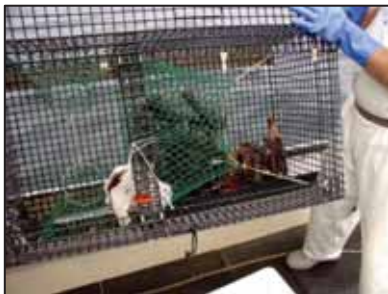

Rhode Island Environmental Monitoring Collaborative

2014 Summary Report

Nicole E. Rohr, Ph.D. (Chair)
*Coastal Institute, University of
Rhode Island*

Susan Kiernan (Vice Chair)
*RI Department of Environmental
Management*

Thomas Uva (Vice Chair)
Narragansett Bay Commission



December 2015

Executive Summary

The Rhode Island's environmental management objectives are based on promoting a healthy environment as the first step toward a strong economy and resilient coastal communities – safe and beautiful beaches attract visitors from around the world, healthy salt marshes protect coastal communities from the increasing threat of sea level rise and hurricanes, and clean marine waters of Narragansett Bay support robust fisheries and aquaculture industries, among others. Long-term environmental monitoring data reveals changes in ecosystem health that spur management actions, and guides assessment of management decisions. Healthy environments are intricately interwoven with healthy economies and quality of life, and environmental monitoring is the foundation upon which healthy environments are built.

RI's executive authorities face eroding state and federal support for environmental monitoring, and the RIEMC **projects an FY17 unmet need of \$2,755,000**, which is over \$100,000 more than in FY16. This ongoing—and increasing—shortfall is already disrupting several monitoring programs, which can lead to management decisions based on a shortage of information. Continuing cuts to environmental monitoring will diminish Rhode Island's ability to protect public health, hamper efforts to adapt effectively to our changing environment and will undermine programs that routinely gauge the health and availability of our state's natural resources, which are essential for continued economic growth.

Despite continued funding constraints, RIEMC monitoring programs reported significant strides toward **water quality improvement**, most notably an over 80% reduction in nitrogen inputs from RI's two largest wastewater treatment facilities Field's Point and Bucklin Point and an over 60% reduction in overall nitrogen inputs. Additionally, RIDEM, along with the RI Chapter of The Nature Conservancy and the University of Rhode Island, initiated the revision of the **RI State Wildlife Action Plan** in 2013, and held regular meetings to incorporate feedback from state and federal partners. Finally, **river and stream flow monitoring** through the stream gage network continues to face funding challenges. This program received additional USGS funding through the National Streamflow Information Program, but a more reliable funding source is critical.

Rhode Island has shown itself to be a national leader on environmental and climate change issues, and has strong voices at the federal, state, and local levels. Investing in long-term environmental monitoring is critical to making the best management decisions for our natural resources and coastal communities, and ensuring the state remains a leader on how best to protect and use our unique natural resources.

If you would like more information on the Rhode Island Environmental Monitoring Collaborative or this report, please contact Nicole Rohr at nrohr@uri.edu or visit the website at <http://www.coordinationteam.ri.gov/envirocollab.htm>

Table of Contents

Executive Summary.....	i
About the Rhode Island Environmental Collaborative	iii
Rhode Island Environmental Monitoring Collaborative Members	iv
Status of the EMC.....	v
List of Abbreviations and Acronyms.....	vi
Findings and Accomplishments.....	1
Critical Issues Regarding Support for Environmental Monitoring.....	3
RIEMC Monitoring Priorities.....	5
Funding Status of RIEMC Monitoring Priorities.....	7
One Page Summaries of RIEMC Monitoring Priorities	
Coastal Fisheries – Trawl Surveys.....	13
Coastal Ponds & Embayments – Rotating Assessment.....	14
Eelgrass Beds.....	15
Freshwater Aquatic Invasive Species.....	16
Freshwater Beach Water Quality.....	17
Freshwater Wetlands.....	18
Harmful Algal Blooms & Cyanobacteria.....	19
Large River Water Quality.....	20
Lobster Population Surveys.....	21
Marine Aquatic Invasive Species.....	22
Narragansett Bay Dissolved Oxygen Field Surveys (Boat Surveys).....	23
Narragansett Bay Water Quality (Fixed-Site Monitoring Network).....	24
River & Stream Flows.....	25
Salt Marshes.....	26
Saltwater Beach Water Quality.....	27
Shellfish Growing Areas – Coastal Waters.....	28
Shoreline Erosion, Accretion & Sediment Transport.....	29
Toxic Contaminants in Freshwater Fish: Mercury.....	30
Volunteer Monitoring – Surface Waters.....	31
Wadeable Rivers & Streams – Rotating Assessments.....	32
Appendix A–RIEMC Partner Organizations.....	vii
Appendix B–RI Comprehensive Monitoring Strategy.....	xi

About the Rhode Island Environmental Monitoring Collaborative

“A growing economy needs a healthy Narragansett Bay to prosper, especially in our most populated areas.”

—Rhode Island Governor Gina Raimondo.

Who We Are

The Rhode Island Environmental Monitoring Collaborative (RIEMC) is charged with developing and coordinating an environmental monitoring strategy that addresses critical state resource management needs. Its work includes identifying state monitoring priorities, establishing statewide environmental indicators, and specifying protocols to ensure consistent and useful data are delivered to resource managers, decision makers and the public. This in turn serves to provide the public and elected leaders with a deeper understanding of the status of Rhode Island’s environment and natural resources. To accomplish its mission, the RIEMC brings together stakeholders from executive agencies, university-based programs, non-governmental organizations, and others to enhance coordination and collaboration.

The RIEMC Annual Report provides information on its activities and serves as an update on the progress made in environmental monitoring during the prior year. The 2014 report:

- 1) Provides a detailed summary of the 20 monitoring initiatives identified by the RIEMC as critical to Rhode Island.
- 2) Highlights key environmental monitoring accomplishments and findings.
- 3) Outlines ways in which the work of the RIEMC supports decisions related to preparation for climate change.
- 4) Describes continued challenges that threaten the capacity to collect, analyze, and report monitoring data.

The Importance of Environmental Monitoring

Rhode Island relies on its natural resources as a major contributor to the state’s economy and cultural identity. Environmental monitoring programs are often taken for granted and vulnerable to cuts when budgets are tight. Nevertheless, robust environmental monitoring is integral to the maintenance of ecosystem services and natural resources productivity, providing the data and benchmarks that allow us to measure progress toward environmental goals. Sustained monitoring programs are also needed to support management strategies that are responsive to and adapt to changing conditions and other new information.

During 2014, the RIEMC was supported by the Coastal Institute at the University of Rhode Island and the former Rhode Island Bays, Rivers, & Watersheds Coordination Team.

Rhode Island Environmental Monitoring Collaborative Members

Tom Borden.....	Narragansett Bay Estuary Program
James Boyd.....	RI Coastal Resources Management Council
Kathleen Crawley.....	RI Water Resources Board
Mark Gibson.....	RI-DEM, Marine Fisheries
Paul Gonsalves.....	RI Statewide Planning
Linda Green.....	URI Watershed Watch
David Gregg.....	RI Natural History Survey
Susan Kiernan (Vice Chair).....	RI-DEM, Office Water Resources
John King.....	URI Graduate School of Oceanography
Tom Kutcher.....	Save The Bay
Charles LaBash.....	URI Environmental Data Center
Matthew Ladewig.....	ESS Group, Inc.
David Murray.....	Brown University
Amie Parris.....	RI Department of Health
Margherita Pryor.....	EPA, Region 1, Ocean/Coastal Protection
Nicole Rohr (Chair).....	URI Coastal Institute
Robert Stankelis.....	Narragansett Bay National Estuarine Research Reserve
John Torgan.....	The Nature Conservancy, Rhode Island
Thomas Uva (Vice Chair).....	Narragansett Bay Commission
Hal Walker.....	EPA, Atlantic Ecology Division

For questions or comments regarding this report please contact Nicole Rohr at nrohr@uri.edu or 401.874.4866. Report compilation coordinated by Terri Breeden, URI Master of Environmental Science and Management candidate.

Cover photos courtesy of RIDEM. Top left: The traps used to collect data on lobster populations. Top right: Scientists collect macroinvertebrate samples in the Saugatucket River in South Kingstown, RI as part of a national EPA study. Bottom left: Scientist collecting a water sample for bacteria analysis at the Woonasquatucket River in Smithfield, RI. Bottom right: Scientists conducting electroshocking at Unnamed Tributary to Borden Brook in Tiverton, RI for National Rivers and Streams Assessment in June of 2014.

Status of the RI Environmental Monitoring Collaborative

The RI Environmental Monitoring Collaborative (RIEMC) was originally established pursuant to both the Comprehensive Watershed and Marine Monitoring Act of 2004 (RIGL § 46-23.2-5) and a separate statute, (RIGL § 46-31), which also created the former RI Bays, Rivers and Watersheds Coordination Team (BRWCT). For the past ten years, the RIEMC functioned as advisory committee of the BRWCT, which also provided some limited funding and other support to the operation of the RIEMC.

As part of the state FY 2016 budget, state law was changed to repeal authority for the BRWCT and it was subsequently disbanded. However, the RIEMC remains in place as authorized by the Comprehensive Watershed and Marine Monitoring Act of 2004, and language in this statute was amended to clarify its charge to broadly include freshwaters, marine waters, and their watersheds. There was no change in powers, duties, or annual reporting requirements. The RIEMC remains active and meets at least twice per year.

Moving forward, the RIEMC will continue to operate as it has in the past by compiling information on key environmental monitoring priorities from RIEMC members and disseminating the information to the governor, general assembly, and other interested parties in an annual report. The RIEMC is also pursuing opportunities to expand access to data and outreach by creating a new website, which would have the added benefit of streamlining the annual report process.



Clockwise from left to right (photo credit): NBC buoy (NBC); NBC employee filtering plankton (NBC); Scientist inspects artificial substrates in Warwick Pond to detect the presence of zebra mussels as part of invasive species monitoring efforts (RIDEM); Buckeye Brook Winter Monitoring training with URI WW volunteer Bob Haiken holding DO bottle (P. Earnshaw of Buckeye Brook Coalition).

