Cities by the Bay

NARRAGANSETT BAY WATERSHED COUNTS

ECONOMY • ENVIRONMENT • EQUITY

Narragansett Bay Watershed Report with a Spotlight on Urban Waters

2015 REPORT

www.watershedcounts.org

NARRAGANSETT BAY WATERSHED COUNTS
ECONOMY • ENVIRONMENT • EQUITY

Executive Summary

Cities by the Bay: The Urban Challenge for the Upper Narragansett Bay Watershed

2015 REPORT

The health of Narragansett Bay and its watershed as a whole continues to improve, but major challenges remain in the urban areas; however, local, site-specific efforts to address urban water quality are seeing progress. These projects can and should help drive more, broader and integrated initiatives in upper Narragansett Bay, where the benefits to bi-state residents of RI and MA are not only environmental and social, but have a direct link to enhancing the region's economy.

Cities along Narragansett Bay have bustling economies, first class arts and culture, and a rich history. Added to that, they have stunning views of beautiful Narragansett Bay and its watershed. But, this combination of urban areas abutting the natural environment poses a conundrum: you can dive into the scenic view of the upper bay, but you cannot dive into its waters.

Upper Narragansett Bay water quality is impacted by cities and urbanized areas throughout the watershed. Whether it is Taunton or Fall River, Providence or Pawtucket, all drains lead to the bay. And there are difficult challenges coming down those pipelines in the future. Water quality is impacted by runoff that carries pollutants and harmful bacteria, which prohibits many urban waters from being safely fishable or swimmable. Development patterns have led to increased flooding, beach closures, and limited access to waterways, with escalating climate change serving to exacerbate these impacts, including those affecting the diverse marine life that calls Narragansett Bay its home.

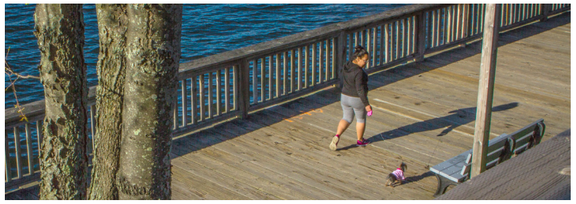
It will take significant, comprehensive, and well-coordinated investments to tackle these challenges to ensure that in the near future our beaches are open to visitors, our fish are safe to eat, and our water-based economies are protected. Unfortunately, the scale of effort that is needed is not currently in development, but partners in the watershed are making small investments that have important local impacts and more elected leaders are starting to make the important link between the environment and the economy.

Examples of recent successful municipal initiatives now point the way for a needed comprehensive approach to solving urban water quality problems. The City of Pawtucket renovated Festival Pier to improve access to the water. The City of Taunton removed several dams to decrease downtown flooding and improve fish habitat. The City of Worcester planted tens of thousands of new trees to improve urban health and water quality. The City of East Providence is on the cusp of having the first licensed urban beach in Rhode Island. These are not only accomplishments to celebrate but also calls to action, much more action.

All of these projects have benefited the local communities by improving water quality, increasing access to the urban waters for fishing and kayaking, or reducing environmental threats to lives and infrastructure. These are great accomplishments and serve as models to other communities. But, local, isolated efforts need help in taking on the big issues – such as degraded water quality and the implications of climate change.

The 2015 Watershed Counts report highlights challenges to and improvements in the urban environments of the Narragansett Bay watershed. Working together with a long-term vision, Rhode Island and Massachusetts can protect the environmental health, economic health, and community health of our urban waters and the people who depend on them to ensure the enjoyment of these benefits for generations to come.

Photos this page: Ayla Fox



Watershed Counts is a coalition of over 60 non-profit entities, government agencies, academic institutions, and other organizations who work together to report regularly on the land and water resources of the Narragansett Bay region. The annual Watershed Counts report highlights the important work that these many partners do every day to protect and restore the Narragansett Bay watershed.

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2015 REPORT

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COASTAL INSTITUTE

NARRAGANSETT BAY ESTUARY PROGRAM

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Front cover—
Providence, RI (top)
Fall River, MA (bottom)

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Our Urban Waters

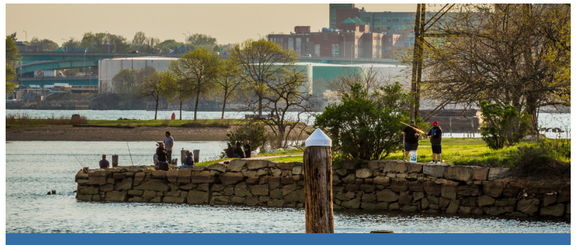
Photos this page: Ayla Fox

Urban Waters: Dive into the view but not the water?

When most people think about waters in the Narragansett Bay region, they likely envision the iconic beaches of the South Shore of Rhode Island, with people of all ages playing in the surf, or the inviting lakes and streams of central Massachusetts with kayaks paddled along tree-shaded waters.

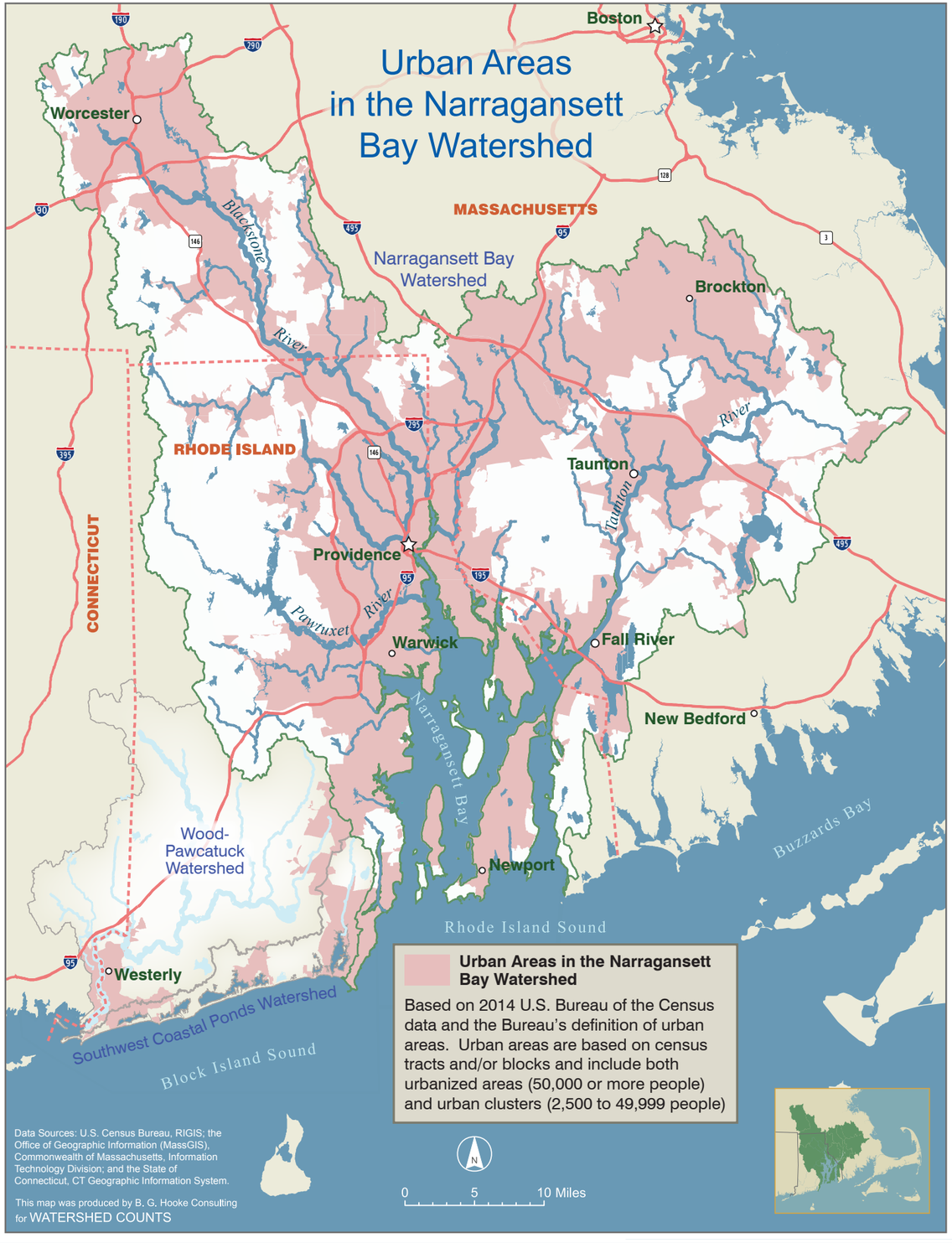
People are less likely to bring to mind the waterfronts of Providence and Fall River, with crowded banks defined by oil tanks, storage piles, transport vehicles, and highways. But, these waters are environmentally, economically, and culturally important to the people who live in coastal urban areas as well as to the people they serve with goods, power, and jobs.

The coastal communities with large populations that rely on these waters often directly and indirectly contribute to the higher level of pollution than is seen in more rural areas.



Our three major watersheds have dramatically different patterns of urbanized land:

Watershed	population	percent urbanized	people/ sq. mile
Narragansett Bay	2,006,112	56 %	1,177
Wood-Pawcatuck	89,775	9 %	297
Southwest Coastal Ponds	35,477	41 %	636



Why are waters in urban areas typically more polluted than waters in less populated areas?

In urban areas, much of the land surface is covered by impervious surfaces–hard surfaces that do not allow rainwater and snowmelt to seep into the ground and undergo a slow process of filtration. Instead, most urban areas rely on storm drains to carry stormwater runoff either directly to a nearby waterway or to a wastewater treatment facility.

This stormwater picks up pollutants as it runs over impervious surfaces. Oil and grease from cars and buses, chemicals and fertilizers from lawns and landscaping, road salt during winter and spring months, bacteria from pet waste, and trash that collects in gutters and along roads. Pollutants carried in stormwater can harm fish and wildlife, kill plants, contaminate drinking water supplies, and make areas unsafe for human recreation if the stormwater is not treated before it is discharged into a local water body.

If stormwater is discharged directly into a stream, it can very rapidly increase the stream flow and lead to erosion of the stream banks, which in turn has implications for flooding during intense rainfall events, and can damage in-stream habitat. In addition, the stormwater runoff from impervious surfaces is often a higher temperature than water naturally found in streams, which can create an unnatural habitat for plants and animals.

Stormwater runoff from impervious surfaces is water that is not infiltrating into the ground. If the stormwater is captured and taken to a treatment facility, then the water is also interrupted in its journey to nearby streams, which can reduce stream flow. Again, stormwater being discharged into streams can harm the plants and animals that live there. But, no water in the streams is also harmful.

What then are communities to do?

