2018-2020 Integrated Water Quality Monitoring and Assessment Report

Quahog digging in the lower Providence River on 5/26/2021. Photo courtesy of D. Borkman, RIDEM.

Section 305(b) State of the State's Waters Report

and Section 303(d) List of Impaired Waters

STATE OF RHODE ISLAND

2018-2020 Integrated Water Quality Monitoring and Assessment Report

Section 305(b) State of the State's Waters Report and
Section 303(d) List of Impaired Waters

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List of Acronyms

ACESD – Atlantic Coastal Environmental Science Division
ARM – Ambient River Monitoring

CSO – Combined sewer overflow

CWA – Clean Water Act

CWSRF – Clean Water State Revolving Fund

EPA – Environmental Protection Agency

NBC – Narragansett Bay Commission

RIDEM – Rhode Island Department of Environmental Protection

RIDOH – Rhode Island Department of Health

RIDOT – Rhode Island Department of Transportation

RIPDES - Rhode Island Pollution Discharge Elimination System

TMDL – Total Maximum Daily Load

USGS – United States Geological Survey

Chapter

1

Integrated Report Overview

Integrated Report Overview

What is in this report?

The Office of Water Resources at the Rhode Island Department of Environmental Management (RIDEM) has developed this document to provide the information on Rhode Island water quality that is required biennially by Section 305(b) of the federal Water Pollution Control Act (the Clean Water Act). This Integrated Water Quality Monitoring and Assessment Report summarizes the Department's assessment of water quality conditions in Rhode Island's surface waters, including rivers, streams, lakes, ponds, and coastal waters. Monitoring and assessing water quality are key components of Rhode Island's overall water quality management framework. The Integrated Report also highlights the environmental results that Rhode Island's water pollution control and watershed protection programs have achieved as well as recent initiatives that support management's goals of protecting and restoring of the quality of our waters and aquatic habitats.

The information provided in this report is organized consistent with guidance and requirements of the United States Environmental Protection Agency (EPA). This format provides five categories of surface water quality assessment information, with Category 5 being the Section 303(d) list of impaired waters requiring a water quality restoration study, known as a total maximum daily load (TMDL). Data for each waterbody or sections of a waterbody are reviewed in comparison to state water quality standards to determine the status of a surface water. The waterbody is assigned one of the five reporting categories based upon the water quality goals (designated use) support, the amount of information known about the waterbody's water quality status, and the type of pollution (impairment) preventing attainment of water quality goals (designated use). The process of placing each waterbody in a water quality category is known as assessment. See page 34 for additional description of assessment methods.

Monitoring continues to fill in key gaps

The assessment process relies on generation of monitoring data within a prior five-year period. Significant gaps in needed data are well-documented in past reports from the Rhode Island Environmental Monitoring Collaborative. However, with implementation of the RI Water Monitoring Strategy (2005, 2019), the State has made strides to fill certain data gaps which in turn reduces the number of waterbodies that remain unassessed.

In rivers and streams, the major source of information for the freshwater river assessments in this report is the Rhode Island Department of Environmental Management (RIDEM)'s Ambient River Monitoring (ARM) program. This program is a rotating basin approach to systematically collect data across the state. Since the inception of the program in 2004, RIDEM has established over 300 stations, collecting information on water chemistry, bacteria, and other parameters, as appropriate, including macroinvertebrates (aquatic insects and non-insects). A major accomplishment in the program was the inaugural establishment of stations in the area known as the "East Bay", including Aquidneck Island, Tiverton, and Little Compton in 2014. For many streams in that area, this was the first time data had been collected for assessment.

RIDEM sampling Sucker Brook, Tiverton for water chemistry, bacteria, and metals

Data on fish tissue contamination has long been a major data gap. RIDEM has continued a collaboration among its Office of Water Resources and Division of Fish and Wildlife and the EPA-Atlantic Ecology Division laboratory to collect freshwater fish in Rhode Island to test for mercury. RIDEM has also received support from EPA-Chelmsford to collect fish from shallow, lightcraft-only lakes. This report also includes new analysis of data collected by the program.

Progress has also been made to advance numeric nutrient criteria by initiation of a method development project. Under the ARM umbrella, some stations were also sampled to determine what type and what kinds of algae are present in Rhode Island streams, along with other factors that influence algal growth in streams, such as canopy cover and substrate availability.

RIDEM samples fish tissue in collaboration with state and federal partners

The expansion of programs and projects has extended RIDEM's ability to collect and assess data across more of the state. Given its compact state size, RIDEM is fortunate to have been able to assess the majority of the state's surface waterbodies. However, it will be critical to sustain investment in existing monitoring efforts to avoid the development of future data gaps. In addition, further investment to enhance monitoring programs will be needed to support adaptive management decision-making and move Rhode Island closer to the goal of comprehensively assessing the state's surface waters.

Key Findings

Rivers and Streams

Due to the coverage of RIDEM's ARM river monitoring program, this report shows an increase in the number of river miles assessed (1101 miles or 80% of the 1376 total mapped and tracked[1] miles statewide). This data led to more waterbodies segments being placed on the impaired waters list. Overall, 751.4 river miles are considered impaired (68% of assessed miles) with 458.1 assessed miles (42% of assessed miles) placed on the State's 303(d) Impaired Waters List for future water quality restoration planning. Most impaired river miles exhibit elevated concentrations of pathogens (bacteria) (702.3 miles). Pathogens are washed into rivers and stream via stormwater runoff from various land uses and activities. The second most prevalent cause of impairment are metals which affect 206.4 miles of impaired river miles, most often dissolved lead (107.0 miles). The other notable causes of river impairment are Nuisance Exotic Species (109.7 miles) and Biologic Integrity (75.0 miles). Biological integrity is evaluated using macroinvertebrate (aquatic insect) data.

Lakes and Ponds

Lakes and ponds saw a an increase in acres assessed for at least one designated use(82% of the 18,693[2] total mapped and tracked acres statewide) and a slight increase in the impaired acres (72% of assessed acres, 11,040 acres) with a steady 6,188 assessed acres placed on the State's 303(d) Impaired Waters List requiring a TMDL. The increase of impaired waters without placement on the 303(d) List is due to a small number of lakes newly impaired for non-native aquatic plants impairments, which are non-pollutants not requiring a TMDL. The most common cause of impaired lake acres is mercury in fish tissue, which affects 6227 acres or 84% of lake acres assessed for this designated use. Prior work has documented the primary source of mercury in RI waters being the result of atmospheric deposition originating out of state. The second most prevalent cause of impaired lake acres are Nuisance Exotic Species documented in 5288 acres. This reflects the widespread occurrence of aquatic invasive plants in RI freshwaters. Additionally, other notable impairment causes in lakes were Phosphorus (3,334.1 acres) and causes associated with nutrient impairments, such as Chlorophyll-a (1079 acres), Total Organic Carbon (1196 acres), and Oxygen Depletion (1,613.3 acres). Excess nutrients in lakes often leads to symptoms of eutrophication, such algal blooms and low dissolved oxygen.

Estuarine Waters

Estuarine waters saw no change in the amount of estuarine waters assessed (156 miles^2, 98%). Of the impaired estuarine miles^2 (36.4 percent of assessed or 57.0 miles^2), the largest cause of water quality degradation is low dissolved oxygen which occurred in 48.8 miles^2 or 85.7% of impaired waters, including about one third of Narragansett Bay. Pathogens were documented to affect nearly as many estuarine waters and ranked as the second most prevalent cause with 41.6

[1] Rhode Island has 1420 river miles mapped at the 1:24,000 scale. Not all these waters are tracked for assessments purposes (i.e., have a waterbody id). Additionally, Rhode Island tracks some waters smaller than this scale.
[2] Rhode Island has 20,749 lake acres mapped at the 1:24,000 scale. Not all these waters are tracked for assessments purposes (i.e., have a waterbody id). Additionally, Rhode Island tracks some waters smaller than this scale.

miles^2 or 73.0% of the total impaired estuarine waters. The other highest percentage of estuarine mile^2 impairment causes are Nutrients (39.7 miles^2), which is typically the reason for oxygen depletion.

Highlights – Improved Water Quality

Despite an increase in the number of waterbodies placed on the State's 303(d) List, this assessment cycle also saw major improvements that allowed RIDEM to remove impairments, because available monitoring data show that water quality criteria are now being met. Among the waterbodies showing improved water quality and proposed for removal of an impairment are several noteworthy water quality improvements resulting from investments in pollution abatement infrastructure and practices. Included for delisting impairments are: Mt. Hope Bay, the Blackstone River, Upper Narragansett Bay, and the Wood River. A summary of the highlighted delistings from the list is below, and a more detailed report of all impairment removals is provided at: Final 2018 - 2020 Delisting Document.

Mt. Hope Bay

Thermal discharges from the Brayton Point Station in Somerset MA, once the largest fossil fuel burning power plant in New England, led to elevated water temperatures and reduced fish abundance in Mt. Hope Bay, and inclusion of fish bioassessments on the state's 303(d) List in 2000. To address the thermal impacts to Mt Hope Bay, the Brayton Point Station converted to closed-cycle cooling in May 2012. In the 2016 IR cycle, water temperature was demonstrated to meet water quality standards in the Rhode Island portion of Mt. Hope Bay. Following removal of the water temperature impairment, the RIDEM Office of Water Resources requested the Division of Marine Fisheries evaluate fish assemblages to determine if the fish bioassessment impairment should also be removed. Available trawl data show that the Mt. Hope Bay fish community has returned to a state consistent with current finfish community in Narragansett Bay resulting in its delisting for fish bioassessments following the removal of the anthropogenic stressor. Further information on the statistical analysis of fish bioassessment analysis can be found here: Final 2018 - 2020 Delisting Document. Brayton Point Station ceased operation in June 2017.

Blackstone River

Based upon extensive chemical monitoring in late 1990s and application of a dissolved oxygen water quality model to the Blackstone River (QUAL2E), a waste load allocation was completed which concluded that (seasonal) advanced treatment at the three municipal wastewater treatment facility (WWTF)s in Massachusetts (Upper Blackstone Water Pollution Abatement District (UBWPAD), Grafton, and Uxbridge) and one in WWTF in Rhode Island (Woonsocket) would be required to enable the Blackstone River to attain Rhode Island's freshwater dissolved oxygen numeric standard of 5.0 mg/l (at 7Q10 flow). RIDEM water quality regulations contain narrative nutrient criteria that specify nutrient levels should not impair any use. Past modeling demonstrated that elevated phosphorus was causing dissolved oxygen impairments.

In 2008, RIDEM reissued the RIPDES permit for the Woonsocket WWTF (RIPDES Permit No. RI0100111) and EPA reissued the NPDES permit for UBWPAD (NPDES Permit No. MA0102369), which required advanced treatment to reduce phosphorus (limit of 0.1 mg/L)[3]. In 2013, EPA reissued NPDES permits for Grafton (NPDES Permit No. MA0101311), Northbridge (NPDES Permit No. MA0100722), and Uxbridge (NPDES Permit No. MA0102440). Woonsocket met their lower phosphorus permit limit beginning with the 2017 summer season, with UBWPAD significantly reducing their phosphorus load beginning with the 2015 summer season.

Total phosphorus data collected by USGS at Roosevelt Street (Pawtucket, RI) between 2014 and 2019 as well as data from 2007 show that phosphorus levels have decreased significantly since 2007, which corresponds with the large phosphorus reductions from the wastewater treatment facilities. Annual and seasonal total phosphorus annual averages since 2016 are below 100 µg/L, a level mentioned in the 1986 EPA Quality Criteria for Water as a recommended target for total phosphorus. There have only been four samples out of forty-seven collected between 2016 and 2019 that exceeded 100 µg/L and all seasonal average phosphorus concentrations have been well-below 100 µg/L in that time frame.

