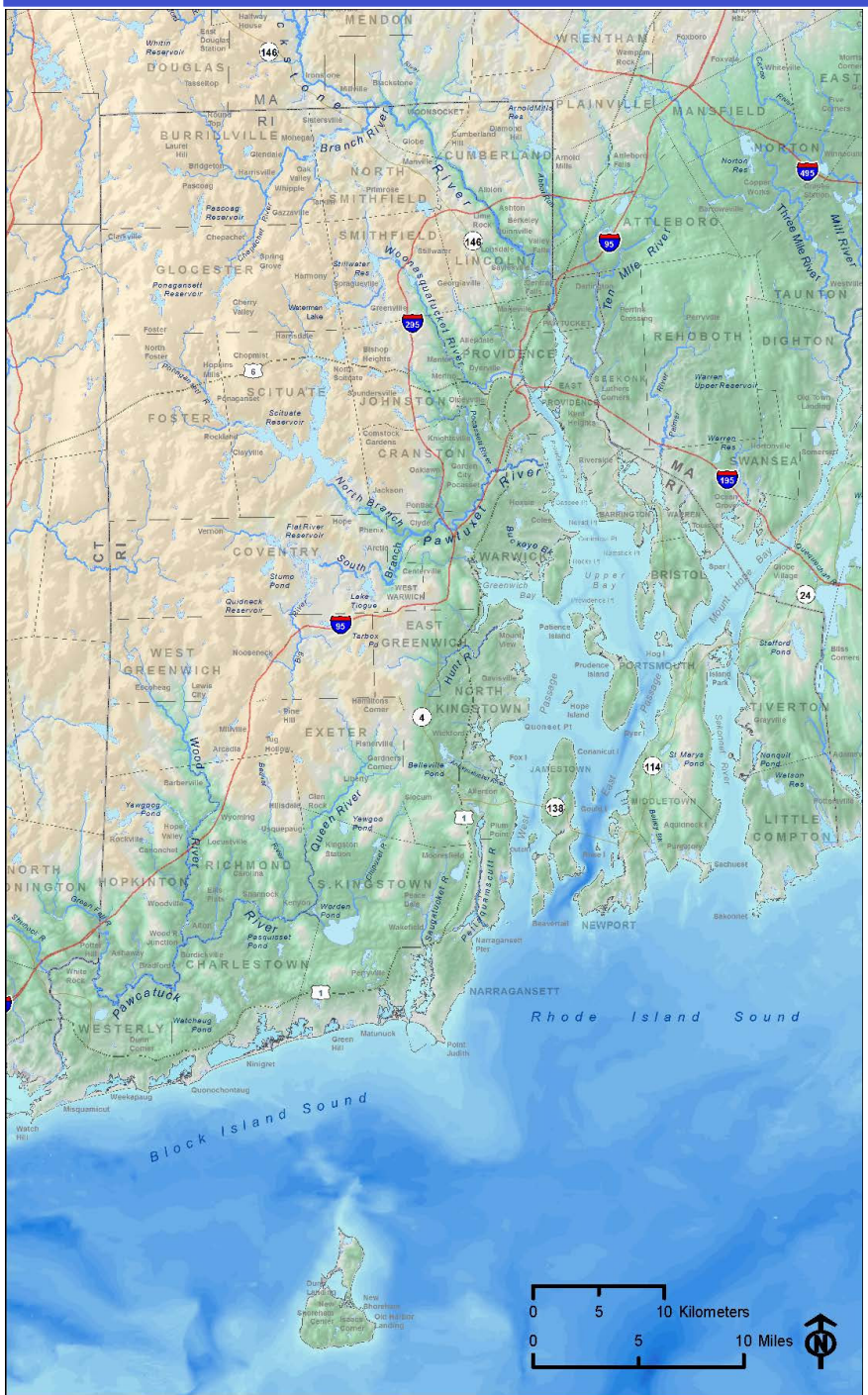
Rhode Island Bays, Rivers, & Watersheds Coordination Team



2013 Annual Report

Rhode Island Bays, Rivers, & Watersheds Coordination Team

Ames Colt (Chair)	RI BRWCT Chair Office of the Governor
Susan Kiernan	Deputy Chief of Surface Water Protection Office of Water Resources RI Department of Environmental Management
Thomas Uva	Director of Planning, Policy, & Regulations Narragansett Bay Commission
Jeff Willis	Deputy Director RI Coastal Resources Management Council
Jared Rhodes	Chief, RI Statewide Planning RI Division of Planning
Michael Walker	Senior Project Manager Commerce RI
Kathleen Crawley	Staff Director RI Waters Resources Board
Veronica Berounsky	Chair RI Rivers Council

Introduction

Rhode Island is a city-state wrapped around an estuary. Rhode Island's natural waters have governed its historical development, inspired its cultures, driven its economic development, and underpinned our quality of life. We appreciate how protection, restoration, development, and sustaining our natural waters will powerfully influence the future of Rhode Island. Our largest publics work projects are for water treatment and bridges spanning Narragansett Bay. Rhode Island hosts a multi-billion dollar tourism economy, much of it marine-oriented. Maritime commerce, recreational and commercial fishing and aquaculture, and maritime defense are major and vibrant sectors of Rhode Island's economy. Our marine and fresh waters present continual challenges and inspiration for our economy, our quality of life, and future opportunities for our children and grandchildren to live and prosper in the Ocean State.

RI Waters & Watersheds

- Rural watersheds & headwaters in western and southern RI
- Urbanized upper Narragansett Bay
- High quality lower Bay & ocean waters
- Salt Ponds
- High quality, abundant water supplies in northern RI
- Vulnerable ground and surface water supplies in southern RI
- Accelerating sea-level rise

Water resources are public trust resources. While many aspects of water resources management can be handled by private entities, and economic incentives for individual and collective behavior change may serve as important management tools, ultimately government must make and act upon critical policy and management decisions for water resources.

Numerous local, state, and federal executive authorities are charged with managing and sustainably developing water resources. These authorities rely upon shared, comprehensive networks of scientific, technical, legal, and socio-economic expertise. As water is fundamental to all aspects of life on earth and instrumental to economic health and community well-being, water resources management and sustainable development are complex and difficult public policy domains. In government and in our economy, we must continue to improve how we address, balance and integrate the positions and priorities of resource users, environmentalists, business interests, seasonal residents, and local communities. Such an "ecology of governance" requires a systems approach to policy, organization, and regulation such as those engendered in the principles of ecosystem-based management, as well as those inherent to strategic economic development.

RI Water Management Drivers

- Aging water supply, wastewater, and stormwater infrastructure
- Urbanized shorelines & watersheds
- Comprehensive shoreline growth management & water quality protections
- Municipal home rule authority
- Public support for high quality natural waters and resources
- Public resistance to new fees for water pollution control and infrastructure renovation
- Monitoring gaps and scientific uncertainties

These properties of water management and development create two significant challenges:

1. The articulation, integration and indefatigable pursuit of long-term strategic priorities; and
2. The design, coordination, and cost-effective operation of aquatic governance, development networks and institutions.

BRWCT Members

- Department of Administration (Planning)
- Department of Environmental Management
- RI Commerce Corporation
- Coastal Resources Management Council
- Narragansett Bay Commission
- Water Resources Board
- Rivers Council

Such challenges have no definitive, universally applicable solutions. But Rhode Island (and a few other states) recognizes their centrality and have taken concrete steps to address them head-on.[1] (The General Assembly utilized the Puget Sound Partnership as a model for the BRWCT.) In 2004, the Rhode Island General Assembly created the Rhode Island Bays, Rivers, and Coordination Team (BRWCT), a state interagency commission tasked with establishing and leading pursuit of the overall goals and strategies for the protection, restoration, management, and sustainable development of Rhode Island's fresh and marine waters and watersheds. The General Assembly recognized that no single agency (state, federal or local) has "the statutory authority to adequately address the full range of issues that pertain to the bays, rivers, and watersheds of Rhode Island", and declared that "the formation of an interagency group for the coordination of the functions, programs, and regulation that affect [these waters and watersheds] is the most effective way to transcend the limited responsibilities and jurisdictions of each agency, address complex issues using an ecosystem-based approach, and provide for continuity over time". [2]

Aquatic Pollutants & Sources

- Stormwater runoff
- Treated municipal sewage discharges
- Septic system & cesspool discharges
- Nutrients
- Pathogens
- Aquatic nuisance species
- Persistent organic contaminants
- Toxic metals

The BRWCT assesses and communicates how Rhode Island's water resources management authorities and programs (in partnership with local and federal governments) "add up", or conjoin into a coherent set of strategic policies, programs, and regulations. This 2013 BRWCT Annual Report provides both some insight into the "big picture" of water resources management and sustainable development in Rhode Island, as well as to report progress on projects that the BRWCT has funded and review progress on BRWCT responsibilities.

Our Water-Reliant Economy

- Recreation & Tourism
- Fishing & aquaculture
- Marine events
- Boat building, boat servicing, & boat related
- Shipbuilding
- Marine transportation
- Military
- Agriculture
- Research, technology development, & education

[1] The efforts of two other states are notable: the California Ocean Protection Council; and the Puget Sound Partnership in the State of Washington.
[2] RIGL 46-31-1

