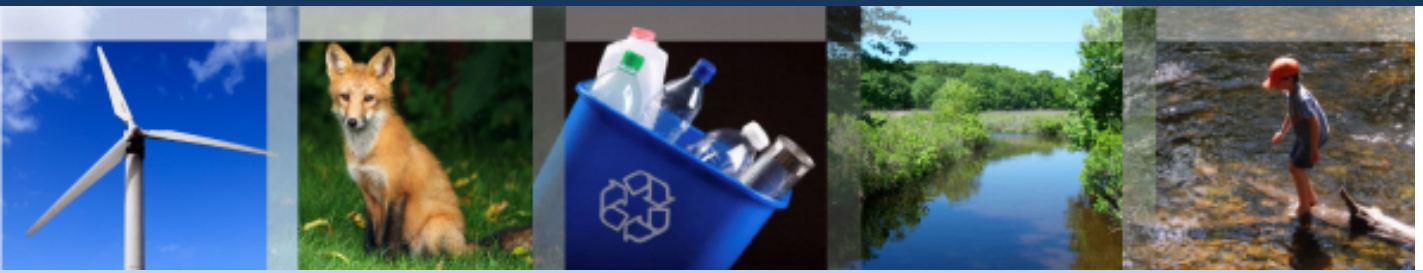
Connecticut Department of Energy and Environmental Protection



Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

Statewide Bacteria TMDL

July 17, 2012
Chris Sullivan
Information Session/ DEEP HQ

Connecticut Department of Energy and Environmental Protection

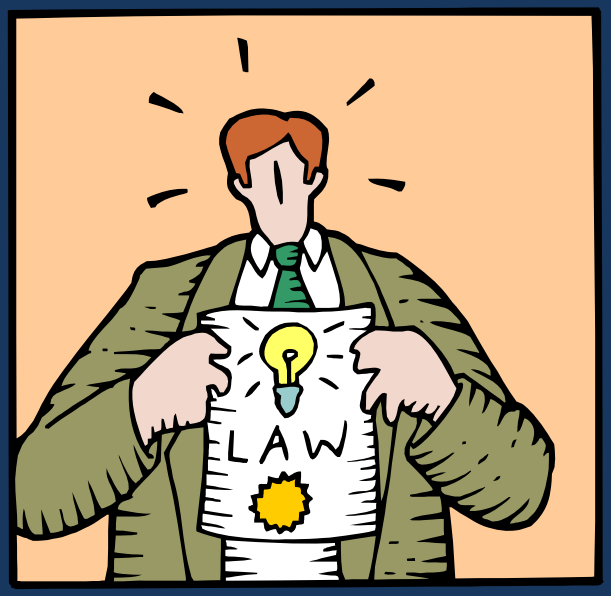
What is a TMDL?

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

- Establishes acceptable pollutant loads and reduction goals
- Informs interested and responsible parties of monitoring results and potential implementations
- The end result of the TMDL process is for the waterbody to attain 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

TMDL Allocations

- Waste Load Allocation (WLA)
  - Point Source Discharges to waterbody
- Load Allocation (LA)
  - Non-point sources and unregulated sources
- Margin of Safety (MOS)
  - Account for uncertainty in analysis and monitoring
  - Seasonal variability

TMDL Process

Bacteria Exceedances

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

Bacteria Data Sources

Impairment	Bacteria Type	Data Source
Freshwater recreation	Escherichia coli	CT DEEP monitoring
		USGS data
		Volunteer data
		Municipal monitoring
Saltwater Recreation	Enterococci	CT DEEP monitoring
		Municipal monitoring
Saltwater shellfishing	Fecal coliform	Bureau of Aquaculture monitoring

CT Water Quality Criteria

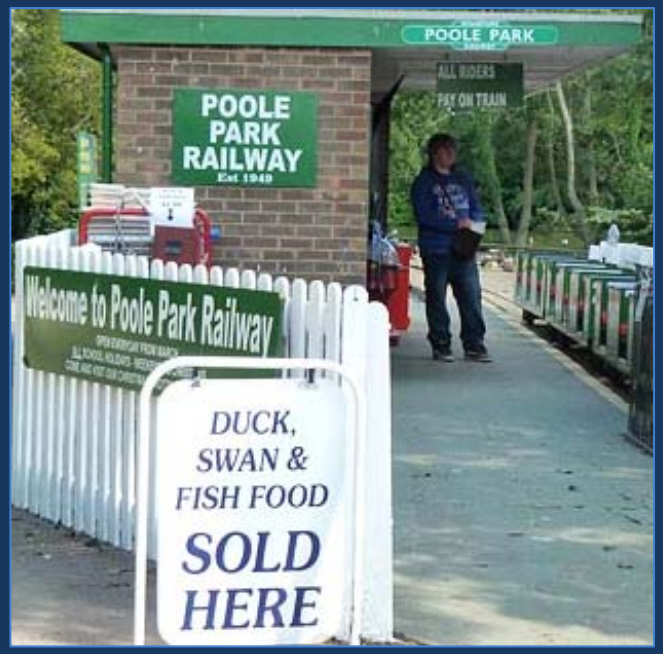
2011 Connecticut Water Quality Standards