In 2017, continuous dissolved oxygen measurements were taken just upstream of the dams at Albion and Central Falls Landing in the Blackstone River at model-predicted "sag points" in the river. The Blackstone River achieved compliance with the dissolved oxygen criteria including during low flow conditions. Given that the river has demonstrated compliance at these predicted lowest dissolved oxygen locations during low flow conditions, based upon the QUAL2E modeling results, it is expected that the entire Blackstone River (RI0001003R-01A and RI0001003R-01B) in Rhode Island complies with its phosphorus and dissolved oxygen criteria. Additionally, USGS routinely collects dissolved oxygen grab samples at Roosevelt Street, which also showed compliance with Rhode Island's water quality standards 2014 to 2019.

Upper Narragansett Bay

The completion of Phases I and II of the Narragansett Bay Commission's (NBC) combined sewer overflow (CSO) project resulted in the removal of shellfish harvesting closures due to pathogen pollution in portions of Upper Narragansett Bay. Phase II improvements to the Fields Point wastewater treatment system capture combined sewage that previously overflowed into tributaries of the Providence River. The combined sewage is now directed to the tunnel constructed in Phase I of this project and then subsequently pumped to the Fields Point wastewater treatment facility for processing. This has eliminated a significant volume of combined sewage that previously discharged to the upstream rivers and entered the Upper Bay via the Providence River. Due to the completion of these phases of the CSO project, an improvement in water quality throughout the lower Providence River and Upper Bay has allowed for reclassification of the Upper Narragansett Bay area previously identified as Conditional Area B by the RIDEM Shellfishing Program, which changed to approved status in May 2017. This former Conditional Area B is the area delisted in the newly created RI0007024E-01B segment.

[3]The 0.1 mg/l total phosphorus seasonal limit is a 60-day rolling average for UBWPAD.

Wood River

One exceedance of acute criteria and two exceedances of chronic criteria (two stations on the same date) were identified using criteria derived from average hardness concentrations. Rhode Island now uses hardness at the time of sample to calculate acute and chronic criteria for each sampling event. Based on the recalculation of the criteria one of the chronic exceedance should not have been identified as violations of criteria. RIDEM revisited the segment in 2011 and 2018 as part of the dry weather ambient river monitoring program. No exceedances of acute or chronic criteria were documented. This segment will be considered Fully Supporting aquatic life use.

Chapter

2

Background Information

Background Information

Scope of Waters in the Integrated Report

Rhode Island's surface water resources include: 1,420 miles of streams and rivers, 20,749 acres of lakes and ponds, 300 square miles of ocean and near coastal waters[4], and approximately 159 square miles of estuarine waters. In general, 100% of the estuarine waters, 100% of ocean and near coastal area, 97% of the rivers/streams, and 90% of the lakes in the state mapped at a scale of 1:24,000 have been assigned a unique tracking number known as a waterbody identification number (WBID). All WBIDs are assessed and their status is reported in the Integrated Report. For the 2018-2020 cycle, 890 assessment units (AU or WBID) were tracked and assessed in the EPA assessment reporting database, ATTAINS. Waters not tracked generally consist of very small ponds or very small streams, many of which may not sustain permanent flows.

State Population	2019 estimate-1,059,361[5]
State Surface Area	**Land only-1,058 square miles**
	Total area-1,214 square miles
Number of major watersheds	**10**
Number of 8 digit HUCs	**5**
Total Stream/River miles	**1,420 miles[6]**
Lakes/Ponds total acreage	**20,749 acres[6]**
Estuarine waters area	**158.96 square miles**
Ocean and Near Coastal area	**300 square miles**
Wetland area	**92,162 acres[7]**

Water Pollution Control Programs

Rhode Island implements a variety of programs carried out at the state, federal, and local levels to monitor, protect, and restore the quality of its surface waters. State Law designates Rhode Island Department of Environmental Management as RI's water pollution control agency to administer federal Clean Water Act programs under delegated authority from the EPA. Within the Environmental Protection branch, the RIDEM Office of Water Resources implements over a dozen regulatory and non-regulatory programs and is well positioned to reinforce watershed–based approaches to water quality protection and restoration. See box for the listing of OWR programs. Additional programs in this branch that contribute to preventing and remediating water quality include solid and hazardous waste, air pollution, site remediation, emergency response (e.g. oil spills). In addition to administration of rules,

[4] The ocean and near coastal waters replace coastal shoreline waters that were formally reported coastal shoreline miles.

[5] From: https://www.census.gov/quickfacts/RI

[6] Scale 1:24,000; Source RIGIS: http://www.rigis.org/

[7] Source: I.E.P. Inc. Feb., 1990, Final report – Development and Digitization of Wetlands Data for Environmental Planning. File No: URI-1, prepared for: University of Rhode Island, Environmental Data Center, Department of Natural Resources, Kingston, RI.

programs carry out activities involving financial and technical assistance, training and public outreach, and education.

RIDEM 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) and Watershed Planning
Water Quality Certification Program
Rhode Island Pollutant Discharge Elimination System (RIPDES) including stormwater management
Wastewater System Planning and Design
Wastewater Facility Operation and Maintenance Program
Onsite Wastewater Management Program
Groundwater Discharge Program (includes Underground Injection Control Program)
Freshwater Wetlands Programs
Shellfish Growing Area Management Program
Financial Assistance Programs

Rhode Island Pollutant Discharges Elimination System Program (RIPDES)

The principal mechanism used to protect waters from municipal and industrial point source discharges is through the federally delegated Rhode Island Pollution Discharge Elimination System (RIPDES) program. http://www.dem.ri.gov/programs/water/permits/ripdes/ This program continues to focus on the implementation of a nutrient reduction strategy that achieved significant reductions in nitrogen pollutant loadings into the upper Narragansett Bay region, including the Providence and Seekonk Rivers, via advanced treatment upgrades at 11 of the 19 Rhode Island major wastewater treatment facilities (WWTF). Managers, scientists, and others are tracking the changes in water quality in this portion of the Bay, in order to characterize the improvements and provide information to support future decision-making on the need for further pollution controls.

In addition to wastewater, the RIPDES Program implements federal Clean Water Act requirements pertaining to stormwater. 33 of 39 RI municipalities and 7 non-municipal public entities are permitted under Rhode Island's Municipal Separate Storm Sewer System (aka MS4) General Permit, which includes requirements governing stormwater management. Local activities involve pre- and post- construction ordinances, illicit detection, street sweeping and related maintenance, proper management of stormwater at municipal facilities, outreach and education, as well as retrofitting existing stormwater infrastructure to improve treatment. Besides the MS4's mentioned above, 172 industrial facilities are also permitted under Rhode Island's Multi-Sector General Permit for Stormwater Discharge Associated with Industrial Activity (a/k/a MSGP), which includes monitoring requirements, best management requirements to minimize exposure of stormwater to industrial activities, and corrective action

requirements if stormwater sampling shows elevated levels of pollutants in the discharges.

Nonpoint Source Pollution Management

The RIDEM's Nonpoint Source Pollution Management Program, supported with federal Clean Water Act funding (Section 319), is focused on developing and implementing strategies to mitigate existing and prevent new sources of nonpoint source pollution. The non-regulatory program is involved in a number of activities and coordinates with a number of federal, state, and other entities to achieve its goals of mitigation and prevention. Areas of focus have included watershed restoration planning, management of septic systems, replacement of cesspools, improving stormwater management with an emphasis on green infrastructure, riparian habitat restoration, pollution prevention, and encouraging conservation development and low impact development. A revised statewide Nonpoint Source Management Plan was completed in September 2019 (link below). As resources allow, the program also distributes grants for eligible implementation projects identified in watershed plans. In 2020, a total of $725,000 in Section 319 funding was awarded to five projects. For more information on this program see RIDEM's website at: Rhode Island Nonpoint Source Management Program Plan and Nonpoint Source Funding.

Restoration of Water Quality Impairments

Available data presented in this document have identified water quality impairments, associated with both point and non-point sources of pollution, in almost 40% of the State's surface waters. In a few waterbodies, water quality restoration goals have been met, but for the large majority of waters known to be impaired, additional actions and time are needed to effectively abate pollution. The Clean Water Act (CWA) Section 303(d) Program provides a mechanism to integrate and implement water quality efforts for the restoration and protection of the nation's aquatic resources. This program systematically assesses waters and prioritizes restoration actions through water quality restoration studies known as Total Daily Maximum Loads (TMDLs), which are developed by RIDEM. These restoration plans serve to direct implementation actions, such as updated discharge permits, stormwater infrastructure improvements, other best management practices, and non-structural strategies such as pet waste control. Approved TMDL plans are listed at: TMDL Documents.

In 2013, the U.S. Environmental Protection Agency announced a new program framework to identify and prioritize water bodies for restoration and protection, entitled "A Long Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program" (referred to as "the Vision"). The Vision is intended to help coordinate and focus EPA and State efforts to advance the effectiveness of the Clean Water Act Section 303(d) Program. RIDEM's evolving approach to implement the new TMDL Vision is consistent with the state's overall management approach and prioritization process articulated in the updated State Guide Plan Element Water Quality 2035.

Rhode Island's water quality management framework is purposefully designed to address water

resource protection and restoration in a more holistic manner. To facilitate more effective management of our water resources, it aims to integrate management activities related to water quality and aquatic habitats within a given watershed. The framework provides a watershed planning process for government and other stakeholders to prioritize problems and work collaboratively on a watershed basis to optimize results in terms of both environmental outcomes and the other societal benefits associated with improved water quality and habitat.

The long-term goal for all Rhode Island watersheds is to achieve clean and healthy waters. For the period from 2015 – 2022, RIDEM's Office of Water Resources' priorities are:

- Protection and restoration of drinking water supply source waters;
- Protection and restoration of shellfish growing area waters;
- Protection and restoration of public beach waters;
- Restoration of waters degraded due to excess nutrients; and
- Protection and restoration of water quality to support high quality aquatic habitats and aquatic life.

As allowed by EPA, RIDEM has opted to select priority waters within the 2016-2022 priorities planning horizon in two-year increments. Within the context of the well-established and publicly vetted priorities, RIDEM/OWR program managers selected the nine reservoirs that serve as sources of supply to the Newport Water Division as the state's priority waters for the 2015-2017 time period. These waters along with their tributary streams remain the priorities for 2018-2022.

The details of other water quality management programs are described in both the 2012 Integrated Report as well as the state planning document Water Quality 2035.

Economic Benefits of Clean Water Act Implementation

Rhode Island's marine and freshwater resources have always been central to its economy, culture, and quality of life. A recent survey of Rhode Islanders indicated that the typical resident engages in outdoor recreation almost daily, with outdoor facilities used more intensively than the national average[8], much of which is centered upon Rhode Island's shoreline and aquatic environments. There continues to be strong public support for investments in water quality enhancement, habitat restoration, fisheries, and outdoor recreation by federal, state, and local governments.

Section 305(b)(1)(D)(ii) and (iii) of the Clean Water Act (CWA) requires states to provide information on the economic and social impacts associated with achieving the objectives of the CWA. A comprehensive economic impact assessment is not available, but RIDEM is able to provide certain related information. The information below excludes the consideration of any

[8] Rhode Island Outdoor Recreation Survey (RIDEM 2018) as noted in Draft Ocean State Outdoors: Rhode Island's Comprehensive Outdoor Recreation Plan (RIDEM 2019). State Guide Plan Element 152.

economic or social impacts related to public and private drinking water supplies. It is self-evident that the public general welfare and the State's economy rely on the waterbodies which serve as a source of clean drinking water supply.

