Rhode Island Statewide Bacteria TMDL
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FB Environmental Associates
Heidi Travers
RI DEM
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?

303(d) List of Impaired Waters

Water Quality Status

Monitor & Assess

Implement BMPs

Survey & Plan

Aquatic Restoration Cycle
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.”
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)

Indicator Organism

- Total Coliform Bacteria
  - Fecal Coliform Bacteria *
    - *Escherichia coli**
  - Enterococci *
    - Enterococcus faecalis
    - Enterococcus faecium
- Fecal Streptococci
  - Streptococcus bovia
  - Streptococcus equinus
  - Streptococcus avium

* Indicators in Rhode Island
**EPA indicator which may be used as an indicator in Rhode Island if other data is not available
<table>
<thead>
<tr>
<th>Waterbody Class</th>
<th>Designated Use</th>
<th>Fecal Coliform (MPN/100 mL)</th>
<th>Enterococci (colonies/100 mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Geometric Mean(^1)</td>
<td>90(^{th}) Percentile(^1)</td>
</tr>
<tr>
<td>Class AA</td>
<td>Public Drinking Water Supply</td>
<td>20(^3)</td>
<td>200(^3)</td>
</tr>
<tr>
<td>Classes AA, A, B, B1, B(^{a}), B1(^{a})</td>
<td>Primary/Secondary Contact Recreation</td>
<td>200(^4)</td>
<td>400(^4)</td>
</tr>
<tr>
<td>Classes SA, SA(^{b})</td>
<td>Shellfish Consumption</td>
<td>14(^5)</td>
<td>49(^5)</td>
</tr>
<tr>
<td>Classes SA, SA(^{b}), SB, SB1, SB(^{a}), SB1(^{a})</td>
<td>Primary/Secondary Contact Recreation</td>
<td>50(^4)</td>
<td>400(^4)</td>
</tr>
</tbody>
</table>
\[ TMDL = WLA + LA + MOS \]

Where:

\[ WLA = \text{Wasteload Allocation} \] – point source

\[ LA = \text{Load Allocation} \] - non-point source category

\[ MOS = \text{Margin of Safety} \]

TMDL Expressed as Concentration - % reduction
<table>
<thead>
<tr>
<th>Class</th>
<th>Source</th>
<th>Enterococci Geometric Mean Colonies/100 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>WLA$^1$</td>
</tr>
<tr>
<td>AA$^*$</td>
<td>RIPDES Wastewater Sources$^2$</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>RIPDES Stormwater$^{1,3}$</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Non-RIPDES Stormwater or Groundwater$^{1,5}$</td>
<td>NA</td>
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<tr>
<td></td>
<td>Illicit Wastewater Discharges$^6$</td>
<td>0</td>
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<tr>
<td></td>
<td>Other Non-Point Source$^7$</td>
<td>NA</td>
</tr>
<tr>
<td>AA**</td>
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<tr>
<td></td>
<td>Other Non-Point Source$^7$</td>
<td>NA</td>
</tr>
<tr>
<td>A$^8$</td>
<td>RIPDES Wastewater Sources$^2$</td>
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<td></td>
<td>RIPDES Stormwater$^{1,3}$</td>
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<td></td>
<td>Other Non-Point Source$^7$</td>
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<td>B$^9$</td>
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<td>NA</td>
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<tr>
<td>B1$^8$</td>
<td>RIPDES Wastewater Sources$^2$</td>
<td>54 / 33$^8$</td>
</tr>
</tbody>
</table>
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
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 90\textsuperscript{th} percentile maximum
- Percent reduction to meet TMDL target

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

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

<table>
<thead>
<tr>
<th>Station Name</th>
<th>Station Location</th>
<th>Years Sampled</th>
<th>Number of Samples</th>
<th>Geometric Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAW11</td>
<td>Mile Brook at Nooseneck Hill Road (Rt 3) near Maxson St, Hopkinton</td>
<td>2005-2006</td>
<td>0</td>
<td>58</td>
</tr>
</tbody>
</table>

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
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.
- 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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