In areas of dense populations, communities are more likely to have an elaborate sewer system that transports wastewater to treatment facilities, which are located in the urban area. Wastewater is treated, reducing nutrients and harmful bacteria, but it is not currently feasible to discharge water that is pollutant-free. These

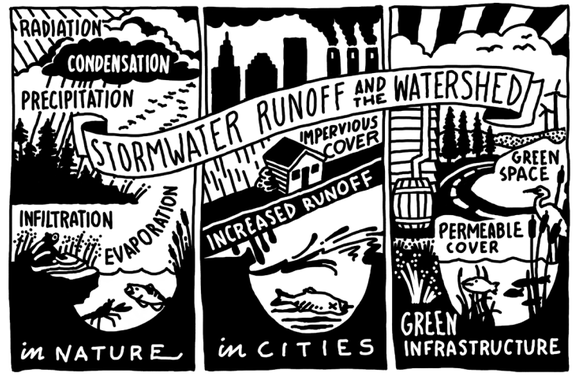


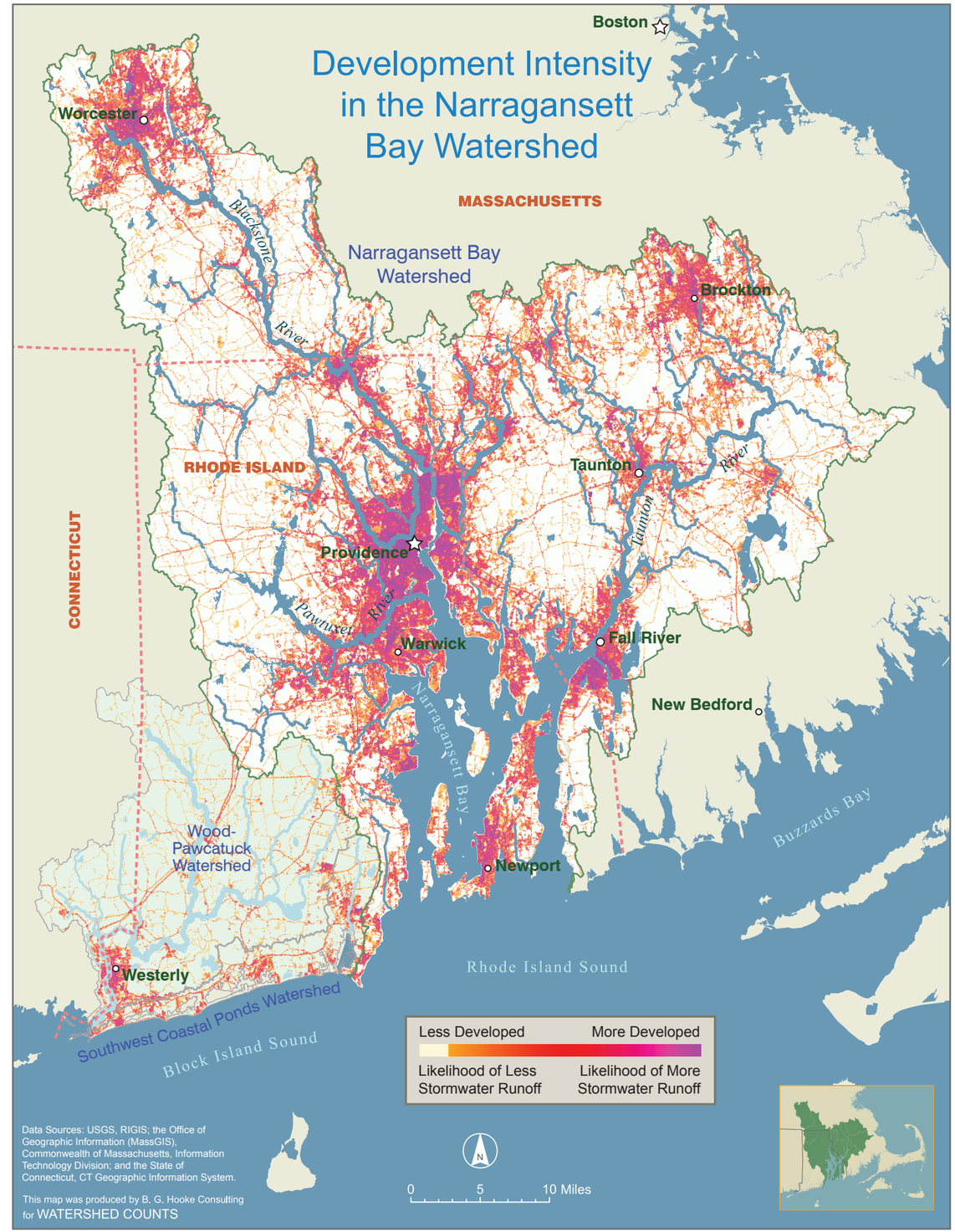
Figure: Brian Jones Design

excess nutrients and bacteria can disrupt the natural ecosystem and make the waters unsafe for ecosystem services—everything from river herring to public swimming and fishing.

Urban areas are enticing for a reason: diversity of people and activities, cultural resources, business enterprise, and a metropolitan lifestyle. These areas often offer some environmental benefits as well such as public transportation systems, and shorter driving times to work and stores. Major urban areas in the Narragansett Bay watershed—and around the world—are located on rivers and marine coasts not by coincidence. The movement of goods around the world relies on ports where products can be moved from ships to trucks or trains, and then quickly moved farther inland to meet consumer demands. Obviously, a port that is located far away from where industries are based, railroad hubs, and major interstates would not be smart business and could degrade the quality of the product or its timely delivery. But those critical ports contribute to the pollution and degradation of our urban waters; innovative solutions are needed to reduce their impact.

While we celebrate urban areas as vital cultural, business, medical, academic, and transportation centers, without which our states, regions, and country would not flourish, we need to be mindful of their role in pollution and as environmental stressors and work to reduce those impacts through green engineering.

Photo: Ayla Fox



What challenges do urban residents face with regards to their waters?

People who live along urban waters face challenges that people in more rural areas are less likely to experience.

Urban waters are more likely to have high levels of bacteria that are harmful to human health. This means that even though many people live very close to the water, they cannot go there to swim or boat or fish because it is not safe from a human health perspective. The view of the water may be inviting, but a nice refreshing swim or leisurely weekend of fishing is not an option.

Even if the water is safe for human recreation, many people do not have access to water adjacent to their neighborhood. Roads, private lands, buildings, and ports may cut off foot traffic without adequate public paths. The lack of public access and parking \options effectively limits visits to our urban waters.

These are a few of the important factors to consider when deciding whether it is possible or wise to visit your urban waters.

What can people and communities do to improve urban water quality?

Urban waters face many challenges. But city planners, environmental managers, and community groups, among others, are working to improve urban water quality. The efforts are innovative and tenacious.

Municipalities make major investments in stormwater and wastewater infrastructure and treatment to reduce nutrients and bacteria that flow to adjacent waterways. New development projects are incorporating less impervious cover and more green space to increase water infiltration and reduce runoff. Community groups are developing parks, public access points, and bike paths so people can get to the water and enjoy their time there.

In the following pages, we will highlight steps communities throughout the Narragansett Bay watershed and across the region are taking to reduce stormwater runoff, improve urban water quality, and increase public access to our beaches, rivers, and coasts.

We labor long and earnestly for peace, because war threatens the survival of man. It is time we labored with equal passion to defend our environment. A polluted stream can be as lethal as a bullet.

—Former Senator Alan Bible, Nevada

DID YOU KNOW?

• The Narragansett Bay watershed has a population of over two million people and 56% of the watershed is categorized by U.S. census data as urban (see map, page 4: *Urban Areas in the Narragansett Bay Watershed*). The resulting density of the watershed is 1,177 people per square mile.

• Impervious cover in a watershed results in increased surface runoff. As little as 10% impervious cover in a watershed can result in stream degradation.

• The density of impervious cover is intense in our urban centers of Providence, Worcester, Brockton, and Fall River (see map, page 6: *Development Intensity in the Narragansett Bay Watershed).*

• A typical city block generates more than five times more runoff than a woodland area of the same size due to impervious surfaces like rooftops and pavement.

• The most recent National Water Quality Inventory reports that runoff from urbanized areas is the leading source of water quality impairments to surveyed estuaries and the third-largest source of impairments to surveyed lakes.

Federal Support for Urban Waters

The U.S. Environmental Protection Agency (EPA) has recently invested resources in the protection and restoration of the nation's urban waters. The Urban Waters Small Grants program was created to fund projects to restore urban waters and support community revitalization. A complementary program is the Urban Waters Federal Partnership through which EPA helps coordinate 13 other federal agencies working to reconnect urban communities with their waterways through community-led revitalization efforts.

What local projects were funded under the Urban Waters program?

Since 2012, the program has provided $5.3 million in Urban Waters Small Grants to 92 organizations. These grants are awarded every two years with individual award amounts of up to $60,000. Two projects in the Narragansett Bay watershed were funded including a stormwater education project led by the Environmental Justice League of Rhode Island and an urban fish community monitoring program co-led by the Wood-Pawcatuck Watershed Association and the Woonasquatucket River Watershed Council (see the case study on page 15).

In the stormwater project, the Environmental Justice League of Rhode Island worked with two community organizations, UPP Arts (formerly Urban Ponds Procession) and Groundwork Providence, to help restore water quality in Mashapaug Pond. Homeowners and school children received hands-on education about residential and neighborhood stormwater practices through arts and environmental education. The project emphasized that urban communities need clean water for many reasons including recreational opportunities such as fishing and boating.

The project included a video collaboration with Jorge Alvarez High School's AP Environmental Science students from the class of 2013.

Mashapaug Pond ultimately flows into Narragansett Bay. Photo: Environmental Justice League of Rhode Island

The film "Toxic Legacy" discusses the history of pollution and the future of Mashapaug Pond and its effects on both the school and the surrounding communities. See the video at: https://vimeo.com/69209729

The project also includes an annual celebratory procession to raise awareness and advocacy for the pond's cleanup. See the UPP Arts website at http://www.upparts.org

Urban impervious cover replaced by homeowner with rain garden. Photo: Environmental Justice League of Rhode Island

How does the Urban Waters Federal Partnership help local communities?

The Urban Waters Federal Partnership is made up of 14 federal agencies (including Departments of Environment, Interior, Agriculture, and Housing and Urban Development) that work to reconnect urban communities, particularly those that are overburdened or economically distressed, with their waterways by building collaboration among federal agencies, state and local agencies, and community-led efforts to promote economic, environmental, and social benefits.

To date, 19 partnership sites have been designated where projects are underway. Projects include cleaning up rivers, installing green infrastructure, connecting citizens to parks and green spaces, establishing networks with local government officials, creating new bike trails and riverfront walkways, and engaging residents to be urban waters stewards for their watershed. Recently 28 non-profit organizations pledged to work with the partnership.

