RHODE ISLAND
NONPOINT SOURCE MANAGEMENT PROGRAM PLAN

September 2019

Rhode Island
Department of Environmental Management
Office of Water Resources

Rhode Island
Nonpoint Source Management
Program Plan

Acknowledgements

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Acronyms Used

AIS	Aquatic Invasive Species
BMP	Best Management Practices
CWA	Clean Water Act
CRMC	RI Coastal Resources Management Council
CSSLP	Community Septic System Loan Program
DEM	RI Department of Environmental Management
DOH	RI Department of Health
DOT	RI Department of Transportation
EPA	US Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FEMA	Federal Emergency Management Agency
GRTS	Grant Reporting and Tracking System
IC	Impervious Cover
LID	Low Impact Development
MS4	Municipal Separate Storm Sewer System
NWQI	National Water Quality Initiative (NRCS)
NBEP	Narragansett Bay Estuary Program
NGO	Non-governmental Organization
NPS	Nonpoint Source
NRCS	US Department of Agriculture Natural Resources Conservation Service
OWR	Office of Water Resources (DEM)
OWTS	Onsite Wastewater Treatment Systems
PPA	Performance Partnership Agreement
PPG	Performance Partnership Grant
RIEMA	RI Emergency Management Agency
RIEMC	RI Environmental Monitoring Collaborative
RIIB	RI Infrastructure Bank
RINHS	RI Natural History Survey
RIGIS	RI Geographic Information System
RIPDES	RI Pollution Discharge Elimination System
TMDL	Total Maximum Daily Load
URI	University of Rhode Island
USDA	United States Department of Agriculture
USGS	United States Geological Survey

I. Introduction

Clean water is essential not only to our natural environment, but also to the way of life enjoyed in Rhode Island. The State's geography, with Narragansett Bay at its center, means all Rhode Islanders live near the water. We are closely connected to both our freshwater and salt water resources through the way we live, work and play. Nonpoint source (NPS) pollution is a major management concern in Rhode Island's waters – both surface waters and groundwaters. Unlike pollution from point sources that is discharged from a specific location (e.g., a pipe outfall), NPS pollution comes from many diffuse sources.

Rhode Island state government has significant responsibility for managing water quality. Through a combination of programs, it carries out responsibilities assigned by both federal and state statutes. Rhode Island Department of Environmental Management (DEM) is designated in state law as RI's water pollution control agency. Within DEM, the Office of Water Resources directly administers all delegated Clean Water Act programs in RI and is therefore well positioned to coordinate actions among them to reinforce watershed–based approaches to water quality protection and restoration. In RI, with respect to water quality management:

- The State has the primary responsibility to coordinate monitoring of Rhode Island's natural environment, including its water resources, in order to generate information that supports effective management of water quality;
- The State, consistent with federal requirements, administers water quality standards and conducts assessments of water quality conditions on a statewide basis;
- The State, under delegated federal authority, has the primary responsibility for regulating the discharge of pollutants from various sources into or onto water, air and land; and
- The State, with public engagement, provides leadership in planning for the protection and restoration of Rhode Island's water resources.

For over twenty-five years, DEM has administered a NPS Management Program as one of several key state water quality programs that work collectively toward clean water goals in Rhode Island's watersheds (see list of DEM Office of Water Resource Programs in the following Box). DEM coordinates the State of Rhode Island Nonpoint Source Management Program in collaboration with other state agencies and many other partners. The Program supports both protection and restoration activities, including distribution of grant funding for local implementation projects. The United States Environmental Protection Agency (EPA) provides annual funding for the RI NPS Program as authorized by Section 319 of the federal Clean Water Act. The annual funding of about $1 million/year supports the state NPS program staff and provides for funding for projects consistent with the state's NPS management plan. This includes grants distributed by DEM for implementation of watershed-based plans. To continue to remain eligible for this funding, EPA requires states have an updated NPS management plan. This plan represents an update of the 2014 Rhode Island Nonpoint Source Management Program Plan, and it incorporates the eight key elements of an effective Nonpoint Source Management Plan as specified in 2013 EPA guidance (EPA 2013).

DEM Office of Water Resources Programs and Activities

- Water Quality Standards – Surface Water and Groundwater
- Water Quality Monitoring and Assessment
- Nonpoint Source Pollution Management Program
- Water Quality Restoration Planning (TMDLs)
- Water Quality Certification Program
- Rhode Island Pollutant Discharge Elimination System (RIPDES) including stormwater management
- Wastewater Planning and Design
- Wastewater Facility Operation and Maintenance Program
- Onsite Wastewater Management Program
- Groundwater Discharge Program (includes Underground Injection Control Program)
- Freshwater Wetlands Program
- Shellfish Growing Area Management Program
- Financial Assistance – State grants, certification for Clean Water State Revolving Fund
- Technical Assistance – various topics including stormwater management, lake management etc.

This Plan outlines a comprehensive approach for addressing NPS pollution across all levels of government. It acknowledges that over time, management strategies will need to adapt in response to climate change. The RI Nonpoint Source Management Program Plan describes:

- The programs, strategies and resources state agencies and partners use to address priority NPS water pollution problems;
- A process for prioritizing watersheds for protection and restoration;
- The priority NPS management actions to be undertaken, primarily by DEM, during the next five years to make progress toward water quality protection and restoration goals, including explicit long and short-term strategies; and
- Specific milestones to evaluate implementation of the plan for the next five years.

A. Water Resources Goals

The Rhode Island NPS Program is guided by the following long–term goals that apply to water quality management in Rhode Island:

- **Protect** the existing quality of RI's waters and aquatic habitats and prevent further degradation due to NPS pollution; and
- **Restore** the quality of waters and aquatic habitats degraded by NPS pollution to conditions that support the intended uses of these waters and habitats.

Within this plan, the concept of "water quality" encompasses both water quality and quantity as well as the condition of aquatic habitats including, but not limited to, wetlands. Healthy aquatic ecosystems have habitats that support the propagation of a diversity of fish and wildlife species. Maintaining riparian buffers, restoring coastal wetlands, controlling invasive species and providing fish access to upstream waters are some examples of the many efforts that will be necessary to ensure healthy habitat for aquatic life.

B. Water Quality Management Principles

The strategies and actions identified in the RI Nonpoint Source Management Plan target RI's most pressing NPS pollution challenges. The foundation for these actions is a set of management principles utilized to develop this plan, as well as other state water related management plans. They are:

- A watershed-based management approach is employed in efforts to restore and protect water quality and aquatic habitat;
- Protection and restoration are equally important to achieving RI's goals for water quality and aquatic habitat;
- Water pollution is to be prevented whenever possible as it is a more cost–effective strategy than source control and restoration;
- Compliance with applicable federal, state and local regulatory programs is necessary for water quality and aquatic habitat protection and restoration;
- Water quality management is based on sound science and regularly integrates new information, including improved scientific understanding, technological innovations and knowledge of climate change;
- Water quality and aquatic habitat management strategies are designed and adapted to mitigate the adverse impacts of a changing climate.

- Monitoring is an essential component of water quality management that yields information necessary for effective management;

- Indicators of environmental conditions and performance, as well as analytical tools, are used to evaluate and report on progress toward water quality goals and objectives;

- Integrated, well supported data management systems are essential for water resource protection and restoration program management;

- Limited resources at all levels of government require and justify efforts to prioritize protection and restoration efforts;

- Rhode Island citizens are informed and aware of water quality management priorities and efforts to protect and restore water quality and aquatic habitat, as well as actions they can take to protect and restore our water resources;

- Stakeholders are involved in the planning and implementation of programs for water resource and aquatic habitat protection and restoration through meaningful public engagement;

- All levels of government (federal, state, local), non–governmental organizations (NGOs) including watershed organizations, private entities and individuals share in the responsibility and duty to protect and restore RI's water resources and aquatic habitats; and

- A collaborative effort is necessary across all governmental jurisdictions, agencies, and programs to ensure success in protecting and restoring RI's water resources and aquatic habitats.

C. RI Water Quality Management Program Framework

The RI NPS Management Program Plan is aligned with the RI Water Quality Management Plan ("Water Quality 2035"), which is a larger, more comprehensive water quality planning effort completed in 2016. Water Quality 2035 is a long-term state water quality management plan that addresses planning for a wider range of pollution sources – both point and nonpoint – as well as other stressors known to threaten or degrade water quality and aquatic habitat in RI. Water Quality 2035 has been adopted as an element of the Rhode Island State Guide Plan. Water Quality 2035 describes the management framework and strategies for ensuring that Rhode Island's water resources are of a quality that supports healthy aquatic ecosystems and meets the needs of future generations, and it reflects a recognition of the need for systems-based planning and management approaches that apply more holistic approaches to water resource protection and restoration. The state guide plan has a twenty-year planning horizon, and in addition to water quality, it articulates state policies across a range of topics including land use, transportation, water supply and others. Because water quality and aquatic habitat are impacted by land use and

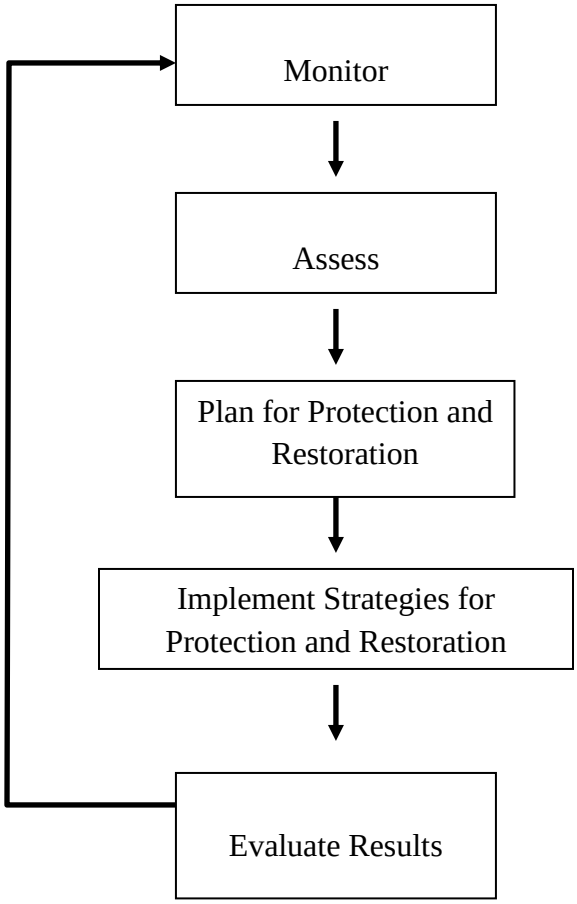
other subjects address by the State Guide Plan, RI DEM will ensure that those plans and the NPS Management Plan are aligned.

The actions in this NPS Management Program Plan are consistent with Water Quality 2035, and are presented in a manner that reflects and reinforces Rhode Island's general water quality management framework. This framework consists of a five-step process organized to facilitate the use of sound science in management decision-making.

The framework steps are – Monitor, Assess, Plan, Protect/Restore, and Evaluate:

1) Monitor the quality and condition of water resources;
2) Based on an assessment of available data, characterize the condition of the water resource and identify stressors or causes of degradation;
3) Develop a plan or strategies to restore and protect water resource conditions to achieve specified goals;
4) Implement the strategies to protect and restore water quality and aquatic habitat; and
5) Evaluate results and cycle through the process again using information to adapt management in light of new information.

The NPS Management Program Plan discusses actions related to each of these steps with respect to prevention and abatement of NPS pollution.



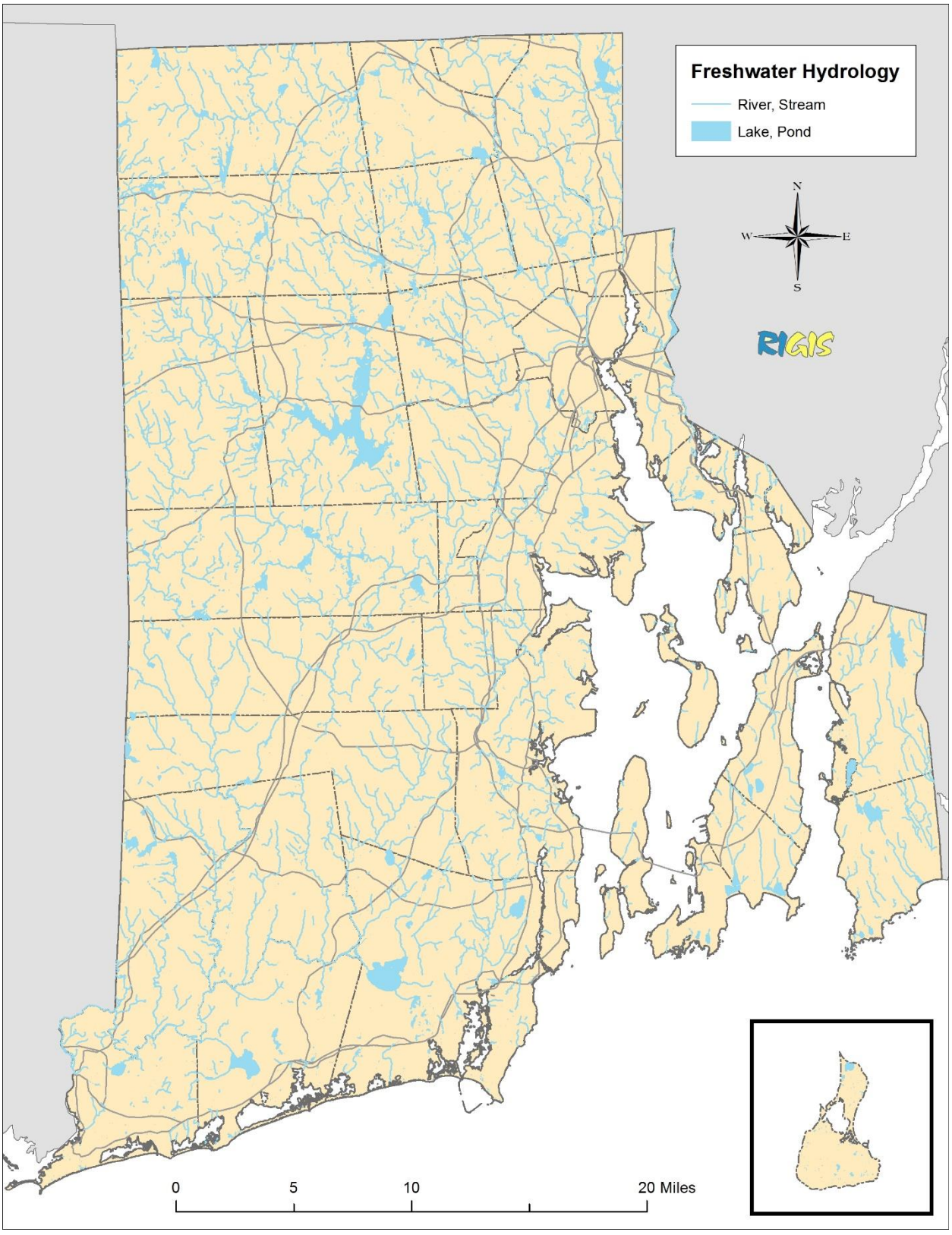
II. Rhode Island Water Resources

A. Description

Rhode Island water resources consist of rivers and streams, lakes and ponds, groundwaters, wetlands and estuarine and marine waters. Their form today was shaped by the region's geologic history including the advance and retreat of glaciers which carved bedrock and deposited layers of sediments to shape Rhode Island's landscape thousands of years ago. Our water resource features are interconnected by the continuous movement of water through our environment in a process known as the water cycle. This hydrologic connectivity reinforces the need for integrated, holistic management approaches developed on a watershed scale. Rhode Island waters include:

	***Freshwater Rivers and Streams:*** 1,420 miles of rivers and streams, 86% of which are small headwater streams. (1:24,000, RIGIS)
	***Freshwater Lakes and Ponds:*** 20,749 acres of lakes, ponds and reservoirs (1:24,000 RIGIS) and many other very small ponds. DEM estimates 75% of lakes 20 acres and larger are manmade impoundments.
	***Groundwater Aquifers:*** 22 major stratified drift aquifers covering 190 square miles; four federal sole source aquifer designations. (RIGIS)
	***Freshwater Wetlands:*** About 92,500 acres or approximately 13.4% of Rhode Island's land area is comprised of freshwater wetlands including swamps, marshes, bogs and fens. Wooded swamp is the most abundant wetland type in RI. (RIGIS)
	***Estuarine Waters***: 159 square miles of estuarine waters including Narragansett Bay and its sub–embayments, Little Narragansett Bay, eleven coastal lagoons are located along the southern RI shore and salt ponds on Block Island. (RIGIS)
	***Salt marshes:*** 3,630 acres of salt marsh located along RI's coastal shorelines. (RI Ecological Classification -2011, RIGIS)
	***Marine Waters***: Rhode Island and Block Island Sounds.

Figure 1. Rhode Island Freshwater Hydrology (excluding wetlands)



B. Summary of NPS Pollution Problems

Nonpoint source pollution is recognized as a management concern in all RI watersheds. It results primarily from human land use activities. While water pollution control programs, including the Nonpoint Source Pollution Program, have clearly spurred improved water quality over the last several decades, statewide assessment results continue to indicate that a significant portion of Rhode Island's surface waters are polluted. Distinguishing between point and nonpoint pollution sources and determining their relative contribution to existing pollution problems in urbanized watersheds can be challenging due to how these sources are defined (see box). However, Rhode Island's experience and the results of water quality studies pertaining to TMDL development, indicate that NPS pollution sources are contributing to many of the documented pollution problems in our watersheds. It is also recognized, however, that in some watersheds, including our most urbanized landscapes, point sources constitute the dominant pollution sources; e.g., wastewater discharges, combined sewer overflows, and urban stormwater outfalls.

When is stormwater runoff a nonpoint source of pollution?

For the purposes of this plan, stormwater runoff from developed land that travels in a diffuse manner is categorized as a nonpoint source of pollution provided that it is not collected in a conveyance system and discharged from a point location, such as a pipe outfall. In contrast, urban stormwater runoff that is collected in infrastructure that leads to a point discharge into a surface water is – in most cases – regulated as a point source via the Rhode Island Pollutant Discharge Elimination System (RIPDES)-Municipal Separate Stormwater System (MS4) program. This plan identifies actions pertaining to the management of *diffuse* sources of stormwater runoff from developed lands.

B.1 Major Water Pollution Concerns

The two most widespread causes of water pollution documented in Rhode Island are:

Pathogens – Waterborne pathogens include bacteria, viruses and other organisms that may cause disease or health problems in humans. Nonpoint sources of pathogens include various discharges from failed and substandard onsite wastewater treatment systems (OWTS), boat discharges, pet wastes, and agricultural animal wastes as well as those from waterfowl and wildlife. Stormwater runoff plays a major role in washing pathogens from many of these sources into surface waters.

Nutrients – Nutrients are chemical elements that all living organisms need for growth. Problems arise when too much of a nutrient is introduced into the environment through human activities. In surface waters, excess nutrients fuel algal blooms that upset the ecological balance and can lead to water quality degradation in a process known as eutrophication. Severe algal blooms can result in the depletion of oxygen in the water that aquatic life needs for survival. Excess algae

also reduce water clarity, preventing the growth of desirable plants (such as sea grasses) and hampering the ability of aquatic life to find food. Certain types of blooms may result in the release of natural toxins that can be harmful to humans, pets, marine mammals, fish and shellfish. Freshwaters are primarily affected by excess phosphorus (usually transported as attached to sediment), while in coastal waters nitrogen is the nutrient of highest concern. In some cases, both nutrients may interact and contribute to the water pollution problem. In groundwater, excess nitrogen can cause nitrate concentrations to rise to levels unsafe for drinking water consumption. The major human nonpoint sources of nutrients in RI include onsite wastewater treatment system (OWTS) discharges, fertilizer use, animal manure, pet wastes and deposition from air pollution. Again, stormwater runoff plays a significant role in transporting excess nutrients into surface waters.

There are a variety of other pollutants associated with nonpoint sources of pollution in RI. These include: sediment, salt, toxics (including metals, pesticides and synthetic organic compounds), petroleum hydrocarbons, solid waste, compounds in pharmaceutical and personal care products, and heat. To date, none of these have been found in concentrations of concern as frequently as nutrients and pathogens; although caution is needed in drawing conclusions as monitoring for these pollutants is also less extensive and in some cases we do not yet know the concentrations at which these compounds are harmful to public health and the environment.

B.2 Water Quality Conditions in Rhode Island

The following information is drawn from the 2016 State's Integrated Water Quality Monitoring and Assessment Report (RIDEM 2016), referred to as the Integrated Report, and other information to provide a summary description of water quality conditions in Rhode Island. For purposes of assessment, DEM assigned waterbody identification numbers to most of Rhode Island's surface waters resulting in 882 assessment units.

Overall statistics from the 2016 Integrated Report include:

> Available data allowed full or partial assessment of 63%, or 556, of the 882 assessment units. Twenty-five percent (25%), or 216, of the assessment units were found to have acceptable water quality.
>
> About 39%, or 340, assessment units were found to have unacceptable conditions with most (35%) exhibiting a water pollution problem caused by pollutants, including pathogens, nutrients, metals and a few others.
>
> Data was lacking in 37%, or 3326, of the assessment units. These consisted primarily of small streams as well as some lakes. Recent targeted monitoring in streams has narrowed the gap compared to past assessment cycles.
>
> When considering *only* those surface waters for which an assessment could be completed, about 61% of the waterbody units were reported as having unacceptable water quality conditions.

The 2016 assessment results are reflected on the maps in Figures 2 through 4, which shows those waters that are of unacceptable water quality. These waters are also referred to as "impaired" -- not meeting their designated uses (see also Section III.A.2). These maps do not distinguish the nature of the impairment; e.g., pollutant, other causes including aquatic invasive species. For more information on specific impairments, see the 2016 Integrated Report. The nature and extent of water quality concerns varies by the type of water resource as briefly described below.

Estuarine Water Quality

Data exist to characterize water quality in almost all of Rhode Island's estuarine waters. While a majority of waters are of good quality, there are certain areas which continue to exhibit persistently poor conditions. RIDEM notes little data is collected from the Narragansett Bay area east of Aquidneck Island, called the Sakonnet River, and that additional monitoring is needed to properly characterize local conditions in many coastal embayments. A USGS project funded by the EPA Southeast New England Estuary Program to characterize the water quality in the Sakonnet River was initiated in 2018 using continuous water quality monitoring buoys and associated surveys. The project is being continued in 2019.

Elevated pathogens from both point and nonpoint sources prevent shellfish harvesting and recreational uses. Protection and restoration of shellfish growing area waters is identified as a priority for the state's ongoing water quality management and planning efforts. While an expansion of shellfishing has been documented in response to the investments in Combined Sewer Overflow (CSO) abatement in the upper bay, it has proven challenging to restore conditions for other coastal waters affected primarily by nonpoint pollution sources including stormwater runoff. Most estuarine waters (88%) fully support recreational uses however the occurrence of saltwater beach closures is indicative of local pollution sources affecting coastal water quality. RIDOH has reported beach closure days were low in 2016 with 12 events spread over 23 closure days. The numbers increased during 2017 to 28 events leading to 73 closure days with more than half occurring in Warwick. RIDOH noted some of the rise was attributed to delayed re-sampling (RIDOH, 2018). Management efforts have focused on identifying local sources of pollution and making improvements through installation of stormwater BMPs and other actions.

Excess nutrients result in low oxygen and degraded habitat affecting the diversity of fish, invertebrates and other marine life. Of particular concern for NPS management are RI's southern coastal ponds which remain vulnerable to pollution despite being located in less densely developed watersheds. Sources of pollution to the coastal ponds include OWTS, fertilizer use and animal wastes (including residential pets as well as wildlife). Stormwater runoff plays a significant role in carrying pollutants into the coastal ponds.

Overall –

- Over a third of estuarine waters (35%) are impaired for one or more designated use due to both point and nonpoint sources.

Pathogens –

- 24%, or 31.6 square miles of Rhode Island's shellfishing waters are impaired and unacceptable for shellfishing due to elevated levels of pathogens from both point and nonpoint sources (excluding off-shore waters).
- Over 89% of estuarine waters are categorized as acceptable for swimming and other recreation; about 10% are not safe for recreational activities.

Nutrients –

- All RI coastal ponds are considered vulnerable to nutrient enrichment.

Toxics –

- Recently generated data on mercury in the tissue of marine finfish in Narragansett Bay are prompting continued research in order to support assessment of public health risks. The 2016 Integrated Report cycle moved all estuarine fish consumption assessments from "Fully Supporting" to "Insufficient Information" until this information can be analyzed for incorporation into the Integrated Report.

Rivers and Streams

Rhode Island's rivers and streams have been impacted by past use, historical growth along river corridors and current development patterns. Data allowed the water quality in about 77%, or 1,091 of the total river miles tracked in Rhode Island to be fully or partially assessed for the 2016 Integrated Report. As seen in Figures 3 through 5, poor water quality affects both the recreational use and ecological health of portions of the RI's rivers and streams. Based on available data, elevated pathogens are the most common problem and are widely distributed through the state. Other pollution problems, including metals and impacted aquatic communities, affect fewer streams and occur most frequently within the urbanized portion of the state. Assessment of riverine habitat as part of the biological monitoring protocol for streams has also provided evidence that sedimentation in some streams is degrading aquatic habitat conditions.

Overall, for the 1,375 miles tracked by DEM

- Almost 53% of river and stream miles are impaired for one or more designated use.

Pathogens –

- 49% of river miles exhibit elevated levels of pathogens unsafe for recreational use; data is lacking for 28%.

Biological condition –

- 25% of river miles exhibit poor conditions for aquatic life; data is lacking for 22%.
- 58% or 801 miles met water quality criteria related to aquatic life uses.

Toxics –

- About 14% of river miles have elevated levels of metals. Lead was the metal most commonly detected at elevated levels.
- Elevated mercury levels in fish tissue were found in about 44 miles, or 3%, of river miles. A large data gap exists with data unavailable for 97% of river miles being tracked by DEM.

Freshwater Lakes and Ponds

DEM currently tracks 233 lakes, ponds and reservoirs covering 18,693 acres or 90% of the total lake acreage in the state. Rhode Island lakes and ponds exhibit not only the impacts of urbanization but also the degradation of native habitat by invasive aquatic plants. DEM has found the largest cause of impairment in lakes and ponds to be mercury in fish tissue (32%, 6,009 tracked acres). Prior work has documented the primary source of mercury in RI waters being the result of atmospheric deposition originating from out of state. The second most prevalent cause of impaired lake acres is aquatic invasive plants (28%, 5,276 tracked acres). Widespread across the state, 14 invasive species have been documented in 100 lakes and ponds which equates to about 61% of the total number of lakes surveyed. Other notable impairment causes in lakes were nutrients (18%, 3,334 tracked acres) and causes associated with nutrient impairments, such as chlorophyll-a (6%, 1,092 tracked acres), total organic carbon (6%, 1,196 tracked acres), and oxygen depletion (9%, 1,613.3 acres). No direct discharges of wastewater into lakes are authorized in RI, although some run-of-the-river impoundments are located downstream and are influenced by wastewater treatment plants discharges.

In rural watersheds, nutrient management is focused on nonpoint sources including OWTSs, stormwater runoff, waterfowl and wildlife waste and internal phosphorus cycling among others. In urbanized areas, DEM has found eutrophic lakes and ponds are affected by a combination of point (i.e., stormwater discharges regulated as point sources) and nonpoint sources of pollution, e.g., waterfowl. Internal cycling of nutrients is increasingly recognized as a management issue that merits attention, especially in shallow ponds. Over the past several years, DEM has documented cyanobacteria (blue-green algae) blooms in 36 lakes and ponds and two rivers/streams associated with an affected lake/pond. DEM and DOH collaborate on activities to identify and confirm blooms and issue public health advisories when conditions warrant. Current monitoring capacity is constrained and limits the tracking of individual blooms after initial confirmation. Sedimentation is also a concern that has been raised by lakefront property owners in certain lakes. In contrast to rivers, most lakes do not exhibit elevated pathogens. There are closures of freshwater beaches in lakes each year that which typically reflect localized sources of pollution.

Overall –

- 53% of lake acres are impaired for one or more designated use.

Toxics –

- Data availability is limited as toxics are not routinely monitored for in lakes and ponds.
- Elevated mercury levels in fish tissues were found in 32 % of lakes acres. A large data gap exists with data unavailable for 61% of lakes acres tracked by DEM.

Invasive Aquatic Plants –

- 28% of the tracked lakes and pond acreage in the state is categorized as impaired by aquatic invasive species. However, invasives are in fact much more widespread and this suggests the problems associated with invasives are likely to grow worse without proactive management and intervention.

Pathogens –

- Most lakes support recreational uses. Elevated levels of pathogens have been found in 3.5% of tracked lake acres.

Nutrients --

- Nutrients affect 18% (3,334.1 acres) of the tracked lake acreage along with causes associated with nutrient impairments, such as chlorophyll-a (6%, 1,092 tracked acres), total organic carbon (6%, 1,196 tracked acres), and oxygen depletion (9%, 1,613.3 acres), also impact freshwater lakes.
- 36 lakes and ponds and 2 rivers/streams associated with an affected lake/pond were documented to have cyanobacteria blooms, also known as blue-green algae.

Impervious Cover (IC) as an Indicator of Stream Condition

Research has established a relationship between water quality in streams and the amount of impervious cover within a watershed. Impervious cover refers to the hard surfaces created by pavement, buildings or other structures which prevent the infiltration of precipitation and as a result, generate additional stormwater runoff. Impervious cover associated with urbanization causes water quality degradation in a variety of ways including changes in hydrology and stream geometry, increased pollutant loadings and physical alteration to aquatic habitats. (CWP 2003)

The Center for Watershed Protection (CWP) developed an impervious cover model based on hundreds of studies that related increasing amounts of IC with declining stream quality. A review of scientific literature confirmed the applicability of the commonly used threshold of 10% IC for streams in our region (CWP 2003). In general, IC levels above 10% were associated with negative changes in indicators of stream health and condition. However, the CWP further noted "many studies also suggest that sensitive elements of the aquatic community are affected at even lower levels of IC. Other impacts include loss of sensitive species and reduced abundance and spawning success."

As a general assessment in support of the NPS Program, DEM calculated the percent of impervious cover for watershed lands in RI as grouped into watershed planning areas (see later discussion of watershed planning). While several watersheds are shared with the neighboring states of MA and CT, the figures here reflect the IC levels for the Rhode Island portion of these watersheds. The results reveal that IC in just over half the state (51.1%) was below the 10% threshold reflecting both the need and the opportunity to manage future growth to prevent future degradation. In another 40.3% of the state land area, the IC % fell above 10% and below 25%. Rhode Island's most heavily developed watershed lands with IC levels greater than 25% constituted 8.6% of the state. These very urbanized watersheds had higher percentage of stream miles with documented water quality impairments indicating a need for sustained restoration efforts, although data gaps limit a full comparison among watersheds.

Figure 2. Northern RI Impaired Waters
(Includes impairments due to pollutants and non-pollutants; e.g., aquatic invasive species.)