List of Abbreviations and Acronyms

ACOE	U.S. Army Corp of Engineers
AIS	Aquatic Invasive Species
ASMFC	Atlantic States Marine Fisheries Commission
BRWCT	Bays, Rivers and Watersheds Coordination Team
CHRP	Coastal Hypoxia Research Program
CRMC	Coastal Resources Management Council
CSO	Combined Sewer Outfall or Overflow
CZM	Coastal Zone Management
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
EPA AED	U.S. Environmental Protection Agency Atlantic Ecology Division
FDA	U.S. Food and Drug Administration
FEMA	Federal Emergency Management Agency
FY	Fiscal Year
GIS	Geographic Information Systems
MA	Massachusetts
NBC	Narragansett Bay Commission
NBEP	Narragansett Bay Estuary Program
NBFSMN	Narragansett Bay Fixed Site Monitoring Network
NBNERR	Narragansett Bay National Estuarine Research Reserve
NEFMC	New England Fishery Management Council
NEIWPCC	New England Interstate Water Pollution Control Commission
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service (part of USDA)
NSSP	National Shellfish Sanitation Program
OWR	Office of Water Resources (part of RIDEM)
PWSB	Providence Water Supply Board
RAM	Rapid Assessment Method
RI	Rhode Island
RIDEM	Rhode Island Department of Environmental Management
RIDOH	Rhode Island Department of Health
RIEMA	Rhode Island Emergency Management Agency
RIEMC	Rhode Island Environmental Monitoring Collaborative
RINHS	Rhode Island Natural History Survey
RTK	Real Time Kinetic
RWU	Roger Williams University
SAMP	Special Area Management Plan
SRF	State Revolving Fund
STB	Save The Bay
SWAP	State Wildlife Action Plan
TMDL	Total Maximum Daily Load
URI CI	University of Rhode Island Coastal Institute
URI EDC	University of Rhode Island Environmental Data Center
URI GSO	University of Rhode Island Graduate School of Oceanography
URI WW	University of Rhode Island Watershed Watch
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WRB	Rhode Island Water Resources Board
WWTF	Wastewater Treatment Facilities

2014 Findings and Accomplishments

Rhode Island monitoring programs and data users have coped with flat or declining budgets for many years, and state and federal agencies and other monitoring stakeholders have long pursued alternative funding sources for monitoring. Despite continued challenges to RI environmental monitoring, important work has been accomplished and a number of innovations have occurred. The concern remains, though, that important environmental monitoring programs remain vulnerable to funding cuts, and constraints are disrupting needed data collection as well as impeding continued innovation.

Despite these constraints, in 2014 and 2015 the RI Environmental Monitoring Collaborative continued to focus on sustaining and coordinating vital environmental monitoring activities and program functions. With much effort and creativity, several RI monitoring programs managed to launch enhancements to monitoring fieldwork and data analysis, and report on key environmental events and trends. The below are just a few examples of the excellent work RIEMC partners have done over the last year.

Nutrient Reduction

Rhode Island sewer system ratepayers along with state taxpayers are investing over \$250 million in wastewater treatment improvements to reduce nutrient pollution in Upper Narragansett Bay. This nutrient pollution can lead to algae blooms, low oxygen events (hypoxia), and fish kills. Upgrades to eleven wastewater treatment facilities (WWTF), including RI's largest - Narragansett Bay Commission's Field's Point facility – have constituted the most direct way to reduce nutrient inputs. These investments are paying off and monitoring data from these WWTFs have documented a 64% reduction in nitrogen inputs compared to 2003, the year of the Greenwich Bay fish kill. Some facilities achieved higher performance: e.g., 81% reduction from NBC's two WWTFs. It is a critical time for continued monitoring of Upper Narragansett Bay in order to measure and characterize the response of its ecosystem to water pollution control actions.

Wastewater treatment facilities are not the only source of nitrogen into Narragansett Bay. Stormwater runoff from lawns and agriculture areas that use fertilizer, leaking septic systems, and cesspools that have not yet been phased out, among other sources, also contribute to the problem. Monitoring in the upstream watersheds that drain to the bay is important in order to quantify pollutant loadings and target water pollution abatement strategies to optimize success. In addition to reducing nutrient inputs to the bay, interest has grown in activities that can be undertaken to enhance the removal of nitrogen from bay waters. This includes activities such as bioextraction, where shellfish or macro-algae are purposefully grown and harvested to naturally remove nutrients from the water as they feed and grow; or wetland restoration where healthy salt and freshwater marshes are re-established or enhanced and function to remove nutrients from runoff before it enters the bay. As these new strategies are pursued, continued environmental monitoring on both the smaller, project scale and the larger, Narragansett Bay ecosystem scale is critical to make sure investments are paying off and progress in being made.

RI State Wildlife Action Plan

The RI State Wildlife Action Plan (SWAP) enhances efforts to conserve Rhode Island's fish, wildlife and habitats not only through its planning and implementation, but also via the funds that become available upon its completion. Rhode Island is home to almost 900 vertebrate wildlife species and 20,000 invertebrate species spanning from the scenic coastline to upland and wetland forests. Included in this natural diversity are a suite of mammal, bird, reptile and amphibian, fish and invertebrate species that the State has identified as in greatest conservation need.

In accordance with the federal State and Tribal Wildlife Grants program, each state must complete a SWAP every 10 years to be eligible for matching grants. RI's original 2005 SWAP will be revised by 2015. These proactive plans assess the health of each state's wildlife and habitats, identify the problems they face, and outline actions needed to conserve them over the long term. Benefits that the RI SWAP brings to the state include:

- A comprehensive approach to wildlife conservation;
- Millions of dollars in matching funds for research grants supporting conservation of non-game species and their habitats;
- New local and regional partnerships; and
- New local and regional support.

In January 2013 RIDEM, along with the RI Chapter of The Nature Conservancy and the University of Rhode Island, held its first Scientific Review Workshop to elicit expert stakeholder feedback on the draft list of priority conservation targets - Species of Greatest Conservation Need and Key Habitat - which will be the foundation for the SWAP's development. The successful workshop also provided the opportunity to inform participants of the RI SWAP process, including activities to-date and moving forward. Invitees included individuals from the EPA, US FWS, NOAA, Audubon Society, The Nature Conservancy, Save The Bay, The RI Land Trust Council, University of Rhode Island, and other public, non-profit, academic, and private entities.

These meetings were held regularly throughout 2013 and resulted in a new list of species of concern for aquatic-dependent species in 2014. Note: The SWAP process was subsequently completed in 2015.

Stream Gage Network

River and stream flow monitoring through the stream gage network is critical to flood forecasting, flood response and risk management, drought and water supply management. This program, which also includes groundwater monitoring, has faced challenges due to reduced state and federal funding in recent years and the 2013 budget shortfalls resulted in elimination of monitoring during some months or a shift in monitoring protocol. However, the USGS National Streamflow Information Program increased its allocation of funding to RI, which averted the need to completely discontinue a stream gage. While this increase of USGS funding assisted RI monitoring efforts last year, continued support is contingent on sustained federal funding for this program. Overall, the stream gage network remains susceptible to funding disruptions.

Critical Issues Regarding Federal & State Support for Environmental Monitoring

Rhode Island's executive authorities face the dilemma of eroding state and federal support for environmental monitoring. States throughout the nation are coping with reductions in federal funding, while increasing efficiency of key programs. RI relies heavily on federal funds for many aspects of environmental and natural resources management from agencies such as the USEPA, NOAA, USGS, and USFWS, making federal funding cutbacks—whether a series of small cuts or a single larger reduction—particularly harmful to the sustainability of RI monitoring initiatives.

The members of the RIEMC will work together to raise awareness of the value of environmental monitoring among federal and state decision makers, and thus work toward achieving sufficient and sustainable investment in critical environmental monitoring in RI. The RIEMC understands the many pressing interests that require funding; however, environmental monitoring becomes evermore important as intensifying climate change threatens our natural resources with cascading effects on our communities, economies, and quality of life.

Against this background of fiscal challenges, it remains the mission of the RIEMC to foster coordination and collaboration among individual monitoring programs and related initiatives, such as Watershed Counts and the Narragansett Bay Estuary Program Status and Trends Report. The RIEMC serves as a platform for articulating the importance of environmental monitoring for environmental management and sustainable economic development.

While there are several examples of how environmental monitoring has been impacted by funding cuts (e.g., changes in established methodology that affect the applicability of the data; suspension or delay of monitoring data analysis, archiving, and dissemination; reliance on funding from supplemental sources that may not be reliable moving forward; etc.), the most pressing challenges are highlighted below.

Cyanobacteria

Cyanobacteria are naturally occurring micro-organisms that may generate natural toxins. When blooms of cyanobacteria occur, the released toxins may occur at concentrations known to be harmful to people or animals, including pets. RIDEM and RIDOH have collaboratively maintained a limited program in which samples of suspected cyanobacteria in freshwaters are confirmed and toxicity levels assessed. When appropriate, public health advisories are issued indicating people should avoid contact with the affected waters. Currently, there is no designated funding to sustain this program. Given documentation of cyanobacteria blooms that triggered health advisories in over 20 waterbodies during the last several years, it is a high priority to secure stable funding for this important public health surveillance effort.

Narragansett Bay Fixed-Site Monitoring Network

The network of continuous monitoring stations operating in Narragansett Bay is critical to measuring the improvements resulting from large investments to upgrade wastewater

infrastructure. The majority of the network is operated by the URI GSO pursuant to an agreement with RIDEM. Currently, RIDEM utilizes a federal EPA funding source associated with the Clean Water State Revolving Fund to support this monitoring, which is not sustainable. This, coupled with uncertainty in federal funding levels with the national State Revolving Fund program results in a need to find alternative sources of support to ensure continuity of data collection.

Long-Term Water Quality Monitoring in Large Rivers

This critical water monitoring program was historically supported by annual joint funding agreements between USGS, RIDEM, and the WRB but continued budget pressures resulted in the failure to keep pace with the rising costs of the joint agreements. Monthly river monitoring was curtailed in 2014 due to funding constraints and rising program costs. In FY 2015, USGS and RIDEM reduced sampling of the Pawcatuck River stations from 12 to 9 months, interrupting data consistency and creating a potential gap for climate research scientists. Within the larger watershed, the same issue exists for long-term sampling stations located upstream on MA tributary rivers; effective management requires data be collected in both states (e.g., Taunton River, and Blackstone River). Due to funding limitations, this program continues to be vulnerable to further reductions despite the value of the long-term dataset.

Saltwater Beach Water Quality

The sole source of funding for monitoring saltwater beach water quality is federally supported through the EPA BEACH Act. Each year, Congress appropriates approximately \$10 million to the EPA beach program to be divided amongst the coastal and Great Lakes states. In recent years, the President's budget has eliminated funding for the beach program, but fortunately Congress has restored the funding each year. Support for this EPA program is essential to ensure RI beaches remain open for enjoyment by residents, and by the many summer tourists who visit our coasts and significantly contribute to our economy. Funding was secured for the 2015 season but remains subject to annual uncertainty.

State Water Information Management System (SWIMS)

Water quality data and assessment results need to be stored and made available for managers, researchers, and others to use. RIDEM has made a series of improvements to the databases it utilizes for these purposes. However, the current systems fall short on providing easy public access to data and needs upgrading to maintain the ability to exchange data with federal data systems as mandated by the EPA. Given changes occurring at the federal level and the loss of long-time staff within the agency, RIDEM now has a critical need to restore capacity with respect to water quality data management. Additional funding is needed for this purpose.

Wadeable Rivers and Streams

The RIDEM Ambient River Monitoring Program is the primary source of data for assessing the quality of wadeable rivers and streams and detecting changes in conditions resulting from management actions. RIDEM relies entirely on federal funding through EPA to support this program. While adequately supported for FY 2015, limitations on funding threaten the long-term stability of the program.

