

www.watershedcounts.org

Introduction

Watershed Counts, a collaborative initiative[1] facilitated by the URI Coastal Institute in its role as Chair of the Rhode Island Environmental Monitoring Collaborative and the Narragansett Bay Estuary Program, has completed a successful second year with 46 partners working together to evaluate the conditions and trends of the land and waters of the Narragansett Bay Region. This year, four new indicators were added to the assessment, fresh and marine water quality, open space and resource economics. These indicators are added to the 2011 indicators – invasive species, beach closures, impervious cover, freshwater flow and climate change. Because we are in the indicator development phase, a time-intensive effort, we will present the new indicators in the 2012 report, and will follow up with annual reporting when we've completed development.

Rhode Island's leaders understand that land and water resources are central to the quality of life in Rhode Island and a critical component of the state's economy. According to the Rhode Island Economic Development Council's web site[2], "Travel and tourism is one of Rhode Island's most valued industries, ultimately generating more than $2.31 billion for the state's economy. With more than 100 beaches, 400 miles of picture perfect shoreline, historical and cultural attractions, and world-class dining, it is no surprise that tourism and hospitality is Rhode Island's fourth largest industry".

The state's natural environment supports agriculture and the "local foods" economy, two growth sectors with increasing jobs and sales as well as outdoor activities. On February 4th the USDA released the 2007 Census of Agriculture[3] that showed that the market value of agricultural production in Rhode Island totaled $65.9 million, up 19 percent from the previous census in 2002. Rhode Island's healthy fish and wildlife populations generate $332 million[4] each year from sportsmen (hunting and fishing), birdwatchers and other wildlife observers.

With legislative support, Rhode Island made a strong commitment to environmental protection. Wastewater treatment facility upgrades have begun to reduce nutrient pollutant loadings (specifically nitrogen) into the upper Bay, with further reductions expected as construction of additional planned upgrades are completed and become operational. The reductions are needed to alleviate hypoxic conditions – periods where the water lacks sufficient oxygen to support healthy marine ecosystems. The Narragansett Bay Commission's $359 million combined sewer overflow tunnel that went on-line in 2008 has captured 2.9 billion gallons of untreated sewage mixed with stormwater, improving water quality in the upper bay. This is Phase I of a multi-part strategy to abate the release of untreated sewage into the Bay – evidence of our collective commitment to improving water quality in the upper Bay.

These investments are encouraging but significant challenges face us. Management accomplishments occur against a back drop of climate change which is already altering our landscape and water

[1] Watershed Counts closely coordinates with the RI Environmental Monitoring Collaborative. The development and application of environmental and economic indicators was mandated by the RI General Assembly in the 2004 Comprehensive Watershed and Marine Monitoring Act, which also established the RI Environmental Monitoring Collaborative.
[2] According to the RI EDC web site http://www.riedc.com/industry-sectors/tourism-and-hospitality (4-16-12)
[3] According to the RI Department of Environmental Management Division of Agriculture web site (4-16-12) http://www.dem.ri.gov/programs/bnatres/agricult/index.htm
[4] U.S. Fish & Wildlife Service, Survey of Fishing, Hunting, and Wildlife-Association Recreation, 2006 http://wsfrprograms.fws.gov/subpages/nationalsurvey/National_Survey.htm

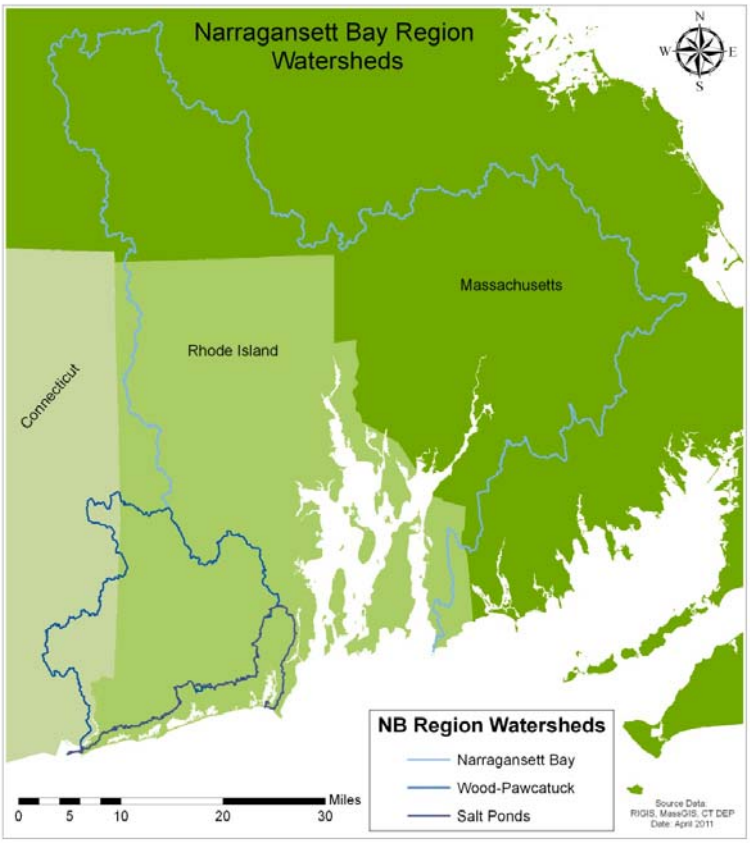
resources. State and federal monitoring resources are limited. Watershed Counts identified significant monitoring challenges for all the indicators evaluated.

Watershed Counts is committed to providing independent, credible, comprehensive information on the Narragansett Bay region's environment that will be used to track progress and ensure accountability as we all work together to protect clean water and special places. This report will be an annual Earth Day event that will expand in scope with each additional year to provide a useful snapshot of conditions.

The Narragansett Bay Region

Narragansett Bay is an estuary – a partly enclosed coastal body of water with one or more rivers or streams flowing into it, with a free connection to the open ocean. More than two billion gallons of fresh water flow daily, on average, from Rhode Island and Southeastern Massachusetts to mix with the salt waters of Narragansett Bay. This mixing of sea water and freshwater produces the unique estuarine habitat that is home to the many creatures of the Bay.

The Narragansett Bay region encompasses the land, waters and communities that are linked to the Narragansett Bay estuary. The region includes Narragansett Bay watershed along with the Wood-Pawcatuck and Salt Ponds watersheds in southern Rhode Island. The Narragansett Bay Region is 2066 square miles in area, with 1028 square miles (50%) in Massachusetts, 984 square miles (48%) in Rhode Island and 57 square miles (2%) in Connecticut. The Narragansett Bay Region is home to two million people in 100 cities and towns in three states.[5]



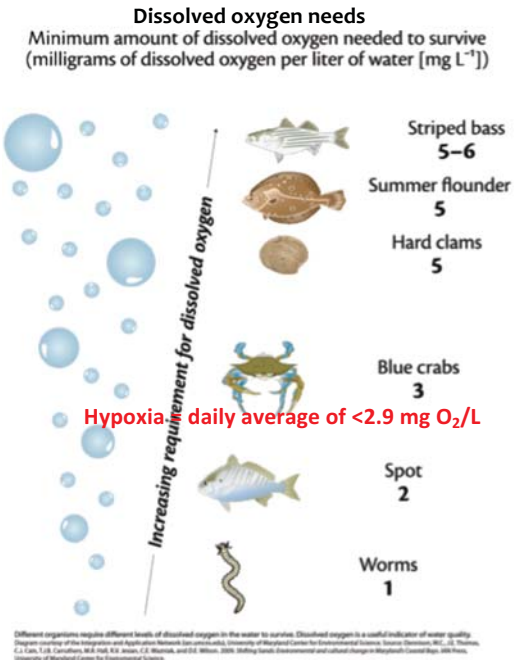
[5] From NBEP, "Currents of Change, Environmental Status and Trends of the Narragansett Bay Region"

Marine Water Quality

Dissolved Oxygen

A healthy Narragansett Bay supports valuable fisheries and a wide variety of other marine life. Marine water quality is a complex issue and requires monitoring a range of aspects. This year Watershed Counts is focusing on dissolved oxygen (DO), just one of many valuable metrics of marine water quality. Additional metrics are under development.

If low dissolved oxygen occurs during the recruitment season (May through October), it can severely impact marine life. The effects on finfish and shellfish populations have implications for the fisheries industry. The State of Rhode Island has dissolved oxygen criteria for Narragansett Bay to protect marine life. When those criteria are exceeded in a section of the bay, that section is classified as "impaired" for dissolved oxygen. If average daily dissolved oxygen concentrations fall below 2.9 mg O_2/L, the water is considered "hypoxic", and only the most tolerant forms of marine life are able to survive. If DO concentrations fall close to zero, the water is considered "anoxic".

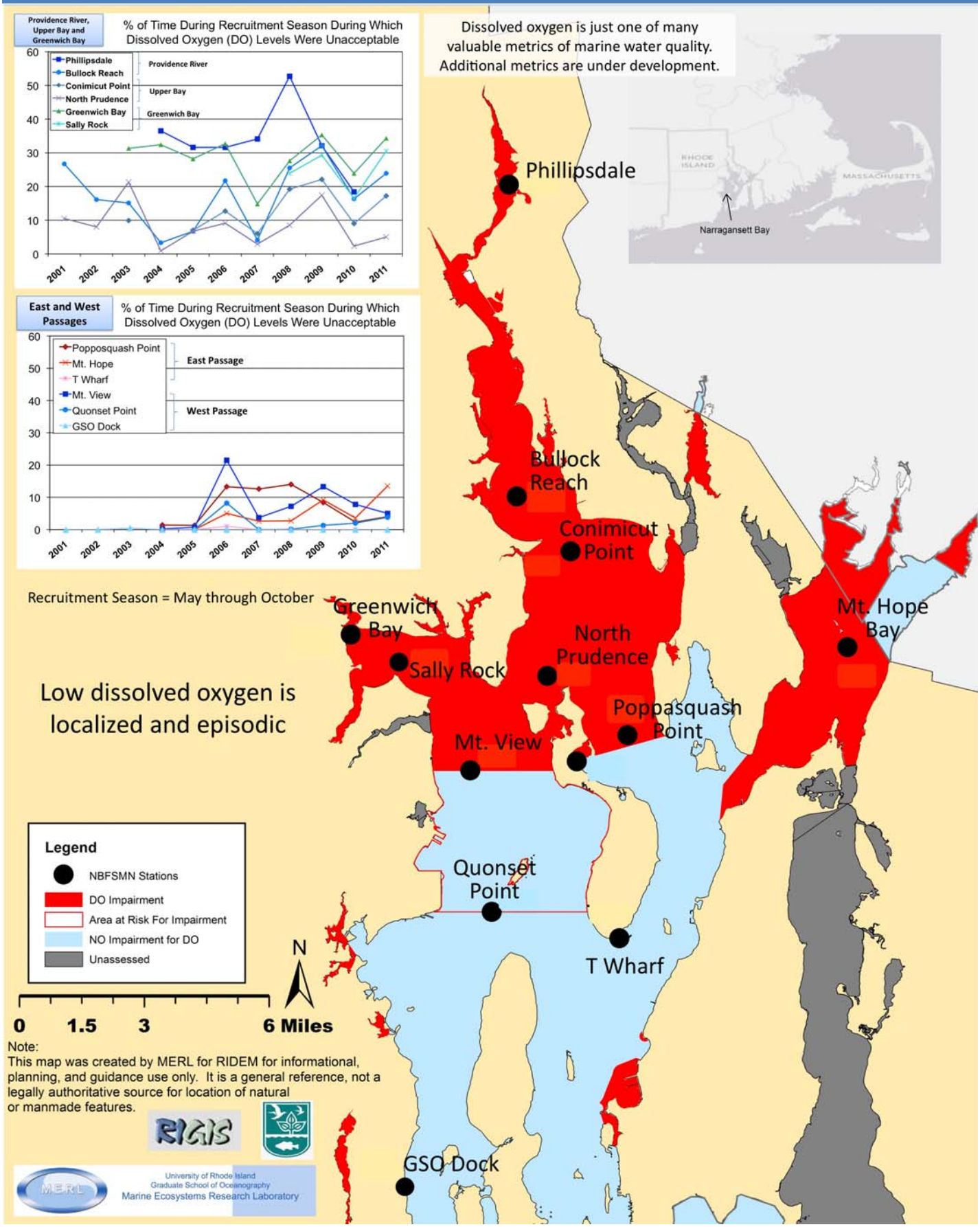


2012 **Marine Water Quality – Dissolved Oxygen**

Status and Trends: Narragansett Bay is 148.6 square miles, 140 of which are in Rhode Island. Based on the 2010 RI DEM and MA DEP assessments, 42.1 square miles in RI and 6.2 square miles in MA are currently designated as impaired for dissolved oxygen, with 23.6 square miles unassessed. Some areas of the bay are improving, with dissolved oxygen conditions approaching unimpaired.