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

Natural Exceedances

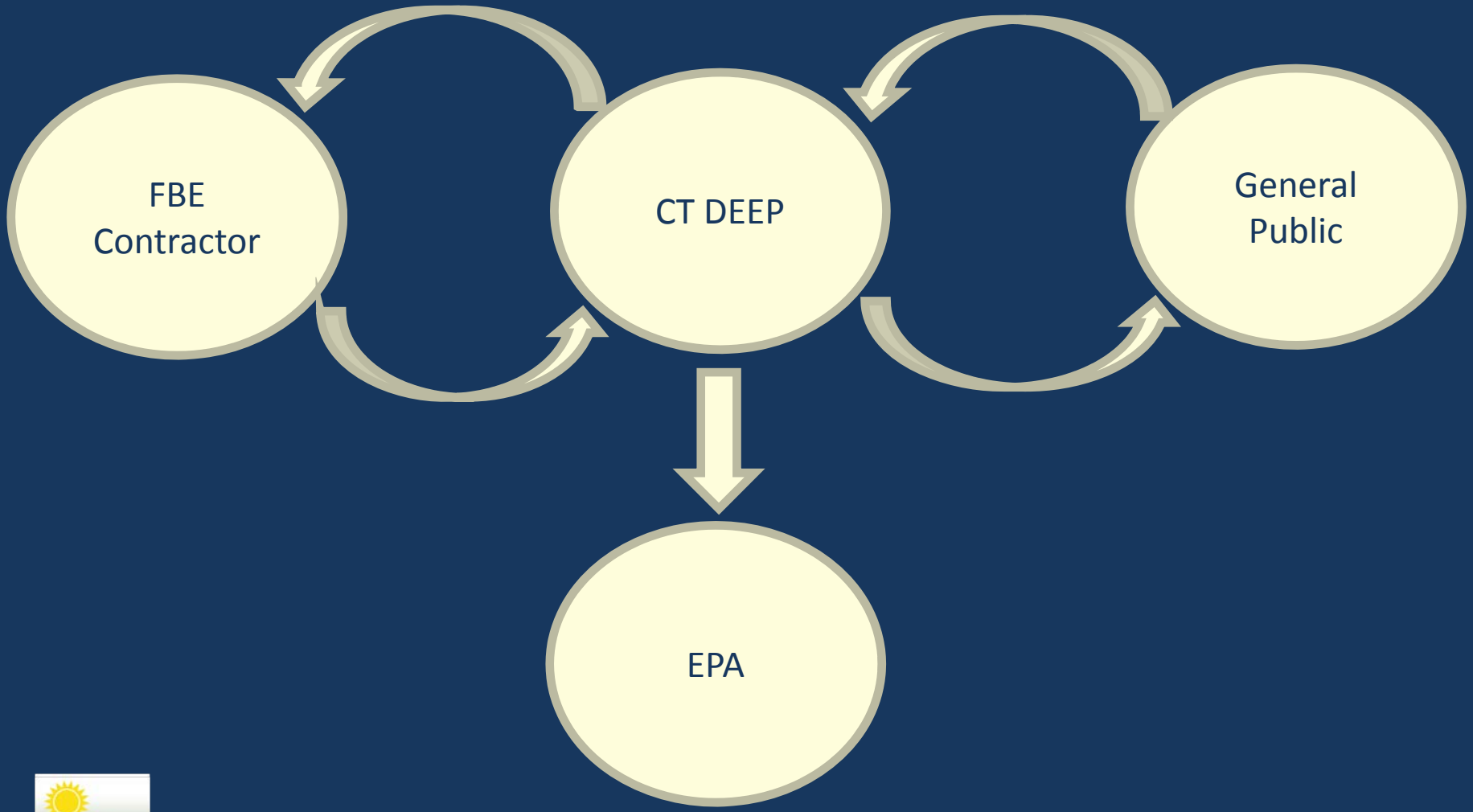
- Criteria do not apply to conditions brought about by natural causes (CT WQS 2011)



Why a Statewide Approach

- Address bacteria impairments in several waterbodies
- Enables earlier implementation and restoration for waterbodies
- Allows for additional future impairments to be appended to Core document

Statewide TMDL Process



Statewide TMDL Structure

Core TMDL Document

- Background and Reference

Appendix 1.

