



Rhode Island Statewide Bacteria TMDL

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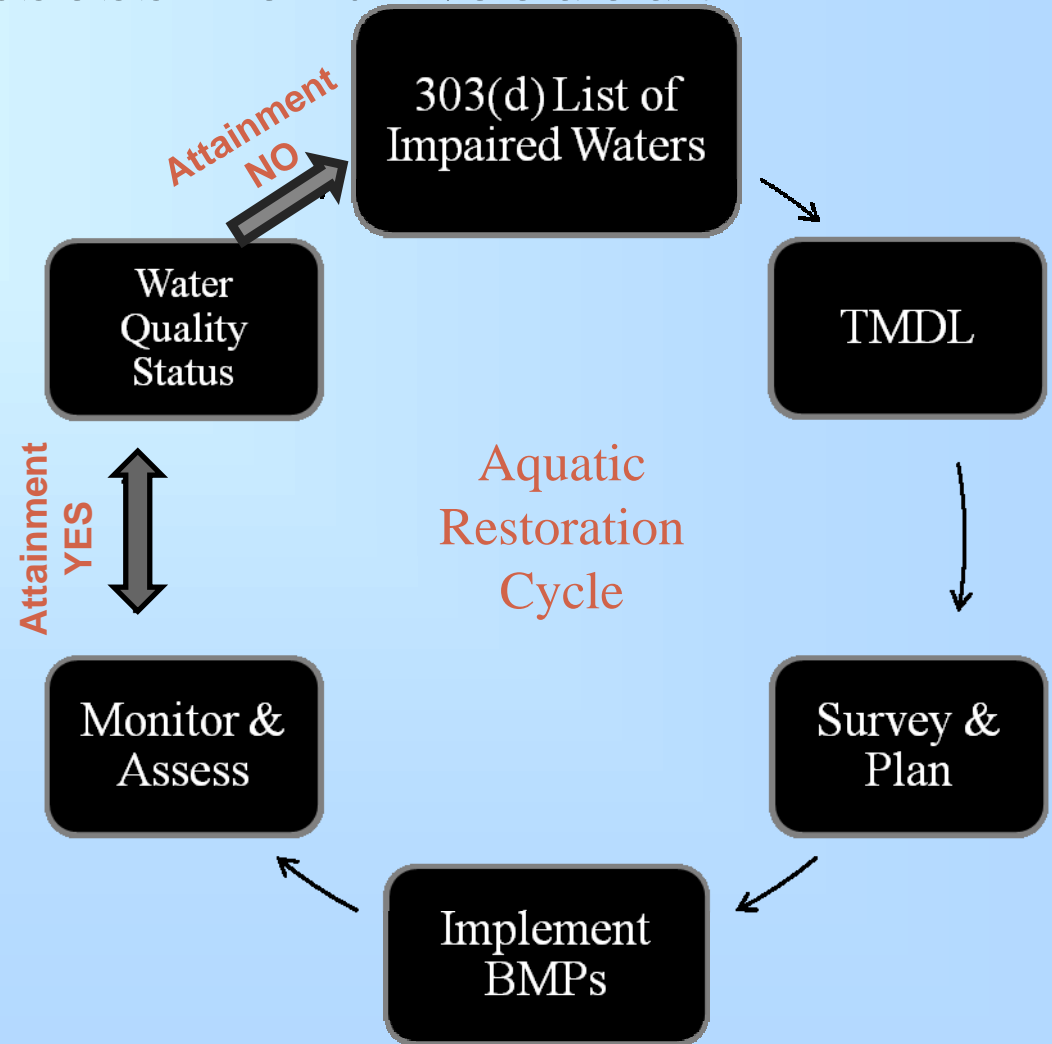
Overview of Presentation

- Introduction to the Statewide Bacteria TMDLs – **Forrest**
- Individual Watershed Summaries – **Emily**
- Implementation Recommendations – **Heidi**
- Questions

Benefits of the Statewide Approach

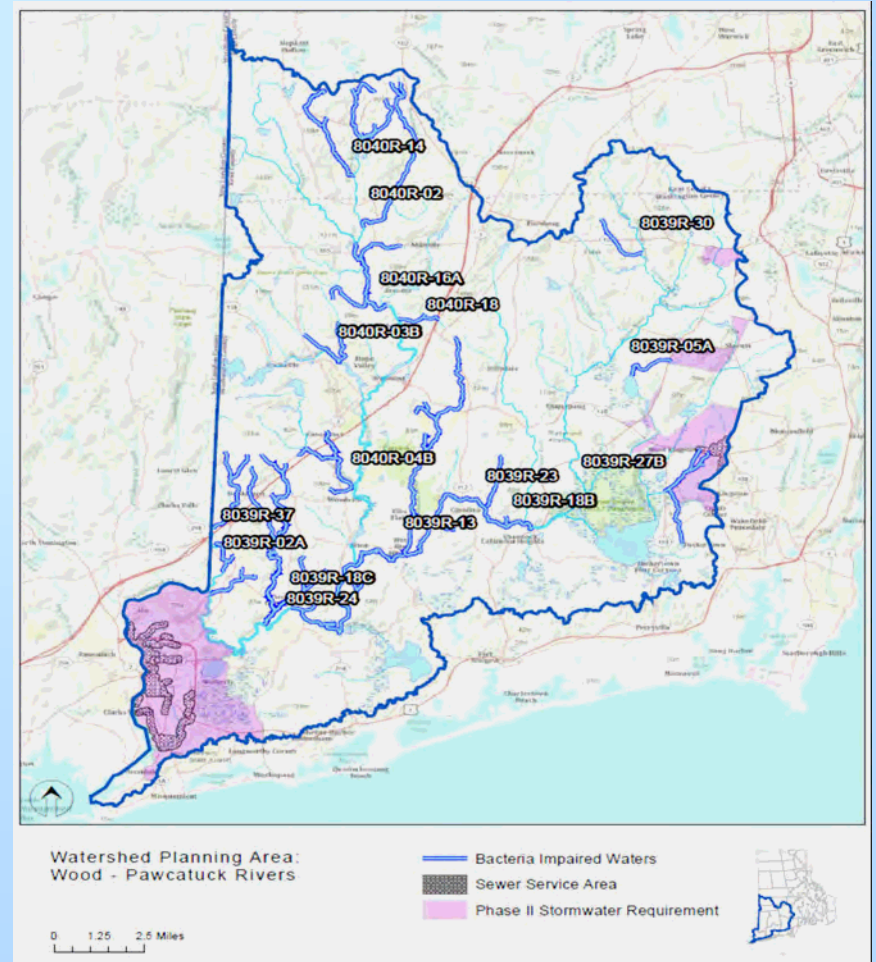
- Addresses bacteria impairments in numerous lakes and streams
- Promotes efficient use of resources
- Streamlines public outreach process
- Ensures that implementation and restoration process can begin sooner
- Allow for additional impaired waterbodies to be added in the future

