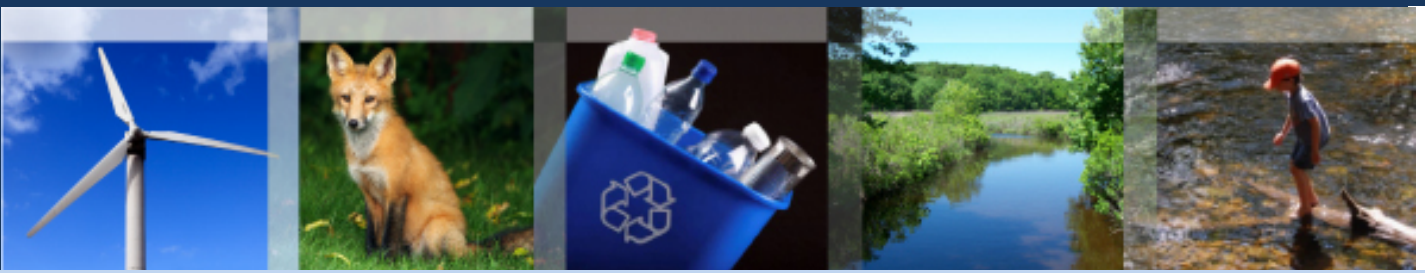
Connecticut Department of Energy and Environmental Protection



Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

Pawcatuck Watershed TMDL

5/14/2014
Chris Sullivan
Westerly Library Public Meeting

Connecticut Department of Energy and Environmental Protection

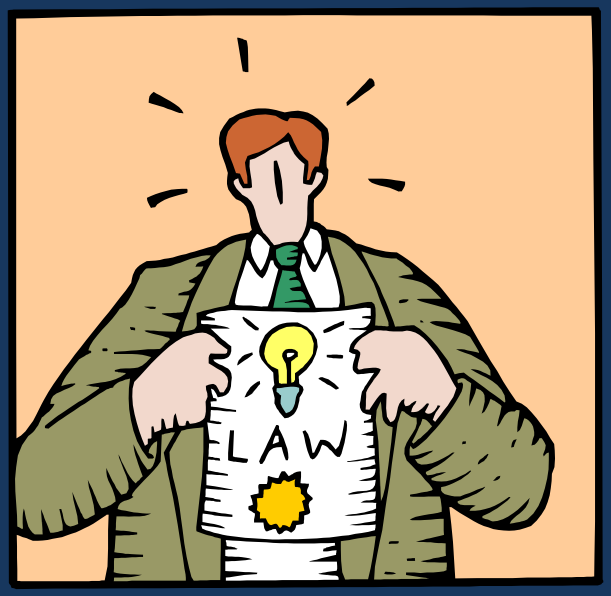
Total Maximum Daily Load (TMDL)

TMDL = Point Sources + Nonpoint Sources + Background + Margin of Safety

- Establishes acceptable pollution amounts and reduction goals
- Provides guidance to concerned parties for implementation efforts
- End goal of TMDL process is a waterbody that meets CT Water Quality Standards

Why do TMDLs?

- Required by Section 303(d) of the Clean Water Act (CWA)
- Impaired waterways are prioritized by CT DEEP for TMDL development
- Make a plan to meet Water Quality Goals through implementation actions



Bacteria Exceedances

- All waterbody segments included in TMDL have data showing exceedances of CT WQS
  - Freshwater Recreation Standards
  - Saltwater Recreation or Shellfish Standards

CT Water Quality Criteria

2011 Connecticut Water Quality Standards

APPENDIX B: WATER QUALITY CRITERIA FOR BACTERIAL INDICATORS OF SANITARY QUALITY
SEE ALSO STANDARDS # 23 AND 25

DESIGNATED USE	CLASS	INDICATOR	CRITERIA
Freshwater			
Drinking Water Supply [1]			
Existing / Proposed	AA	Total coliform	Monthly Moving Average less than 100/100ml Single Sample Maximum 500/100ml
Potential	A	----	--------
Recreation [2][3]			
Designated Swimming [4]	AA, A, B	*Escherichia coli*	Geometric Mean less than 126/100ml Single Sample Maximum 235/100ml
Non-designated Swimming [5]	AA, A, B	*Escherichia coli*	Geometric Mean less than 126/100ml Single Sample Maximum 410/100ml
All Other Recreational Uses	AA, A, B	*Escherichia coli*	Geometric Mean less than 126/100ml Single Sample Maximum 576/100ml
Saltwater			
Shellfishing [6]			
Direct Consumption	SA	Fecal coliform	Geometric Mean less than 14/100ml 90% of Samples less than 31/100ml
Indirect Consumption	SB	Fecal coliform	Geometric Mean less than 88/100ml 90% of Samples less than 260/100ml
Recreation			
Designated Swimming [4]	SA, SB	Enterococci	Geometric Mean less than 35/100ml Single Sample Maximum 104/100ml
All Other Recreational Uses	SA, SB	Enterococci	Geometric Mean less than 35/100ml Single Sample Maximum 500/100ml

TMDL Process

Statewide TMDL Structure

Core TMDL Document

- Background and Reference

Appendix 1.

Appendix 2.

Appendix 3.

Appendix XX.

- Waterbody specific details
- TMDL Goals
- Current Activities
- Recommended Actions

Appendix Content

- Watershed Information
- Maps(impaired segments, land use, impervious cover, MS4 areas, buffer zones, potential bacteria sources)
- Current implementation projects and recommended next steps
- Data tables including % reduction goals

Pawcatuck River and Estuary

Watershed Summary

WATERSHED DESCRIPTION AND MAPS

The Pawcatuck River watershed covers an area of approximately 4,860 acres in the southeastern corner of Connecticut. The remainder of the watershed is located in Rhode Island. There are several towns located at least partially in the watershed in Connecticut, including the municipalities of Stonington and North Stonington, CT.

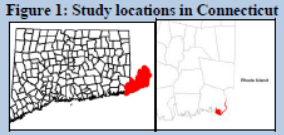
The Pawcatuck River watershed includes six freshwater segments and four estuary segments addressed in this TMDL that are impaired for recreation or shellfishing due to elevated bacteria levels. The mainstem segment (CT1000-00_01) was assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and first included in the CT 2008 303(d) list of impaired waterbodies. All included freshwater tributary segments were discovered to have elevated bacteria concentrations during targeted monitoring for development of this TMDL. These freshwater tributary streams do not meet water quality standards and will be impaired in the 2014 Integrated Water Quality Report (IWQR) based on results of the data collection in 2011. An excerpt of the IWQR is included in Table 1 to show the status of the waterbodies in the watershed.