In 2016, RI had 70 aquaculture farms which generated just over $5.5million in sales of products

Clean water is essential to supporting important sectors in Rhode Island's economy. Rhode Island's coastline is a critical economic asset for marine-based commercial activity including recreational tourism, boat building, and commercial fishing. An analysis by University of Rhode Island (URI) estimates the total economic impact of these businesses in 2016 was at $2.6 billion in sales and another $118 million in local and state tax revenue. Similarly, URI, in collaboration with the Commercial Fisheries Research Foundation and RIDEM, estimated the RI fisheries and seafood section generated $538 million in gross sales in 2016. Additionally, in 2019, URI collaborated with the Rhode Island aquaculture industry and the Rhode Island CRMC to produce a first ever economic evaluation of Rhode Island Aquaculture. The analysis noted 50 farms were responsible for $16.2 million of gross sales and 310 jobs in 2016. Inclusive of economic impacts statewide, the aquaculture sector is responsible for $26.3 million of economic output and 371 jobs throughout Rhode Island. See Aquaculture Impact Study for details.

There are also other ecosystem values provided by water resources that are not easily estimated by current valuation methods. Clean drinking water provides many short-term and long-term benefits to Rhode Islanders health and welfare. The network of waterways and wetlands across our landscape helps to mitigate flooding impacts and thereby reduce risk to property and people. These resources also provide passive recreational opportunities and present aesthetic and spiritual values that are not easily quantified[9].

Water Pollution Control Investments

Protecting and restoring the quality of Rhode Island's valuable water resources has required a sustained investment in various water pollution control programs and projects. The Clean Water State Revolving Fund (CWSRF) Program, continues to operate as Rhode Island's largest financial assistance program for wastewater infrastructure and other clean water related projects. The CWSRF program is co-managed by OWR and the RI Infrastructure Bank (RIIB), formerly the RI Clean Water Finance Agency. The RIIB reported in 2019 that it had, since the program's inception in 1990, awarded $1.53 billion in total CWSRF loans along with an

[9] Water Quality 2035: Rhode Island Water Quality Management Plan (2016). State Guide Plan Element Report #121 http://www.dem.ri.gov/programs/benviron/water/quality/pdf/wqmp2035.pdf

additional $63 million in state financed loans. The funds have assisted the Narragansett Bay Commission and local communities to make various wastewater treatment facility and system improvements, including wastewater treatment facility upgrades, combined sewer overflow abatement projects, pumping station repairs and the extension of sewer lines to areas of failing septic systems. In addition, communities have accessed the SRF for other eligible projects, including landfill closures, property purchase for source water protection, and stormwater abatement. RIIB has to date also administered $ 20 million in loans associated with the Community Septic System Loan Program which targets assistance to homeowners to replace or repair on-site wastewater systems.

In addition to CWSRF, the State of Rhode Island has also used federal and state grant funds to accelerate priority water quality and habitat restoration projects. Between 2003 – 2020, RIDEM used federal Section 319 funds to award over $6 million in non-point source pollution abatement grants for over 80 projects that will improve water quality and habitat conditions throughout Rhode Island.

The state Narragansett Bays and Watershed Restoration Fund, established in 2004, has supported matching grants for water quality and habitat restoration projects and more recently has included flood mitigation projects that incorporate environmental co-benefits. Voters have approved a total of $18,500,000 in state bonds for this program over the years. Examples of completed projects funded include innovative use of ultraviolet light technology to treat stormwater near a popular beach in Newport, stormwater retrofitting in the Narrow River watershed, construction of anadromous fish passage in the Pawtuxet, Ten Mile Rivers and Pawcatuck Rivers. Of this total, $3 million was authorized in 2016 for projects addressing flood mitigation in a manner that incorporated green infrastructure or other environmental benefits. Example projects include replacement of undersized culverts in a manner that restore stream connectivity and use of green infrastructure in flood prone areas to reduce pollutant loadings to nearby waterbodies.

Special State Concerns and Recommendations

The following highlights topics of special state concern and recommended actions to further progress toward achieving clean water goals and objectives.

Changing Climate

Rhode Island recognizes a changing climate has significant implications for our aquatic resources. (Rhode Island Water Quality 2035[10]). The recent report "Resilient Rhody" (2018)[11] identifies warming air and water temperatures, sea level rise, changing precipitation patterns, including the frequency and intensity of storms, as manifestations of climate change that are and will continue to affect RI's environment. It further notes that natural systems, including waterways and wetlands, provide important functions, including carbon storage and flood protection, that are vital to RI's overall resilience to climate change. It emphasizes that both protection of existing systems and restoration of degraded resources are needed as part of adaptation to climate change. Water quality concerns include but are not limited to inadequate stormwater infrastructure, impacts on pollution control effectiveness, and loss of important aquatic habitat and biodiversity. All water resource management programs need to integrate climate change considerations into their planning and implementation. Regular evaluation of adaptation strategies will be needed as new scientific understanding about climate impacts is developed.

Stormwater Management

Untreated stormwater discharges constitute a widespread and major pollution concern in RI associated with beach closures, shellfish closures, and other adverse impacts to aquatic ecosystems. Runoff from a wide range of land uses, e.g. urban, suburban, industrial and agricultural contributes to water quality degradation and has been implicated as a source of pollutant loadings in a majority of the TMDLs completed in RI. Given the density and pattern of land development in the state, strategies to address stormwater management must involve both prevention and abatement; e.g. retrofit programs.

With the implementation of Phase II stormwater requirements, municipalities and the Rhode Island Department of Transportation are responsible for taking actions to improve stormwater management. In November 2017, RIDEM awarded $3.78 million in state grants from the RI Bay and Watershed Restoration Fun, to municipalities and other entities for stormwater projects that improved treatment or enhanced local capacity to carry out street sweeping and maintenance of stormwater infrastructure. About $1.06 million was awarded to municipalities to purchase vacuum trucks or other equipment and $2.68 million was awarded for green infrastructure projects aimed at mitigating stormwater pollution.

Pursuant to a consent decree with EPA, RIDOT has established a stormwater program and has pledged $100 million over ten years to reduce stormwater pollution through infrastructure

[10] Rhode Island Water Quality Management Plan: Water Quality 2035. State Guide Plan Element Report #121 (2016) http://www.dem.ri.gov/programs/benviron/water/quality/pdf/wqmp2035.pdf

[11] Resilient Rhody: An Actionable Vision for Addressing the Impacts of Climate Change in Rhode Island. (2018) http://climatechange.ri.gov/documents/resilientrhody18.pdf

improvements and other actions. RIDEM is also continuing to collaborate with partners to explore strategies for establishing sustainable financing for stormwater management, including but not limited to exploration of local utility districts.

Management of stormwater associated with new development and redevelopment is governed by the updated state stormwater regulations and design manual which together set minimum treatment standards and provide technical guidance on stormwater BMPs, including the application of low impact development policies. First adopted in a stormwater design manual in 2011 and then largely codified as Regulation in 2018, the standards give greater emphasis on effectively treating the stormwater to reduce pollutant loadings as well as managing stormwater flows to support natural hydrologic regimes; e.g. retain water within watersheds. To be most effective, stormwater management strategies will need to be considered in the context of watersheds and be adapted to a changing climate.

Constraints on Municipal Capacity

Achieving clean water goals requires municipal governments in Rhode Island to expand their activities, especially with respect to local stormwater and on-site wastewater management, land use planning, and growth management. A lack of sufficient capacity, in terms of staffing levels, expertise, and available funding, is currently a major obstacle to advancing water quality restoration work in many communities. As noted elsewhere in this report, developing a stable source of funding for the needed retrofitting of locally managed stormwater infrastructure is a priority need.

Federal and state sources of financial assistance for stormwater management and water quality restoration projects, including retrofitting with “green infrastructure”, protection and restoration of riparian buffers, and strategic open space acquisition, need to be maintained and expanded to better incentivize local implementation of projects, many of which are undertaken by municipalities. Given its primary role in financing major water pollution abatement projects as well as growing interest in utilization of the fund for a wider range of water quality related projects, maintaining adequate funding for the Clean Water State Revolving Fund (CWSRF) will be essential to the overall effort of providing local financial assistance. In addition to funding, expanding training opportunities, building and leveraging partnerships, and fostering regional collaborative solutions are actions that can assist in mitigating the local capacity constraints.

Wetland Protection – Rule Revisions

In 2013, state law aimed at regulatory reform (RIGL 42-64.13-10) established a Legislative Task Force (LTF) and charged it with evaluating the adequacy of protection of Rhode Island freshwater wetlands considering both the 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. In December 2014, the LTF issued its Final Report which documented

its findings and made several recommendations to strengthen the protection of wetlands while also streamlining the duplicative permitting procedures among state and municipal government. Building on the report, legislation to implement the LTF recommendations was subsequently adopted in 2015. The new law acknowledged the need to strengthen wetland protection and the need to protect and regulate the area adjacent to wetlands. The law expanded the jurisdiction of RIDEM and the RI Coastal Resources Management Council (CRMC) and directed the agencies to develop buffer standards for freshwater wetlands. Revisions to the freshwater wetland rules have been drafted and further stakeholder engagement and public review is planned as part of the rule development process. Current updates can be found at Revisions to Freshwater Wetlands Rules.

Combined Sewer Overflows (CSOs) – Upper Narragansett Bay

A major impairment of use in Narragansett Bay results from bacterial contamination. The most significant sources are the combined sewer overflows (CSOs) that discharge from the Providence metropolitan region into the upper bay or its tributaries. To address these CSO impacts, the Narragansett Bay Commission (NBC) continues to implement a CSO abatement program, through which the number of permitted CSO outfalls have been reduced from 73 when the NBC's permits were issued in 2001 (28 in the Bucklin Point service area – including the North Diversion Structure – and 45 in the Field's Point service area – including its wet weather treatment system) to 65 when the permits were reissued in 2017 (27 in the Bucklin Point service area – including the North Diversion Structure and its new wet weather treatment system - and 38 in the Field's Point service area – including its wet weather treatment system). In addition, upgrades to the NBC's Wet Weather Treatment Facilities located at the Field's Point and Bucklin Point WWTFs in 2006 and 2008 provide primary treatment and disinfection for up to 123 MGD and 70 MGD of wet weather flow, respectively.

Further, with RIDEM approval, the NBC has pursued a phased approach to further reduce CSOs. Phase I, completed in 2008, included a main spine storage tunnel with an effective volume of 62 million gallons. Phase II, completed in 2014, included two new sewer interceptors that convey additional CSOs along the Woonasquatucket and Seekonk Rivers to the main spine tunnel and also included sewer separation projects, a wetlands treatment system, and floatables control facilities. NBC's Phase III plan was approved by RIDEM in 2017 and includes a 61.4 million gallon deep rock storage tunnel that will collect CSOs in the Bucklin Point WWTF service area and convey flow to the Bucklin Point WWTF. Phase III also includes CSO regulator modifications, sewer separation projects, new sewer interceptors, green stormwater infrastructure projects, and an additional stub storage tunnel. RIDEM and NBC entered a consent agreement in 2018 that includes a schedule for the design and construction of Phase III. Construction of the Phase III storage tunnel is scheduled to begin in 2021 and is expected to be operational by 2027/2028. The remaining Phase III projects are scheduled to be completed over a period of time starting in 2022 and ending in the early 2040s.