Rhode Island Environmental Monitoring Collaborative Priorities

In 2005, the RI Environmental Monitoring Collaborative (RIEMC) established ten environmental monitoring priorities based upon their importance to understanding key environmental trends in Rhode Island, and the relative lack of active monitoring data collection and assessment being conducted for them. Since 2006, the RIEMC has reported on implementation of these monitoring priorities (see the Bays, Rivers, & Watersheds Coordination Team website for previous RIEMC Annual Reports). Based on a review of state monitoring priorities, the RIEMC expanded the list in 2012 to provide a more complete inventory or record of essential environmental monitoring priorities for Rhode Island. The priorities reflect long-term programs that provide data about the ambient environment that is or should be collected on an ongoing basis with the sampling frequency tailored to each program's information need. The list is not intended to reflect the complete universe of monitoring activities, which would include other activities such as pollution source monitoring, targeted short-term studies or assessments, as well as various research efforts. The 20 environmental monitoring priorities are:

- Coastal Fisheries – Trawl Surveys
- Coastal Ponds and Embayments – Rotating Assessment
- Eelgrass Beds
- Freshwater Aquatic Invasive Species
- Freshwater Beach Water Quality
- Freshwater Wetlands
- Harmful Algal Blooms and Cyanobacteria
- Large River Water Quality
- Lobster Population Surveys
- Marine Aquatic Invasive Species
- Narragansett Bay Dissolved Oxygen – Boat Surveys
- Narragansett Bay Water Quality – Fixed Site Monitoring Network
- River and Stream Flows
- Salt Marshes
- Saltwater Beach Water Quality
- Shellfish Growing Areas
- Shoreline Erosion, Accretion, and Sediment Transport
- Toxic Contaminants in Freshwater Fish: Mercury
- Volunteer Water Quality Monitoring
- Wadeable Rivers and Streams – Rotating Assessments

The RIEMC reviews and reports annually to the Governor, General Assembly, and public on the status of the environmental monitoring priorities. It collaborates with key initiatives such as the Narragansett Bay Estuary Program Status and Trends, and the RI Governor's Executive Climate Change Coordinating Council with the shared goals of support and improvement of environmental indicator development and application, and public communication. The RIEMC continues to develop a Comprehensive Environmental Monitoring Strategy for RI.

The following one-page summary sheets for each of the RIEMC environmental monitoring priorities review specific monitoring programs, data applications and on-line locations, the government agencies and programs performing the activities and utilizing data, and program funding information.

This page intentionally left blank.

Table 1: Utility and Funding Status of the RIEMC's Environmental Monitoring Priorities

Monitoring Priority	Utility	Status	Current Funding & Program Support	State Funding Outlook
<i>Coastal Water Quality</i>				
Narragansett Bay Dissolved Oxygen (Fixed-Site Monitoring Network)	<p>Decreases in DO are a major cause of water quality impairment in Narragansett Bay and require additional assessment, planning and wastewater treatment upgrades.</p> <p>Addressing water quality impairments requires comprehensive monitoring of DO in relation to improvements in wastewater treatment, nonpoint source pollution controls, and external drivers such as climate change and increasing water temperatures.</p>	<p>Implemented</p> <p>RIEMC recommends adding additional stations in lower Narragansett Bay & Sakonnet River</p>	RIDEM covers most of this program using federal funds supported by Clean Water Act SRF Funding. NBC uses rate payer funds and NBNERR uses NOAA funds.	<p>Reliance on SRF funding is not sustainable. Long-term program support must be diversified.</p> <p>Annual Unmet Need: \$350,000</p>
Narragansett Bay Dissolved Oxygen (Field Surveys)	Provides cross-sectional information within the Bay; complements the fixed-site network; and identifies areas that are at significant risk for hypoxic conditions to occur.	Implemented	No funding for spatial surveys. Field operations supported by Brown University, URI GSO, RIDEM, and STB. Past support from NOAA CHRP program.	<p>At risk of disruption</p> <p>Annual Unmet Need: \$30,000</p>
Shellfish Growing Areas	Manages commercial shellfishing, harvesting, and public health protection.	Implemented	State general revenues from RIDEM	Currently stable

Monitoring Priority	Utility	Status	Current Funding & Program Support	State Funding Outlook
Rotating Assessment of Coastal Waters	Intended to address major water quality data gaps in coastal coves and embayments. Data is essential to assess point and non-point source pollution controls, cesspool phase-outs, and stormwater management.	Not implemented. Some data collected by RIDEM and volunteers.	No funding available	Annual Unmet Need: \$250,000
Saltwater Beach Water Quality	Monitors saltwater beaches to protect public health, reduce illness associated with swimming in potentially contaminated bathing waters, and to find and eliminate sources of contamination.	Implemented	No state funding. RIDOH uses EPA BEACH Act funding. No federal funding may be available after 2015 field season	At risk for disruption Annual Unmet Need: \$212,000
Volunteer Monitoring of Coastal Waters	Provides supplemental data essential for federal and state agencies to design their monitoring programs, assess indicators at watershed scale, and identify and target un-remediated pollution sources.	Implemented	Multiple sources including state and local sponsors	At risk of disruption Annual Unmet Need: \$25,000
Freshwater Quality				
Water Quality in Large Rivers	Monitors water quality in major rivers to track long term trends for managing water pollution sources. These programs also evaluate pollutant loadings into Narragansett Bay and coastal waters. Need MA rivers (Taunton, upstream portion of Blackstone) to be similarly monitored to support effective watershed management.	Implemented. Additional stations recommended in Pawtuxet River watershed.	USGS, BRWCT and NBC	At risk of disruption. Annual Unmet Need: \$155,000

Monitoring Priority	Utility	Status	Current Funding & Program Support	State Funding Outlook
Water Quality in Wadeable Rivers and Streams (rotating assessment)	Assesses water quality in rivers and streams and guides water pollution control programs for rivers, streams, salt ponds and Narragansett Bay.	Implemented	RIDEM using EPA funds	At risk of disruption. Annual Unmet Need: \$260,000
Volunteer Monitoring	<p><i>Rivers and Streams</i> Supplements data collected by the State to help assess changing conditions in rivers and streams.</p> <p><i>Lakes and Ponds</i> Collects data on State's lakes and ponds that would otherwise go un-assessed. This data improves statewide water quality assessments and management, but needs to be expanded to fill gaps.</p>	<p>Implemented</p> <p>Implemented, no funding for recommended expansion to unassessed lakes</p>	<p>URI Cooperative Extension, RIDEM using EPA funds, watershed organizations and various local sponsors</p>	<p>At risk of disruption Annual Unmet Need: \$25,000</p> <p>At risk of disruption Annual Unmet Need: \$80,000</p>
Freshwater Beach Water Quality	Freshwater beaches make up nearly half of RI's licensed swimming beaches, but are monitored far less frequently than saltwater beaches. Of particular concern are freshwater swimming beaches at youth summer camps.	Partially implemented by freshwater beach owners and operators.	No funding available to enhance the limited existing program	Annual Unmet Need: \$100,000
Harmful Algal Blooms	Provides data to identify potential public health risks associated with harmful algal blooms in RI fresh waters.	Partially implemented	RIDEM and EPA funding provides for minimal amount of sampling	At risk of disruption Annual Unmet Need: \$50,000

Monitoring Priority	Utility	Status	Current Funding & Program Support	State Funding Outlook
Toxic Contaminants in Freshwater Fish: Mercury	Efforts remain largely un-assessed in RI to determine the public health risks of toxic contaminants in freshwater fish.	Partially implemented; limited samples are processed annually	EPA in-kind services, RIDEM OWR and RIDEM DFW	Annual Unmet Need: \$105,000
Physical Conditions				
River and Stream Flows (RI Stream Gage Network) & Groundwater Level Measurements	Provides vital data for flood forecasting, flood response and risk management, water supply planning and management, drought management, water pollution control and water quality management.	Partially Implemented	BRWCT, USGS, RI WRB and Providence Water Supply Board	At risk of disruption Limited state funding provided with concerns for future data collection. Annual Unmet Need: \$173,000
Shoreline Change	Provides data critical to development of CRMC's Shoreline Change Special Area Management Plan and to understand the threat of coastal erosion on public and private infrastructure and natural ecosystems.	Partially Implemented	Federal funds with support from URI, CRMC, and BRWCT	Annual Unmet Need: \$100,000
Biological Communities and Habitats				
Marine Fisheries Surveys	Efforts in data collection support stock assessments and management decision-making of important commercial fisheries, both finfish and shellfish, also provides ecological status and trends.	Implemented - Program enhancements recommended	RIDEM using USFWS funds	Projected as stable for certain programs Annual unmet need: \$200,000

Monitoring Priority	Utility	Status	Current Funding & Program Support	State Funding Outlook
Lobster Population Surveys	Improves characterization of the abundance and recruitment of lobster.	Implemented	NMFS Inter-jurisdictional Fisheries Funding, BRWCT and NOAA	Annual Unmet Need: \$ 52,000
Eelgrass Beds	Provides data for understanding long-term change in estuarine habitats that are critical for finfish, shellfish, and crustaceans. Provides a measure of overall estuarine ecological health and biological diversity.	Partially Implemented	STB, NBNERR, and CRMC using RI Coastal and Estuarine Habitat Restoration Trust Fund	Currently stable Annual Unmet Need: FY15 \$85,000 (periodic investment for overflights)
Saltmarshes	Provides data essential for understanding long-term change in critical habitats for terrestrial, avian, and estuarine and marine species. Helps to assess climate and SLR risks to the shoreline erosion protection and storm buffer values (ecosystem services) that saltmarshes provide.	Partially implemented	CRMC using RI Coastal and Estuarine Habitat Restoration Trust Fund, RIDEM using USFWS Coastal Program and EPA funds. NBNERR and STB document monitoring strategy.	Funding is not stable Annual Unmet Need: \$28,000
Arrival and Spread of Marine AIS	Identifies invasive species, to allow for proper eradication and management techniques.	Partially implemented	CRMC, RIDEM, RINHS, NBNERR, EPA AED, RWU, URI WW	Federal funding from the National Invasive Species Act has steadily declined as more states participate in the Aquatic Nuisance Species Task Force Annual Unmet Need: \$150,000

Monitoring Priority	Utility	Status	Current Funding & Program Support	State Funding Outlook
Arrival and Spread of Freshwater AIS	Identifies species to allow for proper eradication and management techniques.	Partially implemented	RIDEM using USFWS funds, RINHS, URI and NBNERR	Funding is limited & unstable Annual Unmet Need: \$200,000
Freshwater Wetlands	Provides ecological condition data for freshwater wetlands and the stressors adversely affecting their functions and values.	Partially implemented	RIDEM using EPA and RINHS funds	Relies on competitive grants. Limited funding available to continue program. Annual Unmet Need: \$125,000
				FY17 Estimated Total Annual Unmet Need: \$2,755,000

Coastal Fisheries - Trawl Surveys

Description: The RIDEM Division of Fish and Wildlife, Marine Fisheries Section, continues a comprehensive fishery resource assessment program encompassing Narragansett Bay, and Rhode Island and Block Island Sounds. The Marine Fisheries Section collects, summarizes, and analyzes trawl data for biological and fisheries management purposes and provides seasonal and monthly identification of finfish and crustacean assemblages inhabiting Rhode Island coastal waters. Since the inception of the Rhode Island Seasonal Trawl Survey in April 1979, and the Narragansett Bay Monthly Trawl Survey in January 1990, 5,970 tows have been conducted within Rhode Island territorial waters with data collected on 132 species. The *R/V John H. Chafee*, built in 2002, and commissioned in June, 2004, is the State of Rhode Island Coastal Trawl Survey platform. The RIDEM Marine Fisheries Section added an age and growth element to the survey in 2014. Stomach analysis and scale collection conducted in the field with subsequent laboratory analysis allows for more accurate length-at-age estimates and understanding of food chain dynamics. Data show that lobster abundance continues to remain low, with 2013 being the lowest ever observed in the time series. The 2015 season includes plans to collaborate with the URI GSO Trawl Survey.