The Pawcatuck River begins in South Kingstown, Rhode Island and flows southwest through Richmond, Charleston, Hopkinton, and Westerly, RI, before forming the border between Westerly, RI, and North Stonington, CT. The bacteria impaired freshwater mainstem segment (CT1000-00_01) begins when the river flows into North Stonington, CT (Figure 5). Once the river begins to flow south from North Stonington it forms the border between Westerly, RI, and Stonington, CT. The impaired segment ends at the head of tide at the

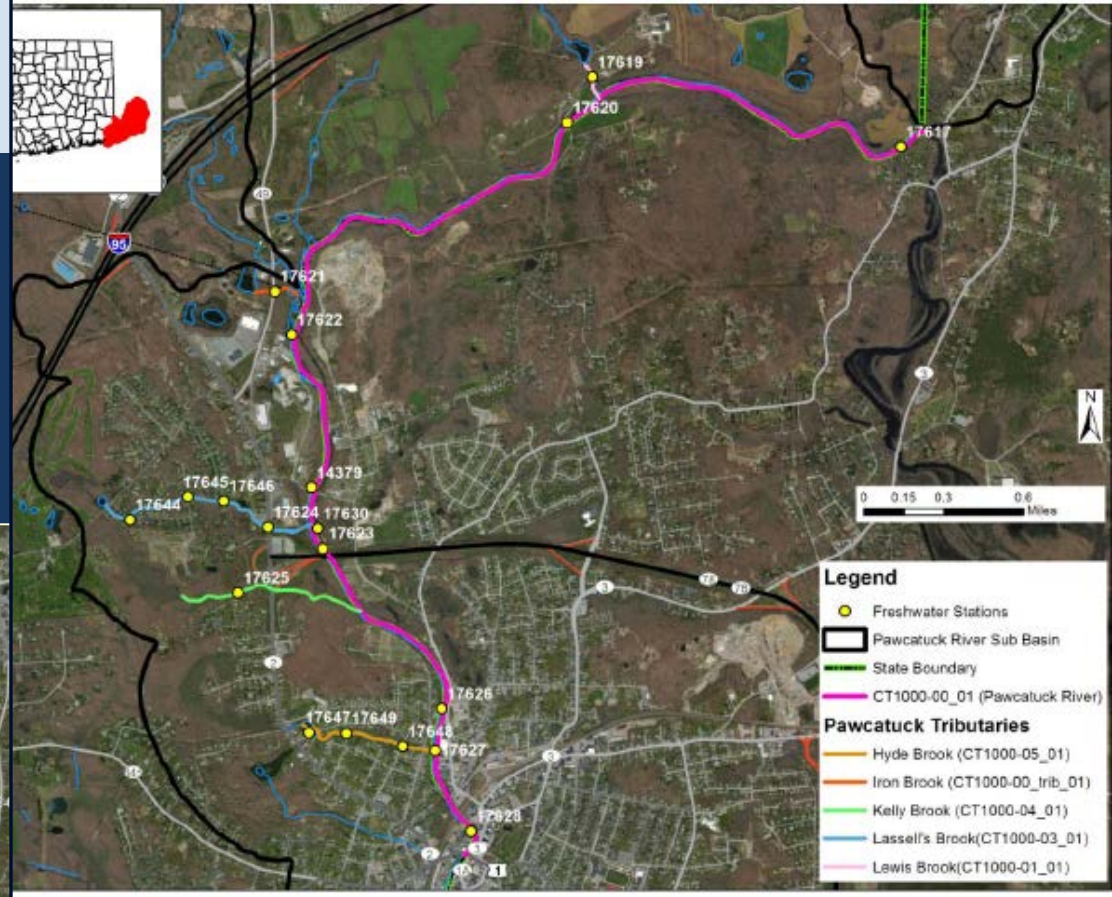
Impaired Segment Facts

Impaired Segment:
Segment 1: Pawcatuck River (CT1000-00_01); B; 5.38 miles
Segment 2: Unnamed Brook 1(CT1000-01_01); A; 0.14 miles
Segment 3: Unnamed Brook 2 (CT1000-03_01); A; 0.87 miles
Segment 4: Unnamed Brook 3(CT1000-04_01); A; 0.71 miles
Segment 5: Unnamed Brook 4 (CT1000-05_01); A; 0.55 miles
Segment 6: Unnamed Brook 5(CT1000-00_trib_01); A; 0.17 miles
Segment 7: LIS EB Inner - Pawcatuck River Stonington (*CT-E1_001-SB*); SB; 0.10 miles^2
Segment 8: LIS EB Inner - Pawcatuck River, Stonington (*CT-E1_002-SB*), SB; 0.31 miles^2
Segment 9: LIS EB Shore - Wequetequock Cove, Stonington (*CT-E2_001*), SA; 0.58 miles ^{2}
Segment 10: LIS EB Midshore - Stonington (*CT-E3_001*); SA; 0.61 miles ^{2}
Municipalities: Stonington, North Stonington
Total Impaired River Segment Length (miles): 7.8464
Impaired Estuary Segment Area (miles^2): 1.74
Water Quality Classification: Class A, Class B, SB, SA
Designated Use Impairment: Recreation, Shellfishing
Sub-regional Basin Name and Code: Pawcatuck River CT1000
Regional Basin:
Pawcatuck Main Stem
Major Basin: Pawcatuck
Watershed Area in Connecticut (acres): 4,860
Estuary Area (acres): 1,113
MS4 Applicable: Yes
Applicable Season: Recreation Season (May 1 to September 30) Shellfishing: All year