Management: Many factors influence dissolved oxygen concentrations in the bay, including weather and circulation patterns, as well as inputs from the watershed. We can most effectively manage nutrient over-enrichment from the watershed. We are making progress toward the RI goal of reducing by 50% the pollutant loadings of nitrogen to the upper Bay. Nutrient loadings are decreasing as wastewater treatment facilities continue to upgrade to remove nutrients. The implementation of stormwater regulations and the adoption of low-impact development approaches throughout the watershed will protect rivers and lakes, as well as contribute to improved water quality in the Bay. Monitoring is essential to track the effects of management on marine water quality.

Marine Water Quality - Dissolved Oxygen Data for Narragansett Bay



A network of fixed-site monitoring stations is used to assess water quality in Narragansett Bay and is an essential component of Rhode Island's monitoring strategy for the bay. The stations are located strategically to transect the length of Narragansett Bay and serve as sentinels of changing conditions. There is a greater concentration of sites in upper Narragansett Bay strategically located because of the presence of discharges from both wastewater treatment facilities and large tributary rivers. The DEM Office of Water Resources has taken a lead role in coordinating the multi-agency network effort. The cooperating agencies are as follows:

Rhode Island Department of Environmental Management- Office of Water Resources (RIDEM-OWR),
University of Rhode Island, Graduate School of Oceanography (URI-GSO),
Narragansett Bay Commission (NBC),
Narragansett Bay National Estuarine Research Reserve (NBNERR),
Roger Williams University (RWU).
Narragansett Bay Estuary Program (NBNEP), and URI Coastal Institute.

Data from the fixed-site monitoring stations can be found at http://www.dem.ri.gov/bart/stations.htm.

Water quality data for the Upper Bay can be found at the Narragansett Bay Commission's SNAPSHOT of Upper Narragansett Bay website: http://snapshot.narrabay.com/app/

Water quality data for Narragansett Bay are also available at the URI Graduate School of Oceanography Marine Ecosystems Research Laboratory (MERL): http://www.gso.uri.edu/merl/data.htm

Other types of data for Narragansett Bay are available at www.narrbay.org

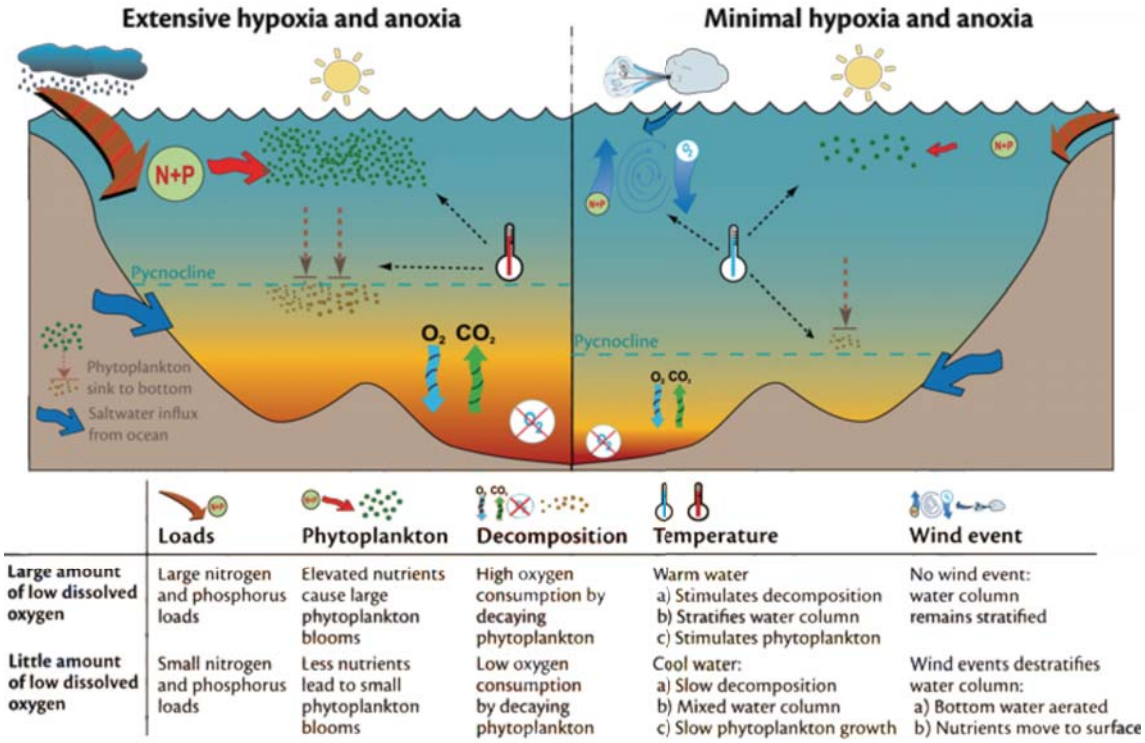
Many factors affect dissolved oxygen concentrations in the bay:

- Weather (rainfall, temperature, wind)
- Circulation patterns (tides and currents)
- River flows into the bay from the watershed
- Discharges, both point and non-point, that result in nutrient over-enrichment
    - Point discharges include wastewater treatment facilities
    - Non-point discharges include stormwater runoff from developed and agricultural lands

The factors that we can control the most effectively are the point and non-point discharges that carry pollutants to the bay. Wastewater treatement facility discharges are the largest source of nutrients to the estuarine Providence and Seekonk Rivers in the Upper Bay. In addition, stormwater and river flows wash pollutants, including nutrients, into the bay. Nutrient loading from the rivers flowing into the Upper Bay can increase from 100% to 400% during rainstorms[6]. Dissolved oxygen is linked to nutrient over-enrichment, particularly nitrogen, which contributes to over-production of algae. A surplus of algae means that dead algae sink to the bottom and decompose, a process that consumes a lot of oxygen. Bottom waters are not readily re-oxygenated because they are cut off from the air, leading to oxygen-depleted bottom waters. Even the fresh water inputs significantly exacerbate the low dissolved oxygen

[6] Narragansett Bay Commission data.

problem. Because fresh water is less dense than the heavier salt water, it forms a layer over the seawater that further prevents oxygen in the air from reaching the salt water, a phenomenon called *stratification*. The waters of Upper Narragansett Bay are most impacted by nitrogen enrichment and stratification, and monitoring data indicates that approximately 32.5% of Narragansett Bay has experienced impaired oxygen levels. The Seekonk River tends to experience the most serious and consistent low dissolved oxygen issues. Conditions improve as you move down the bay along a north to south gradient. Greenwich Bay also is prone to low oxygen conditions during the summer months when weather conditions (high temperatures and little wind) can intensify stratification.



	Loads	Phytoplankton	Decomposition	Temperature	Wind event
Large amount of low dissolved oxygen	Large nitrogen and phosphorus loads	Elevated nutrients cause large phytoplankton blooms	High oxygen consumption by decaying phytoplankton	Warm water a) Stimulates decomposition b) Stratifies water column c) Stimulates phytoplankton	No wind event: water column remains stratified
Little amount of low dissolved oxygen	Small nitrogen and phosphorus loads	Less nutrients lead to small phytoplankton blooms	Low oxygen consumption by decaying phytoplankton	Cool water: a) Slow decomposition b) Mixed water column c) Slow phytoplankton growth	Wind events destratifies water column: a) Bottom water aerated b) Nutrients move to surface

Diagram: Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science

Wastewater treatment facilities have been spending millions of dollars on facility improvements to reduce nutrient discharges and impressive nitrogen reductions have already been observed in Narragansett Bay. The Narragansett Bay Commission is spending over $100 million on facility upgrades to reduce nitrogen discharges and has already reduced nitrogen discharges by 34% since 2003, the year of the historic Greenwich Bay fish kill, and by 2014 the Narragansett Bay Commission nitrogen discharges to Upper Narragansett Bay will be reduced by over 70% compared to 2003 levels. These expensive upgrades should have a significant impact on water quality in upper Narragansett Bay, but additional work is needed to address stormwater pollution issues. As we implement these considerable nitrogen reductions to the Upper Bay it is critical that we support monitoring initiatives so that we can track changes in the bay to better evaluate management actions as they relate to bay water quality. Tracking dissolved oxygen is particularly important to support management of valuable fisheries.



Fresh Water Quality

Rivers and Streams

There are almost 2,800 miles of rivers and 44,000 acres of lakes in the Narragansett Bay region. These fresh waters are a critical resource, providing habitat for fish and wildlife, exceptional opportunities for recreational boating, fishing and swimming and drinking water for almost two million people.

In future years, Watershed Counts will report on the quality of all fresh waters in the Narragansett Bay region including lakes and reservoirs. This year, we started with 4 watersheds – the Blackstone, Taunton, Woonasquatucket and Wood-Pawcatuck and looked at the water quality of rivers and streams. The evaluation was based on the Rhode Island, Massachusetts and Connecticut state water quality assessments[7], and we looked in particular at the suitability of the water as fish and wildlife habitat, a place to swim and boat, and whether it is safe to eat fish that live in the water.

In general, water quality is in the best shape in the upper, headwater regions of the watersheds. Since the health of the major rivers is strongly affected by the health of the streams that feed into them, this is good news. But it is also a cautionary tale. Development pressures can be high in the very areas where the high quality tributary streams flow. Maintaining undeveloped buffer land adjacent to streams and wetlands to filter runoff from roads and lawns, placing road crossings and culverts so flow and the movement of fish and other river animals is not restricted, and minimizing impacts to wetland areas are some actions that we are taking to protect these headwater streams.

2012

Fresh Water Quality – Rivers and Streams



Status and Trends: Water quality is acceptable in only 12 – 43 percent of the river miles assessed. Between 10 and 34 percent of the river miles are not assessed for aquatic life and recreational uses. Almost no river miles are assessed for fish consumption



Management: Investments in wastewater treatment upgrades has resulted in improvements to water quality, particularly in RI treatment plants. Treatment upgrades are slower in the MA portion of the watershed. Stormwater runoff is a major source of pollution to all the freshwater. Both RI and MA have programs in place to address stormwater pollution, but stormwater discharges continue to pollute large segments of the watershed.