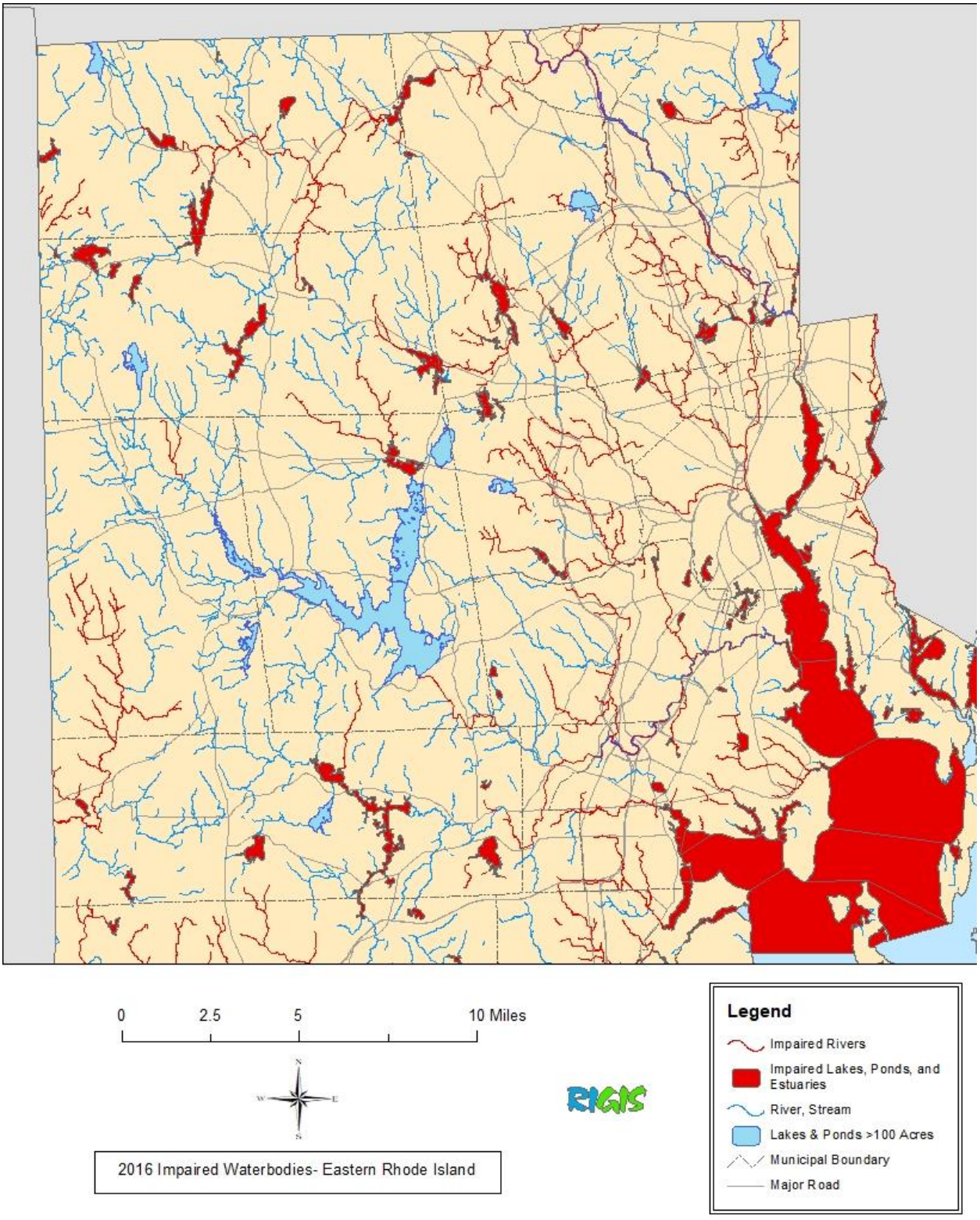


Figure 3. Southern RI Impaired Waters
(Includes impairments due to pollutants and non-pollutants; e.g., aquatic invasive species.)

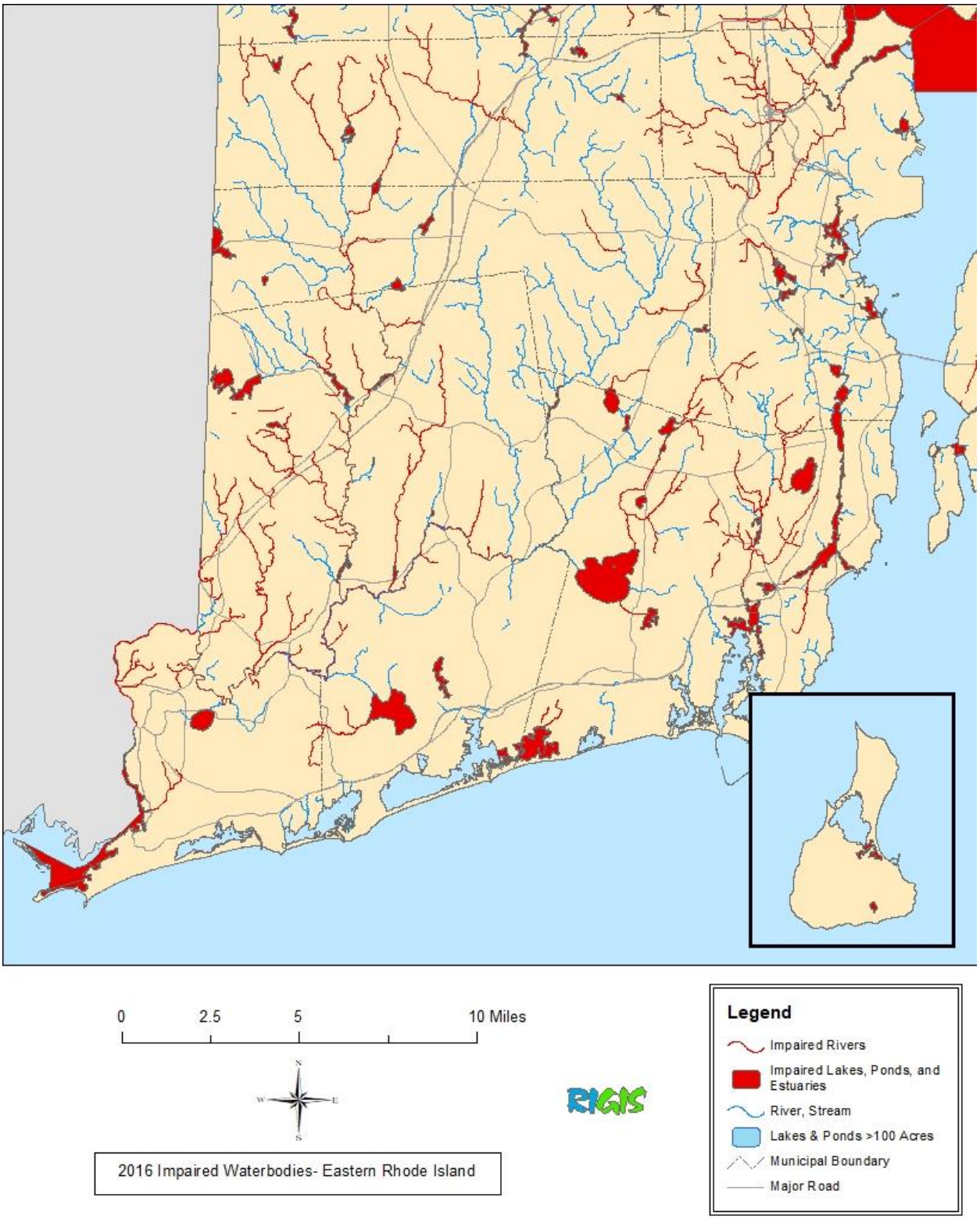


Figure 4. Eastern RI Impaired Waterbodies
(Includes impairments due to pollutants and non-pollutants; e.g., aquatic invasive species.)

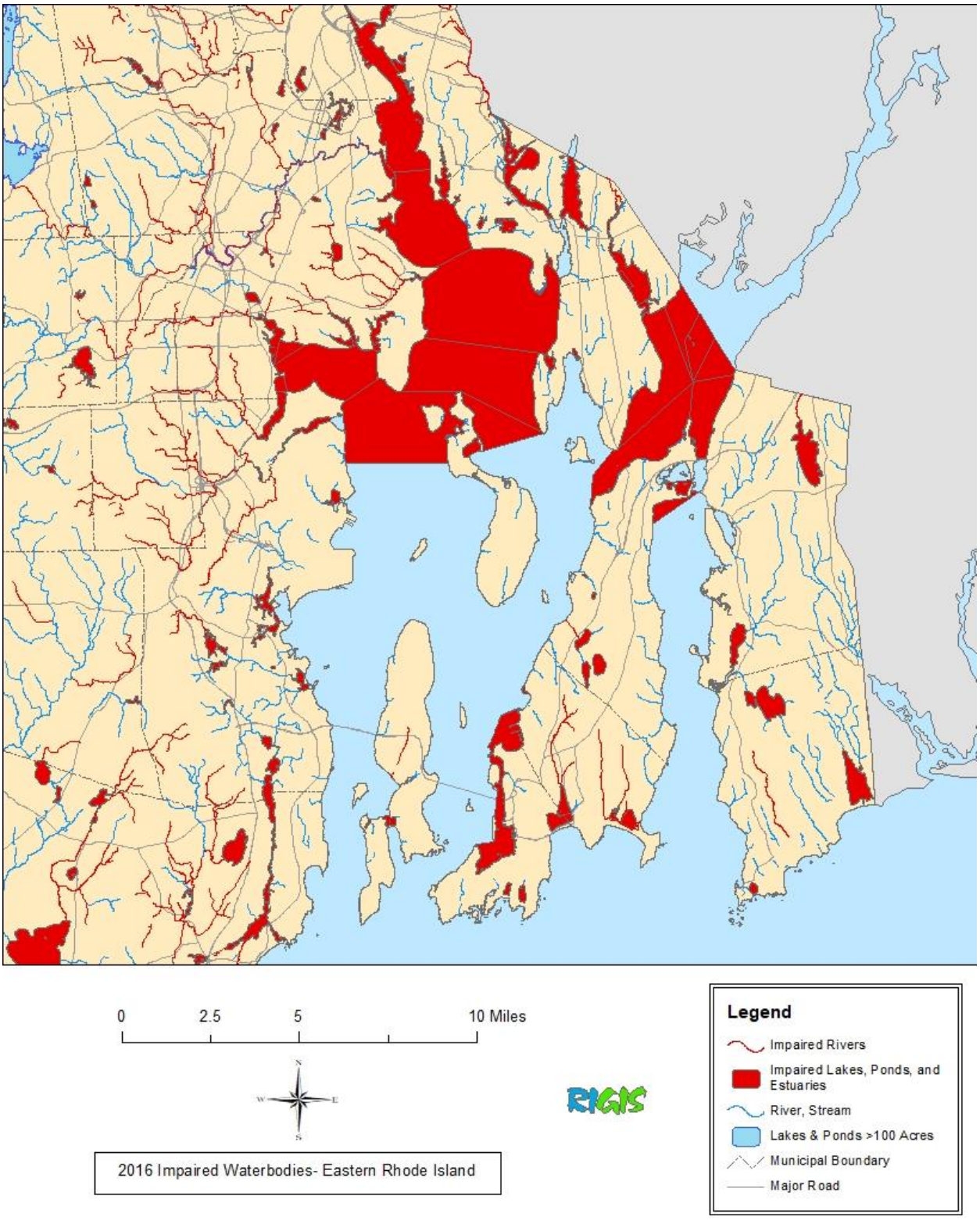
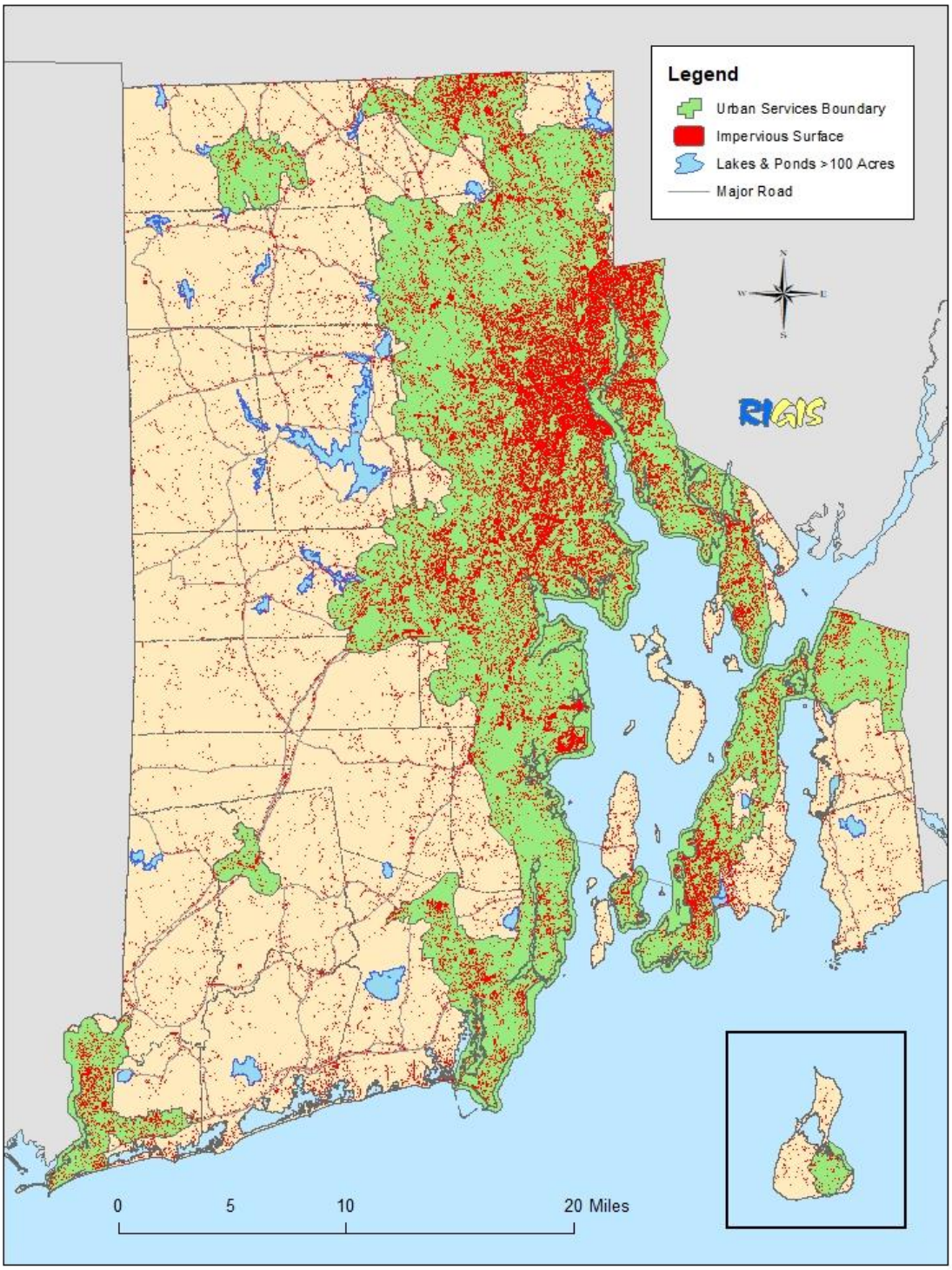


Figure 5. Impervious Cover and the Urban Services Boundary

The urban services boundary is designated in the state "Land Use 2025: State Land Use Policies and Plan." This Plan directs the State and communities to concentrate growth inside the Urban Services Boundary which has existing infrastructure to support growth and within locally designated growth centers in rural areas.



Groundwater Conditions

Because of the generally localized nature of groundwater contamination, no groundwater monitoring network has been established in RI. As noted in Section III.A1., the best source of available information on ambient groundwater quality is the RI Department of Health's data on public drinking water wells that are regularly tested to ensure compliance with drinking water standards.

Nitrate from OWTSs and fertilizer is used as an indicator of human impacts to groundwater. Natural background concentrations of nitrate are less than 1 mg/l. Five mg/l of nitrate (one–half the drinking water standard of 10 mg/l) has been established as the preventative action limit in RI state groundwater quality standards and is often used as a threshold for determining acceptable levels of impact from existing and proposed development. The data from public wells sampled for nitrate over the past six years (Table 1) reveal that the annual percentage of wells that exceeded 5 mg/l averaged 6%. From 2004 through 2012, the annual percentage of wells that exceeded 5 mg/l averaged 5%. Elevated nitrates tend to occur in specific areas affected by local land use densities and are not generally documented to occur as widespread aquifer contamination.

Table 1. Nitrate in Public Wells

Nitrate Concentration	**Number of Public Wells Sampled**					
	2013	**2014**	**2015**	**2016**	**2017**	**2018**
<=0.2	87	110	125	96	102	98
.21 -- 3	194	254	244	198	270	199
3.1 – 4.9	27	31	25	18	32	23
5.0 – 10.0	16	18	16	14	20	19
>10.0	6	6	5	4	4	5
Total Number of Public Wells Sampled	**330**	**419**	**415**	**330**	**428**	**344**

Volatile organic compounds (VOCs) are another often used indicator of groundwater quality conditions. Not all public wells are regularly sampled for VOCs as they are for nitrate, which makes annual comparisons for VOCs difficult. Table 2 shows the annual number of VOC detections by compound from 2013 – 2018. The most commonly detected VOC continues to be methyl tertiary butyl ether (MTBE), which was a common gasoline additive (it is no longer used). Other VOCs from gasoline are also occasionally detected at low levels but at a reduced frequency due to the measures taken to remove older underground storage tanks and to regulate the design and installation of new tanks. Detections in public wells of VOCs used as solvents has also significantly decreased over the years due to more stringent controls on waste discharges and requirements for collecting hazardous wastes. A review of the VOC data from 1995 through 2003 revealed that annually 0-3 wells had an exceedance of a drinking water standard/health advisory for a VOC, but that from 2004 through 2012 only one well has had an exceedance.

There was only one exceedance of a drinking water standard/health advisory in the detections in Table 2 from 2013 through 2018, and that was for MTBE at 44 ppb (health advisory is 40 ppb).

Table 2. Volatile Organic Compounds in Public Wells

VOC	Number of Public Wells with Detections					
	2013	**2014**	**2015**	**2016**	**2017**	**2018**
Dichloromethane	1					
Ethylbenzene	1					
Tetrachloroethylene			2	2	1	1
Toluene	3	2	4	5	1	
Xylenes, total	3		1		1	
Methyl tertiary butyl ether (MTBE)	3	4	5	5	3	6
Total Number of Public Wells with Detections	**11**	**6**	**12**	**12**	**6**	**7**

Per- and polyfluoroalkyl substances (PFAS) are a class of chemicals widely used in a variety of products and applications including non-stick cookware, upholstered furniture, clothing, food packaging, and firefighting foam. Studies indicate that exposure to PFAS above certain levels may result in adverse health effects, including developmental effects to fetuses during pregnancy or to breastfed infants; cancer; and effects to the liver, immune system, or thyroid. PFAS are very persistent in the environment. In 2016, the US Environmental Protection Agency (EPA) established a Drinking Water Health Advisory for two of these PFAS compounds – perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), or a combination of PFOA and PFOS at 70 parts per trillion. Similar to other states, RI is grappling with this environmental contaminant. The RI Department of Health sampling of public and private well led to finding one water system exceed the EPA health advisory. Another industrial location has a confirmed PFAS/PFOA groundwater contamination situation. Further investigation is underway. In 2017, DEM adopted the EPA health advisory as a groundwater quality standard. Many states are now considering and adopting much lower PFAS standards for PFOA, PFOS, and, in some cases, additional PFAS compounds.

Freshwater and Coastal Wetlands

Wetlands are an important component of Rhode Island's water resources. It is estimated that Rhode Island has lost 25% or more of its freshwater wetlands (Hellyer, G. 1995) and 53% of its coastal wetlands through historical filling and alteration (Bromberg, K. 2005). The functions and values associated with wetlands are degraded by NPS pollution including physical stressors such as hydromodification.

The DEM and RI Coastal Resources Management Council (CRMC) regulate construction and other activities within the vicinity of wetland resources. State policies require adverse impacts to wetlands be avoided and minimized. Based upon available data, it is evident that Rhode Island is minimizing permitted losses. The state is aware, however, that greater losses occur due to unauthorized alterations.

With funding support from EPA, DEM has developed a wetland monitoring strategy for freshwater wetlands that reflects the three-tiered approach recommended by EPA that includes landscape scale, rapid and intensive assessment tools. DEM has completed a series of projects to develop methods to implement the plan including the development and validation of a tier-2 rapid assessment method referred to as RIRAM. The RIRAM Index score represents the condition of the assessment unit relative to its condition in the absence of anthropogenic stresses. Deviation from pristine condition incrementally lowers the score of the unit according to the intensity and proportion of stress effects and observable wetland degradation. The method involves collection of field data that characterizes the stressors on wetland ecosystems. An analysis of RIRAM data from 281 vegetated wetlands identified the most common wetland stressors as anthropogenic fluvial inputs, filling and dumping and invasive species (Peach, M. RINHS, 2013). Additional analysis found moderate to strong correlations between wetland condition and percent of developed land within concentric buffers around the wetland, in some cases out to 2000 feet from the wetland. Percent of developed area within 100 feet of a wetland was significantly correlated with in-wetlands stressor RIRAM metrics, thus emphasizing the importance of upland buffer protection.

III. NPS Management Program

The following provides an overview of Rhode Island's overall approach to managing and controlling NPS pollution using the five-step framework discussed in Section I.C. Although the federal NPS funding and DEM Office of Water Resources NPS Program play an essential role, the Rhode Island program also encompasses a broad set of its own tools and authorities exercised by DEM as well as partner agencies. As reflected in this NPS Management Plan, Rhode Island recognizes a combination of both regulatory and non–regulatory programs and activities are needed to effectively manage NPS pollution. The DEM NPS Program has the lead responsibility for tracking and reporting to EPA on efforts across DEM to address NPS pollution and to coordinate with the many other partners described in Section III.B. where practical to prevent and restore water quality and aquatic habitat.

The DEM NPS Program relies upon a foundation of technical information concerning nonpoint source pollution problems that is generated by other programs in the DEM Office of Water Resources including Water Quality Monitoring, Standards and Assessment Programs and the TMDL Program, among others. Accordingly, the DEM NPS Program collaborates with these programs to: produce information that allows for statewide tracking of NPS pollution; target assessments of NPS impaired waters and set priorities; implement actions for controlling NPS pollution; and to measure progress toward restoration and protection goals. The DEM NPS Program is directed by a Supervising Environmental Scientist who reports to a Deputy Administrator in the DEM Office of Water Resources. The program is positioned to collaborate across the DEM Office of Water Resources (including its two major regulatory sections organized as Surface Water Quality and Groundwater and Freshwater Wetlands) and other DEM regulatory and non-regulatory programs.

Data management, including the maintenance of the EPA NPS Grant Reporting and Tracking System and other federally required databases, is another key activity that supports implementation of the NPS Program. DEM is pursuing modernization of the data management systems that support both the OWTS and wetlands permitting programs with full implementation contingent on securing additional resources. Staffing capacity has constrained the pace of improvements. Additionally, the schedule for implementation of this major data system project has been extended as DEM, working with the Department of Administration, explored options to an on-premise database; e.g. cloud-based systems. Additional changes in the systems used to manage water quality data and report assessment results to EPA are also underway. DEM will also be seeking improvements to support tracking of BMP implementation as resources allow.

Implementation of RI's NPS Management Program Plan, including the continuing development of watershed plans, requires active public engagement and stakeholder involvement. While the state may have a lead role in monitoring and assessing water resources, the participation of all entities most affected by management decisions is needed throughout the planning, implementation and evaluation steps in the process. DEM envisions that broad stakeholder engagement is a pre-requisite for success and will require the active involvement of all levels of government (federal, state, local), quasi-governmental agencies, watershed councils, and other non–governmental organizations, interested business and individuals. Effective public

engagement ensures environmental objectives are well integrated with related economic, social and cultural goals, which in turn builds support for implementation of needed actions.

A. Management Framework

A1. Water Quality Monitoring

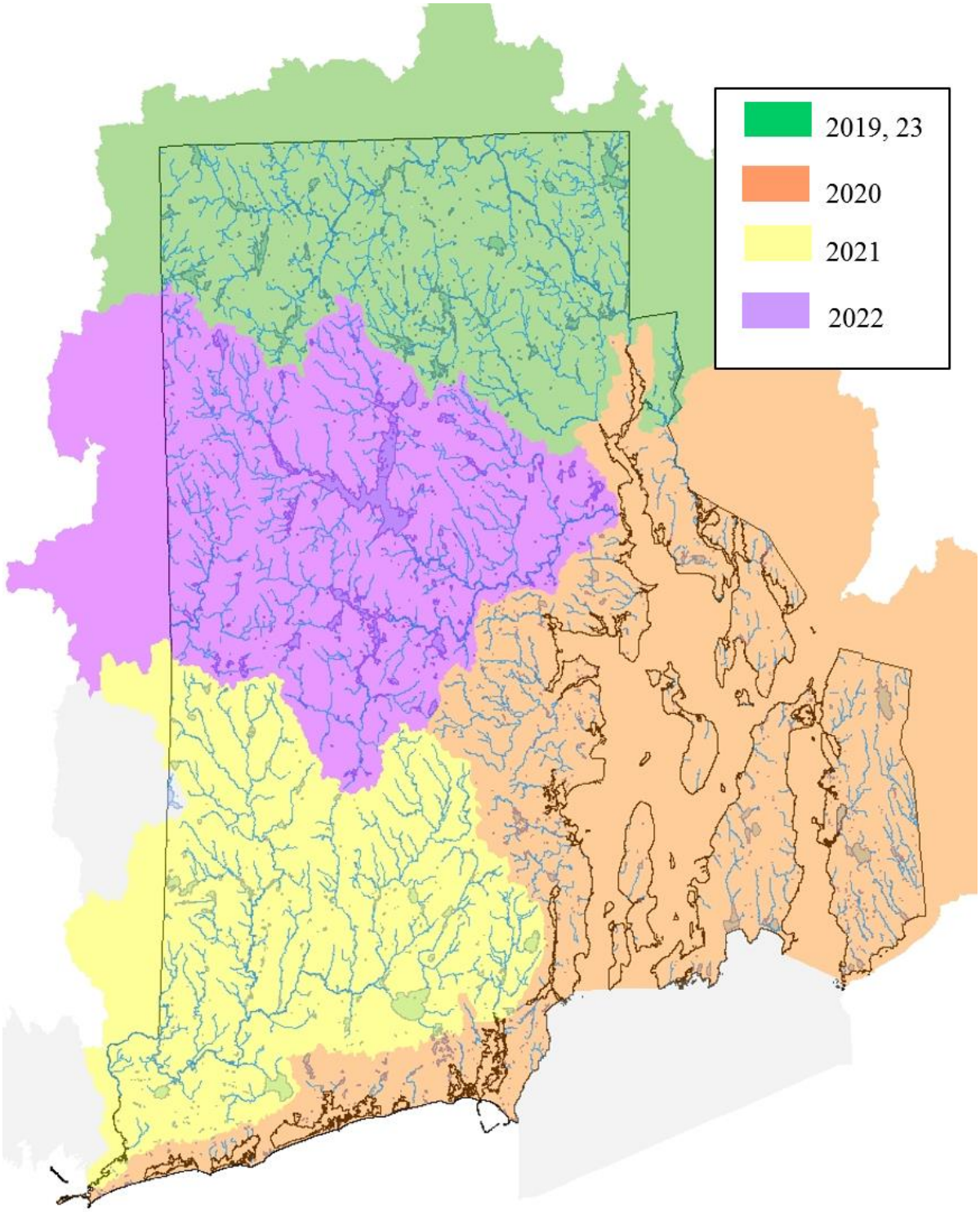
Primary Partners: Multiple Partners

Water quality monitoring is needed to generate information on the nature and extent of nonpoint pollution. The RIDEM Office of Water Resources has a primary role in both conducting monitoring programs and collaborating on water monitoring carried out by other entities. DEM has executed formal agreements with RIDOH, URI and USGS in support of water monitoring for decades. Collectively, DEM's monitoring programs are aimed at gathering ambient water quality to assess water quality conditions and support management decision-making at various scales. Among many applications, the data generated are used in establishing and reviewing the state's water quality standards, measuring progress toward achieving the state and federal water quality goals, and supplying information for use in development of watershed plans, Total Maximum Daily Loads (TMDLs) and permit limits for wastewater dischargers. A mix of monitoring strategies is employed to collect data from estuarine waters, freshwater rivers and streams, and lakes and ponds and are described further in the Rhode Island Water Monitoring Strategy (2019 update pending).

Programs important to characterizing NPS pollution include volunteer–based monitoring of lakes, ponds, rivers and streams coordinated by the URI Watershed Watch Program, the DEM ambient river monitoring program, shellfish growing areas and cyanobacteria monitoring programs. DEM monitors rivers on a rotating schedule that supports assessment of water quality across a watershed (see Figure 6). Ambient monitoring programs are supplemented by more intensive targeted monitoring to characterize pollution sources and develop water quality restoration plans (i.e., TMDLs). Targeted monitoring may be conducted to document changes in conditions associated with the implementation of water quality restoration actions, including NPS pollution abatement actions. The NPS program also uses data generated by the RI DOH Beach Monitoring Program and DEM surveys on aquatic invasive species in freshwaters. The RI Environmental Monitoring Collaborative website provides overviews of priority monitoring programs in RI. Additional information on water monitoring, along with certain monitoring data, is available on the DEM and partner websites.

Unlike the multi–faceted surface water quality monitoring efforts, Rhode Island lacks a comprehensive and coordinated groundwater quality monitoring strategy. Groundwater monitoring presents particular challenges associated with the manner in which pollutants move in different aquifer settings. The best source of available information on ambient groundwater quality is the RI DOH data on public drinking water wells that are regularly tested to ensure compliance with drinking water standards. The RI DOH also maintains data on private wells. In recent years, DEM and DOH have collaborated on groundwater monitoring to screen for the presence of per and polyfluoroalkyl substances (PFAS) in public and private drinking water wells.

Figure 6. RI DEM Ambient River Monitoring Program – Rotating Basin Schedule



A2. Water Quality Assessment Process

Primary Partners: US EPA

A primary source of information to characterize nonpoint source pollution in Rhode Island is the statewide water quality assessment process which is described below.

Water Quality Standards

DEM has established water quality standards and classifications for both its surface and groundwater resources that provide a basis for assessment of water quality conditions. For surface waters, the water quality standards consist of three components: designated uses (denoted by classification); criteria; and an anti–degradation statement that specifies the level of water quality necessary to maintain designated uses. As part of the state Water Quality Regulations, these standards are subject to approval by the EPA pursuant to the federal Clean Water Act and may not be less stringent than federal requirements. All surface waters of the state are assigned to a water quality classification. Specific designated uses are associated with each classification. Every waterbody in the state is designated for swimming (primary and secondary recreational contact), fish consumption, and aquatic life (fish and wildlife habitat) uses. Some waters are also designated for shellfish consumption, shellfish controlled relay and depuration, or drinking water supply uses. Associated with each designated use are water quality criteria which specify the conditions that will support the designed use.