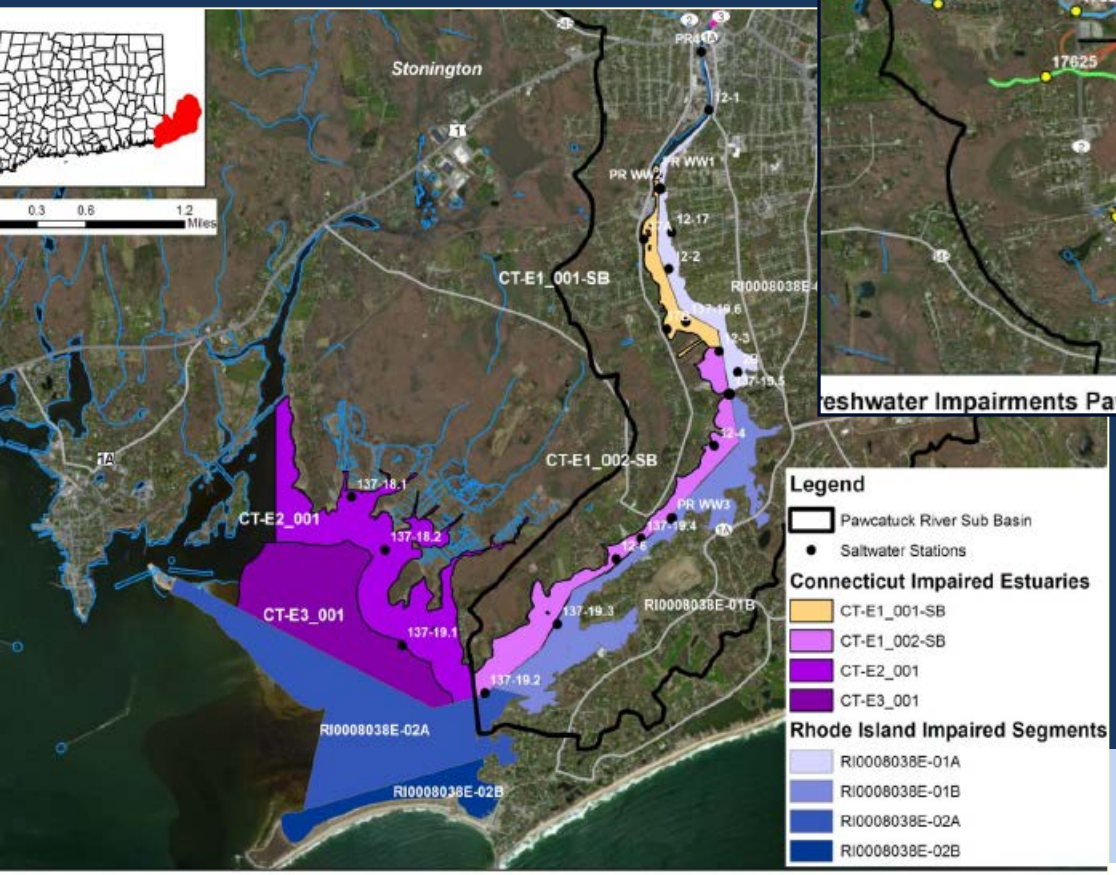
Figure 1: Study locations in Connecticut