FY 2015 Funding: Funding is stable with support from U.S. Fish and Wildlife Service and Federal Aid in Sportfish Restoration

Management Values:

- Supports local and regional fisheries stock assessments
- Tracks the relative abundance of finfish and shellfish assemblages in Narragansett Bay, and Rhode Island and Block Island Sounds
- Provides stock and recruitment information on key commercial and recreational species to help inform fishery management decisions based on stock size
- Tracks changes in fishery dynamics as they relate to environmental changes
- Collects local fish for aquaria and events offered by RIDEM Fish & Wildlife Division's Aquatic Education Program

Implemented by: RIDEM Marine Fisheries Section

Used by: RIDEM, URI GSO, NOAA, ASMFC, NEFMC, fisheries managers and researchers

Data Available: Scott Olszewski, RIDEM Marine Fisheries Fort Wetherill Marine Lab, Jamestown, RI 02835 (401)423-1934 scott.olszewski@dem.ri.gov

It's important because. . .

Trawl Survey data is vital to assessing the health and status of marine fisheries resources and their habitats in the State of Rhode Island, one of the most significant industries in the Ocean State. These data allow managers to assess the performance and effectiveness of management strategies for economically and ecologically important species, and indicate when different techniques should be implemented. There has been a continued shift from demersal to pelagic species over time, and there is an increased presence of species that are typically found in more southern waters. These shifts are likely due to the warming water temperatures associated with climate change.



A haul full of cod, skates and dogfish. Photo courtesy of RI Division of Fish & Wildlife Marine Fisheries Section.

Coastal Ponds & Embayments – Rotating Assessment

Description: The RI Water Monitoring Strategy recommends sampling RI’s coastal ponds and embayments on a rotating basis, similar to the program design RIDEM uses to monitor smaller wadeable rivers and streams. This strategy has not yet been implemented due to a lack of resources, and Narragansett Bay-wide monitoring strategies generally do not collect data on the conditions in coves and embayments. While RIDEM’s Shellfish Water Quality Monitoring Program collects bacteriological data throughout coastal waters, including salt ponds, it is not designed to collect data on other important water quality parameters. Despite the lack of a statewide strategy, a limited amount of data is generated for a number of coastal ponds and embayments through volunteer efforts (for more information see page 31 on volunteer monitoring). For example, the URI Watershed Watch Program lists over a dozen harbors, salt ponds, and embayments among its active sampling locations. Various researchers may also contribute data from targeted studies. The Coastal Waters Rotating Assessment Program, when fully implemented, would complement other core monitoring programs and research efforts by generating water quality data for coastal waters of critical concern, such as Greenwich Bay and the Salt Ponds. Data gaps regarding the southwestern coastal ponds are considered a priority due to worsening or vulnerable water quality and potential for future aquaculture development in that region.

FY 2015 Funding: No state funding is currently available to implement this recommended program. Annual unmet need of \$250,000

Management Values:

- Tracks changing conditions in bays, coves, embayments and coastal ponds
- Tracks effects of wastewater and stormwater management efforts currently underway
- Supports development of water quality restoration plans

Implemented by: Not implemented

Used by: RIDEM, CRMC, NBC, EPA, NBNERR, watershed organizations and researchers

Data Available: Limited data available at <http://www.uri.edu/ce/wq/ww/data/DataTable.htm>

It’s important because. . .

Coastal embayments and lagoons have unique circulatory regimes, biota, and watersheds that create management challenges distinct from those of the larger Narragansett Bay. Targeted water quality monitoring of these coastal water bodies is essential for managing their diverse resources and high productivity, and also ensuring the continuation of their many socio-economic values.



A healthy marsh with a vast meadow of Spartina. Photo courtesy of CRMC.

Eelgrass Beds

Description: Eelgrass grows in shallow areas of Narragansett Bay and southwestern salt ponds. It provides critical nursery habitat for economically valuable species such as quahogs, lobster, tautog, and bay scallops. A three-tiered monitoring effort is required to comprehensively assess eelgrass bed areal extent, cover, and condition. Tier 1 uses aerial photography and remote sensing to map eelgrass distribution throughout RI coastal waters, and is implemented by the RI Eelgrass Task Force, a collaborative led by NBNERR, STB, and URI EDC. Tier 2 provides estimates of eelgrass bed spatial cover in specific areas, such as salt ponds, through rapid assessment techniques. Areas around Prudence Island were observed by NBNERR using underwater video at eighty monitoring stations. Tier 3 measures eelgrass biomass and other eelgrass bed properties over multiple time scales for specific areas and is implemented by STB. Based on the first two years of monitoring, southern Prudence Island showed no significant difference in eelgrass cover. Eelgrass cover was nearly identical between these two years, which is encouraging as it shows little evidence of declining habitat. Mapping efforts are recommended every three years, thus funding will be sought to continue this project for 2015 mapping.

FY 2015 Funding: Funding is stable. Tier one monitoring requires \$85,000 every 3 years for aerial photography statewide. Tier two and three monitoring requires \$3,500-\$5,000 annually.

Management Values:

- Indicates estuarine ecosystem health and habitat quality, which is associated with eelgrass bed extent and health
- Gauges inter-annual variability
- Implements data from Seagrassnet, conducted by STB, to follow monitoring protocols
- Supports local and regional fisheries stock assessments

Implemented by: NBNERR, STB, and URI EDC

Used by: NBNERR, CRMC, RIDEM, USACE, USFWS, NOAA, USEPA and NBEP

Data Available: www.edc.uri.edu/rigis
www.seagrassnet.org/research#percentcountry
http://www.savebay.org/file/2012_Mapping_Submerged_Aquatic_Vegetation_final_report_4_2013.pdf

It's important because. . .

Eelgrass provides critical habitat for numerous fish and invertebrate species, including shellfish. Furthermore, eelgrass stabilizes sediments, protects against shoreline erosion, and filters particles from the water column. It functions as an excellent indicator of water quality due to its rapid response to both nutrient concentrations and *in situ* light levels. Narragansett Bay was once teeming with eelgrass, but today almost 90% of the beds have disappeared. This monitoring effort works to make sure RI does not lose any more of this valuable resource.



The underwater video camera and quadrat-frame used to map eelgrass as part of the Tier-2 Rapid Assessment. Photo courtesy of NBNERR.

Freshwater Aquatic Invasive Species (AIS)

Description: Aquatic invasive species are a widespread management concern in RI freshwaters. RIDEM continued its seasonal surveys of lakes and ponds with a goal of both detecting and tracking the occurrence of aquatic invasive species. Program partners collaborate with RIDEM by sharing reports of suspected problems and other information. Data available for 130 lakes and ponds indicated the presence of one or more aquatic invasive plants in close to 60% of the surveyed water bodies. Variable milfoil and fanwort were the most commonly detected of the 13 plant AIS found. RIDEM initiated a limited financial assistance program in 2014 and in the first round awarded four grants for AIS control in lakes. Coordinated efforts with RINHS and community based control methods were used to control water chestnut in Belleville Pond, North Kingstown. Efforts seem to be sufficient to prevent further spreading but not eliminate it. The northeast corner of Chapman Pond has a dense patch of water chestnut that continues to expand and requires greater management attention. No resources to carry on community based control methods for eradication were available in 2014 (Note: The Town of Westerly was awarded a RIDEM grant for AIS control in Chapman Pond in 2015 with work being planned for 2016). RINHS efforts have decreased in 2014 due to lack of resources but did update and reprint the invasive aquatic plant handbook and responded to approximately 12 requests for technical assistance on aquatic invasive identification and control from citizen groups and the general public. One RINHS staff person attended the Connecticut Invasive Plant Working Group conference to remain current on the AIS regional situation.

FY 2015 Funding: Funding is limited and unstable with small grants from the RI Conservation Stewardship Collaborative and the Northeast Aquatic Nuisance Species Task Force via CRMC.

Management Values:

- Characterizes the nature and extent of AIS
- Continues surveillance of select freshwater sites
- Refines management policies to improve effectiveness

Implemented by: RIDEM, RINHS, URI WW and Save The Lakes

Used by: RIDEM, RINHS, URI WW, Save The Lakes, watershed associations and researchers

Data Available: <http://www.dem.ri.gov/programs/benviron/water/wetlands/pdfs/invasive.pdf>
<http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/lakes012.pdf>
<http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/myrhet.pdf>

It's important because. . .

Invasive species change the ecology—and ultimately the economy—of Rhode Island. Controlling and eradicating invasive species is most efficient when quickly identified and addressed. Rapid detection and response to invasive species requires routine monitoring programs able to promptly identify recent AIS arrivals. Water chestnut is dangerous to freshwater ecosystems because it creates very dense floating mats, severely limiting light – a critical element of aquatic ecosystems. Once established, it can reduce oxygen levels, increasing the potential for fish kills. It also competes with native vegetation and infestations limit boating, fishing, swimming and other recreational activities.



Sam Gregg volunteers to help harvest invasive water chestnut from Belleville Pond, N. Kingstown. Unfortunately, due to lack of funds, efforts were not continued in 2014. Photo courtesy of RINHS.

Freshwater Beach Water Quality

Description: The RIDOH Beach Program oversees monitoring and public health notifications for 43 freshwater beaches throughout the state. Sources of contamination at freshwater beaches include outdated septic systems, cesspools and holding tanks, wildlife, and stormwater runoff. The RIDOH Beach Program uses the indicator bacteria *Enterococci* to determine safe water quality conditions in RI waters. These pathogens can cause a wide range of health problems including ear, nose, and throat infections; gastroenteritis; hepatitis; and respiratory illness. Current funding for RIDOH's beach water quality monitoring program is dedicated entirely to saltwater beaches, yet RI's freshwater beaches account for about one-third of the state's beach closures. RIDOH would like to expand the Beach Program to include a risk-based approach to monitoring of freshwater beaches.

Summer 2014 Beach Closure Summary . . .

- 4 freshwater beach closure days
- 2 freshwater beach closure events
- 2 freshwater beaches closed to swimming

FY 2015 Funding: Freshwater beach monitoring is not a funded effort. An estimated \$100,000 annually is required to monitor RI freshwater beaches.

Management Values:

- Finds and eliminates sources of contamination at licensed freshwater facilities
- Develops preemptive closure protocols to better protect public health
- Evaluates monitoring and notification methods currently in place
- Incorporates cyanobacteria advisories and education at freshwater facilities

Implemented by: Partially implemented by freshwater beach facility owners and operators

Used by: RIDOH, RIDEM, EPA, town beaches, municipalities, and other recreation facilities

Data Available: <https://beaches.health.ri.gov/swim/>

It's important because. . .

Freshwater beaches account for a large portion of RI shorelines. These watersheds impact recreation, habitat, and aquatic life. Children are at the highest risk for contracting water-borne illness from swimming in contaminated waters; more than half of all licensed freshwater facilities are children's summer camps and recreational facilities. Routine monitoring allows authorities to close beaches in a timely manner to ensure the safety of our residents, both young and old.



Bathers at Lincoln Woods State Park, a popular freshwater beach in northern Rhode Island. Photo courtesy of RIDEM.