[7] Rhode Island 2010 Integrated Water Quality Monitoring and Assessment Report, MassDEP 2010 Integrated List of Waters (305(b)/303(d)), 2010 State of Connecticut Integrated Water Quality Report

Narragansett Bay was the birthplace of the industrial revolution. And while we are proud of our industrial history, industrialization was damaging to the region's rivers. Legacy pollution from Narragansett Bay's industrial past continues to affect water quality, particularly in the Woonasquatucket and Blackstone Rivers. Even in the relatively pristine Wood-Pawcatuck watershed, mill discharges impact water quality in localized areas. Controlling point source discharges is an on-going priority for all the rivers.

Rivers throughout the region provide exceptional recreational opportunities for canoeing and kayaking. The Wood-Pawcatuck and Taunton are regionally renowned for their paddling opportunities. In the urban areas, the rivers do not consistently meet standards for boating and swimming. However, local watershed groups encourage safe enjoyment of the rivers. In general, it is best to avoid contact with urban waters during rainstorms. Raw sewage is discharged through the combined sewer overflows and runoff from urban areas contains high levels of bacteria from animal waste. However, three days after a storm, water quality improves significantly. Paddling, biking, walking and enjoyment of the natural beauty of flowing water are there to be enjoyed.

Is it safe to eat the fish? This question continues to puzzle us. Fish consumption testing has been done in the Connecticut portion of the Pawcatuck Watershed. Fish have been determined safe to eat in all the streams tested. While no fish consumption testing has been done in the Rhode Island portion of the watershed, it should be noted that the RIDEM Division of Fish and Wildlife stocks many of the rivers and streams with hatchery raised trout. The intention is that these fish will be consumed. For most of the remaining river miles, there is no data to determine whether the fish are safe to eat. And although the Blackstone has the most information, only about a quarter of the river is studied for fish consumption.

How was water quality assessed?: Watershed Counts based its water quality analysis on the Rhode Island, Massachusetts and Connecticut 2010 state water quality assessments. Under the Federal Clean Water Act, states are required to adopt water quality standards for their surface waters. These standards define the goals for a waterbody by designating its uses and setting criteria to protect those uses. They then look at water quality through a series of lenses, evaluating specific water quality parameters to decide whether the water is safe for swimming and boating (the recreation use), whether water quality will allow fish and other aquatic animals to live and thrive (the aquatic life use), whether it is safe to eat fish caught from the water (fish consumption) and whether the water is safe to drink (drinking water use). In keeping with the states' 2010 water quality assessment determinations, Watershed Counts partners decided to visually present the information by ranking water quality as acceptable (blue), partially acceptable (yellow) and unacceptable (red) based on a combined evaluation of three uses – aquatic life, recreation and fish consumption for each river. River segments that were not assessed (no or insufficient data) are colored gray.

Woonasquatucket River Watershed: The lower Woonasquatucket River has an industrial history and south of the Georgiaville Pond in Smithfield the river is unsuitable for all uses including aquatic habitat, swimming and eating fish. South of the Smithfield line, the Woonasquatucket has a catch and release advisory issued by the Rhode Island Department of Health. This is one of the few places in Rhode Island with a specific fish consumption advisory. Although this river segment shows unacceptable water quality, it still provides habitat for wildlife and recreational opportunities. During rainstorms, raw

sewage flows directly into the Woonasquatucket through the combined sewer overflows and people should not spend time in the river for any reason. But three days after a storm, the water quality improves significantly. The Woonasquatucket River Watershed Council encourages paddling on the river, catch and release fishing as well as biking and walking along the river's shore. It is not unusual to see a variety of birds, fish and turtles while strolling along the river.

North and west of Georgiaville Pond most of the upper watershed in Smithfield, North Smithfield and Glocester is swimmable in almost all areas that have been assessed. The areas that have not been assessed are also likely to be acceptable for swimming and aquatic life as they are in more sparsely developed areas with few polluting inputs. With the exception of Latham and Whipple Brooks in Smithfield, the mainstem Woonasquatucket and its feeder streams support aquatic life and/or swimming. Latham Brook has some elevated lead levels causing it to show unacceptable water quality.

Restoration activities along lower Woonasquatucket have provided fish passage through the first five dams on the river and the river is supporting a healthy herring population. The goal is to have 40,000 adult herring breeding in the lower Woonasquatucket in the next 15 years.

For the most part, the small tributaries to the Woonasquatucket have excellent water quality. It is important to protect these steams to prevent further degredation of the Woonasquatucket system.

Wood-Pawcatucket River Watershed: The Wood-Pawcatuck Watershed encompasses a 300 square mile area of land in southern RI and southeastern CT. The watershed covers about 25% of RI's landmass. Its seven major drainage basins include the Queen, Wood, Chickasheen, Chipuxet, Shunock, Green Falls, and Pawcatuck Rivers, and their tributaries. It is one of the few remaining relatively pristine natural areas along the northeast corridor between New York and Boston. The Nature Conservancy has identified the borderlands between RI and CT as containing the last large forested track south of Boston. The Wood-Pawcatuck Watershed contains the vast majority of the state's threatened, endangered, or species of concern. The Wood River was identified in a National Parks Service study as having the highest biodiversity of any river in New England. Despite its proximity to major metropolitan areas, the watershed remains 80% forested, which helps maintain the excellent habitat quality.

The Wood-Pawcatuck watershed offers unparalleled recreational opportunities. It contains 57 canoeable river miles; numerous streams in pristine forest for fishing native brook trout and stocked brown and rainbow trout; and five state management areas for hiking, biking, hunting, birding and natures studies. Congress is currently considering a bill to direct the National Parks Service study the Wood-Pawcatuck Watershed for inclusion in the Wild and Scenic Rivers System.

The Shannock portion of the Pawcatuck River is currently undergoing fish passage projects, paid for in part by Stimulus Funds. One dam has been removed in lower Shannock; a fish ladder and eel-way has been completed around the iconic Horseshoe Dam; and a rock ramp is proposed to be constructed at Kenyon Industries this summer. Once completed it is anticipated that herring and shad will have access to good quality spawning grounds in the upper Pawcatuck. All of these projects take into account the needs of native residential river fish because any structures will be able to pass brook trout as well. More projects are being planned for the lower Pawcatuck.

Water quality is acceptable or partially acceptable throughout most of the watershed. Areas of the most concern are sections of the rivers below working industrial sites that have RIPDES permits. These include sections on the Pawcatuck River below Kenyon and Bradford, and the Ashaway River. Canochet Brook may have influences from inadequate septic systems and former mill activities and the Chickasheen has agricultural influences. The lower Pawcatuck is in a more heavily urbanized area of the watershed and has problems with road runoff, inadequate septic systems, and agricultural input. There is one section just below the CT border where it is not unusual to see cows in the river.

High bacteria counts are responsible for many of the river sections deemed partially acceptable. This may be largely due natural occurrences from wildlife. These sections still provide excellent boating and fishing opportunities, but swimming is not advisable. Road runoff and homes are thought to impact those sections with unacceptable habitat quality.

Blackstone River Watershed: Thirty-four percent of the river miles in the Blackstone River Watershed are unassessed. But many of these smaller tributaries are being sampled by the Blackstone River Coalition, examining the impacts of stormwater runoff and nutrients on river water quality. Much of this information is not used by the states in their water quality assessments so it is not reflected on the map.

Over forty percent of the river miles are unacceptable for aquatic life. This includes most of the headwater tributaries as well as the mainstem and the larger tributaries. Several of the smaller streams in Glocester, Burrillville, Cumberland and North Smithfield have acceptable water quality for aquatic life. It is likely that many of the other small streams in these areas which have not been assessed have equally good water quality.

The mainstem Blackstone in Massachusetts and Rhode Island has unacceptable water quality for recreation. But like the Woonasquatucket River, the river provides excellent paddling opportunities that can be safely enjoyed by not paddling immediately after a rain storm. In the upper watershed, some tributaries in Cumberland, North Smithfiled, Glocester and Burrillville have water quality that is acceptable for recreation. It is likely that many of the other small streams in these areas which have not been assessed also have acceptable water quality.

Unlike most rivers in Rhode Island, sections of Blackstone watershed have been monitored for fish consumption. The red triangles on the map show where water quality is unacceptable for fish consumption. In Masssachusetts there is a statewide Department of Health advisory for pregnant women, women who may become pregnant, nursing mothers and children under 12, which advises against eating any fish caught in rivers, streams, lakes and ponds in Massachusetts due to elevated concentrations of mercury. Specific monitoring on the Blackstone has resulted in advisories with specific information about species and hazards[8].

Taunton River Watershed: The Taunton River flows freely without dams for forty miles in southeastern Massachusetts through long stretches of forested banks, as well as through urban areas. In March of 2009 the United States Congress added the Taunton River to the National Wild and Scenic Rivers System, acknowledging its “outstandingly remarkable” values, including fisheries, scenery, recreation,

[8] http://www.mass.gov/eohhs/docs/dph/environmental/exposure/fish-consumption-advisory-list.pdf.

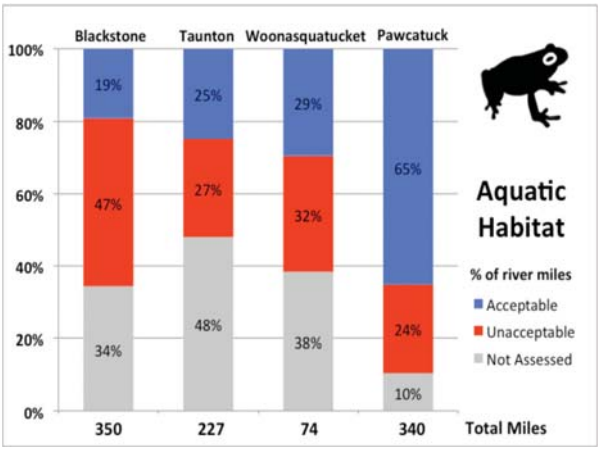
history and ecology and biodiversity, and guaranteeing that the river will be preserved in free-flowing condition in perpetuity. The Taunton River watershed encompasses a large region: 562 square miles of southeastern Massachusetts are drained by the Taunton River mainstem, nine major tributaries and many smaller streams. The watershed includes 43 cities and towns -- a mix of densely developed areas, suburban and rural communities, farmlands and undeveloped forests and wetlands that provide habitat for 77 species listed under the Massachusetts Endangered Species Act. The Taunton River and its tributaries are home to 45 species of fish; the Taunton and Nemasket Rivers together support the largest alewife run in Massachusetts.

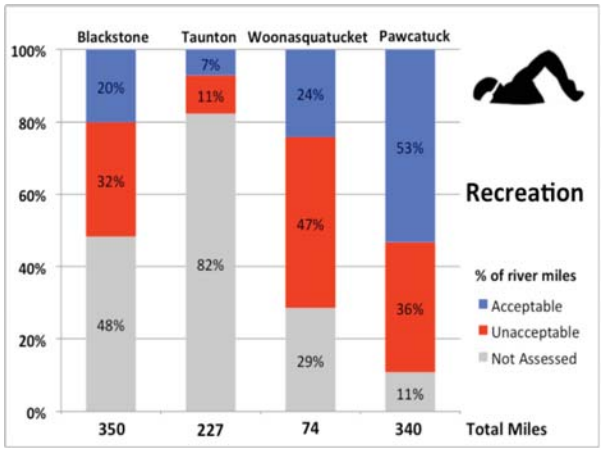
Water quality in 37% of stream miles in the watershed has not been assessed by the Massachusetts Department of Environmental Protection (DEP). DEP's "2010 Massachusetts Integrated Waters List" uses data from testing conducted in 2001, some of which may not accurately reflect current conditions. Nonetheless, this information reveals a patchwork of stream segments across the watershed where water quality supports recreational use and/or fish and aquatic life in some areas and fails to support one or both of those uses in others. Examples of segments that fully support both uses include the Cedar Swamp River and upper reaches of the Assonet River in Lakeville and Freetown and the Satucket River in East Bridgewater. The upper reaches of the Nemasket River in Lakeville and Middleborough meet the standards for fish and aquatic life.