Included Waters



reshwater Impairments Pawcatuck River Map Data: DEEP Map Created: October 2013

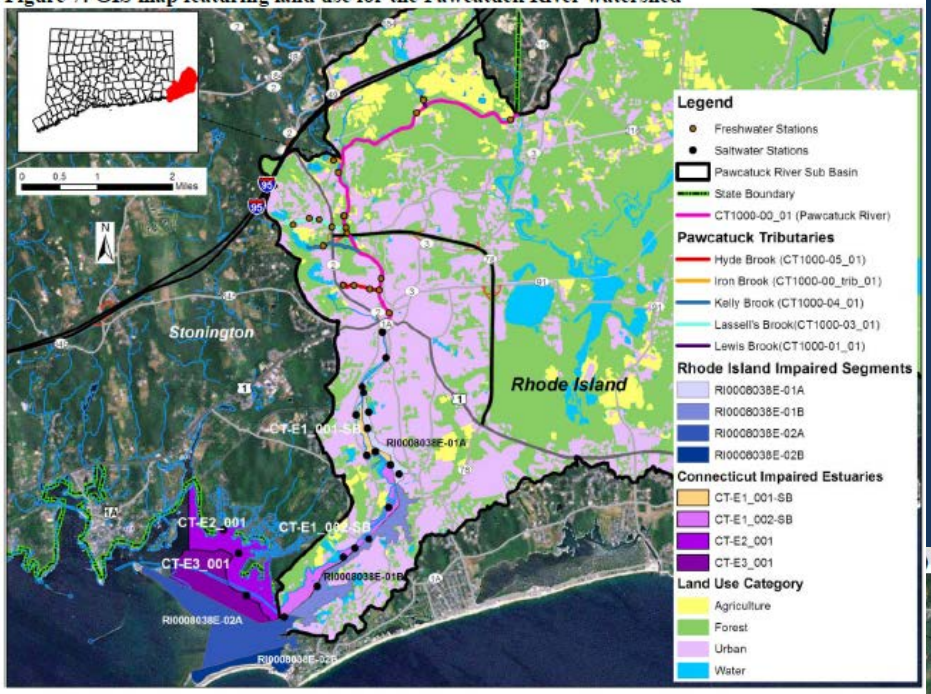


Pawcatuck Saltwater Impaired Segments Map Data: DEEP Map Created: July 2013

Environmental Protection

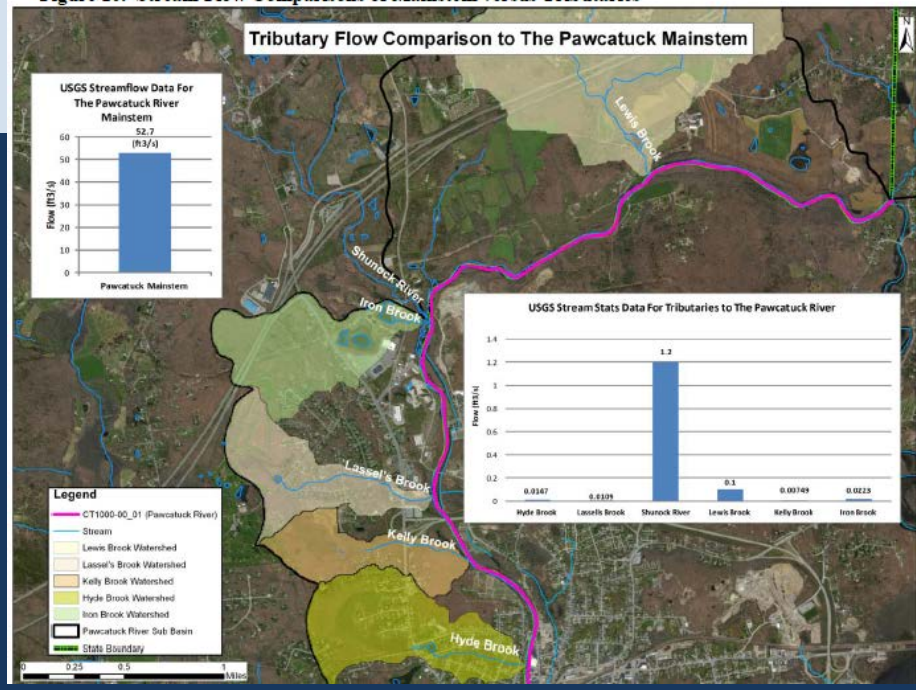
Maps

Figure 7: GIS map featuring land use for the Pawcatuck River watershed

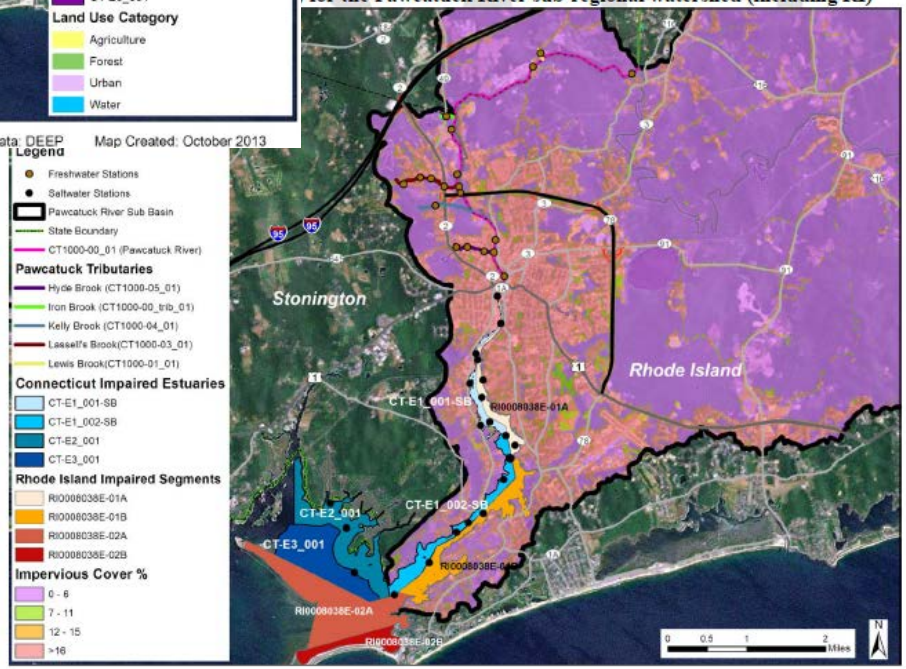


Land Use In The Pawcatuck River Sub Regional Basin Map Data: DEEP Map Created: October 2013

Figure 10. Stream Flow Comparisons of Mainstem versus Tributaries



for the Pawcatuck River sub-regional watershed (including RI)

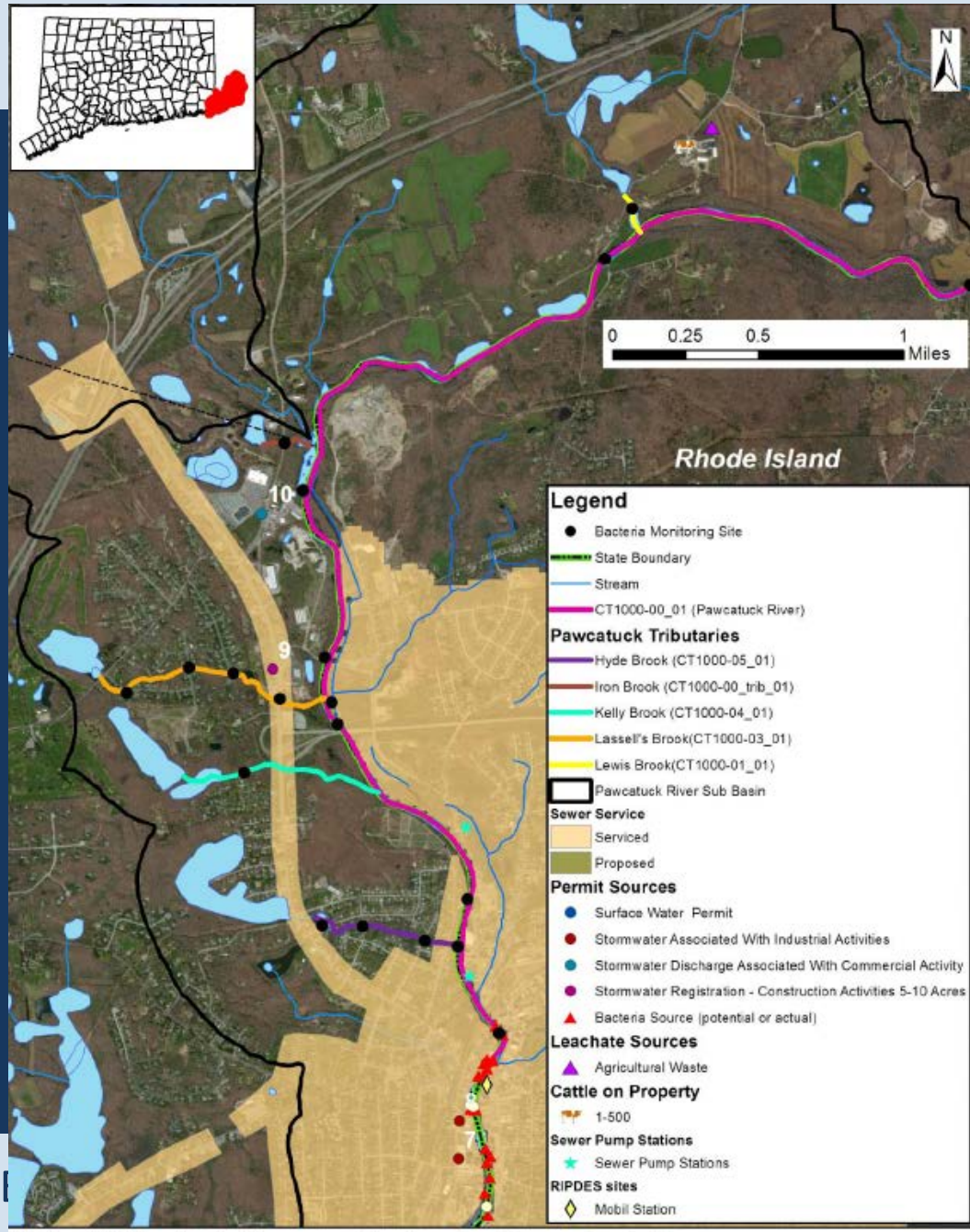


Impervious Surfaces In The Pawcatuck River Sub Regional Basin Map Data: DEEP Map Created: October 2013

Connecticut Dep ection

Potential Sources

- Sources evaluated during development
  - Migratory waterfowl
  - Golf courses
  - Reservoirs
  - Cattle + poultry farms
  - Sewer service
  - Leachate sources
  - Discharge sources
  - Permitted sources