Freshwater Wetlands

Description: Since 2005, RIDEM, in partnership with the RINHS, has developed and refined a rapid assessment method (RAM), which has been applied to assess the condition of freshwater wetlands. Information is collected through field inspections that characterize the ecological condition of the wetland and identify stressors to the functions of wetlands. The data collected is part of a continuing effort to evaluate the overall state of wetland protection and restoration programs in RI. In 2014, field data was not collected; instead efforts were focused on the preparation of several reports. Freshwater wetland monitoring is expected to resume in 2016. Data collected through this program contributed to the review of wetland science undertaken by the Legislative Task Force that studied the topic of wetland buffers and setbacks. Data analysis found correlations between poorer wetland condition and greater disturbance in the lands surrounding the wetland. The Task Force issued a final report in December 2014 with recommendations to strengthen wetland protection (Note: Legislation was adopted in 2015 to implement the recommendations).

FY 2015 Funding: Supported by U.S. EPA Wetland Development Grant

Management Values:

- Characterizes wetland condition which provides vital services as stream and lake buffers and can reduce the impacts of stormwater runoff
- Provides information on long term changes in freshwater wetlands and can be used to determine how these areas are impacted by stressors such as proximity to development
- Assesses the effectiveness of management strategies and assists in directing future strategies
- Aides in the prioritization of wetland restoration projects

Implemented by: RIDEM OWR and RINHS

Used by: RIDEM, EPA, USFWS, and researchers

Data Available: Carol Murphy, 401-222-4700 x 7208, carol.murphy@dem.ri.gov
<http://www.dem.ri.gov/programs/benviron/water/wetlands/wetldocs.htm>

It's important because. . .

Systematic monitoring of wetland ecosystems is an essential element of the comprehensive water monitoring strategy. These data help to characterize the location, extent and condition of our freshwater wetlands which provide valuable ecosystem services. These data improve the protection and management of these areas by allowing appropriate buffer zones to be implemented and assist in the identification and quantification of major stressors to this resource. These data have been used by the Legislative Task Force examining the adequacy of wetland protection in RI.



Volunteers checking the status of wetland restoration efforts. Photo courtesy of Friends of the Moshassuck via RIDEM.

Harmful Algal Blooms & Cyanobacteria

Description: Harmful algal blooms (HABs) can occur in fresh and salt waters and can affect both public and environmental health. A specific HAB of cyanobacteria, also known as blue-green algae, is a growing public safety concern in RI as well as across the country. These blooms can release natural toxins that can sicken pets, livestock, and people. Growing awareness of the presence of cyanobacteria in recreational waters prompted RIDEM and RIDOH to continue their limited monitoring program to both screen for and confirm the presence of cyanobacteria. While samples are screened internally by RIDEM, confirmation of the species and the amount of toxicity were done at an out-of-state laboratory in 2014. RIDOH issues public health advisories when certain thresholds have been exceeded. Between years 2010-2014, 24 waterbodies in RI had experienced blooms that triggered advisories. In 2014, URI WW joined a new regional initiative, known as the New England Cyanobacteria Project, started by EPA Region 1. URI WW volunteers were supplied with integrated water samplers to collect mid-lake and nearshore samples on a bi-weekly basis at 10 lakes. During the sampling period, July-September, cyanobacteria were detected in low amounts although there were no major blooms. The continued use of the Algae Torch® has allowed URI WW to compare results with those of an EPA-provided lab fluorometer. This allowed for the assessment of collection methodology and provided feedback to refine the program for year two of the New England Cyanobacteria Program. The EPA also provided a microscope mount for a smart phone to visualize and photograph algal species and to confirm identification, and other enhanced field monitoring supplies.

FY 2015 Funding: No state funding is currently available. URI WW uses program funds to support this work as well as limited federal grant funding from RIDEM.

Management Values:

- Allows public health advisories to be issued when harmful blooms are detected
- Allows for more timely detection of blooms
- Provides data to assist in finding and eliminating sources of contamination that contribute to blooms

Implemented by: RIDEM, URI WW, RIDOH, watershed organizations, lakeside residents, and consulting services

Used by: RIDOH, RIDEM, URI WW, EPA, watershed organizations, municipalities and veterinarians

Data Available: <http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/cyano13.pdf>

It's important because. . .

Cyanobacteria blooms can release natural toxins that pose a serious health threat to humans and animals even at very low levels. Blooms can contaminate shellfish populations, a top economic industry in Rhode Island. They can also cause fish kills, smother aquatic organisms, and coat shorelines in decaying algae. Cyanobacteria blooms are often an indicator of nutrient loading.



A HAB outbreak occurred in 2014 in Mashpaug Pond. The thick mats began to decay and smother aquatic organisms. Photo courtesy RIDEM.

Large River Water Quality

Description: With funding from the BRWCT (now disbanded), RIDEM partners with USGS on a water quality monitoring program in which over a dozen water quality parameters are sampled at five stations on RI's largest three rivers: the Blackstone, Pawtuxet, and Pawcatuck. The data from these stations support the assessment of water quality in these rivers, which drain large watersheds, and over time allows for trend analysis. Supplementing this program, NBC's river water quality monitoring program also generates data on the Blackstone and Pawtuxet Rivers. The rivers are sampled as part of a larger NBC program that monitors the estuarine waters of the Providence and Seekonk Rivers, rivers from Massachusetts, and the freshwater tributaries which flow into this area. Due to funding limitations in 2014 from RIDEM and USGS, data collection was eliminated for three winter months in the Pawcatuck River.

FY 2015 Funding: RIDEM secured for 2015 but may not be sustainable; reductions in the program may be required unless additional sources of funding are secured. NBC funding is stable.

Management Values:

- Evaluates long-term trends in river water quality assessments
- Tracks and determines pollutant loadings from rivers into Narragansett Bay
- Develops discharge permit limits and water quality modeling

Implemented by: USGS, RIDEM and NBC

Used by: RIDEM, USGS, EPA, NBC, researchers and watershed organizations

Data Available: <http://waterdata.usgs.gov/ri/nwis/current/?type=quality&group%20Key=basin%20cd>
<http://snapshot.narrabay.com/app/WaterQuality/NutrientMonitoring>

It's important because. . .

These data are critical to tracking long-term trends in river flow and riverine pollutant loading to coastal waters. The state's largest river systems receive stormwater and wastewater discharges causing water quality issues, which also contribute a significant amount of nutrients and chemical and biological contaminants to Narragansett Bay. This information will become even more important as precipitation patterns change due to climate change, resulting in a higher frequency of intense rain events.



Scientist collects water samples for bacteria analysis at the Woonasquatucket River in Smithfield, RI. Photo courtesy of RIDEM.

Lobster Population Surveys

Description: The RIDEM Marine Fisheries Program, in cooperation with commercial lobstermen, conducts a study on RI lobster populations utilizing modified lobster traps without escape vents as part of a regional program to characterize the northeast lobster stocks. The survey was implemented to improve the characterization of the lobster populations, particularly in shallow and rocky bottom habitats that are not currently sampled by RIDEM trawl surveys or other federal fisheries independent surveys. RI's commercial lobster fishery is an important fishery in RI but landings have decreased dramatically in the last decade and may be in peril due to declining recruitment in southern New England. The 2013-2014 surveys indicate that lobster abundance in RI's coastal waters remain at low levels, with a continued downward trend in catch per trap. In addition to ventless trap surveys, RIDEM also conducts annual lobster settlement surveys through diver based suction sampling. Young of the year lobster abundance is measured and reported as part of the regional Atlantic Lobster Settlement Index (ALSI). The ventless trap survey is incorporated into the ASMFC American Lobster Stock Assessment as a regional study implemented by individual states.

FY 2015 Funding: Recently allocated NMFS Inter-jurisdictional Fisheries Funding

Management Values:

- Improves assessment of lobster stocks to inform fisheries management and improve conservation efforts
- Assesses the performance and effectiveness of management strategies

Implemented by: RIDEM Marine Fisheries Program with cooperation of commercial lobstermen

Used by: RIDEM, ASMFC, ALSI and researchers

Data Available: RIDEM Marine Fisheries Section upon request. Scott Olszewski, RIDEM Marine Fisheries Fort Wetherill Marine Lab, Jamestown, RI 02835 (401)423-1934 Scott.Olszewski@dem.ri.gov

It's important because. . .

RI's commercial lobster fishery is the most valuable fishery in terms of landed value. It is in peril due to declining recruitment in southern New England stocks, meaning inadequate numbers of young lobsters are not surviving to adulthood. Lobster populations are negatively impacted by the increase in other species such as blue crabs, shellfish diseases, and finfish predation by black sea bass (which is a more southern species), and warming temperatures. Trawl survey data is vital to assessing the health and status of marine fisheries resources and their habitats in RI.



A young lobster that was measured and returned to the ocean to grow to reach adulthood. Photo courtesy RIDEM.

Marine Aquatic Invasive Species

Description: CRMC first investigated the impact of marine AIS in 2000 when it conducted a rapid assessment survey (RAS) for the presence of AIS at floating docks in Narragansett Bay. Since that time, CRMC has partnered with various agencies to conduct a RAS every three years. To acquire funding that addresses the problem of AIS in RI, CRMC promulgated the RI Aquatic Invasive Species Management Plan as approved by the federal Aquatic Nuisance Species Task Force in 2007 (RIAIS Plan). CRMC then developed and implemented the Invasive Species Monitoring Project in 2009, which prioritizes the following tasks:

- Monitor floating docks for the presence, abundance, and spread of AIS in RI's coastal waters
- Determine the impact of AIS on native species by investigating larval settlement and competition
- Monitor for the presence of the Chinese Mitten crab by conducting plankton tows in estuarine rivers
- Monitor for the presence of invasive Grass Shrimp at various sampling sites in RI's coastal waters
- Determine the impact of AIS on eelgrass by sampling eelgrass beds in RI's coastal waters

CRMCs' dock monitoring task provides RI with a database for AIS. Larval settlement and competition studies show the measurable impact of AIS on native species. CRMC has partnered with other institutions to conduct pilot projects and collaborated with the EPA AED to investigate the efficacy of monitoring eelgrass beds, and with RWU to implement methods to sample commercial vessel ballast water for the presence of AIS.

FY 2015 Funding: Federal funding from the National Invasive Species Act has steadily declined as more states participate in the Aquatic Nuisance Species Task Force.

Management Values:

- Characterizes the nature and extent of marine AIS to inform management decisions to control their introduction and spread
- Continues surveillance at select marine and estuarine sites that are of concern due to ecological and/or economic importance

Implemented by: CRMC, RIDEM, RINHS, URI WW and NBNERR

Used by: CRMC, NBNERR, RINHS, RIDEM, EPA, RWU, NOAA, USFW and NPS

Data Available: <http://www.crmc.ri.gov/invasives.html>
http://www.edc.uri.edu/mesm/docs/majorpapers/bfuller_2014.pdf

It's important because. . .

Invasive species compete with native species for habitat and resources. Controlling and eradicating invasive species is more economical and effective when discovered early through monitoring surveys. The latest RAS documented over 50 species at each site sampled in RI, with many being non-native or cryptogenic species.



The Asian Shore Crab, Hemigrapsus sanguineus, has made its way into Narragansett Bay and is outcompeting native species for food and space with its aggressive behavior. Photo courtesy of Brandon Fuller via CRMC.