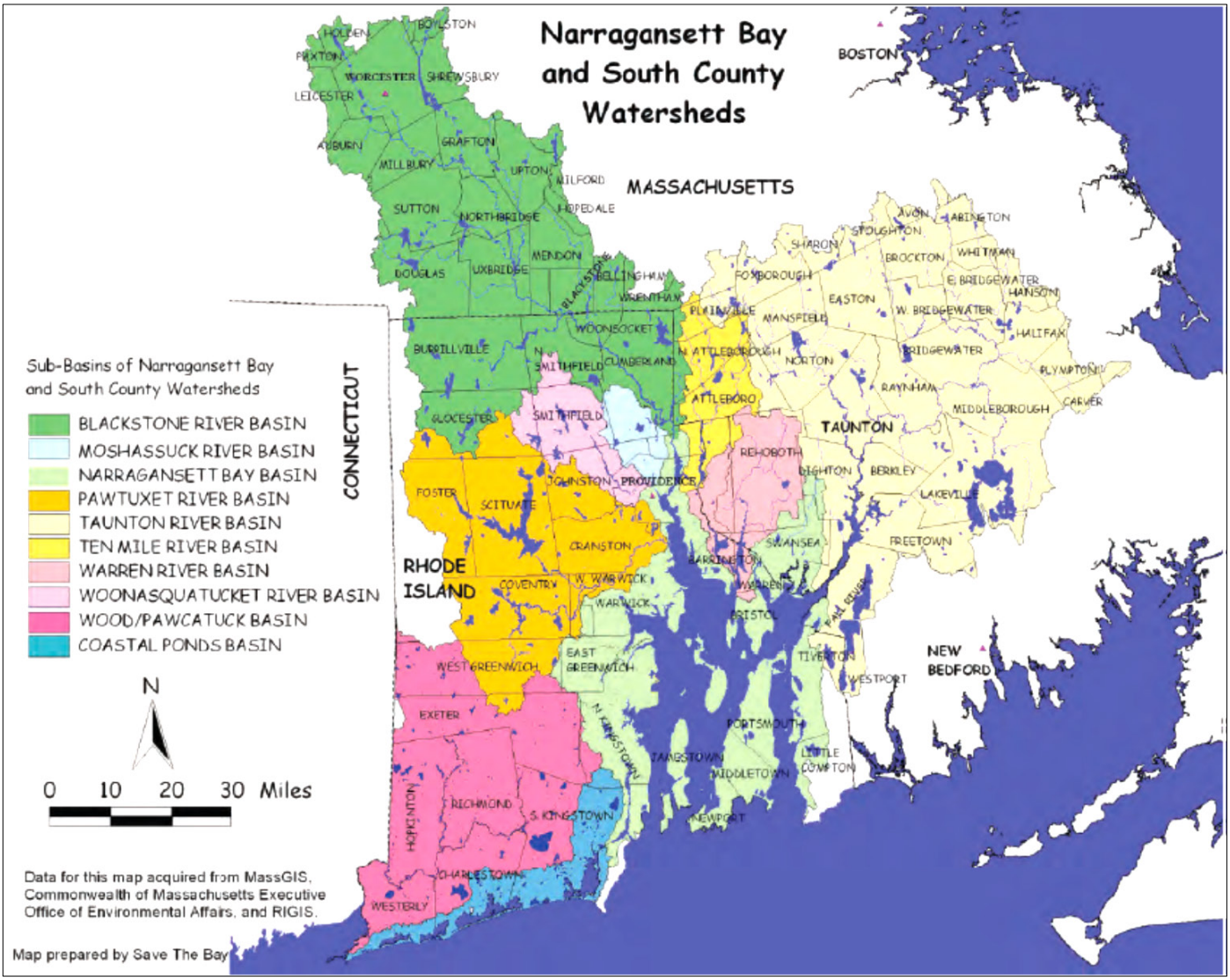


Figure 1: Narragansett Bay Watersheds and Municipalities (Save the Bay – Narragansett Bay)

BRWCT Planning and Reporting

The BRWCT develops and implements the **Rhode Island Bays, Rivers, and Watersheds Systems-Level Plan** (SLP). Under state law[3], the SLP establishes Rhode Island's "overall goals and priorities for the management, preservation, and restoration of the state's bays, rivers, and watersheds, and the promotion of sustainable economic development of the water cluster".[4] The first iteration of the SLP was completed in 2008 and its first major update is scheduled to

[3] RIGL 46-31-5(b).

[4] The "Water Cluster is . . . an economically interconnected grouping of businesses, institutions, and people relying directly or indirectly on the bays, rivers, and watersheds including, but not limited to, the following sectors: (i) Recreation, tourism, and public events; (ii) Fisheries and aquaculture; (iii) Boat and ship building; (iv) Boating-related businesses; (v) Transportation; (vi) Military; (vii) Research; and (viii) Technology development and education.

take place in FY 2015 (July 1, 2014, to June 30, 2016). The SLP consists of a comprehensive set of water resource protection, restoration, management, and sustainable development goals, policies, and strategies, categorized into eight Policy Domains:

- **Coastal and Waterfront Development**
- **Watersheds**
- **Water-Reliant Economy**
- **Natural Hazards**
- **Freshwater Supply**
- **Water Quality**
- **Fisheries & Aquaculture**
- **Aquatic Habitats & Invasive Species**

Appendix IV lists the goals the BRWCT articulated for each of the eight SLP policy domains. The BRWCT also established in 2008 twenty **SLP Implementation Priorities** (Appendix V). In 2013 and into 2104, the BRWCT has devoted funding and staff-time largely to six of these Implementation Priorities:

- **Stormwater Management**
- **Climate Change Adaptation**
- **Estuarine and Ocean Science and Management**
- **Freshwater Resources Management**
- **Aquatic Environmental Monitoring**
- **Water-reliant Economic Development**

The following sections summarize BRWCT efforts in 2013 with regard to these priorities, with reference to continuing BRWCT projects in 2014 and other state agency initiatives of particular relevance.

FY 2013 Projects and Initiatives

Stormwater Management

SLP Implementation Priority 5: *Significantly enhance stormwater control and management state-wide*

Stormwater runoff is precipitation that flows off of land or impervious surfaces and does not percolate into the ground. It accumulates debris, chemicals, sediment, and other pollutants and carries them into any waterbody whose shorelines lack adequate natural buffers and filters. Stormwater is a significant cause of water quality degradation or impairment for Rhode Island lakes, rivers, and streams, coastal and estuarine waters.

Given Rhode Island's development patterns, strategies to address stormwater management must involve both prevention of new stormwater runoff sources and the abatement of existing sources in urban areas. Stormwater regulations were first developed to address flooding and erosion issues. Today, growing recognition of how stormwater runoff degrades water quality spurred the development of stormwater pollution controls, with federal and state requirements for such controls coming into effect during the 1990's.

Stormwater runoff is managed via a multi-faceted regulatory system that includes individual stormwater discharge permits for certain types of facilities, general permits, and regional permits known as MS4s, which apply to municipal governments and state roadways. Federal and state requirements for local stormwater management are based largely upon best management practices. EPA is working to establish more flexible regulatory compliance agreements with states and municipalities.[5]

In January 2011, a major update to the Rhode Island Stormwater Design and Installation Standards Manual by the RI Department of Environmental Management (DEM) and the RI Coastal Resources Management Council (CRMC) came into effect. The revised Stormwater Manual institutes the application of Low Impact Development (LID) principles as the guiding approach to stormwater management in Rhode Island. LID strategies for stormwater entail major changes to how subdivision and commercial development will occur in Rhode Island with much greater use of infiltration and on-site treatment. LID strategies for stormwater management have been applied in Rhode Island for over ten years. For example, the Narragansett Bay Commission (NBC) has since 2003 required site developers to mitigate stormwater runoff through LID strategies and technologies.

Local governments with their land use authorities are central to successful stormwater management. Current management practices vary widely across RI cities and towns, with many municipalities lacking adequate staff or expertise. Inadequate maintenance and renovation of stormwater infrastructure, such as detention and infiltration basins are widely acknowledged problems. The challenge of good local stormwater management is made even harder by federal and state funding and technical support for local stormwater management that remains inadequate relative to overall need. A 2012 Clean Water Needs Survey conducted in Rhode Island identified stormwater facility costs eligible for federal and state funding totaling $58.3 million. This is likely a considerable underestimate of actual need given significant gaps in information regarding catchment basins and stormwater outfalls that have been prioritized for

[5] See EPA's Integrated Planning Framework at http://cfpub.epa.gov/npdes/integratedplans.cfm

remediation (For more information, see below for the description of the Municipal Mapping Assistance Program.).

Since 2011, the BRWCT has focused its efforts on identifying and cultivating additional funding sources for stormwater management at the municipal level. It has worked with Rhode Island municipalities to identify and develop stormwater management financing strategies that are feasible, equitable, and adequate. The BRWCT has funded stormwater utility district (SUD) feasibility assessments conducted by DEM's Office of Water Resources or independent contractors for select municipalities. An SUD feasibility analysis entails the following steps:

- Collect basic information regarding a municipality's stormwater program costs, stormwater and flooding concerns, capital and operating needs, and financing options.
- Generate an impervious cover GIS data layer for the municipality.
- Educate local stakeholders regarding the impacts and solutions to stormwater runoff and promote understanding of how local stormwater management can be better and more equitably financed.
- Provide tools to establish an SUD that fairly and adequately finances municipal stormwater management programs and infrastructure renovations.

Stormwater Utility District Feasibility Studies for the Middletown and West Warwick
BRWCT Project No.'s 13-6 & 14-9

Middletown
In 2011, BRWCT Intern Kate England working out of the DEM Office of Water Resources (DEM OWR) conducted an initial SUD assessment for the town of Middletown. In 2012, Middletown officials decided to build upon this Phase I assessment by requesting, in partnership with DEM OWR, BRWCT funding for a Phase II SUD feasibility assessment. The BRWCT agreed to do so and contracted with the consulting firm AMEC to conduct the work. The assessment culminated in late 2013 with a final report expected in early 2014. The Middletown Town Council will review the results of the project meetings and report in early 2014 and decide whether it will continue onto the final stages of a SUD development and implementation process.

West Warwick
In spring 2013, the BRWCT agreed to provide funding to the Town of West Warwick to conduct a Phase I SUD feasibility assessment, scheduled for completion in early 2014. West Warwick is considering an SUD in recognition of the urgent need for major renovations to its stormwater infrastructure, with an estimated backlog of $10 million in emergency stormwater infrastructure repairs needed in its historic downtown.[6] West Warwick is far from unique among RI cities and towns confronting major, pending stormwater infrastructure repairs and renovations. West

[6] Personal communication; Fred Presley West Warwick Town Manager

Warwick completed its Phase I assessment in December 2013 with issuance of a final report. It is current discussing with DEM OWR and the BRWCT a second grant from the BRWCT to move into a Phase II SUD feasibility assessment.

Handbook on the Municipal Stormwater Management District Enabling Law: Conservation Law Foundation
BRWCT Project 13-7

With a small grant from the BRWCT, the Conservation Law Foundation-Rhode Island (CLF-RI) developed and issued in May 2013 a Guidance Manual on establishing SUD's in Rhode Island entitled, *Stormwater Management Districts in Rhode Island: Questions and Answers*. The Manual was written to address common legal questions that will arise when a RI municipality begins to exercise the authority granted to it under the RI Stormwater Management and Utility District Act of 2002. Important questions that must be addressed on a case by case basis include: what is the scope of municipal authority regarding SUDs? How should a municipality utilize an SUD to finance its particular stormwater management needs? The BRWCT funded development of this manual to supplement and bolster the support it has been providing to individual municipalities to assess the feasibility and design of SUDs.

Key Recommendations for Municipal SUD Development

- SUD fees are highly likely to survive any legal challenge based on the argument that the fees are an illegal tax.
- An SUD may adopt a fee system based on units approximating a property's impervious surface.
- An SUD may only charge fees to properties that discharge to a "stormwater conveyance system" located within the SUD's boundaries.
- A stormwater conveyance system may be defined to include streets, roads, and lawns.
- Because stormwater pollution is more a watershed problem than a municipal problem, municipalities should work together to create watershed-based SUDs.