Reservoir Avenue Elementary 4th and 5th graders learning about storm water runoff. Photo: UPP Arts

Southeast New England Program

Photo: Narragansett Bay Estuary Program

The Southeast New England Program aims to restore and protect both water quality and habitat.

2015 marks the second year of a new program coordinated by the U.S. Environmental Protection Agency called the Southeast New England Program. This program's mission is to protect and restore southeast New England's ecosystems including the coastal waters and watersheds spanning from Westerly, Rhode Island, to Pleasant Bay, Massachusetts.

The geographic scope of this project is broad and includes the watersheds of Narragansett Bay, Buzzards Bay, the Islands, and southern Cape Cod. The Southeast New England Program has a long-term goal that includes the protection, enhancement, and restoration of clean water, healthy diverse habitats, and associated populations of fish, shellfish, and other aquatic dependent organisms. This program joins other geographic programs that are designed to examine larger aquatic ecosystems such as Chesapeake Bay, Columbia River, Puget Sound, and the Great Lakes.

Last year the Narragansett Bay Estuary Program and the Buzzards Bay National Estuary Program assisted EPA in the combined distribution of over $1.4 million to 12 projects with a focus on addressing pollution caused by excess nutrients. During 2015, the two national estuary programs will again assist EPA through a combined grant program of $1.8 million. The grants for 2015 will fund projects that address water quality degradation caused both by nutrients (nitrogen or phosphorus) and pathogens (bacteria). An additional $1.5 to $1.75 million in grants is in the process of being released through EPA New England's Healthy Communities Grant Program.

Senator Jack Reed (D-RI) and Curt Spalding, Administrator for EPA's New England Region, celebrate the launch of the Southeast New England Program. Photo: EPA

2014 Southeast New England Program

Narragansett Bay

In upper Narragansett Bay near Providence, Rhode Island, Save The Bay is addressing excess nutrients by experimenting with the use of ribbed mussels. Nitrogen pollution in the bay leads to an overproduction of algae, which can reduce important light infiltration, directly smother organisms, and lower local oxygen levels in the water when it decomposes. Ribbed mussels are filter-feeders and remove plankton and other nutrients from the water (a process known as bioextraction). Save The Bay is studying this to see if ribbed mussels can be used to lower nitrogen levels in areas of Narragansett Bay.

The use of shellfish for restoration in polluted waters has been problematic because local people may eat contaminated shellfish, risking illness. The restoration of shellfish not commonly eaten by people, such as ribbed mussels, circumvents this problem. Preliminary findings of an ongoing NOAA study suggest that ribbed mussels may be equally or more efficient than oysters at bioextraction and are capable of filtering finer particles including pathogenic bacteria. The project will be visible at Save The Bay's dock (which hosts over 10,000 students each year) and Save The Bay's education staff will be able to inform students about the project and the importance of nutrient removal.

Save The Bay is conducting research to see if ribbed mussels can be used to remove nutrients from the water and reduce the frequency of low oxygen events. Photo: Narragansett Bay Estuary Program

Buzzards Bay

The Town of Wareham's Water Pollution Control Facility is installing state-of-the-art nitrogen monitoring equipment and process controls. A computerized network of monitoring probes will be installed to collect data in real time. These data will allow immediate corrections to the various treatment processes before problems arise and will help ensure that the treatment process is maintained in an optimal state for nitrogen removal. Municipal wastewater facilities can be large contributors of nitrogen loading in some sections of Buzzards Bay.

The Town of Wareham complies with their wastewater discharge permit that limits nitrogen to a seasonal average of 4.0 parts per million. This discharge permit, when issued around 2001, was the first of its kind in Massachusetts and remains one of toughest discharge permits to comply with. This grant will make it possible to further reduce discharge concentrations by 0.5 to 1-part per million, which will result in the reduction of thousands of pounds of nitrogen when the plant reaches full capacity.

Wareham's Water Pollution Control Facility is undergoing upgrades to better monitor and control nitrogen that flows into Buzzards Bay. Photo: Town of Wareham

Cape Cod

On Cape Cod, two communities were selected by EPA for direct assistance projects to design and construct stormwater best management practices (BMPs) for treatment of nitrogen. The first BMP to be constructed will be an innovative subsurface gravel wetland retrofit constructed on a parcel of land at Hyannis Inner Harbor in Barnstable, Massachusetts. The BMP will intercept stormwater runoff discharged from the town's municipal separate storm sewer system to Hyannis Inner Harbor, a water body listed as impaired for total nitrogen and fecal coliform. The second BMP, a surface gravel wetland retrofit, will be constructed on a currently undeveloped parcel of land along Oyster Pond Furlong, in Chatham, Massachusetts. This BMP will also intercept stormwater runoff before discharge to Oyster Pond, a water body similarly listed as impaired for nutrients and pathogens.

Gravel being poured on top of geotextile lining to test best management practices to reduce stormwater runoff in Barnstable, MA. Photo: EPA

More information about the Southeast New England Program is available at: www.epa.gov/region1/snecwrp

CASE STUDY

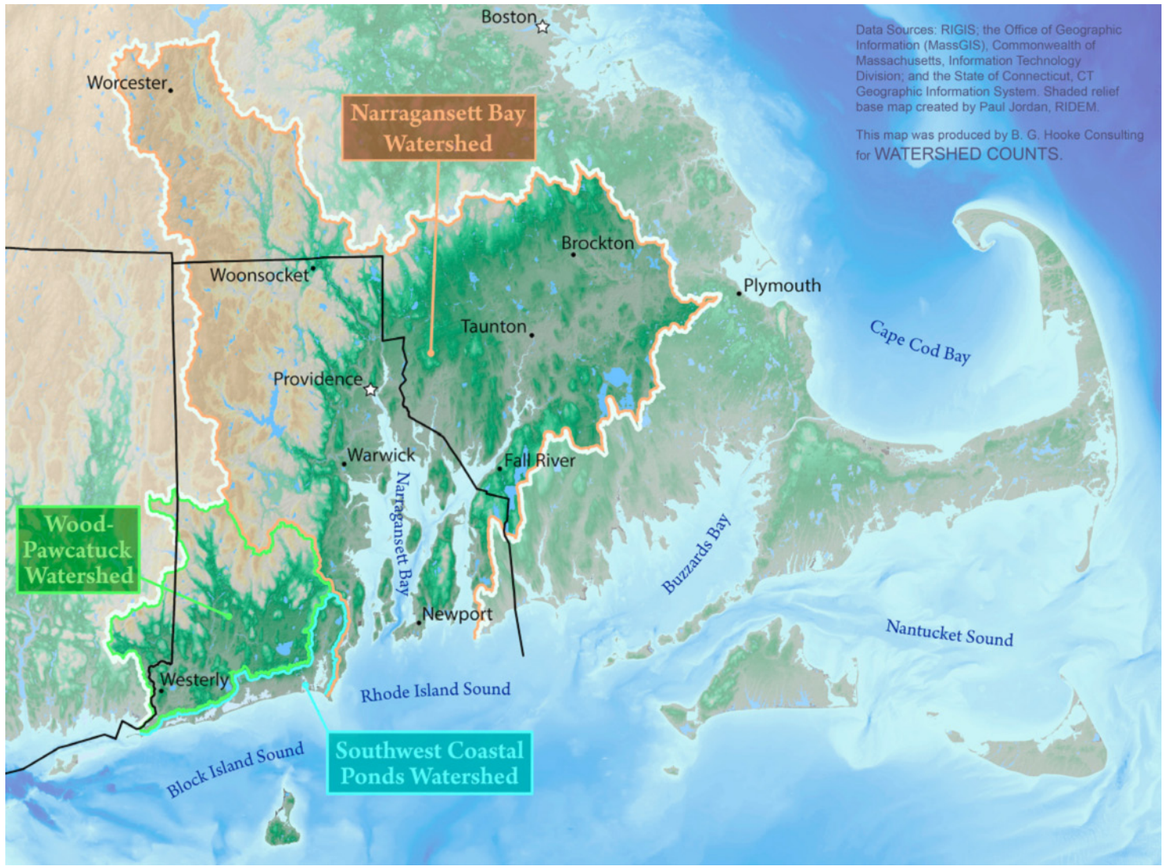
Urban Waters Case Studies

What is being done to make our urban waters healthier and more enjoyable?

Throughout this issue of Watershed Counts, we discuss the unique challenges that face our urban waters: ensuring access to the waterfront, preparing for climate change, reducing stormwater runoff, and deciding if we should eat fish that we catch from these waters.

Partners throughout the Narragansett Bay watershed are dedicated to improving their cities for residents, visitors, and themselves, and the following case studies highlight the variety of solutions being implemented to improve the health and accessibility to urban waters.

Photos this page: Ayla Fox



CASE STUDY

Party on the Pier

The City of Pawtucket was built up around Slater Mill, the birthplace of the American Industrial Revolution. Eventually, the textile mill that was powered by the Blackstone River gave way as the Industrial Revolution marched forward with innovation and progress, but the urban population continued to grow and continues to thrive today.

The Blackstone River becomes the Seekonk River and winds its way past the heart of Providence, crossing under bridges, running alongside houses and businesses, and eventually making its way south into Narragansett Bay. You can see glimpses of it as you drive along the historic Pawtucket streets. Due to urban development, actual public access to the river is more elusive.

Luckily, the City of Pawtucket with help from the Pawtucket Foundation took on this problem.

In 2014, the Festival Pier, also known as the Old State Pier, underwent major renovations. The plain, concrete slab of old was transformed into a waterfront pedestrian plaza with ample parking areas for cars, trucks, and boat trailers. A handicap-accessible boat ramp, as well as a launch area for kayaks and canoes, makes it easy to test out your sea legs. Plenty of lighting was installed to make the area safer at dusk and dawn, and amenities and landscaping around the plaza added to the welcoming site.

The new and improved pier better serves the community by bringing a bit of the outdoors into its urban backyard. The plaza serves commercial and recreational interests, and supports subsistence fishing in the area. Version 2.0 of the Festival Pier will also better support the annual Chinese Dragon Boat Races and Taiwan Day Festival held in September by the Blackstone Valley Tourism Council. Why aren't all urban areas making similar improvements?

Renovations don't come cheap.

The total price tag for the pier face-lift was $2.1 million, which was shared among the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the Rhode Island Department of Environmental Management, and a Community Development Block Grant received by the City of Pawtucket. This collaboration shows that good things happen when state and federal agencies join forces with local communities.

And Pawtucket isn't done yet.