The DEM Groundwater Quality Rules classify all of the state's groundwater resources and establish groundwater quality standards for each class. Protection of drinking water sources is the primary objective of these rules, but the Rules also prohibit contaminated groundwater from adversely impacting surface waters. The four classes are designated GAA, GA, GB, and GC in accordance with the RI Groundwater Protection Act of 1985 (RI General Laws 46-13.1). Groundwater classified GAA and GA is to be protected to maintain drinking water quality, whereas groundwater classified GB and GC is known or presumed to be unsuitable for drinking water use without treatment. Greater than 90% of the state's groundwater resources are classified as suitable for drinking water use (i.e., class GAA and GA).

Assessment of Water Quality Conditions

To measure progress towards meeting the federal water quality goals, states are required to assess and report on the quality of their state's waters every two years pursuant to Section 305(b) of the Clean Water Act. In Rhode Island, this responsibility falls to DEM which assesses available data against established water quality standards and reports the results of this assessment in the State's Integrated Water Quality and Assessment Report (known as the Integrated Report). The water quality assessment process for surface waters is reflected in Figures 3 through 5 and results in a determination of whether or not the current water quality conditions in a specific waterbody fully support its designated uses (swimming, shellfish consumption, aquatic life, etc.). To evaluate the level of use support attainment, available water quality data is compiled and compared to the appropriate criteria for each designated use. While existing water quality monitoring programs provide a sizable amount of information, data gaps exist and currently prevent a comprehensive assessment of all uses in all waters. The assessment

process leads to an assignment of individual waterbodies or portions of waterbodies (assessment units) to one of five categories that reflect its attainment status. A significant outcome of the assessment process is the identification of those surface waters not meeting water quality standards and considered "impaired" (see Figures 2 through 4).

A3. Watershed-based Planning

Primary Partners: Watershed Organizations, Municipalities, CRMC, NBEP

As noted earlier, Rhode Island is placing renewed emphasis on a watershed–based approach to managing water quality. Long recognized as being the most effective means to protect and restore water resources, a watershed-based approach recognizes that watersheds transcend political boundaries. DEM has identified 27 watershed planning areas (see Figure 7) as a guide for determining the scale for watershed plan development. These watershed planning areas were chosen based on watershed size, water quality management issues, watershed characteristics, and level of local citizen involvement. Plans can be developed for all of a watershed planning area or a portion of that watershed, i.e., a sub-watershed. To strengthen implementation of this approach, DEM is committing to developing a minimum of 10 additional watershed plans in-house over this next 5-year planning period. In addition, DEM will provide as much support as possible for others that have chosen to develop a watershed plan (e.g., compiling data, preparing maps, etc.).

A watershed plan serves as a mechanism to integrate the full range of actions recommended for protecting and restoring water quality and aquatic habitat within a given watershed. The plans will include but not be limited to actions pertaining to nonpoint source pollution. The watershed plan provides an opportunity to identify partners and to collaborate across all levels of the public and private sectors to determine and implement actions that are supported by sound science. The plans provide an opportunity to give emphasis to protection strategies as well as needed restoration actions. The aim is to integrate management activities related to water quality and aquatic habitats within a given watershed. This approach provides a process for government and other stakeholders to prioritize NPS pollution and other water quality problems and work collaboratively on a watershed basis to optimize results in terms of environmental outcomes and the other societal benefits associated with improved water quality and habitat. As reflected in Figure 8, actions or initiatives from other plans and reports can be compiled into one unifying vision and action plan for the watershed. (See Appendix A for a description of these other planning activities.)

The goal for the watershed plan is to:

- Describe the water resources and their water quality status;
- Describe the current protection and restoration actions being carried out in the watershed;
- Create an Action Plan with specific prioritized actions to protect and restore water quality identified and the responsible entity and timeframe designated. Actions identified in TMDLs and other plans will be compiled with additional actions added as necessary;
- Establish coordinating mechanisms between towns and others for plan implementation; and
- Promote public understanding about the values of clean water and the actions necessary to achieve clean water goals.

Watershed plans will cross reference other planning documents (such as any TMDLs, local wastewater and stormwater plans that may exist) for those who want or need to delve deeper into a particular topic or strategy. The planning process is ongoing. Once the watershed plan is adopted, success toward implementing the plan is regularly evaluated and the plan must then be updated accordingly.

While intentionally broad in scope, the plans will adequately incorporate the required nine elements of a watershed-based plan specified by EPA guidance. While these elements reflect a federal emphasis on pollutant loading reductions, as envisioned by DEM, the watershed plans developed in RI will also identify protection actions needed to prevent degradation of water quality and aquatic habitats. Per EPA guidance, only those implementation projects within a watershed having a nine–element watershed–based plan are eligible for Section 319 project funds. A watershed plan must address the following minimum elements (See Appendix B for more detail):

a) Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan;
b) An estimate of the load reduction expected from the management measures;
c) A description of the NPS measures that will need to be implemented to achieve load reductions in b), and a description of the critical areas in which those measures will be needed to implement this plan;
d) Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan;
e) An information and education component that identifies the education and outreach activities or actions that will be used to implement the plan;
f) Schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious;
g) A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented;
h) A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards; and
i) A monitoring component to evaluate the effectiveness of the implementation efforts over time. (USEPA 2013)

Although watershed boundaries often extend beyond local or even state boundaries, many of the actions called for in a watershed plan will necessarily be municipally based, as that is where the authority lies for managing land use and for taking many other steps to protect and restore water quality in Rhode Island. Therefore, it is necessary that the watershed plan be closely integrated into the local comprehensive planning process. The watershed plan can take a holistic approach by integrating water quality planning with land use planning and planning for activities such as recreation and habitat preservation; e.g., greenway planning. For example, the watershed plan may call for the creation of greenways in the watershed, which protect water quality, provide recreational resources and vital habitat.

The “best” plans – ones that will be successfully implemented – are created with significant input from the people living, working and playing in the watershed. Such plans provide added value by coordinating among entities with vested interest in the watershed to share water quality information, identify NPS pollution and other water quality priorities, and align resources to drive forward the implementation of needed actions.

Figure 7. Watershed Planning Areas

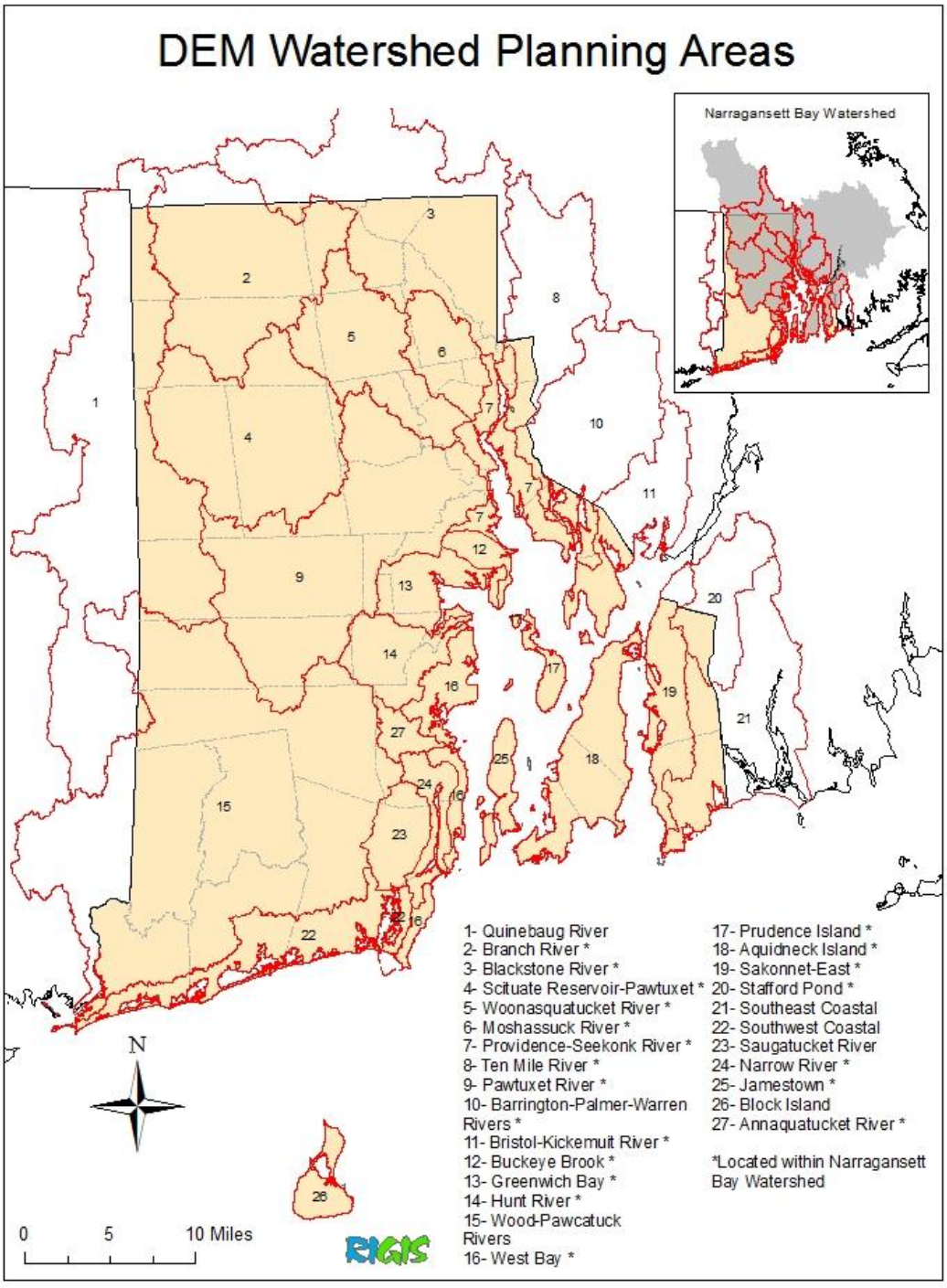
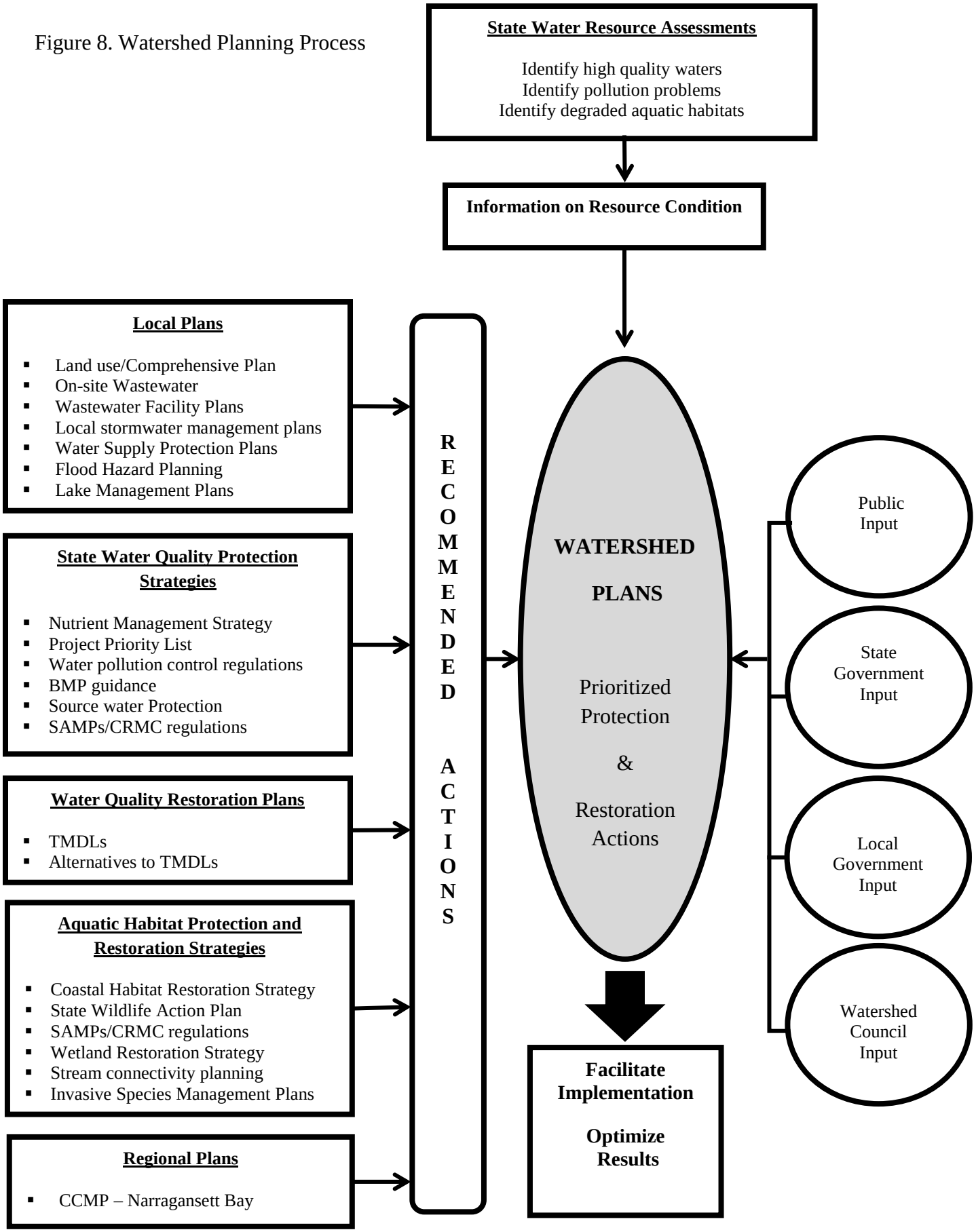


Figure 8. Watershed Planning Process



A.4. Water Quality Restoration Planning (Total Maximum Daily Loads)
Primary Partners: EPA, Municipalities, Watershed Organizations

Once identified as "impaired," the state is required by the federal Clean Water Act to develop a Total Maximum Daily Load (TMDL) or alternatively, implement water quality restoration actions addressing each water body and each pollutant causing the impairment. A TMDL is a water quality restoration plan that establishes the acceptable pollutant loads from both point and nonpoint sources of pollution which allow the impaired waterbody to meet water quality standards and support its' designated uses. TMDLs are based on the relationship between pollution sources in the watershed and instream water quality conditions. 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. These actions are also incorporated into the watershed plans described above.

There are several steps that are common to the development of most TMDLs:

- Identify the impaired waterbodies and pollutant(s) not meeting water quality standards;

- Assemble and review available data and information on the waterbody and its watershed;

- Identify stakeholders having an interest in the waterbody and/or watershed;

- Identify data gaps that need to be addressed to satisfactorily characterize water quality conditions and pollution sources causing the identified impairment, and any factors affecting the extent and severity of the impairment;

- If needed, develop and implement a monitoring plan (and Quality Assurance Project Plan) to collect additional data to further characterize water quality and pollution sources. As part of the assessment process, pollution sources are identified and their significance assessed including point sources, such as wastewater treatment facility discharges and stormwater outfalls, and nonpoint sources, such as septic systems and unchannelized runoff from agricultural and urbanized areas;

- Estimate the current amount of pollutant load from point and nonpoint sources entering the waterbody;

- Establish the TMDL water quality target (typically the applicable water quality criteria) and allowable load of the pollutant of concern that the waterbody can receive and still meet water quality standards. For bacteria TMDLs, a concentration–based approach may be applied whereby a percentage reduction in fecal coliform concentrations is determined to represent necessary pollutant reductions;

- Allocate allowable loads between point and nonpoint sources, including providing a margin of safety;

- Develop an implementation plan identifying the specific actions necessary to achieve the waterbody's water quality target(s);

- Conduct public meeting(s) and formally solicit and respond to public comments; and

- Submit the draft TMDL to EPA for formal approval.

The schedule for planned and future TMDL development is reflected in the DEM Integrated Report. When updating the Integrated Report DEM holds a public hearing to solicit input on the schedule for TMDL development. When feasible, DEM will be aligning TMDL development and watershed planning to reinforce focus within targeted watersheds.

A5. Implementation of NPS Protection and Restoration Actions

As mentioned above, the DEM NPS Program works with many other water–related programs both inside and outside of DEM to coordinate policy and achieve implementation of nonpoint source pollution prevention and abatement actions. (See following section on Partners in NPS Management.)

Statewide Regulatory NPS Programs
Primary Partner: CRMC

One unique aspect of RI's NPS program is the regulatory authority that DEM and CRMC exercise over OWTS as well as land development in proximity to wetlands. In many other states, these activities are largely regulated by county or local governmental agencies. Table 3. lists state regulations germane to NPS management in RI. Regulations aimed at preventing pollution generally apply statewide, although some more stringent rules have been imposed to give greater protection to both surface and groundwater sources of public water supply and to prevent degradation of other high quality special resource waters.

Table 3. State Regulations for NPS Management

DEM Water Quality Rules
DEM Groundwater Quality Rules
CRMC (Coastal Resources Management Council) Coastal Resources Management Program
DEM Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Management Systems
DEM Rules and Regulations Governing the Administration and Enforcement of the Fresh Water Wetlands Act
CRMC Rules and Regulations Governing the Administration and Enforcement of the Fresh Water Wetlands Act in the Vicinity of the Coast
DEM and CRMC Stormwater Management, Design and Installation Rules; and associated guidance "Soil Erosion and Sediment Control Handbook."
DEM Rules for the Discharge of Non-Sanitary Wastewater and Other Fluids To or Below the Ground Surface
DEM Rules and Regulations Relating to Pesticides

DEM Rules and Regulations for Dredging and the Management of Dredged Material
DEM Rules and Regulations for Sewage Sludge Management

Statewide Non-Regulatory NPS Program Activities
Primary Partners: Multiple Partners

As a complement to the regulatory oversight exercised by state and local officials, the RI NPS Program was organized to coordinate a variety of non–regulatory activities aimed at encouraging voluntary actions to strengthen NPS pollution prevention and facilitate water quality restoration. Through its annual Performance Partnership Grant (PPG), DEM utilizes EPA funds to support monitoring, assessment and watershed planning activities described above. In addition, consistent with the overall water quality framework, the program carries out the following activities to promote and implement effective NPS pollution management:

- Interagency coordination via technical committees and other means;
- Monitoring and an assessment of NPS problems and identification of targeted waters and watersheds;
- Policy development to foster prevention and abatement of NPS pollution;
- Technical assistance to municipalities, watershed/lake organizations and others on implementation of NPS best management practices (BMPs);
- Financial assistance, in the form of grants of PPG (319) funds and state grants (as funding allows) for NPS implementation projects;
- Technical assistance (pre–application) to proponents of water quality and wetland restoration projects through an interdisciplinary team (Water Quality and Wetlands Restoration Team);
- Outreach and educational activities, including training workshops; and
- Participation in regional workgroups on NPS priority topics.

See Sections IV. Pollution Source Management and Section V. Other NPS Stressors for a detailed description of the regulatory and non-regulatory programs for controlling NPS sources of pollution.

Outreach and Education
Primary Partners: Multiple Partners

An informed public is necessary to build support for needed management actions. DEM and its partners also strive to increase the public's understanding of individual actions they can take on a regular basis to protect and restore water quality and aquatic habitat. Local municipal officials and staff are routinely making decisions that affect water quality. It is important that this decision making be based on accurate information and training about water quality, NPS pollution and management strategies.

Partners utilize a variety of tools to support public outreach, education and training including extensive collaboration. Efforts to better inform the general public and local officials is a need

that must be continually addressed to be successful. DEM must take steps to make greater use of social media as a means to share information, and DEM must continually improve and update its website materials.

B. Partners in NPS Management

As the lead state agency for water quality management and water pollution control, DEM has responsibility for developing and implementing this Nonpoint Source Management Program Plan consistent with its authorities. However, as noted earlier, there are many federal, state, quasi–state, municipal, academic, and non–governmental entities, and various user groups (fishing, boating, etc.) that contribute in significant ways to the management of NPS pollution in RI that are discussed below.

One of the roles of the DEM NPS Program is to facilitate coordination among NPS–related activities and track progress towards protecting and restoring water quality and aquatic habitat. A variety of coordination mechanisms are used to foster collaboration among programs and alignment of work to optimize the efficient delivery of programs. Coordination mechanisms operate at different levels within state government and include organized committees, ad hoc committees and less formal arrangements among agency staff. These mechanisms help ensure various programs are working with a shared understanding of NPS water quality problems and toward common objectives regarding an issue, project or program. Examples of formal state level coordination mechanisms include:

- State Planning Council and its Technical Advisory Committee
- State Conservation Committee
- CRMC Policy and Planning Committee
- USDA NRCS State Technical Team
- RI Rivers Council

B1. Municipalities

Given the strong relationship between land use and water quality, local governments have an especially important role to play in water quality management through the exercise of their authorities to govern land use. Local land use planning and zoning establishes the type and level of intensity of development on the landscape, which determines to a major degree the potential impacts to water quality. Municipalities have many tools available that can be applied to guide land use development in a manner that is protective of water resources. In doing so, they comply with the goals and policies for development specified in *State Guide Plan – Land Use 2025* that will reduce the impacts of development on water quality, such as:

- Zoning to ensure the type and density of development is suitable for the resources that may be impacted; may include overlay districts that restrict land uses that pose higher pollution risks;
- Conservation Development: This is a zoning technique in which the character–defining features of a parcel are identified and protected before land is developed. It differs from

traditional development in that assessment of natural resources, not identifying building sites, is the first step in the process;
- Land acquisition of open space to protect drinking water and other important water sources and to conserve priority natural habitats; and
- Low impact development (LID) practices, which utilize site planning and design techniques to mitigate the impacts of stormwater and site disturbance on our water resources. In addition to conservation development, LID practices include (see also section on Stormwater):
    - Requirements for vegetated riparian buffers
    - Site clearing and grading standards
    - Roadway and parking design guidelines
    - Compact development
    - Landscaping and tree preservation

In addition to their primary role in regulating land use, many municipalities implement local onsite wastewater management programs, local stormwater management programs and may operate other programs that support water quality management including acquisition and management of open space. However, local capacity to adequately manage and maintain these programs at a level necessary to protect and restore water quality is often lacking. In particular, building capacity to strengthen stormwater management at the municipal or regional levels is essential to fostering progress on abating this widespread source of water pollution.

B2. Program Partners and Examples of Collaboration

Given resource limitations and the nature of nonpoint source pollution, future progress will depend on the State building stronger partnerships and greater collaboration among the many entities working to protect and improve water quality. In this regard Rhode Island's small size is an advantage in that the state agencies are often familiar with the local stakeholders actively working within a given watershed. A significant amount of collaboration is taking place and it is neither practical nor necessary to reflect all instances where this occurs. However, select examples of existing collaboration by the DEM NPS Program and its partners are provided below to illustrate how work is being coordinated and aligned to achieve NPS pollution management goals.

Federal Government:

Environmental Protection Agency – establishes national requirements for implementation of federal laws for water quality management; provides funds to the state to implement water quality programs under federal law and conducts research on water quality issues. In addition to routine program interactions associated with Clean Water Act funding (including Section 319) provided to the State, EPA collaborates with states on special projects that advance environmental protection by mitigating NPS pollution, e.g., recent nutrient sensor competition for OWTS. EPA also provides a variety of training opportunities, including webinar series that support transfer of technical information. RI green infrastructure

projects, supported with CWA Section 319 funding, have been featured in the EPA "Soak up the Rain" series. (Also see description of the EPA Southeast New England Program.)

USDA, Natural Resources Conservation Service (NRCS) – provides funds and technical assistance to farmers to implement best management practices for water quality management and habitat improvement under several funding programs. The DEM Office of Water Resources, EPA and others interested in resource stewardship are members of the NRCS State Technical Team, which generally meets 2 – 4 times per year. Opportunities are provided for water quality concerns to be a key part of NRCS programs and in the development of conservation practice standards. DEM and NRCS are also actively coordinating in the implementation of the National Water Quality Initiative (See discussion under Agriculture).

US Geological Survey (USGS) – conducts water quantity and quality studies of groundwater and surface water resources. In RI, through a joint funding agreement USGS conducts water quality monitoring on the state's largest rivers, operates the stream gage network and measures groundwater elevations. Periodically, USGS carries out additional projects ranging from field investigations, such as in the Sakonnet River (20180-2019), water modeling (e.g., HSPF) and data synthesis including a recent publication on water quality trends in the Blackstone and other rivers.

State Government:

Coastal Resources Management Council (CRMC) – lead agency for coastal zone management. CRMC manages and plans for the preservation of the coastal resources and permits all activities within tidal waters. DEM and CRMC jointly developed and implement the RI Stormwater Design and Installation Standards Manual and Rules, which reflects requirements for low impact development and establishes treatment standards for stormwater discharges. The agencies have also worked closely to revise and implement the Freshwater Wetland Rules. Regulatory staff routinely coordinate on permitting projects in the coastal zone including the emergency repair of OWTS following storms. In addition, CRMC and DEM collaborate on programs related to resource management including monitoring, protection and restoration of coastal wetlands and management of aquatic invasive species.

Rhode Island Environmental Monitoring Collaborative (RIEMC) – the RI Comprehensive Environmental and Watershed Monitoring Act (R.I.G.L. § 46-31) in 2004 established the Rhode Island Environmental Monitoring Collaborative to develop and, through its members, implement comprehensive environmental monitoring to support management of Rhode Island's natural resources. With support from the EPA SNEP funding, DEM collaborated with the RIEMC on an expansion of its website in 2018 and a workshop on environmental indicator development. The RIEMC provides a forum for government agencies, university–based programs, non–governmental organizations, and volunteers to collaborate on monitoring activities, determine monitoring priorities and identify critical gaps in data collection.

RI Department of Health – regulates public water suppliers to ensure that water provided to the public meets drinking water standards; monitors water quality at saltwater bathing beaches; and is only one of two laboratories on the East Coast approved to test for the biotoxin domoic acid. DEM staff work closely with DOH Programs on source water protection planning and responding to instances of public and private drinking water contamination, investigation and abatement of water pollution affecting public beaches and other water related public environmental health threats including cyanobacteria blooms in surface waters, seafood caused illnesses, and fish tissue contamination. DEM organizes an annual interagency meeting with DOH to coordinate cyanobacteria monitoring and bloom response efforts. DOH also provides laboratory services to DEM water monitoring programs via an annual contractual agreement.

RI Infrastructure Bank – administers the state revolving fund to finance municipal wastewater and stormwater projects. The Infrastructure Bank in cooperation with DEM administers the Community Septic System Loan Program (CSSLP), in which the towns that have a DEM–approved Onsite Wastewater Management Plan can access funds from the state Clean Water Revolving Loan Fund for low interest loans to homeowners for OWTS repairs. The Bank can play a critical role for some state and federally funded project grantees that do not have the up-front funds necessary on reimbursable grant projects by providing access to financing via "bridge loans." (See also Section VI.A. Resources for Implementation.)

RI Water Resources Board – oversees the management and use of drinking water resources: identifies potential sources, allocates drinking water supplies and administers financial programs to ensure adequate supplies of drinking water. DEM and DOH are members of the RI Water Resources Board. DEM staff coordinate with Board staff on issues of water allocation and withdrawal and their impact on water quality and aquatic habitat. DEM NPS staff also review the water supply system management plans required by the Water Resources Board of the major water suppliers in the state (see Appendix A).

Department of Administration – creates long-term plans (referred to as elements of the State Guide Plan) for the state's development and management of its natural resources, and ensures municipalities comply with local planning requirements. DEM staff worked closely with DOA on the development of the State Guide Plan Element "Water Quality 2035, RI Water Quality Management Plan" that was adopted in 2016. Rhode Island cities and towns must have a locally adopted Community Comprehensive Plan that must be updated at least once every five years. Municipal plans are required to be reviewed by the State for consistency with State goals and policies. In turn, State agency projects and activities are to conform to local plans that have received State approval. DEM NPS Program staff review draft local comprehensive plans for consistency with this Plan, Water Quality 2035, and DEM water related regulations and policies. The review process is coordinated across state government by the Department of Administration Division of Planning. DEM is represented on the DOA managed State Planning Council and its Technical Advisory Committee

RI Department of Transportation – maintains state and federal roads, which includes stormwater management and road salting and sanding. As a regulated MS4, RIDOT is

implementing a strategic program to comply with an EPA consent decree to improve stormwater management. DOT has partnered with watershed organizations and other entities to facilitate the implementation of stormwater retrofits with an emphasis on "green infrastructure."

Executive Climate Change Coordinating Council (EC4) – The Council was established by state law, and it is charged with incorporating consideration of climate change in the powers and duties of all state agencies. It is responsible for setting specific greenhouse gas reduction targets and planning for mitigation and adaptation to climate change. The Council is chaired by DEM and it works with an advisory board. The Council provides a forum for evaluating how a changing climate in RI may impact nonpoint source pollution management; e.g. design standards for OWTS and stormwater BMPs.

Regional Programs:

Southeast New England Program (SNEP) - In 2012, at the direction of Congress, the U.S. Environmental Protection Agency (EPA) created the Southeast New England Program (SNEP), a comprehensive effort to restore and protect the region's coastal waters and watersheds. The geographic region for SNEP extends from Westerly, RI to Pleasant Bay on Cape Cod, encompassing the major estuaries of Narragansett Bay and Buzzards Bay, and their watershed lands as far north as Worcester, Mass. It includes the south shore of Cape Cod as well as Martha's Vineyard, Nantucket, Block Island and the Elizabeth Islands. Non-point source pollution issues, including nutrient enrichment, are a common challenge across the region. SNEP works in partnership with stakeholders in these states to promote a resilient ecosystem of clean water, healthy diverse habitats, and sustainable communities in Southeast New England. EPA SNEP funding is distributed via grants and other mechanisms to support projects advancing SNEP goals.

New England Interstate Water Pollution Control Commission (NEIWPCC) – This is a state and federal funded regional commission to support State water management programs. DEM participates in several NEIWPCC workgroups that provide a forum for states to share best practices and lessons learned on numerous NPS and aquatic habitat management topics, including: Nonpoint Source Management, Stormwater, Onsite Wastewater, Emerging Contaminants, Wastewater Residuals, Water Quality Standards, Harmful Algal Blooms, Source Water Protection, and Climate Change.

Narragansett Bay Estuary Program (NBEP) – Established in 1987 pursuant to Section 320 of the Clean Water Act, the Narragansett Bay Estuary Program uses federal funds to protect and restore Narragansett Bay through initiating and coordinating projects with public and private partners. The program targets the bi-state watershed of Narragansett Bay as well as southern RI watersheds and accordingly constitutes a regional program with involvement from both Rhode Island and Massachusetts. Under the guidance of a Scientific Advisory Committee, the NBEP completed a Status and Trends Report in 2017 that included information on certain NPS topics, such as OWTS. The program has initiated a process to update the Comprehensive Conservation and Management Plan for Narragansett Bay that is targeted for completion in 2022 and which will include recommended actions pertaining to

NPS problems in RI. The NBEP has also played a role in distributing grants for research and projects, including funding from the SNEP. Among other areas, the DEM collaborates with the Narragansett Bay Estuary Program on outreach to build support for effective management (e.g., Watershed Counts and Status and Trends Report).