This manual highlights several important issues regarding the strengths and limitations of the state's municipal SUD enabling law. For example, § 45-61-4 states that a "fee system shall be reasonable and equitable so that each contributor of runoff to the system shall pay to the extent to which runoff is contributed . . . . This key sentence in the statute is very broad and requires additional analysis in order to determine exactly the type of SUD permissible under state law. The manual thus provides an in-depth discussion key terms such as "reasonable and equitable" and "system". It concludes for example that "system" in this use should be defined as a "stormwater conveyance system", and that it may be broadly defined to include streets, roads, and lawns. This is clearly a key determinant for determining which properties would be subject to a stormwater utility fee. Finally, the manual reviews the differences between a utility fee and a municipal tax, an issue that comes up repeatedly in public discussions.

Another important issue highlighted by the manual is the exemption from paying municipal stormwater utility fees it provides to state agencies. This is important because state roads in many municipalities are major sources of stormwater runoff. Without this state agency exemption, The RI Department of Transportation would likely be liable for substantial

stormwater utility payments. However, the 2002 Act does require to: "cooperate with the municipalities in the planning and implementation of [stormwater] management ordinances, including the providing of funds, if available, to match the fees collected by the municipalities annually".

Statewide Impervious Cover Analysis: Statewide Planning and DEM
BRWCT Project 13-5

In 2013, a BRWCT-funded project led by DEM's Office of Planning and Development, the US Geological Survey (USGS), and the Office of Statewide Planning's Geographic Information System (RIGIS) was completed, updating to 2011 the state's GIS data layer for impervious surfaces. This update of the state's impervious cover GIS data layer update represents a major improvement in the accuracy of impervious cover down to the municipal level, aiding in the advance of stormwater management programs, including the development of SUDs. The impervious surfaces datalayer can be found in the RIGIS Geospatial Data Catalog under Environment and Conservation.

But this BRWCT grant leveraged additional, significant benefits to the state. With funding from US Fish and Wildlife, Rhode Island first acquired Summer 2010 and Spring 2011 aerial photography for the entire state in true color and near infrared. This raw data was then utilized to identify the location and areal extent of RI's major ecological community types, and linking that GIS analysis to population data for the state's "species of greatest conservation need" (GCN) as documented in the RI Wildlife Action Plan (which is being updated). Mapping ecological communities, vegetation, and habitat types begins with identifying all "impervious hardscapes", then working outward to map all development or human disturbance on the land and then finally categorizing what is left into the natural land-cover categories.

Therefore, BRWCT's grant to characterize impervious hardscapes leveraged several hundred thousand dollars from RI Statewide Planning and US F&W State Wildlife grants to create a complete statewide update of impervious surface and land-use change, plus an unprecedented look at the state's natural land cover/ecological community types.

This GIS analysis also provides important support for the project "Rhode Map RI" whose goal is to "strengthen Rhode Island's economy, meet current and future housing needs, and plan for future growth through the development of an integrated plan [that will consist of] strategies for transportation, land use and environmental protection."

These are the kind of benefits that the BRWCT grant program provides; BRWCT grants are targeted investments made flexibly and quickly, and serve as critical sources of state match required to leverage significantly larger grants from federal agencies, foundations, and other sources.

Upper Narragansett Bay Regional Stormwater Utility Feasibility Study: DEM and the City of Providence

BRWCT Project 14-6

While most Rhode Island municipalities lack adequate funds to address their stormwater management needs, many express interest in establishing financing mechanisms that will enable them to meet those needs, including the City of Providence and its adjacent upper bay municipalities. Faced with federal and state requirements to expand their stormwater management programs and begin renovating obsolete urban stormwater infrastructure (in order to address water quality impairments due to pathogens in urban rivers and the upper bay), Providence and six other municipalities[7], working with DEM OWR, received a multi-year grant from the BRWCT to conduct an inter-municipal SUD feasibility assessment. Substantial economies of scale could be captured if the seven municipalities created a single SUD in order to finance stormwater management across their jurisdictions. In addition to major stormwater infrastructure renovation needs, these municipalities need to significantly increase programs in catchment basin cleaning, street sweeping and infrastructure maintenance.

Phase I of this inter-municipal study was funded directly by a grant from DEM OWR and was completed in January 2014 with the final report due in early March 2014. Phase II of the study, funded by a $150,000 grant from the BRWCT will take place from August 2014 to June 2015. Six of the original municipalities have committed to continuing with Phase II.[8] The first phase broadly characterized stormwater issues and costs in each municipality, and explored the organizational, programmatic and legal aspects of a regional stormwater management authority. Phase II will entail a more comprehensive study of the following functional areas:

- Stormwater management needs
- Utility organizational design and legal considerations
- Alternative finance strategies
- Stakeholder and public engagement and education
- Implementation issues such as billing, customer service, and administration

Developing support for a regional SUD require long-term efforts to educate and cultivate support among local officials, community leaders, and residents. Because participation in the feasibility study and a future SUD will need to be approved by each local city and town council, local advocates with support from the Rhode Island Foundation are working to appraise elected officials about the benefits of investing in stormwater management.

[7] The municipalities participating in Phase I of the study were: Central Falls, Cranston, East Providence, Johnston, Lincoln, North Providence, Pawtucket, Smithfield, Warwick, and Cumberland.

[8] Only North Providence chose not to continue into Phase II.

The effort to date has been surprisingly successful in motivating the six municipalities to seriously consider develop a single, inter-municipal utility and stormwater management program. This does not in any way alleviate the fundamental challenge of persuading the public to pay for better stormwater management and infrastructure. But the project will provide clear, detailed justifications for the need to do so and help the municipalities and their constituents take the next steps in improving their stormwater management efforts even if SUDs are not embraced immediately.

Related Initiatives

Municipal Mapping Assistance Program: DEM Office of Water

Despite the enormous size, age, and complexity of the subsurface stormwater conveyance infrastructure beneath all of our roads and cities, very little is known about this infrastructure (such as surveying the extent and location of catchment basins that connect to a polluting stormwater outfall that is responsible for impaired water quality in, say, the Woonasquatucket River). This in turn hinders the development of the most cost-effective stormwater control strategies, or even developing credible cost estimates of what is required to repair and renovate failing stormwater infrastructure.

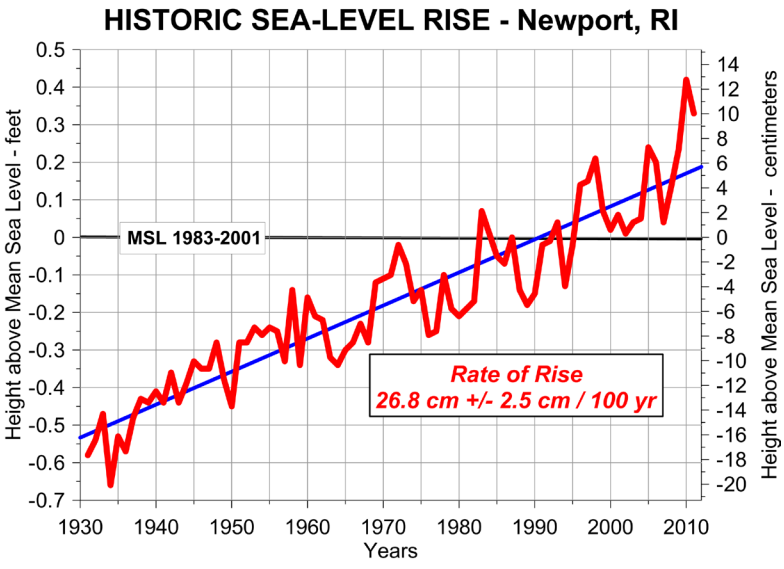
DEM OWR and municipal departments of public works are well aware of these major information gaps and have taken steps to address them. 2013 was the second year of DEM OWR's of Municipal Mapping Assistance Program (MMAP), a collaborative effort by DEM, RI Department of Transportation, the URI Coastal Institute, EPA Region I, and several RI municipalities to develop geospatial information on stormwater drainage systems that discharge into the Woonasquatucket River. In 2012, MMAP was funded by DEM and provided assistance to the Town of Johnston with help from the above project partners and the Town of Smithfield. In 2013, MMAP worked with the Town of North Providence with help from the Town of Jamestown, and the Narragansett Bay Commission (NBC), and funding from the URI Coastal Institute. As a result, Johnston and North Providence were able to develop accurate, GIS-based maps of selected stormwater catchment basins relying upon MMAP summer interns. Developing such geospatial data is required to comply with Rhode Island's Stormwater Management General Permit. The projects also fueled the development of valuable survey and GIS database development techniques that other municipalities will be able to utilize. However, given the enormous size of these infrastructures, the paucity of historic data on how their design and functions, two summer survey projects barely begin to develop the comprehensive geospatial data that, over time, must be established and maintained for the Providence municipal region and other urbanized areas around the state.

Climate Change Adaptation

SLP Priority 1: *Support and advance special area management planning for critical coastal regions in accordance with the 2006 CRMC Marine Resources Development Plan.*

SLP Priority 4: *Adapt current and design future waterfront infrastructure to accommodate sea-level rise.*

Figure 1: Difference between average sea level at Newport, R.I., from 1983 to 2001 and mean annual sea level plotted for each year between 1930 and 2011. The blue trend line shows a 10.6 inch (26.8cm) increase in sea level per century. *Graph courtesy of Jon Boothroyd, 2012. Data from: http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8452660*



The impacts of climate change upon Rhode Island's built and natural environments are wide-ranging, discernible, and growing in severity. Rhode Island will experience stronger, more frequent hurricanes and Nor'easters, increased numbers of other extreme weather events such as heat waves, and rapid alterations to terrestrial and aquatic ecosystems and the natural resource values they generate and sustain.

Locally, nationally, and globally we are just beginning to experience the impacts of a climate (and ocean) disruption. Yet average air temperatures have already increased by 1.7°F from 1905 to 2006, and Narragansett Bay has warmed by four degrees °F at the surface since the 1960s. Southern and inland regions of the Northeast now experience up to 20 days of temperatures above 90°F each year, with about two days above 100°F in urban regions. Average sea level has risen ten inches since the 1930's, and the rate of sea level rise is accelerating (Figure 1). The frequency of intense rainfall events is increasing, while hot and dry spells are lengthening.