The Festival Pier is just one piece of a larger plan to revitalize the river corridor. The 10-acre town landing adjacent to Festival Pier is slated for redevelopment as a mixed-use site. Across the river, planning is underway by the City of Pawtucket with National Grid to remediate 15 acres of prime waterfront land. A new bike trail winds through the area as part of the Blackstone Valley path. And other small parks and lookouts are being developed.

The National Park Service is jumping on the Pawtucket bandwagon as well. While Slater Mill ceased functioning as a textile mill over a hundred years ago, it has continued to honor our industrial legacy as a National Historic Landmark and museum. Slater Mill will be a focal point of the recently-designated Blackstone River Valley National Historical Park.

Access to Pawtucket's urban parks and waters along with a national spotlight on the Blackstone River's heritage is a significant investment and will help to drive private development, improve the housing market, and draw in new events and tourists.

Pawtucket is looking toward the future, and it sees urban river access as a good investment. For the city, for the environment, and for the residents.

CASE STUDY

Taunton Dam Removal – Fighting Floods and Freeing Fish

In 2005, a State of Emergency was declared and a portion of the City of Taunton was evacuated due to potential flooding. A storm dropped more than seven inches of rain in just a few days, resulting in a flood warning the National Weather Service deemed "extremely dangerous." But, the primary threat came from the Whittenton Dam on the Mill River. Originally built in 1832, the Whittenton Dam had buckled due to heavy rainfall and a collapse threatened to send a six-foot high wall of water rushing through downtown Taunton. This was not unprecedented. A similar event flooded part of the city in 1968.

What are the economic implications of our deteriorating dams?

The 2005 evacuation of over 2,000 people from Taunton cost over $1.5 million in emergency response and loss to the business community in response to just one weak dam in a region full of industrial-era dams. In response to growing concerns, Massachusetts established the Dam and Seawall Repair or Removal Fund. This will provide a long-term funding source for dam removal and repair. In September 2014, state and municipal officials celebrated the award of over $13.2 million dollars for projects throughout Massachusetts.

What can we do to reduce future damages?

To reduce the threat of future flooding when aging dams fail, towns should pro-actively invest in dam removal and culvert upgrade projects. While these projects often carry a daunting price tag upfront, the Massachusetts Department of Fish and Game's Division of Ecological Restoration found that these investments pay off in the long run. The Division evaluated six dam removal and culvert upgrade projects—including Whittenton Dam—and found that costs were significantly less over a 30-year period than business-as-usual repair and maintenance of existing structures. For the Whittenton Dam, the $2.2 million cost of repair and maintenance over the next 30 years was four times the $440,000 cost of removing the dam. In addition to these substantial savings, the Whittenton Dam removal also provided other social and economic benefits, including:

- Removed a public safety threat.
- Avoided costs of emergency response due to dam failure, potentially hundreds of thousands of dollars over the next 30 years.
- Avoided costs to regional businesses of closures due to flooding or evacuations.
- Increased property appeal and potential value by reducing flood risk.
- Increased habitat connectivity for native, sensitive species, including herring and American eel.

Does dam removal have similar positive outcomes upstream and downstream?

In general, removing dams such as the Whittenton Dam can result in a significant benefit to both people and fisheries by reducing the risk of flooding and restoring the natural flow of rivers. The Mill River Project involved the removal of three obsolete dams—the Hopewell Mills Dam, the Whittenton Dam, and the West Britannia Dam—and building a fish ladder at Morey's Bridge Dam. This project is a partnership among numerous federal and state institutions and nongovernmental organizations. The Mill River feeds into the National Wild and Scenic Taunton River, which then flows into Narragansett Bay. Ultimately, the removal of the three dams and construction of a fish ladder at a fourth location will remove barriers for nearly 30 miles of river in the Taunton River watershed.

Photos this page: MA Division of Ecological Restoration

Will fish and other aquatic plants and animals benefit from dam removal?

The Mill River Project will remove barriers and improve habitat for many fish species, including river herring (alewife and blueback herring) and American eel. The populations of these species have declined significantly and efforts are underway to list them under the Federal Endangered Species Act. The project kicked off in 2012 when the Hopewell Mills Dam was removed and the fish ladder was constructed at Morey's Bridge Dam. In less than a year, the project partners found fish were already migrating along the restored channel at the Hopewell Mills Dam site.

The Massachusetts Division of Marine Fisheries developed a video monitoring project and filmed numerous migratory fish. One cannot help but marvel at the tenacity of the Mill River fish as they wind their way upstream to a long lost spawning ground.

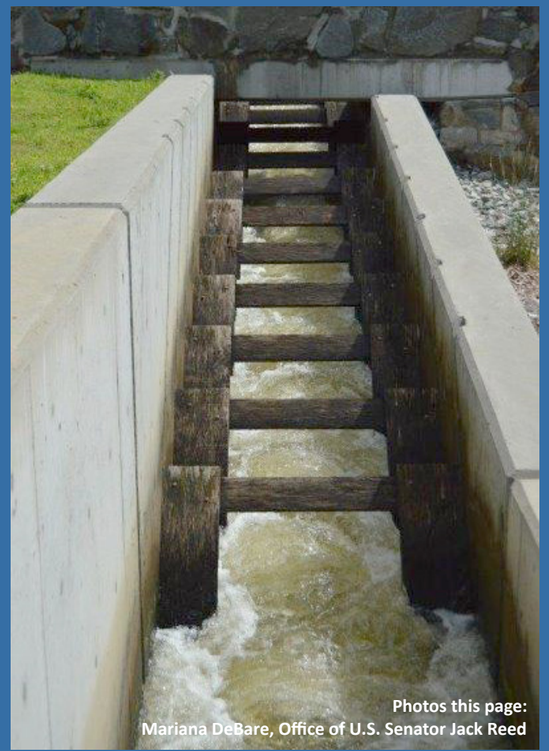
This project is a win-win. Significant future expenses were avoided by removing dams that no longer serve a useful purpose and actually are a risk for urban flooding. These projects also removed hundreds of tons of contaminated sediments from the river. In addition, river herring, which have not been seen in the Mill River system since the early 1800s, now have 30 miles of restored river to swim up to critical spawning habitat.

Stairway to Spawning on the Ten Mile River

A big blue ribbon was recently cut to celebrate the completion of three fish passage projects on the Ten Mile River in East Providence.

The 56 square-mile Ten Mile River watershed originates in Massachusetts, crosses into Rhode Island, flows through East Providence, and then enters the Seekonk River (one of the headwaters of Narragansett Bay) at Omega Pond Dam. Historically, the Ten Mile River hosted large runs of anadromous fish—fish that live as adults in salt water, but spawn in the fresh waters where they were born. In order to provide for upstream migration of adult blueback herring, alewife, and American shad to their historic spawning areas, Denil fish ladders, designed in collaboration with U.S. Fish and Wildlife Service, were installed at the first three dams on the Ten Mile River: Omega Pond Dam, Hunts Mill Dam, and Turner Reservoir Dam. The four-foot wide fish ladders are concrete waterways with wooden baffles that allow fish to swim to their natural spawning habitat.

The project provides access to 340 acres of spawning habit for alewife and approximately three miles of riverine spawning habitat for herring and shad. Inspired by local advocates who had for many years been netting the fish and carrying them over the dams, the project represented a true partnership. Construction was completed through the U.S. Army Corps of Engineers 260 Program with a 35% match provided by the state (RIDEM - $1,065,000 from the Narragansett Bay and Watershed Restoration Fund; CRMC - $100,000 from the Habitat Restoration Trust Fund). The federal share also included U.S. Army Corps of Engineers funding through the American Recovery and Reinvestment Act, the USDA Natural Resources Conservation Service in collaboration with the City of East Providence, and the Environmental Protection Agency's 319 Program. The Ten Mile Watershed Council, Save The Bay, and FishAmerica Foundation also contributed to the project. Construction lasted more than four and a half years and overcame challenges including the need to move a 16" high pressure gas main under the Omega Pond fish ladder. RI-DEM biologists have already documented herring using the fish ladder. The agency, which maintains fish passage across the state, projects that the newly accessible habitat on the Ten Mile River will support a fish run of more than 200,000 herring.



Photos this page: Mariana DeBare, Office of U.S. Senator Jack Reed

CASE STUDY

Electrofishing in Our Urban Waters – It Is Shockingly Fun!

Photos this page: Woonasquatucket River Watershed Council

Fish help tell the story of the health of our urban waters, but we have to get out into the rivers and streams to determine what types of fish are present in order to learn from them. This is a great opportunity for local citizens, including school groups, to get in the water and interact with their urban environments. How can we encourage such activity? An electrofishing backpack should do the trick.

Does electrofishing harm the fish?

This is not like the cartoon depiction of fishing with dynamite where an explosion in the water flings dead fish onto the riverbanks. An electrofishing backpack is attached to a wand that sends a weak electric current into the river. The current attracts and momentarily stuns fish within 10 inches of the wand. The volunteers, who wear waders and gloves to protect them from the mild electric current, then collect the fish with nets, identify and measure each one, and put the unharmed fish back into the river where they swim away.

Is electrofishing currently being done in the Providence metro area?

The Urban Fish Community Monitoring Program, was developed by the Woonasquatucket River Watershed Council and the Wood-Pawcatuck Watershed Association, and was funded by a two-year grant from the U.S. Environmental Protection Agency's Urban Waters Grant Program. This electrofishing project focuses on actively engaging the community in water quality issues, increasing knowledge of water quality and habitat conditions in urban rivers, and sharing information on rivers.

The electrofishing project was piloted on the Woonasquatucket River in 2013 and expanded in 2014 to the Moshassuck and Ten Mile Rivers with the help of Friends of the Moshassuck and the Ten Mile River Coalition.

What do these groups do to monitor fish in our urban waters?

In each of these urban rivers, two sites were chosen for sampling: one upstream site to reflect the headwaters of the watershed and one downstream site to reflect more urbanized areas of the river.

- Moshassuck River: upstream site in Lincoln, RI and downstream site in Pawtucket, RI.
- Woonasquatucket River: upstream site in Smithfield, RI and downstream site in Providence, RI.
- Ten Mile River: upstream site in Attleboro, MA and downstream site in East Providence, RI.

Volunteer groups, which included a charter high school team, avid fisherman, and anyone else who has an interest in becoming a citizen scientist, shocked, netted, and collected the fish. Each fish was identified using a field guide and field identification cards developed for this program, measured, and photographed so that experts could verify the identifications.

What results did the volunteer groups find?

Although it is early in this project, the initial results from 2014 are already providing unexpected results. There was a surprising number of fish and an even more surprising diversity of species of fish. The exception to this was the downstream site on the Moshassuck River where only two American eel were netted. In comparison, volunteers netted 76 fish of three difference species in the downstream site of the Woonasquatucket River.

This sounds like fun! How can I get involved?

