Pequonnock River

Watershed Summary

Watershed Description and Maps

The Pequonnock River watershed covers an area of approximately 15,381 acres in the southwestern portion of Connecticut (Figure 1). There are four towns located at least partially in the watershed, including the municipalities of Newtown, Monroe, Trumbull, and Bridgeport, CT.

The Pequonnock 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. Some segments in the watershed are currently unassessed as of the writing of this document. However, this does not mean there are no problems on those segments, but is an indication that there is no current data to evaluate the segments as part of an assessment process. An excerpt of the Integrated Water Quality Report is included in Table 1 to show the status of waterbodies in the watershed (CT DEEP, 2010).

The Pequonnock River begins in Monroe, continues southerly to join the west branch of the river near the Route 25 crossing in Trumbull, and outlets to Bridgeport Harbor in Bridgeport. The Pequonnock River (Segment 5) (CT7105-00_05) consists of 2.35 miles of river in Monroe (Figure 2). The Pequonnock River (Segment 5) begins at the outlet of Stepney Pond just north of West Maiden Lane, flows southerly through a forested area between two residential neighborhoods, crosses Cutler's Farm Road, and ends at the inlet to Great Hollow Lake in Wolfe's Park. The West Branch Pequonnock River (CT7105-01_01) consists of 1.51 miles of river in Monroe (Figure 2). The West Branch Pequonnock River begins at the outlet to the West Pequonnock Reservoir parallel to Route 25 and ends at the mouth of the Pequonnock River just downstream of the Maple Drive crossing. The Pequonnock River (Segment 4) (CT7105-00_04) consists of 1.83 miles of river in Monroe (Figure 2). The Pequonnock River (Segment 4) begins at the outlet to an unnamed impoundment just upstream of the Purdy Hill Road crossing and Harsh Pond in Monroe, and ends at the

Impaired Segment Facts

Impaired Segments and Lengths (miles):

1. Pequonnock River (Segment 2) (CT7105-00_02); 2.92
2. Pequonnock River (Segment 3) (CT7105-00_03); 4.19
3. Pequonnock River (Segment 4) (CT7105-00_04); 1.83
4. West Branch Pequonnock River (CT7105-01_01); 1.51
5. Pequonnock River (Segment 5) (CT7105-00_05); 2.35

Municipality: Monroe, Trumbull, and Bridgeport

Water Quality Classifications: Class A

Designated Use Impairments: Recreation

Sub-regional Basin Name and Code: Pequonnock River, 7105

Regional Basin: Southwest Eastern

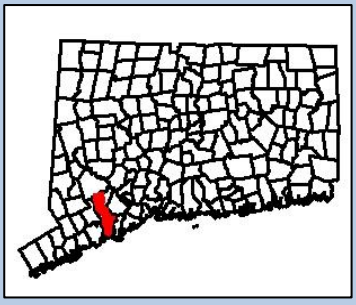
Major Basin: Southwest Coastal

Watershed Area (acres): 15,381

MS4 Applicable? Yes

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

Figure 1: Watershed location in Connecticut



Monroe Turnpike (Route 111) crossing near the intersection of Route 25 in Trumbull. The Pequonnock River (Segment 3) (CT7105-00_03) consists of 4.19 miles of river in Trumbull (Figure 2). The Pequonnock River (Segment 3) begins at the Monroe Turnpike (Route 111) crossing near the intersection with Route 25 and ends at the Daniels Farm Road crossing. The Pequonnock River (Segment 2) (CT7105-00_02) consists of 2.92 miles of river in Trumbull and Bridgeport (Figure 2). The Pequonnock River (Segment 2) begins at the Daniels Farm Road crossing in Trumbull, and ends at the inlet to Bunnell's Pond (Beardsley Park) on the eastern side of Route 8 in Bridgeport.

The impaired segments of the Pequonnock River have a water quality classification of A. Designated uses include potential drinking water supply, habitat for fish and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. As there are no designated beaches in these segments of the Pequonnock River, the specific recreation impairment is for non-designated swimming and other water contact related activities.