We are beginning to discern the impacts of climate change upon Rhode Island's economy and natural resources. Rhode Island farmers are experiencing lengthened seasons but less predictable rainfall. The most common fish species in Narragansett Bay are shifting from cold-water, bottom-dwelling species to warm-water, water column species. Increased jellyfish populations and more frequent large algal blooms are threatening the quality of outdoor recreation in Narragansett Bay and other RI marine waters, activities essential to Rhode Island's tourism and boating industries. Ocean acidification has emerged as a significant risk posed by unchecked global carbon dioxide (CO_2) emissions. Many of these climatological, oceanographic,

ecological, and economic changes and transformations are occurring more rapidly than anticipated. Climate change thus poses significant risks for Rhode Island's water supply and wastewater infrastructures and utilities, our natural environment, and our health, welfare, and economic well-being.

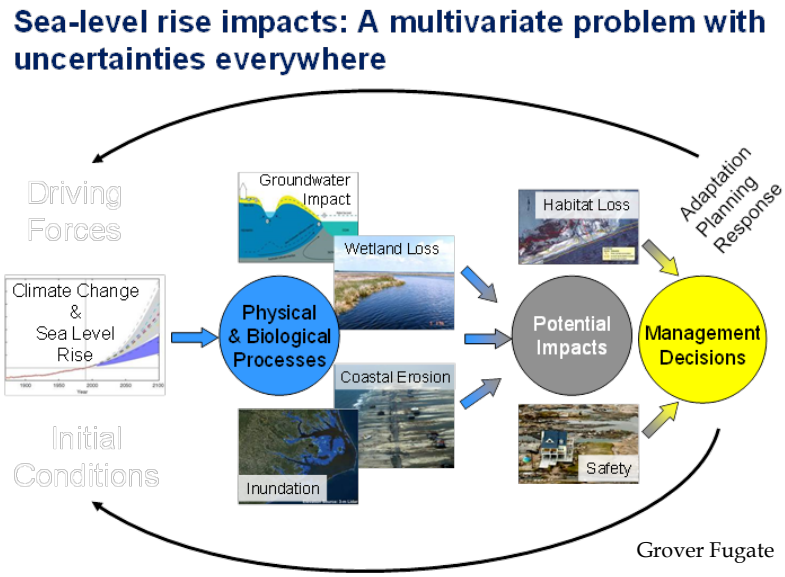
In the 2008 SLP, the BRWCT called for a ratcheting up of state planning and policy development efforts to address climate change adaptation and mitigation. The SLP states:

> *The impacts of climate change will be felt throughout Rhode Island's aquatic environments and water-reliant economy, including watershed and river systems and communities. Agencies and individuals in state, local and federal government face unprecedented policy and regulatory challenges in collaboratively, strategically, and rapidly responding to climate change in order to prepare Rhode Island and Rhode Islanders for what lies ahead. Controlling and adapting to climate change, sea-level rise, and the intimately related issues of energy resource development, generation, and consumption, necessitates a systems approach to aquatic and coastal resources management, protection, and sustainable development.*
>
> (SLP p. 7)

A significant portion of the climate change adaptation challenge facing Rhode Island entails its water resources and shorelines. The BRWCT is currently funding and implementing two major climate change adaptation projects described below. The BRWCT Chair also sits on the RI Climate Change Commission and was instrumental in producing the Commission's first Annual Report in 2012.

The Shoreline Change Special Area Management Plan: CRMC, URI Coastal Resources Center, URI College of Environment and Life Sciences
BRWCT Project 13-4

In April 2013, with $150,000 in funding from the BRWCT, the CRMC and The Coastal Resources Center at the University of Rhode Island launched the Shoreline Change Special Area Management Plan (SAMP), aka the Beach SAMP. The RI Beach SAMP is a multi-year, statewide coastal planning exercise designed to help Rhode Island, municipal governments, and federal agencies determine the type and scope



Grover Fugate

of potential threats from sea-level rise[9], shoreline erosion, and increased storminess to public and private coastal infrastructure. With a scheduled completion date of December 2016, it is focusing first upon Rhode Island's south shore, eventually addressing the entire Rhode Island shoreline. The legal ramifications of intensified shoreline erosion and inundation remain incompletely understood within local and state permitting processes. When development in high hazard areas is allowed to go forward, municipalities and state and federal governments incur long-term obligations to build or maintain public infrastructure already in place in these areas. Vulnerable shorelines will still retain significant real estate value because people want to live and recreate on the shore regardless of the risks of doing so. And, significant tensions between public and private rights will remain with regard to developing and managing shorelines.

Inadequately preparing and planning for coastal change will have significant consequences: massive changes and losses coastal real estate markets due to physical impacts and ballooning property insurance costs, erosion of local tax bases, damage and losses to coastal economies (responsible for up to 60% of US gross domestic product).

Rhode Island has about 20-50 years to institute major changes to how we live and work along the shore. If concerted preparations do not commence now, the state's adaptation choices will steadily diminish in number, feasibility, and affordability. The tools we need to adapt do not exist today in useful form. We urgently need big ideas that can be applied relatively rapidly at local, regional, and national scales. In response, the University of Rhode Island (URI) is working with CRMC to establish a URI Coastal Adaptation Innovation Center. This Center will work to provide solutions across science, planning, engineering, policy, law, economics, and business development.

Cascading Risks posed by Sea Level Rise and Shoreline Erosion

- Massive losses in many coastal communities of key economic assets causing dislocations in local economies.
- Significant losses in job related tax dollars due to loss of key economic assets.
- Declining municipal tax base as real estate markets react to increased property insurance costs and the realization of wide spread property losses.
- Municipalities in turn forced to make up revenue in unaffected areas which are less affluent.
- Municipal financial losses will cascade up to state government budgets and engender significant economic dislocations locally and statewide.

The Beach SAMP is conducting significant local education, outreach, and communication initiatives in order to help the general public understand and support the imperative of proactive coastal climate change adaptation. The Beach SAMP will also develop model planning tools and policies for municipalities and the state. The goal is to produce a plan that will guide CRMC's decisions into the future, but also to help other state and federal agencies, municipalities, the public, and

[9] It is the policy of CRMC to "accommodate a base rate of expected 3-5 foot rise sea level rise by 2100 in the siting, design, and implementation of public and private coastal activities".

the private sector develop solutions to the tremendous challenges we face on the shore in the coming decades.

DEM and Statewide Planning: Assessing Climate Change Risks for RI Wastewater Treatment Facilities
BRWCT Project 13-3

Climate change and sea level rise pose substantial risks for Rhode Island wastewater collection and treatment infrastructure. These risks stem from increased storm and precipitation frequency and intensities, sea level rise, and storm surge. For example, wastewater infrastructure will need to handle increased "flashiness" of southern New England rainfall patterns as well as increased rates of sea level rise and storm related flooding. In New England, the frequency of intense rain and snow storms are estimated to have more than doubled from 1948 to2011.[10] In 2014, RI BRWCT will commence a project led by DEM OWR and the Office of Statewide Planning to comprehensively assess the vulnerability of RI wastewater treatment facilities to climate change and sea-level rise, and to scope out climate change adaptation recommendations.

Climate change will affect both physical and operational aspects of wastewater treatment. Wastewater treatment facilities and critical collection system components such as pump stations tend to be located in low-lying coastal and riverine waterways. This project will evaluate physical and operational impacts to wastewater treatment, identifying vulnerabilities and adaptive strategies for individual treatment facilities and components. Adaptation strategies will include both short- and long-term actions for treatment infrastructure and operations to improve reliability and resilience under changing climatic and oceanographic conditions.

This assessment will employ existing data and reports to summarize the current state of climate change science and characterize potential risks to: (i) Rhode Island's nineteen major wastewater treatment facilities; (ii) vulnerable wastewater collection systems that service these facilities, including pumping stations or wastewater collection lines prone to flooding or storm surge; and (iii) the Narragansett Bay Commission's combined sewer overflow abatement tunnel system.

The project will be launched in the spring of 2014 and completed in 2015. It will dovetail with the RI Department of Health's recent SafeWater RI project, an assessment of climate change risks and adaptation for drinking water supplies and infrastructure.

[10] Environment America. 2012. Global Warming and the Increase in Extreme Precipitation from 1948-2011.

Estuarine and Ocean Science and Management

SLP Strategy 13.4.5*: Evaluate ambient and watershed-scale water quality conditions to track consequences of wastewater treatment facility upgrades for biological nutrient removal.*

SLP Priority 19: *Rebuild fisheries stocks in conformity with state and federal law.*

Hypoxia is the depletion of dissolved oxygen concentrations in natural waters to levels (< 3 mg/l) that "profoundly affect the health of an ecosystem and cause physiological stress, and even death, to . . . aquatic organisms"[11]. Hypoxia is a major cause of water quality impairment in upper Narragansett Bay and embayments such as Greenwich Bay (other major impairments to Narragansett Bay water quality are bacterial contamination and nutrient enrichment) and occurs annually during warm weather months in the upper and mid-bay regions.

In the mid-1990s, the DEM Office of Water (DEM OWR) began to mandate reductions in nitrogen loadings to Narragansett Bay from major point sources in response to persistent hypoxic conditions in upper Narragansett Bay. In 2005, OWR issued a plan to reduce by 50% nitrogen loadings from eleven municipal wastewater treatment plants (WWTFs) that discharge into Narragansett Bay or its tributaries. DEM has issued revised permits with seasonal effluent limits ranging from 5-8 mg/l of total nitrogen to ten of these eleven WWTFs.

DEM OWR, with support from EPA and the scientific community, continues to pursue an adaptive approach to nutrients management that phases in necessary nutrient reductions in accordance with comprehensive monitoring and assessment of water quality conditions in the upper Bay. The BRWCT, beginning in 2014, will implement a technical stakeholders process to examine in detail the design and feasibility of alternative nutrient reduction strategies, including shellfish restoration and aquaculture, modifications to upper bay circulation processes, land-based stormwater control technologies, constructed wetlands, and fertilizer application controls.

URI Graduate School of Oceanography: Coastal Hypoxia Research Program
BRWCT Project 12-4

A key research topic is how upper Narragansett Bay will respond to the seasonal reductions in nutrient discharges from municipal sewage plants discussed above, particularly with regard to reduced occurrences of hypoxia. In 2011, the BRWCT agreed to fund ($25,000 annually for four years) a research project entitled the "**Observations and Modeling of Narragansett Bay Hypoxia and Its Response to Nutrient Management**," being conducted by a URI Graduate School of Oceanography research team in partnership with the Center for Sponsored Coastal Ocean Research (CSCOR) of the National Ocean and Atmospheric Administration. This project

[11] National Science & Technology Council. 2003. An Assessment of Coastal Hypoxia and Eutrophication in U.S. Waters.

advances scientific understanding of nutrient loading and water circulation in Narragansett Bay as drivers of hypoxia in Narragansett Bay and embayments such as Greenwich Bay.