The best news is that this program was developed to be used by other watershed groups. The electrofishing backpack and other equipment may be borrowed from the Woonasquatucket River Watershed Council and the Wood-Pawcatuck Watershed Association. A volunteer monitoring training manual and the EPA-approved quality assurance project plan can be downloaded from the Woonasquatucket River Watershed Council website.

This electrofishing project successfully connected volunteers in a very tangible way to the surprisingly resilient number of fish species that live in our urban rivers.

CASE STUDY

Urban Trees– You Don't Know What You've Got Till It's Gone

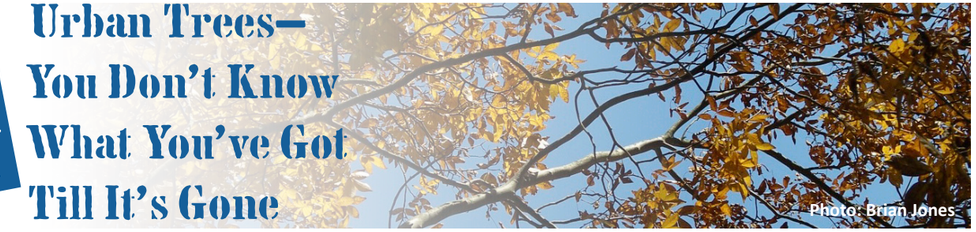


Photo: Brian Jones

Trees play a major role in the health of our urban ecosystems. They keep us cool in the shade, absorb air pollutants, reduce stormwater runoff, and provide habitat for wildlife. Residents of the City of Worcester, Massachusetts, recently learned the hard way just how critical trees are to a healthy community.

In August 2008, the Asian longhorned beetle, an invasive pest, was discovered by a Worcester resident who reported it immediately to the U.S. Department of Agriculture (USDA). The next day, federal officials from USDA Animal and Plant Health Inspectional Services arrived on her doorstep to validate the finding and eventually create a quarantine zone to eradicate the beetles.

Thus began the long process of eradication in which trees had to be inspected and removed if necessary. Since the discovery of the beetle in 2008, over 34,000 trees have been cut down and another 1,500 woodland acres cleared to prevent the spread of this invasive pest. 34,000 trees is hard to imagine but New York City's Central Park has approximately 25,000 trees. This tree loss had a dramatic effect on the city.

What was the impact on the City of Worcester?

The Burncoat and Greendale neighborhoods in Worcester bore the brunt of the tree removals, but eventually the quarantine zone grew to encompass 110 square miles, including all of Worcester, West Boylston, Boylston, Shrewsbury, and parts of Holden and Auburn. This is the largest eradication project in the history of the U.S. Forest Service, and while the number of infested trees identified each year has dropped dramatically, it is expected to be many more years before full eradication is completed.

The Asian longhorned beetle feeds on a variety of host trees, including birch, willow, horse chestnut and elm, but its favorite seems to be maple, found in abundance in Worcester. Prior to the beetle discovery, 80% of Worcester's tree canopy consisted of maple trees. The beetle's larvae bore deep into the tree, eventually killing it. USDA's protocol for eradication includes removal of all infested as well as non-infested host trees within 1⁄4 mile of each infested tree and sometimes chemical treatment of remaining trees.

How did Worcester respond?

In 2009, the Worcester Tree Initiative was formed and has since given away over 6,000 trees to residents, schools, and community groups, trained thousands of people of all ages the proper way to plant and care for trees, and recruited hundreds of residents to become "tree stewards" who help water and maintain trees along public streets.

In 2014, the Blackstone Headwaters Coalition and the Worcester Tree Initiative teamed up to promote the stormwater benefits of trees. With a $25,000 grant from the U.S. Environmental Protection Agency's Healthy Communities Program, the project will plant 100 trees in two low-income neighborhoods in Worcester and provide public education on the positive impact of trees on storm water. Engaging residents in the care and community ownership of their trees provides a bonus opportunity to talk to them about their relationship to the Blackstone River.

The Worcester Tree Initiative recently met their goal of planting 30,000 trees with a ceremonial planting of the thirty-thousandth tree.

How do trees help with stormwater runoff?

Trees suck up water from the soil and in one day, one large tree can lift up to 100 gallons of water out of the ground and discharge it into the air. One hundred mature trees can catch about 371,000 gallons of rainwater per year. Trees capture and store rainfall in the canopy and release water into the atmosphere through evapotranspiration. Trees also help slow down and temporarily store stormwater runoff, which further promotes infiltration and decreases flooding and erosion downstream. As part of their natural growth cycles, urban trees have been shown to significantly reduce rainwater nitrogen and other pollution loads in stormwater runoff.

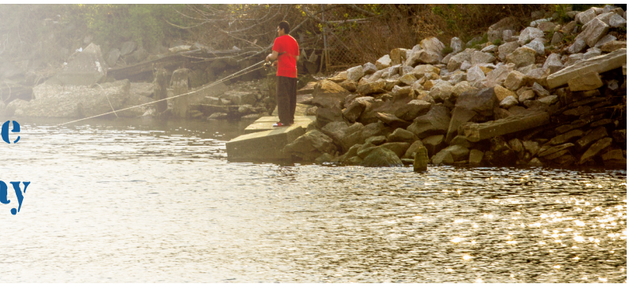
How do trees help in other ways?

Trees also help with air pollution in our urban areas. One hundred trees remove 32 tons of carbon dioxide and 420 pounds of pollutants each year. One large tree can also provide a supply of oxygen for two people. According to the U.S. Forest Service, trees placed around buildings can reduce air conditioning needs by 30% percent and save 20-50% in energy used for heating. For more tree facts, go to: http://www.americanforests.org/discover-forests/tree-facts.

Photo: Worcester Tree Initiative

CASE STUDY

What Fish Are Safe to Eat in the Narragansett Bay Watershed?



Low in calories and saturated fat, and frequently packing omega oils, fish is considered to be one of the healthiest sources of protein available. And what could be a more enjoyable way to get fish from the water to your dinner plate than by wetting the line at your nearest fishing spot? That's exactly what many folks in the Narragansett Bay community do. In fact, recreational angling is one of the most popular pastimes in the region, and sustenance fishers (those who catch fish for food) represent a significant fraction of the recreational fishing community, particularly in urban areas.

Can I go out to any river or coast in my city and eat what I catch?

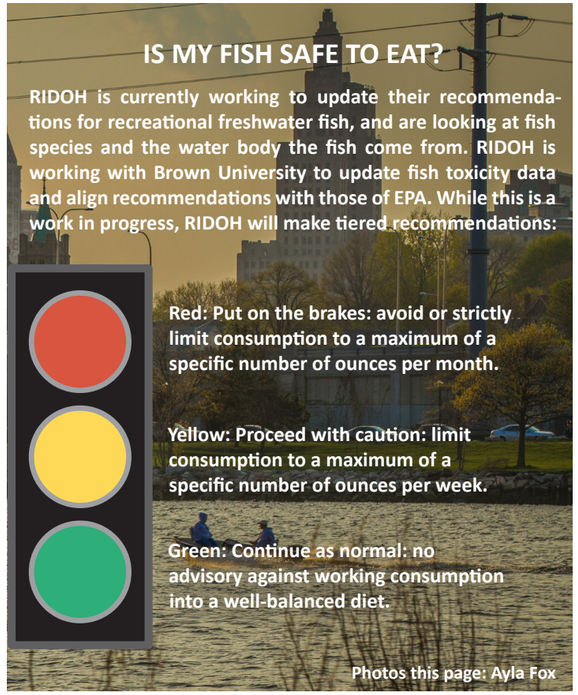
If there were no pollution and no contaminants of any type in the environment, then it would probably be safe to eat just about any fish you caught, but unfortunately, this is not the case. Urban waters—like the rivers and coasts of Narragansett Bay—offer convenient fishing access to large numbers of people, but often have elevated levels of pollutants and contaminants that may make some fish unsafe to eat. And even in relatively clean waters, contaminated fish can migrate in from polluted areas. This means that sustenance fishermen need to be very attentive to the fish they are eating.

The Rhode Island Department of Health (RIDOH) and the Massachusetts Department of Public Health (MADPH) have advisories (or guidance) for fish consumption that varies by the type of consumer and the waterbody. The MADPH recommends that children below the age of twelve, nursing and pregnant women, and women who may become pregnant not consume certain marine fish (i.e., bluefish from Massachusetts, king mackerel, shark, swordfish, tilefish, and tuna steak) or any freshwater fish from Massachusetts, unless MADPH has issued separate waterbody-specific guidance. The waterbody-specific guidance may also apply to the general population and recommend limited or no consumption.

Why do we need to be particularly concerned with certain fish?

Many freshwater and marine organisms accumulate toxins in their tissues. The toxins that are capable of accumulating are referred to as conservative pollutants and these can be inorganic (mostly metals like mercury) or organic (carbon-based like PCBs—polychlorinated biphenyls). These toxins exist mostly in aquatic sediments as remnants of human activities. They make their way into the aquatic food web mainly through absorption by phytoplankton (microscopic aquatic plants) when contaminated sediments are re-suspended in the water column by storms, tidal currents, burrowing animals, boat propellers, and dredging. Toxins can also enter the food web through direct contact or consumption of sediments by benthic organisms like small worms. The process by which an organism accumulates these toxins in its tissues over a lifetime is known as bioaccumulation.

If a small fish that has toxins in its tissues from bioaccumulation is eaten by a medium-sized fish, many of those toxins are incorporated into the medium-sized fish's tissues. Now consider that if the medium-sized fish eats 10 of those small fish every day then the medium-sized fish has effectively concentrated the toxins from those small fish into its tissues. Now think of a large fish eating 10 of the medium-sized fish that each ate 10 small fish. That is like the large fish concentrating the toxins of 100 small fish. This process is called biomagnification, and the higher on the food chain a fish is, the more prone it is to having concerning levels of toxins in its tissues



What toxins are of most concern in the Narragansett Bay watershed?

The inorganic toxin of most concern in our fish is mercury, which enters aquatic environments indirectly through fossil fuel combustion and directly from industrial, dental, and automotive wastes. Mercury is converted to methyl mercury in aquatic environments, which is easily absorbed by plant and animal tissues. While mercury is present in all aquatic systems, higher concentrations are generally found in urban waters where industry and watershed runoff are focused. However, even apparently pristine rural ponds can have elevated mercury levels due to airborne mercury from distant sources.

