts to water quality from development. These techniques can also preserve community character, reduce flooding, and save money. The checklist allows a community to quickly determine what specific LID site planning and design techniques they have adopted or may need to adopt to more effectively encourage LID practices for development. Communities are encouraged to adopt alternative techniques not listed below that can meet the desired objectives. Moreover, not all LID site planning and design techniques are applicable to every community.

Table 4-2: Summary of LID Programs for Barrington, Bristol, East Providence, and Warren, RI

Low Impact Development Objectives	Barrington	Bristol	East Providence	Warren
GOAL: Avoid the impacts of development to natural features and pre-development hydrology.				
Objective I: ***Protect as much undisturbed open space as possible to maintain pre-development hydrology and allow precipitation to naturally infiltrate into the ground.***				
1. Has Conservation Development been adopted to protect open space and pre-development hydrology?	No	Yes	No	No
2. Has a transfer of development rights ordinance been adopted to provide an incentive for landowners to preserve natural lands?	No	No	No	Yes
3. Are limits of disturbance required to be marked on all construction plans?	Yes	Yes	Yes	Yes
4. Are there limits on lawn area for residential lots to protect open space?	Yes	No	No	No
5. Are undisturbed vegetative areas required on new lots as visual screens?	Yes	No	Yes	No
Objective II: ***Maximize the protection of natural drainage areas, streams, surface waters, wetlands, and jurisdictional wetland buffers.***				
6. Do regulations require or encourage new lots to exclude freshwater and /or coastal wetland jurisdictional areas, to the extent practicable?	Yes	Yes	Yes	No
7. Do regulations direct building envelopes away from steep slopes, riparian corridors, hydric soils, and floodplains, to the extent practicable?	Yes	Yes	Yes	Yes
8. Has a community buffer program been created to establish or restore a naturally vegetated buffer system along all surface waters and wetlands to supplement and expand upon the minimum requirements of the DEM and CRMC programs, where applicable?	Yes	No	No	No
9. Are zoning setback distances flexible in residential districts to avoid requiring house lot locations to be unnecessarily close to surface waters, wetland, and riparian corridors?	No	No	Yes	No

Table 4-2: Summary of LID Programs for Barrington, Bristol, East Providence, and Warren, RI (continued)

Low Impact Development Objectives	Barrington	Bristol	East Providence	Warren
Objective III: ***Minimize land disturbance, including clearing and grading, and avoid areas susceptible to erosion and sediment loss.***				
10. Has your community adopted an erosion and sediment control ordinance?	Yes	Yes	Yes	Yes
11. Did your community adopt a grading ordinance to require applicants to maintain as much natural vegetation as possible and limit clearing, grading, and land-disturbing activities to the minimum needed for construction maintenance and emergency services?	No	No	Yes	No
12. Has your community adopted a forest cover, tree protection, or tree canopy ordinance?	No	No	No	No
13. Do you require permits before removing trees on new or re-development sites?	No	No	No	No
14. Have minimum tree preservation standards been established for new development?	No	No	Yes	No
15. Do capital improvement plans include tree planting as part of project budgets?	No	Yes	No	No
16. Do you require that public trees removed or damaged during construction be replaced with an equivalent amount of tree diameter? (for example, if a 24-inch diameter tree is removed it should be replaced with six four-inch diameter trees).	No	No	No	No
Objective IV: ***Minimize soil compaction as a result of construction activities or prior development.***				
17. Have you adopted provisions within land development regulations that prohibit the compaction of soils in areas needed for stormwater recharge?	No	No	No	No
18. Have you adopted requirements for construction site inspections to ensure that soils are not compacted?	No	No	No	Yes
GOAL: Reduce the impacts of land alteration to decrease stormwater volume, increase groundwater recharge, and minimize pollutant loadings from a site.				
Objective V: ***Provide low-maintenance, native vegetation that encourages retention and minimizes the use of lawns, fertilizers, and pesticides.***				
19. Have LID landscaping standards been adopted that require the preservation of as much natural vegetation as possible and encourage low-maintenance native landscaping?	No	No	No	No

Table 4-2: Summary of LID Programs for Barrington, Bristol, East Providence, and Warren, RI (continued)

Low Impact Development Objectives	Barrington	Bristol	East Providence	Warren
Objective VI: *Minimize impervious surfaces.*				
20. Did your community adopt compact growth ordinances such as conservation development, planned development, or mixed use development?	Yes	Yes	Yes	Yes
21. Has your community identified growth centers where increased density is appropriate and encouraged?	Yes	Yes	Yes	Yes
22. Are residential streets required to be as narrow as possible to accommodate traffic volumes without compromising safety?				
22A. Do you require road widths of 22 feet or less for subdivisions of 40 or fewer homes or average daily trips less than 400?	No	No	No	No
22B. Do you require road widths of 26 feet or less for subdivisions of 40-200 homes or average daily trips of 400-2,000?	NA	No	No	No
23. Are street right-of-way widths required to be less than 45 feet?	No	No	No	No
24. Are driveway lengths and widths required to be reduced to the extent possible with pervious surfaces and shared driveways encouraged wherever appropriate?				
24A. Do you require driveways to be nine feet or less (one lane) and 18 feet or less (two lanes)?	No	No	No	No
24B. Do you allow pervious surfaces to be used for residential driveways?	Yes	Yes	Yes	Yes
24C. Do you allow shared driveways to be used in residential developments?	Yes	Yes	Yes	Yes
25. Do you allow the flexibility with curbs in residential streets to encourage side-of-the-road drainage into vegetated open swales, where possible?	Yes	Yes	Yes	Yes
26. Where curbs are needed, do you allow opening in curbs that allow runoff to flow into swales?	Yes	Yes	NA	Yes

Table 4-2: Summary of LID Programs for Barrington, Bristol, East Providence, and Warren, RI (continued)

Low Impact Development Objectives	Barrington	Bristol	East Providence	Warren
27. Have flexible sidewalk design standards been adopted to limit impervious cover?				
27A. Is the minimum sidewalk width four feet or less?	No (4.5 ft)	No	No (5 ft)	No
27B. Do you require sidewalks on one side of the street only in low-density neighborhoods?	Yes	Yes	No	No
27C. Are sidewalks required to be gently sloped so that they drain into the front yard rather than the street?	No	No	No	No
27D. Can alternative pedestrian access such as trails or unpaved footpaths be used instead of sidewalks?	No	No	No	Yes
27E. Can pervious surfaces be used for sidewalks?	No	No	No	No
28. Did your community modify the dimension, design, and surface material of cul-de-sacs to reduce total impervious cover?				
28A. Is the minimum radius allowed for cul-de-sacs less than 45 feet?	No (50 ft)	Yes	No (50 ft)	No
28B. Can a landscaped island or native vegetation be within the cul-de-sac?	Yes	Yes	Yes	Yes
28C. Are alternative turnarounds allowed such as hammerheads or tees?	Yes	Yes	Yes	Yes
29. Have both minimum and maximum parking ratios been adopted to provide adequate parking while reducing excess impervious cover?	Yes	Yes	Yes	No
30. Do you allow pervious materials to be used for parking areas and overflow parking?	Yes	Yes	No	Yes
31. Are parking ratios reduced if the site is served by mass transit or has good pedestrian access?	No	Yes	Yes	No
32. Is shared parking encouraged and implemented wherever feasible in order to reduce total impervious cover?	No	Yes	Yes	No
33. Do off-site parking allowances exist to accommodate re-development and mixed-use compact growth?	Yes	Yes	Yes	Yes

Table 4-2: Summary of LID Programs for Barrington, Bristol, East Providence, and Warren, RI (continued)

Low Impact Development Objectives	Barrington	Bristol	East Providence	Warren
34. Are parking stalls and aisles reduced to the extent feasible in order to decrease total impervious cover?				
34A. Are the minimum stall dimensions nine feet wide by 18 feet long?	Yes	No	No (10 by 18 ft)	Yes
34B. Is 20% or more of the parking lot required to have smaller dimensions (8 feet by 16 feet) for compact cars?	No	Yes	No	No
35. Are parking lot landscaping requirements flexible and do they encourage LID techniques?				
35A. Do parking lots of ten or more spaces require that 10% of the parking lot area be dedicated to landscaped areas that can include LID stormwater practices?	No	No	Yes	No
35B. Is landscaping required within parking areas to "break up" pavement at fixed intervals?	Yes	Yes	Yes	Yes
35C. Is a 25-30% tree canopy coverage over on-site parking lots required?	No	No (20%)	No (20%)	No
36. Have impervious cover limits been adopted to reduce impervious cover on a community or partial-community-basis?	Yes (65%)	No	Yes	Yes
GOAL: Manage the impacts at the source.				
Objective VII: ***Infiltrate precipitation as close as possible to the point it reaches the ground using vegetated conveyance and treatment systems.***				
37. Have you amended regulations to require all development projects comply with LID pursuant to the *Rhode Island Stormwater Design and Installation Standards Manual?*	No	Yes	Yes	No
38. Have you revised regulations to allow and encourage LID vegetated treatment systems such as bioretention, swales, and filter strips to promote recharge and the treatment of runoff?	No	Yes	Yes	No
Objective VIII: ***Break up or disconnect the flow of runoff over impervious surfaces.***				
39. Have you amended regulations to encourage runoff to be diverted over pervious surfaces to foster infiltration, runoff reduction, and pollutant removal, where appropriate?	No	Yes	Yes	No

Table 4-2: Summary of LID Programs for Barrington, Bristol, East Providence, and Warren, RI (continued)

Low Impact Development Objectives	Barrington	Bristol	East Providence	Warren
Objective IX: Provide source controls to prevent or minimize pollutants in stormwater.				
40. Do you encourage or require appropriate pet waste disposal to prevent pet waste from entering stormwater runoff?	No	Yes	Yes	No
41. Are commercial and industrial developments required to sweep their impervious areas on an annual basis?	No	No	No	No
42. Is street sweeping done regularly on community streets to limit pollutant transport to waterbodies and reduce maintenance of catch basins?	Yes	Yes	Yes	Yes
43. Are community road salt storage piles covered?	Yes	Yes	Yes	Yes
44. Has a community wastewater management district been adopted to encourage or require all onsite wastewater treatment systems be inspected and maintained regularly?	NA (few OWTS)	Yes	NA (few OWTS)	Yes
45. Have you adopted a stormwater utility district to manage the existing impacts of stormwater runoff?	No	No	No	No
Objective X: Re-vegetate previously cleared areas to help restore groundwater recharge and pollutant removal.				
46. Have regulations been adopted to encourage re-vegetation with native species, where possible?	No	No	Yes	No
BONUS				
47. Did you revise your comprehensive plan to include the three goals and then objectives described above?	No	No	No	No

4.2.3 Summary of MA LID Programs

In 1996, MADEP worked with the Massachusetts Office of Coastal Zone Management (MCZM) to develop a Stormwater Management Standards and Handbook (http://www.mass.gov/dep/water/laws/policies.htm#storm). Having recently revised the handbook to include LID, the associated policies became part of Massachusetts' Wetlands Protection Act (310 CMR 10.00) and Water Quality Certification Regulations (314 CMR 9.00) in 2008. The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) developed a Smart Growth/Smart Energy Toolkit for LID practices (http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-lid.html). MCZM also created the Coastal Smart Growth Program in 2004 and has published a packet on "The Practice of Low Impact Development" (http://www.mass.gov/czm/smartgrowth/pdf/practice_of_lid.pdf).

4.2.4 Summary of LID Programs for Rehoboth, Seekonk, and Swansea, MA

Rehoboth, MA

- The Conservation Agent/Town Planner is currently working to pass an Open Space by-law for subdivision development. Having recognized the impact of residential sprawl on the town's water quality and natural resources, the town wants to pass this by-law on Open Space Design (OSD) to promote both economic development and natural space preservation;

- As a long-term goal, the town will likely incorporate LID options into their subdivision zoning by-laws; and

- The Rehoboth Land Trust is very active in obtaining land within the town for preservation. For example a private landowner is subdividing his property for 40B development for residents 55 years old or more. ("40B" refers to a MA statute which allows some exemptions from zoning ordinances for developments which provide affordable housing.) Twenty-five percent of the subdivision will be low-income housing for the elderly. The landowner is also teaming up with the University of New Hampshire to develop a stormwater design that includes LID practices.

Seekonk, MA

- The Sustainable Design Incentives (Section 10.6.7) of their Zoning Bylaws (Updated November 2010) allows for new or re-development project proposals to put in LID in lieu of total compliance. Seekonk will continue negotiating these types of projects by encouraging LID in development plans; and

- The Seekonk Land Trust and the Conservation Commission have been working together following the recently passed Community Preservation Act (CPA) which allows town-imposed surcharges on property tax. The collection goes into an account, which partly helps fund open space land

purchases. Part of this funding was used last year to purchase a tract of land that now has public access trails.

Swansea, MA

- The Swansea Planning Board is considering changes to its rules and regulations for small subdivisions to include LID techniques, but only as an encouragement to developers;

- The town has a third-party consultant review all stormwater site plans for new development. The Planning Board and Conservation Commission work together to ensure that developers know all the necessary rules and regulations. A recent CVS development included a bioretention rain garden, which met stormwater control regulations set by the town;

- Swansea has a Community Preservation Committee that has identified all open spaces. The committee has secured an agreement to put at least one of the larger open space areas into a conservation trust (see Swansea Warren Country Club); and

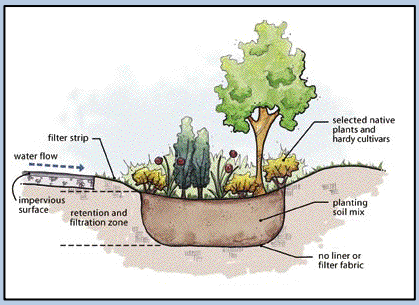
- The town is looking to include Open Space Design in future zoning by-law amendments put toward the Planning Board.

Watershed Case Study: Seekonk BJs Wholesale Club LID Initiative

A shopping center redevelopment project in Seekonk, MA has incorporated creative design options in response to the close proximity of the impaired Runnins River. A new BJs Wholesale Club is currently under construction in Seekonk, MA with construction expected to be completed in 2012. The building and parking lot expansions at the BJs focus on designs that help mitigate stormwater runoff.

Area to be used for bioretention at the BJs in Seekonk, MA

Stormwater runoff from impervious surfaces such as parking lots is a major source of pollution to rivers like the Runnins. Recent use of low impact development (LID), such as bioretention, has created easily-manageable and highly-aesthetic urban design alternatives that divert, catch, and ultimately filter stormwater runoff before reaching surface waterbodies (LIDC, 1999-2007). Bioretention uses the natural filtration and stabilization features inherent to tall grass, shrub and tree buffers to capture pollutants.



Example of a Bioretention Design

BJs Wholesale Club, in conjunction with the Town of Seekonk, has funded a project to install catch basins and bioretention islands in their parking lot. BJs will also be providing money to the town for future LID projects along the Runnins River. This effort is expected to help improve the water quality of the Runnins River as much of the TSS, bacteria, oil and grease, nutrients and trash from the parking lot is captured by the newly-installed bioretention cells.

4.3 Onsite Wastewater Treatment Systems

A properly designed and operating onsite wastewater treatment system (OWTS) prevents pollutants, such as bacteria, from impacting the surrounding surface and groundwaters. These pollutants can be reduced through proper OWTS maintenance and the repair or replacement of failed and/or substandard systems.

As noted previously, developed areas, including residential neighborhoods, cover approximately 26% of the BPW watershed. In the Rhode Island portion of the watershed, developed areas cover 56% of the total land area. As shown in Figure 3-1, most of the Rhode Island portion of the watershed is serviced by a municipal sanitary sewer system. However, many residents, particularly in the Massachusetts portion of the watershed, rely on OWTS.

4.3.1 Summary of RI Onsite Wastewater Treatment Systems (OWTS) Programs

In Rhode Island, all OWTS must follow the *Rules Establishing Minimum Standards Relating to the Location, Design, Construction, and Maintenance of OWTS*, July 2012. In addition to administering these Rules, Rhode Island has established the programs below to limit the impacts of pollutants from OWTS to nearby waterbodies and assist municipalities with the repair and replacement of malfunctioning OWTS.

Onsite Wastewater Management Plan (OWMP) – The required elements of a municipal OWMP necessary to be approved by RIDEM are provided below. RIDEM approval enables a municipality to qualify for the State's Community Septic System Loan Program (CSSLP).

- Summarizes the status of OWTS in a town;
- Identifies areas or resources of particular concern and outlines goals for a wastewater management program;
- Provides a complete summary of issues related to wastewater such as development, land use, population pressures, and natural resources; and
- Outlines a strategy to complete the goals of a wastewater management program including public outreach and education, an inspection and maintenance program, and zoning.

Community Septic System Loan Program (CSSLP)

- CSSLP is a program that provides low-interest loans to municipalities so that they may issue low interest loans to homeowners to repair or replace failed, failing, or substandard OWTSs
- Loans to homeowners are offered at 2% interest rate with a 10-year term.
- RIDEM approval of an onsite wastewater management plan is necessary before a community can be eligible for CSSLP funds.

Cesspool Replacement

- Failed cesspools anywhere in RI are required to be replaced under OWTS Rules.
- The OWTS rules require the replacement of cesspools that serve commercial facilities or multifamily dwellings.
- The Rhode Island Cesspool Act of 2007 requires the replacement of cesspools located within 200 feet of the inland edge of a coastal shoreline feature bordering a tidal area, within 200 feet of all public wells, and within 200 feet of a waterbody with an intake for a drinking water supply by January 1, 2014.

Watershed Case Study: Warren's Septic System Pump-Out Program

Currently, all Warren, RI residents pay a sanitation tax (approximately 6% of the owner's property tax bill), part of which goes to maintaining the sewer system. In an effort to repay residents not connected to sewer, Warren offers free pump-outs (up to twice per year) to residents with onsite wastewater treatment systems. Roughly 25% of the total 5,600 parcels in Warren have these systems. Many residents take advantage of the program, and the town is working to identify all sewer and onsite parcels.

Regular pumping of your septic system is necessary to prevent malfunction

The pump-out program will change as the town adopts a new Onsite Wastewater Management District (OWMD) that will be headed by an OWMD Manager. The OWMD Manager will inspect all onsite wastewater treatment systems before pump-out to ensure pump-out is necessary. This will ultimately increase efficiency. Warren is now eligible to receive funds under the CSSLP to provide financial assistance to residents who repair their systems.

4.3.2 Onsite Wastewater Treatment Systems Checklist for Rhode Island Municipalities

Owners of OWTSs are responsible for maintaining their systems, and each municipality has the opportunity to establish a management program to support property owners in these efforts. Each municipality's OWTS Program has been evaluated based on criteria established by RIDEM, which represents the preferred management scenario (Table 4-3). It should be noted that none of the elements below are required by state or federal rule or law. Municipalities can develop OWTS Programs to improve proper operation and maintenance and provide funding assistance. Although most of the BPW watershed in Rhode Island is serviced by a municipal sanitary sewer system, both Bristol and Warren have active OWTS programs. For instance, they have approved onsite wastewater management plans which make them eligible for the Community Septic System Loan Program and they have also adopted an Onsite Wastewater Management ordinance. Neither municipality has a computer-based system to track OWTS or a staff person responsible for enforcement and management of the onsite wastewater management plan. As the municipalities of Barrington and East Providence are essentially completely sewered, Table 4-3 is not applicable to these communities.

Table 4-3: Summary of Onsite Wastewater Treatment System Programs for Barrington*, Bristol, East Providence*, and Warren, RI

OWTS Management Program Element	Barrington*	Bristol	East Providence*	Warren
Does the town have an approved Onsite Wastewater Management Plan?	NA	Yes	NA	Yes
Does the town participate in the Community Septic System Loan Program?	NA	Yes	NA	Pending
Has the town adopted an Onsite Wastewater Management ordinance?	NA	Yes	NA	Yes
Does the Onsite Wastewater Management Plan have mandatory inspections?	NA	No	NA	Yes
If so, has the town taken enforcement actions in cases of non compliance?	NA	NA	NA	NA
Does the town have a web-based tracking system? (e.g. RI Wastewater Information System?)	NA	No	NA	Pending
Does the town have a website for information and education of OWTS issues?	NA	Yes	NA	Yes
Does the town have a staff person whose primary responsibility is management of the OWMP?	NA	No	NA	Pending
Does the town have a cesspool phase out program?	NA	No	NA	No
If so, has the town taken enforcement actions in cases of non compliance?	NA	NA	NA	NA
Has the town adopted an ordinance for more stringent OWTS standards than the DEM rules?	NA	No	NA	Pending

* Barrington and East Providence are almost completely sewered, therefore this table is not applicable to these communities.

4.3.3 Summary of MA Onsite Wastewater Treatment System Programs

In Massachusetts, all OWTS must follow Title V Regulations (found online at http://www.mass.gov/dep/service/regulations/310cmr15.pdf). Title V of the State Environmental Code is MADEP's regulations for the siting, construction, upgrade, and expansion of onsite sewage treatment and disposal systems. MA Title V also requires inspections of all systems at the time of property transfer. Failing systems identified at this time must be replaced. Massachusetts has established programs to limit the contribution of OWTS to water quality impairments in nearby waterbodies and assist municipalities with the repair and replacement of malfunctioning OWTS by means of:

Community Septic Management Program (CSMP)

- Provides funding of up to $200,000 in the form of low cost loans to allow communities to devise a Community Inspection Plan or a Local Septic Management Plan. MADEP funds these loans through the Massachusetts Water Pollution Abatement Trust.

- Using the State Revolving Fund loans from the Trust, communities can provide betterment loans to assist homeowners who must address onsite wastewater treatment system failures.

Community Inspection Plan or a Local Septic Management Plan

- The Community Inspection Plan is a plan to protect environmentally sensitive areas from contamination from onsite wastewater treatment systems. Inspections must be performed every seven years.

- The Community Inspection Plan requires onsite wastewater treatment system inspections every seven years and eliminates the Title V requirement for mandatory inspection after any property use changes or transfers.

- The Local Septic Management Plan identifies, monitors, and addresses proper operation, maintenance, and upgrade of onsite wastewater treatment systems in a comprehensive manner.

- The Local Septic Management Plan has voluntary system inspections; therefore, Title V inspections are still required.