RI Rivers Council – RI state law (RIGL 46-28) established the RI Rivers Council to coordinate and support activities of local watershed associations. RI DEM is a member of the Council and hosts the Council's monthly meetings. Ten watershed organizations have been designated by the Rivers Council in RI. State law bestows certain rights to these designated organizations. These watershed organizations vary in capacity -- from those with paid professional staff to solely volunteer organizations. However, they all fulfill a critical stewardship role in their watersheds by raising awareness, coordinating and implementing projects and advocating for protection and restoration actions.

State Conservation Committee and Conservation Districts – Rhode Island's Conservation Districts, the Rhode Island State Conservation Committee, and the Natural Resources Conservation Service are collectively known as the Conservation Partnership. DEM is a member of the State Conservation Committee. Rhode Island's three regional conservation districts share a mission of promoting proper stewardship of natural resources and have a long track record of carrying out initiatives involving education and outreach, and various forms of technical assistance as well as project management support on nonpoint source pollution

Regional planning commissions – The Aquidneck Island Planning Commission and the Washington County Regional Planning Council are authorized by state law. While involved in a broader range of topics, these regional commissions have often taken on projects related to water quality and watershed management. The Aquidneck Island Planning Commission has taken a leading role in protecting and restoring the Island's water resources.

Narragansett Bay National Estuarine Research Reserve (NBERR) – preserves, protects and restores coastal and estuarine ecosystems of Narragansett Bay through long-term research, education and training. NBERR Coastal Training Program has provided many opportunities for professionals to improve skills and knowledge to address NPS issues. NBERR current research focuses on salt marsh ecology in the context of climate change and sea level rise.

Narragansett Bay Commission (NBC) – NBC is the regional wastewater utility that services the Providence metropolitan region. It carries out a variety of monitoring activities and is partner in the Fixed-Site Monitoring Network in Narragansett Bay. It supports river clean-ups and is implementing and promoting "green infrastructure" for stormwater management.

Water Suppliers – provide drinking water to the public and work to protect their sources of water supply. Water suppliers are eligible recipients of CWA Section 319 grant funds for protection and restoration of water quality and aquatic habitat in their watersheds/wellhead protection areas.

Academic Institutions:

University of Rhode Island – DEM works collaboratively with various individual researchers as well as programs at URI. Collaboration ranges from projects of short duration to ongoing efforts that have been in place for twenty years or more; e.g., Environmental Data Center and GIS applications. Examples of ongoing collaboration with DEM on NPS related topics include the following Cooperative Extension Programs:

- New England Onsite Wastewater Training Program: A demonstration and training center for onsite wastewater treatment system technologies;
- RI Nonpoint Education for Municipal Officials (NEMO) Program: Supports local decision makers in the management of land use impacts on natural resources;
- Home*A*Syst Program: Provides residential pollution prevention programs, including drinking water well protection and landscaping for water resource protection. The Program continues to hold private well owner workshops across the state in cooperation with the DOH; and
- Watershed Watch Program: A scientist–led volunteer water quality monitoring program. Data collected by the Watershed Watch Program is considered by DEM in the water quality assessment process.

URI Coastal Institute – advances knowledge and develops solutions to environmental problems in coastal ecosystems through a variety of project and initiatives.

- Chairs and coordinates the RIEMC;
- Hosts the RI Climate Change Collaborative; and
- Hosts forums on timely topics such as stormwater management.

URI Coastal Resources Center – mobilizes governments, business and communities to work together as stewards of coastal ecosystems. Areas of current focus that align with the NPS Program include coastal community planning, climate change and capacity building. DEM collaborated with the Resources Center on the stormwater module for the PREP-RI training to provide resilience education for planning preparedness in RI.

Non-governmental Organization (NGOs):

Environmental NGOs, which range in size and capability, are often collaborators with governmental agencies on watershed protection and restoration projects and initiatives. Such groups take on various roles in advocating for and carrying out NPS implementation projects. Larger organizations including Save The Bay, Audubon Society of Rhode Island, and The Nature Conservancy are broadly involved with environmental issues statewide and operate ongoing programs in areas such as monitoring, education, land stewardship, and habitat restoration that contribute to the implementation of this plan. Watershed and lake organizations, which may employ staff or be solely volunteer-based organizations, carry out a variety of programs, projects and activities within their geographic area of focus. Additional organizations representing user groups or other specific interests, such as Save The Lakes, Surfriders, Blueways Alliance, and RI Nursery Association also carry out activities supportive of the goals in this plan. In addition, local land trusts acquire important aquatic, riverine and upland habitat for protection of water quality and aquatic life

C. Setting Priorities

The long-term goal for all Rhode Island watersheds is to achieve clean and healthy waters. That said, there is also a practical and strategic need to prioritize the work undertaken to protect and restore water quality in order to optimize results. At the state scale, it is important to identify which water quality stressors and which watersheds or waterbodies will be the focus of attention within the limited resources of state water resource programs. At the watershed scale, it is equally important to build consensus among a broad group of stakeholders on specific water quality objectives and prioritize actions that address those objectives. A clearly articulated set of priorities helps to facilitate the alignment of resources from various parties and move forward to successfully implement needed actions. The following discusses the RIDEM priority setting process in more detail.

State Level

Priorities within the state water resources programs are influenced by federal and state law, federal funding guidance, state policy and information concerning environmental conditions. State priorities are articulated as part of the management framework described in Water Quality 2035 and are reflected below. The Environmental Protection Agency requires frameworks for prioritization within the programs associated with administration of the federal Clean Water Act. Prioritization does ***not*** mean changes to the level of protection afforded a given waterbody. Regulatory programs that protect water quality and prevent pollution from a variety of sources are equitably administered on a statewide basis across all watersheds as applicable. However, prioritization is an acknowledgement that in order to be strategic in utilization of the limited resources currently available to DEM, certain watersheds may be targeted for and receive greater focus and attention than others within a given time period. Priorities are periodically re–visited based on new information gained through updated water resource assessments and new scientific research.

Existing Prioritization Activities

The DEM Office of Water Resources programs include both protection and restoration activities. For water resources in good condition, the State emphasizes preventing water pollution as well as other forms of aquatic habitat degradation. For water resources known to be impaired or degraded, the objectives are to both prevent further degradation and to restore conditions to support designated uses or healthy habitat conditions.

With respect to focusing NPS management, DEM has identified the following:

- As introduced in Section II, certain watershed planning areas with less than 10% impervious cover and few surface water impairments may also support some of RI's cleanest waters and highest quality aquatic habitat. Protection and pollution prevention are priorities in these areas although there may also be scattered waterbodies that may also need targeted restoration;

- Water quality impairments are more prevalent within watersheds/sub–basins that are more urbanized. DEM has categorized a majority of designated watershed planning areas as being in need of a mix of protection and restoration actions. These areas have existing impervious cover ranging up to 25%; and

- A smaller number of watershed planning areas have the highest extent of urbanization. These lie largely within the urban services boundary designated in the document, "Land Use 2025: State Land Use Policies and Plan" (RIDOA 2006) (See Figure 5). This boundary presents an opportunity for evaluating its future use as a tool in prioritizing water quality protection and restoration activities. The emphasis in these areas is on restoring water quality with recognition these heavily developed watersheds will require sustained investment in retrofitting the existing landscape and infrastructure over many years in order to achieve water quality goals.

(See Table 4 for the categorized list of watershed planning areas.)

Existing DEM priorities can be described in relationship to the protection and restoration of water resources. It is understood that the strategies and actions undertaken to address all of these priorities will have to consider the influence of climate change. Over time, management strategies will need to be adapted in order to remain effective as conditions change. The well-established priorities related to the use of surface and groundwaters have been incorporated into DEM statewide water programs including certain regulations. These priorities, which emphasize protection of public health, are:

- Protection and restoration of drinking water supply source waters – both surface waters and groundwaters;
- Protection and restoration of shellfish growing area waters;
- Protection and restoration of waters used for public recreation, including beach waters;
- Restoration of waters degraded due to excess nutrients; and
- Protection and restoration of water quality to support high quality aquatic habitats.

These priorities are associated with the two major causes of water quality pollution in RI – pathogens and nutrients. (See Section II.B. for additional detail.)

These priorities are reflected in:

- Regulations that provide a higher level of protection by restricting pollution sources in certain areas; e.g., drinking water source areas;
- Scoring criteria used to rank and award both state and federal CWA Section 319 implementation grants for nonpoint source pollution abatement;
- Priority Project List ranking process associated with projects that may receive financing via the Clean Water State Revolving Loan Fund;
- Schedule for TMDL development which gave initial emphasis to both impaired drinking water sources and shellfish growing areas; and
- DEM Annual Performance Partnership Agreement/Grant/Workplan.

Table 4. Watershed Categorization for Protection and Restoration

Watershed Planning Areas With Emphasis on Protection to Prevent Future Impairments (low levels of impervious cover and existing pollutant impairments)		
	% Impervious Cover (RI Land Only)	Planning Areas Associated with watersheds extending outside of RI
Scituate Reservoir	4.1%	
New Shoreham	6.3%	
Prudence Island	3%	
Sakonnet River East	8.5%	X
Southeast Coastal	5.8%	X
Watershed Planning Areas with Emphasis on Mix of Protection and Restoration Strategies		
Aquidneck Island	22.7%	
Narrow River	11.8%	
Bristol– Kickemuit River	21.9%	X
Wood –Pawcatuck Rivers	4.9%	X
Stafford Pond	9.8%	X
Jamestown	12.5%	
Branch River	6.1%	X
Southwest Coastal	11.6%	
Woonasquatucket River	21.4%	
Quinebaug River	2.4%	X
Saugatucket River	12.8%	
Hunt River	14.1%	
Annaquatucket River	11.0%	
West Bay	21.0%	
Blackstone River	19.6 %	X
Pawtuxet River	18.6%	
Watershed with Emphasis on Restoration (highest levels of impervious cover)		
Barrington –Palmer – Warren Rivers	28.3%	X
Greenwich Bay	30.6%	
Moshassuck River	33.3%	
Buckeye Brook	37.0%	
Providence Seekonk	46.4%	
Ten Mile River	44.6%	X

Watershed Priorities for 2020 -- 2024

The DEM Office of Water Resources is adapting its programs to give greater emphasis to watershed management. This will allow DEM to invest additional effort in both watershed planning and facilitating implementation of actions that are part of watershed–based protection and restoration strategies. The DEM OWR directly administers several delegated Clean Water Act programs in RI and is therefore well positioned to coordinate actions among these to reinforce watershed-based approaches to water quality protection and restoration.

To better support a watershed–based approach to implementation, DEM will progressively select watersheds that will be the focus of DEM attention for watershed planning and promoting NPS implementation activities. With respect to planning, DEM expects to be able to complete watershed plans in a 1-2 year period as reflected in the schedule below. With respect to protection and restoration actions, DEM expects varying levels of implementation will be underway in all watersheds. DEM will focus attention in targeted watersheds by utilizing its staffing resources to support an enhanced level of coordination and technical assistance. This includes, but is not limited to, coordinating or participating in technical or other stakeholder committees that work on a watershed basis. Given current resources, DEM will be able to target only a few watersheds each year. The length of time a watershed is targeted will vary (2-5 years) based on local needs and opportunities. Over time, DEM expects to complete watershed plans, conduct monitoring and complete water quality restoration plans (TMDLs) as needed in all of RI's watersheds. This process will extend beyond the five-year period targeted by this plan.

In addition to allocating its staffing resources, DEM targets watersheds for administering programs that distribute grant funding for implementation of water quality and habitat restoration actions. To reinforce the priorities reflected in this plan, DEM will review and revise the scoring criteria applied in the grant programs as needed.

Based on an internal review of available information and consultation with state and local partners, DEM has identified watersheds of focused attention for the five years addressed by this plan. Factors that influenced the selection of watershed priorities included the following:

- Priority beneficial uses of water resources being protected or restored consistent with the priorities identified above;
- Status of watershed planning;
- Status of water quality restoration planning (TMDLs);
- Potential for documenting water quality improvements;
- Local engagement and other partnership opportunities; and
- Potential to leverage resources to advance implementation; e.g., NRCS National Water Quality Initiative (NWQI).

In certain watersheds, DEM expects that its involvement in coordinating and collaborating with partners will extend beyond one year in order to sustain progress. Ideally, the DEM Office of Water Resources would have sufficient resources to assign personnel to support planning and coordination of water quality management activities in all areas of the state. Given this is not possible at this time, DEM will regularly evaluate priorities for watershed plan development and

project selection for available CWA Section 319 funds. The process as used for re-evaluating priorities will involve the following steps:

- Review water quality assessment results and watershed;
- Solicit public input as part of required public meeting on 303(d) List of Impaired Waters;
- Survey level of interest in watershed planning and management of local governments and watershed councils; and
- Consider state strategic priorities and consult other agencies;
  Internal discussion among DEM – OWR managers will be used to reach a consensus on future watershed targets.

The prioritization process will be done in a manner consistent with DEM's evolving approach to the new vision of the TMDL program including prioritizing healthy watersheds for protection. Selected watersheds will be reflected in future Performance Partnership Agreements.

In the prioritization process, DEM will give significant weight to the willingness of local partners to work with DEM on both watershed planning and implementation initiatives and the opportunities to leverage additional resources. DEM sees advantages to remaining flexible in scheduling and aligning its work in order to continue to be responsive to opportunities that lead to strengthened partnerships and enhanced local capacity.

Table 5. Watersheds Targeted for DEM NPS Program Activities from 2020 - 2024

Watershed Planning Area	**Targeted Waters (Including, but not limited to, the following)**	**NPS Management Priority**	**Major Activities**	**Partners***
Aquidneck Island	Bailey's Brook Maidford River Paradise Brook Drinking Water Reservoirs: -Lawton Valley Reservoir -St. Mary's Pond -Sisson Pond -North Easton Pond -South Easton Pond -Nelson Pond -Gardiner's Pond	Drinking Water Supply - restoration of source water quality; Public Recreation – protection of marine beaches.	Complete watershed plan (2020) Develop TMDLs; NWQI coordination; Watershed project implementation; Nutrient management.	Municipalities, Eastern RI Conservation District, Aquidneck Island Planning Commission, Aquidneck Island Land Trust, Save the Bay, Clean Ocean Access
Wood-Pawcatuck Watershed	Wood River Pawcatuck River Chipuxet River Queen River Beaver River Meadow Brook Worden Pond Watchaug Pond Chapman Pond	Drinking Water Supply – protection of groundwater quality; Public Recreation – protection and restoration of water quality; Aquatic Habitat – protection and restoration of high quality habitat.	Watershed project implementation; NWQI coordination; Riverine habitat restoration.	Municipalities, Water Suppliers, Wood-Pawcatuck Watershed Association, National Park Service, The Nature Conservancy.
Narrow River	Narrow River Mattatuxet River Crooked Brook Carr Pond	Shellfish growing area – restoration of water quality; Public Recreation – protection and restoration of water quality; Aquatic Habitat – protection and restoration of estuarine habitat.	Watershed project implementation; Coastal habitat restoration.	CRMC, Municipalities, RI CRMC, Narrow River Preservation Association, Narrow River Land Trust, Southern RI Conservation District, US Fish and Wildlife Service.

Scituate Reservoir	Scituate Reservoir Regulating Reservoir Moswansicut Pond Ponagansett River Barden Reservoir Westconnaug Reservoir	Drinking Water Supply – protection of source water quality.	Completed watershed plan; (2022) Watershed project implementation; Nutrient management.	Municipalities, RI DOH, Providence Water, USDA NRCS, Northern RI Conservation District, Pawtuxet River Authority.
Abbot Run Watershed –Pawtucket and Cumber-land Water Supplies	Abbot Run Diamond Hill Reservoir Arnold Mills Reservoir Sneech Pond Robin Hollow Pond Happy Hollow Pond	Drinking Water Supply – protection of source water quality; Public Recreation – protection and restoration of water quality; Aquatic Habitat – protection and restoration of high quality habitat.	Complete watershed plan; (2021) Watershed project Implementation.	Municipalities, RI DOH, Water Suppliers, Blackstone River Watershed Council/Friends of the Blackstone, Northern RI Conservation District.
Lakes	5 lakes in RI (specific lakes to be determined)	Public Recreation – protection and restoration of water quality; Aquatic Habitat – protection and restoration of high quality habitat.	Complete watershed plans;(2020-2021) Watershed project Implementation.	Municipalities, Save The Lakes, Lake Associations, Conservation Districts.

* Represents some of the partners expected to be engaged in implementing watershed plan actions. The lists are not all inclusive and in no way are intended to limit participation of additional partners.

IV. Pollution Source Management

The following sections discuss the management strategies for various categories of nonpoint source pollution causing water quality impacts. It is important to recognize that most, if not all of these management strategies will need to be adapted to a changing climate which is further discussed in Section V. The pace of climate change in the northeast requires this factor be considered in all aspects of management – planning, implementation and evaluation. This section provides the context for the corresponding actions and milestones in Section VI.B. Implementation Tables. For each pollution source, the primary partners involved in implementing actions to manage the source of pollution are listed.

A. Stormwater Runoff

(See also discussion of Road Salt and Sand Storage and Application in Section IV.C below.)

Pollutants: sediment, pathogens, nutrients, metals, petroleum products, salt, heat
Primary Partners: CRMC, RI DOT, Municipalities, NGOs, RIEMA
Key points:

- Stormwwater is a widespread source of water quality degradation in RI;
- Low impact development strategies are the focus of long–term stormwater management;
- Stormwater from existing impervious surface must be addressed in order to achieve improvements in water quality;
- Maintenance of stormwater management practices is often neglected and must be improved; and
- Among challenges to abating stormwater pollution, a major obstacle is the lack of a reliable source of funding. (See Section VI.A. Resources for Implementation for discussion of stormwater funding strategies)

Stormwater runoff is a major, widespread source of water quality degradation in RI and is known or suspected to be associated with the majority of surface water quality impairments. Stormwater impacts include: pathogen contamination resulting in beach closures and the closure of shellfish growing areas; nutrient enrichment of waterbodies resulting in algal blooms (including toxic cyanobacteria); elevated levels of other water pollutants (e.g., metals); stream bank erosion; and aquatic habitat alterations from high flows. The degree to which stormwater impacts water quality in any particular watershed is primarily a function of the amount of impervious cover and how stormwater generated from the impervious cover is managed.

Diffuse stormwater runoff, such as overland sheet flow, is often categorized as a nonpoint source of pollution. However, in highly urbanized areas prevalent in many portions of RI, stormwater collects in gutters and pipes and is conveyed to a direct discharge into surface waters at the end of a pipe. Pursuant to the federal Clean Water Act, this type of stormwater discharge is regulated as a point source. In Rhode Island stormwater discharges from qualifying urban areas are subject to the federally required Municipal Separate Storm Sewer System (MS4) Program, administered by DEM under the Rhode Island Pollutant Discharge Elimination System Program. Activities

which directly implement an MS4 permit requirement are *not eligible* for Section 319 funding. However, treating stormwater in MS4 areas with Section 319 funds is allowed provided certain conditions are met. DEM has elected to present the following information that is generally applicable statewide with the understanding that inclusion in this plan does not affect requirements in place on the use of 319 funding.

The RI Stormwater Management, Design and Installation Rules (2011, recodified 2018) (formerly referred to as the "Stormwater Manual") is based in part on the following stormwater management requirements in the Smart Development for a Cleaner Bay Act of 2007 (RIGL 45-61.2-2):

- Maintain pre–development groundwater recharge and infiltration on site to the maximum extent practicable;
- Demonstrate that post-construction stormwater runoff is controlled, and that post–development peak discharge rates do not exceed pre–development peak discharge rates; and
- Use low impact design (LID) techniques as the primary method of stormwater control to the maximum extent practicable.

The Stormwater Rules require compliance with 11 minimum standards that apply to both new development as well as certain redevelopment of properties subject to state regulatory jurisdiction. This includes projects under the jurisdiction of the following state regulatory programs: DEM and CRMC Freshwater Wetlands Programs, DEM Water Quality Certification Program, DEM Groundwater Discharge Program/Underground Injection Control Program, DEM RI Pollutant Discharge Elimination System Program, and CRMC Coastal Management Program. Projects must also comply with the Erosion and Sediment Control Handbook that is referenced in the Stormwater Manual.

State policy emphasizing the adoption of LID practices is intended to ensure future land development is done in a manner that minimizes water pollution impacts due to urban stormwater runoff. DEM and partners are promoting "green infrastructure" as the means to abate pollution and enhance a community's resiliency in light of changing precipitation patterns. This includes using techniques that preserve open spaces, riparian buffers, green roofs and other approaches that can capture pollutants and manage storm flows to prevent and mitigate flooding risks. Technologies and BMP designs for treating stormwater are rapidly advancing which creates a need for state managers to review and update state standards as appropriate. DEM is collaborating with EPA, MA DEP and others in the region to quantify the performance of various stormwater practices and share success stories to foster their broader acceptance and implementation.

Local governments play an essential role in facilitating LID through implementation of their local land use authorities. At present, many local land use ordinances are still in need of revision in order to more fully implement innovative land use controls. DEM and URI recently prepared a municipal self-assessment tool to evaluate LID site planning and design in local ordinances. The DEM/CRMC "RI Low Impact Development Site Planning and Design Guidance Manual (2011)," provides information on different LID strategies from roadway design to conservation development and provides examples of how to improve local ordinances. The RI Green

Infrastructure Coalition advocates for LID by fostering the implementation of green infrastructure in urban communities.

Infiltration of stormwater is one of the primary principles of stormwater management to maintain groundwater recharge and decrease flow volumes to surface water. Stormwater infiltration uses engineered BMPs and the natural groundwater flow system to treat pollutants. Infiltrating more stormwater necessitates proper management of these groundwater discharges to prevent impacts to groundwater used for drinking water and other beneficial uses. The DEM Groundwater Discharge Rules discussed above require compliance with the Stormwater Rules by permitting stormwater discharges that are placed below the ground surface (e.g., trenches or drywells) and those that infiltrate at the surface without an engineered filter media (e.g., infiltration basin).

The Soil Erosion and Sediment Control Handbook (2014) is intended to assist property owners, developers, engineers, consultants, contractors, municipal staff and others in planning, designing and implementing effective Soil Erosion and Sediment Control Plans for the development and redevelopment of properties in Rhode Island. Implementation of the practices in this Handbook, as required by the RI Stormwater Management, Design and Installation Rules, will significantly reduce sedimentation in surface waters associated with construction activities.

Stormwater management is an essential service that must be integrated into the local government planning, engineering and public works programs. Local stormwater management practices currently vary widely with many municipalities lacking the financial resources, staff or expertise to effectively manage stormwater from planning to permitting to maintenance. EPA's launching of a new effort through SNEP to build a network of experts that can assist municipalities is a welcome addition to on-going effort to assist cities and towns. RIDEM works with partners, including RIDOT, URI, and others, to provide technical assistance as resources allow. State bond funds have been and are a potential future source of state grants to enhance local capacity to implement stormwater management through acquisition of equipment (e.g., vacuum trucks) and support for retrofitting projects. By aligning water quality and flood mitigation planning, as piloted by RIEMA and EPA, it is likely that resources can be leveraged to accelerate progress on both fronts. However, it is equally evident that in the long-term sustainable sources of funding are needed, as further discussed in Section VI.A., Resources for Implementation, including a discussion of stormwater utilities.

Proper design, siting and installation of BMPs as property is developed are not enough to achieve state water quality goals for waters impaired by stormwater. Two challenges associated with stormwater management include:

- Proper maintenance of BMPs: Maintenance of the existing stormwater infrastructure is a glaring weakness at the state, local and private sector levels. Stormwater management BMPs for improving water quality must be maintained or the water quality benefits of the BMP will largely be lost. Efforts are underway to train workers and promote proper maintenance, but more work is needed; and

- Improving treatment of stormwater from existing developed lands: Accelerating the pace at which performance of stormwater management on existing public and private

property is improved continues to be a significant challenge. Many of the completed TMDL's identify the need to improve stormwater management from existing roadways and public and private properties in the watershed to reduce pollutant loadings to impaired waters. Significant responsibility for improved stormwater management rests with municipal governments and the Rhode Island Department of Transportation (RIDOT). As a regulated MS4, RIDOT is implementing a strategic program to comply with an EPA consent decree to improve stormwater management. RIDOT will prepare stormwater control plans where RIDOT outfalls have contributed to water quality impairments, improve maintenance of their system, and retrofit and construct stormwater BMPs. In addition, the DEM Office of Customer and Technical Assistance manages well established evidence based environmental compliance assistance and certification programs that have a stormwater component for automotive refinishing, auto salvage and underground storage tank facilities.

Climate change is expected to result in wetter and more variable precipitation conditions in the decades ahead with more frequent and more intense storms that have larger amounts of precipitation falling over shorter time periods. Stormwater management systems are designed based on the average precipitation rates in the recent past. Design standards were last changed in 2010. The capacity and performance of these systems will be an issue to closely evaluate as precipitation patterns in RI change in response to climate change. As noted above, efforts to improve state and local climate change resiliency through flood prevention and mitigation can be complementary and have co-benefits of improved stormwater management and aquatic habitat. This relationship between stormwater management and flood mitigation is discussed further in the section on Climate Change (see Section V.A).

Over the five-year planning period, DEM will target its work to update the Stormwater Rules, advance LID site planning and design concepts, and strive to establish local sustainable financing mechanisms.

B. Onsite Wastewater Treatment Systems (OWTS) and Other Groundwater Discharges

B1. OWTS

Pollutants: pathogens, nutrients, pharmaceuticals and personal care products, household hazardous materials
Primary Partners: CRMC, URI, Municipalities
Key points:

- Effective implementation of the OWTS Rules can protect groundwater and surface water quality and public health.
- Alternative OWTS provide opportunities for improved treatment, but they require greater oversight, therefore strategies must be implemented to ensure their proper operation and maintenance.

- Local government can play a major role in ensuring OWTS maintenance.
- Cesspools are a substandard means of wastewater treatment and disposal that should be eliminated statewide.

Wastewater from any structure not served by a sewer system is disposed of onsite using an onsite wastewater treatment system (OWTS, also referred to as a septic system). This is a system of pipes, tanks, and chambers used to treat and disperse sanitary wastewater into the soil. Sanitary wastewater is water from toilets, sinks, showers and baths. Wastewater from commercial and industrial processes (non–sanitary wastewater such as car washes, cooling waters, etc.) that is disposed of onsite where there is no sewer system is regulated as a Groundwater Discharge (see Section IV.B2).

There are approximately 157,000 OWTS in Rhode Island, serving about 30% of the state's population and 80% of the state's land area. In many areas of the state, it is not cost–effective or desirable to extend public sewer service. In addition, Land Use 2025 (RIDOA 2006) discourages the expansion of sewer service outside of the state's designated urban services boundary. Therefore, communities dependent on OWTS will continue to utilize them to treat their wastewater into the foreseeable future. The exceptions to this are the limited areas identified and targeted for future sewer service in facility plans prepared for public wastewater treatment systems.

Wastewater from an OWTS moves downward through the soil into groundwater carrying with it bacteria and viruses, nutrients (nitrogen and phosphorus), pharmaceuticals and personal care products, and other contaminants improperly disposed of into the system. The level of treatment provided depends on many factors – system design and installation, system use and maintenance and the local soil characteristics. A properly sited, designed, installed and maintained OWTS will provide decades of use and provide treatment such that the system does not adversely impact public health or the environment. However, there are areas of the state such as coastal salt ponds, some inland lakes, certain areas dependent on private drinking water wells where OWTS are identified as a primary contributor to water quality degradation generally due to high concentration of older OWTS.

All OWTS are regulated and permitted by DEM through implementation of the DEM "Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment Systems." These rules set prescriptive standards for the OWTS components, size of systems based on intended use and soil conditions on each site, and the location of systems based on maintaining minimum separation distances from drinking water wells, wetlands and waterbodies, property lines, and other structures. Design flow from OWTS range from 345 gallons per day for a 3-bedroom residence to greater than 20,000 gallons per day for some schools and other institutions.

Private sector professionals are licensed by DEM to conduct an evaluation of the proposed site soil conditions, and to design and install the systems. DEM partners with the URI New England Onsite Wastewater Training Center to provide sufficient training opportunities to meet the continuing education needs of OWTS design and installation professionals.

In addition to conventional system designs specified in the Rules, DEM has established a procedure for approval of alternative or experimental OWTS technologies and drainfields. These technologies are vetted by the Technical Review Committee (TRC), a panel of experts convened under the authority of OWTS rule 6.43(G)(2). The TRC is made up of members from the Department, the Coastal Resources Management Council, local universities, OWTS design and installation firms, local municipalities, and environmental organizations. The TRC reviews vendor applications for the use of alternative or experimental technologies in Rhode Island. The TRC evaluates the performance claims for technologies and makes recommendations to the Department based on their findings. If a technology is approved by the TRC and the Department concurs, that technology may then be used for individual OWTS installations. As of January 2019, 6316 alternative or experimental treatment components and 4738 pressurized drainfields have been installed in the state. These are more complex systems that require a greater level of oversight to ensure that they operate as designed in order to achieve the desired level of treatment.

Alternative systems are used on difficult sites where a conventional system can not be installed due to site limitations (e.g., high water table, small lots, nearby private wells). Alternative systems can be installed with a smaller footprint or provide a higher level of treatment, resulting in an equivalent or better environmental condition than a conventional system on an acceptable lot with no site constraints. An acknowledged concern with this approach is the inevitable development of sites formerly considered undevelopable due to new OWTS technologies. The approval of an alternative OWTS allows the lot to be developed, creating impacts not related to OWTS, such as stormwater runoff and loss of habitat. Municipalities should be prepared for this and plan for development accordingly. Alternative systems are also used in sensitive areas to meet water quality objectives as demonstrated by the requirement for denitrification systems in the Salt Pond and Narrow River watersheds for any new or repaired system.

Cesspools are an older, substandard method of disposal. They are essentially just a hole in the ground which does not provide an acceptable level of treatment and is more likely to fail. As of 2019, there are approximately 15,000 cesspools still in use in RI. The RI Cesspool Act of 2007 (RIGL Chapter 23-19.15) requires cesspools within 200 feet of the coastal shoreline, public drinking water wells and drinking water reservoir impoundments to be removed from service by January 1, 2014. As of May 2019, approximately 1000 cesspools within these high priority areas specified in the state law have been replaced and 343 cesspools have been identified that need to be replaced. Removal of these primarily coastal cesspools is a major priority, and DEM will continue to use tools to achieve compliance, including formal enforcement actions. In addition, the use of large capacity cesspools (those serving any non-residential facility that has the capacity to serve greater than 20 people per day or serves any multi-family residence or apartment building) is prohibited by state and federal rules.

Phasing out the use of cesspools has been a major DEM initiative and in 2016 the R.I. Cesspool Act was amended to accelerate the removal of cesspools statewide. A provision was added to require cesspools serving properties subject to sale or transfer to be removed from service. The deadline for cesspool removal is one year from the date of the sale/transfer closing. Limited exceptions are provided for property transfers between immediate family members.