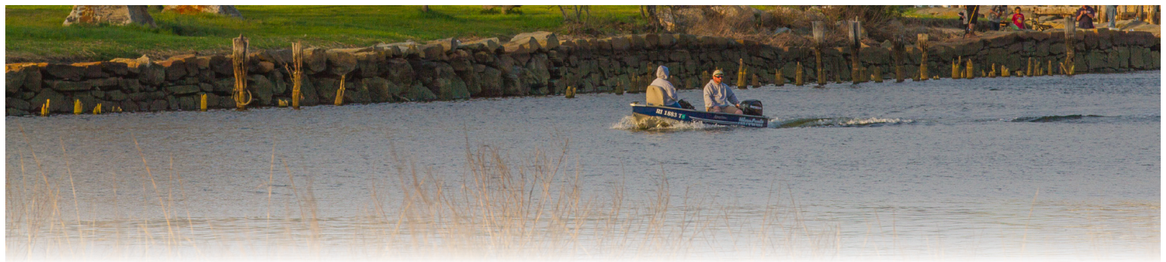
Mercury is highly conservative—most of the mercury that organisms (including people) consume during a lifetime is accumulated in tissues and stays there. Mercury is particularly dangerous for children and expectant mothers because of its potential to harm neurological development even when present at very low levels. Both Rhode Island and Massachusetts have issued waterbody-specific consumption advisories due to mercury contamination for freshwater game fish, including largemouth and smallmouth bass, pickerel, and pike. Additionally, Roger Williams University conducted research indicating that some species of edible saltwater game fish species from Narragansett Bay routinely exceed the EPA regulatory consumption threshold when they are at or above legal size: striped bass, bluefish, tautog, and to a lesser extent scup and black sea bass. This does not mean that every fish caught should be thrown back, but fishers should be aware of the potential for risks. Consumption advisories for mercury in saltwater fish have not been developed to date for Narragansett Bay, but EPA has issued advisories for several marine species.

The main organic pollutants of concern in the Narragansett Bay and its watershed are PCBs. PCBs are a suite of heat-resistant oils and waxes that were widely manufactured in the early through mid-1900s for use in electronic equipment. It was discovered later that PCBs are not only highly toxic carcinogens but are also highly conserved in aquatic sediments and organisms. In fact, many tons of PCBs remain in the sediments of Narragansett Bay, concentrated near the urban areas where produced and used in commercial products. PCBs have been detected in several fish species, and fish that spend more time in PCB-contaminated areas are more likely to have elevated levels in their tissues. Federal and state consumption advisories are in effect for two of our most important recreational game fish, striped bass and bluefish, with the RIDOH recommending that they should not be eaten by any sector of the population due to PCB contamination.

Should I eat fish from urban waters?

Clean fish is undeniably a healthy source of protein and omega oils, and health officials recommend eating fish as an important regular part of your diet. However, sustenance fishers need to educate themselves on the benefits and risks of eating fish so they can make informed decisions about which fish to eat, and how often to eat them. Store-bought fish prone to toxin contamination, such as shark, swordfish, tuna, tilefish, and striped bass, among others, also need to be factored into overall consumption decisions. Eating fish with low levels of mercury once in a while is very different than eating it every day, and fishermen should consider the fish they eat in the context of their entire diets.

All sustenance fishermen should be aware of potential health concerns and know where to find information on risks, concerns, and advisories. Once a fisherman has the information, then he can decide whether that fish he just caught can be dinner that evening or whether he should throw it back and wait for the next tug on his line.



FISH CONSUMPTION SAFETY

Rhode Island Freshwater Consumption Advisories
http://www.eregulations.com/rhodeisland/fishing/freshwater/fish-consumption-advisory/

Rhode Island Saltwater Advisories
http://www.health.ri.gov/healthrisks/poisoning/mercury/about/fish/

Massachusetts Freshwater and Saltwater Advisories
http://www.mass.gov/dph/fishadvisories

All other fish: EPA Advisories
http://www.epa.gov/mercury/advisories.html

CASE STUDY

Sabin Point: Bringing the Beach to the City

Photos this page: Ayla Fox

The Ocean State is known for its abundance of beaches where residents and tourists can spend a fun-filled and relaxing day on the sand and in the water. However, few of the licensed public beaches are located in urban areas, and none of them are in Providence.

It is certainly not the case that urban residents don't want to enjoy the benefits of a nearby beach, but human health and safety standards for beaches are often harder to meet in urban areas.

The Rhode Island Department of Health (RIDOH) has strict standards for monitoring harmful bacteria in waters off beaches to ensure that splashing in the surf doesn't land you in the doctor's office. If a beach can't meet the standards, then it can't be licensed for public use and recreation.

Unfortunately, many of the urban areas fail to meet this standard because harmful bacteria are more abundant in urban areas of upper Narragansett Bay.

Does that mean that there are no safe beaches in upper Narragansett Bay?

The Urban Beach Initiative was launched in 2010, and their efforts led them to Sabin Point in East Providence. Sabin Point is a popular sunny day destination: picnic areas, basketball courts, and playgrounds surrounded on three sides by water. But the fun stops at the water's edge due to pollution.

Since 2010, the RI Department of Health in collaboration with Save The Bay and the City of East Providence has monitored bacteria levels at Sabin Point and found that, with a little work, this could be the first licensed saltwater beach in the greater Providence area.

This possibility is largely due to the efforts of the Narragansett Bay Commission to reduce untreated wastewater and stormwater during intense rainfall events. With phases one and two complete as of late 2014, the CSO tunnel has reduced discharge directly into the bay by about 50%, which means the water at Sabin Point has been getting cleaner.

What are the benefits of having a licensed beach at Sabin Point?

A licensed beach at Sabin Point would provide close, convenient recreational access to the tens of thousands of people who live in East Providence and surrounding communities.

This one beach has the potential to bring economic growth to the City of East Providence depending on the city's vision for the property. Revenue can come from a parking sticker fee program, food stands, and private events. In addition, an increase in jobs is possible ranging from lifeguards, cleanup crews, and food stand workers to parking attendants and daily managers of the beach.

Health benefits reach far beyond swimming, which provides a cool oasis during hot summer months. A community park where residents can swim, fish, kayak, and wade provides an outlet to reduce stress, improve health, and build family connection. An additional perk is the East Bay Bike Path that provides convenient access.

Can I start planning my trip to Sabin Point?

Don't pack your beach bag quite yet. The City of East Providence has a few hurdles before the beach is stamped with RIDOH's seal of approval.

The primary obstacle: funding to relocate a stormwater outfall. Currently, this outlet is at an angle that points back toward the beach. This causes water and algae to back up in the area, which attracts geese and other waterfowl. These birds then defecate in the water, which creates a hotspot for pathogens that are harmful to human health. Fortunately, the RI Department of Environmental Management recently awarded a grant to the city to address the problems at Sabin Point Park so they can continue down the path of beach access that is safe for urban residents.

CASE STUDY

Urban Ports: Nowhere to Run, Nowhere to Hide

Photo: Ayla Fox

Take a look at the items around you right now. What do you see? The window you're looking out. The desk where you are sitting. The clothes you're wearing. The meal you are eating. The computer you're staring at.

Now, think about where those items came from. Chances are, you rarely think about how the items you use every day make their way from raw materials, to the manufacturing facility, to the warehouse or store, and finally to your home. Since 90% of the world's freight moves by sea, there is an excellent chance that ships—and seaports—were involved at almost every step.

Photo: Ayla Fox

Though often out of sight and mind, urban ports serve as critical hubs in global commerce and local economies. And it is not a coincidence that ports are located in the heart of coastal urban areas where the sea meets rivers, rails, and highways. Or, more accurately, urban areas grew in places where cargo is easily transferred between these different transport modes.

Urban areas provide employees for ports as well as the supply chain of convenient connections to major interstates and railways to transport goods to inland markets. Ports—whether they be coastal-, river-, or lake-based—are the only conduit for goods to move from water to land.

Phot: URI Office of Marine Programs

ports, by definition, must be right at the edge where land meets sea, they don't have the option of moving to higher ground to avoid sea level rise and hurricanes.

And these factors don't even take into account all of the ways climate change is impacting transportation pathways that lead to and from the port.

Sea level rise reduces "air draft"—the clearance under bridges—so some of those huge ships bringing cargo into the port may not be able to fit in the not-so-distant future. Rising waters also threaten low-lying railroads and highways that are used to shuttle the cargo away. In some areas, a hotter climate will buckle rail lines and damage pavement. Sea level rise may reduce the need to dredge channels in some areas, but in others it may exacerbate siltation in those channels as new water levels erode away our vulnerable shores.

Coastal storms and hurricanes are expected to become stronger and exceed what ports are prepared for, or may begin threatening ports that were not designed to be resilient in the face of such storms. More extreme precipitation events also result in more flooding at ports.

Sounds like all gloom and doom, right? Wrong.

Ports haven't been bastions of commerce for a hundred years without learning a thing or two. Ports around the world are starting to plan in new ways to be more resilient in the face of climate change. This ranges from updating emergency response and land use plans to discussing how vulnerable structures can be moved to a safer place within ports or perhaps even moved to a remote location in the surrounding community.

Unfortunately, the leap from planning to implementation is long and pricey. But, ports need to look to the future to avoid drowning in place.

Photo: Ayla Fox

Climate Change

Photo: Narragansett Bay Estuary Program

Are there unique climate change concerns that urban areas should be considering?

Urban coastal areas will face the same challenges from climate change as other less populated areas: rising sea levels, increasing temperatures, changing precipitation patterns, and more intense tropical storms. But as our economic hubs, cities will continue to be impacted in unique ways.

Significant climate change risks are concentrated in urban areas, which house more than half of the world's population. Urban residents are more vulnerable to the impacts of climate change, especially heat due to the absorption and retention of heat by the many manmade edifices and the reduced presence of tree canopies, gardens, and water bodies. Added to that, cities are economic hubs. Negative climate impacts to cities will have increased and rippling consequences throughout surrounding communities, which are dependent upon these hubs for financial centers, goods, and services critical to life.

The outcome of these challenges need not be a doomsday scenario. With proper planning and foresight, adaptation measures can be put into place; however, solutions are complex and often require a significant upfront investment in order to save money in the longterm.

What challenges could my city be facing?

Sea Level Rise

Many major New England cities are located in the low elevation coastal zone, making them particularly vulnerable to rising sea levels and flooding from storm surge. As water levels rise and potentially breach manmade barriers, there will be impacts on people, buildings, and the economy. The best solution—move vulnerable populations and infrastructure away from the flood zone—is not practical in most cities, but being aware of what areas will be underwater in the future will help with planning to reduce impacts. Cities are already working on plans to create greater resilience in the face of climate change threats ranging from raising power grids above flood levels to building rain gardens in highway medians or public parks to reduce flooding.

Extreme Weather Events

Stronger tropical storms and more frequent intense precipitation events are expected with climate change. That adds up to a lot of wind and rain battering our urban communities. More water means more flooding, more stormwater runoff, and greater need for investment in emergency response facilities and trained personnel.