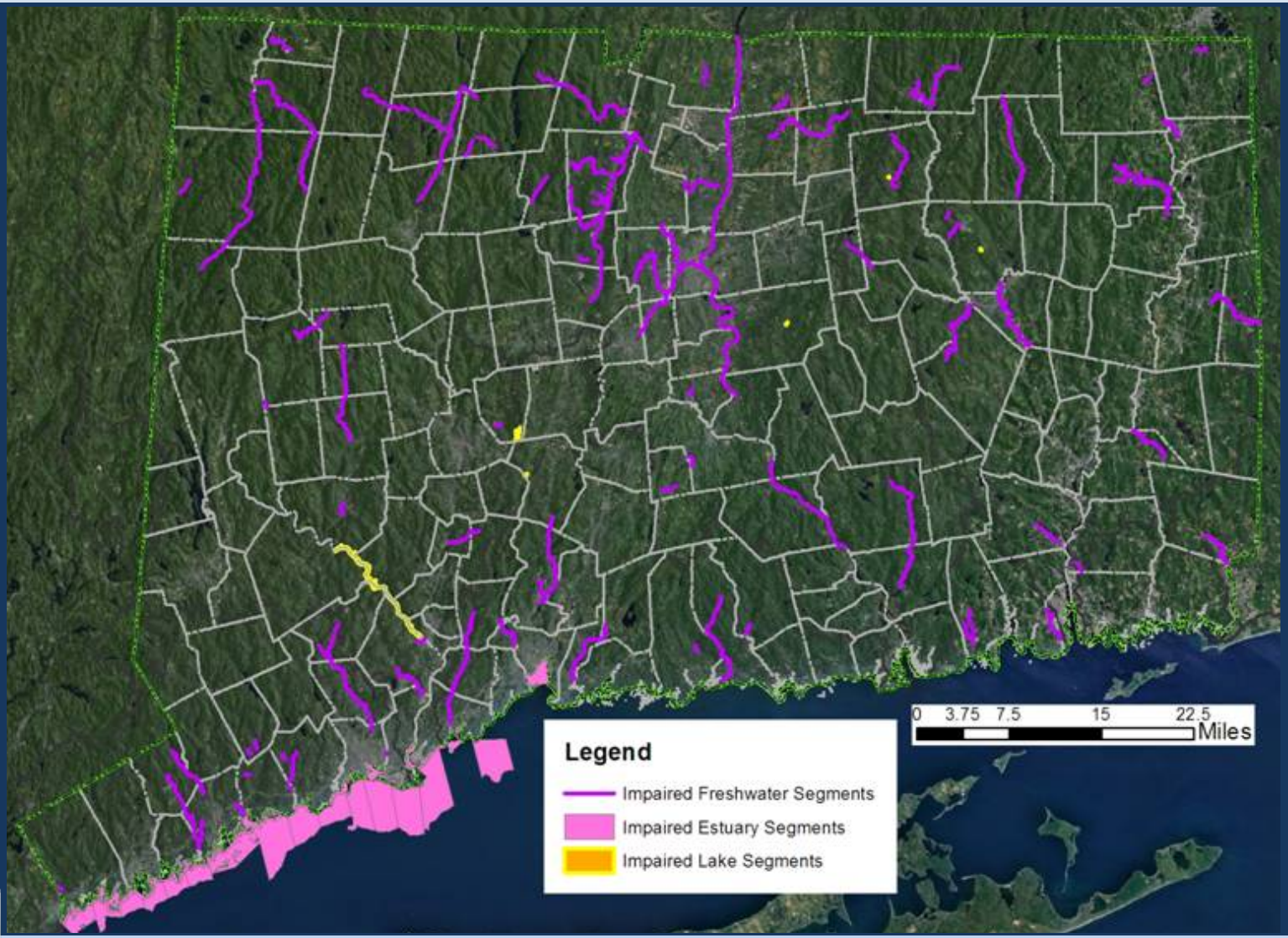
Appendix 2.

Appendix 3.

Appendix XX.

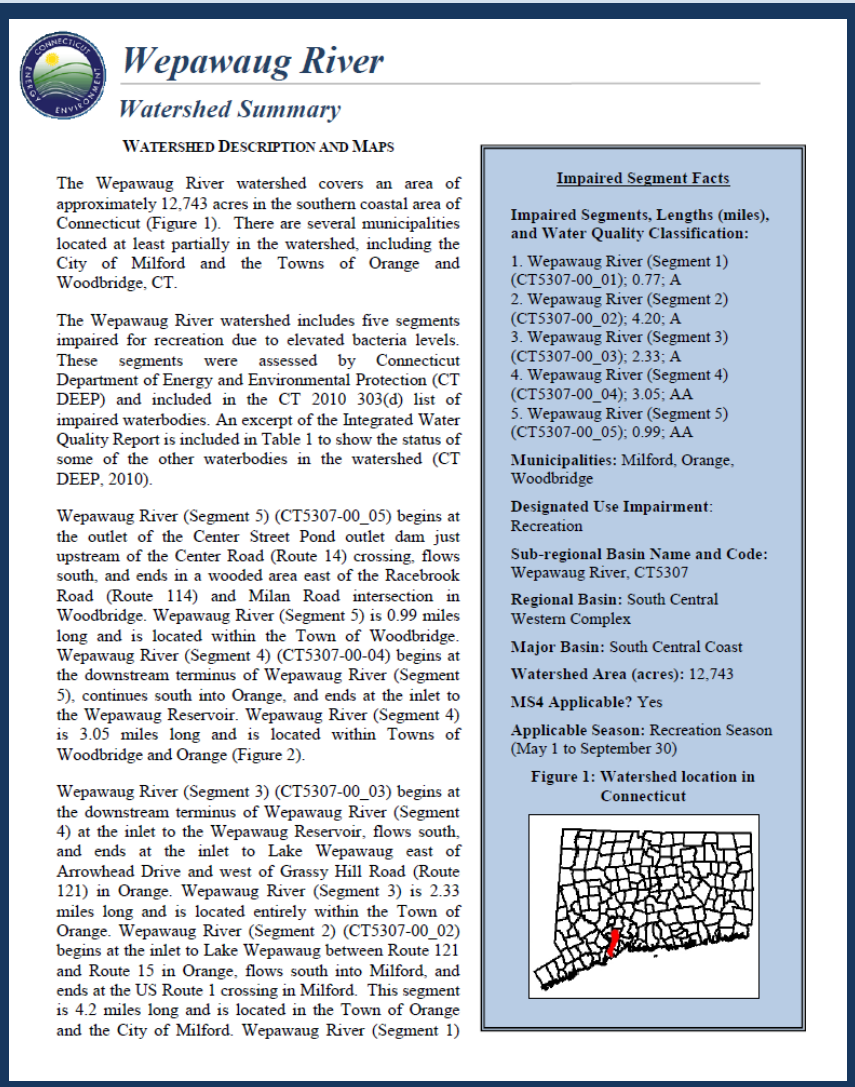
- Waterbody specific details
- TMDL Goals
- Current Activities
- Recommended Actions

Waterbodies Included in Appendices



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



Wepawaug River

Watershed Summary

WATERSHED DESCRIPTION AND MAPS

The Wepawaug River watershed covers an area of approximately 12,743 acres in the southern coastal area of Connecticut (Figure 1). There are several municipalities located at least partially in the watershed, including the City of Milford and the Towns of Orange and Woodbridge, CT.