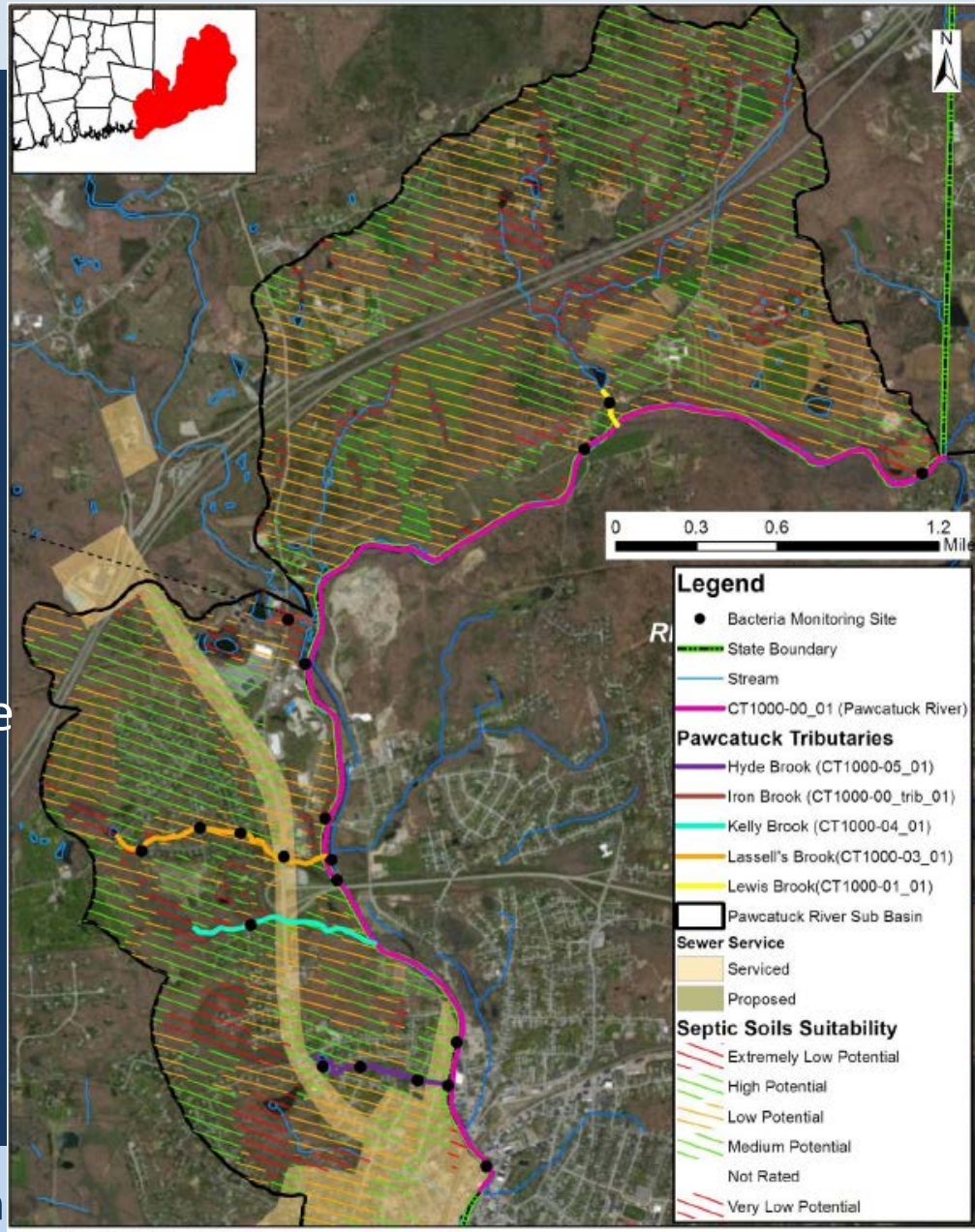
Potential Bacteria Sources Freshwater Pawcatuck River

Map Data: DEEP Map Created: October 2013

Septic Suitability

- Issues considered for mapping layers
  - Soil percolation rates
  - Depth to water table
  - Flooding issues

- Lowest potential sites are unlikely to receive permits for septic systems due to inability to meet state health code regulations



Septic Soil Suitability Pawcatuck River

Map Data: DEEP / NRCS Map Created: February 2014

Current Management Activities

- MS4 documentation and reporting
- Watershed based plans
- Other implementation actions

Table 10: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Stonington, CT (GSM000056)

Minimum Measure	Stonington 2012 Annual Report Update
Public Outreach and Education	1) In 2012, the Town partnered with "Save the Bay" and students from Mystic Middle School to install 40 storm drain markers on catch basins in Cove Road and Kidds Way. There are approximately 160 catch basins in town remaining to be marked.
	2) Task Force members use an Enviroscape model to teach about stormwater issues at Deans Mill Elementary School.
	3) Continue placing information on the Town website and working with a local group (CUSH) that provides even more stormwater information (www.cushinc.org)
Public Involvement and Participation	1) Continue installing catch basin markers with volunteer help in the summer of 2013.
	2) In 2008, the Town worked with a local environmental group, Clean Up Stonington Harbors, on the distribution of a stormwater brochure. The brochure was delivered to 11,825 homes via the Mystic River Press, to 4,305 homes via the Westerly/Pawcatuck Press, and to 7,600 homes via the Stonington Times.
Illicit Discharge Detection and Elimination	1) Completed outfall and drainage mapping project and earmarked 35 different outlets to begin IDDE investigations. Sampling is anticipated in summer of 2013. 2) All wet weather sample locations were continued with sampling in the fall of 2012.

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Recommended Next Steps

- Suggestions for further protection of the impaired waterbody
  - Identify potential areas for BMP implementation
  - Adjust monitoring locations and parameters

RECOMMENDED NEXT STEPS

As show above, the Town of Stonington has developed and implemented programs to protect water quality from bacterial contamination. Future mitigation activities are necessary to reduce the pathogen contamination in the Pawcatuck watershed. These recommendations will guide interested parties towards the restoration of the impaired waters and ensure the long-term protection of the waters of the Pawcatuck River and have been prioritized below.

1). Identify areas along the more developed portions of the impaired segment of the Pawcatuck River to implement Best Management Practices (BMPs) to control stormwater runoff.

To identify specific areas that are contributing bacteria to the impaired segment, the included towns in the watershed should conduct wet-weather sampling at stormwater outfalls that discharge directly to the Pawcatuck River. To manage stormwater runoff, the towns should also identify areas along the more developed sections of the Pawcatuck River, particularly along the impaired segment, to install BMPs designed to encourage stormwater to infiltrate into the ground before entering the Pawcatuck River. These BMPs would disconnect impervious areas and reduce pollutant loads to the river. Information on potential BMPs and local examples can be reviewed by municipal staff at this DEEP website: www.ct.gov/deep/greeninfrastructure.

The Pawcatuck River Estuary and Little Narragansett Bay Interstate Management Plan suggested that towns within the watershed should develop a comprehensive stormwater management plan to address the stormwater pollution entering the Pawcatuck River (Dillingham et al., 1993). More detailed information and stormwater BMP recommendations can be found in the core TMDL document.