- Over 4,000 onsite wastewater treatment systems have been upgraded through the use of $22 million in CSMP loans in the last 15 years.

In order to account for the differences in state government programs, a different set of questions was developed for these MA towns (Table 4-4).

Table 4-4: Summary of Onsite Wastewater Treatment Programs for Rehoboth, Seekonk, and Swansea, MA

OWTS Documentation/Regulation	Rehoboth	Seekonk	Swansea
Does the municipality have an approved Community Inspection Plan or a Local Septic Management Plan?	No	No	No
Does the municipality participate in the Community Septic Management Program?	No	No	No
Has the municipality adopted a septic management ordinance other than what is mandated through Title V?	Yes	Yes	No
If so, has the municipality adopted standards more stringent than MADEP?	Yes	Yes	No
If the municipality has a Community Inspection Plan, has the town taken enforcement actions in cases of non-compliance?	NA	NA	NA
Does the municipality have a tracking system for their OWTS?	No	Yes	Yes
Does the municipality have a website for information and education of onsite wastewater issues?	No	Yes	No
Does the town have a staff person whose primary responsibility is management of the CSMP?	No	No	No

4.4 Other Issues

4.4.1 Agriculture

Properly managing agricultural runoff is important to the water quality in the watershed. As shown in **Section 3**, land use within the watershed is approximately eight percent agricultural; however there are fairly concentrated areas of agricultural activity, particularly in the lower Palmer sub-watershed. (See Appendix A for a detailed map of agricultural lands in the watershed.) Agricultural land use has a long history in the watershed and includes dairy farming, raising livestock and poultry, growing crops, and keeping horses and other animals for pleasure or profit. Activities and facilities associated with agriculture can be a source of pollution to nearby waterbodies through the direct deposition of fecal matter from farm animals standing or swimming in surface waters and the runoff of farm animal waste and fertilizer and pesticides from land surfaces. Properly managing manure and other farm wastes through BMPs, including the maintenance of a vegetated buffer near surface waters, will reduce the impacts of agricultural land use while protecting water quality.

The focus in this section has been on the role of the municipalities, but in regards to controlling pollution from agricultural lands, municipalities have a very limited role. Farmers are encouraged to contact the local US Department of Agriculture Natural Resources Conservation Service office and the Conservation Districts for assistance in preparing farm management plans and for information on grants for installing best management practices to control water pollution.

4.4.2 Land Conservation and Preservation

Protecting open space through land conservation practices is important to the water quality in a watershed. Natural landscapes remove pollutants through processes such as infiltration into the soil and plant uptake of nutrients. Protecting areas along the shoreline of a waterbody is particularly important as natural buffers will reduce the amount of pollutants that enter the waterbody.

In Massachusetts and Rhode Island, natural landscapes are protected through municipal conservation efforts and land trusts, and as State Parks and privately-owned land. A helpful resource to assist municipalities and local citizens with land protection is the Rhode Island Conservation Easement Guidance Manual (http://www.nbwctp.org/programs/easements_openspace.html). This manual provides information on how conservation easements are drafted, reviewed, put into action, and effectively enforced, and also goes into detail on how to manage, monitor, and steward such parcels. Lands that are currently protected through some of these efforts in the BPW watershed are shown in Figure 4-1.

Watershed Case Study: Open Space Mapping in Warren

Characterizing a town's open space can provide valuable information as to current and projected development priorities. The Town of Warren recognizes open space mapping as a chance to obtain a holistic prospective of its landscape. Davison Bolster, a Town Council member, and Caroline Wells, Town Planner, are working to generate a detailed GIS file of all open space in Warren from hand-annotated tax parcel maps.

Mr. Bolster helped delineate areas on the draft map shown. Once completed, the map will be used for several purposes, including determining the size and remaining integrity of Warren's "Green Belt." Maintaining corridors between protected spaces is valuable for wildlife habitat and public use, and will help make the case for further open space protection in Warren.

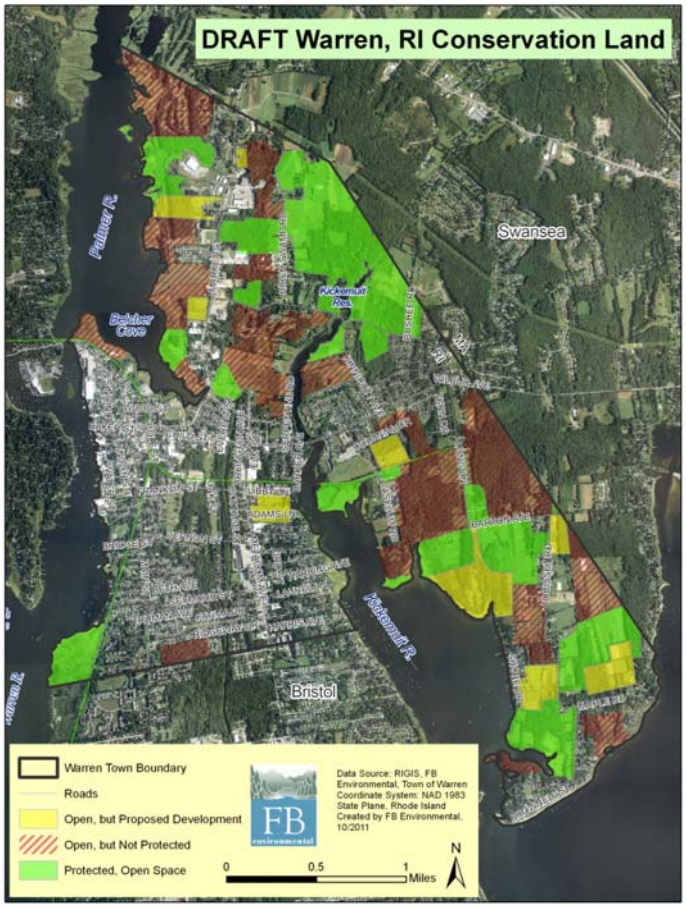
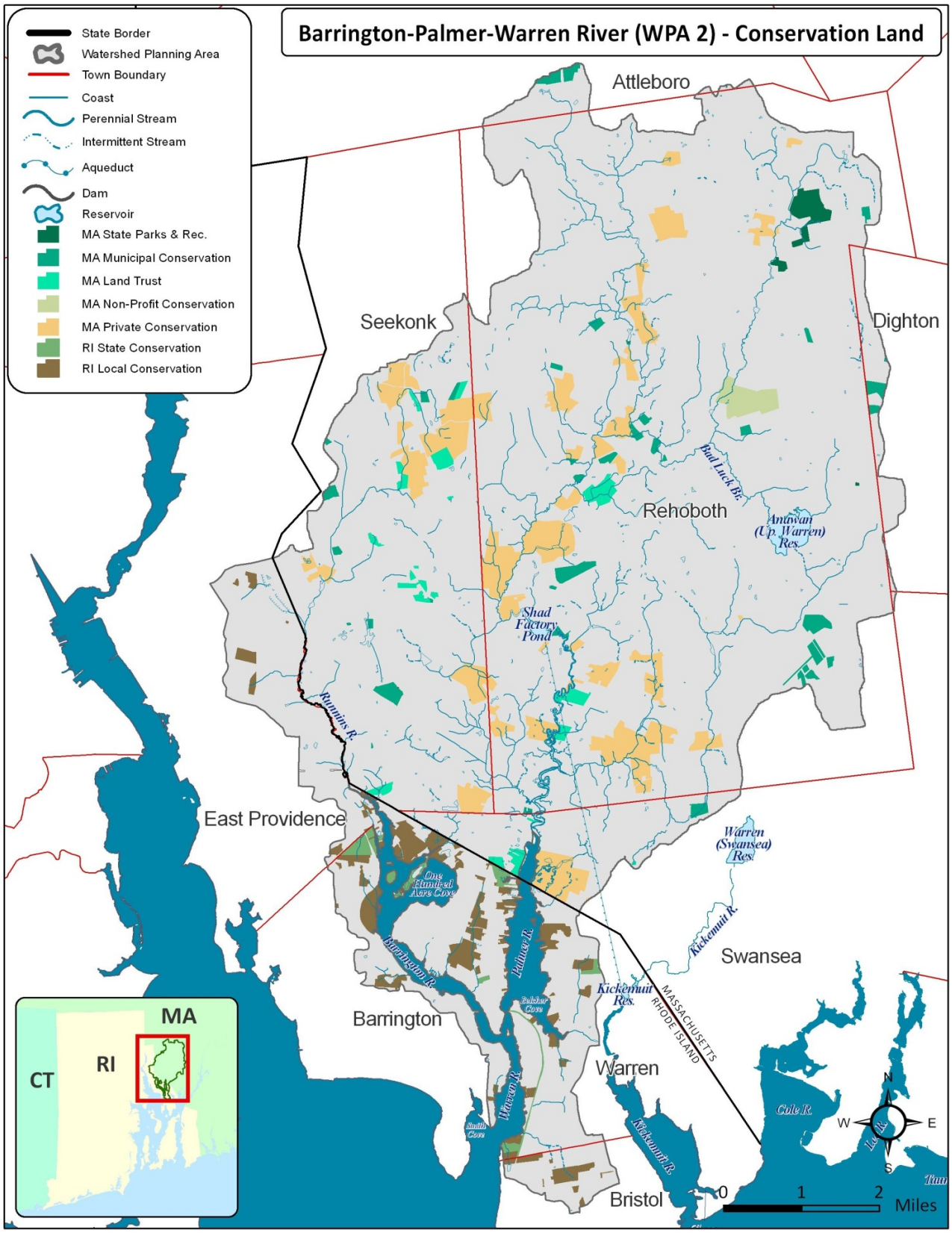


Figure 4-1: Open Space and Protected Lands in the BPW Watershed



Watershed Case Study: Swansea Country Club Conservation Easement

Recognizing the need to protect its excellent birding habitat, the Swansea Country Club is donating a portion of land along the Palmer River to both Swansea, MA, and Warren, RI, to be put into conservation easement. The area was historically used as a private hunting preserve until it became a golf course in the 1960's. Fortunately for conservation, the marshy woodland habitat in the back of the golf course was deemed unsuitable for development and was left natural.

Merriman's Pond located on the golf course property and included in the conservation easement.

Osprey with fish taken on land between Merriman's Pond and the Palmer River. The Audubon Society's Osprey Monitoring Program has classified the Palmer River as having one of the highest concentrations of Ospreys in Rhode Island.

Swansea will receive approximately 80 acres, which includes the freshwater pond, and Warren will receive approximately 45 acres, which abuts 50 acres of conservation land owned by the town.

The Country Club plans to keep the new conservation land as undisturbed as possible, providing only limited access to conservation groups, school groups or Audubon members. Access to the property is already limited either via the golf course itself or the Palmer River. With the addition of Warren's easement, additional access points could be used through public trails. While the land is still attached to the deed of the property, the towns now own the conservation rights according to the agreements signed.

5. Actions to Restore and Protect Water Quality

This Action Plan for restoring and protecting water quality was developed to include specific actions recommended in other plans and TMDLs and from feedback received at municipal meetings held in each municipality. The Action Plan identifies specific tasks to address water pollution issues in the three management categories indentified in Section 4 (stormwater, low impact development as it relates to stormwater and onsite wastewater treatment systems). The Plan outlines responsible parties, approximate costs, estimates of value to the watershed, and an implementation schedule for each task. Action items for other sources of pollution are also identified.

5.1 Watershed-Wide Actions

There are several opportunities for cities, towns, utilities, and other organizations to work together to achieve water quality goals. Advantages to working together include cost and labor savings and access to greater expertise. In addition, a wider geographic scope means a larger pool of potential project ideas, resulting in a better ability to prioritize tasks on a region wide-basis.

5.1.1 Create a Watershed-Wide Organization

While not absolutely necessary, it is highly recommended that a formal organization be created to implement this plan and to advocate for watershed action into the future. A dedicated, stakeholder-led group provides a valuable forum for building consensus among the many public and private stakeholders in the watershed. A clear consensus among all major participants is critical if watershed-level goals are to be attained across the multiple jurisdictions and communities within the watershed. If such a multi-jurisdictional effort cannot be developed or maintained, an alternative is to establish a municipal committee (or designate an existing committee) to implement the Plan and coordinate activities within the municipality. Successful plan implementation will depend on strong leadership. Relevant stakeholders include:

- Residents
- Businesses
- Nonprofit groups
- Municipal officials
- State agencies
- Federal agencies
- Scientists

- Non-residents and concerned citizens

A joint powers agreement is recommended to facilitate coordination among the many levels of government that are involved in watershed planning. These agreements are usually brief (a few pages), non-binding documents aimed at building consensus on issues that span more than one political jurisdiction. They typically contain:

- A list of parties and agencies formally in the plan;
- A vision statement for the partnership;
- Watershed issues to be addressed under the agreement;
- Commitment to provide assistance and coordinate planning efforts through a central management structure;
- Agreement to use the watershed plan to guide land use or water management decisions by each partner;
- Details on funding sources, length of the agreement, and how new partners may be added; and
- Signatures of all the parties involved.

The Long Creek Restoration Project in Portland, Maine (predecessor to the Long Creek Watershed Management District) offers a good example of an initial interim organizational structure. It consisted of a steering committee, specialized subcommittees, and a larger watershed committee composed of business, nonprofit, government, and other stakeholders. The steering committee informs and listens to all stakeholders, oversees the subcommittees, articulates the mission and goals of the effort, and ultimately shapes a specific plan and timeline. A technical subcommittee provides expertise in watershed science and reviews the technical merit of specific proposals. A governance subcommittee develops administrative and funding mechanisms to implement the plan equitably and reliably. An outreach subcommittee conducts ongoing public education, organizes tours, and stimulates engagement with the community. More information is available online at http://restorelongcreek.org/.

The National Estuary Program (NEP) offers another good organizational framework which works across political boundaries to address watershed-scale efforts. The Narragansett Bay Estuary Program (NBEP) is already working across state boundaries to protect water quality, and is developing a Narragansett Bay regional plan. More information about NBEP is available at http://nbep.org/.

The Piscataqua Region Estuaries Partnership (PREP) is an example of a bi-state National Estuary Program (New Hampshire and Maine) working toward implementing a detailed watershed-level plan with specific implementation goals. More information is available online at http://www.prep.unh.edu/.

5.1.2 Form a Stormwater Utility for the BPW Watershed

A stormwater utility is a public utility established to provide stormwater management services. It is to stormwater what a sewer utility is to sewage, and a water utility is to drinking water. Stormwater utilities generate revenue through user fees that are based upon the amount of stormwater generated on a property. An important distinction between stormwater utility fees and real estate taxes is that they are user based and are tied to stormwater management services provided by the utility, whereas taxes are not tied to specific services. Stormwater utilities provide a dedicated, stable, and predictable source of revenue to finance local stormwater management services. More specifically, this stable funding source can be used to ensure ongoing maintenance of stormwater infrastructure, conduct long-term strategic planning, incentivize water quality protection among landowners, and facilitate MS4 permit compliance. This is appropriate since large rooftops and large parking lots generate high demands on city services in terms of the volume of stormwater that flows to municipal drainage systems, and catch basin cleaning and maintenance. Another key benefit of a stormwater utility is that it can assume responsibility for maintaining drainage infrastructure on private lands via easements. This prevents the scenario in which treatment structures (e.g., detention basins) are installed as a condition to planning board approval, but then are gradually forgotten, deteriorate, and cease to function as the development ages. Finally, a stormwater utility can respond to permit requirements and evolving regulations more efficiently and with greater expertise than individual land owners acting alone. The Long Creek Watershed Management District in the greater Portland, Maine, area is one example of an inter-municipal stormwater utility with the above advantages (http://restorelongcreek.org).

In Rhode Island, the Rhode Island Stormwater Management and Utility District Act of 2002 authorizes municipalities to create stormwater management districts, and empowers them to charge fees, provided that the fee system shall be reasonable and equitable so that each contributor of runoff to the system shall pay to the extent to which runoff is contributed. Today, there are over 2,000 stormwater utilities nationwide that either partially or completely fund municipal stormwater services. While stormwater utilities have been most commonly implemented to date in the Pacific Northwest and the Southeast, they are located in all regions of the country with about a half dozen utilities in New England. Stormwater utilities have focused on a variety of needs, including flood management, erosion control, stormwater treatment for water quantity and quality, and infrastructure maintenance.

Recently, the Rhode Island Department of Environmental Management has been working with the Towns of Westerly and Middletown to assess whether establishing a stormwater utility as a funding source might be a practical solution for these towns. With input from town professional staff, the Department has completed stormwater utility district feasibility studies for each town, both of which are available on the RIDEM website. Many resources are available to assist communities in developing a stormwater utility:

- ***USEPA Funding Stormwater Programs Fact Sheet***

  This document includes information on various stormwater funding mechanisms and types of stormwater utilities. It also describes how to create a stormwater utility and provides a list of resources.
  Online at: http://www.epa.gov/region1/npdes/stormwater/assets/pdfs/FundingStormwater.pdf

- ***New Hampshire Department of Environmental Services Stormwater Utilities Webpage***
  This webpage provides information about creating stormwater utilities, provides examples, and a list of resources.
  Online at: http://des.nh.gov/organization/divisions/water/stormwater/utilities.htm

- ***Florida Stormwater Association Manual for Establishing a Stormwater Utility***
  This manual was prepared to assist communities that are considering the development and implementation of a stormwater utility.

  Online at: http://www.florida-stormwater.org/content.asp?pl=8&contentid=33

5.1.3 Form an Onsite Wastewater Management District for the BPW Watershed

Similar to a stormwater utility, an onsite wastewater management district is a good candidate for inter-municipal cooperation. As noted in Section 5.2.1, both Bristol and Warren have onsite wastewater management plans. Opportunities exist to coordinate implementation efforts in order to reduce costs in such areas system pumping, inspections, tracking, and financing repairs.

5.1.4 Conduct Water Quality Monitoring

Water quality monitoring represents another good opportunity for coordinated efforts. Monitoring requires specialized equipment and expertise, much of which already exists at various government, education, and non-profit organizations. An inter-municipal monitoring effort can likely provide a better sense of priority areas on a region-wide basis. See the "Indicators of Progress" section for more detail.

5.2 Municipal Actions

As discussed in **Section 4**, the municipalities within the BPW watershed have already taken significant action to protect their water resources. However, additional actions are necessary to achieve long-term water quality goals, particularly through the improvement of stormwater management and onsite wastewater management and through the improvement of development practices. These actions are outlined in the tables below.

5.2.1 Improving Stormwater Management at the Municipal Level

Structural Best Management Practices (BMPs) are engineered, constructed systems designed to provide water quality and/or water quantity benefits. They function by reducing or disconnecting these impervious surfaces from collection systems leading to ponds or streams, or otherwise mimicking natural hydrology to minimize the adverse impacts to receiving waters. Examples of structural BMPs include porous pavement, created wetland, vegetated soil filters (bioretention), and infiltration systems.

Non-structural BMPs include land use planning techniques, maintenance practices, changing public behavior, and public education, and are generally less costly than structural BMPs. Examples of non-structural approaches include conservation development, regularly scheduled street sweeping to reduce sediment loads, and education programs focused on avoiding dumping waste into storm drains. In practice, both structural and non-structural approaches work well together. For example, an effective maintenance program will extend the life of structural BMPs and help avert expensive repairs.

The tasks listed in Table 5-1 provide a starting point for improving stormwater management in the BPW watershed and include a mix of structural and non-structural BMPs.