OWTS can fail if they are improperly sited, designed, installed and/or maintained, causing health and water quality concerns as wastewater backs up onto the land surface and flows directly into surface waters or stormwater collection systems or it moves untreated into groundwater. Lack of maintenance is considered to be the primary cause of system failure.

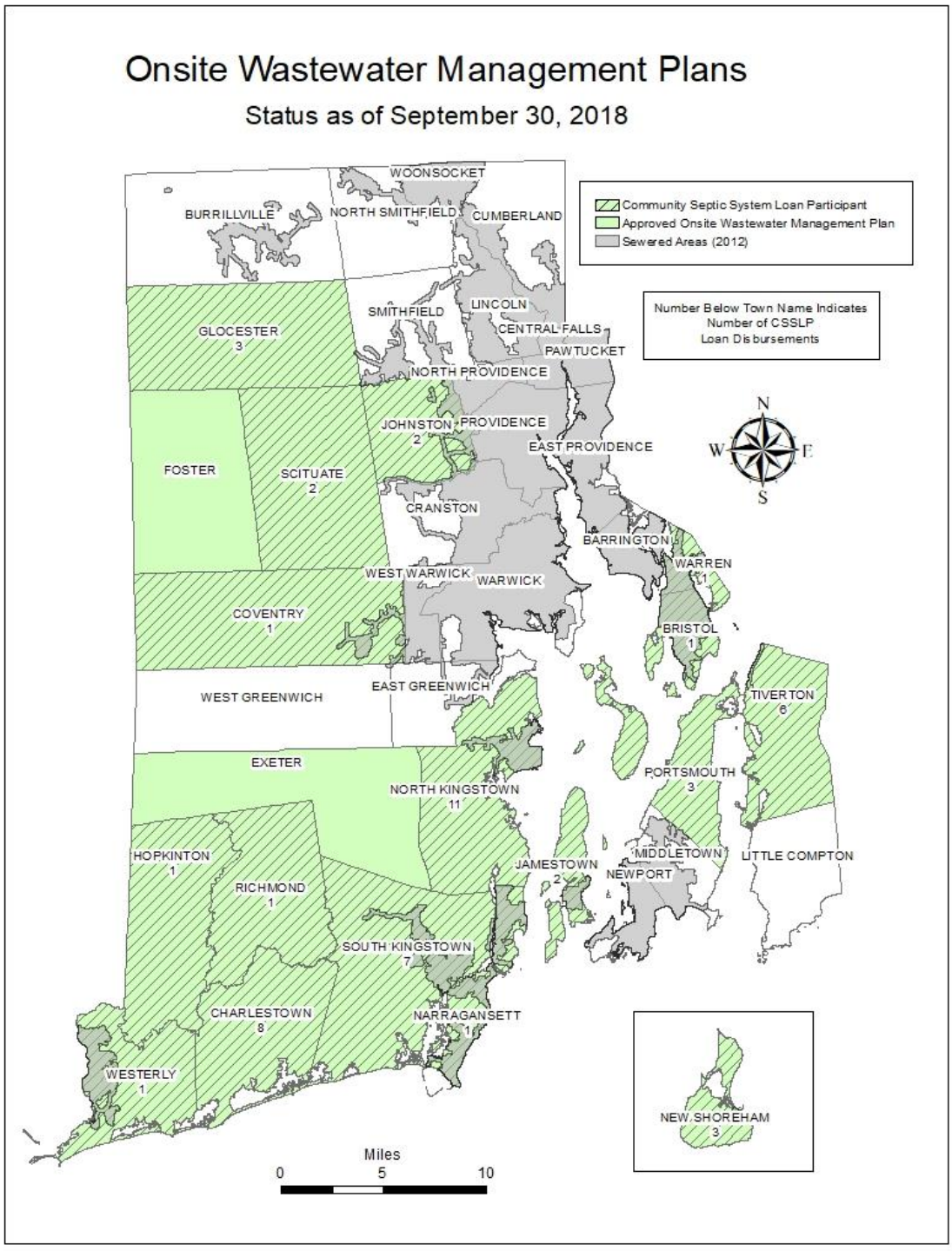
Operation and maintenance of existing systems is the responsibility of the property owner. All OWTS, both conventional systems and alternative treatment systems with pumps and other electronic components, require periodic maintenance to achieve expected levels of treatment performance. Nineteen towns in RI have adopted onsite wastewater management plans to encourage or require maintenance activities such as system inspections or pumping of septic tanks (as enabled by RI General Law Chapter 45-24.5) (see Figure 9). Once approved by DEM, these plans make the towns eligible for the Community Septic System Loan Program (CSSLP), through which the towns can access funds from the Clean Water Revolving Loan Fund for low interest loans to homeowners for OWTS repairs. As of September 1, 2018, 55 loans have been issued to 17 towns over the past 20 years totaling $17,900,000. However, the effectiveness of the plans in improving operation and maintenance is limited in many cases by a lack of local resources.

The impacts of projected climate change through sea level rise and warmer soil temperatures may decrease the effectiveness of OWTS in treating wastewater by means of:

- Sea level rise will increase the vulnerability of systems in the coastal zone to storm damages;
- Rising water tables (due to sea level rise) in the coastal zone will decrease the available aerated soil to treat wastewater beneath the system. Wet and saturated conditions beneath the system favor pathogen survival and transport; and
- Warmer temperatures will change conditions for microbes responsible for wastewater treatment in soil, potentially reducing OWTS effectiveness for reducing nutrients and bacteria.

Over the five-year planning period, DEM will target effort toward the elimination of cesspools, review and evaluation of local wastewater programs, improved oversight of maintenance of alternative and advanced onsite wastewater treatment systems, and improved tracking and compliance of large systems.

Figure 9. Status of Local Onsite Wastewater Management Plans



B2. Other Groundwater Discharges

Pollutants: petroleum products, toxic chemicals, metals
Primary Partners: EPA
Key points:

- Many suspected unauthorized groundwater discharges still need to be identified and either regulated or closed.
- New requirements aimed at recharging stormwater into the ground must be implemented in a manner that considers the value and sensitivity of the groundwater resource so that pollutant impacts are not simply shifted from surface water to groundwater. (See discussion of Stormwater in Section IV.A.)

Discharges of non-sanitary wastewater – any wastewater not regulated by the OWTS Program – to groundwater occur throughout the state in both sewered and non-sewered areas. This includes the discharge of stormwater to the subsurface (See Section IV.A.). Just about any type of activity may have such a discharge into a floor drain, piped into a subsurface system (dry well, leaching chambers, septic system, etc.) or piped to the ground surface. Common discharges include stormwater, car washes, cooling waters, commercial and industrial process waters/rinse waters, injections of chemical and biological materials to clean-up contaminated groundwater, and floor drain drainage from a wide variety of activities, including vehicle and equipment repair shops.

Localized instances of soil and groundwater contamination have occurred because of these groundwater discharges. The primary contaminants of concern are petroleum products, chemical wastes, volatile organic compounds, and metals. It is particularly important in dealing with groundwater resources to prevent contamination from occurring in the first place. Once in the groundwater, contaminants may persist for decades. The process of completely remediating groundwater is generally very lengthy, very expensive, and often technically infeasible.

The DEM "Rules for the Discharge of Non-Sanitary Wastewater and Other Fluids To or Below the Ground Surface" (Groundwater Discharge Rules) regulate discharges into the ground and onto the ground surface that will reach groundwater. The rules incorporate the requirements of the federal Underground Injection Control Program for discharges below the ground surface in order to maintain authority from US EPA to implement the program at the state level. In short, the Groundwater Discharge Rules address all discharges to groundwater that are not addressed under the OWTS Program. Program activities include the review of discharge applications and the issuance of discharge system approvals and registrations, the oversight of voluntary and involuntary closures of groundwater discharges, and review of facility operations for compliance with permit conditions (e.g., monitoring of effluent and groundwater quality).

The Groundwater Discharge Program has records on 1744 sites, of which 540 are closed discharges and 1152 have been approved for discharge with 42 discharges monitored regularly. However, it is estimated that there are likely hundreds of unauthorized groundwater discharges that have not yet been evaluated. Lack of awareness on the part of facility owners also contributes to this continuing problem of non–compliance with the Groundwater Discharge Program requirements. The Program frequently encounters existing and proposed types of discharges that have not been regulated, thus

requiring a comprehensive review of the discharge to determine the appropriate strategy for authorization or closure if it is an existing discharge that can't be permitted.

Recent efforts have focused on identifying, permitting and closure of unauthorized discharges at higher risk facilities such as floor drains at motor vehicle facilities. Over the five-year planning period, DEM will target the elimination of unauthorized groundwater discharges through closures or permitting, focusing on those facilities located in areas dependent on groundwater for water supply.

C. Road Salt and Sand Storage and Application

Pollutants: salt, sediment
Primary Partners: RI DOT, Municipalities
Key point:

- Minimizing impacts to water resources from road salt and sand application while at the same time maintaining public safety presents a unique challenge.

White stained pavement and layers of sand at the edge of the road are ample evidence of our efforts to maintain the safety of our roadways in winter. But there is a water quality cost for the application of salt and sand. Salt and sand can wash into surface waters impacting aquatic life, and salt can enter groundwater and contaminate drinking water wells.

Salt and sand are applied to RI roads by RI Department of Transportation (DOT) staff, municipal staff and private contractors, generally either as a mixture of 1:1 salt to sand ratio or as sand alone. Weather conditions ultimately determine how much is applied. Municipal data is not available, but DOT annual average number of pounds of salt per lane mile from 2005 to 2013 ranged from a high of 791 to a low of 382, averaging 516 pounds per lane mile per year (RIDOA 2014).

The technology and practices utilized by DOT is more advanced than that used by municipal governments and the private contractors. For example, no vehicles other than DOT use the advanced spreader technology and only one other community is known to apply a brine solution. Private contractors play a significant role in winter maintenance in support of state and local governments on public roads and on private property. Up to 300 private contractor vehicles can be used by DOT in any single storm, depending on the severity of the winter (RIDOA 2014).

The sand and sediment that remains on the roadway after the winter season is either washed into our waters, dramatically affecting aquatic life and streambed habitat, or it becomes a major contributor to stormwater BMP failure by clogging the systems. DOT estimates that only about five to 10 percent of the sand applied is recovered as street sweepings (RIDOA 2014).

The sand and salt must be stored in a manner to reduce impacts to water quality, primarily by covering of the salt pile in a structure and containing runoff from the site. DEM Groundwater Quality Rules require covering of all piles (public and private) with at minimum a durable cover in

areas where groundwater is classified GA and GAA. As of 2014, all but 5 of the 20 state salt piles were under cover in a permanent structure (RIDOA 2014).

Over the five-year planning period, DEM will target its efforts to evaluate compliance with the DEM requirements for salt storage, conduct additional assessment of road salt and sand applications in RI, and support actions by state and local governmental entities to reduce the amount of salt and sand applied to road surfaces through modified and improved practices.

D. Agriculture

Pollutants: pathogens, nutrients, pesticides, sediment, petroleum wastes
Primary Partners: USDA Natural Resources Conservation Service, State Conservation Committee, Conservation Districts
Key point:

- Farms should develop and implement a Farm Conservation Plan tailored to their specific operations that identifies the best management practices needed to minimize adverse impacts on water quality.

Rhode Island's farms contribute to the state's economic development and provide Rhode Islanders with local food and plant nursery products, as well as tourism opportunities, farm vistas, and wildlife habitat. But the nature of farming in RI has changed significantly over the past 20 years. There are fewer large farms (particularly dairy) but more of the smaller specialized farms that are producing more locally consumed farm products. It is important to ensure that these farm operations are conducted in a manner that avoids negative impacts to water quality.

US Department of Agriculture 2017 Census of Agriculture (USDA 2019) shows there are 1,043 farms in RI using 56,864 acres. A farm is defined by USDA as "Any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the Census year." These latest number show a 16% reduction of the number of farms and a 18% reduction of acres in farmland from the last census in 2012 (1,243 farms, 69,589 acres) to today. The average size of a farm is 55 acres, however, 36% of all farms are less than 10 acres.

The potential water quality contaminants associated with agricultural operations include nutrients (from fertilizers and animal wastes), pathogens and organic materials (primarily from animal wastes), sediment (from field erosion), pesticides, and petroleum products. Well managed farms

can operate with minimal adverse impact on water resources. However, instances of significant contamination of surface water and groundwater have occurred.

In addition, water withdrawals are a management issue of increasing concern in certain watersheds, e.g., the southern portion of the State. The need for irrigation water can place high demands on local groundwater or surface water supplies which, in turn, can cause a low flow condition in streams potentially resulting in dramatic negative impacts on stream ecology. (See water withdrawals in Section V.E.)

The Rhode Island Division of Agriculture works closely with the federal United States Department of Agriculture programs including the technical and financial assistance programs administered through the USDA Natural Resources Conservation Service (NRCS). An important means to minimize the impact of agricultural operations is for a farm to develop and implement a Conservation Plan that at minimum address water quality issues. Plans are usually developed in consultation with DEM and NRCS. The plan describes the schedule for implementing conservation practices needed to solve natural resource concerns and may include multiple components to address resource issues, such as nutrient management, erosion control, irrigation management, integrated pest management, wildlife and habitat management, forest management and others. In addition to conserving natural resources important to the farm, many of the practices included in such plans offer additional benefits to the farmer including cost–savings. Conservation Plans are not currently required in RI, unless the farm is participating in the RI Farm, Forest, Open Space Program, which is a state program to allow eligible properties to be assessed at its current use, rather than its value for development. A significant number of farms (almost 900) have developed plans as a result of participation in the Farm, Forest Open Space Program. Another option to increase conservation planning is to require that plans be developed for those farms receiving state funds through the purchase of development rights. Efforts to increase the development of conservation planning must be supported by strategies for plan implementation.

There are no state regulations that establish standards for specific farm management practices to control or prevent water pollution. DEM is considering the promulgation of required practices that assure adverse effects to the state's water resources and aquatic habitats are minimized.

In those instances where farmers decide to take actions to prevent contamination or upgrade their existing structural or management practices, DEM Agriculture and the USDA NRCS will work with farmers to identify the appropriate corrective strategies. Funding to implement best management practices may then be available through the NRCS Environmental Quality Incentives Program (EQIP) or other assistance programs. EQIP is a voluntary program that provides financial and technical assistance to farmers to help plan and implement conservation practices that address natural resource concerns. Farmers that apply through the EQIP may be eligible for cost share assistance on projects built in accordance with the NRCS standards. Since the adoption of the 2008 USDA Farm Bill, 1189 EQIP contracts have been awarded in RI. In addition, NRCS has dedicated 5% of the EQIP funds for projects in priority watersheds chosen jointly with DEM under the joint EPA/USDA National Water Quality Initiative (NWQI) to work with farmers to implement approved strategies to improve water quality.

DEM Office of Water Resources has been partnering with the RI Office of NRCS on the National Water Quality Initiative in 3 priority watersheds – Upper East Passage, Sakonnet River and the Tomaquag Brook- Pawcatuck River. NRCS is preparing the NWQI required Watershed Assessments for these priority watersheds. These assessments must meet specific criteria, and they will be a valuable addition in the development of a Section 319 Watershed Plan described earlier. Pursuant to the NWQI, DEM staff have conducted extensive monitoring of waters in the Upper East Passage and Sakonnet River over the past few years to identify potential impacts to water quality from agricultural activities. The Eastern RI Conservation District has contributed to this effort to identify and reach out to the farmers and encourage them to apply for EQIP funds. Under the NWQI Program, 304 core practices have been funded and implemented as of July 2019 under EQIP for water quality improvements.

The DEM Division of Agriculture is responsible for enforcing pesticide state laws and regulations developed to prevent environmental degradation that might result from improper use of pesticides on farms, in yards, and inside homes. Through this program, commercial pesticide applicators are trained, tested, and licensed to achieve a minimum level of competence in the pesticide application industry. Anyone who applies pesticides on land not owned by themselves or their employers must have a commercial pesticide applicator's license to apply general use pesticides. Farmers and farm workers who apply restricted use and state limited use pesticides to produce an agricultural commodity need to have a private applicator's license. Pesticides that are applied by a licensed applicator on farms, yards and in homes in accordance with the EPA approved label directions are considered protective of environmental quality, and such application is not reviewed by DEM. (Note: However, applications to surface waters for control of aquatic nuisance species are reviewed by DEM.)

For the five-year planning period, the DEM NPS Program will focus on working with partners to facilitate implementation of watershed projects and conservation practices on Aquidneck Island and other priority watersheds, developing standards for agricultural practices to minimize adverse effects on water resources and the aquatic environment, and continued water quality monitoring pursuant to the NWQI.

E. Lawn and Grounds Management

Pollutants: Nutrients, pesticides
Primary Partners: Municipalities, NGOs
Key point:

- Educating homeowners on proper turf management is the primary strategy to minimize water quality impacts.

The care and maintenance of residential lawns and gardens, and other landscaped areas such as golf courses, cemeteries, athletic fields, and parks, can contribute to water quality degradation. Turf is often referred to as the largest "crop" in the United States. It is a major feature of all but the highest density urban landscapes, and how it is managed impacts water quality. Excessive amounts and poor timing of applications of fertilizers and pesticides can result in losses to the environment via leaching to groundwater or stormwater runoff.

Proper turf management depends on the use of the turf. Athletic fields, golf courses and other heavily used grassed areas, are managed much differently than residential lawns. There is no single maintenance approach that is applicable to all turf areas whether due to type of use or the site's soil characteristics. Turf at high intensity use areas (athletic fields, golf courses, etc.) are usually professionally managed and represent a small fraction of the overall turf area compared to home lawns. Most homeowners are not aware of the appropriate best management practices to reduce the impacts to water quality in managing their lawns.

Many states, including five in the New England/New York region have enacted state laws to minimize pollution from the overuse and misuse of fertilizer on turf grass. RI does not have a state law to address fertilizer use. Furthermore, local government actions to address fertilizer use have been limited to resolutions, ordinances requiring the use of sustainable vegetation and placing conditions on permit approvals. However, the town of Charlestown has established a Voluntary Recommended Landscaper Process. Landscapers and local retailers who sign onto the program have agreed to follow the town's landscaping and fertilizer process to reduce nitrogen use. These companies are listed on the town's website. The New England Interstate Water Pollution Control Commission worked with the New England states and New York in producing a report with detailed guidelines for turf management ("Regional Clean Water Guidelines for Fertilization of Urban Turf "(2014)) that will be a useful tool in promoting appropriate management strategies.

Strategies for managing fertilizer and pesticide use on turf are focused on education and training. The URI Cooperative Extension Program, including the Master Gardener Program, and other associations have produced public information and provided on–site training and education on proper lawn management. The intent has been for RI residents, landscaping companies, turf managers for golf courses and athletic fields, and garden centers to be aware of and to implement the appropriate strategies to reduce water quality impacts from lawn care activities. The DEM Office of Customer and Technical Assistance has developed a green certification program for turf management with certification available for municipalities, landscaping companies, golf courses and higher education facilities (athletic fields). This is a volunteer program for those municipalities and businesses that want to improve their management of fertilizers, pesticides and water use.

As noted above in the discussion of Agriculture, the DEM Division of Agriculture is responsible for enforcing pesticide state laws and regulations to prevent environmental degradation that might result from improper use of pesticides. Commercial pesticide applicators are trained, tested, and licensed to achieve a minimum level of competence in the pesticide application industry. Anyone who applies pesticides on other people's property must have a commercial pesticide applicator's license. There is no review or oversight of the pesticide application itself.

Lawn watering is the primary use of our water resources in the summer – the time when water levels in streams and groundwater are at their lowest. This water use stresses public supplies, jeopardizing public safety (water for fire suppression) and the resulting low stream flows have devastating effects on stream ecology (see Section V.E. Water Withdrawals). The most effective way to minimize water quality impacts associated with lawn care is simply to minimize lawn area. To the extent that some landscaping is desired, minimum maintenance/minimum disturbance and xeriscaping strategies (the use of plant materials that require low moisture and/or nutrient requirements) should be pursued.

With regard to both residential and non-residential turf management, problems can also originate from storage and disposal practices. Chemicals can leak from hoses and containers, either accidently or because of carelessness or negligence.

For the five-year planning period, DEM will ensure that educational materials are available and distributed as widely as possible. DEM will also continue implementation of the green certification program for turf management.

F. Pet Waste

Pollutants: pathogens, nutrients
Primary Partners: Municipalities, NGOs
Key Point:

- Pet owners must act responsibly to control pet waste.

One of the most common sources of bacteria and other pathogens, as well as nutrients in stormwater is pet waste, primarily dog waste, although other backyard pets (horses, goats, etc.,) can cause localized problems. Dog waste in urban and suburban areas left on the sidewalk, or on grass near the street, can be washed into stormwater drainage systems by runoff. It has been estimated that for a small bay watershed (up to 20 square miles), 2 to 3 days of droppings from a population of 100 dogs contribute enough bacteria to temporarily close a bay to swimming and shellfishing (USEPA website). Dog waste can harbor a host of different bacteria, parasites and viruses that can cause human illness and disease. One gram of dog waste contains 23 million fecal coliform bacteria, almost twice as much as human waste (RIDEM 2010)**.** In Rhode Island, there are approximately 200,000 dogs and it is generally estimated that dogs produce one–half pound of feces per dog per day (RIDEM 2011)**,** which means that approximately 100,000 pounds of dog waste is generated per day in RI.

All of our waters, particularly those identified as impaired for bacteria, can benefit from better control of pet waste. Management of pet waste is clearly the pet owner's responsibility, but only about 60% of dog owners pick up after their pets (Center for Watershed Protection). Proper disposal of pet waste can be accomplished by flushing, burying, or sealing it in bags and putting it in the trash. Efforts by local governments to control pet waste to minimize water quality degradation in RI include ordinances requiring pet owners to pick up the waste, signage, and the installation of pet waste stations.

For the five-year planning period, DEM will have educational materials available and distribute as widely as possible and support local efforts to reduce pet waste.

G. Contaminants of Emerging Concern

Pollutants: multiple chemicals
Primary Partners: RIDOH, URI
Key Point:

- Thousands of chemicals are routinely released to the environment with little understanding of their environmental and public health impacts.

Large numbers of chemical compounds are constantly being introduced into production systems and consumer products without adequate knowledge of the health and environmental impacts. Only a small subset of the vast number of chemicals in use are monitored in our water resources as part of a federal or state program. It is generally due to research projects or when a problem occurs that our society takes notice and a chemical (or group of chemicals) becomes an emerging concern that needs to be addressed from a public health and environmental perspective.

Nonpoint sources of contaminants of emerging concern into RI's waters are primarily OWTS and stormwater. However, they may also originate from non-OWTS wastewater discharges to groundwater, animal feeding areas and land application of biosolids and manure.

These contaminants of emerging concern do not have public health/drinking water or environmental standards to use to respond to instances where they are discovered. In the absence of standards, the RI DOH takes the lead in establishing health-based standards. In addition, there will likely be a need for ambient water quality standards for some of these contaminants, in which case DEM will be the lead state agency. DEM and DOH will have to keep abreast of information from other states and EPA and be prepared to update RI's standards accordingly.

One large class of emerging contaminants has actually been a concern for quite some time now is per and polyfluoralkyl substances (PFAS). PFAS are a class of chemicals that are widely used in a variety of products and applications including non-stick cookware, upholstered furniture, clothing, food packaging, and firefighting foam. EPA has adopted a health advisory for two of the thousands of PFAS chemicals – perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS).

Although PFOA and PFOS are no longer produced in the United States they remain in the environment due to their persistence and use in outdated products. Current areas of concern regarding PFAS are determining a national maximum contaminant level in drinking water for PFOA and PFOS, identifying the health effects and potential drinking water standards for some of the 1000's of other PFAS compounds in use, and determining ambient PFAS surface water quality standards and guidelines. RI DEM established a groundwater quality standard for PFOA and PFOS in 2017 at 70 ppt (individually and total), which is consistent with the federal health advisory. These determinations will drive future efforts to regulate and remediate those facilities that may have or may be using or disposing of PFAS including numerous types of commercial and industrial operations, airports, fire training academies, landfills and other waste disposal facilities. The RI DOH has sampled public water supply wells that were determined to be potentially at risk for PFAS based on nearby land uses. One public water system was found with PFAS concentrations exceeding the federal health advisory. Actions are being taken to connect

this system to another public water system. The suspected source of this contamination is a groundwater discharge via a stormwater system at a nearby fire station.

Pharmaceuticals and personal care products (PPCPs) comprise a diverse and vast group of chemicals including, but not limited to, prescription and over-the-counter human drugs, veterinary drugs, diagnostic agents, nutritional supplements and vitamins, and other consumer products such as antibacterial soaps, fragrances, cosmetics, and sun-screen agents. PPCPs are being detected in groundwater and surface water of the Northeast at very low concentrations. Currently there are no US EPA/state ambient water quality criteria, water quality standards, or drinking water standards for most of the PPCPs. The presence of these chemicals in waterbodies has been linked to impacts on aquatic species, including changes in fish sex ratios, development of female fish characteristics in male fish, changes in nesting behavior by fish, and adverse effects on invertebrates. At this time, many unknowns remain regarding the potential for adverse effects on public health and the environment.

Recent efforts to control PPCPs in our environment have focused on proper disposal of unused drugs by encouraging the public not to flush these drugs into the sewer systems or into onsite wastewater treatment systems and by promoting use of drug disposal designated locations (e.g., police stations). However, most of the drugs that enter the environment do so as a result of human excretion of the unmetabolized drug and their breakdown products.

Perchlorate and 1,4-dioxane are two additional unregulated chemicals that have been found in groundwater and surface water in RI and nationally for many years. These chemicals will likely continue to be a concern potentially warranting the establishment of a drinking water and/or groundwater quality standard.

Expecting wastewater treatment systems to treat our waters to remove these chemicals and materials (and those yet to be determined) is unrealistic. The long-term solution is to consider the environmental and public health consequences of drugs and other chemicals/materials (and their degradation by-products) when the formulations are being developed (a process referred to as "green chemistry").

For the five-year planning period, the NPS Program will focus on updating and establishing appropriate PFAS water quality standards and taking actions to reduce NPS sources of these compounds.

H. Other Sources of Nonpoint Pollution

Although the following sources of nonpoint pollution may be significant contributors of pollutants in localized areas, they are not expected to be a focus of the DEM NPS Program over this five-year planning period. Note however that all of these sources of nonpoint pollution are being addressed to some degree by DEM and other State Programs.

H1. Boating and Marinas

Pollutants: Pathogens, nutrients, petroleum waste, chemicals
Primary Partners: CRMC, Municipalities, US Fish and Wildlife, RI Marine Trades Association
Key points:

- Boating is a major recreational activity and economic generator in RI. There were over 39,000 boats of varying lengths registered in RI in 2018.
- RI's No Discharge Area designation must be enforced and adequately supported by well-maintained pump-out facilities.
- RI's Clean Marina Program provides a unique opportunity to minimize marina impacts

No Discharge Program/Pump-outs

The primary water quality concern from boating is the illegal discharge of sanitary waste (pathogens and nutrients). Under the federal Clean Water Act, it is illegal to discharge untreated (raw) sewage from a vessel within 3 miles of shore, including all of Narragansett Bay. In 1998, Rhode Island became the first state in the country to receive the US Environmental Protection Agency's No Discharge Area designation for all of its marine waters. A No Discharge Area is a designated body of water in which the discharge of untreated *and* treated boat sewage is prohibited (this does not include greywater or sink water).

To maintain the No Discharge Area designation for the state's marine waters, DEM must assure that there are pump-out facilities available to RI boaters and that the pump-out facility infrastructure is in sound operating condition. DEM has spent the last 20 years building a statewide network of pump-out facilities with the goal to maintain the system of pump-out facilities and respond to the need for new land-based and mobile pump-out systems. As of 2018, 63 marine sanitation pump-out facilities were operating in RI waters – 48 dockside pump-out facilities and 15 pump-out boats. From 1994 to 2018 DEM has awarded 110 grants to towns and private marinas totaling $2,138,209 in federal funds for the development and maintenance of pump-out facilities. The grants averaged approximately $15,000 each with approximately 71% of the funds for new facilities and 29% for facility maintenance. DEM received $270,000 under the Clean Vessel Act grant program in FY 2019.

There are approximately 7,960 boats in RI that are likely to have an on-board marine sanitation device using the federal Clean Vessel Act Pump-Out Guidance percentage factors, which are based on boat length. In addition, it is estimated that there are an additional 5,000 out-of-state vessels on peak boating use periods that would need a pump-out facility, resulting in a total of approximately 12,960 boats potentially needing a pump-out facility. This results in a ratio of 206 boats for every pump-out facility, which far exceeds the Clean Vessel Act Guidance of 300:1. Although the guidance ratio is met, there is a continual need for increased pump-out facilities in RI due to mechanical failures, peak usage periods, and location of facilities in order to ensure that these facilities are convenient, operational and accessible to boaters.

This public-private partnership has successfully reduced a significant source of pathogen contamination to the state's coastal waters. During the 2017 season, 585,773 gallons of wastewater was collected from the pump-out facilities. From 2000 to 2017, the Pump-Out Program has prevented 9,414,324 gallons of untreated wastewater from being discharged into RI's waters.

In 2007, the RI No Discharge Law (RIGL 46-12-39.1) went into effect requiring all boats with permanently installed marine toilets to be inspected and certified that they have taken the steps necessary to prevent overboard discharges of sewage when operating or moored in Rhode Island waters. All boats subject to the program must obtain and display a no discharge certificate decal valid for four years issued by a DEM–authorized certification agent (typically a harbor master or marina/boatyard staff).

Marinas

Although marinas are not one of the leading sources of water pollution, just their location on the water's edge means that there is always the potential to release pollutants directly into the water, causing a localized impact on water quality. There are 260 facilities in RI's tidal waters that meet the CRMC definition of a marina, which includes yacht clubs and any dock or facility that can accommodate 5 or more boats (CRMC database). Water quality concerns from marinas include vessel maintenance, handling of petroleum products, and sewage (see above regarding pump-outs) and stormwater management. Boats require a great deal of maintenance over the course of a year: engines must be tuned and lubricated; hulls must be washed, sanded and painted; and vessels must be prepped to withstand the cold of winter. Each of these tasks—along with a myriad of other vessel maintenance activities—has the potential to release pollutants onto land and into the water and air.

The RI Clean Marina Program was developed by CRMC, DEM, Rhode Island Marine Trades Association, and Save the Bay in 2007 to support and encourage the efforts of marina owners to better manage their facilities to prevent water pollution. This is a voluntary, incentive–based program designed to recognize and promote environmentally responsible marinas, boatyards, and yacht clubs that employ water quality best management strategies to prevent pollution and conserve resources. The State developed the RI Clean Marina Guidebook to aid marina operators in their efforts to obtain a Clean Marina designation. While all marina facilities need to be at a minimum compliant with any federal and state regulatory issues to receive a Clean Marina designation, it is the implementation of BMPs for the issue areas present at a marina beyond the minimum requirements that earns the designation.