Southern New England Lobster Monitoring: DEM Division of Marine Fisheries
BRWCT Projects 12-5 & 14-1

The commercial lobster fishery is Rhode Island's most valuable fishery with a total landed value of $12.4 million in 2010. It is also a fishery in peril, given that the southern New England lobster stocks are low in overall abundance, spawning stock biomass, and recruitment.[12] In 2006, a regional ventless trap survey[13] began to estimate the abundance and recruitment for lobsters in the coastal ocean waters of New England and New York. Ventless traps may be set in any type of benthic habitat and they prevent the release of undersized lobsters. Thus, ventless trap surveys fill an important data gap in that they are able to sample rocky habitats and undersized lobster. The regional survey provides critical support to lobster stock assessments conducted by the Atlantic States Marine Fisheries Commission. Additionally, ventless trap surveys are performed in collaboration with commercial lobstermen, boosting the industry's understanding and support for the science and monitoring data underlying regional lobster stock assessments.

Unfortunately, by 2012 previous sources of funding for Rhode Island's portion of the ventless trap survey had been exhausted or terminated. Therefore, the DEM Division of Marine Fisheries (DMF) requested BRWCT support for Rhode Island's portion of the regional lobster ventless trap survey. The BRWCT agreed to do so in 2012 and again in 2013. The lobster industry continues to strongly support the continuation of the ventless trap survey as the "primary abundance-monitoring tool" for lobster and the RI Congressional Delegation working with other New England state delegations has managed to restore federal funding for this important survey program. This should free up BRWCT funds for other monitoring priorities in the future.

[12] RI DEM Div. of Wildlife and Marine Fisheries, 2014 Sector Management Plan for the Crustacean Fishery.
[13] "Ventless traps" capture all lobsters that enter them.

Freshwater Resources Management

SLP Implementation Priority 17: *Integrate management of land use and water use, and promote water use efficiency and conservation.*

SLP Implementation Priority 20: *Restore a diverse array of fresh and marine aquatic habitats.*

SLP Implementation Priority 7: *Identify and implement pollution abatement actions necessary to restore water quality in impaired waters.*

SLP Strategy 10.1.3: *Maintain the state's streamflow gage network, and expand as needed to fill critical data gaps as resources allow.*

Freshwater Resources Monitoring by USGS, WRB, and DEM
Project No's 07-1, 09-1, 10-1, 11-4, 12-2, 13-2, & 14-2

Ecosystem-based management requires extensive monitoring and research on the functions and dynamics of complex, inter-related natural and social systems. Monitoring sustains and guides all aspects of environmental management, from air and water quality protection, to fish and wildlife management, to watershed planning and community development. Monitoring generates insight into progress toward environmental protection, conservation, and restoration goals established in federal, state, and municipal law. Without an unwavering commitment to monitor our natural environments and their human uses, we will not be able to characterize accurately and respond cost-effectively to current and future environmental and socio-economic risks to RI's natural environment and resources.

The monitoring and assessment of quantity, flow, and quality of Rhode Island's freshwaters underpin most aspects of their preservation, restoration and multiple use management. Since 2007, the BRWCT has provided critical funding for Rhode Island's most important ambient water monitoring programs and will continue to do at least through 2014. The data produced and disseminated from these programs is used by numerous state and local authorities for water quality management, drought response, flood control, habitat restoration, and water supply.

In 2013, BRWCT funds were utilized to operate water quality monitoring stations on large rivers, groundwater level observations, and continuous streamflow gages. Support for these monitoring programs, which are contracted out to the US Geological Survey, represents the single largest, multi-year investment made by BRWCT, with over $1.728 million provided since July 2006, 58% of total BRWCT expenditures (see Appendix II).

Related Initiatives

Managing Lakes and Ponds: Invasive Plants and Water Quality
In February, 2012, DEM released a report to the Governor and the General Assembly entitled:

Rhode Island Freshwater Lakes and Ponds: Aquatic Invasive Plants and Water Quality Concerns. The report notes that 63% of total assessed lake and pond acreage suffered from one or more water quality impairments; the most important cause of impairment is aquatic invasive plants, but also fish tissue contamination (mercury), nutrients, metals, and pathogens. The report also identifies the emergence of blue-green algal blooms as a growing water quality problem, likely aggravated by increasing water temperatures due to anthropogenic climate change and to nutrients discharges from septic systems and stormwater.

The report recommends the creation of a lakes management program at DEM to promote lake stewardship and work with lake associations and related interests to address the most pressing water quality and aquatic invasive plant concerns in Rhode Island's lakes and ponds. The BRWCT has continued to work with DEM's Office of Water Resources and the statewide non-profit Save the Lakes to cultivate the legislative and public support required to establish a new lakes management program for Rhode Island.

Water-Reliant Economic Development

SLP Goal 6: Boatbuilding, Shipbuilding, and Boating- Related Businesses. *Ensure that Rhode Island continues to be a world leader in marine trades.*

Commerce RI: Assessing the Economic Benefits of Large Marine Events in Rhode Island
Project No. 13-1

In 2012, the BRWCT agreed to fund a RI Commerce Corporation (RICC) proposal to develop a state-of-the-art model for assessing economic benefits generated by large marine events (LME) such as the America's Cup World Series Regatta, July 2012 in Newport. RICC frequently reviews proposed large marine events and needs independent means to assess the economic benefits a proposed event would generate, without which it is difficult to compare and manage multiple event proposals or to strategically invest in major event venues. This report has provided important guidance to how Rhode Island invests in infrastructure and other capabilities intended to enhance the quality, diversity, and economic benefits of large marine events and related tourism and boating sectors.

The RI Marine Cluster

Rhode Island hosts one of the world's most competitive marine clusters. The Rhode Island Marine Cluster is defined as an interconnected grouping of firms, institutions, and people all relying directly or indirectly on Narragansett Bay and the marine resources of Rhode Island. The Rhode Island Marine Cluster is comprised of eight sectors: marine recreation, tourism & events, fisheries & aquaculture, boatbuilding, boating-related businesses, shipbuilding, marine transportation, military, and marine research, technology development and education.

- The Marine Cluster, RI Senate Policy Office

In February 2013, the Commerce RI released the final report entitled "Large Marine Events Benefits Assessment Modeling Report". The bulk of the study was devoted to assessing the economic benefits generated by the America's Cup World Series Regatta held in Newport, July

2012. It has subsequently been used repeatedly by Sail Newport as a definitive assessment of the suite of economic benefits large yachting events can generate for the City of Newport and the State of Rhode Island.

Economic Benefits Generated by America's Cup Regatta, July 2012

- $38.2 million in sales for Rhode Island businesses
- Supported 345 jobs earning income of $12 million
- $2.5 million in sales tax revenues
- 65,000 attendees/viewers of the Regatta and related events
- $20 million in spending by out-of-state visitors

The Rhode Island Environmental Monitoring Collaborative

Established in 2004 by the Comprehensive Environmental and Watershed Monitoring Act (R.I.G.L. § 46-31), the Rhode Island Environmental Monitoring Collaborative (RIEMC) consists of executive agencies, university-based programs, non-governmental organizations, and other monitoring stakeholders. The RIEMC ensures that critical aquatic and terrestrial monitoring, including long-term programs and specialized projects, is implemented through its member organizations and partners. The RIEMC reviews and disseminate information regarding the state's environmental monitoring initiatives, establishes statewide priorities for monitoring (the 2012 RIEMC Summary Report lists twenty-one monitoring priorities for Rhode Island), assembles a Comprehensive Environmental Monitoring Strategy based upon those priorities, and supports field program coordination to optimize deployment of staff and equipment.

The RIEMC operates as a standing committee of the BRWCT. Rhode Island has numerous unmet environmental monitoring needs, and concern is growing that many invaluable long-term monitoring programs are threatened with termination. The BRWCT is not currently in a position to allocate sufficient funds to maintain current environmental monitoring programs, address major monitoring gaps (such as fish tissue contaminant levels), and help Rhode Island take advantage of advances in environmental monitoring technology, data analysis, and public communications.

Since 2006, as previously discussed, the BRWCT has provided "stop-gap support" to some environmental monitoring programs such as the RI Stream Gage Network, large river water quality monitoring, and groundwater level observations. Unfortunately, the BRWCT's capacity to fund state environmental monitoring remains small relative to overall need. Relying solely upon the BRWCT to plug growing funding gaps will result in only a few of Rhode Island's

critical environmental monitoring needs being met, and will limit the BRWCT's ability to direct funds flexibly to key management and sustainable development priorities.

The BRWCT and the RIEMC are working closely together to continue development of a Comprehensive Environmental Monitoring Strategy, and increase input from the RIEMC on the allocation of BRWCT funding to environmental monitoring needs. While development of a Comprehensive Environmental Monitoring Strategy remains a work in progress, key parts of the Comprehensive Environmental Monitoring Strategy exist across state and federal agencies. This strategy would provide a framework to coordinate monitoring for water quality protection, water pollution control, fisheries and wildlife management, habitat restoration, coastal zone and watershed management, public health, and natural hazards response and recovery. It would promote in-depth evaluation of the status and well-being of Rhode Island's natural environment, promote public education and management support via initiatives such as Watershed Counts, and increase the utility of monitoring data and findings for long-term water resources policy, planning, and management.

Conclusion & Next Steps

The BRWCT continues to evolve as a water resources planning and management institution. Since its creation in 2004, the BRWCT has successfully promoted inter-agency coordination for water resources management and sustainable development, and invested in and facilitated numerous projects that the BRWCT agencies have developed and pursued together. From 2008 to 2013, the BRWCT agencies have invested collaboratively over $3 million in key management needs (Appendix II). These investments have filled critical programmatic and funding gaps in core agency programs.

The BRWCT has deliberately kept its staff costs as low as possible in order to maximize the support it can provide to critical agency and state needs, performing its administrative, planning, and advisory functions with just 1.5 FTE's. The BRWCT and its standing committees have successfully developed ongoing interagency and broad stakeholder opportunities and discussions, including the 4-5 meetings per year of the BRWCT, as well as 2 meetings per year of the RIEMC, and meetings other standing committees.

The BRWCT Chair participates and facilitates other important water resources planning and advisory functions including the Narragansett Bay Estuary Program, the Technical Committee of the State Planning Council, the Northeast Regional Ocean Council, the Rhode Island Climate Change Commission, and the RI Sea Grant Senior Advisory Council. Finally, the BRWCT is well-position to broaden implementation of the BRWCT statute in order to improve its engagement with major policy and budgetary decisions by the Governor and the General Assembly.