Although significant portions of the estuary area are still temporarily closed to shellfishing following rainfall events, the CSO reduction has allowed RIDEM to increase the rainfall thresholds that trigger shellfish closures from 0.5 (Conditional Area C) and 0.8 (Conditional Area

A) in May 2011 to 1.2 inches of rain (merged Conditional Areas A and C) in July 2017. In addition, Conditional Area B was upgraded from Conditionally Approved to Approved shellfishing status as a result of the prior CSO abatement work. Conditional Area B is the newly create Upper Narragansett Bay segment delisted in this 2018-2020 assessment cycle. Water quality data continues to be collected to evaluate the effectiveness of the CSO abatement measures.

Narragansett Bay – Nutrients and Dissolved Oxygen

Eutrophication caused by nutrient enrichment is a priority water quality concern for Narragansett Bay. About one-third of the RI portion of Narragansett Bay is designated as impaired for low dissolved oxygen, also called hypoxia. Significant investment led to completion of upgrades of wastewater treatment facilities located in both RI and MA that discharge into the upper Bay region and its tributaries. The targeted Rhode Island WWTFs first achieved the 50% summer reduction goal during the 2012 summer season. Between 2016 and 2020, the percent reduction of the nitrogen loads from the eleven RI and six MA WWTFs ranged from 70-76% when compared to the (pre-nitrogen reduction) early 2000s time period. Since that time RIDEM, partners and researchers have been focused on monitoring the improvement in water quality. Given the high degree of interannual variability in the data, on-going monitoring is needed to properly characterize water quality trends. A reduction in frequency and duration of hypoxic events has occurred in recent years (notably 2014, 2015, and 2017), but additional data is needed to ascertain significance in the trend. In addition, the reduction of hypoxic events has not been great enough to remove impairments for low oxygen in Narragansett Bay based on the Rhode Island estuarine water quality criteria for dissolved oxygen. Therefore, for this assessment cycle, no change was made in the impairment status of the Bay relative to dissolved oxygen.

Lake Management & Cyanobacteria Blooms

Lake management issues are demanding greater attention in Rhode Island. Priority concerns include proliferation of aquatic invasive plants, increased number of confirmed cyanobacteria blooms, and nutrient enrichment. RIDEM seasonal survey data, coupled with information collected via the Rhode Island Natural History Survey and the URI Watershed Watch Program, has documented aquatic invasive species as being a widespread problem in Rhode Island. The Rhode Island state management plan for aquatic invasive species recommends that RIDEM establish a lake management program. Resource limitations have prevented RIDEM from doing so to date, but the strong need for a program remains. In collaboration with the RIDOH, RIDEM has also instituted seasonal response, with some pre-emptive surveillance when resources allow, of cyanobacteria and confirmed blooms in 49 waterbodies as of 2020. These include the drinking water reservoirs supplying the Newport Water Department - all of which are also enriched with excessive nutrients. As also noted elsewhere, the reservoir system is a current target of TMDL Development. More broadly, RIDEM is encouraging development of lake management plans as an effective means of fostering protection and restoration of lake water quality conditions.

Monitoring Needs

Through the 305(b) assessment process, RIDEM identified gaps in available water quality data

as a significant concern. While steps have been taken to expand monitoring, as this report indicates, the data gaps remain significant: 18% of lake acres and 20% of river miles are unassessed. Additionally, while progress has been made to reduce the gap, the limitations of the available fish tissue contamination data is evident in this report. Sustaining support for monitoring programs is important to avoid creating gaps as a result of available data used to support the assessment of surface waters becoming outdated (more than five years old).

RIDEM updated its surface water monitoring strategy in 2019. The strategy consists of a mix of sampling designs organized to cost- effectively reduce data gaps while meeting the data needs of state water management programs. It includes fixed-site networks, a rotating basin approach to rivers and streams, targeted surveys, and an expansion of the use of biological indicators. The framework reflects the partnerships and collaborations that occur among state, local and federal agencies, universities and colleges, other organizations, and volunteers regarding monitoring activities.

Nonpoint Source Pollution – Onsite Wastewater Treatment Systems

Onsite Wastewater Treatment Systems (OWTS) - either failed or substandard - are recognized as one of the leading non-point source pollution problems in the state – contributing nutrients, bacteria and potentially viruses to both coastal and inland waters. There are an estimated 150,000 OWTS in the state. Consistent with the Nonpoint Source Pollution Management Plan, a multi-faceted strategy has been pursued to prevent and abate pollution from septic systems. Continued implementation of state program initiatives to encourage the upgrade and replacement of inadequate septic systems will remain a priority. Pursuant to legislation adopted in 2007, approximately 1000 cesspools have been removed from use within 200 feet of the coast, public wells and drinking water reservoirs. Amendments to the legislation in 2015 require the removal of cesspools within one year of the property's point of sale statewide. RIDEM estimates that there are approximately 12,000 cesspools remaining in use. For more information, see OWTS Cesspool Phaseout. RIDEM regulations since 2008 have required advanced treatment for OWTS to control the discharge of nitrogen in certain sensitive coastal watersheds. Through 2020, approximately 9,000 denitrification systems have been installed in RI.

Watershed Restoration – Developing & Implementing TMDLs

Watershed restoration plans, known as TMDLs, provide the technical basis for optimizing investments to abate water pollution. Current federal and state funding levels do not provide RIDEM adequate funding to support the water quality studies and modeling that is needed, especially for larger watersheds. In many of the impaired waters, the absence of point source discharges indicates that nonpoint sources of pollution are predominant, which presents challenges for accomplishing actual restoration. With the significant contributions of stormwater and nonpoint sources to the identified impairments, municipalities often bear the major responsibility for implementation of TMDLs. Federal and state grant programs have fostered dozens of implementation projects in recent years; however, it is clear that additional resources are needed in order to meet the demands of the TMDL mandate. The needs include

funding for assessment, building local capacity to implementation projects, and program coordination.

PFOA/PFAS

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 EPA established a Drinking Water Health Advisory for two of these PFAS compounds – perfluorooctanic acid (PFOA), perfluorooctane sulfonate (PFOS), or a combination of PFOA and PFOS at 70 parts per trillion. In 2017, RIDEM adopted the EPA health advisory as a groundwater quality standard. The RI Department of Health established a PFAS Drinking Water Technical Advisory Committee in 2019 to work with DOH in its efforts to develop a RI drinking water standard for PFAS. DOH has prepared documents supporting a state standard much lower than the federal health advisory for 6 PFAS.

Although PFOA and PFOS are no longer produced, they remain in the environment due to their persistence and in out-dated products. Current areas of concern regarding PFAS are determining the appropriate drinking water standard for PFOA and PFOS, identifying the health effects and potential drinking water protection guidelines for some of the 1000's of other PFAS compounds in use, and determining guidelines and eventually water quality criteria for in PFAS in surface waters. These determinations will support management decision-making relative to 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.

Low Flow Impacts - Hydromodification/Withdrawals

Most of Rhode Island's rivers and streams are subject to some type of anthropogenic hydromodification, including the presence of dams as well as water withdrawals. Projects have been completed to both remove dams or construct improved fish passage to mitigate the impacts of dams on stream continuity. Low flow characteristics of streams are important elements in the planning and utilization of water resources, especially with respect to water supply and wastewater discharge. Planners and managers in Rhode Island are concerned that excessive withdrawals of water from certain streams or adjacent aquifers could severely impact the quantity and quality of stream water available during low flow periods. RIDEM has developed an approach to improve management of new water withdrawals to prevent adverse impacts to streamflows. Through a watershed-based approach, the allowable withdrawal from rivers and streams are identified. The approach, referred to as the Stream Depletion Methodology (SDM), is intended to identify those watersheds or portions of watersheds where adequate streamflows will support additional withdrawals as well as those which have constraints to further withdrawals. The approach is intended to streamline permitting of new

withdrawals while also being protective of aquatic ecosystems. A more wholistic program which addresses all withdrawals (historic and new) and other types of hydromodification remains a need.

Habitat Restoration – Coastal and Inland

Habitat restoration is recognized as increasingly important to sustaining healthy ecosystems and supporting Rhode Island's resiliency in light of climate change. In the coastal zone, it is estimated that R.I. has lost 37% of all coastal wetlands that existed in colonial times (from 102,000 acres to 65,000 acres). Eelgrass beds – another important aquatic habitat - in coastal waters are significantly diminished as well. Inland, the loss of freshwater wetland habitat is not as well quantified but has been considerable in portions of the State. In addition to the damaging effects of climate change, both freshwater wetlands and coastal marshes have been impacted from nonpoint source pollution and sedimentation as well as lost to land development. Governmental agencies, including RI Coastal Resources Management Council and RIDEM, along with partners have updated planning for habitat restoration. In the case of salt marshes, CRMC and partners are piloting strategies to improve the resilience of salt marshes to sea level rise.

Recommendations

The following list of recommendations outlines general actions that are deemed necessary to achieve the objectives of the CWA in Rhode Island waters.

- **Expand funding for needed wastewater and stormwater infrastructure improvements.** The State Revolving Fund (SRF) is relied upon as the major source of funding for municipal wastewater treatment projects in Rhode Island. The State's 2020 Project Priority List identified $1.24 billion in clean water financing needs for capital projects involving wastewater, stormwater and other water quality concerns. This significantly exceeds the funds available through the SRF including leveraging. Water quality restoration plans (TMDLs) have identified the need to reduce pollutant loadings from stormwater discharges yet barriers to using SRF for stormwater projects remain in many municipalities. Development of additional sustainable sources of funding for stormwater management is needed to support both retrofitting and on-going maintenance.

- **Assess water quality improvements resulting from implementation of the nutrient reduction strategy for the Upper Bay.** RIDEM, in cooperation with its partners, should continue monitoring in the Bay to assess changes in water quality including the frequency and duration of hypoxia as well as trends in temperature and other climate related impacts. Due to interannual variability, several years of data will be needed to assess changes.

- **Improve stormwater management**. A comprehensive approach to stormwater management program is needed to mitigate and control the runoff generated from both new and existing land uses. RIDEM, working with partners, should continue to promote the use of green infrastructure strategies which benefit water quality and deliver co-

benefits.

- One key component should be the expanded application of low impact development techniques for new and re-development projects. Additionally, strengthening coordination between state and local entities with respect to land use permitting matters will be important. Expanded training and technical assistance to municipalities and other stakeholders remains a need.

- RIDEM should continue to coordinate closely with RIDOT and EPA to facilitate implementation of improvements to reduce pollutant loadings associated with stormwater runoff from state roads and bridges. This includes but is not limited to updating BMP designs and installation and maintenance of BMPs to provide better treatment of stormwater runoff.

- RIDEM and CRMC should continue to closely coordinate on updating the RI Stormwater Manual in order to ensure effective control of the volume and quality of stormwater discharges including adapting to a changing climate and new technologies. Training on the updated manual's requirements and further guidance on the manual's implementation should be developed and offered.

- Foster compliance with MS4 requirements by providing guidance, financial support to build local capacity and incentive grants for priority retrofitting projects. Oversee formal enforcement actions and consent agreement commitments.

- **Invest in adequate water quality monitoring.** Additional investment in ambient monitoring is needed to reduce current data gaps and provide data that allows for a more complete assessment of water quality in surface waters, groundwaters as well as the condition of wetlands. Data management system improvements are needed to facilitate analysis of monitoring data and public access to data via the internet.