Table 5-1: Action Plan for Improved Stormwater Management

Barrington, RI					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Comply with Phase II Stormwater Management requirements.	--	RIDOT and Barrington	Ongoing	***	$$$
Educate community on benefits of a stormwater utility.	Draft Plan Public Meeting, May 2012	Town of Barrington	2-5 years	***	$
Form a stormwater utility.	--	Town of Barrington	2-5 years	***	$$$
Increase enforcement and requirements for BMP maintenance at developments with large stormwater BMPs.	Draft Plan Public Meeting, May 2012	Town of Barrington	Ongoing	**	$$
Install retrofits at the end of dead end roads where stormwater empties into a waterbody.	Draft Plan Public Meeting, May 2012	Town of Barrington and Save the Bay	5-10 years	**	$$$
Collaborate with RIDOT on stormwater compensation for upcoming White Church Bridge replacement.	--	Town of Barrington and RIDOT	2-5 years	*	$$

Table 5-1: Action Plan for Improved Stormwater Management (continued)

Barrington, RI (continued)					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Install structural BMP to pre-treat inflow to Woods Pond, Barrington watershed.	Barrington River Fecal Coliform TMDL, 2002	RIDOT	1-2 years	*	$$
Bristol, RI					
Comply with Phase II Stormwater Management requirements.	--	RIDOT and town of Bristol	Ongoing	***	$$$
Educate community on benefits of a stormwater utility.	Draft Plan Public Meeting, May 2012	Town of Bristol	2-5 years	***	$
Form a stormwater utility.	--	Town of Bristol	2-5 years	***	$$$
Conduct a minimum of two dry weather surveys.	--	Town of Bristol	Ongoing	**	$
Conduct annual cleaning of all catch basins in the town.	--	Town of Bristol	Ongoing	**	$$
Increase enforcement and requirements for BMP maintenance at developments with large stormwater BMPs.	Draft Plan Public Meeting, May, 2012	Town of Bristol	Ongoing	**	$$
Install retrofits at the end of dead end roads where stormwater empties into a waterbody.	Draft Plan Public Meeting, May 2012	Town of Bristol and Save the Bay	5-10 years	**	$$$
Monitor the discharges from the water and sewer pipe underdrain system for bacteria to help prioritize inflow and infiltration reduction work.	--	Town of Bristol	Ongoing	*	$

Table 5-1: Action Plan for Improved Stormwater Management (continued)

East Providence, RI					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Comply with Phase II Stormwater Management requirements.	--	RIDOT and city of East Providence	Ongoing	***	$$$
Install BMPs at County Street and, Route 6.	Runnins River Fecal Coliform TMDL, 2002	RIDOT and East Providence	5-10 years	***	$$$
Educate community on benefits of a stormwater utility.	Draft Plan Public Meeting, May 2012	City of East Providence	2-5 years	***	$
Form a stormwater utility.	--	City of East Providence	2-5 years	***	$$$
Install pigeon deterrent on I-195 Bridge.	Runnins River Fecal Coliform TMDL, 2002	RIDOT and East Providence	2-5 years	**	$$
Explore ways to reduce concentrations of underutilized impervious surfaces in the Taunton Ave. Area.	--	City of East Providence	2-5 years	**	$
Conduct a minimum of two dry weather surveys.	--	City of East Providence	Ongoing	**	$
Conduct annual cleaning and inspection of all catch basins.	--	City of East Providence	Ongoing	**	$$
Increase enforcement and requirements for BMP maintenance at developments with large stormwater BMPs.	Draft Plan Public Meeting, May 2012	City of East Providence	Ongoing	**	$$
Install retrofits at the end of dead end roads where stormwater empties into a waterbody.	Draft Plan Public Meeting, May 2012	City of East Providence and Save the Bay	5-10 years	**	$$$

Table 5-1: Action Plan for Improved Stormwater Management (continued)

Warren, RI					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Comply with Phase II Stormwater Management requirements.	--	RIDOT and Town of Warren	Ongoing	***	$$$
Educate community on benefits of a stormwater utility.	Draft Plan Public Meeting, May 2012	Town of Warren	2-5 years	***	$
Form a stormwater utility.	--	Town of Warren	2-5 years	***	$$$
Increase catch basin size and clean out culverts annually under Metacom Avenue.	Palmer River Fecal Coliform TMDL, 2002	Town of Warren (Phase II)	1-2 years	**	$$
Install BMPs along Market St. And Child St. At Belcher Stream West.	Palmer River Fecal Coliform TMDL, 2002	RIDOT (Phase II)	1-2 years	**	$$$
Install BMPs at the storm drain along St. Teresa Street.	Palmer River Fecal Coliform TMDL, 2002	Town of Warren (Phase II)	1-2 years	**	$$$
Install BMPs along Market Street and Child Street at Belcher Stream East.	Palmer River Fecal Coliform TMDL 2002	RIDOT (Phase II)	2-5 years	**	$$$
Conduct a minimum of two dry weather surveys.	--	Town of Warren	Ongoing	**	$
Improve public outreach, education, and involvement programs.	--	Town of Warren	Ongoing	**	$
Establish a maximum number of parking spaces in municipal ordinances.	Draft Plan Public Meeting, May 2012	Town of Warren	2-5 years	**	$
Increase enforcement and requirements for BMP maintenance at developments with large stormwater BMPs.	Draft Plan Public Meeting, May 2012	Town of Warren	Ongoing	**	$$
Install retrofits at the end of dead end roads where stormwater empties into a waterbody.	Draft Plan Public Meeting, May 2012	Town of Warren and Save the Bay	5-10 years	**	$$$
Install permanent trash receptacles for dog waste disposal at Jamiel Park along Belcher Stream West.	Palmer River Fecal Coliform TMDL, 2002	Town of Warren	1-2 years	*	$
Identify potential upstream pollution sources along north fork of Belcher Stream East to School House Road.	Palmer River Fecal Coliform TMDL, 2002	Town of Warren (Phase II)	1-2 years	*	$$

Table 5-1: Action Plan for Improved Stormwater Management (continued)

Massachusetts					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Educate communities on benefits of a stormwater utility.	Draft Plan Public Meeting, May 2012	Seekonk, Swansea, and Rehoboth	2-5 years	***	$
Map storm drain network, delineate boundaries of catch basins, and control invasive Phragmites.	Runnins River Fecal Coliform TMDL, 2002	Town of Seekonk	1-2 years	**	$$
Conduct stormwater investigation and install BMP for Route 6 Stream no. 2.	Runnins River Fecal Coliform TMDL, 2002	Town of Seekonk	2-5 years	**	$$$
Investigate high bacteria levels seen around Pleasant Street in Massachusetts.	Runnins River Fecal Coliform TMDL, 2002	MA DEP	1-2 years	**	$
Establish a maximum number of parking spaces in municipal ordinances.	Draft Plan Public Meeting, May 2012	Seekonk, Swansea, and Rehoboth	2-5 years	**	$
Increase enforcement and requirements for BMP maintenance at developments with large stormwater BMPs.	Draft Plan Public Meeting, May 2012	Seekonk, Swansea and Rehoboth	Ongoing	**	$$
Improve waterfowl deterrent from pond and adjacent parking lot at Grist Mill Pond.	Runnins River Fecal Coliform TMDL, 2002	Seekonk animal control office, private landowners	1-2 years	*	$

*** Provides maximum progress towards improving water quality, due to strategic value, large geographic scope, or scale of pollutant source being addressed.

** Provides broad opportunity to improve water quality.

* Provides localized improvement to water quality, or addresses smaller pollutant sources.

$$$ Expected to cost over $100,000

$$ Expected to cost approximately $25,000 to $100,000

$ Expected to cost less than $25,000

Case Study: Bristol Town Beach Stormwater Control Project

Project Summary: A multi-phased project at the Bristol Town Beach has been implemented to treat stormwater runoff and improve water quality. The early phases of the project are complete, and have shown notable success in detaining and treating runoff, reducing standing water and numbers of geese on the lawn between the beach and parking lot, and decreased bacteria concentrations in the water by 80%. A final phase of this work is underway. T*his project is located outside of the BPW watershed but provides a good example of a town-led stormwater remediation.*

Collaborating Partners: Bristol Parks and Recreation Department, RI Department of Health (HEALTH), RI Department of Environmental Management (RIDEM), RI Coastal Resources Management Council (CRMC), and Save the Bay.

Funding Sources: USEPA Supplement Environment (SEP), RIDEM Clean Water Act Section 319 Nonpoint Source Grant (319), State Revolving Fund (SRF)

Project Details:

In 2008, the parking lot at the Bristol Town Beach was re-designed using a $70,000 SEP grant. The following actions were taken:

- Installation of a drainage and piping system to control stormwater runoff;
- Installation of hoods and bacteria filters in catch basins;
- Installation of a Vortechs stormwater treatment system to capture fine-particle pollutants; and
- Installation of a vegetated swale at the outfall of the drainage system.
- Redesign of the parking lot to include bioretention areas between the parking lanes.

Vegetative buffer between parking lot and beach at Bristol Town Beach

In 2010, RIDEM and CRMC permits for "Bristol Town Beach Stormwater Pipe Retrofit Design and Permitting Project" were approved, and the project was funded in part by a $36,620 Section 319 grant. The Town of Bristol also took out a $1,000,000 SRF loan for bio-retention cells and vegetation buffers. The following actions were taken:

- Organization of a drainage system and watershed study to assess the source of water to two existing storm drain outfall pipes north of the Town Beach;
- Installation of bio-retention inlets for stormwater runoff treatment from the parking lot;

Case Study: Bristol Town Beach Stormwater Control Project (continued)

- Re-grading of the town beach field by 3½ ft; addition of vegetative buffers (over one hundred trees planted to deter geese); and
- Creation of a long-term Master Plan to address all Beach and Sport Complex renovations and environmental issues.

Bio-retention inlet for stormwater runoff from the parking lot at Bristol Town Beach

The final stages of the project include installation of a gravel wet vegetated treatment system funded by a second Section 319 grant for $195,000 awarded to Bristol in 2010-11. This system will collect and treat stormwater discharge from a drain pipe leading from Fales Road that was designed with the earlier Section 319 grant. An additional $100,000 Trails Grant provided funding to:

- Install nine memorial benches;
- Plant an endangered coastal plant, "black grass," with the help of Save the Bay and local school children; and
- Install educational kiosks on the importance of water quality.

Vegetative infiltration basin at Bristol Town Beach

This project detains and treats stormwater runoff from the parking lot and neighborhood to the north of the beach, has reduced the number of Canadian geese using the area near the beach, reduced the amount of standing water on the re-graded lawn between the beach and parking lot, and has decreased bacteria concentrations in the water by 80% since the bio-retention and plantings went in last year. This project was a topic of the keynote address at the USEPA's 2010 National Conference in Kennebunkport, ME.

Bristol's Parks and Recreation Department, in conjunction with the RI Department of Health, continues to monitor water quality at Bristol Town Beach (north and south side) by conducting enterococci bacteria testing twice a week during the primary swim season from Memorial Day to Labor Day. There was only one beach closing in 2011 as compared to three or four closings per year in previous years. Historical water quality results for Bristol Town Beach are posted on the Department of Health website: http://www.ribeaches.org/beach.cfm?beachID=RI627966.

5.2.2 Improving Development Practices at the Municipal Level

The tasks listed in Table 5-2 provide a starting point for improving development practices in the BPW watershed through low impact development and other conservation practices.

Table 5-2: Action Plan for Improved Low Impact Development

Barrington, RI					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Identify and adopt ordinances necessary to advance LID.	-	Town of Barrington	2-5 years	***	$
Collaborate with Barrington Land Trust in its purchase and stewardship of shoreline conservation lands, which can help protect water quality.	Meeting with Barrington town officials, 2011	Town of Barrington with Barrington Land Trust	Ongoing	**	$$$
Refine ordinances to protect additional sensitive areas from development.	Meeting with Barrington town officials, 2011	Town of Barrington	2-5 years	**	$
Bristol, RI					
Identify and adopt ordinances necessary to advance LID.		Town of Bristol	2-5 years	***	$
As it becomes available, use the Bristol Harbor Habitat Model and associated regional expertise when evaluating land use management options.	--	Town of Bristol, Bristol Harbor Commission, Save Bristol Harbor, Mt. Hope High School, Brown Univ., RI DEM, EPA	Ongoing	***	$
Consider zoning and/or purchase options to restore wetlands and their natural flood mitigation and water quality improvement functions to the landscape.	--	Town of Bristol, Bristol Harbor Commission, Save Bristol Harbor	5-10 years	***	$$$
Continue developing GIS data and capacity within town to enhance education and strategic planning regarding land use.	--	Town of Bristol	Ongoing	**	$
Form a volunteer citizen committee to review and propose updates to comprehensive plan and town ordinances, in order to overcome budget limitations in this area.	--	Town of Bristol	1-2 years	**	$

Table 5-2: Action Plan for Improved Low Impact Development (continued)

East Providence, RI					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Identify and adopt ordinances necessary to advance LID.	--	City of East Providence	2-5 years	***	$
Implement further zoning protections for the sensitive "Wetland Conservation Areas" identified in the Comprehensive Plan and Natural Resource Plan.	City of East Providence 2010-2015 Comprehensive Plan Update	City of East Providence	2-5 years	**	$$
Consider alternatives to the repealed compact parking ordinance which will overcome the unintended consequences (promotion of certain out-of-scale large developments) experienced before, while attaining similar stormwater benefits.	--	City of East Providence	2-5 years	*	$
Warren, RI					
Identify and adopt ordinances necessary to advance LID.	--	Town of Warren	2-5 years	***	$
Adopt ordinances requiring stormwater volume reductions for commercial and industrial redevelopment.	Kickemuit Fecal Coliform & Phosphorus TMDL 2006	Town of Warren	1-2 years	***	$
Continue developing GIS data and capacity within town to enhance education and strategic planning regarding land use.	--	Town of Warren	Ongoing	**	$
Form a volunteer citizen committee to review and propose updates to comprehensive plan and town ordinances, in order to overcome budget limitations in this area.	--	Town of Warren	1-2 years	**	$
Develop a conservation development ordinance, especially for the eastern portion of town.	--	Town of Warren	2-5 years	**	$

Table 5-2: Action Plan for Improved Low Impact Development (continued)

Massachusetts					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
None Identified – Needs Further Analysis	---	---	---	---	---
*** Provides maximum progress towards improving water quality, due to strategic value, large geographic scope, or scale of pollutant source being addressed. ** Provides broad opportunity to improve water quality. * Provides localized improvement to water quality, or addresses smaller pollutant sources. $$$ Expected to cost over $100,000 $$ Expected to cost approximately $25,000 to $100,000 $ Expected to cost less than $25,000					

5.2.3 Improving Onsite Wastewater Management at the Municipal Level

As noted previously, a properly designed and operating onsite wastewater treatment system (OWTS) prevents bacteria from impairing the surrounding surface and ground waters. However, inadequately treated wastewater from substandard or malfunctioning OWTS negatively impacts nearby water quality. The tasks listed in Table 5-3 provide a starting point for improving onsite wastewater management in the BPW watershed.

Table 5-3: Action Plan for Improved Onsite Wastewater Management

Action Item	Source	Responsibility	Timeframe	Value Added	Cost
Barrington, RI					
Find the few remaining cesspools and connect them to public sewer system.	--	Town of Barrington	2-5 years	**	$$
Evaluate remaining areas of the city not yet connected to public sewer system to determine if there is a need for sewer system expansion.	--	Town of Barrington	2-5 years	*	$
Bristol, RI					
Implement the onsite wastewater management plan.	--	Town of Bristol, with RI DEM review.	Ongoing	***	$$
Inspect existing OWTS and prioritize systems for replacement.	Draft Plan Public Meeting, May, 2012	Town of Bristol	2-5 years	**	$
Develop a web-based tracking system for all OWTS in town.	--	Town of Bristol	2-5 years	**	$
Increase education and outreach through local program about water quality issues from wastewater.	Draft Plan, Public Meeting, May 2012	Town of Bristol	Ongoing	**	$
East Providence, RI					
Find the few remaining cesspools and connect them to public sewer system.	--	City of East Providence	2-5 years	**	$$
Evaluate remaining areas of the city not yet connected to public sewer system to determine if there is a need for sewer system expansion.	--	City of East Providence	2-5 years	*	$
Warren, RI					
Implement the onsite wastewater management plan.	Town of Warren Wastewater Management District Ordi-nance, 2011	Town of Warren via Warren Wastewater Management District	Ongoing	***	$$

Table 5-3: Action Plan for Improved Onsite Wastewater Management (continued)

Warren, RI (continued)					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
If high bacteria levels are found in outfalls to the Palmer River and its tributaries, search for cross-connections from wastewater pipes.	--	Town of Warren Wastewater Management District and Warren Sewer District	1-2 years	**	$
Develop a web-based tracking system for all OWTS in town.	--	Town of Warren	2-5 years	**	$
Increase education and outreach through local program about water quality issues from wastewater.	Draft Plan, Public Meeting, May 2012	Town of Warren	Ongoing	**	$
Massachusetts					
Inspect existing OWTS and prioritize systems for replacement.	Draft Plan Public Meeting, May, 2012	Towns of Seekonk, Swansea, and Rehoboth	2-5 years	***	$$
Institute septic management plans that emphasize inspections, pump-outs, and repairs.	Draft Plan Public Meeting, May, 2012	Towns of Seekonk, Swansea, and Rehoboth	2-5 years	***	$$
Characterize groundwater for septic system impacts and conduct repair at Mink-School-Leavitt Street area in Seekonk, MA.	Runnins River Fecal Coliform TMDL, 2002	Town of Seekonk	1-2 years	**	$$
Investigate illicit discharges at Route 6 Stream #2, in Seekonk.	Runnins River Fecal Coliform TMDL, 2002	Town of Seekonk, MA DEP	2-5 years	**	$$

*** Provides maximum progress towards improving water quality, due to strategic value, large geographic scope, or scale of pollutant source being addressed.

** Provides broad opportunity to improve water quality.

* Provides localized improvement to water quality, or addresses smaller pollutant sources.

$$$ Expected to cost over $100,000

$$ Expected to cost approximately $25,000 to $100,000

$ Expected to cost less than $25,000

Case Study: Shellfish Beds Re-Open in Swansea, MA

Shellfish beds in Swansea, MA, have had a history of closures. Prior to 2009, shellfish beds along the Coles and Lee Rivers had been closed for over 25 years. Pollution from onsite wastewater treatment systems and stormwater runoff were major contributors. In the last five years, the Towns of Swansea and Fall River have worked to protect its most valued natural resources: soft shell clams, quahogs and oysters.

Quahog harvest in Fall River after a conditional reopening of Coles River shellfishing beds

A recent study on stormwater runoff linked water quality contamination to failing sewer lines, storm drains and onsite wastewater treatment systems. Other major sources of stormwater runoff were also identified.

Work has been initiated to remedy these and other pollution issues through the following actions:

1. Swansea developed a Comprehensive Wastewater Management Plan to identify failing onsite wastewater treatment systems.
2. Fall River has a combined sewer overflow control strategy, which includes tunnel storage.
3. Swansea instituted a more rigorous and regulated catch basin cleaning schedule.
4. Swansea passed ordinances for stricter enforcement of BMPs for stormwater.

After an in-depth study of the area's water quality, the MA Department of Marine Fisheries approved a conditional reopening of the Coles and Lee Rivers' shellfish beds in July 2009. In 2011, the 746 acres of shellfish beds in Swansea and Somerset have passed the two year conditional phase and have expanded for recreational and commercial harvesting. The season extends from May 1 to December 1 with closings occurring where 24-hour rainfall exceeds 0.3 inches. Since the reopening, Swansea has sold more than 550 commercial and recreational shellfishing licenses. In 2009 alone, 60 bushels of soft shell clams and 175 bushels of quahogs were harvested for recreational purposes while 500 bushels of chowder quahogs and 250 bushels of littleneck quahogs were harvested for commercial purposes.

5.2.4 Other Action Items at the Municipal Level

Table 5-4 provides a list of other actions for the improvement of water quality in the BPW watershed.

Table 5-4: Other Action Items for Improving Water Quality in the BPW Watershed

Barrington, RI					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Increase land preservation within the watershed through targeted education to landowners. Identify key areas for conservation easements, and designated open space. Create open space maps for the entire watershed and collaborate to pursue funding for land purchases.	Draft Plan Public Meeting, May 2012	Local Land Trusts and Town of Barrington	Ongoing	***	$$$
Consider creating a "blueways trail" to enhance awareness and protection of streams for canoes, kayaks, and rowers.	Meeting with Barrington town officials, 2011	Town of Barrington, Barrington Land Trust, NBEP, and/or Save the Bay.	2-5 years	**	$
Recruit farmers interested in water quality to do outreach with farming community.	--	Town of Barrington	1-2 years	**	$
Perform an assessment of the buffers along the waterbodies within the watershed to identify areas that need an increased buffer.	Draft Plan Public Meeting, May 2012	Town of Barrington, RIDEM, and RI NRCS	2-5 years	**	$$
Participate in Tiffany Pond TMDL development, scheduled for 2018.	--	Town of Barrington and RIDEM	4-6 years	**	$
Encourage farmers to work with NRCS to reduce pollution.	--	Town of Barrington	Ongoing	**	$

Table 5-4: Other Action Items for Improving Water Quality in the BPW Watershed (continued)

Barrington, RI (continued)					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Perform an inventory of culverts in the watershed and target undersized culverts in estuarine areas for replacement.	Draft Plan Public Meeting, May 2012	Town of Barrington	1-2 years	*	$
Increase education of environmental and watershed initiatives, such as zoning changes, grant-funded initiatives, and conservation needs.	--	Town of Barrington and RIDEM	Ongoing	*	$
Encourage land management, education, enforcement, and other measures to reduce nuisance waterfowl.	--	Town of Barrington	Ongoing	*	$
Place informational signs at stream crossings in town to increase awareness about water quality issues.	Written Public Comment	Town of Barrington	Ongoing	*	$
Bristol, RI					
Increase land preservation within the watershed through targeted education to landowners. Identify key areas for conservation easements, and designated open space. Create open space maps for the entire watershed and collaborate to pursue funding for land purchases.	Draft Plan Public Meeting, May 2012	Local Land Trusts and Town of Bristol	Ongoing	***	$$$
Perform an assessment of the buffers along the waterbodies within the watershed to identify areas that need an increased buffer.	Draft Plan Public Meeting, May, 2012	Town of Bristol, RIDEM, and RI NRCS	2-5 years	**	$$
Place informational signs at stream crossings in town to increase awareness about water quality issues.	Written Public Comment	Town of Bristol	Ongoing	*	$

Table 5-4: Other Action Items for Improving Water Quality in the BPW Watershed (continued)

Bristol, RI (continued)					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Perform an inventory of culverts in the watershed and target undersized culverts in estuarine areas for replacement.	Draft Plan Public Meeting, May 2012	Town of Bristol	1-2 years	*	$
Encourage land management, education, enforcement, and other measures to reduce nuisance waterfowl.	--	Town of Bristol	Ongoing	*	$
Increase education of environmental and watershed initiatives, such as zoning changes, grant-funded initiatives, and conservation needs.	--	Town of Bristol and RIDEM	Ongoing	*	$
East Providence, RI					
Increase land preservation within the watershed through targeted education to landowners. Identify key areas for conservation easements, and designated open space. Create open space maps for the entire watershed and collaborate to pursue funding for land purchases.	Draft Plan Public Meeting, May, 2012	Local Land Trusts and City of East Providence	Ongoing	***	$$$
Control phragmites along Lower Runnins River to restore native habitat.	Runnins River Fecal Coliform TMDL, 2002	East Providence and RIDEM	2-5 years	**	$
Perform an assessment of the buffers along the waterbodies within the watershed to identify areas that need an increased buffer.	Draft Plan Public Meeting, May 2012	City of East Providence, RIDEM, and RI NRCS	2-5 years	**	$$
Work with Seekonk, the Mobil corporation, and RIDEM to remove the Mobil Dam on the Runnins River.	Draft Plan Public Meeting, May 2012	City of East Providence	2-5 years	**	$$$
Perform an inventory of culverts in the watershed and target undersized culverts in estuarine areas for replacement.	Draft Plan Public Meeting, May 2012	City of East Providence	1-2 years	*	$

Table 5-4: Other Action Items for Improving Water Quality in the BPW Watershed (continued)

East Providence, RI (continued)					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Promote public access to the waterfront area, both along the Runnins R. And Providence Harbor, to improve awareness, understanding, and protection of water resources.	--	City of East Providence	Ongoing	*	$
Encourage land management, education, enforcement, and other measures to reduce nuisance waterfowl.	--	City of East Providence	Ongoing	*	$
Increase education of environmental and watershed initiatives, such as zoning changes, grant-funded initiatives, and conservation.	--	City of East Providence	Ongoing	*	$
Place informational signs at stream crossings in the city to increase awareness about water quality issues.	Written Public Comment	City of East Providence	Ongoing	*	$
Warren					
Increase land preservation within the watershed through targeted education to landowners. Identify key areas for conservation easements, and designated open space. Create open space maps for the entire watershed and collaborate to pursue funding for land purchases.	Draft Plan Public Meeting, May 2012	Local Land Trusts (listed in Section 7.1.7) and Town of Warren	Ongoing	***	$$$
Form a volunteer citizen committee to review and propose updates to comprehensive plan and town ordinances, in order to overcome budget limitations in this area.	--	Town of Warren	1-2 years	**	$
Recruit farmers interested in water quality to do outreach with farming community.	--	Town of Warren	1-2 years	**	$