BRWCT "Value-Adds"

- $3 million in targeted investments since 2008 in management, planning, monitoring and science.
- $650,000-700,000 annual budget with at least 65% allocated to targeted investments.
- Comprehensive long-term and annual strategic planning and reporting authorities
- Established interagency and multi-stakeholder fora dedicated to collaborative, coordinated water resources management and sustainable development.
- Direct support and participation for other collaborative planning and management institutions such as the Northeast Regional Ocean Council and the Narragansett Bay Estuary Program.

The state law creating the BRWCT statute is ambitious, stipulating major changes to how water resources management goals and strategies are to be established and pursued by the State of Rhode Island. There is much still to accomplish in fulfillment of BRWCT statutory mandates for interagency strategic planning and management. Additionally, the Great Recession and ensuing state and federal funding cuts to numerous water resources management programs spurred the BRWCT to provide stop-gap support for programs threatened and impacted by funding cuts.

The BRWCT will continue to work to identify and fill gaps in Rhode Island water resources management and sustainable development. It will also dedicate itself anew to assessing and improving understanding of how substantial economic benefits are generated by the protection and restoration of fresh and marine water resources, which will be essential to motivating greater public and private investment in water resources management, restoration, and sustainable development. Therefore, in conjunction with the changes to state economic development institutions stipulated by the General Assembly in 2013, the BRWCT will revive the BRWCT Economic Monitoring Collaborative (CTEMC). The CTEMC will work to develop a state economic monitoring strategy that establishes "baselines, protocols, guidelines, and quantifiable indicators for assessing the economic health and performance of the [RI] water cluster". It will also work with the BRWCT to demonstrate how environmental values and resources bolster and expand economic benefits and quality of life in the Ocean State.

Management Networks

Stop-gap funding is an important value provided by the BRWCT. However, the BRWCT offers additional values over the long-run. Better coordination of the numerous state and federal water resources management, planning, monitoring, and science institutions dedicated to RI's fresh and marine waters is a primary reason why the General Assembly created the BRWCT. Accordingly, the General Assembly stipulated comprehensive planning, implementation, and reporting requirements and tasked the executive branch with identifying how the new BRWCT requirements are to be fulfilled in conjunction with similar water resources planning requirements stemming from other federal and state laws and regulations. The significant task of coordinating numerous smaller programs, often federally funded and beholden to the planning and program evaluation requirements of federal agencies was recognized by the General Assembly in its stipulation that the BRWCT establish up to four standing committees

dedicated to science advice and guidance, environmental monitoring, economic monitoring, and public engagement.

Given the budgetary and staffing challenges the BRWCT agencies continue to grapple with, interagency coordination and support networks need continual assessment and cultivation to improve how we harmonize multiple management and planning mandates, foster innovative programs, communicate better about strategic goals and implementation challenges, and conduct insightful, constructive program evaluations. Interagency strategic planning and wise management of complex institutional networks becomes even more essential when agency capacities are severely taxed, and difficult choices must be made regarding which of many worthy management goals will be pursued.

To enhance how water management, monitoring, planning, and science programs in Rhode Island conjoin and function as a network, the BRWCT will pursue two planning tasks in the coming years:

- *Review the purpose and function of the SLP in relation to many specialized strategic planning cycles that function at various geographic and management scales for water resources and to the State Guide Plan. Revise and update the SLP to synthesize, distill, and communicate concisely the overall goals and strategies for managing, restoring, and sustainably developing Rhode Island fresh and marine waters and watersheds.*

- *Establish a more robust BRWCT annual work planning and budgeting cycle that produces and continually updates a unified vision and implementation plan regarding key strategic priorities, programmatic and funding gaps that inhibit their attainment, and new initiatives, partnerships, and funding needed to fill such gaps.*

The BRWCT is scheduled to launch a review and update of the SLP beginning the summer of 2014, and it will work with the Governor's Office and BRWCT agency leaders to expand the scope of the BRWCT annual Work Plan and Report for FY 2015 and FY 2016.

Static or diminishing budgets, ambitious statutory missions, complex regulatory programs, and emergent risks such as climate and ocean disruptions due to anthropogenic climate change will continue to magnify the difficulty of decisions regarding executive agency capacity allocation, management, and decision-making. Through the SLP and other strategic planning processes, the BRWCT will help state, federal, and municipal agencies identify how to pursue more strategically the many worthy goals of water resources management and sustainability. The BRWCT will ensure that the SLP and related strategic planning initiatives communicate and justify difficult decisions and new programs to legislative authorities, other agency funding sources, public and private interests, and the general public.

It is our obligation to inform and guide Rhode Islanders and their elected leaders regarding the numerous threats to the viability, sustainability, resilience, and utilization of Rhode Island fresh and marine water resources, and what it will truly take to address these threats. Only when we have fulfilled such obligations will all Rhode Islanders be sufficiently motivated to create and pursue democratic, equitable, and comprehensive water resources management for Rhode Island in the 21st century.

Appendix I:
BRWCT Budget & Expenditures: FY 2013 & FY 2014

BRWCT Funding

The BRWCT relies upon three sources of state funding that generate $650,000 to $700,000 annually: A) a statewide uniform septage disposal fee administered by DEM; B) an annual fee on trans-Atlantic submarine cables making landfall in Rhode Island; and C) an allocation of $250,000 from the RI Oil Spill Prevention, Administration, and Response Fund to be dedicated to environmental and economic monitoring programs. It is difficult to project the revenues that the two dedicated fees generate annually. Therefore, the BRWCT has budgeted conservatively and rolls over unspent funds to subsequent fiscal years. Hence, for FY 2014, the BRWCT is projecting total spending of about $1.1 million.

FY 2013 (7/1/12 – 6/30/13)

Office of the Chair	Budgeted	Actual
Total Personnel	$ 237,000	$ 233,630
Operations		
Supplies, Software, Equipment	$ 500	$ -
Travel	$ 1,200	$ 663
Other	$ 1,000	$ -
Total Operations	$ 2,700	$ 663
Grants		
Project Development Funds	$ 12,000	$ -
Sponsorships	$ 1,500	$ -
BRWCT Advisory Committees	$ 15,000	$ -
Total Grants	$ 28,500	$ -
Total Office	**$ 268,200**	**$ 234,956**
Funded Projects		
Coastal Hypoxia Research Program		
(12-4a) DO Field Survey Intern (2012/2013)	$ 15,000	$ 12,265
(12-4b) Hydrodynamic modelling for Narragansett Bay	$ 20,000	$ 19,221
Economic Indicators		
(13-1) Large Marine Event Benefit Assessment	$ 100,000	$ 99,194
Stormwater Management		
(13-5) RI Impervious Cover Data Update	$ 9,500	$ 9,461
(13-7) Conservation Law Foundation SUD Analysis	$ 2,500	$ 2,500
(12-1) DEM Intern: SUD Feasibility Assessments	$ 500	$ 468
Other		
(13-2) Streamflow and WQ Monitoring (USGS)	$ 267,000	$ 266,272
(13-6) 2012 Lobster Ventless Trap Regional Survey	$ 43,900	$ 35,258
Total Projects	**$ 458,400**	**$ 444,639**
Grand Total	**$ 726,600**	**$ 679,595**

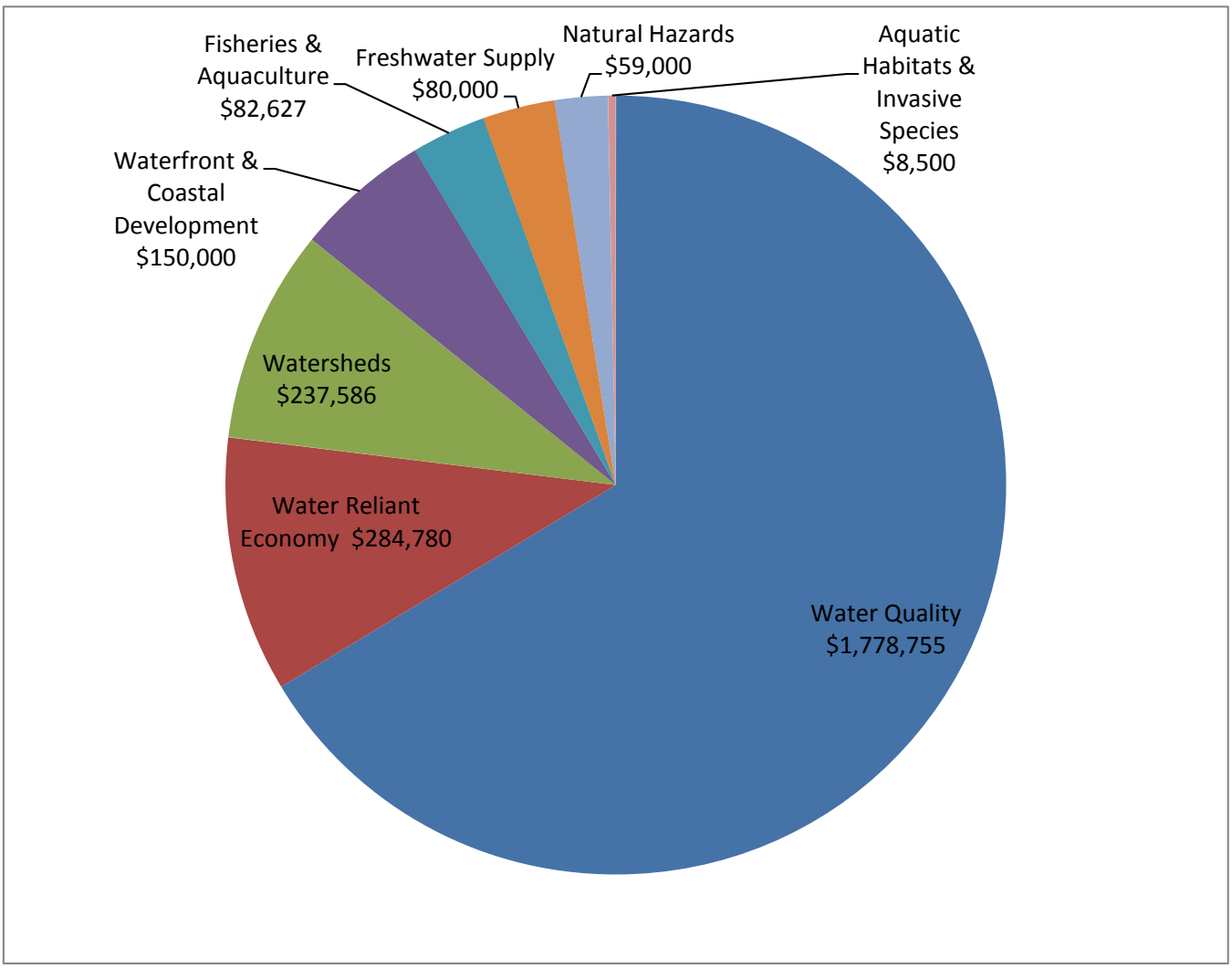
FY 2014 (7/1/13 – 6/30/14)