2). Ensure there are sufficient buffers on agricultural lands along Pawcatuck River.

Agricultural producers should work with the CT Department of Agriculture and the U.S. Department of Agriculture Natural Resources Conservation Service to develop conservation plans for their farming activities within the watershed. These plans should focus on ensuring that there are sufficient stream buffers, that fencing exists to restrict access to livestock and horses to streams and wetlands, and that animal waste handling, disposal, and other appropriate Best Management Practices (BMPs) are in place. Particular attention should be paid to those agricultural operations located along the impaired segment and along tributary streams of the impaired segment.

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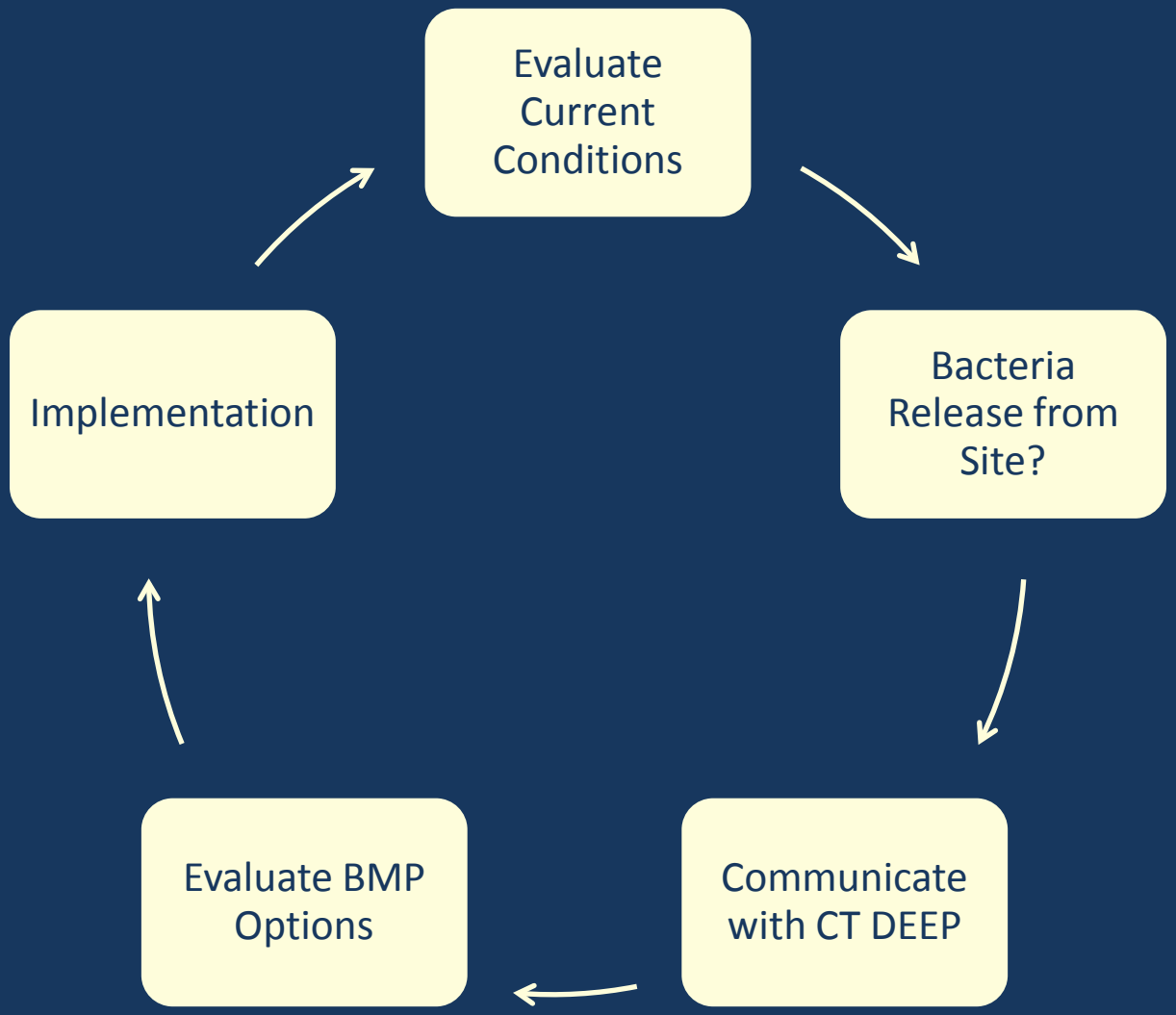
General Implementation Process



Data Calculations

- Geometric Means
- 90% of Samples Less Than (Shellfish)
- Single Sample Exceedance (FW Rec)
- Load Reductions

  [(Max Result – Criteria) / Max Result] x 100 = % Reduction

Data Calculations

- Percent reduction goals are guidance for waterbody
- TMDL identifies required reductions in pollutant to meet WQ goals

Table 15: Pawcatuck River Bacteria Data

Waterbody ID: CT1000-00_01

Characteristics: Freshwater, Class B, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, and Industrial and Agricultural Water Supply

Impairment: Recreation (E. coli bacteria)

Water Quality Criteria for E. coli:

Geometric Mean: 126 colonies/100 mL

Single Sample: 410 colonies/100 mL

Percent Reduction to meet TMDL:

Geometric Mean: **67%**

Single Sample: **98%**

Data: 2006-2009 from CT DEEP targeted sampling efforts and 2011 CT DEEP targeted efforts 2012 TMDL Cycle

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on the Pawcatuck River freshwater segment with annual geometric means calculated by station

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
254	White Rock Road Bridge at State Line	6/21/2006	220	dry**	
254	White Rock Road Bridge at State Line	6/28/2006	750	wet**	
254	White Rock Road Bridge at State Line	7/3/2006	125†	dry**	
254	White Rock Road Bridge at State Line	7/11/2006	190	wet**	
254	White Rock Road Bridge at State Line	7/18/2006	110	wet**	
254	White Rock Road Bridge at State Line	7/27/2006	74	wet**	112
254	White Rock Road Bridge at State Line	8/2/2006	86	dry**	
254	White Rock Road Bridge at State Line	8/9/2006	36†	dry**	
254	White Rock Road Bridge at State Line	8/16/2006	63	wet**	
254	White Rock Road Bridge at State Line	8/23/2006	190	dry**	
254	White Rock Road Bridge at State Line	9/11/2006	30	dry**	