The Program encourages cooperation between marinas, the boating public and the state's regulatory agencies. In fact, the final recommendation for a marina to receive the Clean Marina designation comes from a review delegation consisting of CRMC, DEM and a representative of the Rhode Island Marine Trades Association. As of January 2019, only 5 marinas in Rhode Island have been designated as Clean Marinas. Marinas that participate in the Clean Marina Program are recognized for their environmental stewardship and once certified as a Clean

Marina facility can expect positive publicity and will likely attract new, environmentally responsible boaters.

H2. Waterfowl

Pollutants: pathogens and nutrients
Primary Partners: Municipalities, NGOs
Key point:

- A sustainable statewide strategy is necessary for waterfowl management to mitigate impacts to water quality.

Despite the public appeal of feeding the ducks, most people don't realize that ducks and geese can significantly contribute to water pollution. Feeding of waterfowl and suburban development with large lawns and open land for waterfowl to land and congregate, especially near waterbodies, can result in dramatic and unnaturally high concentrations of waterfowl in some locations.

Recent concern has focused on the large numbers of resident Canada geese. As reported by the Southern RI Conservation District, a single Canada goose can eat up to 4 pounds of grass and produce up to 2 pounds of fecal waste a day. Whether by direct deposition into the water or via transport by stormwater, the bacteria and nutrients in their waste can end up in our waterbodies. Although most people find a few geese acceptable, problems develop as local flocks grow and their droppings become excessive.

Canada goose populations in Rhode Island can be broken into two broad groups: migratory and resident. Migratory Canada goose populations are not considered to be a problem in Rhode Island since they do not nest locally and experience significant hunting pressure across much of their migratory routes. However, resident Canada goose populations have increased greatly over the last 50 years in southern New England.

Efforts to control waterfowl to minimize water quality degradation that have been attempted in RI include:

- Education on the negative impacts of feeding waterfowl;
- Stopping the public from feeding waterfowl (signs, local ordinances);
- Modifying habitat. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shore makes the habitat less desirable to geese; and
- Controlling goose populations with hunting and nest disruption.

H3. Dredging and Dredge Material Management

Pollutants: sediment, metals, toxic chemicals
Primary Partners: CRMC, Army Corps of Engineers
Key point:

- Dredged material must be properly managed at both the location of its removal and its final use or disposal.
- RI strongly encourages the beneficial use of dredged material.

In a state with significant boating and shipping sectors, dredging of our waterways is vital to maintain navigational access to harbors and marinas. Sediment from natural sedimentation patterns and that which is carried off the landscape by stormwater is deposited in our waterways and builds up to levels that impede ship and boat traffic. Due to RI's long industrial history, sediments from urbanized rivers and coastal waters targeted for removal may contain a variety of pollutants, such as metals and hydrocarbons.

Permitting is required for dredging since it can impact water quality and aquatic habitat at both the point of material removal and the subsequent location of its in-water disposal, if this option is chosen. The impacts to the aquatic environment are similar at both steps:

- Suspended sediment that is deposited can impact marine life, such as submerged aquatic vegetation and fish larvae;
- Loss of marine life from the location of dredging; and
- Loss of bottom habitat in the area being dredged and at the place of disposal.

The upland disposal of dredged material also has potential impacts, primarily the infiltration to groundwater of contaminants in the sediment, including chlorides.

DEM and CRMC administer the "Rules and Regulations for Dredging and the Management of Dredged Material" to ensure that dredging in the marine environment and management of the associated dredged material is conducted in a manner which is protective of groundwater and surface water quality. The material to be dredged must be analyzed in order to ensure that the use or disposal of the dredged material will not impact water quality. RI strongly encourages the beneficial use of dredged material for brownfields redevelopment, beach nourishment, landscaping, habitat restoration and/or creation, construction projects, landfill cover and other useful purposes.

Dredging projects in the northern half of the state mainly use the Confined Aquatic Disposal cells located in the upper Providence River. These sediments are typically contaminated, but the cells are required to be capped with clean material. These cells have limited capacity. New CAD cells will be developed as part of the Army Corps of Engineers maintenance dredging of the Providence River shipping channel.

Dredging projects in the southern half of the state will typically dispose of sediments as beach nourishment. Some marinas will reuse material on-site. Dredging also occurs in the coastal ponds and breachways. Coastal storms wash away beaches and transport sediment into the ponds and breachways. In several cases, this coastal pond/breachway dredged material has been

deposited on nearby salt marshes as a thin layer in an effort to build up the marshes to combat sea level rise. Dredge projects where the sediment does not meet beach nourishment criteria can dispose of the material at a federally designated offshore regional disposal site in Rhode Island Sound known as 69B, provided the material meets Army Corps of Engineers suitability determination criteria.

H4. Land Application of Wastewater Treatment Facility Biosolids

Pollutants: nutrients, pathogens, metals
Primary Partners: Municipalities, Treatment Plant Operators
Key point:

- The threat to water quality from the land application of biosolids is equivalent to that from any other fertilizer or soil amendment.

All aspects of sewage sludge management in RI – generation, treatment, transport, disposal, land application, incineration – must comply with DEM's "Rules and Regulations for Sewage Sludge Management." Most of the sludge generated at RI's wastewater treatment facilities is disposed of by incineration (~90%). The DEM Rules also allow for land disposal of sludge (burial) and land application of untreated sludge. However, neither of those methods are utilized in RI, and they are not likely to be used given siting and permitting restrictions and economic considerations.

DEM's sewage sludge Rules allow for the beneficial use of treated sludge by means of land applying biosolids to provide nutrients and soil conditioning properties for growing crops, silviculture, and establishing vegetative cover for reclamation sites. Currently in RI only Class A Biosolids are applied to land as fertilizer or as a soil amendment. Class A Biosolids is sludge that has been treated by a method such as composting to reduce pathogens and meet standards for metals and pathogens. The product is safe for application to food crops and areas for animal grazing without any requirement for DEM permits. In addition to Class A Biosolids generated in-state (primarily at the Bristol wastewater facility), some Class A biosolids come into the state from the Massachusetts Water Resource Authority's Boston wastewater treatment facility and in bags of Milorganite generated at the Milwaukee Metropolitan Sewage District. All Class A Biosolids products that are land-applied in RI must be registered with DEM's Office of Agriculture as a fertilizer or soil amendment.

The threat to water quality from the land application of biosolids in RI is similar to that of any other application of fertilizer or manure where improper application could cause water quality impairments. The DEM rules for sludge management provide the means for preventing impacts to water quality.

H5. Surface Mining

Pollutants: sediments
Primary Partners: Municipalities

Key point:

- Protecting water quality from material excavation operations requires proper site planning and compliance with erosion control standards.

Surface mining activities in Rhode Island are generally limited to sand and gravel operations and stone quarrying/rock crushing operations, of which there are approximately 15-20 facilities regularly operating in RI. The primary water quality concern from these operations is deposition of sediments in nearby surface waters and wetlands from improperly managed sites and poorly reclaimed former sites. Sedimentation is exacerbated by a failure to establish adequate buffers prior to commencing operations, by not limiting the areas of disturbance or failing to maintain erosion and sedimentation controls. Any washing or other type of processing conducted on-site adds to the water quality concerns associated with mining operations. In addition, the process of removing material decreases the depth to the water table from the surface, in some cases exposing the water table, thus increasing the vulnerability of the groundwater resource to spills or leaks from machinery operating in the excavation area.

Active sand and gravel mining and stone quarrying facilities must adhere to the conditions of the DEM "Multi-Sector General Permit for Stormwater Associated with Industrial Activity." This permit is administered by the DEM RI Pollutant Discharge Elimination Program, and it requires a plan to control stormwater. Many municipalities have earth removal ordinances that address these facilities and protect water quality by specifying operational and reclamation standards.

Abandoned or improperly restored mining pits pose additional problems. Sand and gravel operations are too often planned and carried out with little regard for post-production reclamation needs, such as regrading, restoring topsoil, and re-vegetating. Exposed sites that are not properly restored may continue to erode for many years. Abandoned mining pits have also tended to become a convenient location for illegal dumping and disposal of wastes.

H6. Former Solid Waste Landfills

Pollutants: toxic chemicals, metals, sediment
Primary Partners: Municipalities
Key Point:

- Some sites of former solid waste landfills have been closed over the years without the installation of practices necessary to minimize impacts to water quality.

For decades, solid waste was disposed of in community disposal sites that were not properly managed to prevent environmental impacts. These sites were each closed under standard practices in use at the time of closure. The conditions of closure and the environmental monitoring required at each of these sites vary considerably. Currently, only the town of Tiverton has an operational

municipal landfill. All other solid waste in RI is disposed of at the RI Resource Recovery Corporation Central Landfill in Johnston.

Former solid waste landfills contain a vast array of contaminants that have the potential to pollute groundwater and surface water. As precipitation seeps through the landfill, it collects contaminants produced by the waste materials. This leachate can move into groundwater and then to surface waters. In addition, soil erosion of the cover material on the fill side slopes can contribute sediment to nearby surface waters.

Closure of former landfills is overseen by the DEM Office of Waste Management, which administers state regulations governing the disposal of solid waste. Proper closure of these former solid waste landfills to minimize impacts to water resources typically involves:

- Installation of a suitable cap to minimize infiltration of precipitation;
- Stabilization of side slopes to prevent soil erosion and sedimentation; and
- As necessary, monitoring of groundwater and surface water quality.

H7. Silviculture

Pollutants: sediment
Primary Partners: NRCS, RIDOH, Water Suppliers
Key point:

- The utilization of BMPs and the generally small scale of activities limits the overall impacts of timber harvesting on water quality in RI.

While harvesting forest products can contribute to water quality degradation due to increases in soil erosion and sedimentation, the utilization of BMPs and the generally small scale of such activities limit the overall impacts to water quality in RI. With the exception of clearing for development (subject to stormwater permitting), the timber harvesting operations that take place in RI generally involve selective cutting in localized areas. Commercial woodcutting operations are regulated by DEM Division of Forest Environment, which requires that any harvester be registered with DEM, file a Notification of Intent to Cut, implement required BMPs to prevent impacts to water quality, and comply with the Freshwater Wetlands Program Rules. Strategies for protecting water quality during forest harvesting operations are outlined within the 2010 DEM report "RI Forest Resource Assessment and Strategies, A Plan to Tomorrow's Forests." Several water suppliers have significant forest resources in their watersheds, and it is important to ensure these forest resources are properly managed to protect the drinking water supply.

H8. Marine and Riverine Debris

Pollutants: solid waste
Primary Partners: NGOs, RIDOT, Municipalities
Key point:

- Debris in our waters is an often overlooked water quality issue best addressed through increased public awareness.

Styrofoam cups, plastic drinking water bottles, fishing line, cigarette butts floating in our waters and washed up on our beaches are not pleasant images of our "Ocean State." This debris is not just a visual litter or waste issue – is a water quality issue. Trash in our waters can:

- Injure swimmers and beachgoers;
- Kill and injure wildlife: many species accidentally ingest trash, mistaking it for food. Abandoned fishing nets and gear, discarded fishing line and other forms of debris can entangle marine wildlife – sea turtles, sea birds, and fish;
- Threaten tourism and recreation, and the dollars they add to local economies by limiting people's enjoyment of beach and water–related activities;
- Complicate shipping and transportation by causing navigational hazards; and
- Generate steep bills for retrieval and removal.

An estimated 90% of waterway debris comes from land-based sources (NOAA 1999) – blown into the Bay or ocean or most commonly washed off our streets and into our waters via storm drains. Debris also comes from recreational and commercial boaters. Coastal clean-ups have been coordinated in RI by NGOs, including but not limited to RI Audubon Society, Save The Bay and Clean Ocean Access for many years, often as part of national annual coastal clean-ups. Multiple sponsors, including DEM, have contributed to this effort.

The Ocean Conservancy's 2017 International Coastal Cleanup Rhode Island Report compiled by Save the Bay reported that 156,537 pieces of trash (16,484 pounds) were collected along 65 miles of RI shoreline. The primary items collected in descending order by number collected: cigarette butts, plastic pieces, glass pieces, food wrappers, foam pieces, and plastic bottle caps.

Plastic pollution has been a primary concern for many years as plastic production continues to increase and more plastic material ends up in our waterways. However, visible plastics represent only part of the plastic problem in our waters. More recently, studies are documenting the impacts of microplastic pollution. Microplastics are usually defined as pieces of plastic <5 mm in any dimension. The primary source of microplastics is the breakdown of larger pieces of plastic over time, however other sources include synthetic fibers from clothes washing, resin pellets, paints and as abrasives in consumer products. All sizes of plastics in the water will leach out potentially harmful additives and will adsorb many toxic chemicals that may be in the water. Given that microplastics are more likely to be ingested, these chemicals may then be transferred to aquatic life and potentially cause harm to such organisms.

Microbeads are one form of microplastic pollution that was banned for use in personal care products by federal law in 2015. Microbeads range in diameter from 50 microns (about half the thickness of a sheet of copy paper) to 500 microns. Continued efforts are necessary to reduce other sources of all plastic pollution.

Recent efforts in RI to address this issue include:

- Proposed state legislation for producer responsibility for packaging and statewide bans on use of plastic bags by retailers;
- Municipal bans (14 municipalities) on the use of plastic checkout bags by retailers;

- RI's state beaches are smoke-free;
- Efforts by government and NGO's for the collection and recycling of fishing line; and
- Grant funded initiatives to remove large pieces of debris in Narragansett Bay from docks and boats.

V. Other NPS Stressors

As noted in the initial discussion of "water quality," this plan is concerned with the protection and restoration of aquatic habitats from not just pollution sources but also from other types of stressors discussed in this section that are not directly associated with a specific source of pollution. EPA has included these stressors within the broad interpretation of what constitutes nonpoint source pollution. This section will discuss these stressors and identify actions needed to protect, enhance and restore habitat conditions in support of aquatic life.

A. Climate Change

Stressor: Physical impacts of rising sea levels, rising water tables and changes in precipitation patterns.
Primary Partners: CRMC, RIDOT, EPA, FEMA, Municipalities, RIEMA, NGOs
Key Points:

- RI is experiencing the impacts of climate change and must adapt its management of NPS pollution sources and the impacts on aquatic habitat accordingly;
- Certain flood prevention and mitigation strategies have the co-benefit of improved water quality and aquatic habitat.

The effects of climate change will have an impact on many of the nonpoint pollution sources discussed in the previous section, particularly stormwater management and the functioning of OWTSs. Climate change is making these sources of pollution more difficult to manage and therefore resulting in a greater impact on water quality. For each type of threat to water quality and aquatic habitat in this Plan, the impacts of climate change have been discussed in that pollution source section, and where appropriate implementation actions have been included in the Implementation Tables.

In 2018, the state developed "Resilient Rhody: The Statewide Climate Resilience Action Strategy." In regards to nonpoint sources of pollution, "Resilient Rhody" includes a discussion of the effects of climate change on stormwater infrastructure, wastewater treatment facilities (including OWTS) and dams, and the strategy identifies recommended climate resilience actions. Those actions regarding nonpoint sources of pollution and impacts to aquatic habitat have been incorporated into this updated NPS Management Plan.

Climate change can have a variety of impacts on water quality, quantity, and aquatic ecosystems. Water resources are highly vulnerable to impacts from sea level rise, warming water

temperatures, changing precipitation patterns, greater stormwater runoff and flooding. These factors can result in major habitat changes and impacts on biodiversity.

Preservation and restoration of saltwater marshes, freshwater wetlands, riverine buffers and floodplains is a critical component of efforts to improve climate change resilience and mitigate the impacts of flooding. Efforts related to flood prevention and mitigation can be complementary to improving water quality and aquatic habitat, such as:

- GI/LID and the increased infiltration of stormwater;
- Protection and restoration of saltwater and freshwater wetlands and their buffers;
- Protection and restoration of riverine buffers; and
- Improving stream connectivity by reducing sub-standard stream crossings.

The complementary relationship between the NPS program and FEMA's programs should be coordinated wherever practical, particularly with regards to the co-benefits of GI and LID principles and practices. FEMA explicitly promotes incorporating GI methods (both natural restoration and structural practices) in mitigating flood and drought conditions in their Hazard Mitigation Assistance programs. FEMA additionally includes the value of ecosystem services, such as green infrastructure, in the required benefit cost analysis for determining eligible FEMA HMA funded mitigation projects. The National Flood Insurance Program Community Rating System recognizes community efforts to improve stormwater management (including GI, LID, watershed planning) by reducing flood insurance premiums for the community's property owners. Integrating GI and LID into hazard mitigation planning across the state broadens opportunities for using different funding sources and make efficient use of limited resources.

B. Alteration of Wetlands (Freshwater and Coastal) and Wetlland/Riverine Buffers

Stressor: Physical alteration
Primary Partners: CRMC, NRCS, NGOs
Key Points:

- DEM and CRMC programs need to continue to emphasize the avoidance and minimization of alterations to wetlands.
- Many parties are interested in improving processes to facilitate voluntary restoration actions.

Wetlands are generally those areas that are flooded or that have water at or near the surface of the ground for part of the growing season. Freshwater swamps, marshes, and bogs are some of the most commonly known wetland types. Coastal wetlands include salt marshes and contiguous brackish marshes and areas of associated open water.

In Rhode Island, most wetlands are hydrologically linked with surface waters including freshwater lakes, ponds, rivers, and streams or coastal waters. Wetlands function as a component of the larger hydrologic system through which water moves within a watershed. Preventing

degradation of wetlands due to nonpoint source pollution is important to sustaining healthy watersheds.

While historically there has been a significant loss of wetlands resources due to filling and other alterations, since the 1970s Rhode Island state law and policy has recognized the importance of protecting wetlands. DEM and CRMC administer permitting programs that regulate activities that may alter wetlands and their buffers and require that any alterations be avoided and minimized. The agencies have jurisdiction over vegetated wetlands, and flowing and standing surface waters, as well as specified upland buffers that surround them.

In 2013, the RI General Assembly established a Freshwater Wetlands Legislative Task Force and charged it with evaluating the adequacy of Rhode Island freshwater wetlands protection considering both state and local level, evaluating if gaps in that protection exist based on current scientific data and recommending changes in law or regulation that could foster a business climate to grow the economy while ensuring protection of our natural resources. The Task Force issued its Final Report in 2014 making recommendations to strengthen the protection of wetlands while also streamlining the duplicative permitting procedures among state and municipal government. Legislation to implement the Task Force recommendations was subsequently adopted in 2015. The new law acknowledged the important functions and values of freshwater wetlands, the need to strengthen wetland protection and the need to protect and regulate the area adjacent to wetlands. The law also recognized the benefits of having a single set of wetland protection standards administered at the state level. DEM and CRMC have been working on finalizing the revisions to the state's Freshwater Wetlands Rules to implement the new law. The agencies have engaged the public in review of the draft rules and will be pursing promulgation at the appropriate time in late 2019 or 2020.

Wetland condition is vulnerable to degradation from a number of anthropogenic stressors. In addition to the regulation of wetland alterations, effective management of wetland resources requires a multi–faceted strategy that includes both protection and restoration activities. DEM is integrating wetland protection and restoration into watershed-based planning efforts and Rhode Island is working towards a statewide wetland restoration strategy that will facilitate voluntary restoration activities. With respect to freshwater wetlands, areas of particular state interest include enhancing or restoring the functions and values of riparian wetlands and buffers and identifying and protecting wetlands of high ecological value. To facilitate voluntary restoration of wetlands, the DEM OWR formed the Water Quality and Wetland Restoration Team which provides permitting pre-application assistance to restoration project proponents.

Freshwater wetlands will be affected by climate change due to changes in hydrology. For example, the hydroperiod of vernal pools may shorten, affecting the breeding success of species dependent on this habitat, such as amphibians. Wetter or drier conditions due to changing weather patterns and precipitation frequency may also bring about shifts in freshwater wetland plant communities.

In the coastal zone, Rhode Island is focusing attention on the vulnerability of salt marshes as one of the most susceptible ecosystems to changing climatic conditions. Coastal wetlands provide critical nursery habitat for fisheries, play a role in absorbing nutrients to protect water quality and

absorb and mitigate storm surges. RI's salt marshes are currently at an increasing risk of widespread degradation and drowning due to increased inundation and storm events. A project completed by CRMC and partners in 2015 analyzed the potential impacts to coastal wetlands from sea level rise using the Sea Level Affecting Marshes Model and estimated 13% loss of salt marsh acreage in 21 coastal communities with 1 foot of sea level rise. Notably, the project also identified freshwater wetlands likely to be lost due to inundation or conversion to coastal wetlands. Under the same 1-foot sea level rise, the loss of 203.8 acres of freshwater wetlands was projected. CRMC and partners are carrying out projects aimed at mitigating the impacts of sea level rise on salt marshes including a technique known as thin layer deposition. Further adaptation planning is needed to foster resiliency in the coastal areas which are already experiencing impacts from climate change.

Wetland habitats are also valued within the Rhode Island State Wildlife Action Plan being developed by the RIDEM Division of Fish and Wildlife in collaboration with a wide number of partners. As part of the planning process, the threats affecting fish and wildlife species and habitats are being analyzed. Among the threats are activities related to NPS pollution. Additionally, the plan will recommend conservation actions to alleviate those threats, presenting an opportunity to partner with the NPS program. To support the conservation objectives of the Wildlife Action Plan, DEM has retained a contract employee who is tasked with conducting outreach and providing technical assistance to municipalities and others regarding habitat and wildlife issues. This initiative provides an opportunity to expand outreach efforts on certain topics related to nonpoint source management, e.g., waterfowl management.

Under the Wetlands Reserve Easement Program, NRCS provides technical and financial assistance directly to private landowners and Indian tribes to restore, protect, and enhance wetlands through the purchase of a wetlands easement. NRCS will pay 100% of the easement value for permanent easements and the costs for surveying and recording. Additionally, NRCS will pay between 75-100% of the restoration costs.

Over the five-year planning period, DEM will initially be focusing on efforts to effectively implement the new rules which establish buffer standards. As supported with EPA funding, DEM will continue work to improve the rigor and utility of its monitoring program by building out a condition gradient for freshwater wetlands and assessing additional saltmarshes. DEM will be targeting the integration of wetland protection and restoration actions with other NPS management activities via watershed planning and implementation of those plans.

C. Aquatic Invasive Species

Stressor: Physical alteration of aquatic habitat due to excessive plant growth by invasive species
Primary Partners: Lake Associations, NGOs
Key Points:

- Rhode Island lacks an organized lake management program.
- Local entities lack capacity to carry out management, and current levels of available state technical and financial assistance are inadequate to meet local needs.

Rhode Island waters have been degraded by the establishment of aquatic invasive species (AIS). One hundred freshwater lakes and ponds contain one or more macrophyte aquatic invasive plants which in many cases have degraded habitat conditions and impaired recreational uses. Wetlands and brackish water areas also often exhibit invasive plants; e.g., phragmites. In freshwaters, effective management of AIS often involves NPS pollution control activities.

To guide more effective management of aquatic invasive species, Rhode Island developed a statewide management plan that outlines actions to prevent, control and mitigate the impacts of AIS in Rhode Island waters (RIDEM 2012). This plan notes the need for establishment of a lake management program and an expanded level of technical and financial assistance targeted at protecting and improving conditions in lakes and ponds. RIDEM believes stewardship of lake resources should be achieved through lake management plans that reflect actions needed to mitigate and manage existing AIS infestations and promote good water quality through management of pollution sources. For lakes outside urbanized (i.e., sewered) areas, these plans directly address nonpoint sources of pollution, in particular phosphorus, that can promote plant growth in fresh water systems. Through the NPS Program, DEM will be supporting development of lake management plans that will also serve as watershed-based plans.

DEM carries out limited activities on a seasonal basis to address AIS. Certain lakes and ponds are inspected each summer, and DEM will investigate new complaints concerning aquatic plants as part of tracking their occurrence in the state. Technical assistance and limited management support are provided to lake associations and municipalities as resources allow. For example, DEM is collaborating with the City of Central Falls to plan abatement of a major infestation of water chestnut in Valley Falls Pond. Maps and information on each of the AIS detected in RI waters has been posted in the DEM website along with guidance on management of aquatic invasive plants.

D. Barriers to Stream Connectivity

Stressor: Physical alterations in riverine ecosystems that limit access to aquatic habitat
Primary Partners: NOAA, US Fish and Wildlife, NRCS, NGOs, Municipalities, FEMA
Key Point:

- Dams and sub-standard stream crossings pose an impediment to the full functioning of riverine ecosystems.

Rhode Island's development over the last two hundred years resulted in the alteration of rivers and streams throughout the state. Dams of varying size were constructed on all larger rivers and many of the smaller streams in RI. Many of these dams no longer serve a useful purpose. Not as dramatic as a dam, but as equally disruptive for some riverine species, are sub–standard stream crossings that are characterized by constricted or inadequate flow, perched culverts, blocked crossings or crossings in disrepair. These barriers to stream connectivity prevent the free movement of aquatic life up and down a river system. The result is fragmented aquatic habitat, potential impacts on water quality and an increase potential for flooding. These hydromodications to rivers and streams are therefore considered a NPS stressor on aquatic ecosystems.

There is growing recognition that restoration of stream connectivity is important to enhance the functioning of RI's riverine ecosystems. The DEM Division of Fish and Wildlife implements a program to restore access to anadromous fish habitat through either the construction of fish passages or removal of barriers. Major fish passage projects, including dam removals, have been completed with the help of multiple partners on the Pawcatuck, Blackstone, Ten Mile, Pawtuxet and Woonasquatucket Rivers. With implementation of certain projects continuing, the DEM is partnering with the Narragansett Bay Estuary Program to update the Anadromous Fish Restoration Strategy on a statewide basis.

Stream crossings were addressed by the RI Resource Conservation and Development Council and the Natural Resources Conservation Service Stream Continuity Project between 2006 and 2013. Of the 4,374 identified stream crossings in RI, over 1200 were assessed in different watersheds for this project, and 69 of these were found to have severe or significant barriers (RIRC&D 2013). DEM and partners will continue to advocate for resources to assess stream continuity, identify sub-standard crossings and implement improvements.

Changes in storm frequency and increased intensity of individual storms due to climate change will increase the potential for these barriers to stream continuity to cause inland flooding. This represents another opportunity to align efforts seeking to address improvements in aquatic habitat with the need to decrease flooding.

E. Water Withdrawals

Stressor: Physical alteration associated with water withdrawals
Primary Partners: RI Water Resources Board, Municipalities, Water Suppliers, NRCS
Key Point:

- Statewide groundwater demand doubles during the low flow period when there is less water available; this increase is due in large part to agriculture and lawn watering.

Withdrawals of water from certain streams or adjacent aquifers can severely impact the quantity and quality of stream water available during low flow periods. Impacts to the aquatic habitat occur due to loss of riverbed area covered by water, receding wetlands, loss of vernal pools and inadequate baseflow and in-stream water depth for a healthy, reproducing natural fish population. Additionally, lower flows increase pollutant concentrations downstream of dischargers and where discharge limits are based on certain flow assumptions, the limits may no longer prove protective. The impacts of water withdrawal are going to be exacerbated by climate change, which is going to cause an increase in water supply demand due to temperature increases, longer growing seasons, and potentially longer dry periods.

Rhode Island does not have a separate permitting system to regulate water withdrawals. Conditions may be placed on new projects involving withdrawals subject to the state freshwater wetlands rules or the water quality regulations. The RI Water Resources Board has been designated as the overall authority to devise a fair and equitable allocation of water resources among users to ensure that long range considerations of water supply prevail over short term

considerations by prioritizing water withdrawals. To support this and other activities, the Water Resources Board's strategic plan reflects the continued efforts needed to develop water availability estimates and improve water resource management.

DEM has developed a watershed-based approach for reviewing water withdrawal requests and the Water Resources Board has incorporated this approach into their assessments of water availability. The Stream Flow Depletion Methodology presumes a withdrawal done consistent with the methodology will maintain stream flows that are protective of aquatic ecosystems during varying hydroperiods including the low flow period. This approach identifies those watersheds or portions of watersheds where adequate stream flows will support additional withdrawals as well as those which have constraints to further withdrawals. Analysis of current conditions indicates that the Chipuxet River, Hunt River, and Annaquatucket River watersheds are the primary water supply basins where peak demand routinely exceeds the available supply necessary to avoid adverse impacts to water quality.

The primary strategies for suppliers, farmers and other users of large water volumes to reduce water use is to increase the efficiency of water use, reduce water loss, and consider water reuse. Another strategy to mitigate impacts of water withdrawal is to increase the amount of recharge to the subsurface that will supply groundwater wells and streams in dry periods. Recharge can be increased by infiltrating as much stormwater in a watershed as practicable and by considering other opportunities such as aquifer storage and recovery.

VI. Implementation

A. Resources for Implementation

Many sources of funding are utilized to implement NPS management in Rhode Island. At the state level, the DEM NPS Program is supported with federal Clean Water Act Section 319 program funding through a mechanism known as the Performance Partnership Agreement (PPA) and associated Performance Partnership Grant (PPG) which is executed between DEM and EPA. The program funds several fulltime staff as well as water quality monitoring activities. EPA also provides other funds to DEM to support the water quality assessment program, the TMDL program and additional water quality activities relied upon by the NPS program.

On an annual basis, the total financial needs to complete the actions in this plan to control nonpoint sources of pollution and to protect and restore aquatic habitats far exceeds the amount that is available. Increased resources are needed to build local capacity and deliver technical assistance to communities and NGOs; to increase enforcement of regulatory programs; and to support technical enhancements to share data and information between partners. Multiple programs supporting NPS activities in this plan across state government utilize state funds, and these programs (e.g., freshwater wetlands, stormwater management, enforcement, technical assistance) all need to be strengthened by additional resources and staff. DEM will continue to seek resources to build capacity in the areas necessary to implement this Plan.

The NPS Program aims to strike an appropriate balance between activities to proactively protect water resources from NPS threats and activities to abate NPS pollution. Reflecting past guidance, over the past five years, the DEM NPS Program placed greater emphasis on restoration activities including investment in the development and implementation of TMDLs. With the changes in national guidance for FY14 and forward, DEM is pursuing watershed planning in a manner that gives renewed attention to protection activities including the integration of water quality and habitat protection activities within a watershed. Given the extent of urbanization in RI, it has proven impractical to segregate watersheds based on need for protection versus restoration at the scale at which watershed planning occurs. Rather, DEM believes a mix of both types of activities will be necessary to achieve water quality goals in all watersheds in RI. Accordingly, over time DEM is aiming for an equitable allocation of resources to protection and restoration activities within the federally funded DEM NPS Program.

Implementation of the NPS Management Plan involves the staff efforts of governmental agencies as well as investments made through various grants, loan programs, NGO and private contributions. One objective of strengthened watershed planning is to prioritize and better align available resources from the federal, state and local levels to accelerate implementation of needed actions.

A1. Sources of Funding to Support Implementation Projects

Clean Water Act (CWA) Section 319 Grants: DEM administers a competitive grant program that makes available federal EPA PPG (CWA Section 319 project funds) for implementation of actions to prevent or abate NPS pollutions and stressors. Consistent with federal guidance, DEM-OWR currently directs the project funds, which constitute 50% of the total 319 allocation to Rhode Island, to implementation activities that are negotiated annually via the PPA-PPG process. Watershed project proposals are solicited via a RFP process. Given the amount of funding available annually, DEM plans to issue an RFP every two years. The funds distributed as grants for watershed projects generally require project match of 40% and project completion within a 1-3 year time period. To incentivize local watershed projects, DEM has a policy that may allow a lower match amount (25%) upon justification. This flexibility is allowed only when the overall match available to the NPS program from all sources allows DEM to meet the statutory program match requirement (40%) under CWA Section 319 via its Performance Partnership Grant (PPG) with EPA. A quality assurance program plan (RIDEM 2019) is in place that describes the process used to manage NPS Management grants.