Narragansett Bay Dissolved Oxygen Field Surveys (Boat Surveys)

Description: Brown University, RIDEM, URI, and STB, in cooperation with additional partners have conducted boat-based surveys to evaluate the spatial extent of hypoxic conditions. These surveys are conducted every summer during neap tides when tidal mixing and dissolved oxygen are expected to be lowest and include temperature, salinity, dissolved oxygen, chlorophyll, and turbidity data. Seventy-five stations throughout the Providence and Seekonk Rivers, Greenwich Bay, and the East and West Passages of Narragansett Bay were monitored five times during neap tides from July 8 to September 3, 2014. Unfortunately, funding shortages have prevented the data from being processed. In addition, NBC samples weekly from Memorial Day to Labor Day and twice per month for the remainder of the year at eight Providence and Seekonk River stations. NBC collects similar data with the same instrumentation as the Brown-led surveys; dissolved oxygen, temperature, salinity, and density, as well as fluorescence and photosynthetic active radiation (PAR). In August 2014, a menhaden fish kill was noted in Seekonk River. Researchers have noted that menhaden are a particularly sensitive species to environmental conditions and factors in addition to low dissolved oxygen may have played a role.

FY 2015 Funding: No annual funding is dedicated to sustain the spatial surveys; an estimated \$30,000 is needed to collect and process the data adhering to strict quality control protocols. NBC funding is stable.

Management Values:

- Generates cross section profile of the water column to determine periods of high salinity stratification which can lead to low DO
- Provides a comprehensive temporal and spatial dataset that complements the time-series dataset generated by the NBFsMN system
- Helps with decisions associated with water quality impairments
- Provides information on the inter-annual variability and severity of hypoxic and anoxic events in the Bay

Implemented by: Brown University, Save The Bay, RIDEM, NBEP, NBC, and URI GSO

Used by: RIDEM, NBC, EPA, URI GSO, NOAA CHRP, and researchers

Data Available: www.geo.brown.edu/georesearch/insomniacs/index.html
<http://snapshot.narrabay.com/app/WaterQuality/Profiles>

It's important because. . .

DO is critical to the animals that live in Narragansett Bay. When DO levels drop too low, hypoxic and even anoxic conditions can cause physiologic stress, forced migrations, and even death. DO levels are impacted by weather, stormwater runoff and wastewater treatment methods. The boat surveys target neap tides when hypoxic conditions are most likely to occur to help assess the effectiveness of management decisions and investments in capital improvement projects. In early August 2014, a fish kill was recorded in the Seekonk River though researchers note other factors in addition to low DO may have played a role.



A scientist from NBC taking dissolved oxygen measurements using a YSI sonde. Photo courtesy of NBC.

Narragansett Bay Water Quality (Fixed-Site Monitoring Network)

Description: The NBFSMN is a multi-agency collaborative that equips, operates, and conducts data analysis and reports on multi-station monitoring networks for temperature, salinity, DO, turbidity, and chlorophyll. The system collects data on these and other water quality parameters across the Bay, at 13 fixed locations with a focus on the upper bay. Buoys operate from May-October, with four operating year-round. The NBFSMN takes readings every 15 minutes, with five stations providing real-time data online. The data for 2014 was assessed with respect to hypoxia in the upper bay; less hypoxia was documented in 2014, but inter-annual variability must be taken into account. Hypoxia levels were lower in part due to water pollution control efforts and climate factors. As a compliment to operating fixed-sites as part of the NBFSMN, NBNERR also conducts year round monitoring of meteorology and samples for nutrients at four sites around Prudence Island. It also monitors water quality in Nags Creek. The use of YSI extended deployment system (EDS) sondes was discontinued and now the stations have optical dissolved oxygen probes (EXO). Superstorm Sandy recovery funds were used to purchase four new YSI EXO2 sondes that are in rotational use at Potter Cove and Nag Marsh stations.

FY 2015 Funding: Funding is unstable for the long term. RIDEM expended funds to replace equipment in order to maintain nine of the sites within the network. The EPA Clean Water Act State Revolving Fund supports monitoring in critical areas for nine sites; NBC funds two sites, and NBNERR funds four sites with NOAA support.

Management Values:

- Generates primary source of data for RIDEM to evaluate water quality against state criteria for dissolved oxygen
- Provides high-resolution temporal and spatial water quality data, and provides early warning of hypoxic events
- Tracks changes to Bay water quality during warm weather
- Provides critical data for the state assessment of water quality impairments in upper and mid-Narragansett Bay
- Informs the development of predictive water quality models applicable to future management decisions
- Generates data to improve understanding of eutrophication and hypoxia

Implemented by: RIDEM, URI GSO, NBC, NBNERR, EPA, NOAA

Used by: RIDEM, URI, NBC, NBNERR, NBEP, environmental managers, researchers, regulatory agencies, academic institutions and interested public

Data Available: <http://www.dem.ri.gov/bart/stations.htm> (data archives), <http://cdmo.baruch.sc.edu/http://snapshot.narrabay.com/app/> (real-time for the 2 NBC operated stations)
www.neracoos.org (real-time for 2 URI GSO and RIDEM in NBFSMN operated stations)
www.nbnerr.org (real-time for 1 NBNERR operated station that participates in NBFSMN)
<http://nerrdata.org/get/realTime.cfm?stationCode=NARTBWQ>
<http://www.dem.ri.gov/bart/netdata.htm> (processed datasets 2003–2014)

It's important because. . .

A major focus of the NBFSMN is assessing DO dynamics in the bay. Prior monitoring has documented that conditions vary annually due in part to variable weather conditions. With significant reductions to pollutant loadings achieved through the upgrade of WWTFs, the next several years are an especially important time to monitor the bay. The data will yield information on how the bay is responding ecologically as well as help determine how investments in pollution control, including green infrastructure, are paying off.



A scientist from NBC adjusting a meter for data collection. Photo courtesy of NBC.

River & Stream Flows

Description: The RI Stream Gage Network comprises 35 stream gages and provides continuous river and stream flow data. USGS operates and maintains gages under contracts with RIDEM, WRB, and other entities including the Providence Water Supply Board which supports gages in the Scituate reservoir watershed. Two gages are part of the USGS National Streamflow Information Program. These and twenty others are operated pursuant to an agreement with the State. Data include long-term statistical analyses specific to each gage in the network, and are among the most widely used in the water programs. Data from streamflow gages reflected lower than normal precipitation during portions of 2014; nine of the locations in the long-term stream gage network reported record-low minimum monthly mean discharges.

FY 2015 Funding: Rising costs to the state may require cuts to this program in the future despite past recommendations to increase the number of gages. BRWCT, WRB, PWSB, and Ocean State Power are partner contributors.

Management Values:

- Protects public safety and emergency (e.g., floodplain) management
- Contributes to drought and water supply management and planning
- Informs water quality and quantity modeling and pollutant loading calculations
- Supports development of water quality restoration plans and minimum flow standards
- Forms the basis for water resource management.

Implemented by: USGS, RIDEM, WRB, PWSB and local sponsors

Used by: RIDEM, WRB, USGS, PWSB, NBC, RIEMA, FEMA, EPA, NRCS, ACOE, local emergency managers, and researchers

Data Available: <http://waterdata.usgs.gov/ri/nwis/current/?type=flow>

It's important because. . .

Stream flows have a major impact on water quality, sedimentation rates, and also determine the types of organisms that inhabit an area. They also determine how pollution will interact within the aquatic environment. Reliable stream flow data provides essential information for issuing flood warnings and forecasts, preparing for and managing droughts, managing drinking water supplies, determining irrigation withdrawal limits, supporting hydroelectric power production, determining timing of wastewater discharges and reservoir releases. It also establishes minimum stream flow standards and helps manage floodplains.



A USGS scientist measures stream flow. Photo courtesy of USGS.

Salt Marshes

Description: In 2012, a monitoring protocol was created to assess RI salt marshes. The protocol is part of a 3-tiered approach for salt marsh assessment. Tier 1 is a landscape scale, GIS based assessment (data analysis is currently underway); Tier 2 is a rapid field-based assessment; and Tier 3 is a more intensive, research-based assessment encompassing investigations being conducted by many institutions including URI, EPA, and USFWS. The Tier 2 assessment protocol was developed and implemented with input from many local, state, and federal experts. The current program design is to conduct the assessment on a three-year cycle. Contrary to the paradigm of a typical southern New England salt marsh, which should predominantly comprise high marsh meadow, RI salt marshes have become dominated by short form *Spartina alterniflora*. This signals that a major ecological transition is occurring in RI's salt marshes. The change is likely due to accelerated sea level rise due to climate change and several consecutive years of higher than average tides.

FY 2015 Funding: Funding is not stable for 2015 efforts. Initial funding for development and implementation of the assessment was provided by the RI Coastal and Estuarine Trust Fund, and the US Fish and Wildlife Service Coastal Program.

Management Values:

- Informs resource managers in order to understand and mitigate the effects of sea level rise on salt marshes
- Identifies trends in salt marsh ponding, subsidence, vegetation change and soil degradation associated with sea level rise and other stressors
- Provides imperative information for restoration projects

Implemented by: NBNERR

Used by: NBNERR, Save The Bay, EPA, USFWS, CRMC, URI and other partners

Data Available: Upon request from NBNERR and Save The Bay. Please contact Wenley Ferguson at wferguson@savebay.org

It's important because. . .

Salt marshes are rich in marine life and support many popular fisheries species. They are often the first lines of defense for coastal communities and habitats against sea level rise and tidal inundation. Salt marshes are dominated by vegetation that indicate degradation due to oversaturation and ponding. Soil condition data support the hypothesis that marsh soils are degrading and subsiding in correlation with apparent changes in vegetation dominance.



Teachers explore the salt marshes of Prudence Island to learn the impacts of climate change and sea level rise. Photo courtesy of NBNERR.

Saltwater Beach Water Quality

Description: The RIDOH Beach Program oversees monitoring and public health notifications for 71 licensed saltwater beaches in RI. Sources of contamination at beaches include outdated septic systems, cesspools and holding tanks, wildlife and waterfowl, and stormwater runoff. The RIDOH Beach Program uses the federal indicator bacterium *Enterococci* to determine safe water quality conditions at Rhode Island swimming waters. Beach water quality monitoring efforts are dedicated entirely to saltwater beaches because the state's only available source of funding for this monitoring requirement is EPA's Beaches Environmental Assessment and Coastal Health Act (BEACH) program, which requires that its funds be dedicated to saltwater beaches. In addition to samples collected by beach facility operators, RIDOH applies a risk-based monitoring assessment to enhance public health protection. Recently, the EPA issued new beach standards that must be met in order to receive federal funding, and those standards will be implemented for the 2015 beach season.

Summer 2014 Beach Closure Summary

48 saltwater beach closure days

34 saltwater beach closure events

19 saltwater beaches closed to swimming

FY 2015 Funding: No state funding currently available; this program is 100% reliant on federal funding for annual need of \$212,000. At risk for disruption. Only licensed saltwater beaches were monitored by the RIDOH.

Management Values:

- Finds and eliminates sources of contamination at licensed saltwater facilities
- Develops preemptive closure protocols to better protect public health
- Evaluates monitoring and notification methods currently in place

Implemented by: RIDOH Beach Program

Used by: RIDOH, RIDEM, EPA, NBC, municipalities, and the general public

Data Available: <http://www.health.ri.gov/beaches/>
<http://beaches.health.ri.gov/swim/>

It's important because. . .