The Wepawaug River watershed includes five segments impaired for recreation due to elevated bacteria levels. These segments were assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and included in the CT 2010 303(d) list of impaired waterbodies. An excerpt of the Integrated Water Quality Report is included in Table 1 to show the status of some of the other waterbodies in the watershed (CT DEEP, 2010).

Wepawaug River (Segment 5) (CT5307-00_05) begins at the outlet of the Center Street Pond outlet dam just upstream of the Center Road (Route 14) crossing, flows south, and ends in a wooded area east of the Racebrook Road (Route 114) and Milan Road intersection in Woodbridge. Wepawaug River (Segment 5) is 0.99 miles long and is located within the Town of Woodbridge. Wepawaug River (Segment 4) (CT5307-00-04) begins at the downstream terminus of Wepawaug River (Segment 5), continues south into Orange, and ends at the inlet to the Wepawaug Reservoir. Wepawaug River (Segment 4) is 3.05 miles long and is located within Towns of Woodbridge and Orange (Figure 2).

Wepawaug River (Segment 3) (CT5307-00_03) begins at the downstream terminus of Wepawaug River (Segment 4) at the inlet to the Wepawaug Reservoir, flows south, and ends at the inlet to Lake Wepawaug east of Arrowhead Drive and west of Grassy Hill Road (Route 121) in Orange. Wepawaug River (Segment 3) is 2.33 miles long and is located entirely within the Town of Orange. Wepawaug River (Segment 2) (CT5307-00_02) begins at the inlet to Lake Wepawaug between Route 121 and Route 15 in Orange, flows south into Milford, and ends at the US Route 1 crossing in Milford. This segment is 4.2 miles long and is located in the Town of Orange and the City of Milford. Wepawaug River (Segment 1)

Impaired Segment Facts

Impaired Segments, Lengths (miles), and Water Quality Classification:

1. Wepawaug River (Segment 1) (CT5307-00_01); 0.77; A
2. Wepawaug River (Segment 2) (CT5307-00_02); 4.20; A
3. Wepawaug River (Segment 3) (CT5307-00_03); 2.33; A
4. Wepawaug River (Segment 4) (CT5307-00_04); 3.05; AA
5. Wepawaug River (Segment 5) (CT5307-00_05); 0.99; AA

Municipalities: Milford, Orange, Woodbridge

Designated Use Impairment: Recreation

Sub-regional Basin Name and Code: Wepawaug River, CT5307

Regional Basin: South Central Western Complex

Major Basin: South Central Coast

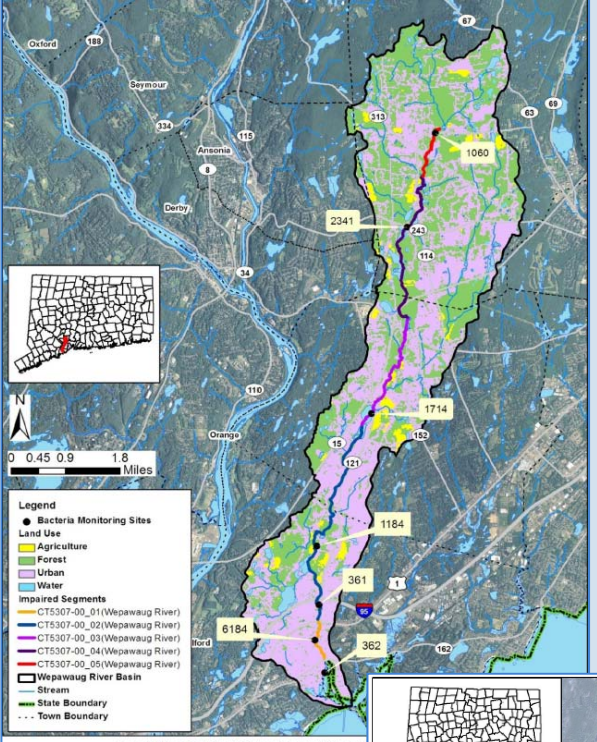
Watershed Area (acres): 12,743

MS4 Applicable? Yes

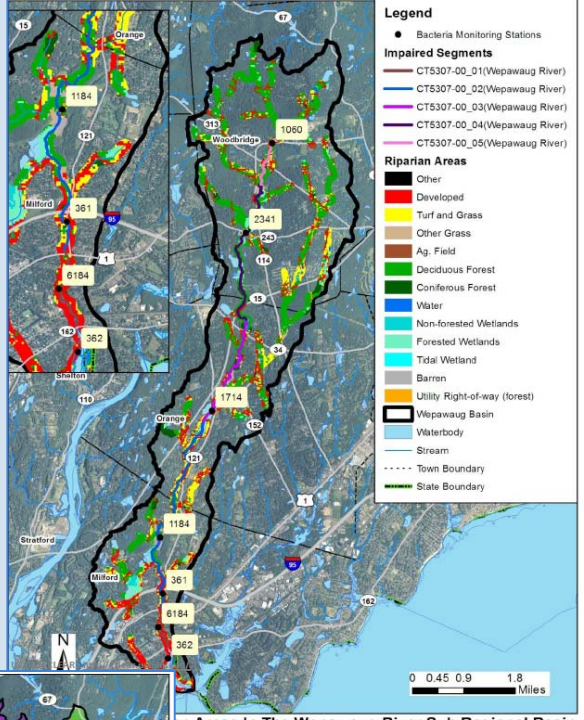
Applicable Season: Recreation Season (May 1 to September 30)