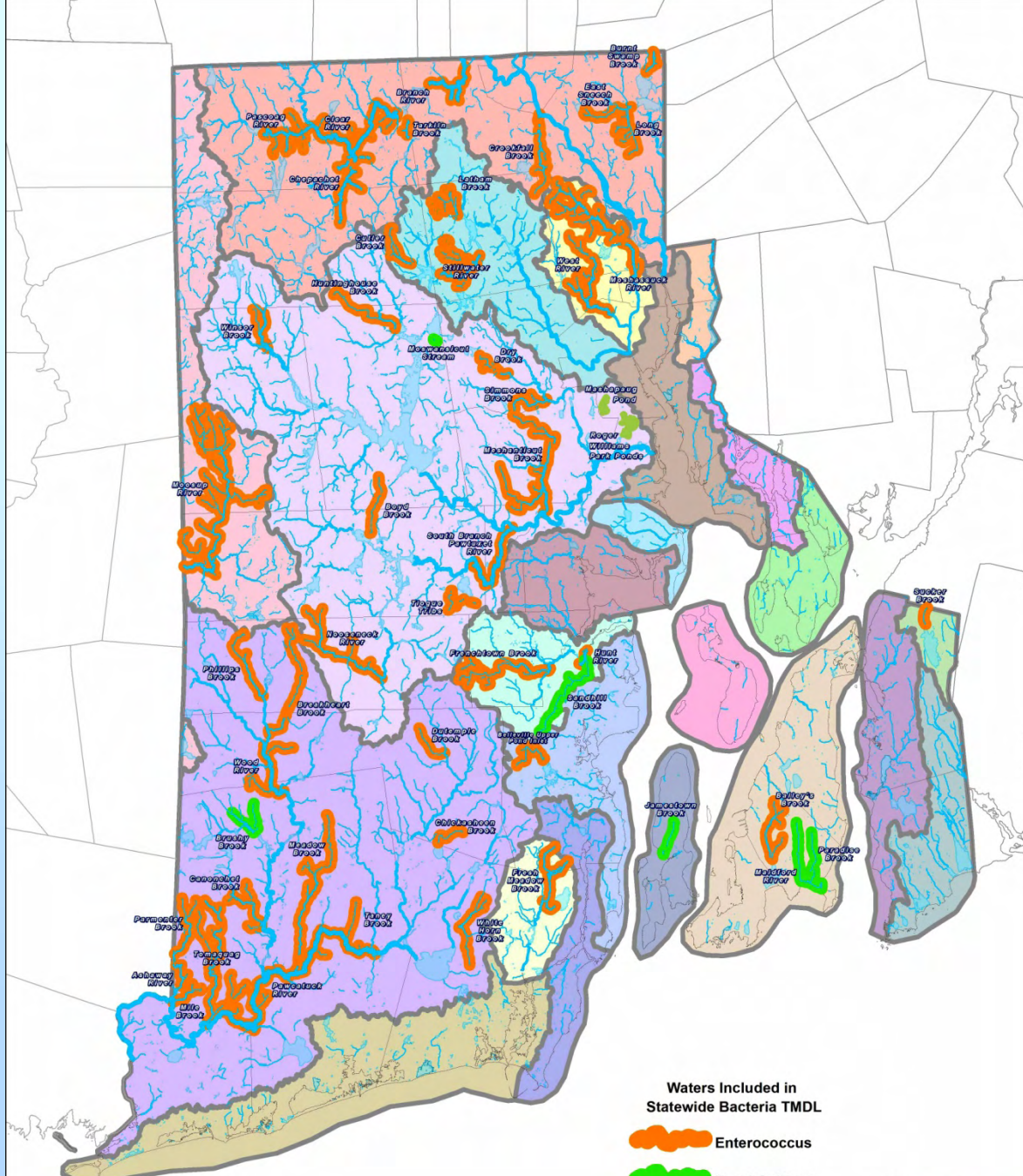
Why is a TMDL (Total Maximum Daily Load) Assessment Needed?



TMDL Process

“The TMDL process maps a course for states and watershed stakeholders to follow that should lead to restoration of the impaired water and its uses.”