Table 1: Impaired segments and nearby waterbodies from the Connecticut 2010 Integrated Water Quality Report

Waterbody ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation	Fish Consumption
CT7105-00_01	Pequonnock River-01	From end of estuary (DS of Glenwood Avenue crossing, along south side of Route 1), US to upper end of Bunnell's (Beardsley Park) Pond (eastern side of Route 8, exit 6 area), Bridgeport. Segment includes Pond.	1.35	U	U	FULL
CT7105-00_02	Pequonnock River-02	From inlet to Bunnell's (Beardsley Park) Pond (eastern side of Route 8, exit 6 area), Bridgeport, US to Daniels Farm Road crossing (US of Route 25 crossing), Trumbull.	2.92	NOT	U*	FULL
CT7105-00_03	Pequonnock River-03	From Daniels Farm Road crossing (US of Route 25 crossing), Trumbull, US to Monroe Turnpike (Route 111) crossing (near intersection with Route 25), Trumbull.	4.19	NOT	FULL*	FULL

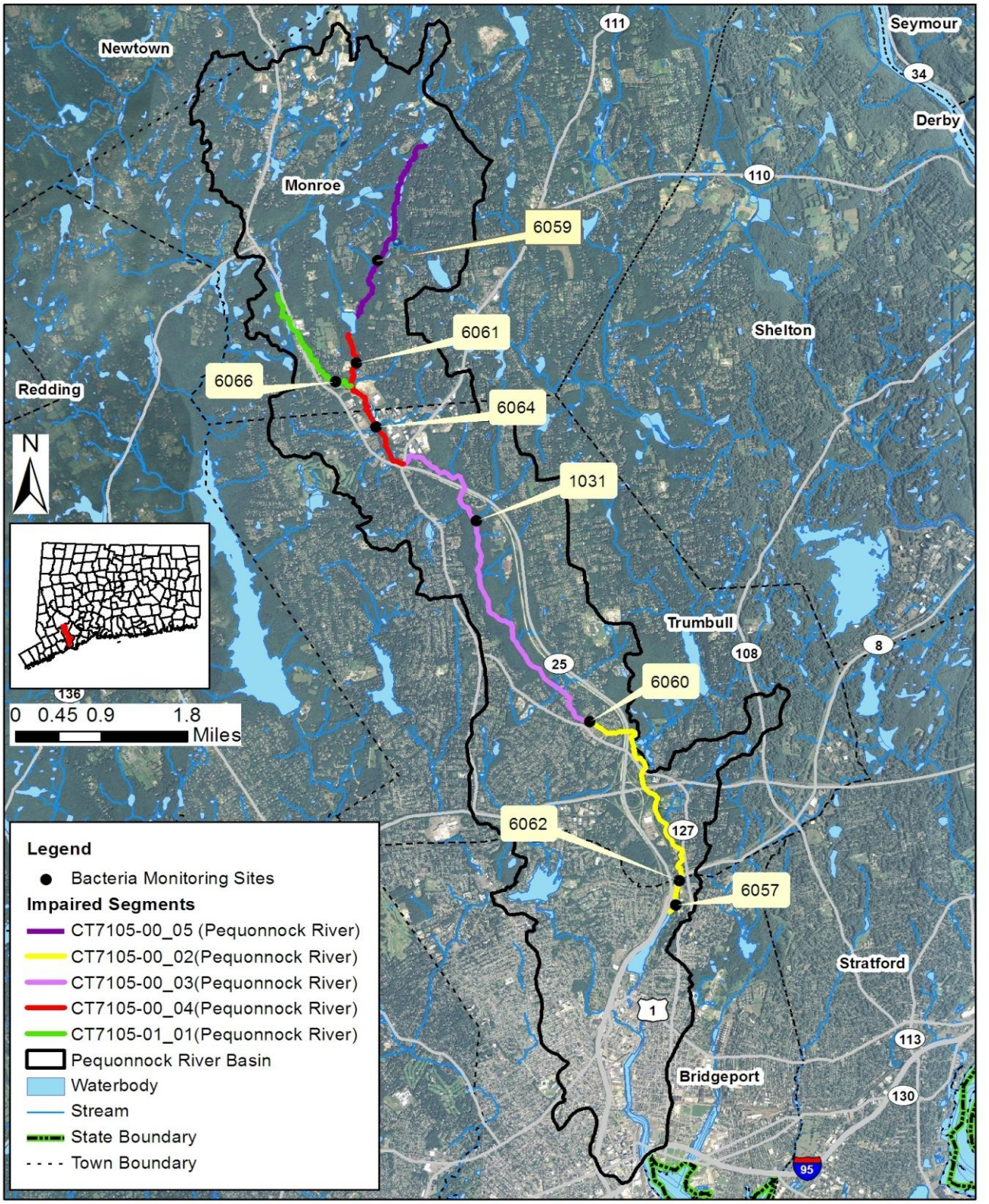
Table 1: Impaired segments and nearby waterbodies from the Connecticut 2010 Integrated Water Quality Report