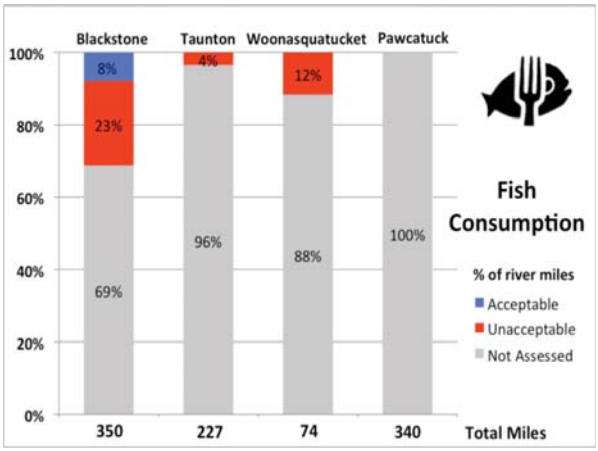
As noted above, some segments do not meet the standards for recreational use and/or fish and aquatic habitat. Because of low levels of dissolved oxygen, the lower portion of the Taunton River, from the Berkley Bridge to the Braga Bridge in Fall River is considered "not acceptable" for aquatic life. Trout Brook, Salisbury Brook, the entire Salisbury Plain and Matfield Rivers in the Brockton/Bridgewater area do not meet the standards for either recreation or aquatic life. Contributing causes in both of these areas may be stormwater runoff from large areas of impervious surface and/or discharges from wastewater treatment facilities. The upper reaches of the Rumford and Wading Rivers in Mansfield do not support aquatic life, possibly because of low levels of streamflow.

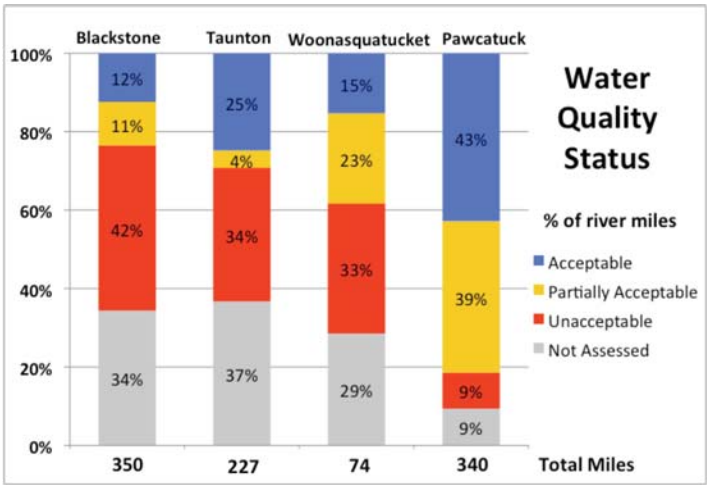
Fresh Water Quality (Rivers & Streams) Data for the Narragansett Bay Region

Watershed Counts 2012 focused on the rivers and streams of four watersheds – Blackstone, Taunton, Woonasquatucket and Pawcatuck. Detailed assessments of all RI waters can be found in the Final 2010 303(d) List of Impaired Waters at www.dem.ri.gov/pubs/303d/303d10.pdf. Sampling data for many RI lakes, rivers and estuarine waters can be found at URI Watershed Watch at http://www.uri.edu/ce/wq/ww/. Detailed assessments of all MA waters can be found in the Final Massachusetts Year 2010 Integrated List of Waters at http://www.mass.gov/dep/water/resources/10list6.pdf.
Detailed assessments of all CT waters can be found in the State of Connecticut Integrated Water Quality Report at http://www.ct.gov/dep/lib/dep/water/water_quality_management/305b/ctiwqr10final.pdf.
Assessments are reported by stream reach and every stream reach has a unique identifier. The following charts and maps are based on these detailed assessments for aquatic life, recreation and fish consumption.