**Waters Included in
Statewide Bacteria TMDL**

-  Enterococcus
-  Fecal Coliform

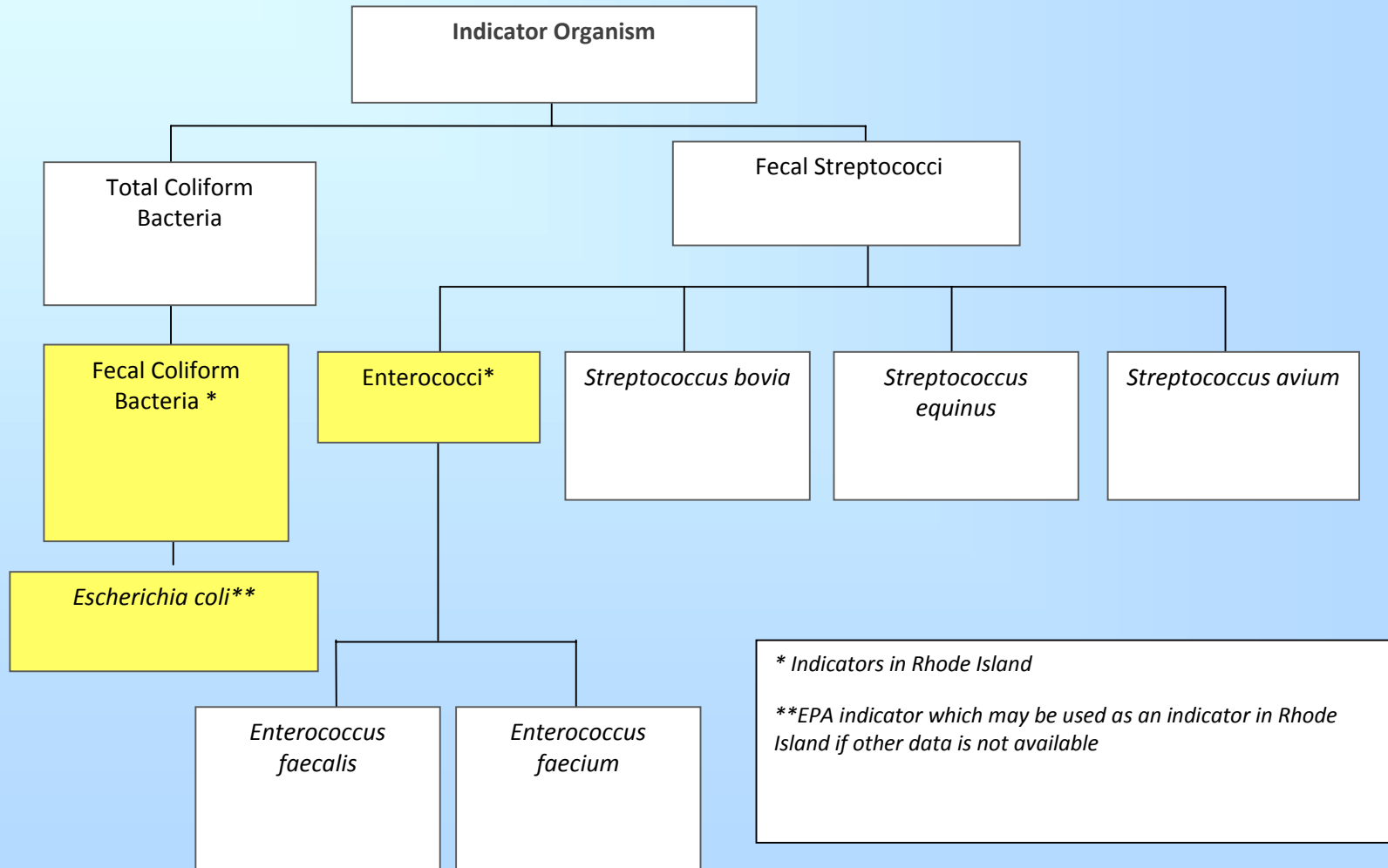
0 10 Miles



What is included in a Statewide Bacteria TMDL?

- Explanation of state water quality standards
- Description of point and nonpoint pollution sources
- Details of bacteria TMDL development
- Guidance for implementation efforts
- Individual waterbody-specific TMDL summaries

Relationship among Indicator Organisms (USEPA, 2001a)



Waterbody Class <i>Designated Use</i>	Fecal Coliform (MPN/100 mL)		Enterococci (colonies/100 mL)	
	<i>Geometric Mean¹</i>	<i>90th Percentile¹</i>	<i>Geometric Mean¹</i>	<i>Single Sample Maximum²</i>
Class AA <i>Public Drinking Water Supply</i>	20 ³	200 ³	NA	NA
Classes AA, A, B, B1, B{a}, B1{a} <i>Primary/Secondary Contact Recreation</i>	200 ⁴	400 ⁴	NDB: 54 DB: 33	61 ²
Classes SA, SA{b} <i>Shellfish Consumption</i>	14 ⁵	49 ⁵	NA	NA
Classes SA, SA{b}, SB, SB1, SB{a}, SB1{a} <i>Primary/Secondary Contact Recreation</i>	50 ⁴	400 ⁴	35	104 ²

$$TMDL = WLA + LA + MOS$$

Where:

WLA = Wasteload Allocation – point source

LA = Load Allocation - non-point source
category

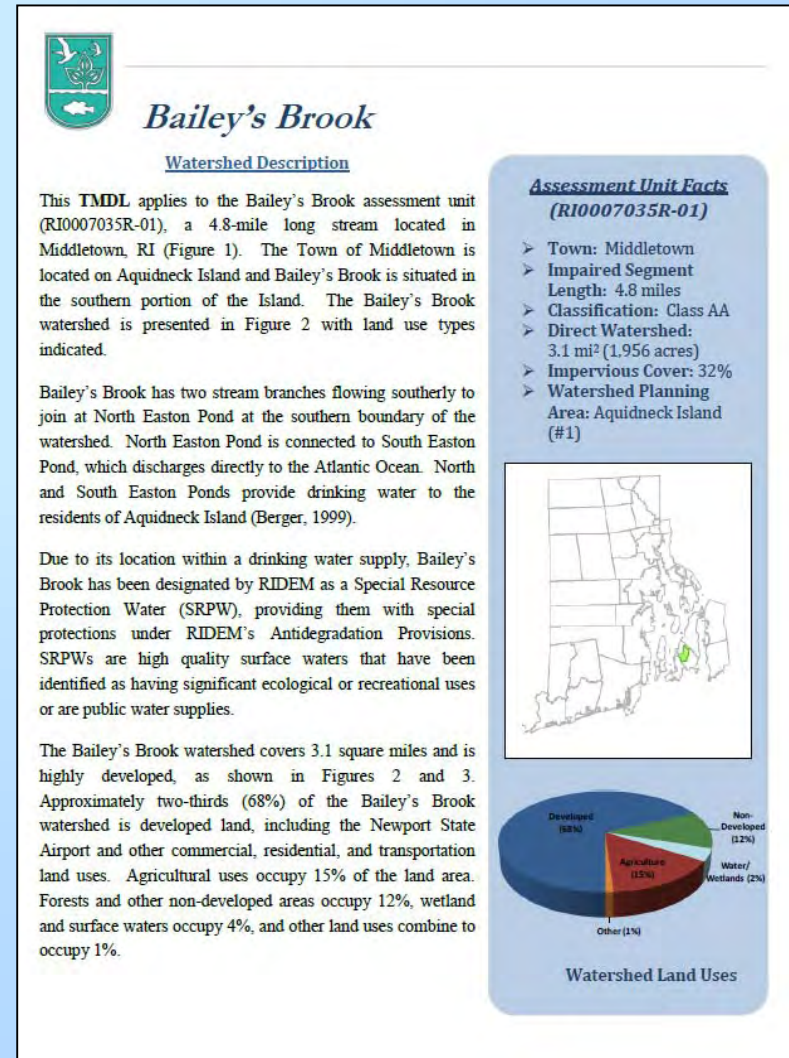
MOS = Margin of Safety


TMDL Expressed as Concentration - % reduction

Class	Source	Enterococci Geometric Mean Colonies/100 mL	
		WLA ¹	LA ¹
AA*	RIPDES Wastewater Sources ²	0	NA
	RIPDES Stormwater ^{1,3}	--	NA
	Non-RIPDES Stormwater or Groundwater ^{1,5}	NA	--
	Illicit Wastewater Discharges ⁶	0	0
	Other Non-Point Source ⁷	NA	54
AA** A ⁸	RIPDES Wastewater Sources ²	0	NA
	RIPDES Stormwater ^{1,3}	--	NA
	Non-RIPDES Stormwater or Groundwater ^{1,5}	NA	--
	Illicit Wastewater Discharges ⁶	0	0
	Other Non-Point Source ⁷	NA	54 / 33 ⁸
B ⁸	RIPDES Wastewater Sources ²	0	NA
	RIPDES Stormwater ^{1,3}	--	NA
	Non-RIPDES Stormwater or Groundwater ^{1,5}	NA	--
	Illicit Wastewater Discharges ⁶	0	0
	Other Non-Point Source ⁷	NA	54 / 33 ⁸
B1 ⁸	RIPDES Wastewater Sources ²	54 / 33 ⁸	NA
	RIPDES Stormwater ^{1,3}	--	NA
	Non-RIPDES Stormwater or Groundwater ^{1,5}	NA	--
	Illicit Wastewater Discharges ⁶	0	0
	Other Non-Point Source ⁷	NA	54 / 33 ⁸

Watershed Summary Content

- Watershed description
- Maps
- Monitoring data description
- Actual/Potential sources of bacteria in the watershed
- Existing management and recommended next steps
- Data summary tables and necessary pollutant reductions



 **Bailey's Brook**

Watershed Description

This TMDL applies to the Bailey's Brook assessment unit (RI0007035R-01), a 4.8-mile long stream located in Middletown, RI (Figure 1). The Town of Middletown is located on Aquidneck Island and Bailey's Brook is situated in the southern portion of the Island. The Bailey's Brook watershed is presented in Figure 2 with land use types indicated.

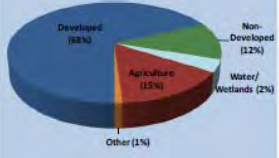

Bailey's Brook has two stream branches flowing southerly to join at North Easton Pond at the southern boundary of the watershed. North Easton Pond is connected to South Easton Pond, which discharges directly to the Atlantic Ocean. North and South Easton Ponds provide drinking water to the residents of Aquidneck Island (Berger, 1999).

Due to its location within a drinking water supply, Bailey's Brook has been designated by RIDEM as a Special Resource Protection Water (SRPW), providing them with special protections under RIDEM's Antidegradation Provisions. SRPWs are high quality surface waters that have been identified as having significant ecological or recreational uses or are public water supplies.

The Bailey's Brook watershed covers 3.1 square miles and is highly developed, as shown in Figures 2 and 3. Approximately two-thirds (68%) of the Bailey's Brook watershed is developed land, including the Newport State Airport and other commercial, residential, and transportation land uses. Agricultural uses occupy 15% of the land area. Forests and other non-developed areas occupy 12%, wetland and surface waters occupy 4%, and other land uses combine to occupy 1%.

**Assessment Unit Facts
(RI0007035R-01)**

- Town: Middletown
- Impaired Segment Length: 4.8 miles
- Classification: Class AA
- Direct Watershed: 3.1 mi² (1,956 acres)
- Impervious Cover: 32%
- Watershed Planning Area: Aquidneck Island (#1)



Watershed Land Uses

Land Use	Percentage
Developed	68%
Non-Developed	12%
Agriculture	15%
Water/Wetlands	2%
Other	1%

Developing the Summaries

- Maps
- Municipal Stormwater Management Plans and MS4 Annual Reports
- Municipal Onsite Wastewater Management Plans
- Municipal Wastewater Facilities Plans
- Municipal Websites
- Existing TMDLs
- Data

Data Sources

- RIDEM Ambient River Monitoring Program
- Rhode Island DEM Shellfish Growing Area Monitoring Program
- Rhode Island HEALTH Bathing Beach Monitoring Program
- Narragansett Bay Commission (NBC) Monitoring Programs
- University of Rhode Island Watershed Watch Program
- USGS Monitoring on Non-wadeable Rivers