Saltwater beaches cannot operate without being certified for safe swimming. The state and wastewater ratepayers have made significant investments in capital improvements in order to reduce CSOs and stormwater runoff, which can negatively impact beaches and cause beach closures. Beach monitoring not only protects human health, but allows us to ensure that our investments are paying off. The City of East Providence and RIDOH used this data to identify sources of pollution, develop an action plan, and leverage grant funding to evaluate the possibility of re-opening Sabin Point Park Beach.



Stormwater carries contaminants such as bacteria to beaches causing closures. Photo courtesy of RIDOH via Watershed Counts.

Shellfish Growing Areas – Coastal Waters

Description: Approximately 95% of Rhode Island’s coastal waters including RI and Block Island Sounds are designated for shellfishing uses. The RIDEM Shellfish Growing Area Monitoring Program provides an extensive dataset on pathogens in these waters. The program assures compliance with the USFDA’s National Shellfish Sanitation Program (NSSP) by collecting samples from 17 delineated shellfish growing areas throughout the state and analyzing these water samples for fecal bacteria. The growing areas include most of Narragansett Bay, its shellfish harboring tributaries, all of the south shore coastal salt ponds and offshore waters, Little Narragansett Bay and the waters of Great Salt Pond and the surrounding offshore waters of Block Island. The frequency of sampling depends upon the current classification of these waters as approved, conditionally approved or prohibited and what the area’s management plan or NSSP Model Ordinance requires. Sampling is conducted year round by program staff with a varying frequency of 6-12 times per year. There are over 300 established sampling stations distributed throughout each of the growing areas. Historical results from this extensive database are used along with shoreline surveys and routine bio-toxin monitoring to ensure acceptable water quality for harvesting shellfish. The program also monitors and institutes emergency closures of shellfish waters that may be necessitated due to conditions such as extreme weather events that cause flooding, power outages and malfunctions or overflows at wastewater treatment facilities that discharge to these waters. Follow up sampling that result in acceptable bacteria results are required in order to re-open an area following one of these emergency events.

FY 2015 Funding: RIDEM state funds currently stable.

Management Values:

- Provides data necessary to manage shellfish growing areas, permit harvesting and the interstate sale of shellfish
- Protects public health by ensuring shellfish are harvested from areas with acceptable water quality
- Evaluates success of infrastructure investments

Implemented by: RIDEM and RIDOH Laboratory

Used by: RIDEM, CRMC, USDA, FDA and NBC

Data Available: Upon request from RIDEM Office of Water Resources. More information at <http://www.dem.ri.gov/programs/benviron/water/shellfish/index.htm>

It’s important because. . .

In 2013 through 2014 the northeast region saw an increase in gastrointestinal illnesses associated with a naturally occurring bacterium found in warm salt water. Fortunately RI did not experience an outbreak of illnesses while adjoining states did. Recognizing the importance of public health and being proactive, the RIDOH, CRMC, and RIDEM voluntarily promulgated a plan to implement time to temperature controls for harvesters and dealers of shellfish. The shellfish program continues to monitor water temperatures in shallow shore ponds and coastal coves and continues to collect phytoplankton samples as an indicator of harmful algae blooms which can also cause illnesses when exposed shellfish are consumed.



Shellfish chilled to temperature. Photo courtesy of Judith Hausman of Urban Farm.

Shoreline Erosion, Accretion & Sediment Transport

Description: The current CRMC shoreline change maps document changes from 1939 to 2006, and are available online. Updated maps covering the entire RI shoreline are planned for 2015 using newly acquired 2014 orthophotos, 2011 orthophotos, 2011 LiDAR data, 2012 eelgrass aerial photo images, and new post-Superstorm Sandy aerial photo images. Updated shoreline change maps will be prepared as part of the upcoming CRMC Shoreline Change (Beach) Special Area Management Plan (SAMP; see: <http://www.beachsamp.org/>). In 2014, URI acquired a federal grant to obtain 2014 aerial orthoimages to calculate shoreline change up to and including 2014.

The entire Block Island shoreline has been traversed with a real time kinetic (RTK) GPS unit to establish an accurate wet-dry line to assist in calculating shoreline change. In addition, an expansive collection of shoreline images are indexed in a Google Earth KMZ file for referencing conditions as of 2014; (see <http://www1.easternct.edu/oakleyb/bi-bluff-photos/> for additional information). Shoreline erosion processes will be characterized as part of the CRMC Shoreline Change SAMP. Sea level rise and flood inundation scenarios will also be analyzed to inform planning efforts and decision-making regarding public and private infrastructure and natural resources.

FY 2015 Funding: Federal funding through several sources. Partial funding has been secured to initiate data collection but full funding is still being sought. CRMC and BRWCT support provided via funding for the Shoreline Change SAMP.

Management Values:

- Allows CRMC to track and establish regulatory setbacks from eroding shorelines and planning for public infrastructure and new building construction
- Provides valuable planning information for local government and other entities

Implemented by: CRMC, URI Coastal Resources Center, URI Department of Geosciences

Used by: State agencies, municipal government, planners, consultants and property owners

Data Available: http://www.crmc.ri.gov/maps/maps_shorechange.html
<http://www.beachsamp.org/resources/shoreline-change-maps/>

It's important because. . .

In RI coastal communities, shoreline erosion and sea level rise are compromising the integrity of major portions of the natural and developed coastline which play a vital role in the economy. These threats are increasing in severity as climate change causes greater rates of sea level rise and more frequent intense coastal storms.



Erosion and coastal change due to Superstorm Sandy. Photo courtesy of CRMC.

Toxic Contaminants in Freshwater Fish: Mercury

Description: One of RI's largest environmental data gaps is the evaluation of toxic contaminant concentrations in freshwater fish tissues. RI has yet to establish a fully supported program to assess fish tissue and the associated public health risks. In the interim, collaborations by the RIDEM's OWR and Division of Fish and Wildlife with the EPA AED continue to sample a subset of water bodies around the state. In 2014, Carbuncle and Union Ponds, Lake Washington, and Slatersville and Smith and Sayles Reservoirs were sampled. These data indicate if mercury levels in freshwater fish tissue are elevated and if consumption advisories are needed to protect public health. Researchers then use these data to improve understanding of the fate and impact of contaminants in the environment. These data are also used in the statewide water quality assessment process. RIDEM has made a commitment to sample a subset of RI lakes and ponds, particularly those publicly accessible to boats, for fish tissue contamination. The program design will be implemented over a five-year time frame. Additionally, RIDEM is collaborating with NEIWPCC for regional monitoring of mercury in fish tissue aimed at evaluating progress on implementation of the regional mercury TMDL. In 2014, RIDOH increased efforts surrounding fish toxin advisories. RIDOH, with Brown University and RIDEM, is currently building an external website devoted to fish consumption advisories for mercury and PCBs. In addition, historical data sets are being collected from state-wide sampling initiatives to bring all fish toxin data into one location. Funding for the website is being supplied by multiple RIDOH divisions.

FY 2015 Funding: The program does not have annual base support. Public health advisories and health recommendations related to fish toxins have no source of funding.

Management Values:

- Determines if fish are suitable for human consumption
- Regulates whether public health advisories are needed
- Tracks trends in concentrations of mercury in fish tissues over time

Implemented by: RIDEM OWR in collaboration with RIDEM Fish and Wildlife, and EPA AED

Used by: RIDEM, RIDOH, researchers, outdoor recreationalists, and general public

Data Available: Data from 2014 not yet available.
<http://www.health.ri.gov/healthrisks/poisoning/mercury/about/fish/>
<http://www.neiwpcc.org/mercury/mercurytmdl.asp>

It's important because. . .

Mercury is a metal that is odorless, colorless, and tasteless in fish. Ingesting fish that contains high levels of mercury is dangerous to human health, particularly pregnant mothers and young children. Expanding this monitoring program would allow identification of those waters in which fish tissue contamination presents a health and safety risk and allow RI to better inform the public of such dangers through fish consumption advisories.



Anglers enjoying a successful day out on the water. Rhode Island lakes provide a valuable recreational resource, including fishing. Photo courtesy of RIDEM.

Volunteer Monitoring - Surface Waters

Description: URI WW, the largest citizen scientist-led volunteer monitoring program in RI, has over 250 sites and 350 volunteers. Data collected from lakes, rivers, streams, and coastal waters provides information on water conditions that supplement the State's periodic rotating assessments. 2014 marked the 27th year for URI WW volunteer monitoring efforts and volunteers monitored 65 lakes and ponds, 90 river and stream sites, and 102 salt water and estuarine sites during the monitoring season. At the end of the season there were 177 five-plus-year volunteers (including families), 94 ten-plus-year volunteers, 46 fifteen-plus-year volunteers, 25 twenty-plus-year volunteers, and 7 volunteers who have monitored for twenty-five or more years. The most-senior volunteer is 92, and was featured in a front page article in the *Providence Journal* (<http://www.providencejournal.com/article/20140914/NEWS/309149981>). Monitoring includes measurement of water clarity, algae concentrations, dissolved oxygen, temperature, alkalinity, pH, nutrients, and bacteria. 2014 was the second year of a 2-year grant from the URI Coastal Institute to create an easily searchable relational database for URI WW and other volunteer monitoring data. The database was successfully created and populated with data from 1988-2012. With funding provided by RI Airport Corporation, URI WW in association with the Buckeye Brook Coalition started the Buckeye Brook Winter Monitoring Program on six sites in the Warwick watershed. Volunteers performed biweekly monitoring for dissolved oxygen, temperature, and glycol. In addition, they sampled after every snow event from November 2013–April 2014, and collected monthly water samples for URI WW lab analyses.

FY 2015 Funding: Funding is unstable with a \$105,000 shortfall. Budget constraints of local sponsors may inhibit the total number of sites monitored, with each site costing a minimum of \$600. RIDEM has historically provided a grant to support this program, but it has been level funded since 1999. URI Cooperative Extension provides significant salary support for the administration of the program. Funding after 2015 is threatened.

Management Values:

- Monitors and assesses water quality in lakes and ponds for which there is little other water quality data collected
- Provides data to supplement state watershed assessments and allows tracking of changes in water quality as pollution management actions are implemented
- Identifies new water pollution problems as well as high quality waters
- Contributes to the refining and updating of nutrient water quality criteria and standards
- Supports municipal and state TMDL implementation and stormwater management

Implemented by: URI WW, URI Cooperative Extension, RIDEM, 45 local organizations, and 2 businesses

Used by: RIDEM and watershed organizations

Data Available: Elizabeth Herron, 401.874.4552 emh@uri.edu 001 Coastal Institute, Kingston, RI 02881
www.uri.edu/ce/wq/ww

It's important because. . .

Volunteer-based monitoring is an important source of water quality information in RI lakes, ponds, streams, and beaches. These data are shared with RIDEM to supplement state-led river and coastal monitoring efforts, and helps them prioritize restoration efforts and also meet EPA data reporting requirements. Local partners use the results to understand, protect, and restore RI waters. With almost 150 lakes covering over 20 acres throughout RI, there remains a need to expand the program to address water bodies that are currently unassessed.