- **Continue combined sewer overflow abatement.** Implementation of Phase 3 of the Narragansett Bay Commission combined sewer overflow (CSO) abatement program is needed to further reduce untreated discharges to the Blackstone and Seekonk Rivers.

- **Develop water quality restoration and protection plans**. Continue to develop water quality restoration plans (TMDLs) to identify and prioritize needed water pollution control actions in waters with documented impairments. Additional funding is needed to support the application of water quality modeling tools that are available. Building on TMDLs, develop watershed plans to guide implementation of additional protection actions including habitat restoration.

- **Build capacity to monitor and respond to harmful algal blooms.** Rhode Island needs to

build capacity within state and local programs to more effectively address problems with harmful algal blooms (HABs), including cyanobacteria which have been confirmed in 49 freshwater bodies in RI. Additional capacity is needed to conduct more frequent monitoring to track bloom conditions (including toxicity) and to support communication for public health protection.

- **Establish a lake management program within RIDEM**. Declining conditions in freshwater lakes, including excessive growth of invasive plants, have highlighted the need for a state program that would facilitate development and implementation of lake management plans. The plans are needed to guide actions to address water quality and aquatic habitat degradation including but not limited to nutrient pollution, cyanobacteria blooms, and invasive plant management. DEM's capacity to provide technical and financial assistance to local entities and lake associations should be expanded to meet the demands for more effective lake management.

- **Strengthen Local On-site Wastewater Management Programs**. All communities which rely significantly on septic systems should implement active local wastewater management programs which provide oversight, as well as financial assistance as appropriate, to promote effective on-site wastewater system maintenance and address repair and replacement needs in the community.

- **Continue phase-out of cesspools.** The State should continue to implement mandatory cesspool phase-out in environmentally sensitive areas pursuant to 2007 state law, continue to encourage the voluntary phase out of cesspools in other areas, and support point of sale requirements statewide. Where sewers are available, the state should compel mandatory hook-ups.

- **Improve oversight of alternative and experimental (A&E) technologies for on-site wastewater disposal.** RIDEM should develop, in coordination with municipalities, a more systematic means to track the maintenance of A & E on-site wastewater systems and evaluate their performance over time. Where necessary, requirements for use of nitrogen-removal systems should be mandated in sensitive environmental areas.

- **Integrate water quality protection in land use planning**. Growth management planning occurring on the state and local level should embrace approaches and techniques that minimize impacts to water quality; e.g. conservation development, LID, etc. The state should continue to provide tools and training to assist municipalities in managing the environmental impacts of growth and provide incentives for communities to build local capacity to take advantage of innovative land use controls among other strategies.

- **Implement agricultural best management practices (BMPs).** Agricultural operations should use best management practices to prevent water quality impacts. DEM should continue to collaborate with the Natural Resources Conservation Service, conservation districts, and other stakeholders to offer technical and financial assistance that fosters

agricultural BMP implementation.

- **Build capacity for regular reviews of water quality standards.** RIDEM should build capacity for regular reviews and updates to the state water quality standards to ensure protection of Rhode Island's surface waters and their designated uses, and to allow for enhanced assessment tools. Incorporation of biocriteria, where possible, and refinement of nutrient criteria are needed. Waters which fail to support designated uses should be further evaluated and restored through the development of water quality restoration plans, known as TMDLs.

- **Build capacity for managing hydromodifications**. Further development of statewide policy/guidance is needed in the areas of water use (water withdrawals, out-of-basin transfers and other hydromodifications) in relation to water quality and aquatic habitat. Expanded data collection on water use is needed to inform policy development.

- **Promote compliance with the no discharge designation granted for Rhode Island coastal waters.** Continue to issue grants to foster a network of boat pump out facilities that supports the no-discharge designation for RI coastal waters.

- **Continue to implement strategies to prevent groundwater pollution**. Enforce siting restrictions and encourage use of overlay zoning to protect groundwater resources used for water supply from higher risk pollution sources. Enforce design and operating requirements to prevent the release of pollutants to groundwater from regulated facilities including landfills and underground storage tanks among others.

- **Eliminate high risk discharges to groundwater**. Discharges that pose a high risk for adversely affecting groundwater quality should continue to be eliminated under the closure procedures administered by the Underground Injection Control (UIC) Program. Best management practices should be encouraged at facilities to minimize pollution risks.

- **Track and respond to the occurrence of emerging contaminants including PFOA/PFAS.** PFAS/PFOAs have been detected in RI groundwaters supplying drinking water prompting further investigative and response actions.

- **Protect water quality and conserve vital aquatic habitats through open space acquisition.** RI should continue to strategically conserve lands through acquisition or easements that will protect water quality and aquatic habitat.

- **Invest in priority habitat restoration projects**. RIDEM should continue to work with partners to secure funding to support priority aquatic habitat restoration projects including those related to stream connectivity and riparian buffers among others. State and local funds should be used to leverage federal funds that are or may become

available for such purposes.

- **Maintain strong partnerships**. DEM should continue to participate in regional partnership programs and collaborate with watershed organizations and other stakeholders to foster implementation of protection and restoration actions. Partnerships help align resources to accelerate getting the needed work done.

Chapter

3

Monitoring and Assessment

Surface Water Monitoring and Assessment

In accordance with Section 305(b) of the CWA, states are required to survey their water quality for attainment of the fishable/swimmable goals of the Act and to report the water quality assessments biennially (every even year). The attainment of the CWA goals is measured by determining how well waters support their designated uses. For the purposes of the 305(b) water quality assessments, seven designated uses are evaluated: fish and wildlife habitat (aquatic life use), drinking water use, shellfish consumption, shellfish controlled relay and depuration, fish consumption, primary contact recreation and secondary contact recreation (swimming use), as assigned by classification in the Rhode Island Water Quality Regulations.

In the assessments, use support status is determined by comparing available water quality information and data to the water quality standards established in the Rhode Island Water Quality Regulations. The methodology for this assessment process is outlined in RI's Consolidated Assessment and Listing Methodology (CALM). The results of this comparison are then used to categorize each waterbody's specific designated uses as "Fully Supporting" or "Not Supporting". If data is insufficient or not available to evaluate a designated use, it is considered "Not Assessed". Waterbodies that are not supporting their criteria or designated uses by a pollutant are placed on the state's List of Impaired Waters, which is developed in accordance with Section 303(d) of the CWA. This List is prioritized and schedules are set for developing Water Quality Restoration Plans, also known as Total Maximum Daily Loads (TMDLs).

Monitoring Program

The RIDEM Office of Water Resources (RIDEM-OWR) has a primary role in both conducting monitoring programs and collaborating on water monitoring carried by other entities. 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 permit limits for wastewater discharges and Total Maximum Daily Loads (TMDLs). 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.

Estuarine and Coastal Monitoring Programs

Over the past decade, the capacity to monitor water quality in Narragansett Bay has been expanded. Current water quality sampling approaches constitute variations of fixed-site sampling designs with different locations, parameters, and sample frequency being employed to support specific program needs. The programs are coordinated, and in some cases, designed to complement each other to provide both spatial and temporal information.
Rhode Island's criteria for dissolved oxygen in salt waters has emphasized the need for collection of continuous measurements of DO and related parameters. This is accomplished through the multi-partner Narragansett Bay Fixed Site Monitoring Network (NBFSMN) which consists of thirteen (13) stations located on either docks or buoys in RI waters and two newer stations in Mt. Hope Bay in MA. The stations collect data on a continuous basis seasonally. The network is described further at Fixed-Site Monitoring Stations and Data in Narragansett Bay.

Complementing the NBFSMN are surveys carried out by Brown University, in collaboration with Save the Bay and DEM, that collect water quality profile data from more than 75 locations in the mid to upper Bay region. This collaborative program is further described at Narragansett Bay Dissolved Oxygen Surveys. These two long-range programs are supplemented with water quality data collected in certain target coastal waters by the Narragansett Bay Commission (NBC) and generated via water quality restoration studies conducted by RIDEM, as well as by other research projects of various duration and scope.

In addition to water quality parameters, there exists extensive monitoring of the coastal waters for pathogens. On a statewide basis, the RIDEM Shellfish Growing Area Monitoring Program and the RIDOH Beach Monitoring Program extensively samples for pathogens. In addition, the NBC samples its receiving waters for pathogens as part of its overall management of its wastewater system. For more information on bacteriological monitoring see DEM's Shellfish Monitoring Program. For more information on Rhode Island's Beach Program see RIDOH's website. NBC describes its activities and makes data available via its website portal "Snapshot of the Bay".

In addition to the above, there are volunteer monitoring programs active in RI coastal waters. The URI Watershed Watch Program involves over 70 sites, including many of RI's southern coastal ponds. Volunteers are active in the Blackstone River Watershed as part of regional monitoring program. A collaborative effort led by Surfrider Association is resulting in additional data being collected on beach water quality on Aquidneck Island and along the southern RI shore; this data includes the off-season, and helps to identify potential pollution sources that may affect priority beaches. Clean Ocean Access also carries out volunteer monitoring on Aquidneck Island.

While capacity has increased, there are gaps in the current configuration of monitoring activities. RIDEM notes little data is collected from the Sakonnet River and that additional monitoring is needed to properly characterize local conditions in many coastal embayments. A USGS project funded by the Southern New England Estuary Program monitored water quality in the Sakonnet River in 2018 using continuous water quality monitoring buoys and associated

surveys. This work continued on a more limited basis in 2019, but no long-term, stable funding has been secured. Future investment in additional monitoring will be needed to more fully characterize conditions in the Sakonnet River.

Freshwater Monitoring Programs

RIDEM ARM sampling Carr River, West Greenwich

To address historical large data gaps, RIDEM adopted a rotating basin approach to sampling wadeable rivers and streams that was first implemented in 2004. The sampling design involves an intensive data collection effort conducted at the 10-12 digit HUC watershed scale. This monitoring approach results in a portion of the state's watersheds being sampled annually on a schedule aimed at covering the entire state every four to five years depending upon staffing and resources. More information about the ARM Program can be found in the Quality Assurance Project Plan (QAPP) for the project. The ARM program rotated to the Clear/Branch/Blackstone/Woonasquatucket Rivers watersheds in 2019 and rotated to the East Bay, Aquidneck Island, and coastal Bay tributaries in 2021, depending on funding and resources.

In addition to the Ambient River Monitoring Program, RIDEM continued to partner with USGS on water quality monitoring of large (non-wadeable) rivers, which occurs monthly for a core set of parameters. Stations sampled in the program are located on the Blackstone, Pawtuxet, and Pawcatuck Rivers. Data on river water quality is also generated by the Narragansett Bay Commission, Pawtucket Water Supply, Providence Water Supply, and through volunteer programs, including URI Watershed Watch and the Blackstone River Watershed Council/Friends of the Blackstone. This data supplements the State's core programs and may be helpful in identifying changes in water quality conditions that may be occurring in between the State's rotations in a watershed.

With respect to lakes, RIDEM relies primarily on the water quality data generated by the University of Rhode Island Watershed Watch Program which coordinates the volunteer-based monitoring of lakes throughout the state. RIDEM supports this program with a multi-year grant agreement. RIDEM has also completed more detailed assessment of water quality conditions for lakes as part of the development of water quality restoration studies, known as TMDLs. During the past assessment cycle, the waterbodies that make up the Newport Water Supply were the focus of a targeted monitoring effort by RIDEM's TMDL group. Growing public interest in the problem of nuisance aquatic invasive plant growth in lakes and ponds prompted RIDEM to establish a seasonal monitoring program that surveys for the presence and extent of aquatic invasive species (AIS). Information from the surveys is combined with data reported via the URI

Watershed Watch Program and RI Natural History Survey to track the locations of Aquatic Invasive Species.