Waterbody ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation	Fish Consumption
CT7105-00_04	Pequonnock River-04	From Monroe Turnpike (Route 111) crossing (near intersection with Route 25), Trumbull, US to outlet of unnamed impoundment (US of Purdy Hill Road crossing, and US of Harsh Pond) Monroe.	1.83	U	FULL*	FULL
CT7105-01_01	West Branch Pequonnock River	Mouth on Pequonnock River, DS of Maple Drive crossing, on Jewish Community Center property, US to outlet of West Pequonnock Reservoir, parallel to Route 25, Monroe.	1.51	U	NOT	FULL
CT7105-00_05	Pequonnock River-05	From inlet to unnamed impoundment (northeastern portion of pond), US to headwaters at Stepney Pond outlet dam (just US of West Maiden Lane crossing), Monroe.	2.35	U	NOT	FULL

Shaded cells indicate impaired segment addressed in this TMDL
***Impairment determined from 2010 data; will be listed as impaired on the 2012 303(d) List of Impaired Waters**
FULL = Designated Use Fully Supported
NOT = Designated Use Not Supporter
U = Unassessed

Since the Pequonnock River outlets to Bridgeport Harbor, more information about potential sources impacting the water quality of the Pequonnock River and Bridgeport Estuary watersheds can be found in Estuary 7: Bridgeport (Appendix 81).

Figure 2: GIS map featuring general information of the Pequonnock River watershed at the sub-regional level



Land Use

Existing land use can affect the water quality of waterbodies within a watershed (USEPA, 2011c). Natural processes, such as soil infiltration of stormwater and plant uptake of water and nutrients, can occur in undeveloped portions of the watershed. As impervious surfaces (such as rooftops, roads, and sidewalks) increase within the watershed landscape from commercial, residential, and industrial development, the amount of stormwater runoff to waterbodies also increases. These waterbodies are negatively affected as increased pollutants from failing and insufficient septic systems, oil and grease from automobiles, and sediment from construction activities become entrained in this runoff. Agricultural land use activities, such as fertilizer application and manure from livestock, can also increase pollutants in nearby waterbodies (USEPA, 2011c).

As shown in Figures 3 and 4, the Pequonnock River watershed consists of 60% urban area, 35% forested area, 3% water, and 2% agriculture. The northern portions of the watershed are characterized by a mix of land uses, including forested areas, scattered residential developments, and agricultural operations. By contrast, the middle and southern portions of the watershed in Trumbull and Bridgeport are more heavily developed, particularly in Bridgeport (Figure 4).