Table 5-4: Other Action Items for Improving Water Quality in the BPW Watershed (continued)

Warren (continued)					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
Perform an assessment of the buffers along the waterbodies within the watershed to identify areas that need an increased buffer.	Draft Plan Public Meeting, May 2012	Town of Warren, RIDEM, and RI NRCS	2-5 years	**	$$
Encourage farmers to work with NRCS to reduce pollution	--	Town of Warren	Ongoing	**	$
Encourage land management, education, enforcement, and other measures to reduce nuisance waterfowl.	--	Town of Warren	Ongoing	*	$
Increase education of environmental and watershed initiatives, such as zoning changes, grant-funded initiatives, and conservation needs.	--	Town of Warren	Ongoing	*	$
Perform an inventory of culverts in the watershed and target undersized culverts in estuarine areas for replacement.	Draft Plan Public Meeting, May 2012	Town of Warren	1-2 years	*	$
Place informational signs at stream crossings in town to increase awareness about water quality issues.	Written Public Comment	Town of Warren	Ongoing	*	$
Massachusetts					
Increase land preservation within the watershed through targeted education to landowners. Identify key areas for conservation easements, and designated open space. Create open space maps for the entire watershed and collaborate to pursue funding for land purchases.	Draft Plan Public Meeting, May 2012	Local Land Trusts (listed in Section 7.1.7) and Seekonk, Swansea, and Rehoboth	Ongoing	***	$$$
Install agricultural BMPs in the upper Palmer watershed in Rehoboth.	Draft Plan Public Meeting, May 2012	Town of Rehoboth, Rehoboth Agricultural Commission	5-10 years	**	$$$

Table 5-4: Other Action Items for Improving Water Quality in the BPW Watershed (continued)

Massachusetts (continued)					
Action Item	**Source**	**Responsibility**	**Timeframe**	**Value Added**	**Cost**
RI and MA NRCS offices should work together in the Palmer River watershed. Create a memorandum of understanding to work across state lines and help improve water quality.	Draft Plan Public Meeting, May 2012	RI NRCS and MA NRCS	Ongoing	**	$
Perform an assessment of the buffers along the waterbodies within the watershed to identify areas that need an increase in buffer length.	Draft Plan Public Meeting, May 2012	Seekonk, Swansea, Rehoboth, RIDEM, and RI NRCS	2-5 years	**	$$
Have local agricultural commissions work together on a watershed level.	Draft Plan Public Meeting, May 2012	Local agricultural commissions	Ongoing	**	$
Work with East Providence, the Mobil corporation, and RIDEM to remove the Mobil Dam on the Runnins River.	Draft Plan Public Meeting, May 2012	Town of Seekonk	5-10 years	**	$$$
Encourage farms to work with NRCS to reduce pollution.	--	Seekonk, Swansea, Rehoboth	Ongoing	**	$
Recruit farmers interested in water quality to do outreach with farming community.	--	Seekonk, Swansea, Rehoboth	1-2 years	**	$
Place informational signs throughout the watershed planning area to increase awareness about water quality issues.	Written Public Comment	Seekonk, Swansea, and Rehoboth	Ongoing	*	$
Perform an inventory of culverts in the watershed and target undersized culverts in estuarine areas for replacement.	Draft Plan Public Meeting, May 2012	Seekonk, Swansea, and Rehoboth	Ongoing	*	$
Create a “Palmer River Farm Fresh Program to support local farms (similar to “Farm Fresh RI”).	Draft Plan Public Meeting, May 2012	Rehoboth Agricultural Commission, MA NRCS	Ongoing	*	$$

*** Provides maximum progress towards improving water quality, due to strategic value, large geographic scope, or scale of pollutant source being addressed.
** Provides broad opportunity to improve water quality.
* Provides localized improvement to water quality, or addresses smaller pollutant sources.
$$$ Expected to cost over $100,000
$$ Expected to cost approximately $25,000 to $100,000
$ Expected to cost less than $25,000

5.3 Individual and Non-Governmental Actions

Though many actions to improve water quality in a watershed are the responsibility of the municipal, state, and federal agencies, other actions taken by local residents and non-governmental groups have the potential to make a large difference in local water quality.

Non-governmental groups in the watershed include watershed associations, universities, and other research-based and non-profit organizations whose focus is protecting the water resources in the watershed. These groups contribute to the improvement and protection of the water quality of waterbodies in the BPW watershed by continuing water quality monitoring, public education, stormwater abatement, and other water quality improvement projects. Descriptions of three Narragansett Bay regional efforts are listed below and a description of other watershed groups is provided in Section 6.2.

- **Save the Bay**: Founded in 1970, Save the Bay has been working to protect and restore the Narragansett Bay and its watershed for over 40 years. Save the Bay has completed multiple projects in the East Bay watersheds in their continued efforts to improve the water quality of Narragansett Bay and its watershed. Projects have included stormwater abatement and habitat restoration. O**nline:** http://www.savebay.org.

- **Narragansett Bay Estuary Program (NBEP)**: Since 1987, the Narragansett Bay Estuary Program (NBEP) has strived to protect and preserve Narragansett Bay and its watershed through partnerships that conserve and restore natural resources, enhance water quality and promote community involvement. While funding and oversight comes largely from USEPA, support also comes from stakeholder commitment and the Association of National Estuary Programs (ANEP). NBEP is mandated by the U.S. government to update the existing Comprehensive Conservation and Management Plan (CCMP), which will be renamed as the Narragansett Bay Region Plan. This plan is a multi-state consensus of goals and priority actions regarding the Narragansett Bay watershed. The NBEP has worked on a number of habitat restoration and water quality monitoring programs throughout Rhode Island. O**nline**: http://www.nbep.org/.

- **Narragansett Bay National Estuarine Research Reserve (NBNERR) Coastal Training Program (CTP)**: The NBNERR CTP provides coastal decision-makers with science-based

trainings and tools to help them make informed decisions about how to best protect the health of their communities and Narragansett Bay. Training programs include, among others, Low Impact Development Site Planning and Design, Conservation Development, and Conservation Easements and Open Space Management. O**nline:** http://www.nbwctp.org.

Local residents also play an important role in protecting water resources in the BPW watershed. Table 5-5 lists actions that individuals can take to help improve water quality in the watershed. Many of these actions are described in greater detail at the Rhode Island Stormwater Solutions webpage (http://ristormwatersolutions.org/).

Table 5-5: Individual Actions to Improve Water Quality

General Actions			
Action Items	**Specific Actions**	**How Will This Help?**	**Link to Information**
Become involved in your watershed	1) Join an existing watershed association	Learning about and becoming involved in your watershed is the first step towards taking action to protect and restore the quality of your water resources for future use.	There are currently no active watershed associations in this watershed. USEPA Adopt a Watershed Webpage: http://water.epa.gov/action/adopt/index.cfm University of Rhode Island Watershed Watch: http://www.uri.edu/ce/wq/ww/index.htm USEPA 10 Things you can do in your Watershed: http://water.epa.gov/action/adopt/earthday_index.cfm
	2) Form a watershed association		
	3) Volunteer as a water quality monitor		
	4) Attend public education opportunities about the water resources in your watershed		
Do not feed waterfowl		Unnatural concentrations of waterfowl contribute to pollution.	
Conserve water		This will either result in reduced discharge from a municipal wastewater treatment facility or increased OWTS longevity.	
Dispose of medicines properly	Do not flush or pour down the drain unused medications and supplements	Prevent these drugs and other supplements from entering water resources where they may have an adverse effect on aquatic life and drinking water resources.	USEPA "How to Dispose of Medicines Properly: http://water.epa.gov/scitech/swguidance/ppcp/upload/ppcpflyer.pdf New England Interstate Water Pollution Control Commission: http://www.neiwpcc.org/ppcp/

Table 5-5: Individual Actions to Improve Water Quality (continued)

Stormwater Management			
Action Items	**Specific Actions**	**How Will This Help?**	**Link to Information**
Install BMPs on your property to treat stormwater runoff	1) Install a rain garden or other filtering system	Encouraging stormwater to infiltrate into the soil will allow the soil to naturally filter the water before it reaches a waterbody.	Univeristy of Rhode Island Rain Garden Fact Sheet: http://www.uri.edu/ce/healthylandscapes/raingarden.htm
	2) Install a vegetated buffer between your property and local waterbodies	Vegetated areas limit erosion and encourage stormwater to infiltrate into the soil.	USEPA Vegetated Buffer Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=50 RI CMRC Buffer Zone Planting Guide: www.crmc.ri.gov/coastallandscapes/Coastal_Buffer_Planting_Guide.pdf
	3) Install a rain barrel to collect roof runoff	This water can be re-used on your property and will then be filtered through the soil before it reaches a waterbody.	University of Rhode Island Rain Barrel Fact Sheet: http://www.uri.edu/ce/healthylandscapes/rainbsources.html
Limit the amount of impervious surfaces on your property	1) Install pervious pavers or gravel in place of a traditional driveway	Pervious materials allow stormwater to enter the soil instead of just running off your property.	USEPA Fact Sheets: http://www.epa.gov/owow/NPS/lid/#fact
	2) Limit sidewalks or pathways on your property or ensure they are made of pervious material		
Limit "lawn" pollution	1) Establish "no mow" zones	Vegetated areas discourage erosion and encourage stormwater to infiltrate into the soil.	USEPA Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=50
	2) Use less or natural fertilizer	Fertilizers contain nutrients such as nitrogen and phosphorus that pollute waterbodies.	USEPA Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=97

Table 5-5: Individual Actions to Improve Water Quality (continued)

Stormwater Management (continued)			
Action Items	**Specific Actions**	**How Will This Help?**	**Link to Information**
Limit "lawn" pollution (continued)	3) Use less or natural pesticides	Pesticides contain toxic substances that can enter nearby waterbodies.	USEPA Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=98
Manage your pet's waste	1) Pick up after your pet and dispose of pet waste properly	Pet waste contains pollutants including bacteria and nutrients that pollute waterbodies.	USEPA Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=4
	2) Utilize public dog parks		
Proper driveway maintenance	If sealing the driveway, use asphalt based sealants, not coal tar based	Particles of sealant wash off with stormwater. Asphalt based sealants contain much less pollutants than coal tar based sealants.	US Geological Survey Fact Sheet: http://pubs.usgs.gov/fs/2011/3010/
Onsite Wastewater Treatment System Management			
Maintain your OWTS	Inspect your system regularly, pump it and repair it as necessary.	A properly functioning OWTS will prevent failures.	RIDEM Septic System Handbook: http://www.dem.ri.gov/pubs/regs/regs/water/isdsbook.pdf
Manage what you put into your OWTS	1) Limit the use of your garbage disposal	Garbage disposals can overload the septic tank.	
	2) Limit the amount of chemicals that enter your OWTS	Certain chemicals can pollute groundwater and can kill the bacteria essential to breaking down the sludge.	

Table 5-5: Individual Actions to Improve Water Quality (continued)

Low Impact Development			
Action Items	**Specific Actions**	**How Will This Help?**	**Link to Information**
Protect open space	Donate land to and/or support a local land trust	Land trusts help protect land from development.	Land Trust Alliance: http://findalandtrust.org/

Kayaking on the Barrington River

6. Implementation Tools

6.1 Financial Support and Technical Assistance

Funding assistance for water quality improvement actions and other watershed management projects is available from various government and private sources. This section provides an overview and contact information for financial and technical assistance programs that can improve water quality.

6.1.1 Federal Clean Water Act, Section 319 Nonpoint Source Implementation Grants

Section 319 Grants are available to assist projects that promote restoration and protection of water quality through reducing and managing nonpoint source pollution. These grants are made possible by federal funds provided to RIDEM by the USEPA under Section 319 of the Clean Water Act.
Eligible applicants: Statewide, including municipal, state, or regional governments, quasi-state agencies, public schools and universities, and non-profit watershed, environmental, or conservation organizations.
Online at: http://www.dem.ri.gov/programs/benviron/water/finance/non/index.htm
Contact: RIDEM Office of Water Resources, 235 Promenade St., Providence, RI 02908. (401) 222-4700

6.1.2 Clean Water Finance Agency, Clean Water State Revolving Fund Loans

The Clean Water State Revolving Fund is a federal/state partnership designed to finance the cost of infrastructure needed to achieve compliance with the Clean Water Act. The program is available to fund a wide variety of water quality projects including: 1) Traditional municipal wastewater treatment projects; 2) contaminated runoff from urban and agricultural areas; 3) wetlands restoration; 4) groundwater protection; 5) Brownfields remediation; and 6) estuary management. Through this program, Rhode Island maintains revolving loan funds to provide low-cost financing for a wide range of water quality infrastructure projects. Funds to establish or capitalize these programs are provided through federal government grants and state matching funds (equal to 20% of federal government grants). The interest rate charged to the Clean Water State Revolving Fund is one-third off the borrower's market rate.
Eligible applicants: Statewide, including municipal, state, or regional governments, quasi-state agencies. Funds are awarded to projects based on ranking of environmental benefits of the project, readiness to proceed, and availability of funds.
Online at: http://www.dem.ri.gov/programs/benviron/water/finance/srf/index.htm
Contact: RIDEM Office of Water Resources, 235 Promenade St., Providence, RI 02908. (401) 222-4700; Rhode Island Clean Water Finance Agency, 235 Promenade St., Suite 119, Providence, RI 02908. (401) 222-4430

Community Septic System Loan Program

The Community Septic System Loan Program allows homeowners in participating communities to obtain low interest loans to repair or replace failed, failing, or substandard onsite wastewater treatment systems.

These individual loans are funded from a Clean Water State Revolving Fund loan to a community and are administered locally by Rhode Island Housing. Loans to homeowners are offered at 2% interest rate with a 10-year term.

Eligible applicants: Statewide. Municipal participation requires RIDEM approval of an onsite wastewater management plan. Funds are awarded to communities based on ranking of environmental benefits of the project, readiness to proceed, and availability of funds.

Online at: http://www.dem.ri.gov/programs/benviron/water/finance/srf/index.htm and http://www.ricwfa.com/CommunitySepticSystemLoanProgram.html

Contact: RIDEM Office of Water Resources, 235 Promenade St., Providence, RI 02908. (401) 222-6800; Rhode Island Clean Water Finance Agency, 235 Promenade St., Suite 119, Providence, RI 02908. (401) 222-4430

Sewer Tie-In Loan Fund (STILF)

Modeled after the Community Septic System Loan Program, the Sewer Tie-In Loan Fund allows homeowners to access funds to connect to the local sewer system. Individual loans are funded from a Clean Water State Revolving Fund loan to a sewer system owner and are administered locally by Rhode Island Housing. Sewer tie-in loans to homeowners up to $10,000 are offered at a 2% interest rate for up to a five year term.

Eligible applicants: Statewide. Funds are awarded to communities based on ranking of environmental benefits of the project, readiness to proceed, and availability of funds.

Online at: http://www.ricwfa.com/

Contact: RIDEM Office of Water Resources, 235 Promenade St., Providence, RI 02908. (401) 222-6800; Rhode Island Clean Water Finance Agency, 235 Promenade St., Suite 119, Providence, RI 02908. (401) 222-4430

6.1.3 Pump-out Station Grants

This program awards grants to promote the development and maintenance of boater waste disposal facilities in Rhode Island marine waters in conformance with the mandatory Federal "No Discharge" designation. To maintain this designation for the state's marine waters, RIDEM must assure pump-out facility infrastructure is in sound operating condition. Through this ongoing grant program, RIDEM and participating marinas have successfully reduced a significant source of bacterial contamination to Rhode Island's coastal waters, including waters in close proximity to shellfish harvesting and swimming areas.

Eligible applicants: Rhode Island marina owners and city or town harbor departments may apply for grants. For marinas, a non-owner operator may apply for such a grant, but only if the owner co-signs the application and grant award. RIDEM has determined that the current status of pump-out facilities in the BPW watershed is satisfactory, with pump-out facilities located at Stanley's Boat Yard, Barrington Yacht Club, and the Warren Town Dock.

Online at: http://www.dem.ri.gov/programs/benviron/water/shellfsh/pump/index.htm

Contact: RIDEM Office of Water Resources, 235 Promenade St., Providence, RI 02908. (401) 222-6800

6.1.4 Community Development Block Grants

Title 1 of the Housing and Community Development Act of 1974 authorized the Community Development Block Grant program. The program is sponsored by the US Department of Housing and Urban Development and the Rhode Island program is administered through the State of Rhode Island Office of Housing and Community Development. These grants include water and sewer system improvements.

Eligible applicants: Municipalities

Online at: http://www.hrc.ri.gov/CDBG-R.php

Contact: Division of Planning, Office of Housing and Community Development, 1 Capitol Hill, 3rd Floor, Providence, RI 02908, (401) 222-7901

6.1.5 Rhode Island Statewide Planning Challenge Grant Program

This grant program, funded by the Rhode Island Statewide Planning Program, provides money for innovative solutions to address land use and transportation issues faced by Rhode Island communities. Past projects have included support for local planning initiatives, improving bike paths to promote sustainable transportation, and support for geographic information system projects.

Eligible applicants: Statewide.

Online at: http://www.planning.ri.gov/misc/pcgrants.htm

Contact: Rhode Island Division of Planning, Rhode Island Statewide Planning Program, 1 Capitol Hill, Providence, RI 02908, (401) 222-7901

Watershed Case Study: East Providence-Taunton Ave. Planning Challenge Grant

In an effort to improve traffic and pedestrian safety, increase access to existing and future businesses, and incorporate LID initiatives, East Providence, RI was awarded a $52,800 Planning Challenge Grant from the Statewide Planning Program. East Providence used these funds to study roadside development impacts and recommend improvements to future land use development, public transportation, and streetscape appearances along Taunton Avenue from Hall Street to the Seekonk, MA border, locally referred to as "Auto Row." The study made the following recommendations:

Focus area of Taunton Avenue for the transportation improvement project

1. Redevelop medium and high-density areas for mixed land use;
2. Reconfigure Taunton Avenue from a 4-lane road to a 3-lane road (with center turning lane);
3. Turn the RIPTA Park and Ride into a multi-modal transit center;
4. Encourage alternative transportation by developing bus turnouts and bicycle lanes; and
5. Enhance the streetscape appearance of Taunton Avenue through the use of LID, including the reduction in impervious cover and improvement of stormwater abatement.

The City Council approved the feasibility of the Taunton Avenue improvement project and the project has been submitted for listing on the State Transportation Improvement Program (TIP). Once on the TIP list, East Providence will be eligible for funding to implement the objectives outlined above. The goal of TIP is to fund projects that reflect the goals, policies, and strategies outlined in Rhode Island's transportation plan for the next 20 years, particularly regarding the encouragement of economic development through environmental mitigation and conservation.

6.1.6 U.S. Department of Agriculture Natural Resources Conservation Service Grants

Environmental Quality Incentives Program (EQIP)

This program is a voluntary conservation grant program designed to promote and stimulate innovative approaches to environmental enhancement and protection, while improving agricultural production. Through EQIP, farmers and forestland managers may receive financial and technical help to install or implement structural and management conservation practices on eligible agricultural and forest land. Examples of eligible EQUIP activities include practices for farm waste storage, nutrient management, riparian buffers and stream bank improvements, wetland restrictions, and groundwater and surface water

conservation activities. EQIP payment rates may cover up to 75 percent of the costs of installing certain conservation practices. In 2006, NRCS EQIP expanded its program to include shellfish management funding.

Eligible applicants: Any person engaged in livestock, agricultural production, aquaculture, shellfishing, or forestry on eligible land.

Online at: http://www.ri.nrcs.usda.gov/programs/eqip/EQIP.html

Contact: USDA NRCS – RI State Office/Service Center, 60 Quaker Lane, Suite 46, Warwick, RI 02886, (401) 828-1300.

Case Study: Environmental Quality Incentives Program (EQIP) Shellfish Management Funding

Since 2006, eleven out of 30 growers in Rhode Island signed contracts for the new Shellfish Management Program under EQIP, and approximately $282,212 was allocated to implement best management practices (BMPs) on 55 acres of shellfish farms across the state. By 2008, eight more applicants were added, requesting over $1 million to restore oyster habitat and improve water quality in Rhode Island coastal waters.

Oyster bed transplants

Wildlife Habitat Incentives Program (WHIP)

This program is a voluntary program for landowners who want to develop and improve fish and wildlife habitat on private agricultural land, non-industrial private forest land, and tribal land. Through WHIP, farmers and forestland managers may receive financial and technical help to develop upland, wetland, aquatic, and other types of wildlife habitat on their property. The current focus of WHIP in RI is on coastal habitats, freshwater wetlands, vernal pools, riparian habitats, upland habitats of State significance (early successional habitats), and the restoration of native habitats impacted by invasive species.

Eligible applicants: Any person owning private agricultural land, non-industrial private forest land, or tribal land.

Online at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/whip

Contact: USDA NRCS – RI State Office/Service Center, 60 Quaker Lane, Suite 46, Warwick, RI 02886, (401) 828-1300.

Watershed Case Study: Wildlife Habitat Incentives Program (WHIP) Projects in Warren and Barrington, RI

Palmer Avenue Salt Marsh Restoration Project: A WHIP grant helped fund the restoration of 0.5 acres of salt marsh habitat along Palmer Avenue in Warren, RI, by removing fill and planting vegetation along the coast (2001 - 2004). Partners included the Warren Conservation Land Trust, the Town of Warren, Save the Bay, the Natural Resources Conservation Service, RIDEM Aquafund, and the Narragansett Bay Estuary Program. The Warren Conservation Land Trust received $10,051 from NRCS WHIP, and $6,400 from RIDEM Aquafund. Total project costs amounted to $40,000.

Easement Programs

NRCS offers various easement programs to landowners who want to maintain or enhance their land in a way beneficial to agriculture and/or the environment. NRCS provides technical help and financial assistance to protect private lands through a variety of programs. These programs include the Farm and Ranch Land Protection Program, the Grasslands Reserve Program, the Healthy Forests Reserve Program, and the Wetlands Reserve Program.