Assessment Methodology and Results

Data Sources

RIDEM's methods for assessing water quality are specified in a document referred to as the Consolidated Assessment and Listing Methodology (CALM). As noted in the CALM, RIDEM strives to consider all readily available water quality data and related information in assessing surface waters quality. In determining if data are appropriate, RIDEM considers quality assurance/quality control, data quality objectives, monitoring design, age of data, accuracy of sampling location information, data documentation, and data format (hard copy versus electronic). The data quality objectives outlined in the CALM are used to allow RIDEM to determine, in a consistent manner, whether data can be used to make determinations about the water quality attainment status. Detailed requirements for data considered in this cycle can be found in the 2018-2020 Consolidated Assessment and Listing Methodology (CALM; http://www.dem.ri.gov/programs/benviron/water/quality/pdf/calm20.pdf).

For the 2018-2020 cycle, a comprehensive review of water chemistry data included all available data from 2012 – 2016 that met minimum QA and QC procedures outlined in the 2018-2020 CALM. In a few limited cases, data through 2019 were also included. The primary resources of data are presented below:

Table 1 Data Sources Used in Assessments

Agency	**Volunteer/Municipality/Other**
Ambient River Monitoring (RIDEM)	Fixed Site Monitoring in Narragansett Bay*
Large River Monitoring (USGS)	Narragansett Bay Commission
TMDL Studies (RIDEM)	Providence Water Supply Board
Fish Consumption, Beach Closure, & Drinking Water (RIDOH)	URI Watershed Watch
RIDEM Shellfishing Program	Pawtucket Water Supply Board
Collaborative Hg Fish Tissue Surveys	City of Newport

*Joint program administered by RIDEM through contract with URI

Given the small size of the state, RIDEM is able to conduct a census survey of publicly accessible lakes in lieu of implementing a probabilistic sampling design as suggested by EPA. The data provided by the collaborative mercury fish tissue surveys has reduced the data gap with respect to lakes with major public access. The results to date are included in the assessment of Fish Consumption in coordination with the Rhode Island Department of Health (RIDOH) for individual waterbodies and data has been collected since 2004.

Data Assessment

The CALM describes in detail the decision- making process for assessing the quality of surface

waters in accordance with requirements of Section 305(b) and for generating the list of impaired waters in accordance with requirements of Section 303(d). The Methodology describes the quality of data necessary to be used in the assessment and listing process, and how that data and information are then interpreted to arrive at an assessment of water quality for placement in one of the five Integrated Report Categories.

Assessment Results

Table 2 shows the summary of assessment units (waterbody IDs) for each Category and by waterbody type. Most assessment units in the state fell into Category 3 (Insufficient or no data to assess any designated use. One hundred and nineteen (118) assessment units are impaired for one or more designated uses but have TMDL approved by EPA for the causes of impairment (Category 4A). No waterbodies or impairments fell into Category 4B, following the removal of Aquatic Life Use impairments for fish bioassessment in Category 4B in the four segments of Mt. Hope Bay. The waterbodies in Category 4C are primarily for impairments associated with the presence of invasive species of aquatic plants and/or animals. One hundred and ninety-eight (19) assessment units are in Category 5, the 2018-2020 303(d) List of Impaired Waters needing a TMDL. The 303(d) List identifies waterbodies within the State, which are not currently meeting Rhode Island Water Quality Standards. The Category 1-4 Lists and the Category 5 303(d) List can be found at: 2018 - 2020 Integrated Reporting Lists.
The rationale for delisting of waterbodies can be found at: 2018 - 2020 Delisting Document.

Table 2. Assessment Unit Category Listing Summary

Category	Waterbody Type								Total Number AU/WBID#s
	Estuarine Waters		**Rivers/Streams**		**Lakes/Ponds**		**Ocean / Near Coastal**		
	Miles^2	AUs/WBIDs	Miles	AUs/WBIDs	Acres	AUs/WBIDs	Miles^2	AUs/WBIDs	
1	0	0	0	0	0	0	0	0	0
2	99.7	70	349.74	116	4289.42	21	305.36	8	215
3	2.56	14	274.75	212	3363.11	101	0	0	327
4A	5.58	18	274.67	69	3239.4	31	0	0	118
4B	0	0	0	0	0	0	0	0	0
4C	0	0	18.59	3	1612.97	29	0	0	32
5	51.37	36	458.13	111	6187.93	51	0	0	198
Totals	159.21	138	1375.88	511	18692.83	233	305.36	8	890

Summaries of Designated Use Support

Rivers and Streams

Eighty percent of mapped river miles are assessed for at least one designated use. Most river miles assessed have enough data to assess Fish and Wildlife Habitat and/or Recreational Use. The low percentage of assessed river miles for fish consumption and public drinking water supply are due to limitations on available data.

Branch River at Douglas Turnpike, Burrillville

Of the impaired river miles (751.4 miles), most impaired river miles (93.5%, 702.3 miles) have a pathogen impairment. The second most prevalent cause of impairment are metals with 27.35% (206.4 miles) of impaired river miles. The metal with the highest percent of impaired river miles (14.2%, 107 miles) is dissolved lead. Additional notable causes of river impairments are Nuisance Exotic Species (14.6%, 109.7 miles) and Biologic Integrity (9.98%, 75.0 miles).

Table 3 Individual Use Support Summary for Rivers and Streams (miles)

USE	Total Size (miles)	Assessed	Fully Supporting Assessed	Not Supporting Assessed	Not Assessed/ Insufficient Information
Fish and Wildlife habitat (Aquatic Life)	**1375.9**	1072.4 (77.9%)	785.4	287.1	**303.5**
Fish Consumption	**1375.9**	43.7 (3.2%)	0.0	43.7	**1332.3**
Swimming (Primary & Secondary Contact Recreation)	**1375.9**	998.0 (72.5%)	295.6	702.4	**377.9**
Public Drinking Water Supply	205.8	**6.1 (3.0%)**	**6.1**	**0.0**	**199.7**

Table 4 Miles of Rivers and Streams Impaired by Various Causes

Cause Group/detail *Total Impaired Miles: 731.2*	Size (miles)	% of Total Impaired Miles	% of Total Miles
PATHOGENS	**702.3**	**93.5%**	51.0%
Enterococcus	606.1	80.7%	**44.1%**
Fecal Coliform	137.6	18.3%	**10.0%**
BIOLOGIC INTEGRITY (BIOASSESSMENTS)	**75.0**	**10.0%**	**5.4%**
Benthic-Macroinvertebrate Bioassessments	75.0	10.0%	5.4%
BIOASSAYS	**6.1**	**0.8%**	**0.4%**
Ambient Bioassays -- Chronic Aquatic Toxicity	4.0	0.5%	0.3%
Whole Effluent Toxicity (WET)	2.2	0.3%	0.2%
OXYGEN DEPLETION	21.1	2.8%	**1.5%**
Oxygen, Dissolved	21.1	2.8%	**1.5%**
NUTRIENTS (Macronutrients/Growth Factors)	40.1	5.3%	**2.9%**
Phosphorus (Total)	40.1	5.3%	**2.9%**
TOXIC ORGANICS	**28.4**	**3.8%**	**2.1%**
Dioxin (including 2,3,7,8-TCDD)	8.7	1.2%	0.6%
Polychlorinated biphenyls	8.7	1.2%	0.6%
PCB in Fish Tissue	28.4	3.8%	2.1%
TOXIC INORGANICS	**17.4**	**2.3%**	**1.3%**
Chloride	17.4	2.3%	1.3%
METALS	206.4	27.5%	**15.0%**
Aluminum	6.8	0.9%	0.5%
Cadmium	53.2	7.1%	3.9%
Copper	42.3	5.6%	**3.1%**
Iron	64.3	8.6%	**4.7%**
Lead	107.1	14.2%	**7.8%**
Mercury	8.7	1.2%	0.6%
Zinc	15.1	2.0%	1.1%
Zinc (Dissolved)	3.7	0.5%	**0.3%**
Mercury in Fish Tissue	43.7	5.8%	3.2%
Mercury in Water Column	4.6	0.6%	0.3%
OTHER	**8.6**	**1.1%**	**0.6%**
Turbidity	8.6	1.21%	0.6%
NUISANCE EXOTIC SPECIES	109.7	14.6%	**8.0%**
Non-Native Aquatic Plants	109.7	14.6%	**8.0%**
NUISANCE NATIVE SPECIES	**1.6**	**0.2%**	**0.1%**
Aquatic Plants - Native	1.6	0.2%	0.1%

Lakes and Ponds

Of the impaired lake acres (11,040 acres), the highest cause of impaired lake acres is metals (61.3% of impaired acres, 6,772.9 acres), with the highest metal impairment being mercury in fish tissue (56.4%, 6227.4 acres). The second most prevalent cause of impaired lake acres are Nuisance Exotic Species with 34.5% (5,287.8 acres). The other highest percentage of lake acre impairment causes are Nutrients (47.9%, 3507.9 acres) and causes associated with nutrient impairments such as Chlorophyll-a and Total Organic Carbon (10.8%, 1196.1 acres) and Oxygen Depletion (14.6%, 1,613.3 acres).

Peace Dale Reservoir, South Kingstown

Table 5 Individual Use Support Summary for Lakes and Ponds (acres)

USE	Total Size (acres)	Assessed	Fully Supporting Assessed	Not Supporting Assessed	Not Assessed/ Insufficient Information
Fish and Wildlife habitat (Aquatic Life)	18,692.7	11227 (60.1%)	3,239	7,988	7466
Fish Consumption	18,692.7	7450 (39.9%)	1,145	1,145	6,304
Swimming (Primary & Secondary Contact Recreation)	18,692.7	8151 (43.6%)	7,794	357	10542
Public Drinking Water Supply	7,788.7	5519 (70.9%)	4,267.5	1,251.0	2,270.1

Table 6 Acres of Lakes and Ponds Impaired by Various Causes

Cause Group/detail	Size (acres)	% of Impaired Acres	% of Total Acres
PATHOGENS	**356.5**	**3.2%**	**1.9%**
Enterococcus	29.1	0.3%	0.2%
Fecal Coliform	327.4	3.0%	1.8%
OXYGEN DEPLETION	**1613.3**	**14.6%**	**8.6%**
Oxygen,	1613.3	14.6%	8.6%
NUTRIENTS (Macronutrients/	**3506.9**	**31.8%**	**18.8%**
Phosphorus	3506.9	31.8%	18.8%
TOXIC INORGANICS	**26.3**	**0.2%**	**0.1%**
Chloride	26.3	0.2%	0.1%
TOXIC ORGANICS	**76.8**	**0.7%**	**0.4%**
PCB in Fish	76.8	0.7%	0.4%
METALS	**6772.9**	**61.3%**	**36.2%**
Aluminum	245.0	2.2%	1.3%
Cadmium	245.0	2.2%	1.3%
Copper	282.4	2.6%	4.2%
Lead	477.3	4.3%	2.6%
Mercury in Fish	6227.4	56.4%	33.3%
MINERALIZATION	**81.2**	**0.7%**	**0.4%**
Total Suspended	26.3	0.2%	0.1%
Taste	42.2	0.4%	0.2%
OBSERVED EFFECTS	**2422.7**	**21.9%**	**13.0%**
Chlorophyll-a	1079.5	9.8%	5.8%
Total Organic	1196.1	10.8%	6.4%
OTHER	**163.9**	**1.5%**	**0.9%**
Turbidity	163.9	1.5%	0.9%
NUISANCE EXOTIC	**5287.8**	**47.9%**	**28.3%**
Non-Native	5287.8	47.9%	28.3%
Non-Native Fish,	280.9	2.5%	1.5%
FLOW ALTERATIONS	**497.1**	**4.5%**	**2.7%**
Other flow	497.1	4.5%	2.7%

Estuarine Waters

Of the impaired estuarine miles^2 (56.95 miles^2), the highest cause of impaired estuarine miles^2 is Oxygen Depletion (85.7%, 48.8 miles^2 of the impaired area). The second most prevalent cause of impaired estuarine miles^2 is Pathogens with 73.0% (41.6 miles^2). The other highest percentage of estuarine mile^2 impairment causes are Nutrients (69.8%, 39.7 miles^2), which is often the reason for oxygen depletion.