Data Calculations

- Geometric mean and/or 90th percentile maximum
- Percent reduction to meet TMDL target

Single Sample Enterococci (colonies /100 mL) Results for Mile Brook (2005-2006) with Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
PAW11	Mile Brook at Nooseneck Hill Road (Rt 3) near Maxson St, Hopkinton	10/27/2006	1	Dry	58 (12%)*
PAW11	Mile Brook at Nooseneck Hill Road (Rt 3) near Maxson St, Hopkinton	8/9/2006	410	Dry	
PAW11	Mile Brook at Nooseneck Hill Road (Rt 3) near Maxson St, Hopkinton	5/31/2006	170	Dry	
PAW11	Mile Brook at Nooseneck Hill Road (Rt 3) near Maxson St, Hopkinton	9/21/2005	160	Dry	

Shaded cells indicate an exceedance of water quality criteria

*Includes 5% Margin of Safety

Data Calculations

Wet/dry analysis

Wet and Dry Weather Geometric Mean Enterococci Values for Station PAW11

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
PAW11	Mile Brook at Nooseneck Hill Road (Rt 3) near Maxson St, Hopkinton	2005-2006	0	4	58	NA	58

Shaded cells indicate an exceedance of water quality criteria
Weather condition determined from rain gage at URI in Kingston, RI