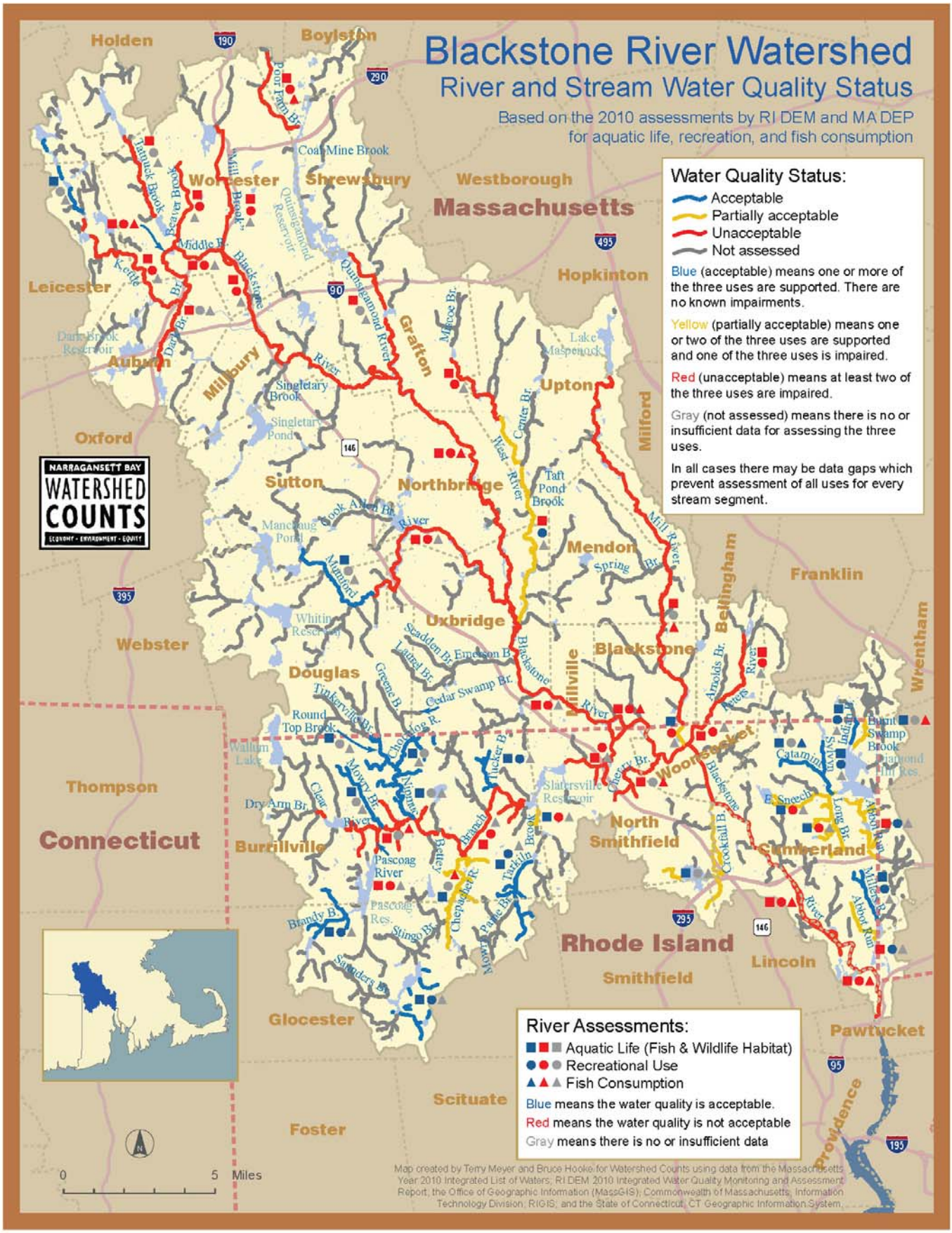


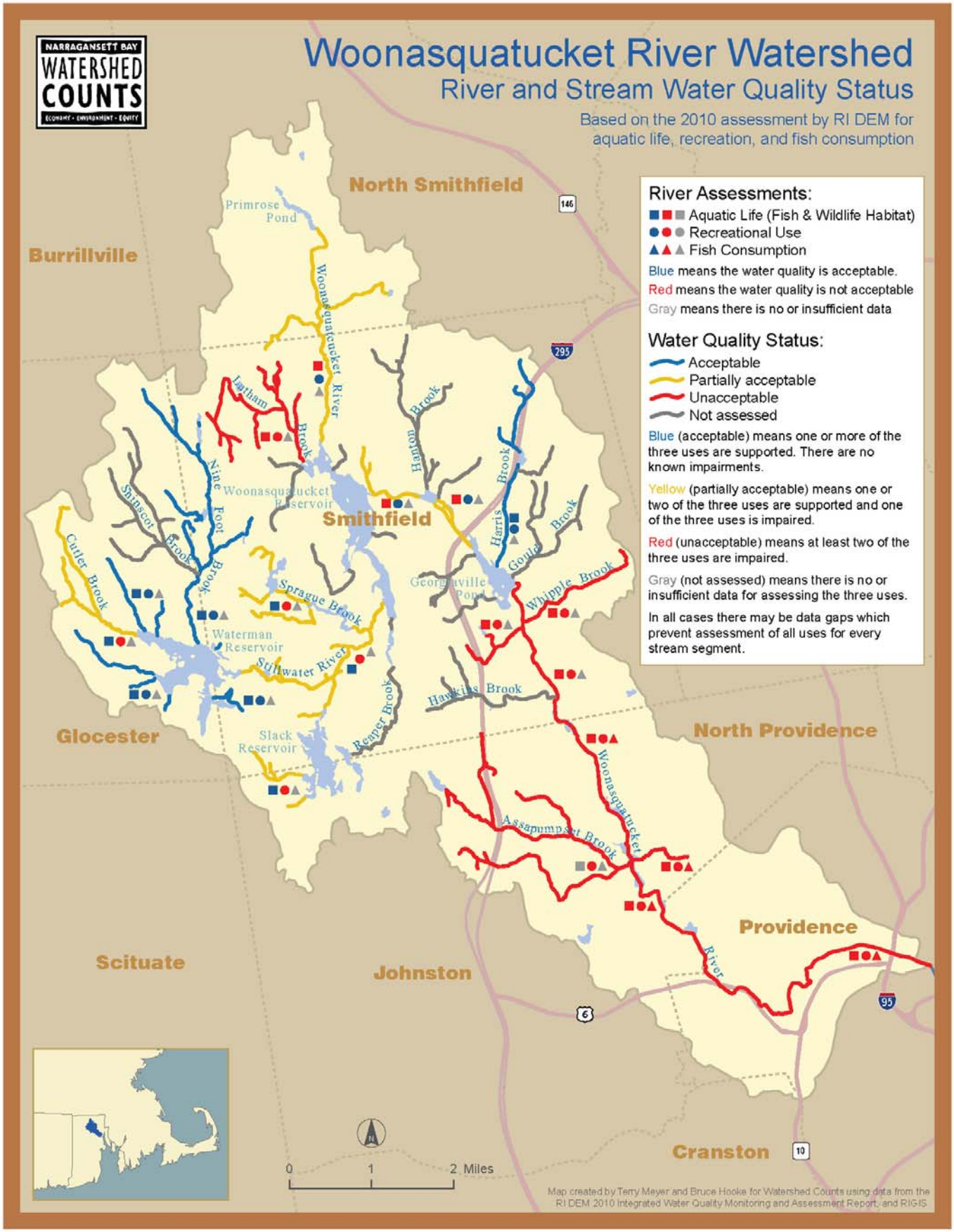


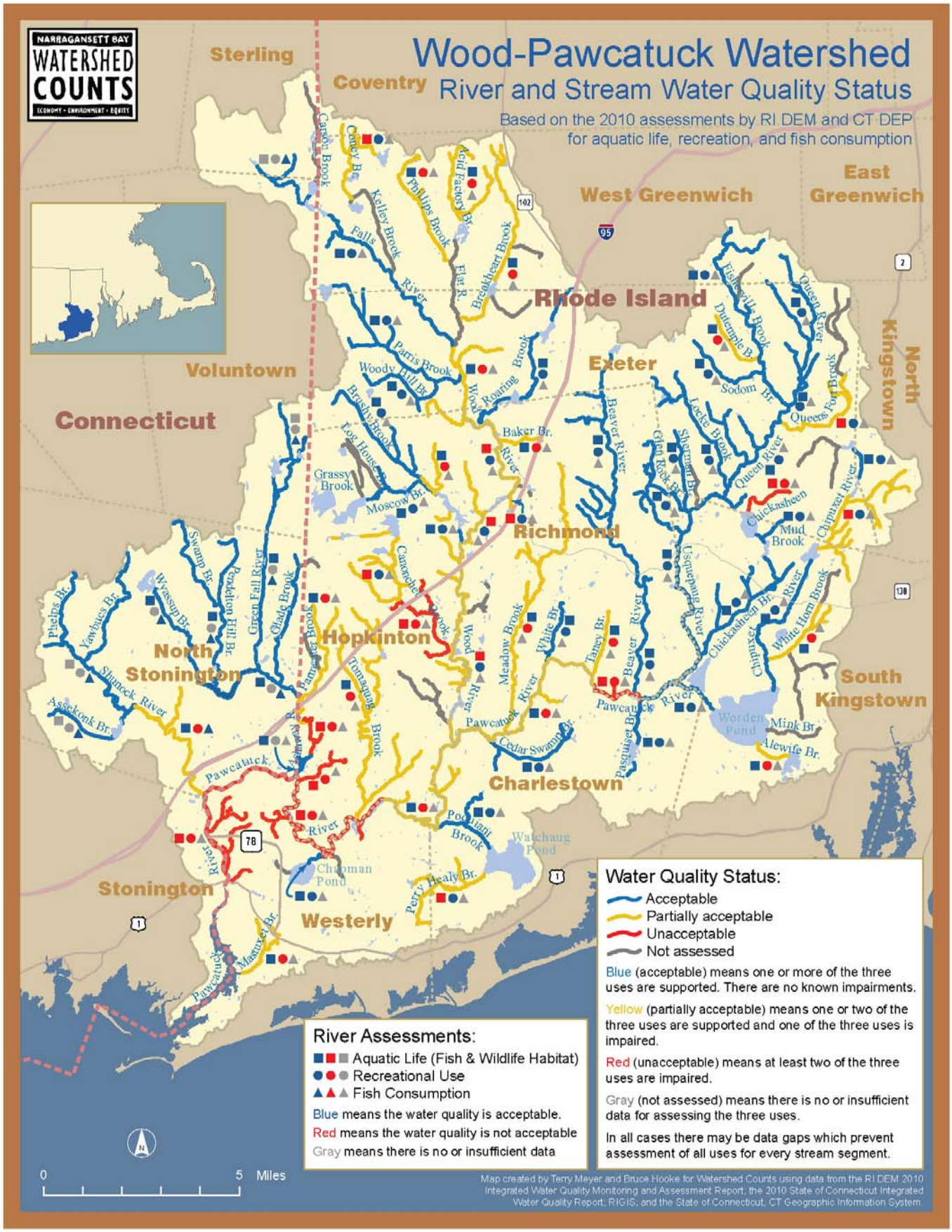


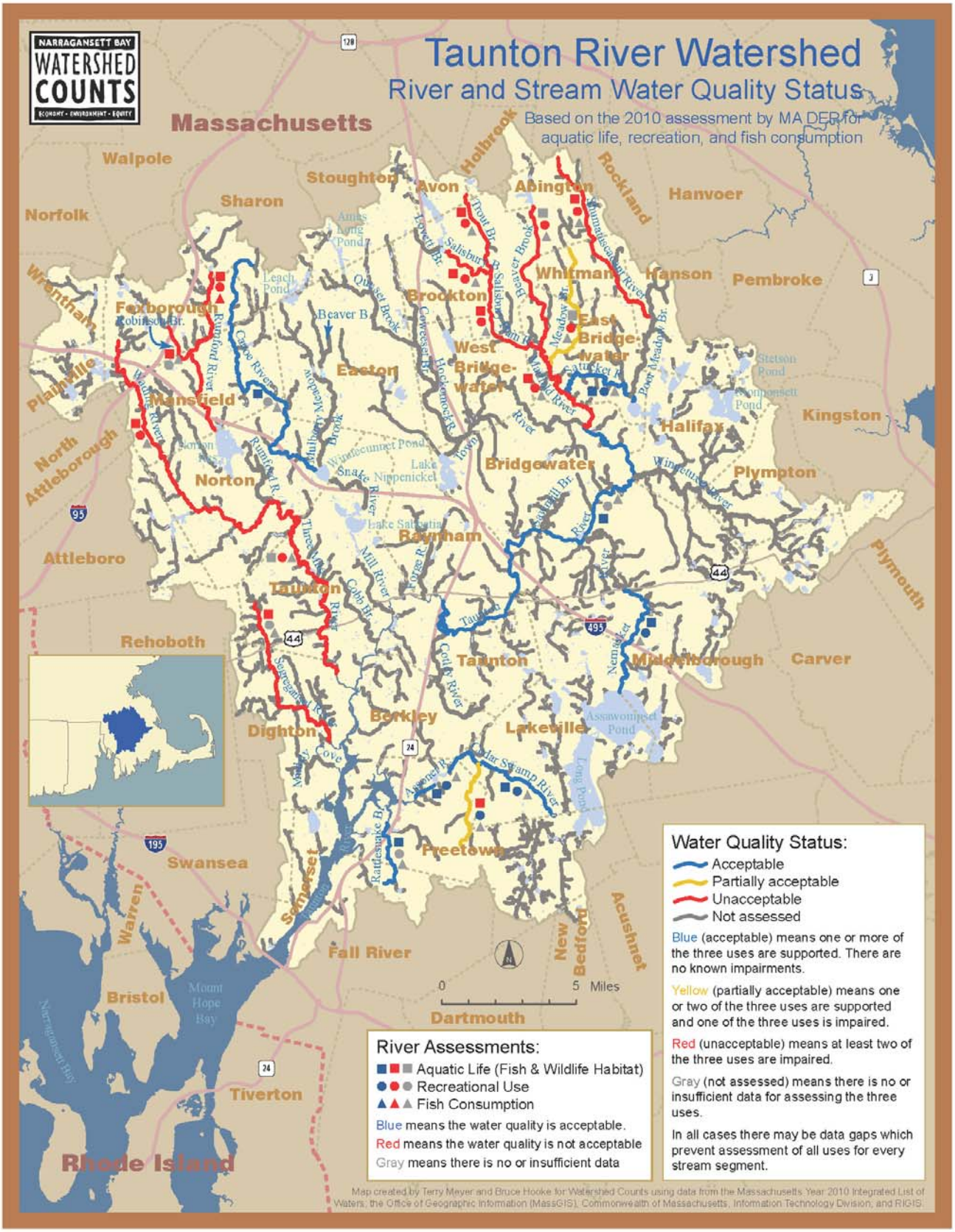
Acceptable = one or more of the three uses are supported. There are no known impairments.
Partially Acceptable means one or two of the three uses are supported and one of the three uses is impaired.
Unacceptable means at least two of the three uses are impaired.
Not Assessed means there is no or insufficient data for assessing the three uses.

In all cases there may be data gaps that prevent assessment of all uses for every stream segment.


Blackstone River Watershed
River and Stream Water Quality Status
Based on the 2010 assessments by RI DEM and MA DEP
for aquatic life, recreation, and fish consumption
Water Quality Status:
Acceptable
Partially acceptable
Unacceptable
Not assessed
Blue (acceptable) means one or more of the three uses are supported. There are no known impairments.
Yellow (partially acceptable) means one or two of the three uses are supported and one of the three uses is impaired.
Red (unacceptable) means at least two of the three uses are impaired.
Gray (not assessed) means there is no or insufficient data for assessing the three uses.
In all cases there may be data gaps which prevent assessment of all uses for every stream segment.
River Assessments:
Aquatic Life (Fish & Wildlife Habitat)
Recreational Use
Fish Consumption
Blue means the water quality is acceptable.
Red means the water quality is not acceptable
Gray means there is no or insufficient data
NARRAGANSETT BAY WATERSHED COUNTS
ECONOMY · ENVIRONMENT · EQUITY
Holden
Boylston
Worcester
Shrewsbury
Westborough
Massachusetts
Hopkinton
Leicester
Auburn
Millbury
Grafton
Upton
Milford
Oxford
Sutton
Northbridge
Mendon
Franklin
Bellingham
Wrentham
Webster
Uxbridge
Blackstone
Douglas
Thompson
Connecticut
Burrillville
North Smithfield
Cumberland
Rhode Island
Lincoln
Smithfield
Pawtucket
Glocester
Scituate
Foster
Providence
Coal Mine Brook
Quinsigamond River
Blackstone River
Singletary Brook
Singletary Pond
Taft Pond Brook
Mill River
Spring Br.
Emerson Br.
Cedar Swamp Br.
Round Top Brook
Tinkerville Br.
Dry Arm Br.
Pascoag River
Pascoag Res.
Slatersville Reservoir
Crookfall Br.
Abbott Run
Miles River
Diamond Hill Res.
0
5
Miles
Map created by Terry Meyer and Bruce Hooke for Watershed Counts using data from the Massachusetts Year 2010 Integrated List of Waters; RI DEM 2010 Integrated Water Quality Monitoring and Assessment Report; the Office of Geographic Information (MassGIS); Commonwealth of Massachusetts, Information Technology Division; RIGIS; and the State of Connecticut, CT Geographic Information System.