Figure 3: Land use within the Pequonnock River watershed

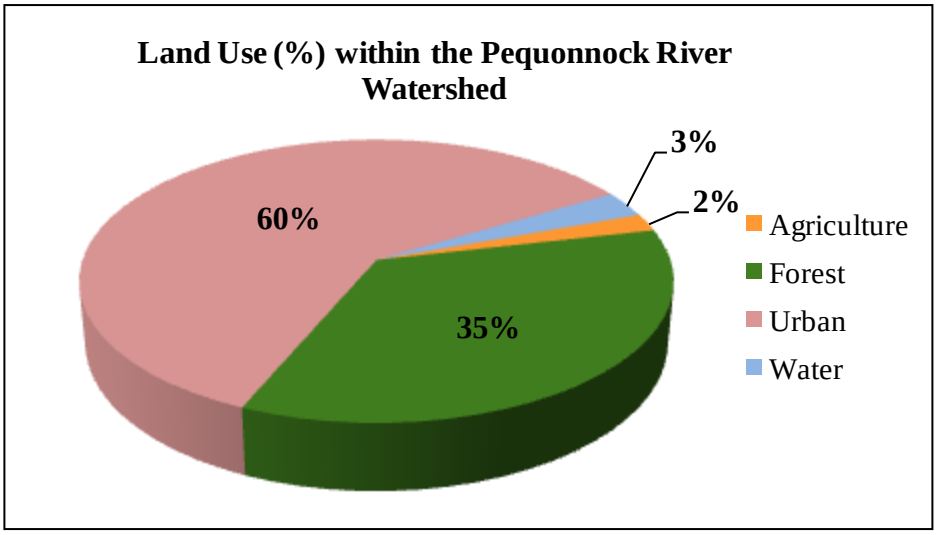
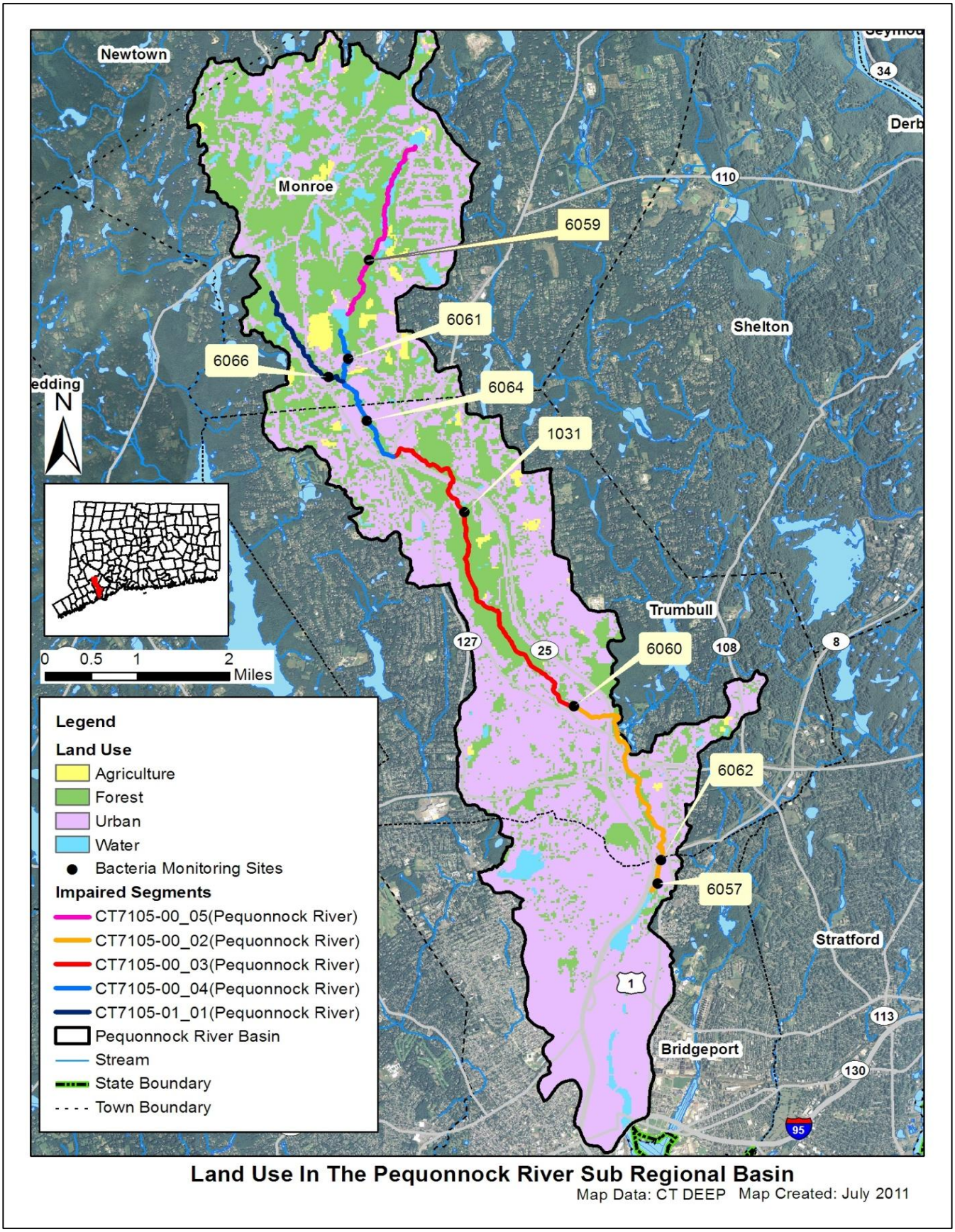