Actual/Potential Bacteria Sources

Developed Area Stormwater Runoff



Potential Bacteria Sources

Sewer Leaks/Overflows



Potential Bacteria Sources

Onsite Wastewater Treatment Systems



Potential Bacteria Sources

Agricultural Activities



Potential Bacteria Sources

Waterfowl, Wildlife, and Domestic Animal Waste



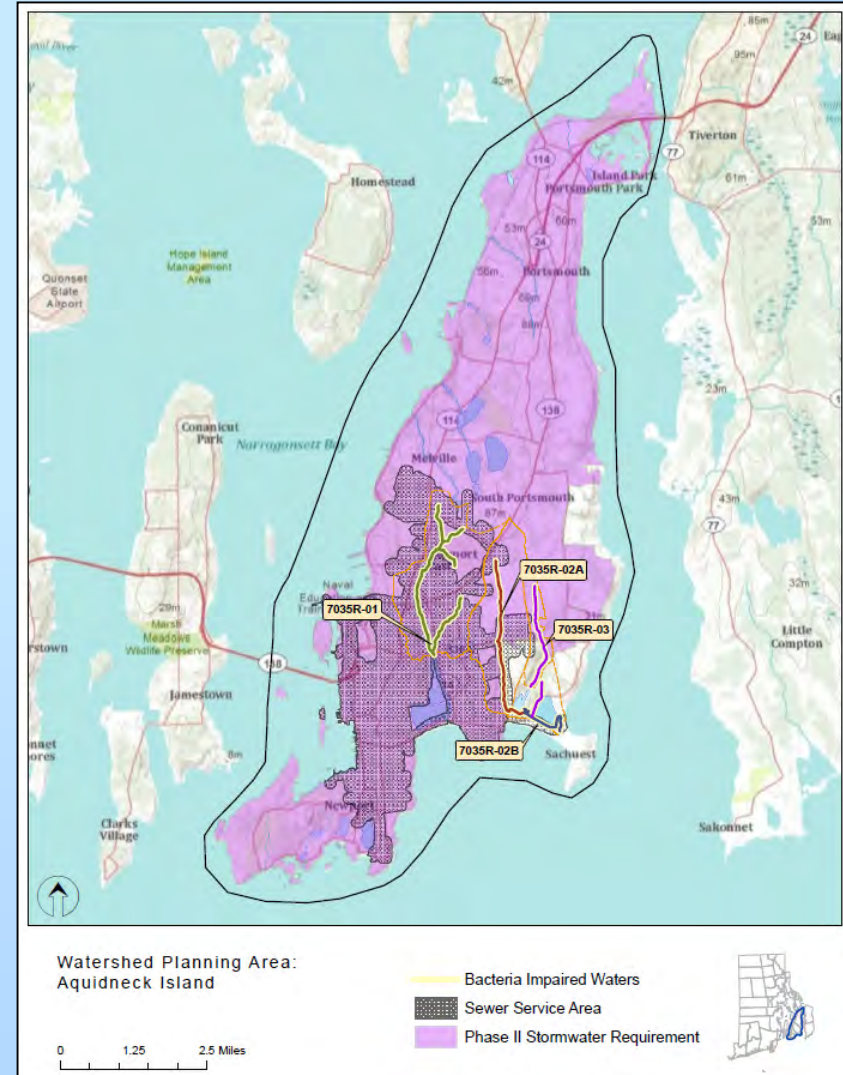
Potential Bacteria Sources

Other



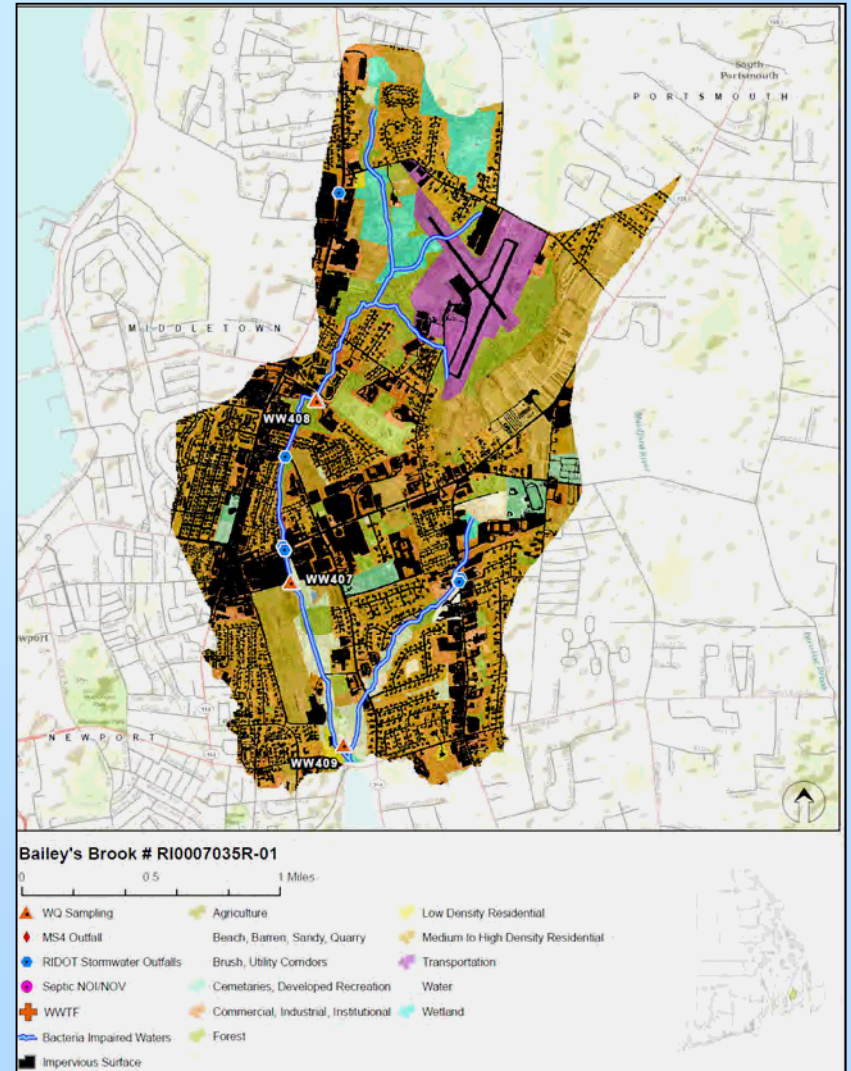
Bailey's Brook

- WPA 1: Aquidneck Island
- Middletown, RI
- Freshwater, Class AA
- Impaired for Enterococci

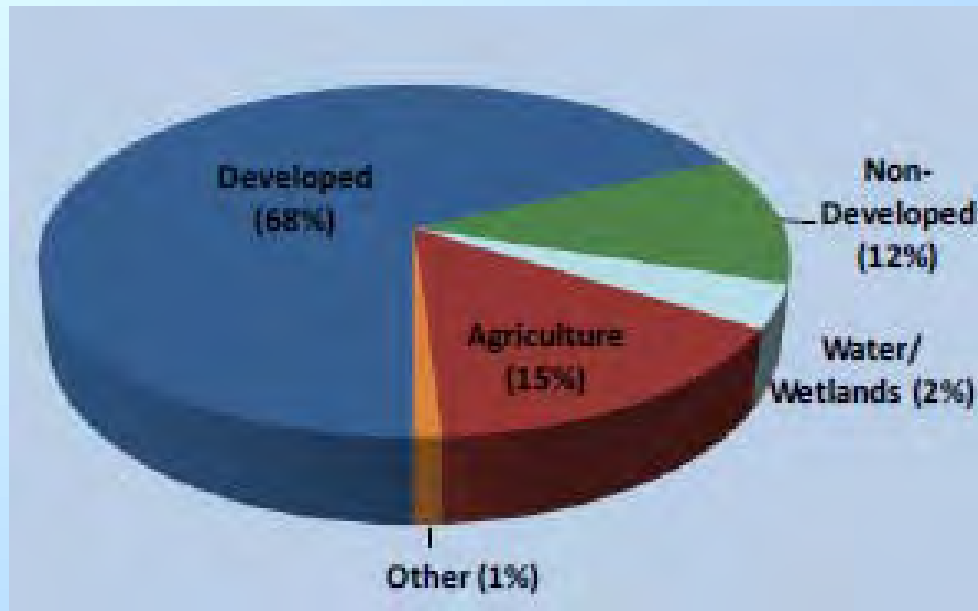


Data and Impairment for Bailey's Brook

- Data available from 2006 – 2008 for 3 stations
- Geometric mean exceeded the water quality criteria for enterococci
- Wet and dry weather impairment
- **97% reduction to meet the TMDL**