The Northeast is projected to see a steady increase in precipitation, with a total increase of about 10%, or four inches each year. Periods of heavy rainfall are expected to become more frequent, with longer periods of drought in between. This will impact cities in the Narragansett Bay watershed that are built near or around rivers as water levels rise with rainwater and overflow banks and dams.

For urban areas directly on the coast, residents should be prepared for stronger storms as climate change intensifies. It is predicted that the number of high intensity storms—category 4 and 5 hurricanes in the Atlantic—will double by 2100. Of course, not all of these storms will make landfall and, of those that do, not all will head to Rhode Island and Massachusetts, but the odds are that a few of those will directly impact urban areas in the watershed.

Higher winds and storm surge are the coastal storm impacts that first come to mind with more intense storms, but precipitation may also increase up to 20%. While many of the wind and storm surge impacts are restricted to areas close to the coast, increased precipitation has the potential to impact the entire Narragansett Bay watershed.

Sea level rise + intense rainfall + stronger storms = a triple threat

These two changes in extreme weather events—intense rainfall and stronger coastal storms—often go hand-in-hand and are further complicated by rising sea level.

Most of the coastal towns on the east coast will see triple the number of flooding events by 2030. By 2045, those towns may see ten times as many tidal floods—and those floods will seep further inland, last longer, and threaten more property. The estimated cost of hurricane damage roughly doubles with every three feet of sea level rise. At the current rate of sea level rise, that is an increase in cost of about 0.5% per year. We would all like to see our investments be so steady.

Photo: Ayla Fox

Consider Providence, Rhode Island—

Located at the top of Narragansett Bay, the city is experiencing the same sea level rise that the rest of New England is facing. However, storm surge from intense coastal storms can be amplified as it rushes up the bay and, added to that, increased rainfall associated with stronger storms will be making its way into rivers north of Providence. Providence may soon be threatened by increased volumes of water from the bay and landward sides.

Providence is currently protected from storm surge up to 20 feet above sea level by the Fox Point Hurricane Barrier, which stretches from Allens Avenue to India Point Park. But each foot of sea level rise reduces the storm surge protection potential of the barrier. In addition, the barrier can be used to control river flow. But when these two functions are simultaneously necessary it may result in a choice between flooding from the river or storm surge from the bay. In addition, there has been urban growth since the hurricane barrier was completed in 1968, and now many parts of the city, including the Port of Providence, are below the hurricane barrier and will not benefit from it.

Increased Temperatures

Higher temperatures and extreme heat waves are amplified in urban areas because concrete buildings, roads, and parking lots absorb more heat than shaded, natural areas in surrounding rural areas. This is known as the "heat island effect," which is especially dangerous for vulnerable segments of the population, such as the elderly and children.

For example, in Providence, it is up to 15° F hotter in the city than in nearby rural areas and there are three more days above 90° F each year than in rural areas. Hot summer city temperatures can have serious health impacts including heat stress and dangerous ozone levels that can trigger asthma attacks, heart attacks, and other serious health impacts on the hottest of the days. Heat is the #1 weather-related killer in the U.S. and days over 90° F are associated with the greatest risk to human health. There is also considerable stress on domestic animals as well as to the environment in general.

The heat island effect can be mitigated by increasing tree cover, creating green roofs, installing reflective roofs, and using cool pavements.

Image: U.S. General Services Administration

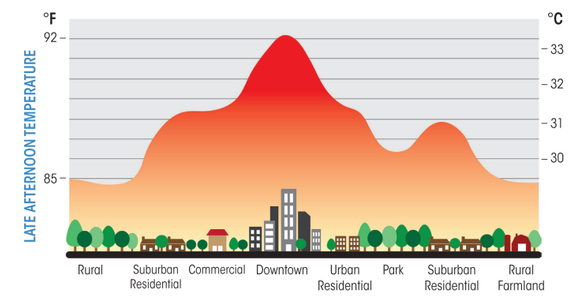


Image: U.S. Environmental Protection Agency

Marine and freshwater beaches in Narragansett Bay and its watershed are often described as among the best in the United States if not world class. They are an iconic part of our culture and significantly contribute to our economy. Most of us likely visit a beach at least once in the summer—whether it is along the south shore of Rhode Island, in the more protected areas of upper Narragansett Bay, or a freshwater lake. We dive into the cool waters, but rarely do we stop to question whether the waters are safe from a public health point of view. We are fortunate that the Rhode Island Department of Health (RIDOH) and the Massachusetts Department of Public Health (MDPH) are looking out for us.

Permitted beaches in both states are regularly sampled for bacteria that can lead to human illness. If the bacteria count is below a certain level, then the beach is open. If the bacteria count is above that level, then the chance that people may get sick is too high and the beach is closed until the harmful bacteria can flush out of the area. (For more details, please see the 2014 Watershed Counts report with a spotlight on marine and freshwater beaches.)

The U.S. Environmental Protection Agency (EPA) sets all acceptable bacteria levels and in 2014, it recommended more stringent marined beach bacteria values that some states, including Rhode Island, chose to implement in summer 2015.

What does a lower accepted bacteria standard mean?

Well, it may mean more marine beach closures even though the water is exactly the same as or even cleaner than it was last year.

In previous years, the magic number to avoid a marine beach closure was 104 colony forming units (cfu) per 100 milliliters of water. This means that if you scoop out just under ½ cup of your local beach water and expert analysts find 104 or fewer healthy bacteria, then the beach is safe and can stay open. However, if 105 or more bacteria are found, then the beach is closed until the bacteria flushes out of the system.

Starting this summer, some states have opted to reduce the threshold to 60 cfu. This means that last summer you may have swum at a beach that had 70 cfu, which did not trigger a closure. However, if that same scenario were to happen in summer 2015 in Rhode Island, the beach would be closed.

Why did EPA decide to lower the standard?

The EPA monitors possible marine beach contaminants to protect public health. EPA collects a large amount of data with help from partners, experts analyze the data to make sure the standards are working to keep people safe, and specialists incorporate new environmental and medical research so the standards reflect the best available science. The lower standard reflects new information about how often people get sick when exposed to harmful bacteria in marine beach waters as well as the symptoms they show.

The bottom line is that EPA is watching out for you so you can enjoy the sun, sand, and surf at beaches in the Narragansett Bay watershed. Implementing ways to reduce harmful bacteria to ensure beach-goers have a great experience and continue to visit marine beaches in the area is important to local and state economies.

How will this change in marine beach closure criteria impact me?

How you are impacted may depend on whether you live in Rhode Island or Massachusetts. As always, federal regulations often are much more complicated when you dive in than at first glance.

The 60 cfu standard recommended by EPA and described here may either be adopted by a state or EPA may accept a different standard if it is justified by the state based in science, local water quality data, or monitoring experience. The difference comes down to a technical issue: Beach Action Values versus Beach Notification

Thresholds. This description is beyond the scope of Watershed Counts, but if you are interested in the nitty gritty you can find more information on the EPA Beach Program Website or the MA Department of Public Health Beach Testing Annual Report on page 32.

In Rhode Island, RIDOH has adopted the 60 cfu standard recommended by EPA as a Beach Action Value and marine beaches during summer 2015 were evaluated against this standard. The state decided to adopt this standard because when it looked at past year's marine beach closures, it noticed that the lower standard would have a minimal impact on beach closures. The majority of safe, clean marine beaches already fall below 60 cfu and would remain open for recreational uses under the new standard system.

In Massachusetts, the story is slightly different. While Massachusetts only has six marine beaches in the Narragansett Bay watershed, it has 530 public and semi-public marine bathing beaches across the state. MDPH also has over ten years of data for these monitored beaches. Given the state's concern for the potential of increased closures at clean beaches, it is working to identify Beach Notification Thresholds based on extensive monitoring data and analysis that are specific to Massachusetts.

Regardless of the path your state is taking, both Rhode Island and Massachusetts, along with the EPA, recognize that great strides have been made in reducing nutrient and bacterial input into Narragansett Bay (see the Marine Water Quality section of this report). The steps we have taken as communities, states, and a watershed are working and need to continue to be supported. It is important to differentiate those efforts from this new marine beach standard.

Are other changes being made at the state levels?

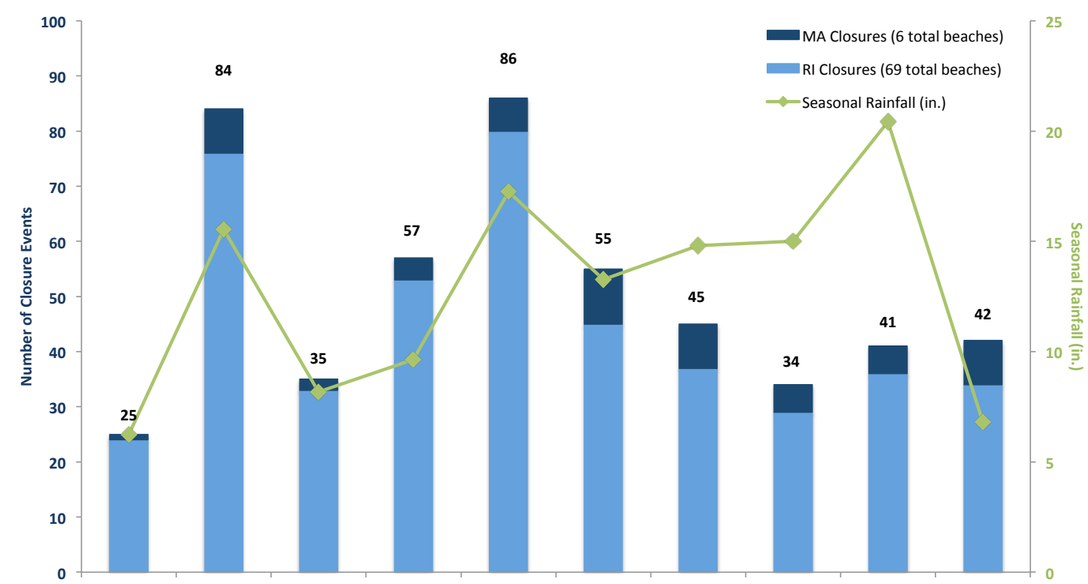
In Spring 2014, the MDPH updated the criteria for when beaches are required to close and post a warning to beachgoers of the risk associated with getting in the water at that time. Now, for many of the beaches with a history of infrequent closure events, the beach is required to post a warning only when two samples collected on consecutive days come back over the bacteria limit.

If a retest is not collected on the day following the initial exceedance, then posting is still required until a sample confirms that the water quality standard is met. For beaches with a history of consecutive-day exceedances, postings continue to be required after each exceedance.

How many beaches were closed the summer of 2014?