RI Infrastructure Bank: The RI Infrastructure Bank administers the following Programs that support NPS project implementation. The Bank can also play a critical role on some reimbursable grant implementation projects where grantees do not have the up-front funds necessary (referred to as "bridge loans"). The RI Infrastructure Bank has established a Stormwater Project Accelerator program that offers upfront capital for green stormwater infrastructure projects that will eventually be funded through reimbursable state or federal grants.

Community Septic System Loan Program (CSSLP) – As discussed in the Section on OWTS (Section IV.B1.), 18 towns in RI have adopted DEM approved onsite wastewater management plans to encourage or require maintenance activities such as system inspections

or pumping of septic tanks. These plans make the towns eligible for a financial assistance program managed by the RI Infrastructure Bank referred to as the Community Septic System Loan Program. The program allows eligible towns to access funds from the Clean Water State Revolving Fund for low interest loans to homeowners for OWTS repairs. As of July 1, 2014, 39 loans have been issued to 14 towns over the past 15 years totaling $10,900,000.

Clean Water State Revolving Fund Loan Program--available to governmental entities for NPS watershed projects. Between 1990 and 2013, the program had issued over $1 billion in loans with the majority allocated to wastewater projects including upgrades to treatment works and abatement of combined sewer overflows. Many of the actions to implement the NPS Management Plan and the Narragansett Bay Comprehensive Conservation and Management Plan are eligible for SRF funding. In RI, the SRF loan program has also been used for NPS watershed projects including land acquisition for water quality protection, landfill closures and green infrastructure practices to protect bathing beaches. Recent changes to federal legislation (Water Infrastructure Finance and Innovation Act) may open up additional opportunities for financing NPS pollution abatement.

Sewer Tie-In Loan Fund Program – Modeled after the CSSLP, the RI Infrastructure Bank also administers a program that allows sewer system owners to access funds for low interest loans to homeowners to connect their residences into the local sewer system and abandon their OWTS.

State Narragansett Bay and Watershed Restoration Fund: DEM administers a competitive state grant program that provides financial assistance to eligible entities primarily for implementation of projects that restore water quality associated with NPS pollution, including all types of stormwater discharges as well as aquatic habitat. Established in 2006, the fund is supported by state bond funds approved periodically by RI voters. In 2014, the fund was expanded to include a category for flood prevention projects that utilize approaches that provide environmental quality co-benefits. In 2017 DEM awarded $3,784,800 under the Stormwater and Nonpoint Source Pollution Sub-Fund for projects to construct stormwater pollution abatement BMPs and enhance capacity for stormwater management. Grantees are required to provide matching contributions to projects (25-50%) and complete projects within a 1-3 year time period. Future grant rounds will be contingent on a renewal of funding for this program. As of 2019, the BWRF was largely allocated and any future solicitation for projects will require new funding.

Southeast New England Program (SNEP): The Southeast New England Program region consists of coastal areas in Massachusetts and Rhode Island including Cape Cod, Narragansett Bay and Buzzards Bay. This EPA program includes government and non-government organizations all of whom are currently working collaboratively and innovatively to maintain and improve water quality and habitat conditions within these coastal watersheds. SNEP works to address complex issues at the ecosystem level, use existing resources more efficiently, find synergies and leveraging opportunities across multiple agencies and organizations, and increase the likelihood of developing sustainable solutions. The program has provided over $20 million in grants and assistance to the region including a variety of projects that benefit RI communities

and their waters. It continues to be an important source of funding for work to protect and restore water quality and habitats in the RI.

NRCS Grant Programs: As discussed in Section IV. D. Agriculture, funding to implement best management practices is available through the NRCS Environmental Quality Incentives Program (EQIP) or other assistance programs. EQIP is a voluntary program that provides financial and technical assistance to farmers to help plan and implement conservation practices that address natural resource concerns. Farmers that apply through the EQIP may be eligible for cost share assistance on projects built in accordance with the NRCS standards. Since the adoption of the 2008 USDA Farm Bill, 1189 EQIP contracts have been awarded in RI. In addition, NRCS has dedicated 5% of the EQIP funds for projects in priority watersheds chosen jointly with DEM under the joint EPA/USDA National Water Quality Initiative to work with farmers to implement approved strategies to improve water quality.

Marina Pump-out Grants: DEM administers an ongoing financial assistance program that supports the installation, repair and upgrade of pump out facilities that service boats in Rhode Island's estuarine waters. Pursuant to the Clean Vessel Act, the program directs federal funds from the Sport Fish Restoration and Boating Trust Fund, provided to DEM by the United States Fish and Wildlife Service for this purpose. An average of $150,000-$200,000 has been made available annually**.**

Narragansett Bay Estuary Program: The NBEP has offered grants for targeted purposes and acted as a conduit for certain SNEP funding from EPA. Its small grant programs in recent years have focused on building capacity and supporting project planning, applied research on bay and watershed topics and implementation of small projects. SNEP has also funded larger projects involving nutrients, stormwater and habitat topics among others.

Coastal Habitat Restoration Program: Pursuant to state law, CRMC administers a state grant program capped at $250,000 per year that provides grants to support planning and implementation of coastal habitat projects including the restoration of anadromous fish passage.

State General Revenues: The DEM annual budget includes state funding that supports the two positions that oversee the DEM NPS Program, the staff of the OWTS and Freshwater Wetlands regulatory programs and limited operating expenses. General revenue funds have not been available for distribution as grants in the Office of Water Resources.

Municipal Funding: Local governments devote resources to implementation of this Management Program Plan in a number of ways. Chief among them are staffing and operational expenses to administer local programs and matching funds for watershed projects that address NPS pollution. The total expended annually varies considerably due to number and scale of projects.

Watershed Organizations and Nongovernmental Organizations: While capacity varies, NGOs often provide funding or in–kind services in support of monitoring, outreach and education and the planning, design and execution of NPS watershed projects.

A2. The Challenge of Building Local Capacity

In addition to their primary role in regulating land use, many municipalities bear significant responsibility for managing wastewater and stormwater infrastructure. This places a significant burden on the local governments to have the necessary expertise and resources to manage these tasks effectively. Among the legal, technical and fiscal obstacles to abating stormwater pollution, a major constraint is the lack of a reliable funding source for this work. DEM has been able to utilize certain state bond funds and limited federal funds to provide matching grants to municipalities and other entities for projects that abate pollution associated with stormwater runoff, but the funding availability has been variable rather than stable. In order to address local funding shortfalls, DEM, working with partners such as the Narragansett Bay Estuary Program and EPA's Environmental Finance Centers, has supported the exploration of establishing sustainable local and regional funding sources, through mechanisms such as a stormwater enterprise fund or utility district. Under these models, a stormwater utility fee is based on the demand placed on the municipal stormwater system by each user, not on a property's assessed value, with the fee usually determined by the amount of runoff the user contributes to the system. A stormwater utility provides a means for:

- Consolidating or coordinating responsibilities that were previously dispersed among several departments and divisions;
- Generating funding that is adequate, stable, equitable and dedicated solely to managing stormwater including needed retrofitting to improve treatment; and
- Developing stormwater management programs that are comprehensive, cohesive and consistent year-to-year.

In addition to municipalities, building capacity of non-governmental organizations (including conservation districts and watershed/lake organizations) has also been identified as a resource need. These organizations vary in their capacity and are seeking access to greater technical and financial assistance in order to carry out projects. Due to its own constraints, the state has limited capacity to directly assist local organizations in the planning and management of watershed projects. With partners, DEM is continuing to explore options for supporting the strengthening of these organizations.

B. Implementation Tables

Note: Not all actions listed are supported by Clean Water Act Section 319 funds. The projects listed represent an integration of programs with DEM and between DEM and other entities.

> ***As described earlier, preventing NPS pollution and protecting and restoring water quality and aquatic habitat involves many partners. This table focuses on DEM policies and actions, unless otherwise noted. These are the actions and milestones that DEM will be accountable for in NPS Program annual reporting to EPA.***

AN = As Necessary; TBD = To Be Determined

B1. Overarching Management Strategies

Policies and Actions	Milestones	2020	2021	2022	2023	2024
Data Management						
Policy: *From Management Principles:* Integrated, well supported data management systems are essential for water resource protection and restoration program management.						
A. Design new data management systems to support OWTS, Wetlands, and Groundwater Discharge/UIC permitting. Complete evaluation of options and select approach. Develop and test software application. (*Subject to availability of additional funding.)*	a. Selection of new database solution. b. New database application for OWTS, Wetlands, Water Quality Certification, and Groundwater Discharge/ UIC permitting.	X		X		

Policies and Actions	Milestones	2020	2021	2022	2023	2024
B. Transition from existing system to new data system including migration of data. *(Subject to availability of additional funding.)*	Data migration to new system complete.			X		
C. Develop data systems to improve tracking of water quality restoration projects, including installed BMPs.	Updated application to track water quality restoration actions.		X			
Coordination						
Policy: *From Management Principles:* A collaborative effort is necessary across all governmental jurisdictions, agencies, programs and partners to ensure success in protecting and restoring RI's water resources.						
A. Host, in collaboration with RI Rivers Council, an annual meeting of watershed groups to facilitate program planning, coordinate activities and share experiences in water quality protection and restoration.	a. Annual meeting b.Identify follow-up actions.	1 X	1 X	1 X	1 X	1 X
B. Support activities of the RI Rivers Council as member of the Council.	a. Attend regular meetings of the RI Rivers Council. b. Report on specific DEM activities undertaken to support the RI Rivers Council. c. Designate watershed councils for Aquidneck Island, Hunt River, Saugatucket River, and the Tiverton/Little Compton area.	11 X	11 X	11 X	11 X	11 X X

Policies and Actions	Milestones	2020	2021	2022	2023	2024
C. Support collaboration on state policy through formal and informal interagency coordination mechanisms.	Report on inter-agency state policy initiatives or actions pertaining to NPS pollution. Topics expected to be addressed inlcude: Freshwater Wetlands management, harmful algal blooms, hazard mitigation planning, monitoring and PFAS	X	X	X	X	X
D. Ensure that the State Building Code is consistent with DEM Rules for water resources protection.	Review of state building code for consistency with DEM Rules.				X	
E. Administer State funded financial assistance programs to assist watershed protection and restoration actions (as resources allow).	Report on state grant awards for NPS implementation promoting projects that provide multiple benefits and implement green infrastructure.	X	X	X	X	X
F. Manage the Section 319 funds in collaboration with partners (See also Section VII.B. NPS Program Evaluation)	NPS Annual Report	X	X	X	X	X
Outreach						
Policy: *From Management Principles:* Rhode Island citizens are informed and aware of water quality management priorities and efforts to protect and restore water quality and aquatic habitat, as well as actions they can take to protect and restore our water resources						
A. Increase general public understanding of water resources, watershed management issues, and actions individuals can take to protect and restore water quality and aquatic habitat.	a. Outreach activities participated in by DEM. b. Report on tools (including social media) used and products created (website materials, brochures, fact sheets,	5 X	5 X	5 X	5 X	5 X

Policies and Actions	Milestones	2020	2021	2022	2023	2024
	etc.) by DEM and partners to increase public understanding.					
B. Maintain Watersheds Listserve of upcoming webinars, talks and information on watershed and water quality science and management.	Postings on the Watersheds Listserve.	25	25	25	25	25

B2. Monitoring, Assessment and Planning

Policies and Actions	Milestones	2020	2021	2022	2023	2024
Water Quality Monitoring						
Policy: Monitoring is an essential component of NPS management to determine priorities and management actions.						
A. As resources allow, implement the DEM Water Quality Monitoring Strategy to collect data needed to support assessment of water quality and aquatic habitat conditions and to identify NPS pollution sources.	a. Stations on wadeable rivers and streams monitored as part of the Ambient River Monitoring Program.	50	50	50	50	50
	b. Coastal and East Bay stream monitoring.	X				
	c. Wood-Pawcatuck River Basin monitoring		X			
	d. Pawtuxet River Basin monitoring			X		
	e. Blackstone, Woonasquatucket, Moshassuck River Basin monitoring				X	
	f. Lakes monitored via annual agreement to support volunteer based monitoring.	50	50	50	50	50
	i. Number of locations targeted monitoring is conducted to document changes due to NPS.	1-3	1-3	1-3	1-3	1-3
	j. Shoreline surveys for shellfishing areas conducted.	2	2	2	2	2
	k. Waterbodies sampled for cyanobacteria.	20	20	20	20	20

Policies and Actions	Milestones	2020	2021	2022	2023	2024
B. Improve ease of access to water quality and other monitoring data.	Data reports and spreadsheets posted on DEM website.	X	X	X	X	X
C. Document refined strategies to monitor the condition of wetlands – freshwater (DEM) and coastal (NBNERR/CRMC). *(Note: Implementation contingent on future availability of funding.)*	Updated monitoring strategies for wetlands.		X			
Water Quality Assessment						
Policy 1): Maintain updated surface water and groundwater quality standards.						
A. Update the DEM Water Quality Rules and the DEM Groundwater Quality Rules and related policies.	a. Updated rules and policies.	AN	AN	AN	AN	AN
Policy 2): Periodically assess water quality data to identify causes of impairments and provide information to help characterize NPS pollution.						
A. Contribute data and information to preparation of the biennial Integrated Water Quality Monitoring and Assessment Report.	a. Content on NPS Program and NPS pollution developed for inclusion into the Integrated Water Quality Monitoring and Assessment Report. b. Content on hydromodification and other nonpoint stressors on wetland and aquatic habitat developed for inclusion into the Integrated Water Quality Monitoring and Assessment Report.	X	X X		X X	
B. Evaluate DOH public well data as an indicator of ambient groundwater quality in RI.	Evaluation of DOH public well data.		X		X	

Policies and Actions	Milestones	2020	2021	2022	2023	2024
C. Seek public input on water quality assessment results reported via the Integrated Report process. Includes a comment period and public workshop	Public workshop	1		1		1
D. Utilize statewide water quality assessment results to refine prioritization of watersheds/waters. Prioritization will take into account evolving implementation of national guidance regarding the TMDL Program Vision.	Updated list of targeted watersheds/waters.		X		X	
E. Continue to develop and apply assessment tools to characterize the condition of wetlands. *(Subject to availability of additional funding.)*	Report on characterization of wetland resources.	X	X		X	
Water Quality and Aquatic Habitat Planning						
Policy: Watershed plans articulate the priority actions needed to protect and restore water quality and aquatic habitats.						
A. Develop watershed plans through the process of public engagement and outreach.	Completed watershed plans.	3	3	2	2	2
B. Develop watershed focused webpage with specific information about each of RI's watersheds.	a. Watershed webpage established. b. Maintain updated watershed webpage	X X	X	X	X	X
C. Develop water quality restoration plans for waters known or presumed to be impaired in whole or part by pollutants from nonpoint sources. These plans provide the technical basis for needed water quality restoration actions for specific pollutants.	Completed TMDLs for waters impaired in part or whole by NPS pollution.	2	TBD	TBD	TBD	TBD

Policies and Actions	Milestones	2020	2021	2022	2023	2024
D. Review and comment on local comprehensive plans, water supply system management plans and other water quality related plans in support of watershed planning.	Water-related plans reviewed.	5	5	5	5	5
D. Promote development of lake management plans and, as resources allow, provide technical or financial support for lake management plan development.	Completed lake management plans.	2	3	1	1	1
E. DEM Participate in updates of relevant State Guide Plan Elements to ensure consistency with this NPS Management Plan.	Review and comment on updates to State Guide Plan, particularly the Land Use Plan.	X	X	X	X	X

B.3 Pollution Source Management – Priority NPS Sources

Policies and Actions	Milestones	2020	2021	2022	2023	2024
Stormwater Runoff DEM priorities for next 5 years: - Update the Stormwater Rules and Guidance - Advance implementation of LID site planning and design - Establish sustainable financing mechanisms						
Policy 1): Improve state management strategies to protect RI's water resources from impacts of stormwater runoff.						
A. Implement the Stormwater Management, Design and Installation Rules	Report on permitting activities and issues that have arisen.	X	X	X	X	X
B. Update the Stormwater Management, Design and Installation Rules.	a. Meetings with stakeholder groups b. Updated Stormwater Rules. c. Updated Stormwater Guidance Manual.	3	2 X X			
C. Review and update the RI Stormwater Management Guidance for Individual Single-Family Residential Lot Development.	Updated Guidance.		X			
D. Update the Soil Erosion and Sediment Control Handbook.	Updated Soil Erosion and Sediment Control Handbook.			X		
E. Establish and implement an improved process for approving new technologies for stormwater management.	a. Improved process for approving new stormwater management technologies.		X			

Policies and Actions	Milestones	2020	2021	2022	2023	2024
	b. Number of new stormwater technologies approved.		2	2	2	2
F. Evaluate and approve methodologies for determining stormwater load reductions from the use of non-structural BMPs (e.g., buffers) to mitigate the impacts of stormwater.	Methodology for determining stormwater load reductions from non-structural BMPs	X				
G. Maintain the Stormwater listserve for distributing information on rules and policies as well as public information.	Postings on the Stormwater listserve.	25	25	25	25	25
Policy 2): Use low impact development planning and design techniques and associated BMPs as the primary method of stormwater management to maintain and restore pre-development hydrology.						
A. Improve coordination with the municipalities on permit reviews in order to improve project design by incorporating LID strategies.	a. DEM internal process for consistent response to municipal requests for comment at the Master Plan stage of development.	X				
	b. Municipal requests for comments responded to.	5	5	5	5	5
	c. Adopt requirements in Rule for municipal Master Plan approval prior to submission to DEM for freshwater wetlands applications.	X				
	d. Evaluate of other opportunities to require local approval prior to submission to DEM for review of permit applications.			X		

Policies and Actions	Milestones	2020	2021	2022	2023	2024
B. Increase the level of required LID strategies in municipal development review ordinances.	a. Work with municipalities to complete the LID assessment checklist. Promote its use and results with support of NGOs.	X	X	X	X	X
	b. LID assessment checklist is required for MS4 reporting by communities (contingent upon issuance of the new MS4 permit).		X			
	c. Municipal ordinances amended to improve on LID.			1	2	2
	d. Actions taken to support to individual community efforts to adopt LID strategies, as resources allow.	5	5	5	5	5
C. Participate in the RI Green Infrastructure Coalition to foster implementation of green infrastructure for stormwater management.	a. DEM staff attend meetings of the Green Infrastructure Coalition.	3	3	3	3	3
	b. Report on initiatives involving DEM. Identify actions to support broader GI approaches, including highlighting GI in RFPs for grant funds.	X	X	X	X	X
Policy 3): Manage stormwater from significant areas of existing impervious surface on public and private property through increased water quality treatment and improved maintenance.						
A. Evaluate strategies to improve maintenance of existing public and private stormwater BMPs.	On-going process to identify strategies and incentives to improve maintenance of existing BMPs.	X	X	X	X	X

Policies and Actions	Milestones	2020	2021	2022	2023	2024
B. Improve management of stormwater from existing development on public and private property as opportunities arise; typically done through grants, loans, demonstration projects.	Report on financial assistance and regulatory and non-regulatory efforts.	X	X	X	X	X
C. DOT compliance with Consent Agreement to prepare stormwater control plans and construct BMPs to treat stormwater that has caused water quality impairments.	Report from DOT on implementation of requirements pursuant to the Consent Agreement.		X		X	
D. Improve stormwater BMP maintenance by better enforcement of state and local permit conditions.	a. Report on number of sites required to undertake maintenance. b. Inspections of state and federally funded BMPs.	X 10	X 10	X 10	X 10	X 10
Policy 4): Support the development of dedicated and sustainable funding mechanisms that are needed to effectively manage and maintain local and regional stormwater programs.						
A. Provide financial and technical assistance to municipalities to establish sustainable funding mechanisms, such as stormwater utilities.	Report on efforts to establish sustainable funding mechanisms.	X	X	X	X	X
Policy 5): Track implementation of stormwater management.						
A. Develop and implement a process to improve tracking of public investment in stormwater management. Phase 1 will involve tracking state and federal expenditures; with local expenditures considered in Phase 2.	a. Improved process for tracking public investment in stormwater management. Phase 1 Phase 2 b. Report on public investment in stormwater management.		 X	 X X	 X	 X

Policies and Actions	Milestones	2020	2021	2022	2023	2024
B. Develop and implement a strategy to document BMPs installed and for tracking areas of impervious cover that are receiving stormwater treatment, including a distinction between new and existing impervious cover. Will involve eventual changes to data management systems.	a. Develop strategy. b. Implement strategy in a demonstration watershed. c. Automation of tracking via data system improvements.			X	X	X
Policy 6): Stormwater management programs adapt to effects of climate change.						
A. Target existing stormwater BMPs that are subject to impacts from climate change for retrofit as opportunities arise.	Report on efforts at retrofitting vulnerable stormwater infrastructure.		X		X	
B. Modify the statewide stormwater management design standards to reflect impacts of climate change.	Updated stormwater management design standards.		X			
Onsite Wastewater Treatment Systems (OWTS) and Other Groundwater Discharges DEM priorities for next 5 years: - Eliminating cesspools - Improved maintenance oversight of alternative and advanced OWTS - Improved tracking and compliance of large systems - Eliminating unauthorized groundwater discharges in areas dependent on groundwater for drinking water						
Policy 1): Ensure proper siting, design, and construction of onsite wastewater management systems to protect groundwater and surface water quality and public health.						
A. Implement OWTS Rules.	Report on permitting activities	X	X	X	X	X
B. Periodically evaluate the effectiveness of the OWTS Rules and revise rules as necessary.	a. Revised Rules to be consistent with revisions to the Freshwater Wetlands Rules.	X				

Policies and Actions	Milestones	2020	2021	2022	2023	2024
	b. Other Rule changes as necessary.		X	AN	AN	AN
C. In coordination with URI, provide sufficient training opportunities to meet the continuing education needs of OWTS design and installation professionals.	Number of trainings.	20	20	20	20	20
D. Evaluate DEM licensed OWTS professionals	Analysis of licensee performance, e.g., evaluation of quality of submittals.					X
E. Coordinate meetings of the OWTS Technical Review Committee.	Technical Review Committee meetings.	2	2	2	2	2
F. Evaluate/improve the DEM process for approving new OWTS technologies.	a. Identify current gaps in the approval process and report on changes made. b. Updated rules and procedures. c. Technologies approved.	X AN 2	 AN 2	 AN 2	 AN 2	 AN 2
G. Continue implementation of denitrification requirements in the Salt Pond and Narrow River critical resource areas.	Denitrification systems installed.	175	175	175	175	175
H. As water quality data becomes available indicating elevated levels of nitrogen in surface water bodies and/or groundwater, evaluate the need for OWTS additional denitrification requirements in these areas.	a) Completed assessment of denitrification needs. b) Revised rules for expanded areas requiring denitrification, as necessary.		X AN		X AN	
I. Assess the need for OWTS design standards (i.e., treatment performance, structural resiliency) to be modified in response to the effects of climate change.	a. Recommendations on need to modify OWTS Rules due to climate change. b. Adopt rule changes, if necessary.		X	 X		

Policies and Actions	Milestones	2020	2021	2022	2023	2024
J. Maintain the OWTS listserve for distributing information on rules and policies as well as public information.	Postings on the OWTS listserve.	25	25	25	25	25
Policy 2): Ensure that OWTS are properly operated and maintained, with particular emphasis on alternative treatment systems.						
A. Work with the TRC to develop standards and processes to ensure improved operation and maintenance of alternative treatment OWTS (e.g., performance monitoring).	a. Initiate this targeted effort. b. Report on efforts to improve alternative system operation and maintenance.		X X	 X	 X	 X
B. Improve performance and permit compliance for large systems.	a. Revised permit approval conditions/standards for large systems. b. Revised procedures for submittal and review of large system performance data. c. Establish renewal requirements for all large systems (including existing permitted systems).		X X		 X	
C. Develop a strategy for addressing high strength wastewater discharges.	Strategy to address high strength wastewater discharges.			X		
D. Review the role of local governments in OWTS management and in the CSSLP.	a. Report on strategies/options for local governments to improve OWTS management and the policy changes that are made if necessary. b. Town by town summary of OWTS management.		 X	X		 X

Policies and Actions	Milestones	2020	2021	2022	2023	2024
E. Manage the OWTS related components of the Portsmouth MOA to improve water quality in The Cove and Sakonnet River	Report on status of completed tasks specified in MOA.	X	X	X	X	X
F. Promote proper use of OWTSs through public outreach.	a. Updated outreach materials b. Report on outreach activities (see also OWTS listserve above).	X X	AN X	AN X	AN X	AN X
Policy 3): Improve coordination of wastewater management planning for OWTS and sewered areas.						
A. Ensure consistency between municipal/public sewer system facilities plans and local OWTS management plans.	Report on number of wastewater facilities plans reviewed for towns that also utilize OWTS	X	X	X	X	X
B. Incorporate Facilities Planning and OWTS planning into one Municipal Wastewater Management Plan.	Recommendations for preparing one Municipal Wastewater Management Plan					X
Policy 4): Eliminate use of cesspools.						
A. Continue enforcement of the 2007 Cesspool Phaseout Act requirements to remove cesspools within 200 feet of the shoreline, public wells and drinking water reservoirs. DEM Office of Water Resources to coordinate with the DEM Office of Compliance and Inspection on enforcement efforts, including prioritization of sites.	Report on progress removing cesspools that remain subject to the Act.	X	X	X	X	X
B. Develop and implement a strategy for expediting the elimination of large capacity cesspools as required by state and federal rules.	a. Strategy for removing large capacity cesspools. b. Number of large capacity cesspools replaced.		X 25	 25	 25	 25
C. Evaluate compliance with cesspool replacement point of sale requirements	a. Evaluation of current point of sale compliance.		X			

Policies and Actions	Milestones	2020	2021	2022	2023	2024
	b. Improved tracking methodology for point of sale compliance.			X		
D. Report the number of cesspools replaced statewide.	Number of cesspools replaced statewide.	400	400	400	400	400
Policy 7): Groundwater discharges (non-OWTS) are properly designed, sited, constructed and monitored to protect groundwater quality and public health.						
A. Implement the Groundwater Discharge Rules for permitting, monitoring and closure of groundwater discharges with focus on facilities located in areas dependent on groundwater for water supply. Periodically review rules for needed changes.	a. Report on Rule revisions and policy determinations. b. Unauthorized non-stormwater discharges that are permitted or closed.	X 5	X 5	X 5	X 5	X 5
B. Monitor permitted facilities to ensure that they meet permit conditions and standards.	Facility monitoring reports reviewed.	75	75	75	75	75
Road Salt and Sand Storage and Application DEM priorities for next 5 years: - Evaluate compliance with salt storage requirements - Assessment of road salt and sand application - Support the use of improved practices to reduce the need for salt and sand on State's roads.						
Policy: Minimize impacts to water resources from road salt and sand application on all roads, private paved areas and from product storage areas while maintaining public safety.						
A. Assess compliance with DEM Rules for covering salt piles.	Assessment/inventory of salt storage practices in RI.			X		

Policies and Actions	Milestones	2020	2021	2022	2023	2024
B. Assessment of current areas designated as reduced salt zones; and in cooperation with RI DOH, identify if necessary, additional areas that should be designated as reduced salt zones focusing on locations near drinking water sources and in watersheds of chloride impacted waters.	a. Inventory and assessment of practices in currently designated reduced salt zones. b. Designation of new reduced salt use zones.	X AN	 AN	 AN	 AN	 AN
C. Assess road salt/sand application practices by public entities.	Updated report on road salt/sand application.			X		
Agriculture DEM priorities for next 5 years: - Implement agricultural BMPs on Aquidneck Island - Develop required BMPs for agricultural activities - Monitor water quality pursuant to the National Water Quality Initiative						
Policy: Manage agricultural operations to protect groundwater and surface water quality.						
A. Investigate opportunities to encourage or require farmers to prepare Conservation Plans.						
B. Inspect farms with required Conservation Plans (e.g., farms enrolled in Farm, Forest, and Open Space Program) to ensure plan implementation and protection of water quality and aquatic habitat.	Report on Conservation Plan development and implementation.			X		
C. DEM and NRCS continue to collaborate on implementing the National Water Quality Initiative.	Report on DEM efforts pursuant to the NWQI.	X	X	X	X	X
D. Work with partners to encourage farmers to participate in NRCS cost–sharing programs.	Report on DEM efforts to support increased participation.	X	X	X	X	X
E. Adopt and implement required practices that assure adverse effects to the state's water resources from agricultural activities are minimized.	Rules adopted.		X			

Policies and Actions	Milestones	2020	2021	2022	2023	2024
F. Participate in NRCS Technical Team Meetings.	a. Technical Team meetings attended by DEM. b. Report on DEM activities collaborating with NRCS beyond NWQI.	3 X	3 X	3 X	3 X	3 X
G. Implement the Rules and Regulations Relating to Pesticides.	On-going required activity.	X	X	X	X	X
Lawn and Grounds Management DEM priorities for next 5 years: - Continue implementation of the green certification program for turf management - Distribute educational materials						
Policy: Prevent adverse water quality impacts from lawn care and turf management.						
A. Develop and distribute educational information on lawn and grounds management.	Report on DEM efforts to develop and distribute educational information.	X	X	X	X	X
B. Implement green certification programs for municipalities, golf courses, landscaping companies, and higher education facilities.	Report on number and type of facilities that have been awarded the Green Certification.	X	X	X	X	X
C. Improve turf management at DEM facilities to meet the green certification program criteria and minimize impacts to water quality.	a. Assessment of current turf management at DEM facilities for opportunities to demonstrate "green" practices. b. Report of efforts to improve turf management at DEM facilities		X		 X	

Policies and Actions	Milestones	2020	2021	2022	2023	2024
D. Inventory municipalities for municipal actions, ordinances and policies on proper lawn care to minimize impacts to water quality.	Inventory of municipal lawn care actions, ordinances and policies.		X			
Pet Waste DEM priorities for next 5 years: - Distribute educational materials - Support local efforts to reduce pet waste						
Policy: Reduce pollutants from pet waste in stormwater runoff.						
A. Provide outreach to: a) improve public understanding of the impact of pet waste on water quality, and b) support municipal efforts to adopt and enforce local ordinances addressing pet waste.	Report on DEM efforts to develop and distribute educational information.	X	X	X	X	X
B. State and town public facilities adopt strategies for controlling pet waste, such as, specially designated dog parks, provision of pet waste stations (plastic bags and receptacles).	Inventory of municipal pet waste actions, ordinances and policies.		X			
Contaminants of Emerging Concern DEM priorities for next 5 years: - Updating groundwater standards and establishing surface water quality standards for PFAS compounds - Reducing the NPS sources of PFAS compounds						
Policy: Prevent impacts to water quality from contaminants of emerging concern.						
A. Inform the public on the proper disposal of PPCPs.	Updated website materials on PPCPs.	X	X	X	X	X

Policies and Actions	Milestones	2020	2021	2022	2023	2024
B. Attend DEM-DOH PFAS Advisory Committee meetings	PFAS Advisory Committee meetings.	3	3	AN	AN	AN
C. Establish surface water quality standards for PFAS.	PFAS surface water quality standards.		X			
D. Update PFAS groundwater quality standards as necessary.	Updated groundwater quality standards.	AN	AN	AN	AN	AN
E. Establish state drinking water/groundwater and surface water quality standards for currently unregulated contaminants as determined necessary.	Updated drinking water and water quality standards.	AN	AN	AN	AN	AN

B.4 Pollution Source Management – Other NPS Sources

Although the following sources of nonpoint pollution may be significant contributors of pollutants in localized areas, they are not expected to be a focus of the DEM NPS Program's resources over this five-year plan period. To be more comprehensive, the actions to mitigate impact to water resources from these sources are listed below. There are programs being carried out by DEM and others that support implementing the actions below. However, for purposes of NPS reporting **no milestones** are specified.