Eligible applicants: Private landowners.

Online at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements

Contact: USDA NRCS – RI State Office/Service Center, 60 Quaker Lane, Suite 46, Warwick, RI 02886, (401) 828-1300.

6.1.7 Land Trusts

Land trusts seek to preserve open spaces, natural areas, scenic character, watersheds, drinking water sources, farmland, forests, historic sites, and shorelines that uniquely define communities.

"Calf's Tongue," land donated to the Barrington Land Conservation Trust along the Barrington River

The most traditional tool for conserving private land is through conservation easements that permanently limit the use of the land in order to protect its conservation value. This type of preservation can take various forms. For instance, an easement on property containing rare wildlife habitat might prohibit any development, while an easement on a farm might allow continued farming and the addition of buildings.

There are economic benefits to placing a conservation

easement on private land. First, it will usually lower property value and therefore lower property taxes, making ownership more affordable. Second, if the landowner decides to donate the land to a local land trust, the donation can qualify as a tax deductible charitable donation.

Land trusts can help private landowners begin the process of developing a conservation easement. There are a number of land trusts in Rhode Island and Massachusetts that are likely interested in land conservation in the BPW watershed, including:

- American Farmland Trust (http://www.farmland.org/)
- Audubon Society (http://www.asri.org/)
- Bristol Land Conservation Trust
- Northeast Wilderness Land Trust (http://www.newildernesstrust.org/)
- NE Forestry Foundation (http://www.newenglandforestry.org/)
- Orenda Wildlife Land Trust (http://www.orendalandtrust.org/)
- Rehoboth Land Trust (http://www.rehobothlandtrust.org/)
- Trust for Public Land (http://www.tpl.org/)
- Trustees of Reservations (http://www.thetrustees.org/)
- Wildlands Trust (http://www.wildlandstrust.org/)

6.1.8 RIDEM Open Space Grants

Offered through RIDEM's Planning and Development Grant Program, Open Space Grants help land trusts, cities, towns, and other non-profit organizations acquire and protect their communities' open space lands.

Eligible applicants: Land trusts, conservation commissions, watershed councils, non-profit environmental agencies, municipal agencies, and Native American tribes.

Online at: http://www.dem.ri.gov/programs/bpoladm/plandev/grants.htm

Contact: RIDEM – Division of Planning and Development, 235 Promenade Street, Providence, RI 02908, (401) 222-2776.

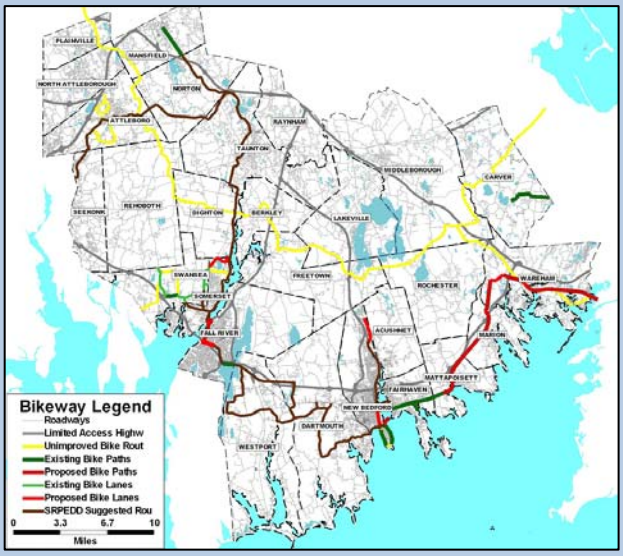
6.1.9 USEPA Funding Website

The USEPA recognizes that committed watershed organizations and state and local governments need adequate resources to achieve the goals of the Clean Water Act and improve our nation's water quality.

To this end, the USEPA has created the following website to provide tools, databases, and information about sources of funding that serve to protect watersheds:
Online at: http://water.epa.gov/aboutow/owow/funding.cfm

Watershed Case Study: Southeast Regional Planning and Economic Development District (SRPEDD)

The Southeastern Regional Planning & Economic Development District (SRPEDD) serves 27 cities and towns in southeastern Massachusetts in land use, transportation, economic, and environmental planning. Since 1968, this public agency has served 808 square miles of urban, suburban and rural areas with over 600,000 people. SRPEDD provides research, technical assistance, and bylaw and ordinance preparation through the following initiatives:



Example of GIS mapping performed by SRPEDD

1. **Transportation Planning:** SRPEDD is a Metropolitan Planning Organization that programs federal highway and transit funds through various regional authorities, while also conducting traffic counts, pavement management, and traffic/parking studies.
2. **GIS Database Maintenance:** SRPEDD hosts an elaborate GIS database on regional population, housing, employment, water and tax rates, and buildings.
3. **Comprehensive Planning:** SRPEDD's Comprehensive Planning division offers assistance on open space plans, zoning bylaws, subdivision regulations, resource management plans, housing studies, and community development.
4. **Economic Development:** SRPEDD focuses on economic development through infrastructure investment, workforce training, and capital incentives.

SRPEDD can also assist towns through the Cooperative Purchasing Program. If capital investment in equipment is too much for a single town, SRPEDD can help team up towns for joint-share purchases. Contact SRPEDD at (508) 824-1367, info@srpedd.org, or 88 Broadway, Taunton, MA 02780.

6.2 Public Information and Outreach

6.2.1 Outreach Efforts for Rhode Island TMDLs

USEPA regulations require that calculations to establish TMDLs be subject to public review (40 CFR 130.7 (c) (ii)). Following the presentation and publication of a draft Rhode Island TMDL, the public has a 30-day period to review and submit comments on this study and its findings.

For some TMDLs, a pre-meeting is also held to discuss environmental activities and studies being conducted in the watershed. In either case, the key stakeholders are identified and contacted by RIDEM prior to the public comment period. More information about the RI TMDL program is available online: http://www.dem.ri.gov/programs/benviron/water/quality/rest/

6.2.2 Outreach Efforts for This Watershed Plan

Outreach efforts for this watershed plan and the Bristol-Kickemuit River watershed plan are described jointly below. Detailed information about this process (flyers, meeting summaries, etc.) is in a separate document -- "Outreach Efforts for the Development of the Barrington-Palmer-Warren Rivers Watershed Plan and the Bristol-Kickemuit Watershed Planning Area Plan 2011-2012" that is available by contacting the RIDEM Office of Water Resources.

RI-MA Kickoff Meetings

Two kick-off meetings were held in April 2011. The purpose of these meetings was to introduce the watershed-based planning process, engage stakeholders to solicit their input in the process, and identify key water quality issues and concerns about the watersheds. Stakeholders included town board/council members, town/regional planners, watershed association members, natural resource professionals, non-profit organizations, and watershed landowners.

Warren Town Hall

Outreach efforts are documented below.

- **March 30, 2011**: Flyers announcing the meetings sent to all stakeholders.
- **April 1, 2011 – April 10, 2011**: Follow-up phone calls to all stakeholders made by FBE.
- **April 19, 2011**: First meeting held at the Warren Town Hall, Warren, RI (27 attendees)
- **April 27, 2011**: Second meeting held at the Seekonk Town Hall, Seekonk, MA (17 attendees)
- **May 10, 2011**: All meeting documents and maps were made publically available on the FBE website (http://www.fbenvironmental.com/project_RI_WatershedPlans.html).

- **May 11, 2011**: Meeting notes with a list of attendees and contact information were sent to all stakeholders.

Municipal Meetings

Meetings were held in the individual watershed towns in July 2011. The purpose of these meetings was to complete and review municipal checklists, to get feedback on draft recommendations and identify feasible options for implementation in each town.

Barrington Town Hall

Outreach efforts and meeting summaries are documented below.

- **April 19 and April 27, 2011**: Municipal employees and other stakeholders to include in the municipal meetings were identified at the two kickoff meetings.
- **June 2011**: Phone calls and emails were sent to those stakeholders by FBE inviting them to the meetings.
- **July 20, 2011**: All meeting documents were emailed to the confirmed attendees for each town.
- **July 26, 2011**: First two municipal meetings were held in Swansea and Seekonk, MA.
- **July 27, 2011**: Three municipal meetings were held in Warren and Barrington, RI and Rehoboth, MA.
- **July 28, 2011**: Final two municipal meetings were held in Bristol and East Providence, RI.
- **August 2, 2011**: Draft summaries of the municipal meetings were submitted to each town for review before final submittal to RIDEM and USEPA.
- **August 5, 2011**: All comments received from the towns.
- **August 11, 2011**: Final summaries of the municipal meetings with a list of attendees were submitted to RIDEM and USEPA.

Public Meetings and Public Comments

The DRAFT BPW watershed plan was posted for review and comment in April 2012. A public meeting was held on May 10, 2012 at the Barrington Town Hall in Barrington, RI and public comments were accepted on the draft document until May 25, 2012. Comments from the meetings (including proposed action items) and comment period were addressed in the final version of this plan. A summary of this meeting and the responses to public comments are located in Appendix C.

6.2.3 Importance of Continued Public Involvement

Local stakeholders, RIDEM, and the USEPA have a responsibility to continue to work together to implement the actions proposed in this watershed plan. These actions are designed to protect and restore the quality of local waterbodies. Specific actions and responsible parties have been outlined in **Section 5.**

Watershed associations are integral for the long-term protection of a waterbody. Watershed associations are formed by groups of concerned citizens within a watershed with the shared goal of maintaining or restoring the water quality of a local waterbody for the use of its residents for generations. Watershed councils designated by the RI Rivers Council are eligible to receive notice of state and local projects in their watershed, are empowered to testify before local and state hearings on issues affecting their watershed, and are eligible for small state grants through the RI River Council (http://www.ririvers.org/). The following associations have been active in the BPW watershed:

- Pokanoket Watershed Alliance (1992 – 2011): see box

- Runnins River Steering Committee (1993-2008): The New England Interstate Water Pollution Control Commission established a steering committee comprised of members of local municipalities, state agencies, USEPA, and the Pokanoket Watershed Alliance, in 1993. This committee, known as the Runnins River Steering Committee, held bimonthly meetings that were open to the public. The Runnins River Steering Committee participated in the 1995 wet weather study of the Runnins River and contributed actively to the content of the ongoing work by RIDEM. The committee ensured that improvements to the water quality of the Runnins and Barrington River have remained on the agendas of the state and federal agency agendas. RIDEM was an active member of the steering committee and worked to keep committee members informed on the progress of the TMDL.

- Palmer River Watershed Alliance (1992 - 2000): The Palmer River Watershed Alliance was formed in 1992 to advocate for the protection of the natural resources along the Palmer River. The alliance focused on portions of the watershed in the Towns of Rehoboth and Swansea, MA, and Warren, Bristol, and Barrington, RI. Activities included working with all towns to inventory potential threats to water quality and address the most urgent water resources protection issues within the area. Efforts included water quality monitoring, developing a public education strategy, and working with local boards to upgrade existing water resources protection laws. Mapping of land uses in the entire watershed was completed and an award was received from the RIDEM for "outstanding service in monitoring the waters of the state of Rhode Island in 1992".

Other research-based and non-profit organizations whose focus is protecting the water resources in the watershed include:

- Save the Bay

- Narragansett Bay Estuary Program
- Narragansett Bay National Estuarine Research Reserve
- University of Rhode Island Watershed Watch

Watershed Case Study: Pokanoket Watershed Alliance

The Runnins River Task Force was formed to identify and mitigate sources of bacterial contamination to the Runnins River. In 1992, this group expanded into a non-profit organization, known as the Pokanoket Watershed Alliance (PWA), dedicated to the preservation and protection of water quality on the Runnins River and Hundred Acre Cove.

Early morning at Hundred Acre Cove in Barrington, RI

PWA was involved with monitoring of a Mobil gas spill along the Runnins River in 1993 when RIDEM negotiated a multi-million dollar settlement with Mobil as part of the river clean-up. PWA also established a Runnins River Water Quality Monitoring Program to assess conditions in the lower Runnins River and Hundred Acre Cove. Data collection included fecal coliform, Enterococci, *E. coli*, temperature, pH, dissolved oxygen, and salinity. Data sets from 2003, 2004 and 2006 have been used in Runnins River TMDL reports. Aside from water testing, PWA also focused on runoff studies and a Whole Rivers Program with high school students. PWA officially dissolved in June 2011.

6.3 Monitoring and Measuring Progress

6.3.1 Summary of Water Quality Monitoring Efforts

Section 106(e)(1) of the Clean Water Act requires States to develop a comprehensive monitoring and assessment strategy that provides a description of the sampling approach, a list of parameters to be tested, and a schedule for collecting data and information. RIDEM, in cooperation with the RI Environmental Monitoring Collaborative, accomplished this by preparing the RI Water Monitoring Strategy in 2005. The monitoring framework reflects the partnerships and collaborations that occur among state, local and

federal agencies, universities, other organizations and volunteers regarding monitoring activities. When fully implemented, the strategy will yield data to support a statewide assessment of water quality conditions, allow measurements of key environmental indicators and provide important information to support management decision-making at both the state and local level. Monitoring programs outlined in the RI Water Monitoring Strategy that assess water quality in coastal and freshwaters are listed below.

RIDEM Monitoring Programs

Rotating Basin Assessments of Rivers and Streams Program

This statewide freshwater sampling program run by the RIDEM Office of Water Resources assesses one to two basins (of ten total basins) each year over a five year period using an intensive sampling design. Data from this program are used to assess whether water quality is sufficient to support the applicable designated uses based on water quality criteria. The BPW watershed has not yet been monitored under this ongoing program.

Data collected: Dissolved oxygen, metals, nutrients, pathogens, and macroinvertebrate and fish assemblages.

Shellfish Growing Area Monitoring Program

The Shellfish Growing Area Monitoring Program is part of the State of Rhode Island's agreement with the U.S. Food and Drug Administration's National Shellfish Sanitation Program. The purpose of this program is to maintain national health standards by regulating the interstate shellfish industry. The program is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the State of Rhode Island is required to conduct continuous bacteriological monitoring of the shellfish harboring waters of the State to maintain a certification of these waters for shellfish harvesting for direct human consumption. Shoreline surveys are an additional requirement of the National Shellfish Sanitation Program that is conducted by the RI Shellfish Monitoring Program. This sampling program monitors approximately 300 stations in salt waters annually and analyzes the samples for fecal coliform bacteria.

Online: http://www.dem.ri.gov/programs/benviron/water/shellfsh/smon/index.htm

Data collected: Fecal coliform bacteria

Waterbodies in the BPW Watershed sampled: Barrington, Palmer, and Warren Rivers

Other Governmental Monitoring Programs

Rhode Island HEALTH Bathing Beach Monitoring Program

This sampling program run by the RI Department of Health monitors approximately 70 coastal stations and numerous freshwater stations annually. The data are primarily used to open/close bathing beaches and to assess recreational use for these waterbodies.

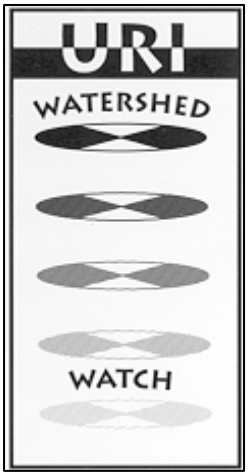
Online: http://www.ribeaches.org/

Data collected: Enterococci bacteria
Waterbodies in the BPW Watershed sampled: Warren Town Beach

Volunteer Monitoring Programs

University of Rhode Island Watershed Watch Program

The University of Rhode Island Watershed Watch (URI WW) program is a volunteer-based freshwater and saltwater sampling program providing supplemental data to state programs in Rhode Island. Watershed Watch works with local communities and shoreline residents to assess water quality and provide information for more effective management of critical water resources. URI WW also helps local governments, watershed, tribal and other organizations to recruit and train volunteers to become citizen scientists gathering detailed, quality-assured monitoring data. Their watershed-based program focuses on long-term ecological monitoring of RI's fresh and salt water resources including lakes, ponds, streams, and coastal waters. URI WW provides training, equipment, supplies, and analytical services tailored to organizational needs while meeting strict quality assurance and quality control guidelines in the field and in their state-certified laboratory.



Online: http://www.uri.edu/ce/wq/ww/index.htm
Data collected: Water clarity, algal density, dissolved oxygen, water temperature, alkalinity, pH, nutrients, and pathogens
Waterbodies in the BPW Watershed sampled: Prince's Pond in Barrington, RI

6.3.2 Indicators of Progress

There are a wide variety of indicators of progress that can be used to measure and document improvements in water quality protection and watershed restoration. The most direct and straightforward indicators are water quality measurements, such as concentrations of bacteria, phosphorus, and nitrogen; dissolved oxygen (in particular, the periods of low oxygen that lead to fish kills); and suspended sediment loads. Monitoring can extend to biological indicators, such as aquatic macroinvertebrates, anadromous fish, eelgrass, clams, and oysters. Biological monitoring can look at species population levels, species composition, and/or contaminant levels in tissues. A region-wide monitoring program is best suited to measuring these indicators.

As shown in Section 7.3.1, significant monitoring efforts are already underway by a diverse group of government, university, and non-profit organizations within the watershed including:

- RI Department of Environmental Management
- RI Department of Health

- Save the Bay
- Narragansett Bay Estuary Program
- University of Rhode Island Watershed Watch Program
- MA Department of Environmental Protection

There is active collaboration among monitoring groups in the region, evidenced by the Watershed Counts effort (http://watershedcounts.org), RI Bays, Rivers, and Watersheds Coordination Team (http://www.coordinationteam.ri.gov/), the Narragansett Bay Region Indicator Development Workgroup (http://www.ci.uri.edu/Projects/Indicators/NarrBayIndicators.html), and the NarrBay.org data portal (http://www.narrbay.org). The Watershed Counts effort lists 35 partners, to give an idea of idea of the breadth of participation in watershed indicator development (http://watershedcounts.org/partners.html).

The following is a proposed list of topics to indicate progress in the watershed. Many of these indicators are listed in the 2011 Watershed Counts report

(http://watershedcounts.org/documents/WatershedCountsReport2011.pdf).

1. Impervious Cover
    - Percent of watershed area which is impervious cover; and
    - Total treated impervious surface in the watershed (i.e., impervious cover that drain to adequate stormwater treatment, which could be defined as compliance with current stormwater standards for new development).
2. Water Quality Assessment
    - Percent of water (stream miles, estuarine acreage, etc) within the watershed that is listed as impaired;
    - Percent of waterbodies assessed for attainment within past 5 years; and
    - Percent of recently assessed streams which show water quality impairment.
3. Specific Water Quality Parameters
    - Number of beach closures per year;
    - Dry weather bacteria concentrations;
    - Dissolved oxygen levels;

- Nutrients, such as phosphorus and nitrogen;
- Metals and other toxins; and
- Pharmaceuticals (measures of this water quality impairment are still experimental).

4. Conservation and Habitat Restoration

- Percent of watershed in conservation;
- Invasive species counts; and
- Acres of degraded habitat restored.

5. Other Potential Indicators

- Opening of shellfish areas;
- Number of BMPs installed;
- Municipal progress in implementing strategies for improved OWTS, Stormwater, and LID programs;
- Number of contact hours of outreach attained;
- Awareness among residents or certain stakeholder groups as measured by surveys; and
- Extent of conservation land.

Watershed Case Study: Watershed Counts

Watershed Counts (http://watershedcounts.org) is a broad coalition of agencies and organizations that have committed to work together to examine and report regularly on the condition of land and water resources of the Narragansett Bay Watershed. Formed in 2011, the coalition is using five environmental indicators (climate change, impervious cover, beach closures, freshwater flow, and invasive species) to evaluate and describe the condition of the watershed region and to communicate this information to the public.

Current project partners include:

Audubon Society of Rhode Island
Blackstone River Coalition
Blackstone Watershed Council/ Friends of Blackstone
Conservation Law Foundation
Environment Council of Rhode Island
Friends of the Moshassuck
Grow Smart RI
MA Audubon Society
Narragansett Bay Commission
Narragansett Bay Estuarine Research Reserve
Narragansett Bay Estuary Program
Office of Sen. Sheldon Whitehouse
RI Bays, Rivers, and Watersheds Coordination Team
RI Coastal Resources Management Council
RI Department of Administration
RI Dept of Environmental Management
RI Department of Health
RI Department of Transportation
Rhode Island Foundation
RI Nursery and Landscape Association
RI Resource Conservation and Development Council
RI Natural History Survey
RI Water Resources Board
Save the Bay
RI Surfrider Foundation
North Kingstown Planning Department
U.S. Fish and Wildlife Service
URI Coastal Institute
URI Cooperative Extension
URI Graduate School of Oceanography
URI Natural Resources Science
URI Watershed Watch
US EPA Atlantic Ecology Division
US EPA Region 1
Wood Pawcatuck Watershed Association

7. Lists of Relevant Plans/Studies

Total Maximum Daily Load Reports

Rhode Island: http://www.dem.ri.gov/programs/benviron/water/quality/rest/reports.htm

- RIDEM Fecal Coliform TMDLs for the Runnins River, RI (2002)
- RIDEM Fecal Coliform TMDL for the Barrington River, Rhode Island (2002)
- RIDEM Fecal Coliform TMDL for the Palmer River, Rhode Island (2002)

Massachusetts: http://www.mass.gov/dep/water/resources/tmdls.htm

- MADEP Final Pathogen TMDL for the Narragansett Bay Watershed (2010)
- MADEP Fecal Coliform TMDL for the Palmer River (2004)

Town Comprehensive/Master Plans

Rhode Island:

- Barrington: http://72.46.3.26/commplanupdate.php
- East Providence: http://www.eastprovidenceri.net/content/662/684/698/default.aspx
- Warren: http://www.townofwarren-ri.gov/documentlibraries/draftcomprehensiveplan.html
- Bristol: http://www.bristolri.us/community/comprehensive_plan.php

Massachusetts:

- Rehoboth: Town of Rehoboth Master Plan, 2000
- Seekonk: http://www.horsleywitten.com/seekonk-master-plan/?refreshed
- Swansea: Comprehensive Plan Town of Swansea, 2003

Stormwater Management Plans

Rhode Island:

- Barrington: Barrington Stormwater Management Program Plan
- East Providence: http://www.eastprovidencewaterfront.com/files/Tech%20Memo%20102906.pdf
- Warren: Warren Stormwater Management Program Plan
- Bristol: http://www.bristolri.us/documents/community/Revised%20Phase%20II%20Storm%20Water%20Management%20Plan.pdf

Onsite Wastewater Management Plans

Rhode Island:

- Warren: http://www.townofwarren-ri.gov/images/touisset_summary.pdf
- Bristol: http://www.bristolri.us/documents/community/Bristol%20OWMP.pdf

RI Department of Health Source Water Assessments

- ***Bristol County:***
  http://www.uri.edu/ce/wq/RESOURCES/dwater/Assessments/index.htm#AssessmentResults

8. References

Bird, S., J. Harrison, L. Exum, S. Alberty and C. Perkins. 2002. "Screening to Identify and Prevent Urban Storm Water Problems: Estimating Impervious Area Accurately and Inexpensively." *In Proceedings for National Water Quality Monitoring Conference*, May 20-23, 2002, Madison, WI.