Table 7 Individual Use Support Summary for Estuarine Waters (square miles)

USE	Total Size (miles^2)	Assessed	Fully Supporting Assessed	Not Supporting Assessed	Not Assessed/ Insufficient Information
Fish and Wildlife habitat (Aquatic Life)	159.2	104.6 (65.7%)	54.9	49.8	54.6
Fish Consumption	159.2	0 (0%)	0.0	0	159.2
Swimming (Primary & Secondary Contact Recreation)	159.2	155.3 (97.5%)	138.9	16.4	4.0
Shellfish Consumption	135.5	132.0 (97.4%)	105.9	26.1	3.5
Shellfish Controlled Relay and Depuration	16.6	15.3 (91.8%)	14.5	0.8	1.4

Table 8 Square Miles of Estuarine Waters Impaired by Various Causes

Cause Group/detail	Size (miles^2)	% of Impaired Miles^2	% of Total Miles^2
PATHOGENS	**41.6**	**73.0%**	**26.1%**
Enterococcus	1.2	2.0%	0.7%
Fecal Coliform	40.4	71.0%	25.4%
BIOASSAYS	**1.0**	**1.8%**	**0.6%**
Sediment Bioassays for Estuarine and Marine	1.0	1.8%	0.6%
OXYGEN DEPLETION	**48.8**	**85.7%**	**30.7%**
Oxygen, Dissolved	48.8	85.7%	30.7%
NUTRIENTS (Macronutrients/Growth Factors)	**39.7**	**69.8%**	**25.0%**
Phosphorus (Total)	0.01	0.02%	0.01%
Nitrogen (Total)	39.7	69.8%	25.0%

Impairment Changes

Table 9 Waterbody Segments Causes Removed from the 303d List (Category 5)

Cause of Impairment	Waterbodies
Copper	• Wood River (-16D)
Dissolved Oxygen	• Blackstone River (-01A, -01B)
Fecal Coliform	• Upper Narragansett Bay (-01B)
Fish Bioassessment	• Mt. Hope Bay (-01A, -01B, -01C, -01D)
Phosphorus (Total)	• Blackstone River (-01A, -01B)

Table 10 New Waterbody Impairments Added to the 2018-2020 303(d) List

Cause	Waterbodies
Enterococcus	• Borden Brook & Tribs (-01) • Dry Brook & Tribs (Johnston) (-02B) • Quaket Creek (-04) • Trib to Nonquit Pond (-20)
Iron	• Burnt Swamp Brook & Tribs (-06) • Indian Brook (-04) • Sylvyns Brook (-09)
Phosphorus (Total)	• Borden Brook & Tribs (-01) • Dry Brook & Tribs (Johnston) (-02B) • Trib to Nonquit Pond (-20) • Trib to Watson Reservoir (-21)

Assessment of Wetlands Conditions

The RIDEM and RI Coastal Resources Management Council (CRMC) regulate construction and other activities within vicinity of wetland resources. State policies require adverse impacts to wetlands be avoided 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. Updated data on status and trends is being compiled and will be reported in the next assessment cycle.

With funding support from the EPA, RIDEM has developed a wetland monitoring strategies for freshwater wetlands and coastal wetlands (salt marshes) that reflect the three-tiered approach recommended by EPA that includes landscape scale, rapid and intensive assessments tools. Building on work completed in the prior years, DEM collaborated with the CRMC, and RI Natural History Survey and Narragansett Bay Estuarine Research Reserve, has refined and validated a salt marsh assessment method known as MarshRAM and then more recently assessed salt marsh restoration sites. This work informed the development of a prioritization protocol for coastal wetland restoration.

RIDEM has continued to complete projects to further and refine develop methods to assess freshwater wetland conditions, including the tier-2 rapid assessment method referred to as RIRAM. This method was employed to assess twenty freshwater wetlands of high ecological value, thirty privately owned wetland locations and a group of peat-dominated wetlands (bogs/fens). Draft reports are in review at RIDEM. The data contribute to building out a gradient of condition for freshwater wetlands in RI. An earlier analysis of RIRAM data identified the most common wetland stressors as anthropogenic fluvial inputs, filling and dumping, and invasive species. Prior data analysis also 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 emphasizing the importance of upland buffer protection.

Public Health

Fish Consumption Advisories

All states in the northeast have issued fish advisories for mercury and other contaminants warning residents, particularly children and pregnant women, to limit ingestion of certain fish species or fish caught in particular waterbodies. The statewide freshwater advisory against consumption of fish species known to contain the most mercury and the statewide saltwater advisory against consumption of fish species known to contain mercury and PCBs are based on precautionary, region-wide advisories, and not on actual contaminant monitoring data collected within Rhode Island waters. Therefore, these advisories are not reflected in the assessment of Fish Consumption use. Unlike other northeast states, resource constraints in Rhode Island have prevented a routine surveillance program for fish tissue. RIDEM collaborates with the EPA Atlantic Coastal Environmental Sciences Division (ACESD) in Narragansett, RI, RIDEM Division of Fish and Wildlife, and EPA Region 1 Laboratory to collect fish tissue at select waterbodies each year. However, funding and staffing limitations have prevented this program from being fully implemented. This report documents the need to support this program. A number of lakes were listed as impaired for mercury in fish tissue based

on the data collected by the ACESD. Mercury in fish tissue is now the top impairment for impaired lakes in Rhode Island.

Another notable change in Fish Consumption use is in the estuarine waters was implemented in the 2016 cycle. RIDEM is aware of new data collected by researchers in Narragansett Bay and the Sounds. However, the data has not been fully reviewed by RIDEM and RIDOH in time for this report. In previous reports, RIDEM listed estuarine areas of Narragansett Bay as "Fully Supporting" for Fish Consumption use. These assessments have been changed to "Insufficient Information", given the new, unreviewed data beginning in the 2016 cycle. The RIDEM plans to review and collaborate with the researchers to use this data in future assessments, dependent on resources and funding.

Shellfish Consumption

The RIDEM Shellfish Growing Area Monitoring Program provides an extensive dataset concerning pathogens in the Narragansett Bay, other embayments, and coastal ponds. The program assures compliance with the USFDA National Shellfish Sanitation Program (NSSP), which regulates the interstate shellfish industry and enforces a national health standard among all shellfish producing states. Pathogen data, and other data where relevant, supports assessment of the shellfishing use and decisions to open and close areas to shellfish harvesting. RIDEM announces seasonal shellfish closures and any changes to shellfish closure status, annually in May. A map of the status of shellfish areas, including closed areas, is available at Shellfish Map.

Protection and restoration of shellfish growing area waters is identified as a priority for the state's ongoing water quality management and planning efforts. The efforts, investments, and coordination with many partners are allowing expanded shellfishing opportunities in Rhode Island waters, including some areas that have been restricted for decades. Due to improved water quality, RIDEM announced several improvements in May 2017 that expanded shellfish opportunities. The greatest improvement was the reclassification of Upper Narragansett Bay Conditional Area B (3,712 acres) from Conditionally Approved to Approved status and removal of the bacteria impairment for this area from the 303(d) list in 2020. Simultaneous with this, the closure rainfall threshold for Conditionally Approved Area A increased from 0.8 to 1.2 inches of rain. Unfortunately, due to localized, wet-weather bacteria sources small conditionally approved areas have been created in portions of Upper Narragansett Bay and Pt. Judith Pond.

Through significant investment by many partners, the Upper Narragansett Bay has seen great improvement in water quality and increased opportunities for shellfishing. Investments in infrastructure upgrades have brought marked improvements in water quality. Phases I and II of Narragansett Bay Commission's (NBC) Combined Sewer Overflow (CSO) abatement plan have collected and treated almost 12.5 billion gallons of dilute sewage between inception and early 2021 that would have been discharged to the Bay and urban rivers. NBC is finalizing its plan for Phase III of the CSO project. Upon implementation, further improvements to Upper Narragansett Bay and the Providence, Seekonk and Blackstone Rivers are expected.

Water quality monitoring, combined with shellfish tissue data, also shows that the lower portion of the Providence River holds potential as a new conditional shellfish harvest area. Shellfishing has been prohibited in the lower Providence River for more than 70 years. RIDEM, along with its partners, completed a Conditional Area Management Plan for the area to ensure seafood safety and the long-term sustainability of the shellfish stock. RIDEM organized a successful shellfish transplant from this area in September 2020. And in 2021, RIDEM announce the reclassification of the Lower Providence to create a new condition area (Conditional Area E). Over 1,900 acres, or 35% of the Providence River, opened for shellfishing in accordance with a carefully developed harvest schedule and subject to the provision that not more than a half-inch or rainfall occurs in the prior seven days.

Bathing Beach Monitoring and Closures

The Rhode Island Department of Health (RIDOH) is responsible for the licensing and associated regulation of bathing beach facilities in the state of Rhode Island. This includes both fresh and saltwater beaches. Funding for the RIDOH's water quality monitoring program for saltwater beaches is provided by the EPA. These funds support risk-based surveillance for bacteriological fecal indicator at licensed marine beaches, and a public notification system. Currently, the EPA does not provide funds to monitor freshwater bathing beaches. Freshwater beach managers are responsible for sampling on a schedule recommended by RIDOH.

With support from EPA, RIDOH continues to implement their risk-based program for coastal beaches to assign sampling frequency at each licensed beach. Sampling frequency ranges from monthly to twice weekly throughout the beach season based on level of use, proximity to potential pollution sources, and other factors. Currently, RIDOH does not conduct surface water monitoring at freshwater bathing beaches. Freshwater beach managers assure that their beaches conform with RIDOH regulations and monitoring recommendations.

Beach closures occur at both fresh and saltwater beaches. According to RIDOH, the number of beach closures in Rhode Island historically correlated with amounts of seasonal precipitation. Stormwater runoff from roads, parking lots, and other impervious surfaces transports contamination, including bacteria, to Rhode Island's fresh and salt-water bodies. Numerous municipalities including Barrington, Bristol, and Newport have installed stormwater improvement projects at and around their beaches. In the City of Warwick, hundreds of cesspools have been eliminated from use through connections to municipal sewer in the Oakland Beach area. While some problems still exist, and heavy rains still contribute to excessive pathogen loads, water quality has improved and there have been fewer beach closures in the last decade. Additional municipalities are in the process of installing systems to improve the quality of water at their beaches.