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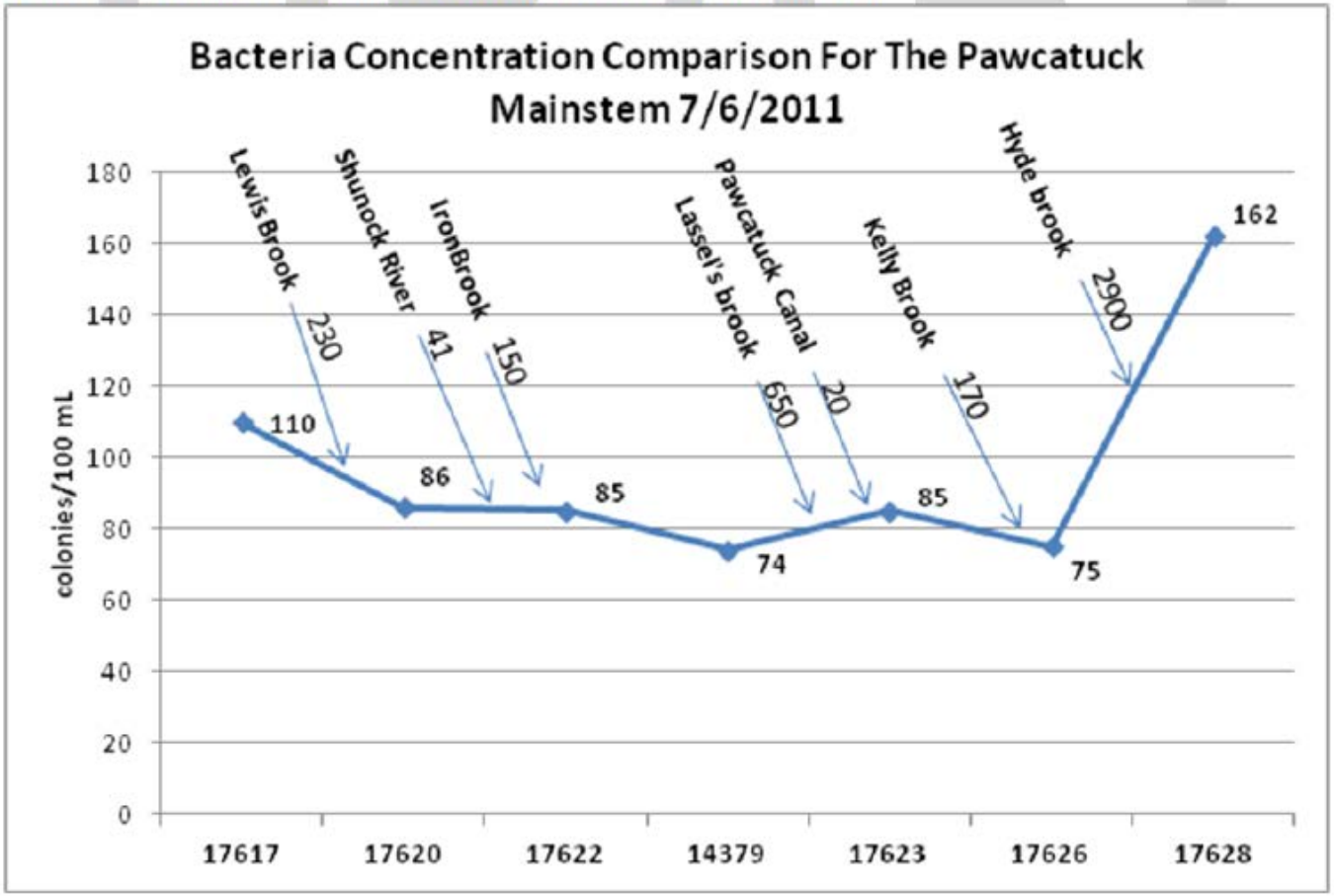
Bacteria Mass Loading

- Traditional bacteria analysis
  - Concentration based from grab samples
  - Direct comparison versus criteria

Figure 21. Chart of e.coli concentrations in the Pawcatuck River



Bacteria Mass Loading

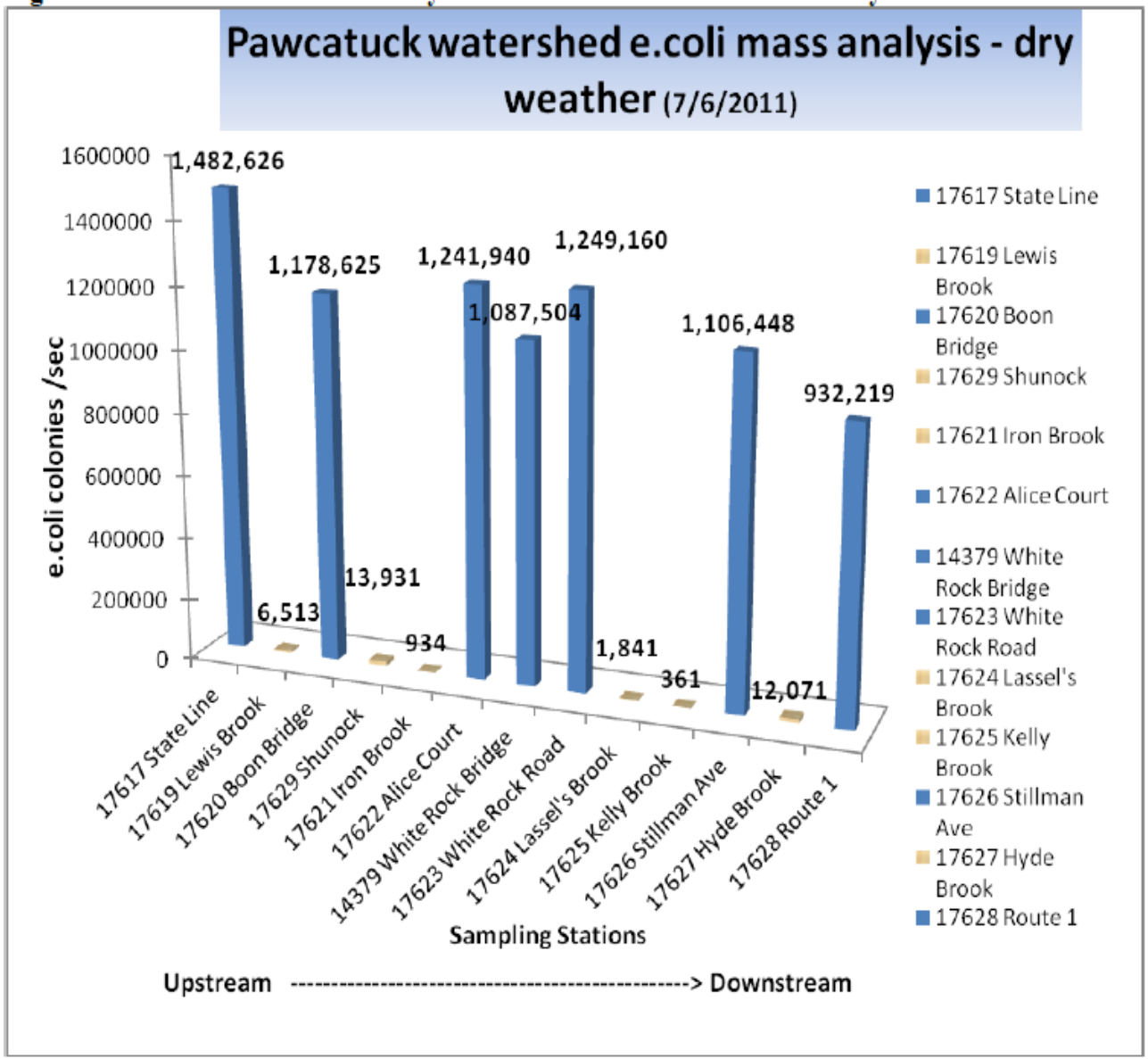
- Convert concentrations to mass loads
  - Estimate Flow from USGS Stream Stats