Figure 1: Watershed location in Connecticut

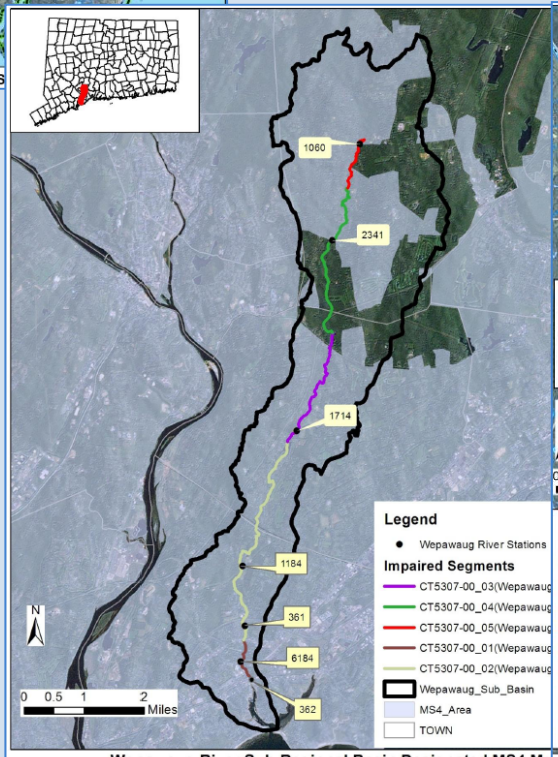
Maps



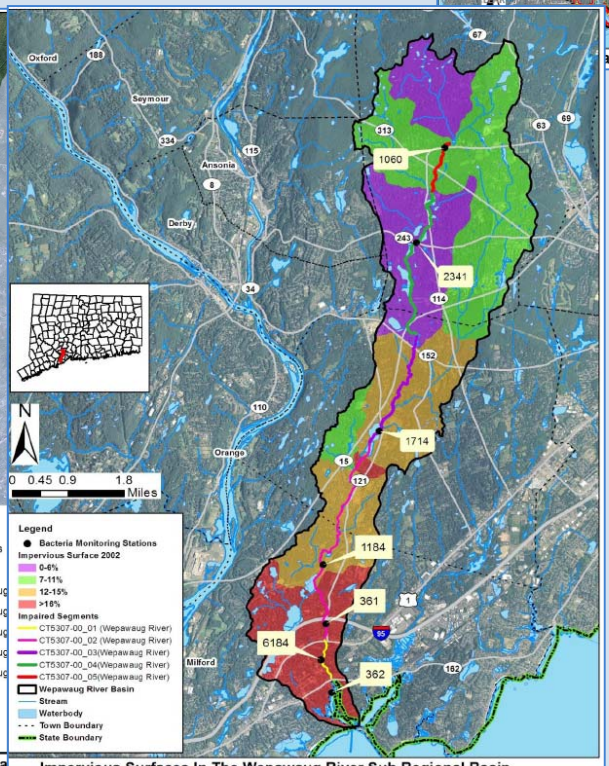
Land Use In The Wepawaug River S



an Areas In The Wepawaug River Sub Regional Basin



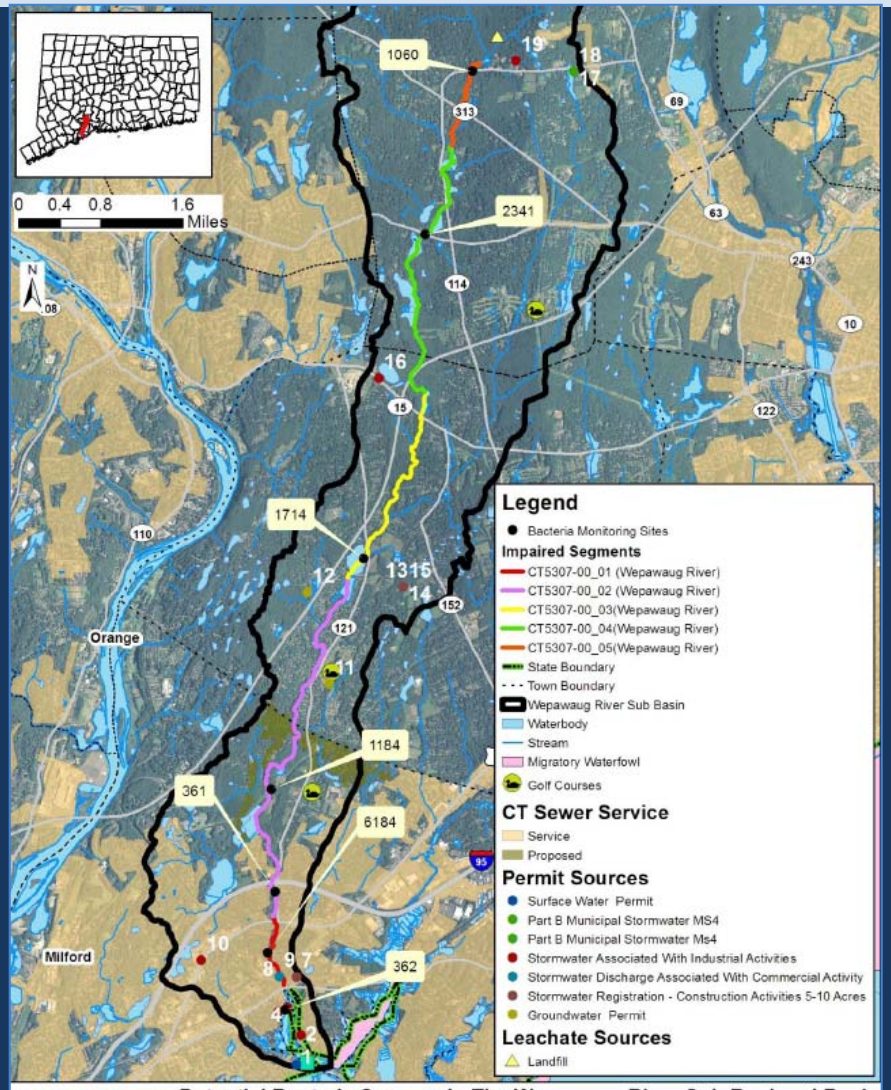
Wepawaug River Sub-Regional Basin Designated MS4 Ma