Rhode Island experienced two freshwater beach closure events at the same beach facility (out of 36 monitored freshwater beaches) and Massachusetts had 18 freshwater closure events at 15 different beach facilities (out of 49 monitored freshwater beaches in the Narragansett Bay watershed). In Rhode Island, 19 marine beaches (out of 69 monitored beaches) experienced a total of 34 closure events and Massachusetts had eight closure events at three marine beaches (out of 6 monitored beaches in the Narragansett Bay watershed).

Seasonal Marine Beach Closure Events and Seasonal Rainfall (in.) in the Narragansett Bay Region



Data Source: Rhode Island Department of Health and Massachusetts Department of Pulic Health, Beach Monitoring Programs
Graph: Watershed Counts, 2015

Marine Water Quality

Photo: Mike Laptew Productions

A healthy Narragansett Bay supports valuable fisheries and a wide variety of marine life. One important aspect of ecosystem health is water quality and a major component of this is dissolved oxygen (DO). Fish, lobsters, oysters, and other marine animals need DO to survive, reproduce, and thrive. When DO gets too low some animals are able to leave the area for seas with higher DO, while other animals are stationary and cannot move to a better environment. However, if DO drops throughout the water column very quickly or occurs over a very large area, then even mobile animals may not be able to escape and fish kills are possible. Over long periods of time, if oxygen conditions do not improve, these impacted areas can become altered ecosystems since organisms will not be able to flourish in these oxygen-starved areas.

What causes low DO?

There are many factors that contribute to low DO (also known as hypoxia) but one of the largest manmade contributors is nutrient discharges from point and non-point sources. In Rhode Island, historically the largest point source contribution of nutrients to the bay has come from wastewater treatment plants. (For an explanation of how this works, check out the 2014 Watershed Counts report at http://www.watershedcounts.org/documents/Watershed_Counts_Report_2014.pdf). Luckily, Rhode Island is taking steps to reduce nutrient discharges and improve the health of Narragansett Bay, particularly the upper bay.

What is being done to improve wastewater treatment plants?

There are 13 wastewater treatment facilities in Rhode Island's Upper Narragansett Bay watershed, and all are required to reduce nutrient loading to the bay. These largest of these facilities are owned and operated by the Narragansett Bay Commission (NBC). NBC collects and treats sewage and stormwater from 119,000 households in Rhode Island at its Fields Point and Bucklin Point facilities. The facilities were not originally designed to remove nitrogen, a nutrient contributing to low oxygen in the bay, so the NBC recently invested $52 million to upgrade its facilities. The upgrades have allowed the NBC to reduce its summer nitrogen load by over 75% when compared to 2003, the year of the Greenwich Bay fish kill event. NBC's 2014 data showed some of the lowest nitrogen concentrations in the Providence River since the NBC started monitoring in 2007. The Narragansett Bay Fixed-Site Monitoring Network is instrumental in documenting these improvements

The NBC's other investment in improving water quality is its Combined Sewer Overflow (CSO) Abatement Project, which began in 2001. When intense rain falls in a short period of time, the system cannot accommodate the large volume and contaminated water spills into the bay before it can be treated.

But, NBC is working to fix that.

When NBC's CSO Project is complete, infrastructure will capture and store excess water during high volume rainfall events until the treatment facilities can treat it, and will have a hefty $1.36 billion price tag. Due to the size and cost of the project, it is being completed in three phases:

- Phase one was construction of a 3-mile long, 26-foot-wide tunnel under Providence that can store runoff. Cost: $360 million.

- Phase two included construction of pipes that connected to the tunnel. Cost: $187 million.
- Phase three, which was just approved in late April 2015, will be the construction of a second 3-mile long pipe from the Bucklin Point facility up the Seekonk River. Estimated cost: $815 million.

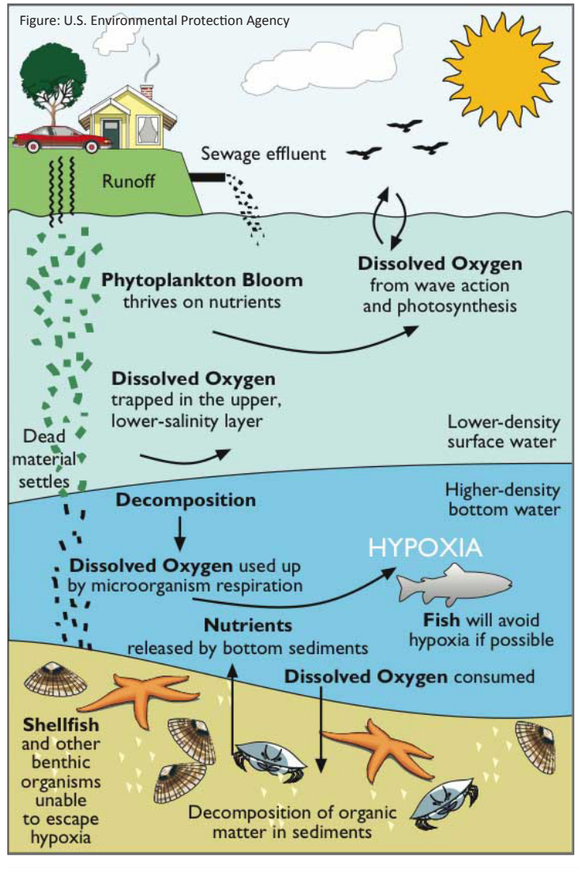
While ratepayers will see an increase in their average annual bill, costs will remain comparable with what households outside of the NBC service area pay. NBC supports the CSO Project as a balance between affordability and water quality improvements.

In addition, since over half of Narragansett Bay's watershed is in Massachusetts, upgrades to its wastewater treatment facilities are also being completed

Can anything else can be done?

While wastewater treatment plants are the largest contributor of nutrients that lead to low DO in Narragansett Bay, they are not the only source. Untreated stormwater runoff and on-site wastewater treatment such as septic tanks and cesspools are two examples of other sources. Solutions that reduce nutrient inputs from these nonpoint sources are often harder to develop and implement, but stakeholders in our watershed are thinking outside-the-box and have come up with some creative solutions.

Figure: U.S. Environmental Protection Agency



The Upper Narragansett Bay Water Quality Stakeholders Process was formed to review and evaluate these alternative, sustainable, ecosystem-based strategies to improve water quality in ways other than wastewater infrastructure, which include:

- **Promote shellfish/bio extraction**

Oysters, other shellfish, and macroalgae remove nutrients from the water, acting as natural scrubbers. Promoting the natural growth and aquaculture of these organisms may help contribute to nutrient reductions.

- **Tidal restriction/circulation improvements**

When low DO water is not flushed out and replaced with oxygenated water, the oxygen is used up by animals that live in the area. Removing constraints to flow in key areas can help contribute to fewer low DO events.

- **Stormwater management**

Stormwater runoff can carry nutrients and pollutants into the bay, and many of our coastal communities are not connected to larger treatment facilities such as NBC. Implementing stormwater best management practices to reduce runoff is something each community can do.

- **Wetland restoration and shoreline improvements**

Natural shorelines that are not hardened, such as wetlands, serve as valuable buffers that protect marine water quality and serve as habitat for fish and shellfish. Improving these habitats will improve water quality and protect economically valuable species at the same time.

- **Fresh water wetland buffer improvements**

Similar to saltwater marshes, wetlands along freshwater tributaries to Narragansett Bay serve as a buffer. Protecting these wetlands could help reduce nutrient inputs from the tributaries that flow into Narragansett Bay.

The stakeholder process is underway and experts from across the watershed are adding their valuable insights to determine how these options would actually be implemented on the ground, but it is abundantly clear that there is no silver bullet answer. Instead, an all-of-the-above approach is needed to improve marine water quality in the upper Narragansett Bay.

Photo: Ayla Fox

Watershed Counts 2015 Report Contributors

Watershed Counts relies on the participation of the member organizations and the people who generously contribute their time and expertise to make sure the information is current, accurate, and understandable. We thank the partners who contributed to the 2015 Watershed Counts report as well as those who were involved in the prior updating of indicators.

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Taunton Dam Removal—Fighting Floods and Freeing Fish
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Stairway to Spawning on the Ten Mile River
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Electrofishing in Our Urban Waters—It Is Shockingly Fun!
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Denise Poyer, Wood-Pawcatuck Watershed Association

Urban Trees—You Don't Know What You've Got Till They're Gone
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What Fish Are Safe to Eat in the Narragansett Bay Watershed?
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Sabin Point: Bringing the Beach to the City
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Urban Ports: Nowhere to Run To, Nowhere to Hide
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Photo: Ayla Fox

Watershed Counts Partners

The following partners are critical to the success of Watershed Counts. Please see links to partner websites here.

Aquidneck Land Trust
Audubon Society of Rhode Island
Blackstone River Coalition
Blackstone River Watershed Council / Friends of the Blackstone
Brown University
Buckeye Brook Coalition
City of Pawtucket
Clean Ocean Access
Clean Water Action
Conservation Law Foundation
EcoAsset Inc.
ecoRI News
Environment Council of Rhode Island
Friends of the Moshassuck
Grow Smart Rhode Island
Kickemuit River Council
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Massachusetts Department of Public Health
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Narragansett Bay National Estuarine Research Reserve
Narragansett Bay Estuary Program
Narrow River Preservation Association
Pawtuxet River Authority & Watershed Council
RI Coastal Resources Management Council
RI Department of Administration
RI Department of Environmental Management
RI Department of Health
RI Department of Transportation
RI Environmental Monitoring Collaborative
RI Land Trust Council
RI Natural History Survey
RI Nursery and Landscape Association
RI Resource Conservation & Development Council, Inc.
RI Rivers Council
RI Sea Grant
RI Water Resources Board
Salt Ponds Coalition
Save The Bay
Save The Lakes
Surfrider Foundation
South Kingstown Land Trust
Taunton River Watershed Alliance
Ten Mile River Watershed Council
The Nature Conservancy
The Pawtucket Foundation
The Rhode Island Foundation
The Trust for Public Land
Town of North Kingstown, Dept. of Planning and Development
Upper Blackstone Water Pollution Abatement District
UPP Arts
URI Coastal Institute
URI Coastal Resources Center
URI Cooperative Extension
URI Environmental & Natural Resource Economics
URI Graduate School of Oceanography
URI Watershed Watch
USDA Natural Resources Conservation Service
U.S. Environmental Protection Agency, Atlantic Ecology Division
U.S. Environmental Protection Agency, Region 1
U.S. Fish and Wildlife Service
U.S. Geological Survey
Washington County Regional Planning Council
White Memorial Conservation Center
Wood-Pawcatuck Watershed Association
Woonasquatucket River Watershed Council
Worcester Tree Initiative

NEIWPCC
New England Interstate Water Pollution Control Commission

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