Land Use in the Bailey's Brook Watershed



Impervious Cover: 32%

Pollutant Sources in the Bailey's Brook Watershed

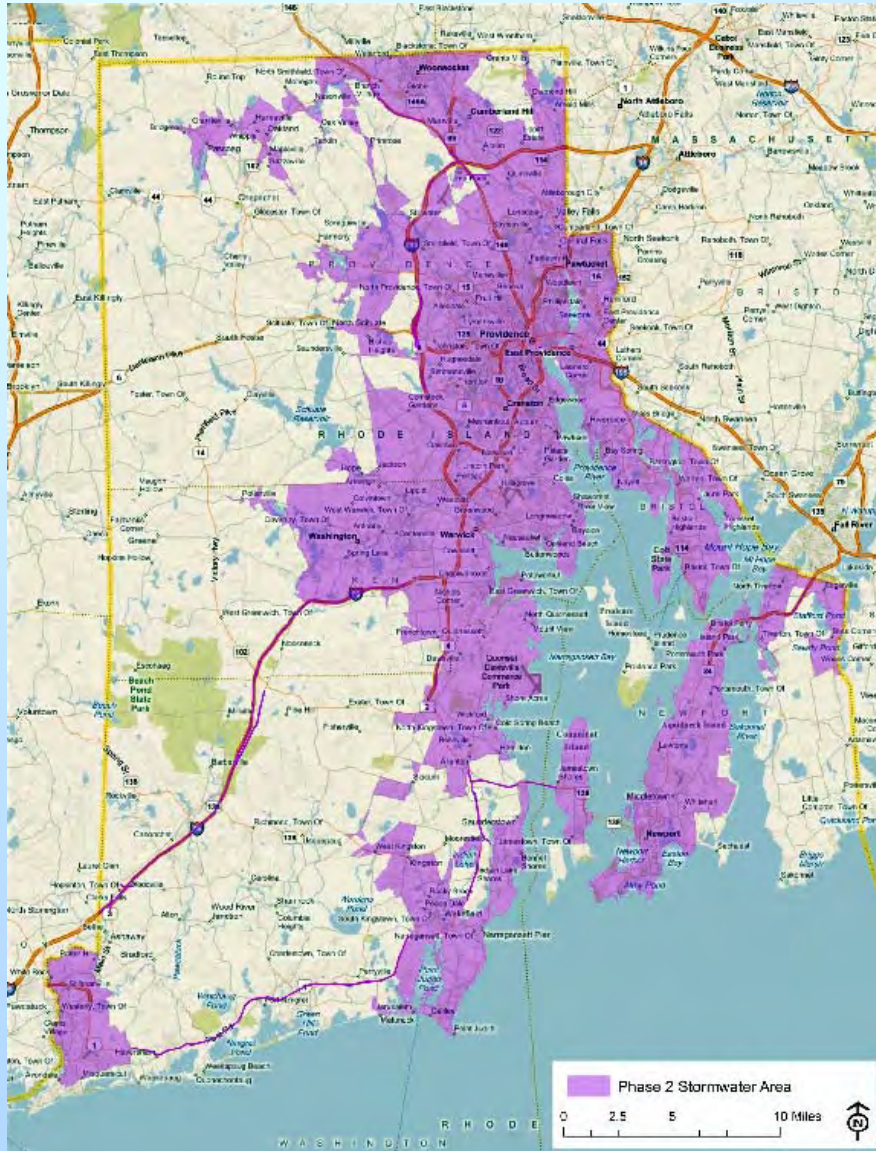
- Developed Area Stormwater Runoff
- Sewer Leaks
- Onsite Wastewater Treatment Systems
- Agricultural Activities
- Waterfowl, Wildlife, and Domestic Animal Waste





Recommended Pollution Reduction Strategies

- Stormwater Control - Municipal Separate Storm Sewer Systems (MS4s)
 - Stormwater Management Program Plans (SWMPP)
- Wastewater Management
 - On-site Wastewater Treatment Systems
 - Sewer Infrastructure
 - *No Discharge* from Marine Sanitation Devices
- Animal Waste Control
- Landuse Protection



Stormwater Phase II

Who is regulated?

- Municipalities within the urbanized area or densely populated area
- Federal, State, and Quasi-State facilities serving an average daily population of equal to or greater than 1,000 persons
- RIDOT in urbanized areas, densely populated areas, and areas qualifying as a divided highway
- Others



Stormwater Phase II

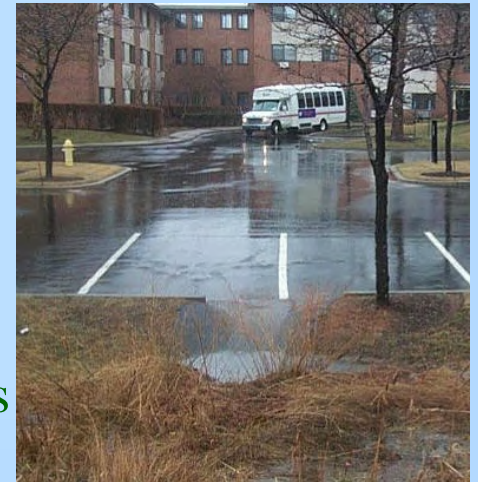
Six Minimum Measures

- Public education and outreach program
- Public involvement/participation program
- Illicit discharge detection and elimination program
- Construction site stormwater runoff control program for sites disturbing 1 or more acres
- Post-construction stormwater runoff control program for new and re-development disturbing 1 or more acres
- Pollution prevention and good housekeeping program

Stormwater Control (MS4s)

Changes to Permit: Impervious Cover

- <10% Impervious Cover
 - Unless watershed-specific information, bacteria impairments assumed caused by sources other than urban stormwater
 - No change to Phase II Permit Requirements
- Between 10% and 15% Impervious Cover
 - Revise post-construction ordinances
- >15% Impervious Cover
 - Revise post-construction ordinances
 - Evaluate the sufficiency of the minimum measures
- Structural BMP Requirements
 - Determined on a case-by-case basis, generally where specific information identifies significant sources or where previous TMDL has required structural BMPs.



Stormwater Control (MS4s) Phase II TMDL Requirements

Revise Stormwater Management Program Plan (SWMPP) in a TMDL Implementation Plan (TMDL IP).

- Modify Six Minimum Measures to incorporate TMDL recommendations.
- Revise local ordinances to require:
 - new development sites to use stormwater controls to prevent **any net increase** in bacteria
 - re-development sites to use stormwater controls to reduce bacteria to the **maximum extent feasible**
- Use of LID (Low Impact Development) techniques wherever feasible
- Other TMDL IP Requirements (including a schedule)



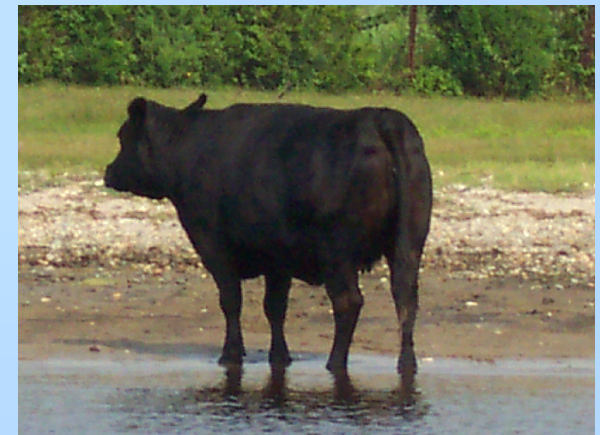
Proper Operation and Maintenance of On-Site Wastewater Treatment Systems (OWTS)