Impervious Surfaces In The Wepawaug River Sub Regional Basin

Potential Sources Map

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



Potential Bacteria Sources In The Wepawaug River Sub Regional Basin

Available Data

- Available results from permittees
  - Stormwater data
  - Discharge permits

Table 7: MS4 permits in the Wepawaug River watershed with *E. coli* (colonies/100 mL) sample results

Town	Location	MS4 Type	Receiving Waters	Sample Date	Result
Milford	Factory Lane	Commercial	Wepawaug River	11/30/05	TNTC
Milford	Factory Lane	Commercial	Wepawaug River	09/11/07	TNTC
Milford	Factory Lane	Commercial	Wepawaug River	11/13/08	1,900
Milford	Factory Lane	Commercial	Wepawaug River	10/15/09	>2500
Milford	Factory Lane	Commercial	Wepawaug River	11/04/10	>2000
Orange	East side of Mapledale Rd D70-6	Residential	Wepawaug River	12/29/05	220
Orange	East side of Mapledale Rd D70-6	Residential	Wepawaug River	02/03/06	93
Orange	East side of Mapledale Rd D70-6	Residential	Wepawaug River	11/08/06	35
Orange	East side of Mapledale Rd D70-6	Residential	Wepawaug River	09/11/07	1,986
Orange	East side of Mapledale Rd D70-6	Residential	Wepawaug River	11/25/08	219
Orange	East side of Mapledale Rd D70-6	Residential	Wepawaug River	10/07/09	>2419.6
Orange	East side of Mapledale Rd D70-6	Residential	Wepawaug River	10/15/10	179
Woodbridge	Pine Ridge Rd, Cul-de-sac SE pipe SW-A	Residential	Wepawaug River	11/12/04	>8000
Woodbridge	Pine Ridge Rd, Cul-de-sac SE pipe SW-A	Residential	Wepawaug River	11/09/05	34
Woodbridge	Pine Ridge Rd, Cul-de-sac SE pipe SW-A	Residential	Wepawaug River	11/08/06	161
Woodbridge	Pine Ridge Rd, Cul-de-sac SE pipe SW-A	Residential	Wepawaug River	01/11/08	261
Woodbridge	Pine Ridge Rd, Cul-de-sac SE pipe SW-A	Residential	Wepawaug River	11/06/08	387
Woodbridge	Pine Ridge Rd, Cul-de-sac SE pipe SW-A	Residential	Wepawaug River	09/11/09	1,986
Woodbridge	Pine Ridge Rd, Cul-de-sac SE pipe SW-A	Residential	Wepawaug River	10/15/10	2,420

Shaded cells indicate an exceedance of single-sample based water quality criteria (410 colonies/100 mL)
TNTC = Too numerous to count

Current Management Activities

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

CURRENT MANAGEMENT ACTIVITIES

The Towns of Woodbridge and Orange and the City of Milford have developed and implemented some programs to protect water quality from bacterial contamination. The City of Milford has taken action to restore Eisenhower Park. Land Tech Consultants completed a Natural Resource Inventory (NRI) for Eisenhower Park in 2005, and King's Mark Environmental Review Team (ERT) completed a report on its revitalization (Eisenhower, 2010). The reports address water quality issues in the Wepawaug River, and offer recommendations for BMP installation at areas that may be contributing bacteria.

As indicated previously, the watershed communities are regulated under the MS4 program. The MS4 General Permit is required for any municipality with urbanized areas that initiates, creates, originates or maintains any discharge of stormwater from a storm sewer system to waters of the State. The MS4 permit requires towns to design a Stormwater Management Plan (SMP) that reduces the discharge of pollutants in stormwater and improves water quality. The plan must address the following 6 minimum measures:

1. Public Education and Outreach.
2. Public Involvement/Participation.
3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control.
5. Post-construction stormwater management.
6. Pollution prevention/good housekeeping.

Each municipality is also required to submit an annual update outlining steps taken to meet the six minimum measures. All updates that address bacterial contamination in the watershed are summarized in Tables 8, 9, and 10.