NARRAGANSETT BAY WATERSHED COUNTS
ECONOMY · ENVIRONMENT · EQUITY
Woonasquatucket River Watershed
River and Stream Water Quality Status
Based on the 2010 assessment by RI DEM for aquatic life, recreation, and fish consumption
River Assessments:
Aquatic Life (Fish & Wildlife Habitat)
Recreational Use
Fish Consumption
Blue means the water quality is acceptable.
Red means the water quality is not acceptable
Gray means there is no or insufficient data
Water Quality Status:
Acceptable
Partially acceptable
Unacceptable
Not assessed
Blue (acceptable) means one or more of the three uses are supported. There are no known impairments.
Yellow (partially acceptable) means one or two of the three uses are supported and one of the three uses is impaired.
Red (unacceptable) means at least two of the three uses are impaired.
Gray (not assessed) means there is no or insufficient data for assessing the three uses.
In all cases there may be data gaps which prevent assessment of all uses for every stream segment.
North Smithfield
Burrillville
Smithfield
Glocester
Scituate
Johnston
North Providence
Providence
Cranston
Primrose Pond
Woonasquatucket River
Latham Brook
Hanton Brook
Harris Brook
Goulet Brook
Whipple Brook
Nine Foot Brook
Smithfield Brook
Cutler Brook
Woonasquatucket Reservoir
Georgiaville Pond
Sprague Brook
Waterman Reservoir
Stillwater River
Hawkins Brook
Reaper Brook
Slack Reservoir
Assapumpset Brook
Woonasquatucket River
146
295
6
95
10
0
1
2 Miles
Map created by Terry Meyer and Bruce Hooke for Watershed Counts using data from the RI DEM 2010 Integrated Water Quality Monitoring and Assessment Report, and RIGIS


NARRAGANSETT BAY WATERSHED COUNTS
ECONOMY • ENVIRONMENT • EQUITY
Wood-Pawcatuck Watershed
River and Stream Water Quality Status
Based on the 2010 assessments by RI DEM and CT DEP
for aquatic life, recreation, and fish consumption
Sterling
Coventry
West Greenwich
East Greenwich
Rhode Island
Voluntown
Connecticut
Exeter
North Kingstown
Richmond
Hopkinton
North Stonington
South Kingstown
Charlestown
Stonington
Westerly
Water Quality Status:
Acceptable
Partially acceptable
Unacceptable
Not assessed
Blue (acceptable) means one or more of the three uses are supported. There are no known impairments.
Yellow (partially acceptable) means one or two of the three uses are supported and one of the three uses is impaired.
Red (unacceptable) means at least two of the three uses are impaired.
Gray (not assessed) means there is no or insufficient data for assessing the three uses.
In all cases there may be data gaps which prevent assessment of all uses for every stream segment.
River Assessments:
Aquatic Life (Fish & Wildlife Habitat)
Recreational Use
Fish Consumption
Blue means the water quality is acceptable.
Red means the water quality is not acceptable
Gray means there is no or insufficient data
0
5 Miles
Map created by Terry Meyer and Bruce Hooke for Watershed Counts using data from the RI DEM 2010 Integrated Water Quality Monitoring and Assessment Report, the 2010 State of Connecticut Integrated Water Quality Report, RIGIS, and the State of Connecticut, CT Geographic Information System.


NARRAGANSETT BAY WATERSHED COUNTS
ECONOMY · ENVIRONMENT · EQUITY
Taunton River Watershed
River and Stream Water Quality Status
Based on the 2010 assessment by MA DEP for aquatic life, recreation, and fish consumption
Massachusetts
Walpole
Stoughton
Avon
Abington
Rockland
Hanover
Norfolk
Sharon
Holbrook
Whitman
Hanson
Pembroke
Wrentham
Foxborough
Brockton
East Bridgewater
West Bridgewater
Easton
Plainville
Mansfield
Halifax
Kingston
North Attleborough
Norton
Bridgewater
Plympton
Raynham
Attleboro
Taunton
Plymouth
Rehoboth
Middleborough
Carver
Berkley
Dighton
Lakeville
Swansea
Freetown
Somerset
Warren
Fall River
New Bedford
Acushnet
Bristol
Mount Hope Bay
Dartmouth
Tiverton
Rhode Island
0
5 Miles
Water Quality Status:
Acceptable
Partially acceptable
Unacceptable
Not assessed
Blue (acceptable) means one or more of the three uses are supported. There are no known impairments.
Yellow (partially acceptable) means one or two of the three uses are supported and one of the three uses is impaired.
Red (unacceptable) means at least two of the three uses are impaired.
Gray (not assessed) means there is no or insufficient data for assessing the three uses.
In all cases there may be data gaps which prevent assessment of all uses for every stream segment.
River Assessments:
Aquatic Life (Fish & Wildlife Habitat)
Recreational Use
Fish Consumption
Blue means the water quality is acceptable.
Red means the water quality is not acceptable
Gray means there is no or insufficient data
Map created by Terry Meyer and Bruce Hooke for Watershed Counts using data from the Massachusetts Year 2010 Integrated List of Waters, the Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division, and RIGIS.



Open Space

Land use, transportation and development patterns influence watershed health and both marine and freshwater water quality. Urban development creates impervious surfaces[9] that impair water quality through increased stormwater runoff. Protected open space lands provide natural streamflow and groundwater recharge areas, and buffers that filter stormwater.

Development in the Narragansett Bay region is consuming land at a rate several times greater than population growth. Rhode Island's most recent land use plan, Land Use 2025[10], points out that about a third of the land available for development in 1995 is now gone. In some rapidly developing communities, building activity has consumed as much as 75 percent of vacant land. These trends are also occurring in the Massachusetts portion of the watershed.

Citizens in Rhode Island and Massachusetts have made a significant commitment to preserving open spaces though statewide and local bond referenda and by supporting the work of local land trusts.

The Narragansett Bay Watershed encompasses 1,754 square miles with 730 square miles in Rhode Island and 1,024 square miles in Massachusetts. In Rhode Island, 234 square miles are protected or conserved (22 percent of the total RI area) and 534 square miles are undeveloped and unprotected (50 percent of the total RI area). The remaining 28 percent of the Rhode Island watershed is developed.

2012 **Open Space**



Status and Trends: RI has made significant investments in land conservation. But land use continues to sprawl.



Management: There is on-going public support for protecting land for water quality protection, farm protection, wildlife habitat and recreation. Stewardship of protected land is a challenge, but it is receiving increasing attention. Ensuring permanent protection of preserved lands is also a priority.

[9] Impervious cover is one of the Watershed Counts metrics. The watershed as a whole is 14 % impervious. Watersheds show water quality degradation when impervious cover is more than 10%.
[10] Land Use 2025, RI Department of Administration Statewide Planning Program. State Guide Plan element 121, Report 109 (http://www.planning.ri.gov/landuse/121/landuse2025.pdf)

Open space provides a variety of benefits:
Water quality: Development and the accompanying increases in impervious cover have a significant impact on water quality. Lands immediately adjacent to waterways are protected by state regulations as coastal and riparian wetland buffers[11]. Extending these buffer areas with protected, undeveloped land provides additional water quality protection.

Flood mitigation: The floods of March 2010 crippled the Rhode Island economy, displacing over 6,200 people, forcing at least 222 companies to close and causing damage to public infrastructure including roads and sewage treatment plants. The economic loss to the state was enormous, generating over $43 million in RI national flood insurance claims[12]. Undeveloped floodplains reduce the risk of flood damage to other areas of the watershed.

Protecting working farms: Since the 1940s, Rhode Island has lost more than 80% of its farmland. Today less than 7 percent of Rhode Island, about 40,000 acres, is in active agriculture. Only a quarter of the farmland is protected. Preserving working farms contributes to the local and state economies, community character, quality of life, local food production and food security.

Protecting recreational areas: Protected open spaces provide urban, suburban and rural recreational, cultural and historical areas that improve Rhode Islanders' health and quality of life.

Throughout the Narragansett Bay Region, communities enjoy and value open space lands that are widely thought to be protected but are not really permanently protected from development. These land holdings fall into several categories:

- Buffer lands around drinking water supplies. For example, the land surrounding the Scituate Reservoir is owned by the Providence Water Supply Board for water quality protection. However, the land is not protected by conservation easements that will ensure that it is protected from future sale or development.
- Institutional land holdings. Universities, churches, camps, scouts and country clubs own large tracts of undeveloped land that are not protected from development. Some familiar examples include URI's Alton Jones campus, Brown's Mount Hope property in Bristol, Catholic Monasteries and retreats and Camp Yawgoo in Hope Valley and Camp Hoffman in South Kingstown.
- Municipal-owned lands. Examples include The Glen in Portsmouth, Cumberland Monastery in Cumberland and Neutaconkanut Hill in Providence.

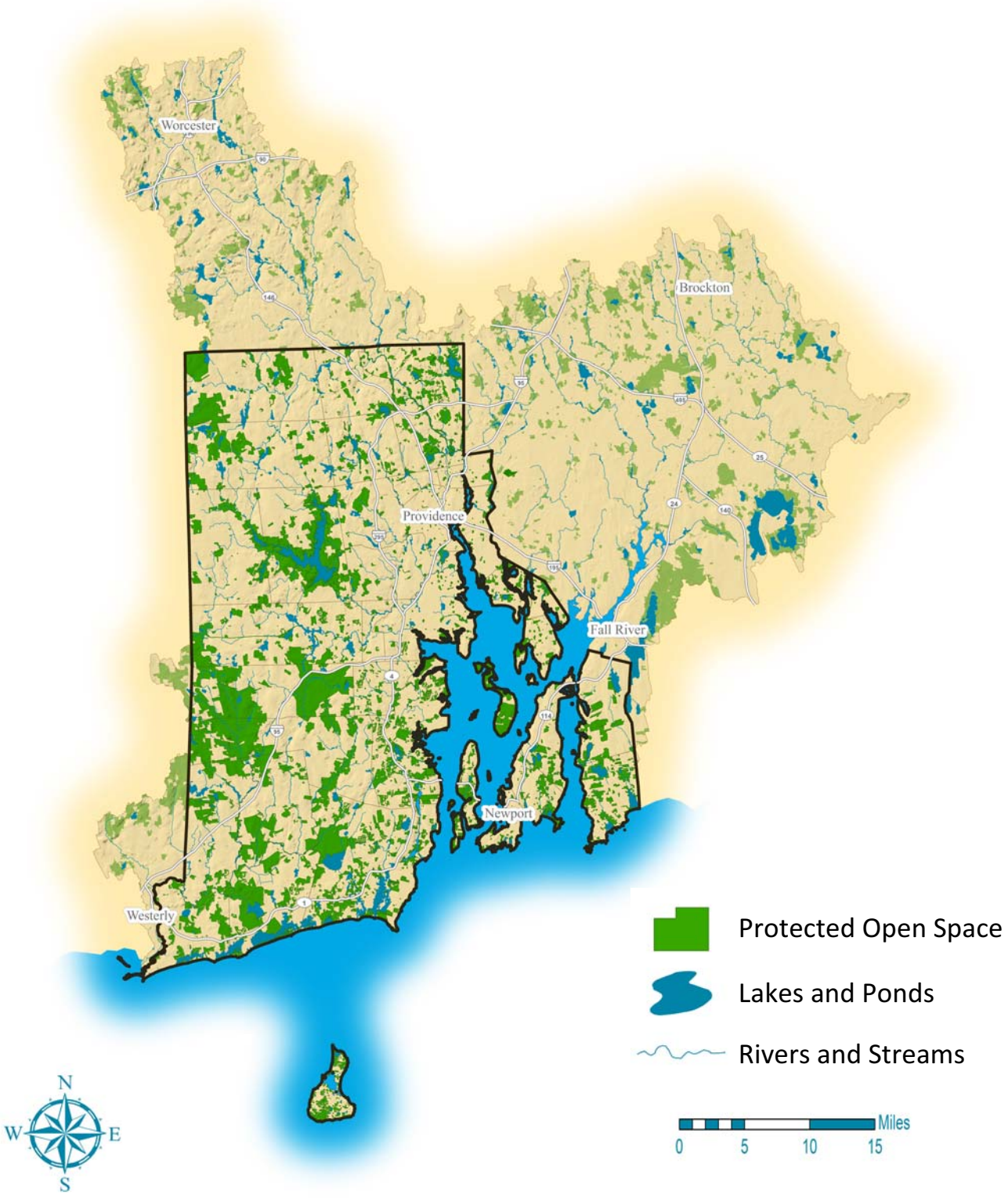
During 2013, Watershed Counts partners will develop a list of at-risk properties and work together to publicize the importance of permanent protection strategies for these special places.