FLOW VOLUME (FT^3/SEC) * E.COLI CONCENTRATION (COLS/100ML) * 28316 ML/1FT^3 = BACTERIA MASS LOAD (COLS/SEC)

Bacteria Mass Loading

- Same sampling date and results
- Consider volume in calculations
- Tributaries appear to be minimal contributors
  - But tributaries are impaired for WQ
- Guide implementation efforts and priorities
- Qualitative Analysis

Figure 22. Chart of e.coli mass analysis in the Pawcatuck Watershed –dry weather



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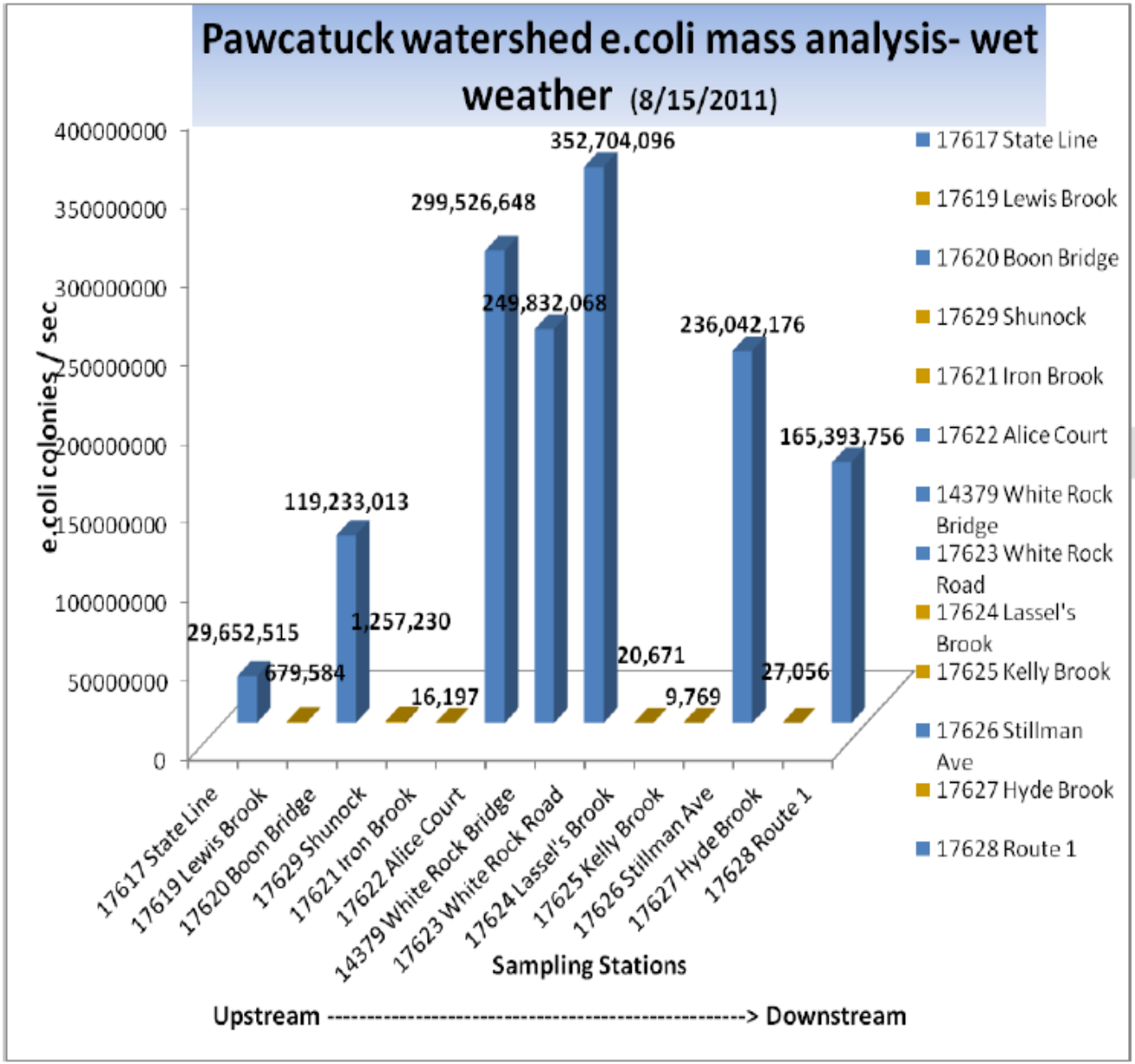
Bacteria Mass Loading

- Same stations
- Wet weather
- Tributaries still proportionally lower numbers
- Large increase where urban development trends upward

Figure 23. Chart of e.coli mass analysis in Pawcatuck Watershed – wet weather



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Collaborative Project

- Efforts of many groups to draft TMDL
- CT DABA (shellfish data, GIS, and reports)
- RIDEM (monitoring data, GIS, communication and reports)
- Volunteer groups (data)
- Municipalities (MS4 reports and data)

Opportunities

- Work with CT DEEP and RIDEM programs to improve water quality
  - Municipal programs (MS4), Watershed coordinators, Permitting group
- Work with Health Districts/ Departments
  - Assist with track-down of known sources
- Work with municipalities & local watershed associations
  - Generate watershed plans, implement monitoring, conduct outreach to public
- <u>Communication</u>

Public Comment Period

- CT DEEP is accepting public comments on the documents until June 9, 2014
- Email or snail mail written comments to Chris Sullivan
- Comments will be addressed in a Response to Comments document and posted on website

Questions?

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