HEALTH, 2011. Beach Water Quality Monitoring. Rhode Island Department of Health.
Online: http://www.ribeaches.org/

Mallin, M.A., Williams, K.E., Esham, E.C., and Lowe, R.P. 2000. Effect of human development on bacteriological water quality in coastal watersheds. Ecological Applications. 10(4), 1047-1058.

MADEP, 2010. DRAFT 2010 303(d) List of Impaired Waters, April 2010. Massachusetts Department of Environmental Protection.
Online: http://www.mass.gov/dep/water/resources/tmdls.htm

Rice, Michael A. 2008. A History of Oyster Aquaculture in Rhode Island. 41 Degrees North. A Publication of Rhode Island Sea Grant & The University of Rhode Island Coastal Institute. Volume 4, No. 2. 2008. Pages 28-31.
Online: http://seagrant.gso.uri.edu/41N/vol4no2/41Nvol4no2.pdf

RIDEM, 2008. Shellfish Growing Area Monitoring Program Standard Operating Procedures. Rhode Island Department of Environmental Management. Last Revised, January, 2008.
Online: http://www.dem.ri.gov/pubs/sops/shellgro.pdf

RIDEM, 2009. 2010 Consolidated Assessment and Listing Methodology for Section 305(b) and 303(d) Integrated Water Quality Monitoring and Assessment Reporting, June 2009. Rhode Island Department of Environmental Management.

RIDEM, 2011a. Notice of Polluted Shellfishing Grounds, May 2011. Rhode Island Department of Environmental Management. **Online**: http://www.dem.ri.gov/maps/mapfile/shellfsh.pdf

RIDEM, 2011b. 2010 303(d) List of Impaired Waters, July 2011. Rhode Island Department of Environmental Management. **Online**: http://www.dem.ri.gov/pubs/303d/303d10.pdf

RIDEM, 2011c. RI Stormwater Design and Installation Standards Manual. Rhode Island Department of Environmental Management. **Online:**
http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/t4guide/desman.htm

RIDEM, 2011d, Rhode Island Low Impact Development Site Planning and Design Guidance Manual. March 2011. Rhode Island Department of Environmental Management. O**nline.** http://www.dem.ri.gov/programs/bpoladm/suswshed/pdfs/lidplan.pdf.

Ruggerio, Peter, 2009. Rhode Island Conservation Easement Guidance Manual. **Online:** http://www.nbwctp.org/CEG_Manual/RI%20Conservation%20Easement%20Guidance%20Manual.pdf

USEPA, 2008. National Menu of Stormwater Best Management Practices. National Pollutant Discharge Elimination System. United States Environmental Protection Agency.
Online: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/

USEPA, 2011a. Land Use. United States Environmental Protection Agency.
Online: http://cfpub.epa.gov/eroe/index.cfm?fuseaction=list.listBySubTopic&ch=48&s=225

USEPA, 2011b. Low Impact Development. United States Environmental Protection Agency.
Online: http://www.epa.gov/owow/NPS/lid/

9. Appendices

Appendix A: Detailed Maps for the BPW Watershed

A-1: Detailed Base Map for the BPW Watershed

A-2: Detailed Land use map for the BPW Watershed

A-3: Potential Nonpoint Agricultural Sources within the Limits of the Palmer and Kickemuit River Watersheds

Appendix B: Water Quality Data

B-1: Data Summary for the Runnins River

Table B-1: Summary of the Data Used in the MADEP and RIDEM Fecal Coliform TMDLs for the Runnins River and MADEP Bacteria Source Tracking Data

B-2: Data Summary for the Barrington River

Table B-2: Summary of Data Used in the Fecal Coliform TMDL for the Barrington River and RIDEM Shellfish Monitoring data (2005-2010)

B-3: Data Summary for the Palmer River

Table B-3A: Summary of RIDEM Shellfish Monitoring data for the Palmer River (2005-2010)

Table B-3B: Summary of Data Used in MADEP and RIDEM Fecal Coliform TMDLs for the Palmer River

B-4: Data Summary for the Warren River

Table B-4A: RIDEM Shellfish Monitoring data for the Warren River (2005-2010

Table B-4B: Summary of Recent Beach Closures for Warren Town Beach (2005-2011)

Appendix C: Public Meetings and Response to Public Comments

C-1: Summary of the Public Meeting for the DRAFT BPW Watershed Plan

C-2: Summary of Public Comments Received for the DRAFT BPW Watershed Plan

C-3: Action Item Handouts for the Prioritization Group Exercise at the Public Meetings in May 2012

BARRINGTON-PALMER-WARREN RIVERS WATERSHED PLAN

Barrington, Bristol, East Providence and Warren, RI
Rehoboth, Seekonk and Swansea, MA

APPENDICES

November 2012

Appendix A: Detailed Watershed Maps

A-1: Detailed Base Map for the BPW Watershed

A-2: Detailed Land Use Map for the BPW Watershed

A-3: Potential Nonpoint Agricultural Sources within the Limits of the Palmer and Kickemuit River Watersheds

Appendix B: Water Quality Summaries

B-1: Data Summary for the Runnins River

B-2: Data Summary for the Barrington River

B-3: Data Summary for the Palmer River

B-4: Data Summary for the Warren River

Appendix C: Public Meetings and Response to Public Comments

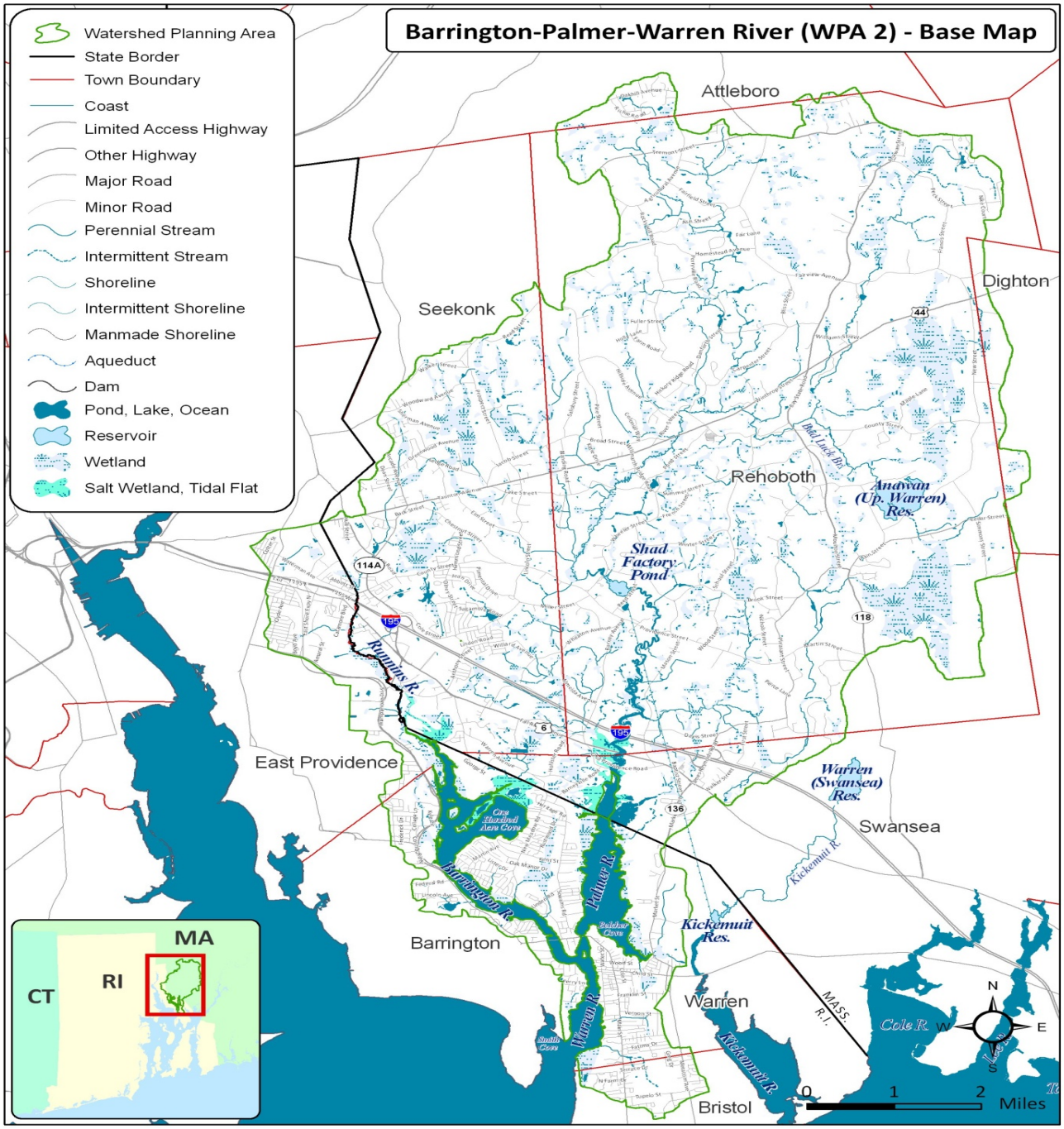
C-1: Summary of the RI WBP Public Meeting for the DRAFT BPW Watershed Plan

C-2: Summary of Public Comments Received for the DRAFT BPW Watershed Plan

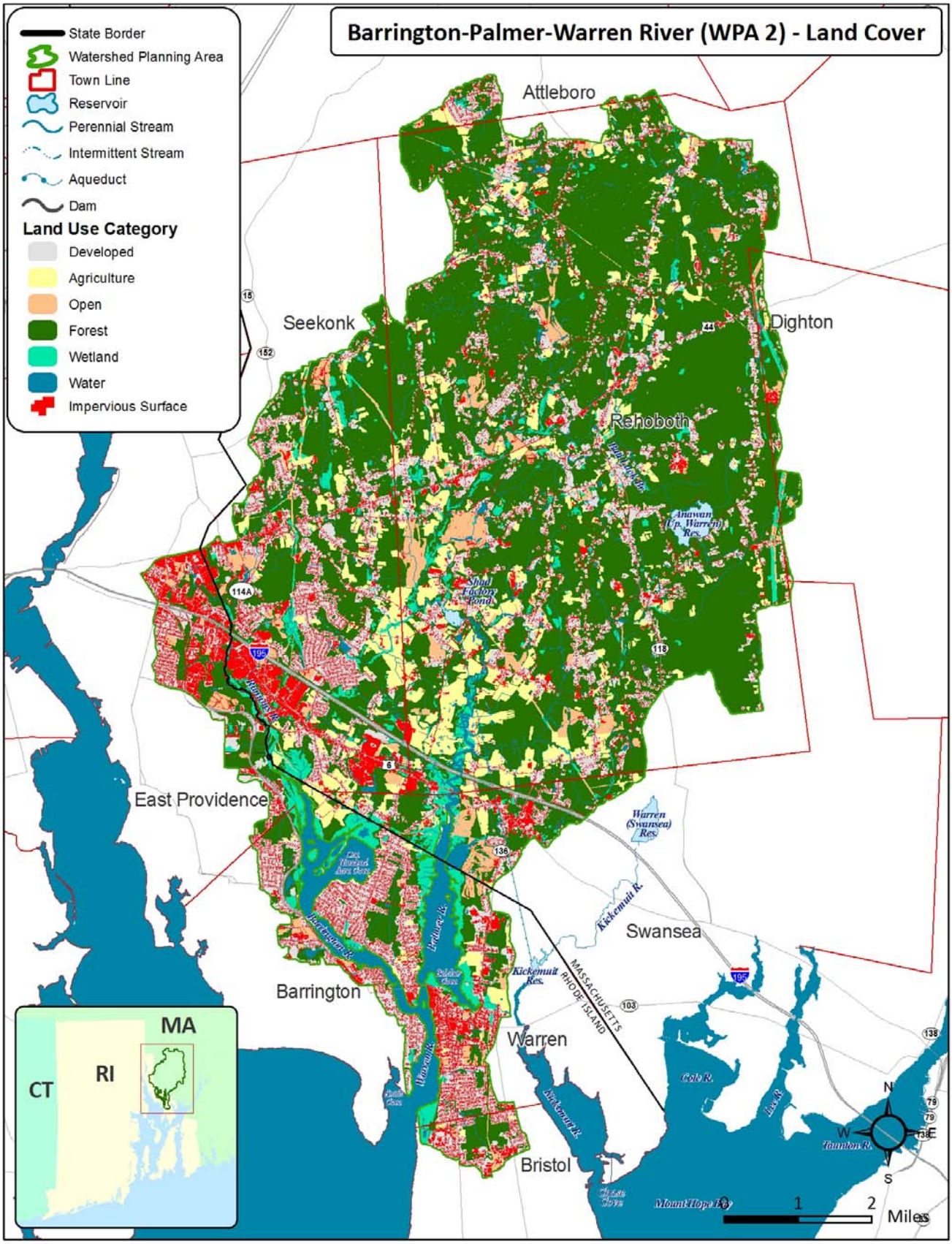
C-3: Action Item Handouts for the Prioritization Group Exercise at the Public Meetings in May 2012

Appendix A: Detailed Watershed Maps

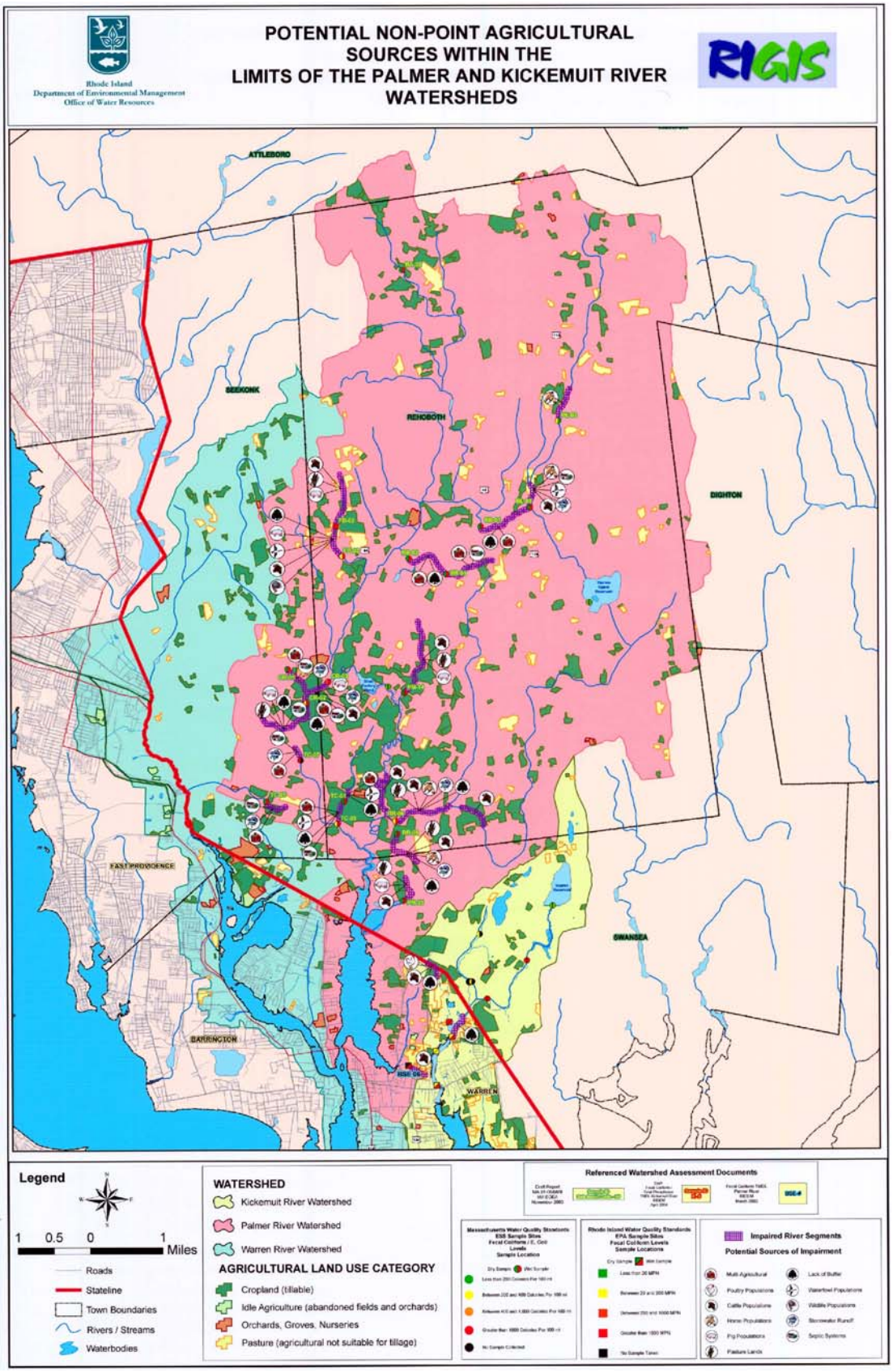
A-1: Detailed Base Map for the BPW Watershed



A-2: Detailed Land Use map for the BPW Watershed



A3: Potential Nonpoint Agricultural Sources within the Limits of the Palmer and Kickemuit River Watersheds



Appendix B: Water Quality Summaries

B-1: Data Summary for the Runnins River

Table B-1: Summary of the Data Used in the MADEP and RIDEM Fecal Coliform TMDLs for the Runnins River and MADEP Bacteria Source Tracking Data

B-2: Data Summary for the Barrington River

Table B-2: Summary of Data Used in the Fecal Coliform TMDL for the Barrington River and RIDEM Shellfish Monitoring Data (2005-2010)

B-3: Data Summary for the Palmer River

Table B-3A: Summary of RIDEM Shellfish Monitoring Data for the Palmer River (2005-2010)

Table B-3B: Summary of Data Used in MADEP and RIDEM Fecal Coliform TMDLs for the Palmer River

B-4: Data Summary for the Warren River

Table B-4A: RIDEM Shellfish Monitoring Data for the Warren River (2005-2010)

Table B-4B: Summary of Recent Beach Closures for Warren Town Beach (2005-2011)

B-1: Data Summary for the Runnins River

Table B-1: Summary of the Data Used in the MADEP and RIDEM Fecal Coliform TMDLs for the Runnins River and MADEP Bacteria Source Tracking Data

Pokanoket Watershed Alliance (used in MADEP and RIDEM TMDLs)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Range	**Geometric Mean**
School Street (dry weather)	1990 - 1998	2 - 9000	300
School Street (wet weather)	1990 - 1998	2 - 83,000	1054
School Street (wet weather)	1998	20 - 12,000	298
Pokanoket Watershed Alliance (2003-2004; 2006)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Range	**Geometric Mean**
Burrs Pond	2003-2004; 2006	< 1 - 2400	297
Mink Street	2003-2004; 2006	120 - 2400	1318
School Street	2003-2004; 2006	380 - 23,000	2575
MADEP Bacteria Source Tracking Data (2007-2009) (used in MADEP TMDL)			
Station	**Years**	***E. coli* (colonies/100 mL)**	
		Range	**Geometric Mean**
Pleasant Street	2007 - 2009	185 - 921	340
County Street	2007 - 2009	108 - 921	380
Mink Street	2007 - 2009	579 - 1793	1049
School Street	2007 - 2009	670 - 12,033	2694
MA and RI Class B Fecal Coliform standard = 200 MPN/100mL USEPA *E.coli* standard = 126 colonies/100mL Shaded cells indicate an exceedance of water quality criteria			

B-2: Data Summary for the Barrington River

Table B-2: Summary of Data Used in the Fecal Coliform TMDL for the Barrington River and RIDEM Shellfish Monitoring Data (2005-2010)

RIDEM Computer Model (from Barrington River TMDL)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Dry Weather Geometric Mean	**Wet Weather Event Maximum**
Tongue (GA2-1)	--	93	155
100 Acre Cove (GA2-2)	--	41	51
White Church Bridge (GA2-3)	--	24	66
Bike Path Bridge (GA2-5)	--	7	43
RIDEM Shellfish Monitoring Data (2005-2010)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Range	**Geometric Mean**
GA2-1	2005 - 2010	2 - 1100	36
GA2-1A	2005 - 2010	2 - 1500	24
GA2-2	2005 - 2010	2 - 2400	15
GA2-3	2005 - 2010	2 - 2400	14
GA2-4	2005 - 2010	2 - 460	11
GA2-5	2005 – 2010	2 - 460	10
RI Class SA Fecal Coliform standard = 14 MPN/100mL Shaded cells indicate an exceedance of water quality criteria			

B-3: Data Summary for the Palmer River

Table B-3A: Summary of RIDEM Shellfish Monitoring Data for the Palmer River (2005-2010)

RIDEM Shellfish Monitoring Data (2005 - 2010)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Range	**Geometric Mean**
Upper Palmer River (MA)	2005 - 2010	4 - 11,000	176
Upper Palmer River (RI)	2005 - 2010	2 - 4,600	55
Lower Palmer River	2005 - 2010	2 - 2,400	14
Belcher Cover	2005 - 2010	2 - 4,600	19
Mouth of the Palmer River	2005 - 2010	2 - 930	16
RI Class SA Fecal Coliform standard = 14 MPN/100mL Shaded cells indicate an exceedance of water quality criteria			

Table B-3B: Summary of Data Used in MADEP and RIDEM Fecal Coliform TMDLs for the Palmer River

Data used in the MADEP Palmer River TMDL (2004)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Geometric Mean	
Palmer (West Branch) (Class B)	1997 - 2002	335	
Palmer (East Branch) (Class B)	1997 - 2002	390	
Main Stem (Class B)	1997 - 2002	92	
Upstream of the Shad Factory Pond Dam Outlet (Class B)	1997 - 2002	164	
Downstream of the Shad Factory Pond Dam Outlet (Class SA)	1997 - 2002	278	
Main Stem (Class SA)	1997 - 2002	173	
RIDEM Dry Weather Sampling (1996 - 1997; from RIDEM Palmer River TMDL)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Low Tide Geometric Mean	**High Tide Geometric Mean**
Upper Palmer River (RI) (Class SA)	1996 - 1997	550	8
Lower Palmer River (Class SA)	1996 - 1997	9	4
Belcher Cove (Class SA)	1996 - 1997	3	2
Mouth of the Palmer River (Class SA)	1996 - 1997	5	6
RIDEM Shellfish Monitoring Data (1996 - 1999; from RIDEM Palmer River TMDL)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Dry Weather Geometric Mean	
Upper Palmer River -MA (Class SA)	1996 - 1999	62	
Upper Palmer River-RI (Class SA)	1996 - 1999	18	
Lower Palmer River (Class SA)	1996 - 1999	10	
Belcher Cove (Class SA)	1996 - 1999	14	
Mouth of the Palmer River (Class SA)	1996 - 1999	10	
MA and RI Class B Fecal Coliform Standard = 200 MPN/100mL **RI Class SA Fecal Coliform Standard = 14 MPN/100mL** Shaded cells indicate an exceedance of water quality criteria			

B-4: Data Summary for the Warren River

Table B-4A: RIDEM Shellfish Monitoring Data for the Warren River (2005-2010).