More information about the beach program can be found at:
https://health.ri.gov/beaches/

Table 11 2008-2020 Beach Closures Days Attributed to Pathogens[1]

Beach Name	City/Town	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Atlantic Beach Club	Middletown	12	18	8	8	3	1	2	2						**54**
Barrington Town Beach	Barrington	3	15	2	1		7	1		2	5		2	3	**41**
Bonnet Shores Beach Club	Narragansett											3	2		**5**
Briar Point Beach	Coventry											14	2		**16**
Bristol Town Beach	Bristol	4	12	5	4	6		1		2	1	1	1		**37**
Burlingame State Park Picnic Area	Charlestown												10		**10**
Camp Aldersgate	Scituate						1								**1**
Camp Aquapaug	West Kingston												1		**1**
Camp Canonicus	Exeter		7												**7**
Camp Cookie	Glocester										5				**5**
Camp Fuller	S. Kingstown		1	3	2		4	2					1		**13**
Camp Grosvenor	N. Kingstown	25	10	4	4	2						5	5		**55**
Camp Hoffman	S. Kingstown											6			**6**
Camp Ruggles (Iron's Homestead)	Glocester													6	**6**
Camp St. Dorothy	Bristol			5		5	2								**12**
Camp Watchaug	Charlestown		1	1		2							9		**13**
Camp Watmough	Glocester						2			11			7		**20**
City Park Beach	Warwick	15	12	2		1	13	1	3		2				**49**
Conimicut Point	Warwick	19	18	8	13	2	16	14	4	6	12	21	1		**134**
Difonso Recreation Area	Glocester											5			**5**
Dunes Club Beach	Narragansett	1													**1**
Dunes Park Beach	Westerly												2		**2**

Beach Name	City/Town	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Dyer Woods Campground	Foster												5	6	**11**
Easton's Beach	Newport	4	3	5	2	1		2	6	1			2	6	**32**
Echo Lake Campground	Glocester	6										4			**10**
Episcopal Conference Center	Richmond		5											2	**7**
Fogland Beach	Tiverton					2	2	1						2	**7**
Fort Adams State Park	Newport	1	6	2	1	3	5	1	1				7		**27**
Ginny B's Campground	Foster												2		**2**
Goddard Memorial State Park Beach	Warwick	1	10	5	6	3	7	2	8	2	1	10		2	**57**
Gooseberry Beach	Newport					1							5	4	**10**
Goosewing Beach	Little Compton											3			**3**
Gorton Pond	Warwick	22	21	1											**44**
Governor Notte Park	N. Providence	4	17	59											**80**
Grinnell's Beach	Tiverton					1	2	1					2		**6**
Harmony Hill School Beach	Chepachet												5		**5**
Hazard's Beach	Newport			2			1				2	0	2	2	**9**
Kent County YMCA[2]	Warwick	1		14		2	2								**19**
Kent County Lower Pond[2]	Warwick										14	10	17		**41**
Kent County Upper Pond[2]	Warwick										8	3	7		**18**
King Park Beach	Newport				1	4		5	1		4		1		**16**
Kingston's Camp at Larkin Pond	N. Kingstown							4				14			**18**
Larkin's Pond Beach	Kingston										1	9		3	**13**
Lincoln Woods	Lincoln	3		3								2			**8**
Mackerel Cove Beach	Jamestown	5			1					3					**9**
Misquamicut Club	N. Kingstown		1												**1**

Beach Name	City/Town	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Mother of Hope Day Camp	N. Kingstown			2											**2**
Narragansett Town Beach	Narragansett						2								**2**
Ninigret Pond	Charlestown	1				1				2		1			**5**
North Kingstown Town Beach	N. Kingstown		8				6	1	2				2	1	**20**
Oakland Beach	Warwick	15	17	5	14	2	27	3	9	9	26	6			**133**
Peabody's Beach	Middletown		11	3	3	3	1	2	7		3	3	3	4	**43**
Plum Beach Club	N. Kingstown		1								1				**2**
Roy Carpenter Beach	S. Kingstown												4		**4**
Sachuest Beach	Middletown						1								**1**
Sandy Point Beach	Portsmouth		2	1	1		5				2	9	9		**29**
Saunderstown Yacht Club	Saunderstown	3	3								4		2		**12**
Scarborough State Beach North	Narragansett	1	5	2	2	1	3	1	1				1		**17**
Scarborough State Beach South	Narragansett	1	5	2	2	1	3	2	1				3	2	**22**
Spouting Rock Beach	Newport									2	2			2	**6**
Spring Lake Beach	Burrillville						2						10		**12**
Surfer's Rock at Sachuest Beach	Middletown												7		**7**
Third Beach	Middletown	2	11		8	8		2	2		2	5	10	3	**53**
Warren Town Beach	Warren	9	9	4	1		2	4	4		6	1		2	**42**
Watch Hill Carousel Beach	Westerly		1												**1**
Westwood YMCA	Coventry	2												1	**3**
World War II Memorial Park	Lincoln	1													**1**
Yawgoog Scout Reservation	Exeter						1						1		**2**
	TOTAL	**161**	**230**	**148**	**74**	**54**	**118**	**52**	**51**	**40**	**101**	**135**	**150**	**51**	

[1]Beach closures at Georgiaville Pond and Slack Reservoir attributed to cyanobacteria are not included in this table.

[2]Kent County YMCA has two distinct ponds. Prior to 2017, closure information did not distinguish which pond was closed for swimming.

Drinking Water Program and Assessments

The Rhode Island Department of Health (RIDOH), is delegated to administer the EPA's Safe Drinking Water Act. The Center for Drinking Water Quality (DWQ) at RIDOH monitors approximately 490 public water systems, which include surface and groundwater supplies. DWQ monitors drinking water quality at the source, at the entry to the distribution system, and within the distribution system to evaluate for compliance. The larger public drinking water suppliers monitor the source waters for several parameters to adjust treatment levels as necessary for compliance.

More information about RIDOH's DWQ program can be found at: Center for Drinking Water Quality.

The terminal reservoir is the location within the drinking water supply system where RIDOH requires water samples to be collected that provide information on ambient surface water quality. In general, sampling conducted within the drinking water supply system upstream of the terminal reservoir has been determined by RIDOH to be too limited in scope to support a drinking water use assessment. Therefore, these upstream waters are considered unassessed for drinking water use in this report. Summaries of drinking water use assessments are shown in Table 3 for rivers and streams and in Table 5 for lakes and reservoirs.

Since RIDOH/DWQ requires filtration and disinfection for all surface waters, this report assesses surface water quality from the perspective of whether or not the water source required more than reasonable treatment. According to DWQ, source waters in the East Bay, particularly those serving Newport are challenging to treat, likely due to a combination of watershed development and land-use patterns and the small size and shallow depth of available water resources. Poor source water quality can create challenges with respect to compliance with standards for disinfection by-products.

There are nine public water systems in the state that use surface water, and they range in size from a small seasonal campground supplied by a lake up to Providence Water, which draws from the Scituate Reservoir. Starting in May 2019, Rhode Island became one of the growing number of states that regulate algal toxins in public drinking water. All water systems that utilize a surface water source must submit plans for issues such as source protection and emergency response, and various methods of raw water surveillance and testing are required from May through October at a minimum.

The Newport Water Division have made treatment plant upgrades to improve their ability to treat these challenging source waters. In addition, Newport has conducted a study of the nutrient loading and presence of cyanobacteria (blue-green algae) in all of its source waters to help assess which additional source protection measures would be most beneficial. The source waters for the Newport Water Supply are designated as impaired for the drinking water use and are the subject of TMDL development by RIDEM.

Chapter

4

Groundwater Assessments

Groundwater Assessment

In Rhode Island, groundwater is a locally abundant and widely used resource. The US Geological Survey has estimated that 27 million gallons per day of groundwater are used in the state for drinking water and other beneficial uses. Approximately 26% of the state's population is supplied with drinking water from public and private wells. Groundwater resources are expected to be utilized to meet a substantial part of the state's future water supply needs.

- Groundwater in RI is generally free of pollutants. Over 90% of the state is classified as suitable for drinking water use without treatment.
- Approximately two-thirds of the state's municipalities rely on groundwater entirely or in part as a source of drinking water.
- The state's most significant and productive aquifers are located in the glacial deposits of stratified drift. Twenty-two potentially highly productive stratified drift aquifers have been identified. The fractured bedrock underlying the state is also an important aquifer providing drinking water to most private wells and small public water systems.
- The state's groundwater resources are considered vulnerable to contamination because of the generally shallow depth to groundwater, aquifer permeability and the absence of subsurface confining layers.
- RIDEM has designated wellhead protection areas for all 692 public wells in RI identified as of 2018. 157 of these are active community wells serving a residential population. RIDEM sets a high priority for source control and remediation efforts in wellhead protection areas.
- The US Environmental Protection Agency has designated four sole source aquifers in RI: Block Island, Pawcatuck, Hunt-Annaquatucket-Pettaquamscutt, and Jamestown.

Because of the generally localized nature of groundwater contamination, no groundwater monitoring network has been established in RI. 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 is often used as an indicator of human impacts to groundwater. Natural background concentration of nitrate in groundwater is 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 from 2013 to 2018 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.

Volatile organic compounds (VOCs) are another often used indicator of groundwater quality conditions. The most commonly detected VOC in public wells from 2013 to 2018 was 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 compared to years past 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 2018 only two wells had an exceedance.

Groundwater Protection Program

The RI Department of Environmental Management administers a number of programs that address groundwater protection (Groundwater Protection Programs). The framework for these programs is the Office of Water Resources Groundwater Classification and Standards Program. RIDEM Groundwater Quality Rules classify the state's groundwater resources into four classes, establish groundwater quality standards for each class, and designate wellhead protection areas. In addition, the Office of Water Resources administers two programs to regulate discharges to groundwater: the Onsite Wastewater Treatment System program and the Underground Injection Control Program for all non-sanitary discharges to groundwater, including stormwater. In addition, the RIDEM Office of Land Revitalization and Sustainable Materials Management administers several programs to regulate existing and potential sources of groundwater contamination (e.g., underground storage tanks, solid waste facilities) and manages the investigation and remediation of sites of groundwater contamination.

Management of nitrogen from (onsite wastewater treatment systems or “OWTS”) remains an area of focus for state agencies. To reduce its adverse impact to coastal waters, RIDEM has required nitrogen reducing technology for all OWTS applications since 2008 (new systems and alterations or repairs to existing systems) in the RI Coastal Resources Management Agency Salt Pond and Narrow River Critical Resource Areas. RIDEM has also been implementing Rules requiring removal of all cesspools 200 feet of a coastal shoreline feature (anywhere in the state), as well as within 200 feet of any public well, and within 200 feet of a waterbody with an intake for a public water supply system. In addition, RIDEM rules require the removal of cesspools within one year of a property’s point of sale statewide.

Chapter

5

Public Participation

Public Participation

Public Submission of Data

Public participation for the Integrated Report begins with a public request for submissions of data and information for use in the development of the Integrated Report and Lists. The data used in this report data came from multiple partners, including agency, volunteer, municipality, and other organizations. The full list of groups is presented in Table 1.

Public Review of Draft Integrated Lists

Only Category 5 (Impaired Waters List) of the Integrated Report is subject to EPA approval and public participation requirements. While the Department provided all five Draft Integrated Lists for public information and education purposes, comments were sought only on the Category 5 list (303(d) List of Impaired Waters). A public workshop to present the 2018-2020 Draft Integrated Lists including the 303(d) List was held on October 6, 2020via Zoom due to the COVID-19 pandemic and public health guidance. The public comment period ended on October 30, 2020. RIDEM prepared a Response to Comments document. No revisions to the draft 2018-2020 303(d) list were made in response to comments received.