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[11] RI DEM defines perimeter wetlands as land within 50 feet of the edge of any bog, marsh, swamp, or pond. A River Bank is the area of land within two hundred feet (200') of the edge of any flowing body of water having a width of ten feet (10') or more, and that area of land within one hundred feet (100') of the edge of any flowing body of water having a width of less than ten feet (10') during normal flow (http://www.dem.ri.gov/pubs/regs/regs/water/wetlnd98.pdf). CRMC coastal buffers range in size based on the type of development and the classification of the adjacent coastal water (http://www.crmc.ri.gov/regulations/RICRMP.pdf).

[12] Climate Change and Rhode Island's Coasts, 2012 (page 13). http://seagrant.gso.uri.edu/z_downloads/coast/climate_change_summ_web.pdf.

Protected Open Space Data for the Narragansett Bay Region



Map by Kevin Ruddock, The Nature Conservancy

Data Sources:

RIGIS, 2011. State Conservation Lands *and* Municipal & Non-Governmental Organization Conservation Lands. Both available at www.edc.uri.edu/rigis/data/

The Nature Conservancy, 2010. Secured Lands 2009 Northeast States, Public Version http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/rhodeisland/index.htm.

Natural Resource Economics

Narragansett Bay plays a central role in the quality of life Rhode Islanders enjoy. And the citizens of the state have made significant investments in clean water infrastructure including drinking water storage and treatment, wastewater collection and treatment systems.

The biggest recent investment is the combined sewer overflow tunnel, or CSO tunnel, that captures untreated sewage from the greater Providence metro area that, until recently, flowed into the upper bay every time it rained. The tunnel stores the sewage/rainfall mixture and sends it to the Narragansett Bay Commission wastewater treatment plant at Fields Point where it is first treated and later released into Narragansett Bay. Dealing with the 66 combined sewer overflows in the metropolitan Providence and Blackstone Valley areas is a huge undertaking. Phase 1 of the CSO project captures sewage from 12 of the 66 combined sewage overflows in the Narragansett Bay Commission service area. It went on-line in 2008 and cost $359 million.

This may be a large investment, but it has made a real difference in the quality of the upper bay. Since the tunnel went on-line, 2.9 billion gallons of untreated sewage mixed with stormwater has been collected and treated. At three upper bay beaches affected by the CSO project, there was a 44% decrease in closure events in 2010 compared to 2006 – an 82% decrease in closure days.

2012

Natural Resource Economics



Status and Trends: The state's economy benefits from a strong travel and tourism sector, and Rhode Islanders benefit from the many outdoor recreational activities supported by the region's natural assets including beaches, rivers and parks. A significant investment has been made in wastewater infrastructure and open space protection.



Management: Better data are needed to accurately track investments in environmental improvements and the resulting economic and social paybacks.

Natural Resource Economics Data – Beach Values

Beaches are not just a fun part of a summer day in Rhode Island. They are a significant part of the local and state economy. Here are few telling statistics:

- In total, there are over 20 million "beach visits" in Rhode Island per year (defined as one person visiting a beach for any part of a day); and over 15 millions salt water swimming days per year.[13]
- The total social value of these beach days is estimated at over $155 million per year.[14]
- On average, about 1.5 times as many people visit beaches on a sunny day, as compared to a cloudy or partly cloudy day.[15]
- 70% of RI households surveyed stated that they have a need for saltwater beaches.[16]
- 64% of RI households surveyed stated that they had visited beaches over the past year.[17]
- 37% of individuals surveyed rated visiting beaches as 1st or 2nd most needed water-based activities in Rhode Island, and 27% rated salt-water swimming as the 1st or 2nd most needed water-based activity.[18]

The Town of Narragansett can be used to estimate the value of thriving beaches to a Rhode Island community – on a single perfect summer beach day (which may occur 8-10 times per year[19]):

- Around 7,400 or more people visit Narragansett Town Beach.[20]
- The lots for day-visitors fill with around 465 cars, and the season pass-holder lots are full.[21]
- The cars with daily visitors translate to around 1,000 people,[22] who spend around $49,000 total related to their visit to the beach, including money the town receives in parking fees, and money people spend for food and other things related to a visit to the beach.[23] (this includes only day visitors and does not include people who rent or stay at hotels in town because of the beach)
- The 7,400 visitors to the beach have an estimated total social benefit valued at over $93,000.[24]
- This does not include people who visit the beach after-hours.

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[13] Sources: average estimate from RIDEM Outdoor Recreation Demand Citizen Survey, Conducted by Leisure Vision, Aug-Oct., 2002 and National Survey of Recreation and Environment 2000 (From: http://coastalsocioeconomics.noaa.gov/core/nsre/nsre2000.html#marine, preliminary estimates from versions 1-6: coastal recreation participation, and 2001 participation in marine rec nsre_2).

[14] This refers to the "consumer surplus" or net "willingness to pay" value for a beach day – what a person would be willing to give up beyond what they actually pay for that day at the beach. Sources: Peconic Estuary recreation survey, conducted summer of 1995, at Peconic Estuary LI beaches, using travel cost (revealed preference) method and Kline and Swallow, 1998, based on CV survey (stated preference method) conducted in summer 1995 at Gooseberry Island, near Horseneck Beach, MA (beach with no facilities or services).

[15] Source: calculated using actual attendance and weather data for Sandy Point Beach in Portsmouth for 2010 and 2011.

[16] Source: RIDEM Outdoor Recreation Demand Citizen Survey, Conducted by Leisure Vision, Aug-Oct., 2002.

[17] Source: RIDEM Outdoor Recreation Demand Citizen Survey, Conducted by Leisure Vision, Aug-Oct., 2002.

[18] Source: RIDEM Outdoor Recreation Demand Citizen Survey, Conducted by Leisure Vision, Aug-Oct., 2002.

[19] Source: S. Wright, Narragansett Town Beach Manager, personal communication.

[20] Source: actual beach attendance data for 11 days in August 2011, obtained from S. Wright, Narragansett Town Beach Manager (in personal communication, Mr. Wright indicated that there could be up to 10,000 people on the beach on the most crowded day).

[21] Source: parking data for 2011 season from S. Wright, Narragansett Town Beach Manager.

[22] Source: calculated value using statistical regression of people per car based on actual data for 2010 and 2011 from Sandy Point Beach, Portsmouth, RI (obtained from T. Dunbar, Sandy Pt. Beach Manager).

[23] Source: survey conducted by Ninigret Partners survey in July-August, 2007, commissioned by the RI Economic Monitoring Collaborative (reported in their FY08 Monitoring Report).

[24] This refers to the "consumer surplus" or "willingness to pay" value for a beach day – what a person would be willing to give up beyond what they actually pay for that day at the beach. Source: estimated consumer surplus per day from Peconic Estuary recreational survey - $12.60/person * 7400 people (Opaluch et al. 1999, Johnston et al. 2002).

On an *average* August beach day:

- There are around 5,000 people on the beach.[13]
- There are close to 700 day visitors, who spend around $34,000 in the local area (including parking).[25]
- In total, the social benefits for all visitors are valued at close to $64,000 for this day.[26]

Facts about Easton's Beach:

On a single perfect summer beach day (this may occur around 6 times per year[27]):

- The lot will fill with 850 cars, including day visitors and seasonal pass holders.[28]
- This translates to around 1,800 people, but does not include people who walk or bike or take public transportation to the beach, which is a significant number for Easton's Beach.[29]

Facts about Warwick beaches:

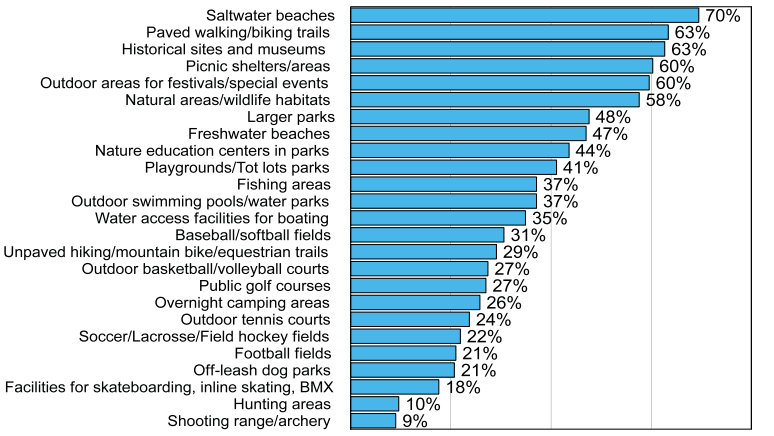
- Oakland Beach and Conimicut Point Beach in Warwick are among the beaches that have frequent closures.[30]
- Around 14,000 people use these beaches each summer.[31]
- Usage at these beaches is way below maximum capacity (5-25%),[32] and therefore many more people [in the urban area] might enjoy these beaches if water quality improves.

And this analysis just looks at the impact of the beach during the summer season! Beaches are important to the RI economy even in the "off" season – people use beach year-round surfing, walking on the beach, or simply enjoying the vista of ocean waves breaking on the shore.

[25] Sources: actual beach attendance and day parking data for 11 days in August 2011, obtained from S. Wright, Narragansett Town Beach Manager; and Ninigret Partners survey referenced in note 23 above.
[26] This refers to the "consumer surplus" or net "willingness to pay" value for a beach day – what a person would be willing to give up beyond what they actually pay for that day at the beach. Source: Peconic survey on recreational values referenced in note 24.
[27] Source: E. Reis, Newport Town Beach Manager, personal communication.
[28] Source: E. Reis, Newport Town Beach Manager, personal communication.
[29] Source: calculated using actual attendance and weather data for Sandy Point Beach in Portsmouth for 2010 and 2011 (obtained from T. Dunbar, Sandy Pt. Beach Manager).
[30] Source: RI DOH beach closure data.
[31] Source: M. Rooney, Warwick Parks and Recreation Department, based on 2011 data.
[32] Source: M. Rooney, Warwick Parks and Recreation Department, based on 2011 data.