URI WW volunteer, Vuarnelle Urena, taking water quality measurements on a lake during the summer sampling season. Photo courtesy of Kim Osienski.

Wadeable Rivers & Streams-Rotating Assessment

Description: RIDEM monitors wading rivers and streams via a rotating basin monitoring strategy. A portion of the state is monitored each year, with 2014 focused on the Woonasquatucket River, Ten Mile River, Saugatucket River and selected streams in Tiverton and Little Compton and on Aquidneck Island. Sampling occurred at 42 stations, and included chemical, physical and biological parameters. Improvements continue to be made in field techniques, station selection, documentation, quality assurance, and safety. Parameters are tailored at each station to meet management needs. In 2015, the Wood-Pawcatuck River watershed is scheduled to be monitored.

FY 2015 Funding: Supported by US EPA Clean Water Act funding.

Management Values:

- Assesses water quality in wadeable rivers and streams
- Provides data to support permitting decisions
- Provides data to support development of water quality bio-criteria
- Documents nutrient inputs to lakes and estuaries for TMDL and restoration planning
- Evaluates the effectiveness of management actions within a watershed
- Tracks changes due to infrastructure improvements

Implemented by: RIDEM with technical support from NEIWPCC, lab services from RI DOH, and taxonomic services from ESS Group, Inc.

Used by: RIDEM, EPA, NBC, watershed organizations, and researchers

Data Available: RIDEM Office of Water Resources upon request. Please contact Mark Nimiroski, mark.nimiroski@ri.dem.gov, 401-222-4700 x 7545

It's important because. . .

Long term monitoring efforts in wadeable rivers and streams enable Rhode Island experts to track environmental trends and patterns within watersheds. It also allows scientists to identify specific river segments and streams that exhibit poor water quality or degraded aquatic habitat so proper management and restoration plans can be initiated.



Scientist collecting an algae sample at Indian Run Brook in South Kingstown for nutrient criteria development. Photo courtesy of RIDEM.

Appendix A – RIEMC Partner Organizations



Brown University was founded in 1764 and is an Ivy League institution specializing in medicine, engineering, public health and professional studies. Brown University has a mission to serve the community, nation and the world by discovering, communicating and preserving knowledge and understanding in a spirit of free inquiry.

<http://www.brown.edu/>



The Rhode Island **Coastal Resources Management Council (CRMC)** is the State's federally-designated coastal zone management agency. The CRMC manages and plans for the preservation of the coastal resources of the state and is responsible for the management and permitting of all activities within tidal waters, including dredging, and along shoreline features and their contiguous areas. The CRMC, in collaboration with many partners, manages the marine aquatic invasive species program, maintains shoreline change maps depicting erosion and accretion along the coast, and assesses the impacts of sea level rise on Rhode Island's coasts.

www.crmc.ri.gov



The **Environmental Protection Agency Atlantic Ecology Division (EPA AED)** conducts research to enhance the understanding of the effects of human activity on land and waters of the Atlantic seaboard. Researchers collect and analyze data to provide tools for diagnosing and predicting the effects of these activities on aquatic resources and wildlife. EPA AED provides research support to EPA Program & Regional Offices and state & local governments.

<http://www.epa.gov/aed/>



The mission of the **Narragansett Bay Commission (NBC)** is to protect and sustain water quality in Narragansett Bay and its tributaries by providing safe and reliable wastewater collection and treatment services at a reasonable cost. NBC's water quality monitoring programs are essential to this mission, particularly monitoring of dissolved oxygen, nutrients, bacteria, and benthic habitats. Its website contains monitoring data and represents a comprehensive look at water quality in upper Narragansett Bay. NBC serves as vice chair of the RIEMC.

<http://snapshot.narrabay.com/app/>



The **Narragansett Bay Estuary Program (NBEP)** conducts marine monitoring efforts, and provides assistance to state agencies and the RI Bays, Rivers, and Watersheds Coordination Team in developing and implementing marine monitoring plans. Summer dissolved oxygen distributions are measured by NBEP in a collaborative effort to map the extent and severity of hypoxia (low oxygen) throughout the Bay. The NBEP also helped to conduct aerial summertime macro algae surveys using monthly high resolution, GPS stamped, digital photography. Surveys are conducted monthly during low spring tides from June-September each year.

www.nbep.org/



The **Narragansett Bay National Estuarine Research Reserve (NBNERR)** collects a comprehensive set of abiotic and biological monitoring data. Water quality data are collected continuously around Prudence Island as part of the national System-wide Monitoring Program. These data are complemented by continuous monitoring of meteorological data at the weather station near Potter Cove and by monthly nutrient and chlorophyll sampling at four water quality sites. NBNERR is also tracking changes at two of the most pristine salt marshes on Prudence Island in response to climate change and sea level rise. The biological parameters regularly monitored by NBNERR include eelgrass and macro algae distribution and cover, benthic fauna, invasive crabs, nekton in estuarine habitats, and songbirds and ticks in upland habitats.

www.nbnerr.org



The **Rhode Island Department of Environmental Management's Office of Water Resources** (RIDEM OWR) monitors, protects and restores rivers, lakes, wetlands, groundwater, and coastal waters in order to support healthy communities of fish, plants, and other aquatic life, as well as sustain ecosystem services such as fishing, swimming, and drinking water supplies. RIDEM OWR is responsible for using water quality monitoring data to assess the conditions of Rhode Island's surface waters in accordance with the federal Clean Water Act. The results of the assessments of the condition of surface waters are available online and specific data can also be requested from the Surface Water Quality Assessment Program. RIDEM serves as vice chair of the RIEMC.
<http://www.dem.ri.gov/programs/benviron/water/quality/index.htm>



The mission of the **Rhode Island Department of Environmental Management's Marine Fisheries Section** (RIDEM Marine Fisheries Section) is to research and monitor marine species to support the effective management of finfish and shellfish of commercial and recreational importance.
<http://www.dem.ri.gov/topics/mftopics.htm>



The mission of the **Rhode Island Department of Health** (RIDOH) Beach Program is to protect the public from illness associated with swimming in contaminated bathing waters. The Beach Program achieves this goal by licensing recreational bathing beaches throughout the state. It furthers this mission by assisting beach owners and managers with finding and eliminating sources of contamination. The Beach Program collects various types of environmental data including *Enterococci* levels, water temperature, bather load, beach conditions, precipitation, seaweed load, illness complaints, etc.
<http://www.health.ri.gov/>



The **Rhode Island Natural History Survey** (RINHS) collects and distributes information on the location and viability of animal and plant species and natural communities in Rhode Island. Ongoing monitoring focuses on rare species and natural communities and invasive species.
<http://rinhs.org/>



Save The Bay (STB) protects, restores, and improves the ecological health of the Narragansett Bay region, including its watershed and adjacent coastal waters, through an ecosystem-based approach to environmental action. STB also defends the right of the public to use and enjoy the Bay and its surrounding waters, and fosters an ethic of environmental stewardship among people who live in or visit the Narragansett Bay region. STB conducts monitoring at two natural eelgrass bed sites in the Bay and sends its data to the SeagrassNet database (www.seagrassnet.org/research#percentcountry) a world-wide monitoring database and web site. STB uses data from natural eelgrass sites to compare with monitoring data conducted at transplant bed sites.
<https://www.savebay.org/>



State of Rhode Island Division of Planning consists of three main components: the Statewide Planning Program, the Office of Housing and Community Development, and the Water Resources Board. The Water Resources Board and the Water Resources Board Corporate have authority in planning, developing, and managing public water supplies. These two agencies support the proper development, protection, conservation, and use of the state's water resources while providing for economic development and protection for the environment.
<http://www.planning.ri.gov/>



The Nature Conservancy (TNC) was founded in 1951 with a mission to conserve the lands and waters on which all life depends and advance conservation around the world. TNC-Rhode Island added the Ocean and Coastal Conservation program in 2007, to bring together experts from around the state and across the country to protect and restore the health of Rhode Island's marine environment.
www.nature.org



The **University of Rhode Island Coastal Institute** (URI CI) is a neutral venue where knowledge is advanced, issues discussed, information synthesized, and solutions developed for the sustainable use and management of coastal ecosystems. The geographic scope of the Coastal Institute is broadly defined to include continental shelves, inland or partially enclosed seas, estuaries, bays, lagoons, beaches, and terrestrial and aquatic ecosystems within watersheds that drain into coastal waters. The conceptual scope of the Coastal Institute includes the environmental, economic, ethical, and cultural dimensions of coastal environments and their governance. The Coastal Institute serves as chair of the RIEMC.

<http://web.uri.edu/coastalinstitute/>



The **University of Rhode Island Graduate School of Oceanography** (URI GSO) is an internationally respected oceanographic institution in regards to ocean education and research. The main interests include marine geology, geophysics, biology, atmospheric and ocean chemistry, and physics.

<http://www.gso.uri.edu/>



The **University of Rhode Island Environmental Data Center** (URI EDC) operates within the Department of Natural Resources Science at the University of Rhode Island. The URI EDC specializes in 1) the collection, storage, analysis, display, and distribution of geospatial data and 2) teaching, instruction, and training in the use of geospatial technologies. The URI EDC works closely with the Rhode Island Geographic Information System (RIGIS) Consortium and regional entities on the coordination of geospatial data acquisition and distribution that supports environmental monitoring efforts throughout Rhode Island. URI EDC was part of a consortium through USGS to collect high resolution elevation (LIDAR) data covering all of Rhode Island. These data are immediately applicable in flood hazard mapping, sea level rise modeling, ecological climate change habitat assessments, and alternative energy siting.

www.edc.uri.edu



The **University of Rhode Island Watershed Watch** (URI WW) program works with RIDEM, watershed organizations, and local communities to assess water quality, and provide information for more effective management of critical water resources. The URI WW produces quality data for a broad range of parameters for over 250 monitoring sites on lakes, ponds, reservoirs, rivers, streams, salt ponds, and marine waters statewide. Field monitoring is conducted by trained volunteers typically from May through October either weekly or bi-weekly following well-established and documented methods, and samples are processed in a state certified laboratory. Data are summarized in on the URI WW website with design of a new database underway.

www.uri.edu/ce/wq/ww/Data.htm



The **Rhode Island Water Resources Board** (WRB) is an executive agency of state government charged with managing the proper development, protection, conservation, and use of the state's water resources. Goals and strategies include water supply management, water facilities assistance, information systems, property acquisition and management and education and outreach. Information on the strategic plan can be found here,

http://www.wrb.ri.gov/policy_statutes_planning/WRB_StrategicPlan_031612.pdf

<http://www.wrb.ri.gov/index.html>

This page intentionally left blank.

Appendix B - RI Comprehensive Environmental Monitoring Strategy

The RI Comprehensive Environmental Monitoring Strategy consists of:

- An inventory of existing monitoring programs
- An outline of additional monitoring programs the state needs
- A list of indicators that will be used to measure the health of the marine habitats of the state
- A list of data standards and protocols that will be used on a reasonable and consistent basis by monitoring programs that contribute data to the state monitoring system
- A mechanism for data sharing among all monitoring programs that enables both monitors and users to securely access monitoring data via the Internet and to retain the integrity of such data
- A plan to provide data from the state marine monitoring system for disaster prevention, preparedness, response and recovery efforts in the marine environment
- A communications strategy to provide for public access to monitoring data

(RIGL 46-31)