- TMDL Recommendations
 - Enforceable mechanisms to ensure the proper operation and maintenance of OWTS
 - Detailed property records
 - Identify and replace sub-standard systems through inspections
- Cesspool Phase-Out
 - Commercial facilities or multifamily dwellings (Rules effective 01/01/2008) [EPA]
 - Within 200 feet of inland edge of coastal shoreline by 2013 (Rules effective 08/04/2010)
 - Within 200 feet of public wells and drinking water reservoirs (Rules effective 08/04/2010)



Animal Waste Control

- Domestic Pets
 - Dispose waste away from waters and storm drains
 - Identify problem areas and install signage and receptacles
- Farms
 - Restrict access to wetlands and streams
 - Establish buffers
 - Use proper animal waste handling, disposal, and storage practices



Animal Waste Control

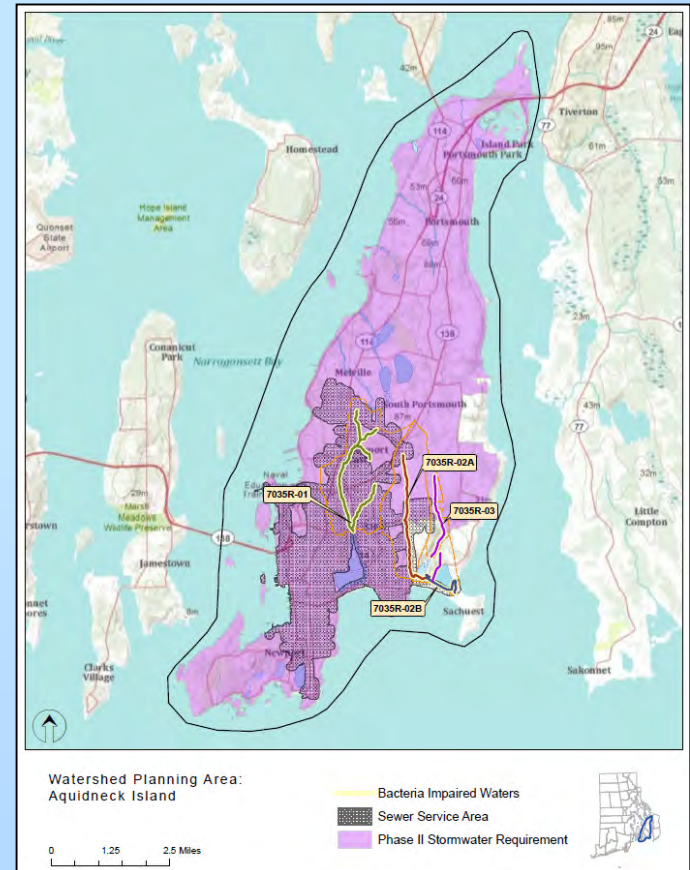


- Waterfowl
 - Minimize waterfowl impacts by installing and maintaining waterfront buffers
 - Prevent feeding by humans
 - Develop education programs that emphasize that feeding waterfowl can be harmful to waterfowl, humans, and the environment



Bailey's Brook Implementation

- Developed Area Stormwater Runoff
- Wastewater
 - Onsite Wastewater Treatment Systems
 - Sewer Infrastructure
- Agricultural Activities
- Waterfowl, Wildlife, and Domestic Animal Waste
- Landuse Protection



Bailey's Brook Implementation: Stormwater

- Impervious Cover is 32%
- Entire watershed regulated under the Phase II Program
- Revise Stormwater Management Program Plan (SWMPP) in a TMDL Implementation Plan (TMDL IP).
 - **Modify Six Minimum Measures to incorporate TMDL recommendations.**
 - Revise local ordinances to require:
 - new development sites to use stormwater controls to prevent **any net increase** in bacteria
 - re-development sites to use stormwater controls to reduce bacteria to the **maximum extent feasible**
 - Use of LID (Low Impact Development) techniques wherever feasible

RHODE ISLAND STORMWATER DESIGN
AND INSTALLATION STANDARDS MANUAL

DECEMBER 2010



RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL
MANAGEMENT AND
C.R.M.C. COASTAL RESOURCES MANAGEMENT COUNCIL



Bailey's Brook Implementation: Stormwater

- Evaluate Sufficiency of Minimum Measures
- Implement 2007 Eutrophic Ponds TMDL stormwater provisions
 - Require Middletown and RIDOT to design and construct structural BMPs to reduce stormwater runoff volume, phosphorus, and, now, bacteria to the maximum extent feasible.
 - Conceptual Designs provided in 2005 Watershed Management Plan (Geosyntec, 2005).
- Other TMDL IP Requirements (including a schedule)



Bailey's Brook Implementation: Wastewater

- Majority of Watershed has sewers
- Enforceable mechanisms to ensure the proper operation and maintenance of OWTS in parts of the watershed without sewers.
 - Detailed Property Records
 - Identify and replace sub-standard systems through inspections
- Sewer Infrastructure
 - Sewer Leaks were a past issue
 - Continue with inspections and other actions to prevent leaks and overflows





Bailey's Brook Implementation

- Agriculture
 - Develop Conservation Plans
- Waterfowl, Wildlife, and Domestic Animal Waste
 - Education
 - Mitigation
- Landuse Protection
 - Source water to drinking water supply.
 - Only 16% of the watershed is undeveloped with only a very small portion protected as open space.



Public Comment Period Ends August 1, 2011

DEM TMDL Program Website

<http://www.dem.ri.gov/programs/benviron/water/quality/rest/index.htm>

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