RIDEM Shellfish Monitoring Data (2005-2010)			
Station	**Years**	**Fecal Coliform (MPN/100 mL)**	
		Range	**Geometric Mean**
Station 9	2005 – 2010	2 - 240	10
Station 10	2005 – 2010	2 - 240	8
Station 13	2005 – 2010	2 - 2400	9
RI Class SB/SB1 Fecal Coliform standard = 50 MPN/100mL			

Table B-4B: Summary of Recent Beach Closures for Warren Town Beach (2005-2011). Closures based on single sample enterococci results (colonies/100mL)

Sample Date	Warren Town Beach Enterococci Results	Warren Town Beach Closure Date	Warren Town Beach Re-Open Date
8/15/2011	97	8/16/2011	8/17/2011
8/3/2010	766	8/4/2010	8/5/2010
7/21/2010	350	7/22/2010	7/23/2010
6/23/2010	156	6/24/2010	6/25/2010
6/14/2010	121	6/15/2010	6/16/2010
7/22/2009	74	7/23/2009	7/26/2009
7/8/2009	110	7/8/2009	7/10/2009
7/16/2008	228	7/17/2008	7/18/2008
6/25/2008	110	6/26/2008	6/27/2008
6/16/2008	109	6/17/2008	6/20/2008
8/9/2007	345	8/9/2007	8/15/2007
7/20/2007	538	7/21/2007	7/24/2007
7/5/2007	1086	7/6/2007	7/10/2007
6/6/2007	199	6/7/2007	6/8/2007
6/5/2007	135	6/5/2007	6/6/2007
8/28/2006	160	8/29/2006	8/31/2006
8/15/2006	368	8/16/2006	8/18/2006
7/31/2006	272	8/1/2006	8/3/2006
7/14/2006	663	7/15/2006	7/25/2006
6/26/2006	262	6/26/2006	7/1/2006
8/30/2005	24192	8/31/2005	9/1/2005
RI Class SB Enterococci standard for designated beaches = 104 colonies/100 mL Shaded cells indicate an exceedance of water quality criteria			

Appendix C: Public Meetings and Response to Public Comments

C-1: Summary of the RI WBP Public Meeting for the DRAFT BPW Watershed Plan

C-2: Summary of Public Comments Received for the DRAFT BPW Watershed Plan

C-3: Action Item Handouts for the Prioritization Group Exercise at the Public Meetings in May 2012

C-1: Summary of the RI WBP Public Meeting for the DRAFT BPW Watershed Plan

DRAFT - MEMORANDUM

To: RI/MA Barrington-Palmer-Warren River WBP Stakeholders

From: FB Environmental Associates

Subject: Barrington-Palmer-Warren River Draft watershed-based plan public meeting–May 10th 2012

Date: June 14, 2012

This memo summarizes the RI WBP public meeting for the draft watershed-based plan for the Barrington-Palmer-Warren Rivers watershed planning area (WPA). The meeting was held in the Barrington Town Hall Council Chambers in Barrington, RI on Thursday, May 10, 2012 from 2-5 PM.

At this meeting, it was essential to get the attendees opinions on how to best move forward with improving water quality within the WPA. Two key aspects of the meeting were the detailed discussion of action items for the WPA and the public's comments on the plans. The draft plan was modified to incorporate the action items and comments made at the meeting. Where and how the changes were made to the draft plan are outlined within this memo under the sections "summary of action item prioritization exercise" and "summary of important questions / comments raised in the meeting."

Attendees *– 34 Attendees*

Ted Ballard – Rehoboth, MA Water Commission – cbal277612@aol.com
Werner Horlbeck – Rehoboth, MA Water Commission – whorlbeck7@comcast.net
Walter H Munroe – Rehoboth, MA Agricultural Commission – no e-mail
Warren Prell – Brown University / Barrington Resident – warren_prell@brown.edu
Don Pryor – Brown University – Donald_Pryor@brown.edu
Doug Materne – Barrington Conservation Commission – wwspdwm@aol.com
Phil Hervey – Barrington, Town Planner – phervey@barrington.ri.gov
Cyndee Fuller – Barrington Conservation Commission – cfuller4@cox.net
Thomas D. Gordon – Warren, Town Manager – tgordon@townofwarren-ri.gov
Michael Bartlett – East Providence, Assistant Super of Parks and Rec. – mbartlett@cityofeastprov.com
Diane Feather – East Providence, City Planner – dfeather@cityofeastprov.com
Davison Bolster – Warren Town Council – davisonbeaux@juno.com
Rachel Calabro – Save The Bay – rcalabro@savebay.org
Tom Kutcher – Save The Bay – tkutcher@savebay.org
Phoebe Lee Dunn – Seekonk, MA, Planning Board – phoebeleed@gmail.com
Cindy Coyne – Town of Barrington – ccoyne@barrington.ri.gov

Brandon M. Doyle – Resident near Palmer River – bravia129@yahoo.com
Jeremy Doyle – Resident near Palmer River – jeremydoyle33@yahoo.com
Rich Fennessy – Bristol County Water Authority – rfennessy_bcwa@msn.com
Kelley Whitmore – Seekonk & Rehoboth Land Trusts – kwhitmore@ttor.org
James Boyd – RI Coastal Resources Management Council – jboyd@crmc.ri.gov
Jessica Blackledge – Eastern RI Conservation District – info@easternriconservation.org
Colleen Brown – Swansea Conservation Commission – swanseaconcom@aol.com
Walter Burke – Bristol, Parks and Rec. Dept. – wburke@bristolri.us
Patrick Barosh – Consulting Geologist from Bristol – pjbarosh@fullchannell.net
Caroline Wells – Warren, Senior Planner – cwells@townofwarren-ri.gov
Amie Parris – RI Department of Health – amie.parris@health.ri.gov
Eric Boettger – NRCS, Rhode Island - Eric.Boettger@ri.usda.gov
Barbara Miller – NRCS, Massachusetts – Barbara.miller@ma.usda.gov
Margherita Pryor – US EPA - Pryor.Margherita@epamail.epa.gov
Ernie Panceria – RIDEM - Ernie.Panciera@DEM.RI.GOV
Elizabeth Scott – RIDEM - Elizabeth.Scott@DEM.RI.GOV
Heidi Travers – RIDEM – Heidi.travers@DEM.RI.GOV
Betsy Dake – RIDEM - elizabeth.dake@DEM.RI.GOV

Summary of responses to Keypad Polling Questions

1.) I am from:

- Rhode Island, watershed resident: **23%**
- Massachusetts, watershed resident: **12%**
- Rhode Island, non-watershed resident: **42%**
- Massachusetts, non-watershed resident: **23%**
- Away: **0%**
- ***26 responding***

2.) As a watershed stakeholder, I am a:

- Non-profit: **10%**
- Municipal official: **38%**
- State official: **21%**
- Other Professional: **21%**
- Interested Resident: **7%**
- Other: **3%**
- ***29 responding***

3.) What priority is stormwater and LID?

- Not worth pursuing: **3%**
- Worth doing a little: **3%**
- Medium priority: **28%**
- Highest Priority: **66%**
- ***32 responding***

4.) What priority is Wastewater?

- Not worth pursuing: **0%**
- Worth doing a little: **11%**
- Medium priority: **46%**
- Highest Priority: **43%**
- ***28 responding***

5.) What priority is drinking water, land conservation, and agriculture?

- Not worth pursuing: **0%**
- Worth doing a little: **0%**
- Medium priority: **27%**
- Highest Priority: **73%**
- ***26 responding***

6.) What priority is governance and monitoring?

- Not worth pursuing: **0%**
- Worth doing a little: **11%**
- Medium priority: **56%**
- Highest Priority: **33%**
- ***27 responding***

7.) How would you rank these sectors (which one do you see as the MOST important)?

- Stormwater / LID: **43%**
- Wastewater: **0%**
- Drinking water, land conservation, agriculture: **50%**
- Governance and monitoring: **7%**
- ***28 responding***

Summary of Action Item Prioritization Exercise

After the presentation of the plans there was a group exercise to prioritize the action items for the Barrington-Palmer-Warren River watershed. The attendees volunteered to be in one of four groups based off the following sectors:

- Stormwater and Low Impact Development (LID),
- Drinking Water / Land Conservation / Agriculture,
- Wastewater, and
- Governance and Monitoring.

The four groups were given handouts containing action items for their sector, taken directly from the watershed based plan. The handouts for each sector are attached at the end of this memo. The action items included a description, an estimate of the value added, and an estimate for the cost of implementing the

action item. The cost estimates were broken down as follows: $ = expected to cost less than $25,000 to implement, $$ = expected to cost approximately $25,000 to $100,000 to implement, and $$$ expected to cost over $100,000 to implement. Attendees were encouraged to come up with their own action items, beyond those provided on the hand outs. When a new action item was added to the list, the group discussed the estimated cost to implement the action item, and it was assigned an appropriate number of dollar signs.

Before the attendees were broken up into groups, the sectors were assigned a number of poker chips. A total of 50 poker chips were assigned and they were distributed based roughly off the percentage of the attendees that felt the sector was the most important. The poker chips were used by the groups to "fund" their most important action items. One poker chip was equal to one $. The cumulative total of $ from the groups action items could not exceed the number of poker chips they were assigned.

Since stormwater / LID received 43% of the vote, that sector was assigned 20 poker chips. Wastewater did not receive any votes and since the group needed some poker chips to work with, so drinking water, land conservation, agriculture "donated" four chips to wastewater. Drinking water, land conservation, agriculture received 50% of the vote and was initially assigned 24 poker chips. Since four chips were "donated" to wastewater, the group had a total of 20 poker chips. Governance and monitoring received 7% of the vote and was assigned six poker chips.

Individuals in each group were given a chance to discuss the action items they felt were the most important for their sector. The group facilitator placed all of the discussed items on a flip chart. The groups then decided the specific action items they would "fund" with their allotted poker chips. This forced the groups to pick the highest priority action items for their sector within a hypothetical budget. Having a prioritized list of action items is an important step in implementing a watershed based plan. Below are the results from the prioritization exercise for each sector (in no particular order).

Stormwater and LID – (20) $

- Implement, through municipal ordinances, comprehensive stormwater requirements for new developments and re-developments within watershed municipalities. In Rhode island, align the stormwater requirements with the RI Stormwater Manual - $
    - Reference to this was added to section 6.2.1 to explain how, pending RI legislation S2445a, municipalities would have the authority to adopt ordinances requiring compliance with the RI Stormwater manual.
- Implement, through municipal ordinances, requirements for LID in new developments and re-developments - $
    - Action item is located in Table 6-3: "Identify and adopt ordinances necessary to advance LID"
- Within municipal ordinances, provide incentives for large developments to retrofit impervious surfaces with LID - $
    - Action item is located in Table 6-3: "Identify and adopt ordinances necessary to advance LID"

- Investigate the creation of a "blueways" trail to enhance public access to the waterbodies and awareness of water quality issues in the watershed - $
    - Action item is located in Table 6-1 and 6-3.
- Perform an inventory of culverts in the watershed and target undersized culverts in estuarine areas for replacement (Save the Bay is currently working on this in some areas) - $
    - Action item added to Table 6-4.
- Regulate development with a maximum number of parking spaces in municipal ordinances - $
    - Action item added to Table 6-1.
- Continue to clean and inspect the catchbasins within watershed municipalities - $$
    - Action item is located in Table 6-1
- Increase enforcement and requirements for BMP maintenance at developments with large stormwater BMPs - $$
    - Action item added to Table 6-1.
- Form a stormwater utility. It is most feasible for each municipality to have its own stormwater utility - $$$
    - Action item is located in Table 6-1.
- Increase education and target education for stormwater issues and water quality problems within the watershed community. This education could focus on what a stormwater utility is and what it does. In the long run, it is believed that stormwater utilities could save tax payers money, but most citizens do not understand what a utility is or what it does - $$
    - Action item added to Table 6-1.
- Remove the Mobil Dam on the Runnins River. This will help with phragmites removal and will increase the overall health of the salt marsh - $$
    - Action item added to Table 6-4.
- Move forward with retrofits at the end of dead end roads that empty into the watershed waterbodies - $$$
    - Action item added to Table 6-1.

Drinking Water / Land Conservation / Agriculture – (20) $

- Work with Farm Fresh RI to connect farms with consumers. This will help farmers better predict the market for their goods, will help them network, and will help keep agricultural land from becoming developed which increases land preservation. Create a "Palmer River Farm Fresh." In order to be a member, farmers would have to meet specific criteria to show they are protecting water quality. This would accent the positive side of agriculture and could influence residents to buy local - $$
    - Action item added to Table 6-4.
- The RI and MA NRCS offices should work together in the Palmer River watershed. Create a memorandum of understanding to work across state lines. This would help to improve water quality on both sides of the border - $
    - Action item added to Table 6-4.

- Buffer zones on the waterbodies in the watershed should be standardized. There should be an assessment of the buffers along the waterbodies within the watershed. Potentially the NRCS or a 319 grant could help with this project - $$
    - Action item added to Table 6-4.
- Increase land preservation. Identify key areas to protect with conservation easements. Create open space maps for the entire watershed. Increase outreach to land owners about the funding available and local economic benefits of open space preservation. Increase collaboration to get funding for the purchase of important lands in the watershed - $$$
    - Action item added to Table 6-4.
- Work on getting agricultural BMPs installed in the upper Palmer River watershed in Rehoboth, MA. The peer-peer interaction of farmers in the upper Palmer could help farmers see the type of BMPs they can implement. Accentuate success stories on local farms and highlight farms that are working to protect water quality - $$$
    - Action item added to Table 6-4.
- Have local agricultural commissions work together on a watershed level - $$
    - Action item added to Table 6-4.
- Maintain local drinking water reservoirs. Work to develop geese management plans for drinking water reservoirs. Implement soil testing to better understand the geology of the watershed planning area. Create a watershed overlay for drinking water reservoirs - $$$
    - Action item is located in Table 6-4.
- Prioritize outreach to landowners with priority lands and ask if they will donate land to the town, or portions of land to the town. This could allow for a state tax credit in Rhode Island - $$$
    - Action item added to Table 6-4.
- Educate landowners and farmers on their options to protect open space and water quality within the watershed - $
    - Action item added to Table 6-4.

Wastewater – (4) $

- Inspect existing septic systems and prioritize systems for replacement - $$
    - Action item added to Table 6-2.
- Institute septic management plans that accentuate inspections, pump outs, and septic repairs - $$
    - Action item added to Table 6-2.

Governance and Monitoring – (6) $

- Form a watershed-wide inter-local organization for implementing priority actions and overseeing monitoring - $
    - Action item already in Section 6.1.1.
- Investigate a local or regional stormwater utility - $$
    - Action item already in Section 6.1.2.

- Investigate a local or regional onsite wastewater management district in Massachusetts - $
    - Action item already in Section 6.1.3.
- Expand existing monitoring in watershed by non-governmental organizations. Encourage businesses in the area to make donations to these groups - $
    - Action item already in Section 6.1.4.

Summary of important questions / comments raised in the meeting and responses

- Question: Are Massachusetts residents / organizations / municipalities allowed to comment on the plans, or is it only for Rhode Island?
    - Response: Comments are welcome, and encouraged from any individual, organization, or municipality in Massachusetts. The public comment period is open until May 26th, 2012.
- Question: Does Rhode Island collect all potential water quality parameters on the Warren River?
    - Response: RIDEM does not have the resources to collect every potential water quality parameter on the waterbodies it samples. The specific water quality parameters collected pertain to the designated use of the waterbody.
- Question: The Warren River is not considered impaired, but it is the receiving water of several impaired waterbodies. How is it that the Warren is not listed as impaired if shellfishing is prohibited in the Warren River? As part of the plans, the overall well being and water quality within these waterbodies should be considered. More data should be collected on these waterbodies, and RIDEM should not just look at the designated uses.
    - Response: Water quality in the Warren River could be improved. Just because it is not listed as impaired does not mean that it does not have issues. (An interesting note is that the bacteria readings taken in the Warren are actually lower than those found within the Palmer and Runnins Rivers.) RIDEM would love to be able to fully characterize the water quality of all waterbodies in the state, however they do not have the resources or the time to collect and analyze all of that data. Additional monitoring can be done by local watershed groups, and RIDEM supports those efforts. RIDEM is required by EPA (through the Clean Water Act) to determine if the state's waters are meeting their designated uses. That is why there is so much emphasis on the parameters determining if waters meet their designated uses.
    - Response: The Warren River is not listed as impaired due to the shellfish bed closures, because shellfishing is not one of its designated uses. Shellfishing is prohibited in the Warren River because of the wastewater treatment facility (WWTF) outfalls in the river. The Clean Water Act specifically forbids shellfishing in waters that have WWTF outfalls. In order for a waterbody to have a designated impairment, it must be impaired for a specific water quality designation. Since shellfishing is not one of the designated uses for the Warren River, it is not considered impaired, even though shellfishing is prohibited.

Summary of Next Steps – Who will move this plan forward and how can that be done?

- Local conservation commissions could take on the plan and work to implement the action items specific to each town.
- The local conservation districts are set up and available to help with implementing this plan.
    - The Eastern RI Conservation District will be in touch with representatives from RIDEM about moving forward with this process.

- RIDEM would like to hold an annual meeting and stay in touch with individuals / organizations interested in administering the watershed-based plan. This will help to keep an organizational structure and to keep the momentum moving in the right direction.
- The US EPA would like to provide support for this plan as local individuals and organizations move to implement the plan. EPA can help facilitate discussions and look for funding sources to help with implementation.
- There are other state and federal organizations in the area that have expertise in water quality. The RI Department of Health, RI Coastal Resources Management Council, and NRCS are a few examples of organizations that can be counted on to help move the process forward.
- **Individuals that are interested in receiving more information on how they can help to move the planning process forward should contact Ernie Panciera at RIDEM:** Ernie.Panciera@DEM.RI.GOV**. This way a list of interested individuals can be generated and a committee can be formed to help guide this process.**

C-2: Summary of Public Comments Received for the DRAFT BPW Watershed Plan

MEMORANDUM

To: RI/MA Barrington-Palmer-Warren River WBP Stakeholders

From: FB Environmental Associates

Subject: Public Comments for Barrington-Palmer-Warren watershed-based plan

Date: June 14, 2012

Introduction

This memo summarizes the public comments received by FB Environmental for the Barrington-Palmer-Warren (BPW) and the Bristol-Kickeumit (BK) watershed-based plans. The public comment period closed on Saturday, May 26, 2012. This memo is organized as follows: the watershed-based plan the comments were made for, the person submitting the comments and their affiliation, the exact text of the comment, and then an explanation of how the comment was addressed in the final version of the plan. A total of nine individuals submitted written comments to FBE during the public comment period.

Public Comments for both Plans

Submitted by: James Boyd – RI Coastal Resources Management Council - jboyd@crmc.ri.gov

- **Comment:** I think both watershed plans should note in the Stormwater Implementation Sections (5.1) that pending RI legislation (S2445a) would authorize municipalities to adopt ordinances requiring compliance of any development with the RI Stormwater Manual. See: http://www.rilin.state.ri.us/BillText12/SenateText12/S2445A.pdf. I think the notation cold also be made in Section 6.1 for local city/town implementation.
    - **Response to Comment:** Added a reference within Section 5.1 (Stormwater) in both plans. Also, included a footnote in Section 6.2.1 (Improving Stormwater Management at the Municipal Level) explaining that pending the above legislation, municipalities will have the ability to regulate any new development by requiring compliance with the RI Stormwater Manual.

Submitted by: Ken Orenstein – Providence, RI - kenorenstein@gmail.com

- **Comment:** A number of years ago, as I was driving on Interstate 88 east of Binghamton, NY, I noticed a roadside sign reading "Entering Chesapeake River Watershed." I thought how brilliant, I wondered how many people living in/driving thru this area of New York's Southern Tier realize that anything that drains

into a storm sewer ends up two states and hundreds of miles away in Chesapeake Bay. As you emphasize in your report reported on the Sundays ProJo, a large portion (the largest, I believe) of the Narragansett Bay watershed is in Massachusetts. How many people understand or appreciate the extent of the watershed. Hundreds of thousands of vehicles a day drive up/down 95, 195, 495 and various RI and Mass state roadways. Putting signs on these roads reading "entering Narragansett Bay Watershed" would help them to do so and remind them every time they drive past the sign.

- **Response to Comment:** In Table 6-4 (Other Action Items for Improving Water Quality) Action Item was added: "Increase awareness about the extent of the watershed-planning areas by placing informational signs throughout the watershed-planning area."