Q6. Respondent Households that Have a Need for Various Outdoor Recreational Facilities

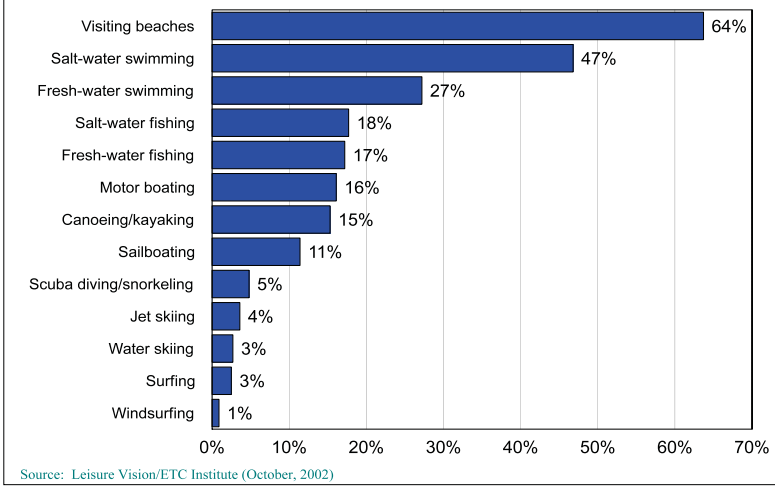
by percentage of respondents



Source: Leisure Vision/ETC Institute (October, 2002)

Q12. Various Water-Based Activities that Respondents Have Participated in Over the Past Year

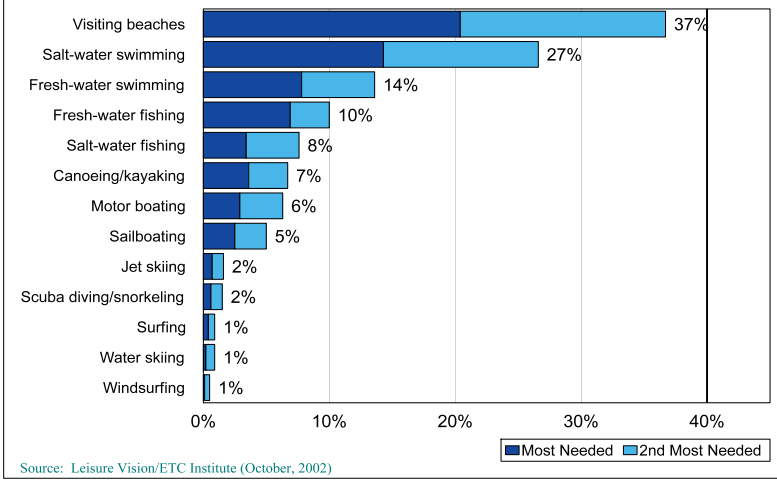
by percentage of individuals in households who will have the next birthday (multiple choices could be made)



Source: Leisure Vision/ETC Institute (October, 2002)

Q13. Water-Based Activities that are Needed Most in Rhode Island

by percentage of individuals in households who will have the next birthday (two choices could be made)



Source: Leisure Vision/ETC Institute (October, 2002)

Source: RIDEM Outdoor Recreation Demand Citizen Survey, Conducted by Leisure Vision, Aug-Oct., 2002 and National Survey of Recreation and Environment 2000 (From: http://coastalsocioeconomics.noaa.gov/core/nsre/nsre2000.html#marine, preliminary estimates from versions 1-6: coastal recreation participation, and 2001 participation in marine rec nsre_2).



Aquatic Invasive Species

Freshwater

When plants or animals are released in areas outside their native range, without their natural predators, they can grow and reproduce out of control, destabilizing the environment and harming native species and human activities. They become "invasive species."

Aquatic invasive plants are a widespread problem in RI freshwater lakes. A 2012 RI DEM report[33] reviewed information on aquatic invasive species in 133 Rhode Island lakes and found that 80 lakes are infested with one or more invasive plant. A total of 13 different species have been detected with variable milfoil and fanwort being the plants most commonly found. Aquatic invasive plants create dense vegetative growth that interferes with the desirable uses of lakes and has been documented by researchers to reduce lakeside property values. The occurrence of aquatic invasive plants in Rhode Island lakes is similar to that documented in neighboring Connecticut and Massachusetts.

The State has an aquatic invasive species management plan developed by CRMC, RIDEM, and federal and private partners and approved in 2007. State, federal, and private partners are implementing some plan elements with federal funds made available through CRMC. Nonetheless, the plan is not fully implemented and Rhode Island continues to struggle with the significant and growing threat of aquatic invasive species to its environmental resources.

2012

Aquatic Invasive Species - Freshwater



Status and Trends: Many invasive species are already here, and only a few of them are being tackled adequately to limit or reverse their damage. Non-native species will continue to make their way to Rhode Island, with the potential for some to become invasive.



Management: Rhode Island needs to be vigilant to catch new invaders early and develop effective long-term management strategies for invaders that are already well established.

[33] RI DEM. 2012. Rhode Island Freshwater Lakes and Ponds: Aquatic Invasive Plants and Water Quality Concerns. A Report to the Governor and Rhode Island General Assembly.
http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/lakes012.pdf

Aquatic Invasive Species – Freshwater Data

In 2012, Watershed Counts examined freshwater invasive species. At a workshop led by the RI Natural History Survey, participants selected from a list of known invaders sixteen species whose status will be monitored regularly as an indicator of how we're doing managing the aquatic invasives problem. These indicator species were further sorted into four categories:

Does not occur, but could: zebra mussel, Chinese mitten crab, hydrilla, European frog-bit

Limited distribution: parrot feather, Eurasian water nymph, rusty crayfish, American water lotus

Moderate distribution: Asiatic clam, water chestnut, European carp, water hyacinth

Wide distribution: fanwort, purple loosestrife, variable milfoil, phragmites

Invasive species are a reality that the state must manage. Management takes many forms:

- **monitoring** allows species to be detected early before they are firmly established;
- **mitigation** helps reduce the damage invaders do to specific resources and helps re-establish the competitive balance between invasive and native species;
- **eradication** is expensive and time consuming and often ineffective.

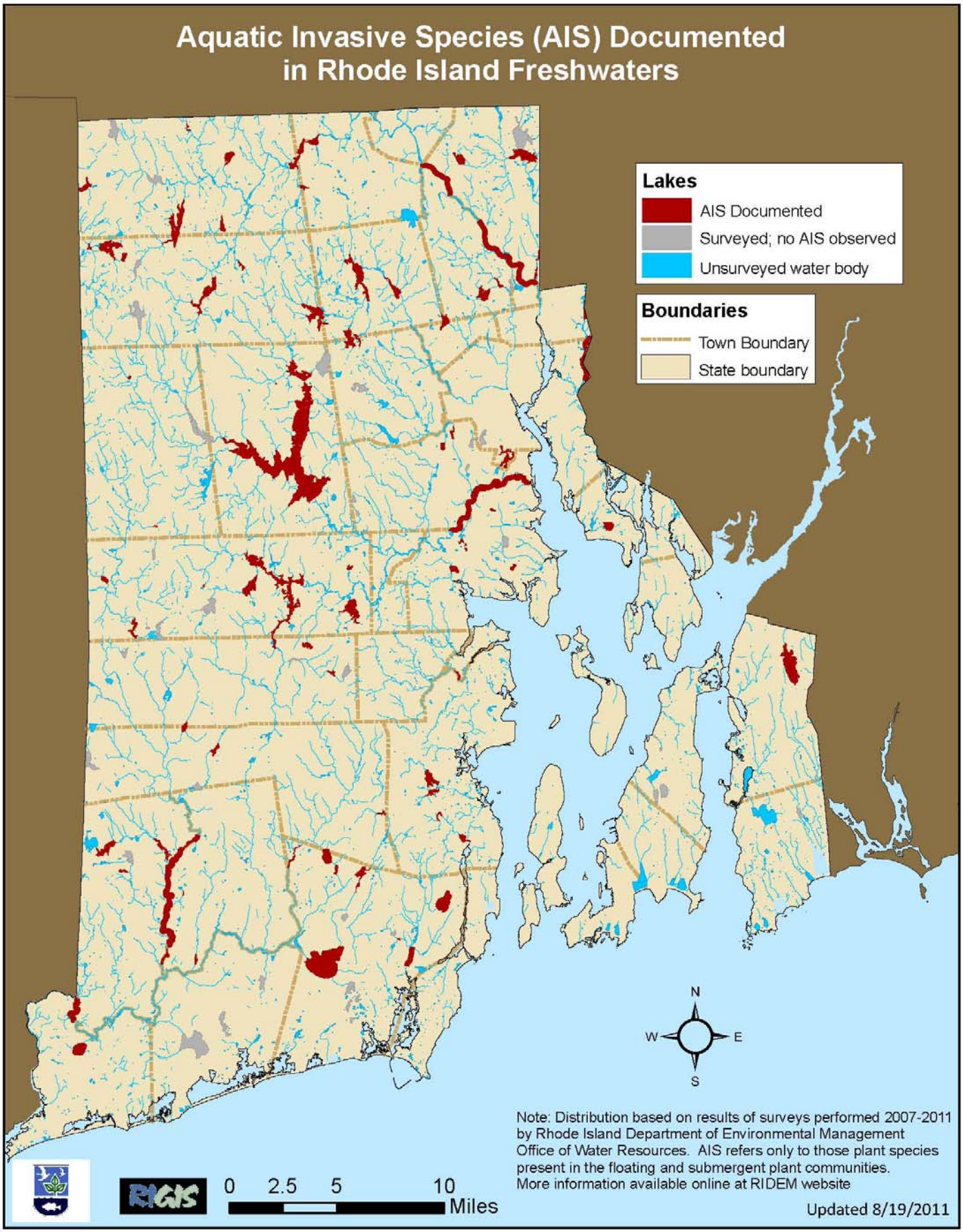
As much as possible, efforts should be made to prevent the introduction of new species, to respond rapidly to new infestations and to apply long-term management techniques to existing infestations that threaten specific resources.

Source: RI DEM. 2012. Rhode Island Freshwater Lakes and Ponds: Aquatic Invasive Plants and Water Quality Concerns. A Report to the Governor and Rhode Island General Assembly.
http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/lakes012.pdf

More information on aquatic invasive species may be found at:

RI DEM Office of Water Resources:

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


Aquatic Invasive Species (AIS) Documented
in Rhode Island Freshwaters
Lakes
AIS Documented
Surveyed; no AIS observed
Unsurveyed water body
Boundaries
Town Boundary
State boundary
N
W
E
S
RIGIS
0 2.5 5 10
Miles
Note: Distribution based on results of surveys performed 2007-2011 by Rhode Island Department of Environmental Management Office of Water Resources. AIS refers only to those plant species present in the floating and submergent plant communities. More information available online at RIDEM website
Updated 8/19/2011

NARRAGANSETT BAY

WATERSHED COUNTS

ECONOMY • ENVIRONMENT • EQUITY

Aquidneck Land Trust
Audubon Society of Rhode Island
RI Bays, Rivers, and Watersheds Coordination Team
Blackstone River Coalition
Blackstone River Watershed Council / Friends of the Blackstone
Brown University
Clean Water Action
Conservation Law Foundation
EcoAsset Inc.
ecoRI News
Friends of the Moshassuck
Grow Smart Rhode Island
Mason & Associates, Inc.
Massachusetts Audubon Society
Massachusetts Department of Environmental Protection
Narragansett Bay Commission
Narragansett Bay National Estuarine Research Reserve
Narragansett Bay Estuary Program
Narrow River Preservation Association
Town of North Kingstown, Department of Planning and Development
Office of Senator Sheldon Whitehouse
Rhode Island Resource Conservation & Development Council, Inc.
Rhode Island Natural History Survey
Rhode Island Nursery and Landscape Association
RI Coastal Resources Management Council
RI Department of Administration
RI Department of Environmental Management
RI Department of Health
RI Department of Transportation
Rhode Island Land Trust Council
RI Water Resources Board
Save the Bay
Surfrider Foundation
South Kingstown Land Trust
Taunton River Watershed Alliance
The Nature Conservancy
The Rhode Island Foundation
The Trust for Public Land
URI Coastal Institute
URI Cooperative Extension
URI Graduate School of Oceanography
URI Watershed Watch
U.S. Environmental Protection Agency, Atlantic Ecology Division
U.S. Environmental Protection Agency, Region I
U.S. Fish and Wildlife Service
White Memorial Conservation Center
Wood Pawcatuck Watershed Association
Woonasquatucket River Watershed Council

www.watershedcounts.org