Boating and Marinas
Policy: Ensure boating activity and marinas do not adversely impact water resources. A. Provide and maintain an adequate number of pump-out facilities in coastal waters. B. Oversee compliance with the No Discharge Area designation. C. Foster partnership with RI Marine Trades Association to educate, inform and encourage additional marina participation in the CRMC Clean Marina Program.
Waterfowl
Policy: Manage waterfowl populations in RI, particularly Canada geese, at appropriate numbers for the habitat to minimize their water quality impacts. A. Prepare a sustainable statewide strategy for waterfowl management. B. Discourage the feeding of ducks and other waterfowl, particularly in waters targeted as impacted by waterfowl in TMDLs. Municipalities adopt local ordinances to prohibit feeding. C. Increase public understanding of proper waterfront landscaping to deter geese. D. Support training of volunteers to assist in controlling goose populations, particularly in waters targeted as impacted by waterfowl in TMDLs.
Dredging and Dredge Material Management

Policy: Reduce water quality and aquatic habitat impacts of dredging at both the location of material removal and the location of its use or disposal in water or on land. A. Continue to implement, in coordination with CRMC, the "Rules and Regulations for Dredging and the Management of Dredged Material" and amend as necessary.
Land Application of Biosolids
Policy: Manage land application of biosolids to prevent water quality impacts. A. Continue to implement the DEM "Rules and Regulations for Sewage Sludge Management."
Surface Mining
Policy: Minimize adverse impacts to surface water and groundwaters from pollutants associated with resource extraction operations. A. Municipalities adopt local earth removal ordinances that include requirements for water resources protection and site reclamation. B. At active resource extraction sites, DEM continues to implement rules requiring facilities to comply with the DEM "Multi-Sector General Permit for Stormwater Associated with Industrial Activity."
Former Solid Waste Landfills
Policy: Minimize impacts to groundwater and surface water resources from former solid waste landfills. A. Ensure complete and proper closure of former solid waste landfills.
Silviculture
Policy: Protect water quality during forest harvesting operations. A. Continue to provide a coordinated review of timber–harvesting operations involving wetlands. B. Implement strategies for protecting water quality during forest harvesting operations within the "Rhode Island Forest Resources Management Plan", State Guide Plan Element 161, and "RI Forest Resource Assessment and Strategies, A Plan to Tomorrow's Forests."

Marine and Riverine Debris
Policy: Decrease the amount of human generated debris in RI waters. A. Increase public understanding of marine debris sources and issues in order to reduce marine debris in RI. B. Support increased participation in coastal and riverine clean-ups. C. Advocate for source reduction strategies (e.g., producer responsibility for packaging, state and local bag bans) for items most often found in the marine environment.

B5. Other NPS Stressors

Policies and Actions	Milestones	2020	2021	2022	2023	2024
Climate Change ***See also climate change policies and actions under specific pollution sources in the Tables above.***						
Policy 1): Water quality and aquatic habitat management strategies adapt to mitigate the adverse impacts of a changing climate.						
A. Institute coordination meetings among DEM, CRMC and RIEMA to improve coordination with state and federal agencies addressing hazard mitigation. Report on any new coordination mechanisms among the agencies.	Annual coordination meeting	X	X	X	X	X
B. DEM staff attend RI Floodplain Manager's Association meetings/conferences	Report on coordination with RI Floodplain Manager's Association	X	X	X	X	X
Alteration of Wetlands and Wetland Buffers						
Policy 1): Avoid and minimize alterations and losses of wetlands and their buffers to protect the functions and values they provide.						
A. Implement the Freshwater and Coastal wetland regulatory programs.	Report on acres of authorized loss of wetlands.	X	X	X	X	X
B. Revise Freshwater Wetlands Rules as required by state legislation including establishing buffer standards to strengthen resource protection.	Revised Freshwater Wetlands Rules.	X				
C. Revise Freshwater Wetlands Rules to reduce regulatory burdens for low impact mission aligned projects.			X			

Policies and Actions	Milestones	2020	2021	2022	2023	2024
D. Provide technical assistance and guidance to applicants to promote project designs that avoid and minimize impacts on wetlands.	Update or generate new guidance materials including fact sheets, guidance manuals. Report on distribution of materials to towns, consultants and others	X	X	X	X	X
E. Identify and assess inland riparian buffer conditions; with a priority on small headwater streams and their riparian buffers.	Completed analysis of riparian buffer conditions for specific watersheds.		1	2	2	2
Policy 2): Facilitate restoration of the quality and quantity of wetlands and their buffers.						
A. Complete development of statewide freshwater wetland restoration strategy that incorporates actions to mitigate NPS pollution including hydromodification of wetlands.	Freshwater wetlands restoration strategy.		X			
B. Complete projects to assess effectiveness of salt marsh adaptation strategies. Subject to availability of funding.	Completed saltmarsh demonstration project.	X				
C. Improve tracking of wetland and aquatic habitat restoration projects.	Updated inventory of active and completed restoration projects.		X		X	
D. Provide technical assistance to proponents of voluntary restoration projects via the Water Quality and Wetlands Restoration Team.	Number of projects reviewed.	X	X	X	X	X
Aquatic Invasive Species (AIS)						
Policy 1): Prevent the introduction and establishment of aquatic invasive species.						
A. Expand targeted outreach to educate water users about AIS and measures that should be taken to prevent their spread; e.g., boat hygiene.	Report on outreach and education activities.	X	X	X	X	X
B. Continue surveillance for AIS and refine rapid response protocols.	a. Number of locations inspected for AIS.	15	15	15	15	15

Policies and Actions	Milestones	2020	2021	2022	2023	2024
	b. Refined rapid response protocols.	X				
Policy 2): Control the spread of AIS and minimize their harmful effects in RI waters.						
A. Establish a lake management program in DEM. *(Subject to availability of funding.)*	Report on status of establishing a DEM Lake Management Program. a) Seek legislation b) Establish program – subject to new resources being available.		X	X	X	X
B. Coordinate manual removal of water chestnut in targeted waters.	Number of lakes with DEM coordinated removal activities.	4	4	4	4	4
C. Provide financial and technical assistance to local entities carrying out lake management. *(Subject to availability of funding.)*	Report on assistance provided.	3	3	3	3	3
D. Implement regulatory program for aquatic herbicide applications to control aquatic invasive species.	Applications reviewed for aquatic herbicide permits.	50	50	50	50	50
Barriers to Stream Connectivity						
Policy: Restore riverine ecosystem functioning through the removal of barriers to stream connectivity.						
A. Update the statewide strategy for anadromous fish restoration.	Updated strategy.				X	
B. Support efforts to conduct stream continuity assessments, identify substandard stream crossings and provide financial assistance to improve connectivity as resources allow.	Report on efforts to improve stream connectivity.	X	X	X	X	X

Policies and Actions	Milestones	2020	2021	2022	2023	2024
Water Withdrawal						
Policy: Manage water use and withdrawals based on water availability that considers hydrologic capacity and aquatic resources.						
A. In watersheds where demand does not exceed or threaten to exceed available water, ensure actions are taken to avoid possible future exceedances.	Apply the stream depletion method to review applications; number per year.	1-2	1-2	1-2	1-2	1-2
B. In watersheds where demand exceeds or threatens to exceed available water, employ various strategies to reduce demand and increase supply						
C. Apply the DEM Streamflow Depletion Methodology in agency water withdrawal decisions as applicable.						

VII. Evaluation

As noted earlier, the long-term goals of the RI NPS Management Program are to protect and restore the condition of Rhode Island's water resources affected by NPS pollution sources. Evaluation of progress toward these goals is an essential step in RI's overall water quality management framework. Management effectiveness is primarily evaluated by the assessment of water quality and aquatic habitat conditions over time. In addition, DEM and its partners continue to work toward the development of commonly used environmental indicators that serve to supplement water quality assessments results. Information garnered through evaluation will provide a basis for updating the Nonpoint Source Management Program Plan every five years to adapt to new scientific understanding of emerging issues and changes in water quality. In addition, the plan may be revised as needed to address changes resulting from legislation or budgetary actions that affect the availability of resources.

A. Measures of Progress

Implementation of the RI Water Monitoring Strategy, described in Section III.A1., provides a majority of the ambient water quality data necessary to evaluate success in preventing new impairments and restoring existing impaired waters. This data may be supplemented by targeted studies as needed and as resources allow. The periodic statewide assessment of water quality conditions for surface waters and groundwaters produces information which can be used to track progress toward water quality goals in individual waterbodies. For surface waters, if no new waterbodies, particularly those previously assessed as in acceptable condition, are added to the list of impaired waters, then Rhode Island has by one measure succeeded in meeting its prevention goal. Additional tracking of trends in water quality will be performed to determine if waterbodies of high quality conditions are experiencing degradation (decline in condition). A return to condition that complies with surface water quality criteria marks a success. However, as full restoration is often a very lengthy process, DEM is continuing to work toward indicators that will allow reporting of partial progress. Success in protecting groundwater resources will be evaluated in terms of the number of public wells that report exceedances of applicable drinking water standards that are associated with source water conditions. In addition to water quality assessment, DEM and its partners continue to work toward indicators of condition for freshwater wetlands and salt marshes. These will provide an additional means of characterizing the condition of this important component of a watershed once they are fully reviewed and adopted into agency policy and practice.

In addition to direct measures of water quality, the following table (Table 4) lists other indirect, but nonetheless valuable, environmental indicators that can be used to describe progress. These indicators can be used statewide and within particular watersheds as applicable. Certain measures can be evaluated annually while others would be better determined periodically (every two to five years).

Table 6. Measures of Progress

		Performance Measures	
NPS Category	**Pollutant/Stressor**	**Environmental**	**Programmatic**
• Onsite wastewater • Stormwater runoff from developed lands • Agriculture • Boating and Marinas • Pet Waste • Waterfowl • Land application of biosolids	Pathogens	Reduction in beach closure events Reduction in shellfish closures Reduction in surface waters impaired for recreation uses	Number of cesspools removed Progress in implementing local OWTS programs Progress toward implementing local LID ordinances Number of watershed projects implemented to address nonpoint sources of pathogens Number of marine pump-out facilities operating and volume of wastewater collected Number of manure management BMPs installed with NRCS funds Number of volunteers trained to control goose population
• Onsite wastewater • Stormwater runoff • Agriculture • Lawn and Grounds Management • Pet Waste • Boating and Marinas • Waterfowl • Land application of biosolids	Nutrients	Reduced number of confirmed cyanobacteria blooms Full and partial progress toward meeting water quality criteria Improved water clarity (lakes)	Progress in implementing local OWTS programs Number of denitrification OWTS installed Progress toward implementing local LID ordinances

		Performance Measures	
NPS Category	**Pollutant/Stressor**	**Environmental**	**Programmatic**
			Number of watershed projects implemented to address nonpoint sources of nutrients Number of nutrient management BMPs installed with NRCS funds. Number of green certifications issued for the turf management and golf course industries. Number of volunteers trained to control goose populations
• Stormwater runoff Agriculture • Dredging • Surface mining • Silviculture	Sediments	Reduction in aquatic life impairments associated with sedimentation	Number of watershed projects implemented to address nonpoint sources of sediments Progress toward implementing local LID ordinances Number of sediment management BMPs installed with NRCS funds.
• Groundwater discharges • Stormwater runoff from developed lands • Agriculture • Lawn and Grounds Management • Marinas • Dredge material management	Metals, toxics, Hydrocarbons, synthetic organics, pesticides	Reduction in number of public wells reporting detection of VOCs	Number of unauthorized groundwater discharges eliminated

		Performance Measures	
NPS Category	**Pollutant/Stressor**	**Environmental**	**Programmatic**
• Land application of biosolids			
• Road Salt and Sand Application	Salt and sand	Reduction in volume of salt and sand applied to RI state roads	Progress in reducing salt and sand application volumes
Alteration of wetlands	Physical alteration of habitat	Total acreage of authorized wetland loss Total acreage of wetland restored	Number of watershed projects implemented to improve wetland buffers or abate NPS pollution
Aquatic Invasive Species	Physical alteration of habitat	Reduction in number of lakes impaired by aquatic invasive species	Percent of public lakes managed pursuant to lake management plan
Barriers to Stream Connectivity	Physical alteration of habitat	Total stream miles with improved stream connectivity due to removal of barriers	Number of watershed projects implemented to improve stream connectivity
Water Withdrawals	Physical alteration of habitat	Stream miles experiencing depleted flows	

B. NPS Program Evaluation

In addition to tracking progress in protecting and restoring the condition of RI's water resources, DEM will evaluate progress of its NPS Program as required by EPA's Section 319 NPS Program Guidance. The following mechanisms will be used to report to EPA on Rhode Island's progress in meeting annual milestones and implementing the NPS Management Plan.

Annual NPS Report – Each year, DEM will prepare and submit to EPA an annual report that summarizes NPS program activities, successes and completed projects. The report will reflect the goals, actions and track progress on the milestones in this Plan.

Grant Reporting and Tracking System (GRTS) – DEM enters required data into the EPA GRTS's database to describe NPS program activities and projects. Pollutant load reduction estimates are entered upon completion of implementation projects.

PPG Reporting – DEM will continue to comply with EPA requirements governing the expenditure of Performance Partnership Grants including all applicable financial reports.

Satisfactory Progress Determination – DEM will provide information to EPA to conduct its annual progress and performance review under Section 319(h)(8). This will include information on the expenditure of PPG funds on NPS projects.

Table 7. NPS Programmatic Milestones

NPS Programmatic Milestones	2020	2021	2022	2023	2024
NPS Annual Report Submitted.	X	X	X	X	X
Number of NPS Success Stories submitted to EPA for partially restored waterbodies.		1		1	
Number of NPS Success Stories submitted to EPA for waterbodies where there has been a demonstration of substantial improvement.	1	1	1	1	1
Issue RFP for Section 319 grants for NPS protection and restoration actions.		X		X	
Report on funds awarded and new grant agreements in place with Section 319 funds.	X	X	X	X	X
Report on projects completed and BMPs installed with Section 319 funds. BMPs installed.	5	5	5	5	5
Data reported in the EPA GRTS database by February 15.	X	X	X	X	X
Updated NPS Grant Program Programmatic Quality Assurance Project Plan.					X
EPA approved NPS Management Program Plan update in place by October 1, 2024.					X

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Appendix A

Integration of Planning Activities to Support Watershed Management

As noted in Figure 8, water-related planning activities occur on different scales (federal, regional, state, local) and for varying purposes. Plans generated by these efforts provide direction to enhance the development and coordination of statewide and watershed-wide programs and activities. Where sufficiently specific, they may also reflect actions appropriate for inclusion in watershed-based plans.

There are a variety of additional ongoing planning efforts relevant to watershed planning that address both nonpoint and point sources of pollution. Described below, these plans, typically prepared with a specific focus, can contribute content related to the protection and restoration of water resources. These plans often serve as a source of watershed specific recommended actions that should be reflected in a watershed plan.

1. Water Quality Management Planning

Water Quality Restoration Plans – Pursuant to federal Clean Water Act requirements, waters impaired by pollutants become targets for Total Maximum Daily Load (TMDL) development or the subject of other effective pollution control actions that are expected to restore water quality. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. TMDLs are based on the relationship between pollution sources in the watershed and instream water quality conditions. A TMDL addresses a single pollutant or stressor for each waterbody or waterbody segment. The water quality studies performed to support TMDL development often yield additional information that helps characterize the nonpoint sources of pollution that may be affecting a specific waterbody. The process results in a water quality restoration plan, or TMDL plan, that identifies and provides the technical basis for the actions needed to restore water quality.

Special Area Management Plans (SAMPs) – The Coastal Resources Management Council prepares these comprehensive plans that provide for natural resource protection and reasonable coastal–dependent economic growth in policies and actions set forth for a specific coastal area of the State. Protection of water quality is a key component of SAMPs. The CRMC coordinates with local municipalities, as well as government agencies and community organizations, to prepare the SAMPs and implement the management strategies. The following SAMPs have been prepared: Metro Bay, Greenwich Bay, Aquidneck Island West Side, Narrow River, Salt Ponds Region, Pawcatuck River, Ocean, and Shoreline Change (Beach).

Lake Management Plans – While lacking a formally organized lake management program within state government, DEM has encouraged the development of lake management plans that integrate topics related to water quality and management of aquatic invasive species taking into account the larger watershed within which the lake is located. A lake management plan provides

the framework for fostering more effective management by identifying the threats to water quality and habitat conditions, actions needed to prevent degradation and restore and manage existing conditions. During the last decade, several lake associations have taken steps toward developing plans.

Water Supply System Management Plans – Water Supply System Management Plans are required by the Water Resources Board for the 29 large suppliers – those supplying greater than 50 million gallons of water per year. These comprehensive management plans have a water quality protection component wherein the supplier is required to identify actions for protecting water quality in its source water protection area (reservoir watershed and/or wellhead protection area). Plans must be updated every 5 years.

Source Water Protection Assessments/Plans (Large supplier) – These plans were prepared by the RI DOH for the 29 large water suppliers in RI in 2003 in response to federal Safe Drinking Water Act requirements to conduct source water assessments. Plans included an assessment of the vulnerability of the water supply based on water quality data and activities in the source water protection area and recommendations to protect the water supply. Although there has been no required comprehensive update of these assessments, some of the suppliers have prepared updated source water assessments following the methodology recommended by the State.

Source Water Protection Plans (Small supplier) – Source water protection/supply system plans for the smaller suppliers (all those not subject to Water Supply System Management Plan requirements) are not required but are strongly recommended. A number of plans have been prepared for willing suppliers using state and federal resources as they become available.

National Water Quality Initiative Assessments (see discussion under Agriculture, Section IV.D.) -- NRCS is preparing the required Watershed Assessments for the priority watersheds selected for the National Water Quality Initiative (NWQI). These assessments must meet specific NWQI criteria that will provide detailed information about the watershed's characterization, hydrology, and water quality.

2. Water Related Infrastructure Planning

Land Use 2025: State Land Use Policies and Plan (State Guide Plan Element 121) -- Adopted in 2006 (planned for updating in 2020) by the RI Department of Administration, this Plan identifies an Urban Services Boundary, based upon a detailed land capability and suitability analysis that demonstrates the capacity of this area to accommodate future growth. The Plan directs the State and communities to concentrate growth inside the Urban Services Boundary and within locally designated centers in rural areas, and to pursue significantly different land use and development approaches for urban and rural areas. This boundary presents an opportunity for evaluating its use as a tool in prioritizing water quality protection and restoration activities (see Figure 5).

Wastewater Facility Planning – Facility plans are long-term (20 year) planning documents that document the needs of wastewater treatment systems. Based on sound engineering principles, they identify need related to enhanced treatment, system capacity and service areas; e.g., identify

areas that may require sewer service in the future. Facility plans are prepared by the operators of wastewater treatment facilities and certain municipalities that have responsibility over portions of a sewer collection systems but not treatment facilities. Consistency with a facility plan is a pre–requisite for decisions by DEM to authorize modifications to existing wastewater infrastructure. It also is a factor in determining projects as qualifying for funding, such as the state's Clean Water State Revolving Fund.

Onsite Wastewater Management Plans – Local communities that rely on onsite wastewater systems have been encouraged to develop local onsite wastewater plans and programs. The plans identify specific actions a community expects to carry out to promote proper operation and maintenance of OWTS. The plans also identify actions that would enhance local programs.

Stormwater Management Plans – Most RI municipalities have developed local stormwater management plans which outline actions needed to prevent and abate impacts to water quality from stormwater runoff. The plans may identify actions municipalities want to take to enhance locally administered programs, such as pre– and post – construction oversight of stormwater BMPs, as well as specific projects that are needed to retrofit existing infrastructure in support of water quality restoration goals. RIDOT, as a regulated MS4, is implementing a strategic program to comply with an EPA consent decree to improve stormwater management. RIDOT will prepare stormwater control plans where RIDOT outfalls have contributed to water quality impairments, improve maintenance of their system, and retrofit and construct stormwater BMPs.

Water Supply System Management Plans – In addition to the water quality protection component described above, Water Supply System Management Plans include information on the water supply infrastructure and water use which is relevant to watershed hydrology and watershed plans.

Hazard Mitigation Plans -- Integrating Green Infrastructure and Low Impact Development into local hazard mitigation planning across the state broadens opportunities for using different funding sources and make efficient use of limited resources. In addition to the benefits of improving water quality, GI and LID provide benefits for hazard mitigation through reduced flood volumes.

3. Land Use Planning for Water Quality

Comprehensive Community Plans – Rhode Island cities and towns must have a locally adopted Community Comprehensive Plan that must be updated at least once every five years. Municipal plans are required to be reviewed by the State for consistency with State goals and policies including all elements of the State Guide Plan. In turn, State agency projects and activities are to conform to local plans that have received State approval. The local comprehensive plan sets the basis for the exercise of key local implementing powers for land use – zoning and development review ordinances.

The Rhode Island Comprehensive Planning and Land Use Regulation Act (RIGL 45-22.2) specified the requirements for municipal comprehensive plans, calling each "a statement (in text,

maps, illustrations, or other media of communication) that is designed to provide a basis for rational decision–making regarding the long-term physical development of the municipality." There are nine required elements with many opportunities to include provisions for the protection and restoration of water quality.

Special Area Management Plans (SAMPs) – In addition to the strategies to protect water quality, the SAMPs, in conjunction with the CRMC Coastal Management Program, direct allowable land uses and activities within the coastal zone jurisdictional area. The CRMC coordinates with local municipalities, as well as government agencies and community organizations, to prepare the SAMPs and implement the management strategies.

4. Planning for Habitat Protection and Restoration

State Wildlife Action Plan – Rhode Island has prepared a State Wildlife Action Plan that is part of a national program was created by Congress in 2000 to address the longstanding need to fund actions to conserve declining fish and wildlife species before they become threatened or endangered. The plan, subject to USFW approval, allows RI to remain eligible for matching grants. DEM prepared the first plan in 2005 and updated the Plan in 2015. Intended to be proactive, the plans assess the health of each state's wildlife and habitats, identify the problems they face, and outline actions needed to conserve them over the long term. It encompasses both marine and freshwater habitat types and provides recommended actions on conservation that will be relevant to watershed plans.

Coastal Habitat Restoration Strategies – The growing interest in habitat restoration has prompted a commitment by CRMC and DEM to update and further develop habitat restoration strategies. DEM,is seeking resources to produce an update of the statewide plan for fish passage that includes site specific recommendations for dams on coastal tributary rivers and streams. This program supports restoration of anadromous fisheries, but improved passage also benefits other aquatic species. DEM also plans to complete a statewide freshwater wetlands restoration strategy during the next five years. In the coastal zone, CRMC has a lead role in many habitat restoration activities. It has collaborated with partners including the RI Natural History Survey and NBNERR to develop a Rhode Island Coastal Wetland Restoration Strategy in 2018 which focuses on salt marshes.

Appendix B

EPA Required Minimum Nine Elements of a Watershed-based Plan (WRB)

(From: EPA Nonpoint Source Program and Grants Guidelines for States and Territories; issued April 12, 2013.)

The nine elements, as well as short explanations of how each element fits in the context of the broader WBP, are provided below. Although they are listed as *a* through *i*, they do not necessarily take place sequentially. For example, element *d* asks for a description of the technical and financial assistance that will be needed to implement the WBP, but this can be done only after you have addressed elements *e* and *i*.

The level of detail needed to address the nine elements of WBPs will vary in proportion to the homogeneity or similarity of land use types and variety and complexity of pollution sources. For example, densely developed urban and suburban watersheds often have multiples sources of pollution from historic and current activities (Superfund sites, point sources, solid waste disposal, leakage from road salt storage, oil handling, stormwater caused erosion, road maintenance, etc.) in addition to some agricultural activities. Plans will be more complex than in predominantly rural settings in these cases. For this reason, plans for urban and suburban watersheds may need to be developed and implemented at a smaller scale than watersheds with agricultural lands of a similar character.

Element a. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. Sources that need to be controlled should be identified at the significant subcategory level along with estimates of the extent to which they are present in the watershed (e.g., X number of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).

What does this mean?
Your WBP source assessment should encompass the watershed of the impaired waterbody(ies) throughout the watershed and include map(s) of the watershed that locates the major cause(s) and source(s) of impairment in the planning area. To address these impairments, you will set goals to meet (or exceed) the appropriate water quality standards for pollutant(s) that threaten or impair the physical, chemical, or biological integrity of the watershed covered in the plan.
This element will usually include an accounting of the significant point and nonpoint sources in addition to the natural background levels that make up the pollutant loads causing problems in the watershed. If a TMDL or TMDLs exist for the waters under consideration, this element may be adequately addressed in those documents. If not, you will need to conduct a similar analysis (which may involve mapping, modeling, monitoring, and field assessments) to make the link between the sources of pollution and the extent to which they cause the water to exceed relevant water quality standards.

Element b. An estimate of the load reductions expected from management measures.

What does this mean?
On the basis of the existing source loads estimated for element *a*, you will similarly determine the reductions needed to meet water quality standards. After identifying the various management measures that will help to reduce the pollutant loads (see element *c* below), you will estimate the load reductions expected as a result of implementing these management measures, recognizing the difficulty in precisely predicting the performance of management measures over time. Estimates should be provided at the same level as that required in the scale and scope described in element *a* (e.g., the total load reduction expected for dairy cattle feedlots, row crops, eroded streambanks, or implementation of a specific stormwater management practice). For waters for which TMDLs have been approved or are being developed, the plan should identify and incorporate the TMDLs; the plan needs to be designed to achieve the applicable load reductions in the TMDLs. Applicable loads for downstream waters should be included so that water delivered to a downstream or adjacent segment does not exceed the water quality standards for the pollutant of concern at the water segment boundary. The estimate should account for reductions in pollutant loads from point and nonpoint sources identified in the TMDL as necessary to attain the applicable water quality standards.

Element c. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in element b, and a description of the critical areas in which those measures will be needed to implement this plan.

What does this mean?
The plan should describe the management measures that need to be implemented to achieve the load reductions estimated under element *b*, as well as to achieve any additional pollution prevention goals outlined in the watershed plan (e.g., habitat conservation and protection). Pollutant loads will vary even within land use types, so the plan should also identify the critical areas17 in which those measures will be needed to implement the plan. This description should be detailed enough to guide needed implementation activities throughout the watershed and can be greatly enhanced by developing an accompanying map with priority areas and practices. Thought should also be given to the possible use of measures that protect important habitats (e.g., wetlands, vegetated buffers, and forest corridors) and other non–polluting areas of the watershed. In this way, waterbodies would not continue to degrade in some areas of the watershed while other parts are being restored.

Element d. Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.

What does this mean?
You should estimate the financial and technical assistance needed to implement the entire plan. This includes implementation and long-term operation and maintenance of management measures, information/education (I/E) activities, monitoring, and evaluation activities. You should also document which relevant authorities might play a role in implementing the plan. Plan sponsors should consider the use of federal, state, local, and private funds or resources that

might be available to assist in implementing the plan. Shortfalls between needs and available resources should be identified and addressed in the plan.

Element e. An information and education component used to enhance public understanding of the plan and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.

What does this mean?
The plan should include an I/E component that identifies the education and outreach activities or actions that will be used to implement the plan. These I/E activities may support the adoption and long–term operation and maintenance of management practices and support stakeholder involvement efforts.

Element f. A schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.

What does this mean?
You should include a schedule for implementing the management measures outlined in your watershed plan. The schedule should reflect the milestones you develop in *g* and you should begin implementation as soon as possible. Conducting baseline monitoring and outreach for implementing water quality projects are examples of activities that can start right away. It is important that schedules not be "shelved" for lack of funds or program authorities; instead they should identify steps towards obtaining needed funds as feasible.

Element g. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.

What does this mean?
The WBP should include interim, measurable implementation milestones to measure progress in implementing the management measures. These milestones will be used to track implementation of the management measures, such as whether they are being implemented according to the schedule outlined in element *f*, whereas element *h* (see below) will develop criteria to measure the effectiveness of the management measures by, for example, documenting improvements in water quality. For example, a watershed plan may include milestones for a problem pesticide found at high levels in a stream. An initial milestone may be a 30% reduction in measured stream concentrations of that pesticide after 5 years and 50 percent of the users in the watershed have implemented Integrated Pest Management (IPM). The next milestone could be a 40% reduction after 7 years, when 80% of pesticide users are using IPM. The final goal, which achieves the water quality standard for that stream, may require a 50% reduction in 10 years. Having these waypoints lets the watershed managers know if they are on track to meet their goals, or if they need to re–evaluate treatment levels or timelines.

Element h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.

What does this mean?
As projects are implemented in the watershed, you will need water quality benchmarks to track progress towards attaining water quality standards. The *criteria* in element *h* (not to be confused with *water quality criteria* in state regulations) are the benchmarks or waypoints to measure against through monitoring. These interim targets can be direct measurements (e.g., fecal coliform concentrations, nutrient loads) or indirect indicators of load reduction (e.g., number of beach closings). These criteria should reflect the time it takes to implement pollution control measures, as well as the time needed for water quality indicators to respond, including lag times (e.g., water quality response as it is influenced by ground water sources that move slowly or the extra time it takes for sediment bound pollutants to break down, degrade or otherwise be isolated from the water column). Appendix B of these guidelines, "Measures and Indicators of Progress and Success," although intended as measures for program success, may provide some examples that may be useful. You should also indicate how you will determine whether the WBP needs to be revised if interim targets are not met. These revisions could involve changing management practices, updating the loading analyses, and reassessing the time it takes for pollution concentrations to respond to treatment.

***Element i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under element* h.**

What does this mean?
The WBP should include a monitoring component to determine whether progress is being made toward attaining or maintaining the applicable water quality standards for the waterbody(ies) addressed in the plan. The monitoring program should be fully integrated with the established schedule and interim milestone criteria identified above. The monitoring component should be designed to assess progress in achieving loading reductions and meeting water quality standards. Watershed-scale monitoring can be used to measure the effects of multiple programs, projects, and trends over time. Instream monitoring does not have to be conducted for individual BMPs unless that type of monitoring is particularly relevant to the project.