Submitted by: Jean Burritt Robertson - burrittrobertson@fullchannel.net

- **Comment:** All in all good plans with nice graphics. Not sure that it needs to be part of the plan but it would be good to have guidance for property owners as to types of plantings that are best for properties that abut the water, like Hundred Acre Cove. Many people want to do the right thing but there is often conflicting information on planting and no clear guidance and no clear guidance for the average homeowner. Particularly for waterfront properties it would be helpful to have a list of desired plantings as well as information on where to source them. Where is Massachusetts? It seems based on the data that no real solution to the pollution can be secured without the active participation and commitment of Massachusetts communities within the watershed.
  - **Response to Comment:** In Table 6-5 (Small-Scale Actions to Improve Water Quality at the Local Level) there is already a reference to how landowners can help protect water quality through vegetated buffers. Added a reference to the RI Coastal Resources Management Councils "Coastal Buffer Planting Guide" to help landowners understand what plants would be native to the area.

Submitted by: Jennifer West – Narragansett Bay Research Reserve – Jennifer@nbnerr.org

- **Comment:** In lines 5 and 6, section 5.2.1, it should read "...Rhode Island Low Impact Development Site Planning and Design Guidance Manual (March 2010), is ..."
  - **Response to Comment:** The change suggested above was made in both plans. However, the date used was March 2011.
- **Comment:** Consider mentioning protected open space within cluster and conservation subdivisions in section 5.4.2 (b/c Bristol has adopted Conservation Development and Warren is considering it). It is another way that communities can protect substantial amounts of open space (for ex. 40% of North Kingstown's total amount of protected open space is held in cluster and conservation subdivisions). A helpful resource is the "Rhode Island Conservation Easement Guidance Manual" http://www.nbwctp.org/programs/easements_openspace.html. In addition to providing information on how conservation easements are drafted, reviewed, put into action, and effectively enforced, it also goes into detail on how to manage, monitor, and steward such parcels (it includes an example of a property management plan and a checklist, a baseline documentation report checklist, and a sample stewardship endowment calculation worksheet).
  - **Response to Comment:** The above document was mentioned in Section 5.4.2 in both plans.
- **Comment:** 1st line of 1st paragraph of section 6.2.1 - non-structural BMPs are really land-use planning techniques such as conservation development, minimizing clearing and grading, minimizing impervious cover via shorter and narrower roads, etc. Public education, etc is really a category of its own.

  - **Response to Comment:** Examples of the land-use planning non-structural BMPs mentioned in the comment above were added to Section 6.2.1 in both plans. Non-structural BMPs are not only land-use planning techniques and also include maintenance, changing public behavior, and public education. Therefore, those examples of non-structural BMPs should not be removed from this section and added to another, as requested in the comment.

- **Comment:** Sections 6.3 and 7.2.3- is there a reason why only those groups are mentioned? There are quite a few other organizations in RI and MA that are working on these issues and provide training and technical assistance to communities. If you'd like to add more, please let me know and I can send you a blurb about my program and have my partners do the same.
  - **Response to Comment:** A paragraph about NBNERR was added to Section 6.3 and the organization was listed in Section 7.2.3 in both plans.
- **Comment:** In the references section I noticed that the LID Manual (mentioned above) isn't included. You might also want to include the RI Conservation Easement Guidance Manual as a reference.
  - **Response to Comment:** A reference for both manuals was added to the References Section of both plans.

Public Comments for the BPW Plan

Submitted by: Alan M. Corvi – Department of Public Works, Town of Barrington, RI - acorvi@barrington.ri.gov

- **Comment:** On Page 70, Table 6-1 under action plan for stormwater management - The drainage outfall that discharges to Woods pond is owned and maintained by the State of RIDOT. The runoff from this pipe is from County Road which is a state road. RIDOT should be responsible for the pre-treatment if necessary for this.
  - **Response to Comment:** Removed "Town of Barrington" and added "RIDOT" under Responsibility for the Action Item mentioned above.
- **Comment:** Also, at this time, the Town of Barrington has no intent to develop a Stormwater Utility
  - **Response to Comment:** This suggestion remains in the plan. While the Town may not be intending to develop a stormwater utility, it is left in the plan as a suggested action item.
- **Comment:** On Page 78, the only septic systems in Town are located on George Street in Barrington. There is no sewer service on this street due to its geographic location (see map). There is no intent to install sewer on this street due to the limited number of homes.
  - **Response to Comment:** Removed the Action item "Develop a system to determine if there are any remaining OWTS," as the Town already knows the location of all septic systems in Town.
- **Comment:** The Town has no intent on setting up a system to "look" for cesspools. We do not believe this is needed**.**
  - **Response to Comment:** It is important for the Town to know where the cesspools are and that suggestion remains in the plan.

Submitted by: Jeremy Doyle – jeremydoyle33@yahoo.com

- **Comment:** Interested in advocating for cleaner rivers, in particular the Palmer and Barrington. What are the sources of pollution, and which are the most devastating and preventable? Please keep me informed of possible next steps, I'd like to play a constructive role.
    - **Response to Comment:** FBE has included Jeremy Doyle on the list of individuals for RIDEM to follow up with in the BPW watershed.

Submitted by: Donald Pryor – Visiting Lecturer in Environmental Studies, Brown - donald_pryor@brown.edu

- **Comment:** Dynamics - The plan should address the future in some way, possibly by extrapolating from recent trends. For instance:

	2010 pop	2010/1980	pop/sq mile	Buildout/pop increase
Rehoboth	11,608	53.3%	245	~7,500
Seekonk	13,722	11.8	738	2,042
Swansea	15,865	2.6	701	
Barrington	16,310	0.8	1081	?
East Providence	47,037	-7.73	3623	?
Warren	11,360	-4.1	1771	?

Rehoboth has had the greatest growth and has more additional capacity than other towns in the watershed. RI towns are probably near build-out. East Providence and Warren have lost population but both towns have reuse potential in some areas. It would be very interesting to see land use trends along with streamflow, water use and water quality trends. The latest snapshot of land use (fig A-2) would be more valuable in a context of trends.

    - **Response to Comment:** In Section 2.4 (Compelling Issues in the BPW Watershed), a section entitled "Managing Population Growth" was added. This section discusses the above concern.

- **Comment:** Water Use - Given that protecting water supplies is a major concern, current supplies (as well as trends) should be better described. Municipal wells serve nearly all of Seekonk and Barrington (through Bristol County Water Authority (BCWA), but a separate production and distribution system from its surface reservoirs). Swansea's desalination facility is well-described except for the fact that its current well supply which is being replaced is also being turned into a treated wastewater injection area. BCWA's Swansea reservoir is not being used (use would probably require a pipeline connection rather than surface streams due to contamination). BCWA's Shad Factory Pond supplies only a small amount of water – BCWA customers except in Barrington use almost all Scituate water. I've been told that to more fully use the Shad Factory Pond water would require replacement of the pipeline (along a different route?) and upgrades to the BCWA treatment plant. A clearer understanding of how water is now used should be helpful in protecting water supplies for the future.
    - **Response to Comment:** Some of this information is already in Section 2.4.1 (Protecting Drinking Water Sources). Though additional information would be helpful, it is not necessary at this time.

- **Comment:** Interstate - Recommended actions include several watershed-wide efforts. However, since the watershed is divided between two states (as well as several towns), cooperation at that level is sufficiently difficult at this point to make achieving those recommendations very unlikely. The report could do more to encourage interstate cooperation. For instance, Table 5-1 on MS4 programs could include MA (and MA DOT and RI DOT) as well as RI – there are far more similarities than differences among these programs and comparisons could be insightful. Bringing out more of the numbers, such as catch basins, mapping percent and miles of storm drains would be helpful. A bit of independent analysis would also be valuable – are these programs proving useful especially in light of expected phase 2, round 2 requirements? Although

the similarities among LID efforts are not as clear as for MS4 programs, Table 5-2 could be constructed in a way that would allow both RI and MA communities to be reasonably represented (note that parts of Table 5-2 are mislabeled as Table 5-4). Tables 5-3 and 5-4 on on-site systems could be made more similar and perhaps combined allowing both MA and RI communities to be shown in similar ways. All the action plans could be made to include MA as well as RI municipalities in similar, comparable fashion. The EP Taunton Avenue planning grant box on p. 97 could be expanded to include mention of the SRPEDD 2011 study (mentioned in Seekonk's Master Plan) done for the contiguous section of Taunton Avenue in MA. As another example, perhaps over the dam, the meeting on the draft plan was announced by a flyer headed as "Rhode Island Watershed-Based Plan".

- **Response to Comment:**

  1. Corrected the mislabeling of Table 5-2 as Table 5-4.
  2. Though this is a multi-state watershed plan, it is a RIDEM project. As such, the municipal evaluations are focused on the RI communities with less detail provided for the MA communities.
  3. In Section 2.4, the issue of interstate cooperation is addressed in the introductory paragraph.
  4. At this time, the EP Taunton Avenue box will remain as is due to time constraints.

- **Comment:** Impaired waters – fig 1-1, 4-1 and A-3. Not all impaired waters depicted, esp in MA. Compare to EPA Waterbody Assessment and TMDL Status maps – for MA only since RI is a delegated state. Inclusion of low order streams does not add useful information – not assessed, better to consider subwatersheds.

  - **Response to Comment:** The major impairments discussed in the plan are included in these maps. .

- **Comment:** Regulations - Water regulations have become very complex. This report could do a better job at integrating them and encouraging simplification. For instance, no mention is made of permits or requirements under the MultiSector General Permits (MSGP). Seekonk's BJ's is given a box on page 56 but there is no explanation of how that was related to municipal regulations, MSGPs, other requirements or unprodded civic concerns.

  - **Response to Comment:** Given the complexity of water regulations, and the scope of this plan, there is not a need to go into more detail, or include a reference to the MSGP. The Seekonk BJ's example was used to show what a town has done to include Low Impact Development into recent development projects. A further level of detail is not necessary for this example.

- **Comment:** Action Plans - It would be useful to check earlier reports (such as from 1994) to see what actions were recommended, what was done and what resulted. Even for the 2002 analyses, more specific recommendations than listed were made, some presumably were address, and some made a difference – it would be helpful to have a summary of that. (The Wannimoisett Rd pump station renovation might be worthy of mention since it was often noted to be a source of pathogens.) No mention is made of RI or MA DOT even though they have been assigned actions in previous studies.

  - **Response to Comment:** A more detailed reference about the Wannimoisett Pump station renovation is included in Section 4.1.3. RI and MA DOT are currently included in the action plans. More detailed analysis of past plans and actions that have been completed cannot be completed at this time due to time constraints. It is anticipated that specific towns will have that information.

- **Comment:** Flooding/Dams - There are several dams in the watershed in various stages of disrepair. They may have impacts on water quality and their care or removal might be part of a strategy. Similarly, several municipalities have floodplain area ordinances and/or flooding problems – these should be given consideration in an overall watershed-based plan.
    - **Response to Comment:** In Section 2.4.4 (Protecting Fish and Wildlife Habitat) a reference to how dams limit fish access was included. .

Submitted by: Heidi Travers – Office of Water Resources, RIDEM - heidi.travers@DEM.RI.GOV

- **Comment:** Table of Contents - It should contain links to sections of the document. Also there are some items that should be deleted below Section 3.2.
    - **Response to Comment:** The items below Section 3.2 in the TOC were deleted. As RIDEM is responsible for accepting these comments and producing the final document, they will be responsible for converting the TOC in Word to bookmarks in PDF.
- **Comment:** Table 3-1 - Warren River impervious cover percentage is missing. Also, can you directly compare the landuse types between Massachusetts and Rhode Island? Are they using the same 'rules' to classify landuse types (i.e. is agriculture defined the same by each state)? Should they be presented separately?
    - **Response to Comment:** The missing percentage of impervious cover for the Warren River was added. A note was made in Table 3-1 that the land use data may be different.
- **Comment:** Page 23 - Typo – Missing Parenthesis.
    - **Response to Comment:** Fixed the typo and added parenthesis.
- **Comment:** Table 4-1 - Palmer River also has an SB1 section. Are the impairments from only Rhode Island or both Massachusetts and Rhode Island?
    - **Response to Comment:** The SB1 designation was included in Table 4-1 for the Palmer River. As shown in the title of Table 4-1, the impairments are from both MA and RI.
- **Comment:** Page 29 - This paragraph is confusing (below). Which state has the Runnins River in Category 5? Clarify if you are only talking about Rhode Island or if you are including Massachusetts as well. If you are only referring to Rhode Island, then the RI portion does not begin at Route 44. If you are including Massachusetts, then TMDL should be plural, as both states have completed a TMDL. Need to be more specific concerning which state you are including in your descriptions.

  "The **Runnins River** is listed on Category 5 and is assessed as impaired from Route 44 south (Figure 4-1). A TMDL has been written for its recreation impairment due to bacteria. However, aquatic life use impairments have not yet been addressed in a TMDL."
    - **Response to Comment:** According to the 2010 305(b) lists in RI and MA, the Runnins is a Category 5 waterbody in both RI and MA. Though TMDLs have been written for recreation impairments due to bacteria, aquatic life use impairments have not yet been addressed in TMDLs.
- **Comment:** Reword this sentence (below). RIDEM does not believe that the pump station is still discharging. The sentence makes it seem as though we believe it to be an intermittent source.

"Other potential sources of bacteria to the Runnins River as identified in the TMDLs include the Wannimoisett Pump Station in East Providence, RI, which periodically discharged untreated sewage to Orange Juice Creek in the late 1990s."

- **Response to Comment:** The sentence now references the renovations made to the pump station...

- **Comment:** Page 32 - The Barrington River TMDL does not state this (below). Delete the reference to the TMDL!!

  "Other sources of bacteria to the Barrington River identified in the TMDL include **stormwater runoff** below White Church Bridge."

  - **Response to Comment:** Removed the above reference to the TMDL from the document.

- **Comment:** Page 34 - Change XX to actual percentage. Where is the data source for this information? This may be correct for the non-point source load, but RIDEM analyses showed that the existing NPDES sources were larger than the watershed sources, particularly in the summer.

  "DEM studies have also determined that the most significant nitrogen loading to the Palmer River originates in MA, which is not surprising given that *XX%* of the land area of the Palmer sub-watershed is in MA."

  - **Response to Comment:** This sentence was removed from the plan.

- **Comment:** Page 35 - This is not consistent with the TMDL plans that identify agriculture as a large source of bacteria.

  "The largest sources of bacteria to the Palmer River are concentrated along the more developed reaches of the river in Massachusetts in the southern portion of the watershed."

  - **Response to Comment:** This sentence was re-worded.

- **Comment:** Page 43 – Change septic system to OWTS.

  - **Response to comment:** Changed septic system to OWTS where appropriate throughout plan.

- **Comment:** Other – Some of the tables in Section 6 are missing action items for Massachusetts.

  - **Response to Comment:** These areas were intentionally left blank to display that we are looking for action items for MA.

C-3: Action Item Handouts for the Prioritization Group Exercise at the Public Meetings in May 2012

Stormwater			
Action Item	**Timeframe**	**Value Added**	**Cost**
Install structural BMP to pre-treat inflow to Woods Pond in Barrington, Barrington watershed	1-2 years	*	$$
For MS4 communities - Submit Phase II Stormwater Management Plans and annual reports, as required	Ongoing	***	$
Form a stormwater utility for watershed	5-10 years	***	$$$
Consider creating a “blueways trail" to enhance awareness and protection of streams for canoes, kayaks, and rowers in watershed	2-5 years	**	$
Collaborate with RIDOT on stormwater compensation for upcoming White Church Bridge replacement in Barrington	2-5 years	*	$$
Install BMPs at County Street and, Route 6 in East Providence	5-10 years	***	$$$
Monitor the discharges from the water and sewer pipe underdrain system for bacteria to help prioritize inflow and infiltration reduction work.	Ongoing	*	$
Install pigeon deterrent on I-195 Bridge in East Providence	2-5 years	**	$$
Explore ways to reduce concentrations of underutilized impervious surfaces in the Taunton Ave. area in East Providence	2-5 years	**	$
Conduct a minimum of two dry weather surveys	Ongoing	**	$
Conduct annual cleaning and inspection of all catch basins within watershed municipalities	Ongoing	**	$$
Install permanent trash receptacles for dog waste disposal at Jamiel Park along Belcher Stream West in Warren	1-2 years	*	$
Install BMPs along Market Street and Child Street at Belcher Stream East in Warren	1-2 years	*	$
Identify potential upstream pollution sources along north fork of Belcher Stream East to School House Road in Warren	1-2 years	*	$
Increase catch basin size and clean out culverts annually under Metacom Avenue in Warren	1-2 years	**	$$

Stormwater			
Action Item	**Timeframe**	**Value Added**	**Cost**
Install BMPs along Market Street and Child Street at Belcher Stream West in Warren	1-2 years	**	$$$
Install BMPs at the storm drain along St. Teresa Street	1-2 years	**	$$$
Improve public outreach, education, and involvement programs	Ongoing	**	$
Map storm drain network, delineate boundaries of catch basins, control invasive Phragmites	1-2 years	**	$$
Conduct stormwater investigation and install BMP for Route 6 Stream no. 2 in Massachusetts			
Investigate high bacteria levels seen around Pleasant Street in Massachusetts	1-2 years	**	$
Improve waterfowl deterrent from pond and adjacent parking lot at Grist Mill Pond in Massachusetts	1-2 years	*	$

Low Impact Development			
Action Item	**Timeframe**	**Value Added**	**Cost**
Refine ordinances to protect additional sensitive areas from development	2-5 years	*	$
Identify and adopt ordinances necessary to advance LID	2-5 years	***	$
As it becomes available, use the Bristol Harbor Habitat Model and associated regional expertise when evaluating land use management options	Ongoing	***	$
Consider zoning and/or purchase options to restore wetlands and their natural flood mitigation and water quality improvement functions to the landscape	5-10 years	***	$$$
Continue developing GIS data and capacity within town to enhance education and strategic planning regarding land use	Ongoing	**	$
Consider seeking a volunteer citizen committee to review and propose updates to comprehensive plan and town ordinances, in order to overcome budget limitations in this area	1-2 years	**	$
Consider alternatives to the repealed compact parking ordinance in East Providence which will overcome the unintended consequences experienced before, while attaining similar stormwater benefits	2-5 years	*	$
Adopt ordinances requiring stormwater volume reductions for commercial and industrial redevelopment	1-2 years	***	$
Implement further zoning protections for the sensitive "Wetland Conservation Areas" identified in East Providences' Comprehensive Plan and Natural Resource Plan	2-5 years	**	$$

*** Provides maximum progress towards improving water quality, due to strategic value, large geographic scope, or scale of pollutant source being addressed.

** Provides broad opportunity to improve water quality.

* Provides localized improvement to water quality, or addresses smaller pollutant sources.

$$$ Expected to cost over $100,000

$$ Expected to cost approximately $25,000 to $100,000

$ Expected to cost less than $25,000

Agriculture			
Action Item	**Timeframe**	**Value Added**	**Cost**
Work with the USDA, NRCS, and local Conservation Districts to prepare farm management plans	1-5 years	***	$$
Distribute educational materials to local farms outlining actions they can take to reduce their impact on surface waters	Ongoing	***	$
Apply for grants to install BMPs to control water pollution	1-5 years	**	$
Land Conservation			
Action Item	**Timeframe**	**Value Added**	**Cost**
Collaborate with local land trusts in their purchase and stewardship of shoreline conservation lands, which can help protect water quality	Ongoing	***	$$$
Increased education of environmental and watershed initiatives, such as zoning changes, grant-funded initiatives, and conservation	Ongoing	*	$
Drinking Water Source Protection			
Action Item	**Timeframe**	**Value Added**	**Cost**

*** Provides maximum progress towards improving water quality, due to strategic value, large geographic scope, or scale of pollutant source being addressed.

** Provides broad opportunity to improve water quality.

* Provides localized improvement to water quality, or addresses smaller pollutant sources.

$$$ Expected to cost over $100,000

$$ Expected to cost approximately $25,000 to $100,000

$ Expected to cost less than $25,000

Wastewater			
Action Item	**Timeframe**	**Value Added**	**Cost**
Find the few remaining cesspools in areas with sewer, and connect them to public sewer	2-5 years	**	$$
Develop a system to determine if there are any remaining OWTS.	2-5 years	**	$$
Evaluate remaining areas of the watershed towns not yet connected to public sewer.	2-5 years	*	$
Implement the onsite wastewater management plan in Bristol	2-5 years	**	$
Support the recently created onsite wastewater management district in Warren by implementing and administering its provisions	2-5 years	***	$$
If high bacteria levels are found in outfalls to the Palmer River and its tributaries search for cross-connections from wastewater pipes.	Ongoing	**	$
Characterize groundwater for septic system impacts and conduct repair at Mink-School-Leavitt Street area in Seekonk, MA	1-2 years	**	$
Investigate illicit discharges at Route 6 Stream #2, in Seekonk	2-5 years	**	$$

*** Provides maximum progress towards improving water quality, due to strategic value, large geographic scope, or scale of pollutant source being addressed.

** Provides broad opportunity to improve water quality.

* Provides localized improvement to water quality, or addresses smaller pollutant sources.

$$$ Expected to cost over $100,000

$$ Expected to cost approximately $25,000 to $100,000

$ Expected to cost less than $25,000

Watershed Governance/Monitoring			
Action Item	**Timeframe**	**Value Added**	**Cost**
Form a watershed-wide organization/steering committee to implement priority actions for the BPW watershed	1-5 years	***	$
Form a stormwater utility for the BPW watershed	5-10 years	***	$$$
Form an onsite wastewater management district for the BPW watershed	5-10 years	***	$$$
Create a plan for inter-municipal water quality monitoring efforts to identify priority areas in the BPW watershed	1-5 years	**	$
Basic research efforts through universities, aimed at better understanding sources and solutions to water pollution	1-5 years	**	$$
Examine land use patterns and flow response to storms, and set specific target levels for runoff	1-5 years	***	$$
Support non-profit and volunteer monitoring programs	5-10 years	**	$

*** Provides maximum progress towards improving water quality, due to strategic value, large geographic scope, or scale of pollutant source being addressed.

** Provides broad opportunity to improve water quality.

* Provides localized improvement to water quality, or addresses smaller pollutant sources.

$$$ Expected to cost over $100,000

$$ Expected to cost approximately $25,000 to $100,000

$ Expected to cost less than $25,000