Office of the Chair		Budget
Personnel	$	240,500
Operations		
Office Space & Supplies	$	-
Supplies, Software, Equipment	$	500
Travel	$	1,000
Other	$	300
Total Operations	$	1,800
Grants		
BRWCT Advisory Committees	$	10,000
Total Grants	$	10,000
TOTAL	$	252,300
Funded Projects		
Stormwater Management		
(13-5) RI Impervious Cover Data Update	$	16,300
(13-6) Middletown SUD Assessment	$	38,000
(14-9) W. Warwick SUD Assessment	$	6,200
(14-6) Upper Narr. Bay Regional SUD Feasibilty Study	$	75,000
Climate Change Adaptation		
(13-3) WWTF Climate Vulnerability Analysis	$	59,000
(13-4) Shoreline Change SAMP	$	85,000
Estuarine & Ocean Science & Management		
(14-5) Upper Bay WQ Stakeholder Process	$	60,000
(12-4b) Hydrodynamic modelling for Narragansett Bay	$	14,810
(12-4a) Dissolved Oxygen Field Survey Intern (2013-2014)	$	10,600
(14-3) Marine Invasives Assessment	$	5,000
(14-1) Lobster Ventless Trap Regional Survey	$	45,400
Freshwater Resources Management		
(14-2) Stream flow and WQ monitoring (USGS)	$	303,000
(14-7) Water Resources Board water consumption database	$	80,000
Water-Reliant Economic Development		
(14-8) Freight Planning for Ports	$	65,000
Other		
(14-4) Governor's Bay Day (2013)	$	8,000
Total	$	871,310
Grand Total	**$**	**1,123,610**

Appendix II:
BRWCT Funded Projects: FY 2007-FY2014

Project No.	Title	SLP Policy Domain	Sponsor	Grant	Start/End Dates
07-1	USGS FY 2007 Water Monitoring Contract	Water Quality	DEM, WRB	$ 137,000	7/1/06 - 6/30/07
07-2	Narragansett Bay Fixed Site Monitoring Network	Water Quality	DEM	$ 33,000	7/1/06 - 6/30/07
07-3	Rotating Assessment of Rivers and Streams	Water Quality	DEM	$ 50,000	7/1/06 - 6/30/07
07-4	Marine Economic Baseline Survey	Water Reliant Economy	EDC	$ 30,000	7/1/06 - 6/30/07
08-1	Marine Economic Value Chain Analysis	Water Reliant Economy	EDC	$ 39,500	7/1/07 - 6/30/08
09-1	USGS FY 2008 Water Monitoring Contract	Water Quality	DEM	$ 190,500	7/1/08 - 6/30/09
09-2	Narragansett Bay Fixed Site Monitoring Network	Water Quality	DEM	$ 20,000	7/1/08 - 6/30/09
10-1	USGS FY 2010 Water Monitoring Contract	Water Quality	DEM	$ 276,149	7/1/09 - 6/30/10
11-1	BRWCT Science Advisory Committee Retreat	-	CT Chair	$ 2,000	10/27/2010
11-2	Port Development Opportunities Project	Water Reliant Economy	Planning, EDC	$ 49,280	11/1/10 - 5/31/11
11-3	2010 Marine Invasives Rapid Assessment Survey	Aquatic Habitats & Invasive Species	CRMC	$ 3,500	8/1/2010 - 9/30/10
11-4	USGS FY 2011 Water Monitoring Contract	Water Quality	DEM	$ 311,530	7/1/10 - 6/30/11
12-1	Stormwater Utility District Feasibility Assessments (Middletown, Bristol, Cranston)	Watersheds	DEM	$ 13,162	5/1/11 - 6/30/12
12-2	USGS FY 2012 Water Monitoring Contract	Water Quality	DEM	$ 243,576	7/1/11 - 6/30/12
12-3	Sponsorship: Sustainable Seafood Conference	Water Reliant Economy	CT Chair	$ 1,000	6/27/2011
12-4a	Coastal Hypoxia Research Program: Numerical Modelling	Water Quality	CT Chair	$ 60,000	2/1/12 - 8/31/15
12-4b	Coastal Hypoxia Research Program: DO Field Surveys	Water Quality	CT Chair	$ 40,000	5/1/12 - 9/30/15
12-5	Ventless Lobster Trap Survey for 2012	Fisheries & Aquaculture	DEM	$ 35,258	06/1/12 - 09/30/12
13-1	Large Marine Events Benefits Assessment Study	Water Reliant Economy	EDC	$ 100,000	5/1/12 - 2/28/13
13-2	USGS FY 2013 Water Monitoring Contracts	Water Quality	DEM	$ 267,000	7/1/12 - 6/30/13
13-3	Assesment of Risks to WWTFs posed by Climate Change	Natural Hazards	DEM, Planning	$ 59,000	4/1/14 - 12/31/14
13-4	RI Shoreline Change Special Area Management Plan	Waterfront & Coastal Development	CRMC	$ 150,000	4/1/13 - 12/31/16
13-5	Statewide Impervious Cover GIS Datalayer Update	Watersheds	DEM, Planning	$ 25,724	5/1/12 - 9/30/13
13-6	Middletown Stormwater Utility District Feasibility Assessment	Watersheds	DEM	$ 40,000	3/1/13 - 2/1/14
13-7	Conservation Law Foundation White Paper on RI Stormwater Utility Districts	Watersheds	DEM, CT Chair	$ 2,500	9/1/12 - 6/30/13
14-1	Ventless Lobster Trap Survey for 2013	Fisheries & Aquaculture	DEM	$ 47,369	6/1/13 - 9/30/13
14-2	USGS FY 2014 Water Monitoring Contract	Water Quality	DEM	$ 304,000	7/1/13 - 6/30/14
14-3	2013 Marine Invasives Rapid Assessment Survey	Aquatic Habitats & Invasive Species	CRMC	$ 5,000	8/1/13 - 9/1/13
14-4	2013 Governor's Bay Day Picnic	-	Governor's Offic	$ 7,960	7/28/2013
14-5	Upper Narragansett Bay Water Quality Stakeholders Process	Water Quality	NBC, DEM	$ 150,000	5/1/14 - 6/30/15
14-6	Upper Narraganset Bay Regional Stormwater Utility District Assessment	Watersheds	DEM	$ 150,000	5/1/14 - 6/30/15
14-7	Water Supplier Database Development	Freshwater Supply	WRB	$ 80,000	7/1/14 - 12/30/14
14-8	RI Freight Plan Development: Maritime Ports	Water Reliant Economy	Planning, EDC	$ 65,000	7/1/14 - 6/30/15
14-9	West Warwick Stormwater Utility District Assessment	Watersheds	CT Chair	$ 6,200	6/25/13 - 1/31/14
			TOTAL FUNDING:	**$ 2,995,208**	

FY 2007-FY 2014 Total Spending by Policy Domain (See Appendix IV)

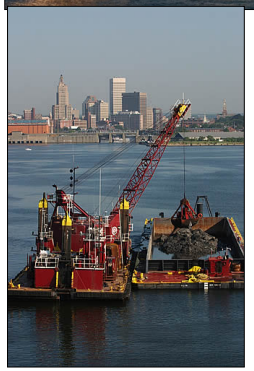


Appendix III:
SLP Policy Domains & Goals

Policy Domains	Goals			
Waterfront & Coastal Development	**Goal 1**	**Goal 2**		
	Sufficient quantity and quality of industrial waterfront lands to foster marine and waterfront economic development.	*Waterfront, riverine, and coastal developments that incorporate design standards sensitive to the environmental and cultural values of their surroundings.*		
Watersheds	**Goal 3**	**Goal 4**		
	Significant progress toward all water quality standards for RI waters and the prevention of water quality degradation for RI's rivers, streams, lakes and ponds.	*Future land-uses and development that fully protect and restore watershed resources, habitats, and freshwater resources.*		
Water Reliant Economy	**Goal 5**	**Goal 6**	**Goal 7**	**Goal 8**
	Recreation and Tourism: *A thriving tourism industry based on RI's environmental and cultural offerings. Diverse marine and freshwater recreational resources for RI's citizens and visitors.*	*Boat-building & Ship-building:* *Continued global leadership in marine trades.*	*Water-based Transportation:* *Expanded, competitive water-based transportation of people and goods to, from, and within RI.*	*Commercial Fisheries & Aquaculture:* *Profitable, sustainable businesses in commercial and recreational fishing, and in aquaculture.*
Natural Hazards	**Goal 9**			
	Significantly reduced natural hazard risks to coastal and riverfront residents, infrastructure, and development.			

Policy Domains	Goals			
Freshwater Supply	**Goal 10**	**Goal 11**	**Goal 12**	
	Efficient Water Use.	*Reliable Water Supplies.*	*Integration of land-use and water-use management.*	
Water Quality	**Goal 13**	**Goal 14**	**Goal 15**	
	Significant progress toward all water quality standards for RI waters, including fishable, swimmable water quality in upper Narragansett Bay and the Blackstone River by 2015.	*Significantly Improved water quality in sensitive coastal regions including the south shore coastal ponds, state beaches, and Greenwich Bay.*	*Restoration of shellfish resources in historically closed areas throughout RI's estuarine and marine waters.*	
Fisheries & Aquaculture	**Goal 16**	**Goal 17**		
	Sustainable and profitable commercial fish harvests.	*A flourishing aquaculture industry that respects traditional & commercial fisheries and cultures.*		
Aquatic Habitats & Invasive Species	**Goal 18**			
	Enhanced aquatic biodiversity due to successful aquatic nuisance species control and habitat restoration and conservation.			