Table 8: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Milford, CT (Permit # GSM000030)

Minimum Measure	Milford 2010 Annual Report Update
Public Outreach and Education	1) Local newspapers published articles and letters to the editor regarding the affect of stormwater pollution in Long Island Sound, and measures that citizens can take to prevent stormwater pollution.
Public Involvement and Participation	1) The Inland Wetlands Agency (IWA) is collaborating with the Southwest Conservation District on a lower Wepawaug River Watershed Study. The goal is to propose a restoration project.
	2) The DPW supported volunteers on multiple clean ups throughout the City focusing on river side and ocean side parks.
Illicit Discharge Detection and Elimination	1) The City approved 3 permits for connections to the City's stormwater drainage system. Applicants who received a connection to the system signed an agreement with the City that stated only "clear and uncontaminated water" will be discharged to the system.

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

The Towns of Orange and Woodbridge and the City of Milford have developed and implemented programs to protect water quality from bacterial contamination. Future mitigative activities are necessary to ensure the long-term protection of the Wepawaug River and have been prioritized below.

1) Evaluate the municipal education and outreach programs regarding animal waste.

Any education and outreach programs should highlight the importance of not feeding waterfowl and wildlife, and picking up after dogs and other pets within recreational areas along the Wepawaug River. The Eisenhower Park Revitalization Report discusses potential water quality issues associated with dogs, horses, and geese within Eisenhower Park in Milford surrounding Wepawaug River (Segment 2) (Eisenhower, 2010). Since residents often walk their dogs and ride horses within the park near Wepawaug River (Segment 2), pet waste may be contributing bacteria to the waterbody. The report recommends that residents pick up after their dogs or horses within the park, and park managers establish a riparian buffer along Wepawaug River (Segment 2) to protect the waterbody from bacterial contamination and make the shoreline less attractive to geese or other waterfowl (Eisenhower, 2010).

Municipalities and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of the Wepawaug River that are frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. In addition, any educational program should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in the Wepawaug River watershed and can harm human health and the environment. Animal wastes should be disposed of away from any waterbody or storm drain system. BMPs effective at reducing the impact of animal waste on water quality include installing signage, providing pet waste receptacles in high-use areas, enacting ordinances requiring the clean-up of pet waste, and targeting educational and outreach programs in problem areas.

2) Identify areas along developed portions of the Wepawaug River to implement Best Management Practices (BMPs) to control stormwater runoff.

As noted previously, approximately 49% of the Wepawaug River watershed is considered urban, and high impervious surface percentages were identified around Wepawaug River (Segments 1-3). As such, stormwater runoff may be contributing bacteria to these segments. To identify areas that are contributing bacteria to the impaired segments, the towns should continue to conduct wet-weather sampling and prioritize sampling stations with high bacteria concentrations for BMP installation (Table 6). To treat stormwater runoff, the towns should identify areas along the impaired segments to install BMPs that encourage stormwater to infiltrate the ground before entering the waterbodies. These BMPs would disconnect impervious areas and reduce pollutant loads to the river. More detailed information and BMP recommendations can be found in the core TMDL document.

Data Calculations

- Percent reduction goals are guidance for waterbody
- TMDL is when waterbody meets the CT WQS

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: **73%**

Single Sample: **97%**

Data: 1998 and 2010 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wepawaug River (Segment 1) with annual geometric means

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
362	Upstream of Route 162 crossing	9/28/1998	3100	dry	NA
6184	#100 West River Road	8/26/2010	330	wet	**465* (73%)**
6184	#100 West River Road	9/9/2010	98	dry	
6184	#100 West River Road	9/14/2010	120	dry	
6184	#100 West River Road	9/20/2010	410	dry	
6184	#100 West River Road	9/22/2010	**16000* (97%)**	dry	
6184	#100 West River Road	9/27/2010	430	wet	
6184	#100 West River Road	9/29/2010	430	dry	

Shaded cells indicate an exceedance of water quality criteria

***Indicates single sample and geometric mean values used to calculate the percent reduction**

Wet / Dry Sample Analysis

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for all monitoring stations on Wepawaug River (Segment 1)

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
362	Upstream of Route 162 crossing	1998	0	1	NA	NA	NA
6184	#100 West River Road	2010	2	5	465	377	506

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gage at Tweed KMMK station in New Haven, CT