Appendix IV:
SLP Implementation Priorities



Legend

~ ***Policy Domain***: one of SLP's eight major sections
~ Priority: one of twenty SLP Strategies identified by the BRWCT as an implementation priority
~ **Agency**: implementation lead
~ *Additional Action*: An action not listed in the SLP that subsequently emerged as key to an SLP Implementation Priority
~ **(2.1)**: SLP Strategy Number. *(See SLP Strategy Tables)*
~ **(2.1.1)**: SLP Recommended Action Number. *(See SLP Strategy Tables)*

Policy Domain & SLP Implementation Priority	**Recommended Actions**
Waterfront and Coastal Development Priority 1 **(2.1)** Support and advance SAMP Planning for critical coastal regions in accordance with the 2006 CRMC Marine Resources Development Plan.	**(2.1.1)** Update, revise, and implement the Metro Bay SAMP. **(2.1.2)** Complete development of the Aquidneck Island SAMP. **(2.1.3)** Update and continue implementation of the Greenwich Bay SAMP. **(2.1.4)** Develop and Implement Ocean SAMP. **CRMC**, DEM, DoP, Commerce RI

Policy Domain & SLP Implementation Priority	**Recommended Actions**
Waterfront and Coastal Development Priority 2 **(2.2)** Ensure SAMP and TMDL recommendations are reflected in state and local decisions.	**(2.2.1)** Update and enforce local development requirements in conformity with relevant SAMP and TMDL mandates. **CRMC**, DEM, DoP
Waterfront and Coastal Development Priority 3 **(1.2)** Develop clear policy statements for marine transportation and the maintenance and development of key port facilities.	**(1.2.1)** Identify those activities which are determined to be of regional benefit and demonstrate how state legal authority will ensure that these activities are not unreasonably excluded by local government action from locating in the coastal area. **DoP**, Commerce RI, CRMC
Waterfront and Coastal Development SLP Priority 4 **(1.3)** Adapt current and design future waterfront infrastructure to accommodate sea-level rise.	**(1.3.1)** Communicate with municipalities and maritime companies on the need to adapt infrastructure to sea-level projections over the coming decades. Develop policies and regulations to ensure investments in current and future waterfront infrastructure made in accordance with official state sea-level rise projections. **CRMC**, Commerce RI, DoP
Water Quality Priority 5 **(13.8)** Significantly enhance stormwater control and management state-wide.	**(13.8.1)** Adopt low impact development (LID) site permitting approaches for new construction and redevelopment designed to reduce stormwater pollution. **(13.8.4)** Integrate guidance from revised (2010) Rhode Island Stormwater Design & Installation Standards Manual into permitting of state and municipal stormwater programs. Provide training to facilitate its use by municipalities,

Policy Domain & SLP Implementation Priority	**Recommended Actions**
Priority 5 **(13.8)** Significantly enhance stormwater control and management state-wide.	developers and others. **(13.8.5)** Support local government efforts to establish utility districts to provide a stable source of funding for stormwater management. **(13.8.6)** Strengthen state requirements for retrofits of existing stormwater systems as part of TMDL implementation. **(13.8.7)** Renew funding for Narragansett Bays and Watersheds Restoration Fund to provide incentive grants for retrofitting stormwater systems. Continue to give priority to projects that implement TMDL stormwater provisions. **(13.8.8)** Ensure that state and quasi-state demonstrate leadership in adopting effective stormwater management practices. **(13.8.9)** Increase federal and state funding for RI Department of Transportation to implement stormwater system retrofits identified in TMDL's. ***Additional Actions****:* Pursue local MS4 (Municipal separated stormwater sanitation sewer systems) stormwater programs to track whether municipalities have responded to TMDL stormwater and Phase II Stormwater Permit requirements. **DEM, CRMC,** Narragansett Bay Commission
Water Quality Priority 6 **(13.3)** Develop funding sources to meet the state's estimated $1.36 billion worth of wastewater infrastructure needs.	**(13.3.1)** Increase federal and state support for Rhode Island's State Revolving Fund. *Additional Actions:* Maintain database on benefits of Clean Water State Revolving Fund investments. **RI Congressional Delegation**, RI General Assembly, RI Clean Water Finance Agency

Policy Domain & SLP Implementation Priority	**Recommended Actions**
Water Quality Priority 7 **(13.6)** Identify and implement pollution abatement actions necessary to restore water quality in impaired waters.	**(13.6.1)** Continue to development TMDL's consistent with schedule in the 2008 303(d) list. **(13.6.2)** Continue work with municipalities and others to implement TMDL recommendations. **DEM**, local governments
Watersheds Priority 8 **(3.5)** Minimize impervious cover to reduce stormwater runoff.	**(3.5.1)** Work with municipalities to update zoning ordinances to allow for reductions in impervious cover. **DoP**
Watersheds SLP Priority 9 **(3.2)** Establish and promulgate green development standards and land use techniques to protect water quality.	**(3.2.1)** Expand technical assistance and seek additional financial support to help communities implement green development standards and land use techniques. **DEM**, DoP, CRMC, RIRC
Watersheds SLP Priority 10 **(3.1)** Work with local governments to establish their most important priorities for protecting natural resources with strategies such as regional green space protection.	**(3.1.2)** Help local governments to develop "*community asset maps*" that identify and prioritize natural, cultural, and recreational resources, including headwater tributaries and ground and surface water supplies. **DEM**, DoP, CRMC,
Watersheds SLP Priority 11 **(3.3)** Expand local and state-wide protection of riparian buffers, freshwater wetlands, brackish wetlands, and salt marshes.	**(3.3.1)** Expand grants and technical assistance to protect and restore riparian buffers and wetlands, particularly in urban watersheds. **DEM**, CRMC, RIRC

Policy Domain & SLP Implementation Priority	**Recommended Actions**
Water-Reliant Economy SLP Priority 12 **(8.1)** Fisheries and Aquaculture: develop creative uses for state ports and piers that provide fishermen with needed infrastructure while maximizing complementary uses.	**(8.1.1)** Assess present and future infrastructure needs for commercial fisheries. **DEM**, Commerce RI, DoP, CRMC
Water-Reliant Economy SLP Priority 13 **(6.3)** Boat and Ship Building: Develop strategies to recruit new workers into marine related careers.	**(6.3.1)** Implement workforce development strategies for all levels of employees to meet industry needs, utilizing Commerce RI's industry skill gap analysis completed in Feb. 2008. Increase industry awareness of training initiatives and the need to upgrade worker skills. **Commerce RI,** CRMC
Water-Reliant Economy SLP Priority 14 **(5.1)** Recreation and Tourism: Implement the National Geographic Geo-tourism Charter Principles for Sustainable Tourism.	**(5.1.1)** Implement Geotourism Charter via programming under development by Commerce RI's Tourism Division. **Commerce RI**
Water-Reliant Economy SLP Priority 15 **(6.2)** Boat and Ship-Building: Support the development of marine industry sites on portions of the surplus Navy land on the Westside of Aquidneck Island.	**(6.2.1**) Assist with implementation of the Aquidneck Island West Side Master Plan. **(2.1.2)** Complete Development of Aquidneck Island SAMP *(See Implementation Priority One)* **Commerce RI**, DoP, CRMC

Policy Domain & SLP Implementation Priority	**Recommended Actions**
Natural Hazards SLP Priority 16 **(9.3)** Develop local natural hazard mitigation plans (floods and coastal storms), increase the capacities required to implement them, and to improve local responses to coastal and inland flooding events.	**(9.3.1)** Ensure that where necessary BRWCT agencies develop and implement natural hazard mitigation plans for their facilities and assets under management. **RIEMA**, DoP, CRMC, DEM
Freshwater Supply SLP Priority 17 **(12.1)** Integrate management of land use and water use Promote water use efficiency and conservation.	**(12.1.1)** Coordinate community comprehensive plans and water supply management plans to included guidance for watershed-based planning for municipalities. **WRB**, DEM, local governments and water suppliers
Freshwater Supply SLP Priority 18 **(11.1)** Implement strategic water supply plans to ensure reliability of supply.	**(11.1.1)** Consolidate and update State Water Supply Policies and Plan. **(11.1.2)** Develop Big River Groundwater wells. **(11.1.3)** Establish enterprise accounting for all major public water suppliers. **(11.1.4)** Develop implementation plan for supplemental water projects and interconnections. Invest in redundant and backup supplies. **(11.1.5)** Regionalize small systems to improve overall system reliability. *Additional Actions:* Complete facilities maintenance and upgrade projects for Bristol County Water Authority. **WRB**, DOP, RI Clean Water Finance, Water Suppliers, DEM, DOP, DOH

Policy Domain & SLP Implementation Priority	**Recommended Actions**
Fisheries & Aquaculture SLP Priority 19 **(16.1)** Rebuild fisheries stocks in conformity with state and federal law.	**(16.1.1)** Maintain fishing mortality rates and stock abundances to minimize the risk of stock depletions and recruitment failures. **DEM**, Atlantic States Marine Fisheries Commission, New England Fisheries Management Council
Aquatic Nuisance Species & Habitat Restoration SLP Priority 20 **(18.2)** Restore a diverse array of fresh and marine aquatic habitats.	**(18.2.1)** Establish a statewide habitat restoration coordinator. **(18.2.2)** Implement 2002 strategic plan for restoration of anadromous fisheries. **(18.2.3)** Renew state funding to ensure matching funds availability for priority habitat restoration projects. **(18.2.4)** Establish a comprehensive set of status and trends indicators for coastal habitats program to assess habitat changes, impacts, and conservation and restoration progress. **(18.2.5)** Maintain and expand state-wide mapping for brackish and freshwater wetlands, salt marshes and seagrass beds. Use mapping to support wetlands and eelgrass restoration and conservation planning, and enhanced enforcement wetlands protection law. **(18.2.6)** Improve regulatory protections for riverine vegetated buffers. **DEM, CRMC**

Appendix III:
RI Environmental Monitoring Collaborative Roster

ORGANIZATION	INDIVIDUAL	TITLE
RI DEM, Office of Water Resources	Sue Kiernan (Vice Chair)	Deputy-Chief, Surface Water Protection
URI Coastal Institute	Nicole Rohr (Chair)	Assistant Director, URI Coastal Institute
Narragansett Bay Commission	Thomas Uva (Vice-Chair)	Director of Planning, Policy, & Regulations
Coastal Resources Management Council	James Boyd	Coastal Policy Analyst
RI Water Resources Board	Kathy Crawley	Staff Director
Division of Planning, Statewide Planning	Paul Gonsalves	Senior Planner
RI Department of Health, Beach Monitoring Program	Amie Parris	Beach Program Coordinator
RI DEM, Division of Fish & Wildlife	Mark Gibson	Deputy Chief
Narragansett Bay National Estuarine Research Reserve	Robert Stankelis	Reserve Manager
Narragansett Bay Estuary Program	Tom Borden	Director
EPA Region 1: Office of Ocean/Coastal Protection	Margherita Pryor	
EPA Office of Research and Development: Atlantic Ecology Division	Henry Walker	Research Environmental Scientist
Brown University	Dave Murray	Senior Research Associate

ORGANIZATION	FIRST NAME	TITLE
URI Graduate School of Oceanography	John King	Professor
URI Watershed Watch	Linda Green	Program Director
RI Natural History Survey	David Gregg	Executive Director
URI Environmental Data Center	Charles LaBash	Director
Save the Bay	Marci Cole-Ekberg	Coastal Ecologist
The Nature Conservancy-Rhode Island	John Torgan	Director of Ocean & Coastal Conservation
ESS Group, LLC	Matt Ladewig	Project Scientist
RI Water Resources Board	Kathy Crawley	Staff Director