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

% Reduction Goals

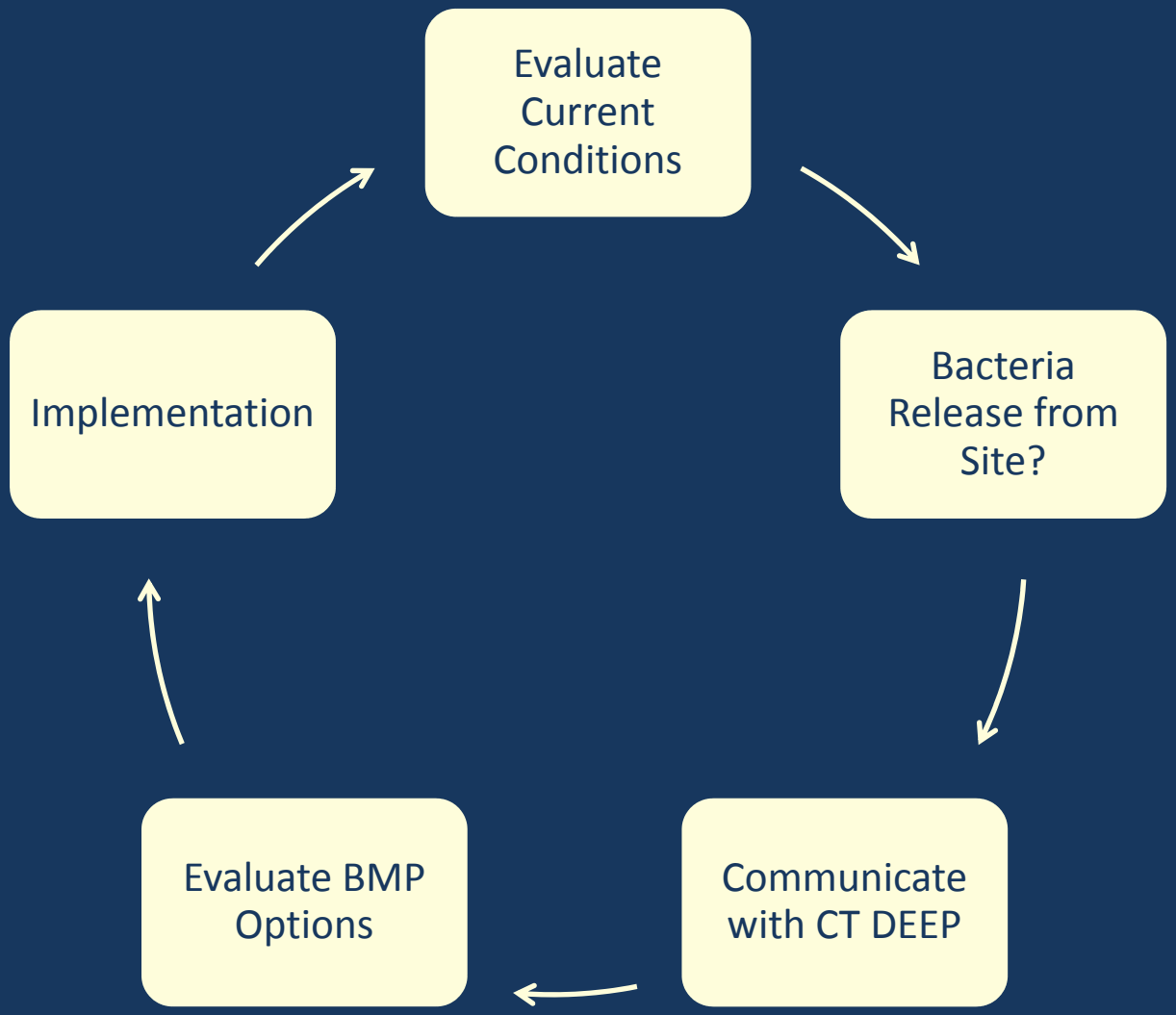
- Required load reduction for waterbody to meet CT WQS
- Sets the target goal for each segment

Attainment of TMDL goals in waterbody = Meeting CT WQS at ambient water conditions

Loading Targets

		Instantaneous *E. coli* (#/100mL)						Geometric Mean *E. coli* (#/100mL)		Permit Limit
Class	**Bacteria Source**	**WLA[6]**			**LA[6]**			**WLA[6]**	**LA[6]**	
	Recreational Use	**1**	**2**	**3**	**1**	**2**	**3**	**All**	**All**	
B[4]	Non-Stormwater NPDES	235	410	576				126		YES
	CSOs	235	410	576				126		
	SSOs	0	0	0				0		
	Illicit sewer connection	0	0	0				0		
	Leaking sewer lines	0	0	0				0		
	Stormwater (MS4s)	235[7]	410[7]	576[7]				126[7]		NO
	Stormwater (non-MS4)				235[7]	410[7]	576[7]		126[7]	NO
	Wildlife direct discharge				235[7]	410[7]	576[7]		126[7]	NO
	Human or domestic animal direct discharge[5]				235	410	576		126	NO

General Implementation Process



Implementation Stormwater(MS4)

- Follow existing permit requirements
- Not permit effluent limits
- Conduct monitoring with guidance from DEEP, if necessary
- Update SMP with modifications based on TMDL
- End-of-pipe monitoring results will NOT be used to establish compliance with MS4 permit

Implementation BMPs

- Recommended focus areas for SMP
  - Increased IDDE efforts
  - Enhanced monitoring plans (locations and parameters)
  - Public Education
  - Implement or improve nuisance wildlife & pet waste programs
- Modifications submitted to DEEP for review in MS4 Annual Reports
- Non-MS4 municipalities can implement similar measures on a voluntary basis and schedule

Implementation Stormwater(Non-MS4)

- Continue with any current monitoring obligations
  - Industrial sites refer to monitoring requirements associated with Industrial GP
  - Ensure data collection includes the appropriate indicator bacteria
- Update Pollution Prevention Plans (Industrial Sites)
  - BMPs onsite to reduce bacteria loading
  - Nuisance wildlife control
  - Increased surface flow infiltration, where appropriate

Implementation Agriculture

- Collaborate with NRCS to develop conservation plans
- Encourage site specific BMPs at farming sites:
  - Appropriate agricultural waste management
    - Adequate storage, collection, treatment and transfer
  - Clean water diversions
  - Ensure buffers are maintained around water sources
  - Install fencing and designate stream crossings to prevent livestock from entering waterbody

Opportunities

- Work with CT DEEP 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 August 2, 2012
- Email or snail mail comments to Chris Sullivan
- Comments will be addressed in a RTC document and posted on website

Questions?

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