Figure 4: GIS map featuring land use for the Pequonnock River watershed at the sub-regional level



WHY IS A TMDL NEEDED?

E. coli is the indicator bacteria used for comparison with the CT State criteria in the CT Water Quality Standards (WQS) (CTDEEP, 2011). All data results are from CT DEEP, USGS, Bureau of Aquaculture, or volunteer monitoring efforts at stations located on the impaired segments.

Table 2: Sampling station location description for the impaired segments in the Pequonnock River watershed (ordered downstream to upstream)

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT7105-00_02	Pequonnock River (Segment 2)	6062	Before Bunnell's Pond at Beardsley Park	Bridgeport	41.22155	-73.17894
		6057	Bunnell's Pond outlet	Bridgeport	41.21765	-73.17963
CT7105-00_03	Pequonnock River (Segment 3)	6060	Daniel's Farm Road bridge	Trumbull	41.24688	-73.19722
		1031	Whitney Avenue in town park	Trumbull	41.27889	-73.220278
CT7105-00_04	Pequonnock River (Segment 4)	6064	Spring Hill bridge downstream of confluence with un-named brook	Trumbull	41.29388	-73.24072
		6061	East Branch of Pequonnock River at Purdy Hill Road bridge	Trumbull	41.30408	-73.24475
CT7105-01_01	West Branch Pequonnock River	6066	Maple Drive bridge	Monroe	41.30102	-73.24886
CT7105-00_05	Pequonnock River (Segment 5)	6059	Cutler Farm Road before William E. Wolfe Park	Monroe	41.320410	-73.240550

The impaired segments of the Pequonnock River are Class A freshwater rivers (Figure 5). Their applicable designated uses are potential drinking water supply area, habitat for fish and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. Water quality analyses were conducted using data from one sampling location on the Pequonnock River (Segment 5) and the West Branch Pequonnock River, and from two sampling locations on the Pequonnock River (Segments 2-4) in 2006 and from 2009-2010 (Table 2). Water quality criteria for *E. coli*, along with bacteria sampling results in 2006 and from 2009-2010 are presented in Tables 13-17.

Pequonnock River (Segment 2) (CT7105-00_02): As shown in Table 13, geometric mean values exceeded the WQS for *E. coli* at Station 6062 in 2009 and 2010 and at Station 6065 in 2010. Single sample values for both stations exceeded the WQS for *E. coli* multiple times.

Pequonnock River (Segment 3) (CT7105-00_03): As shown in Table 14, geometric mean values exceeded the WQS for *E. coli* at Station 6060 in 2010. Single sample values also exceeded the WQS for *E. coli* multiple times at Station 6060 in 2010.

Pequonnock River (Segment 4) (CT7105-00_04): As shown in Table 15, geometric mean values exceeded the WQS for *E. coli* at Station 6064 in 2010. Single sample values also exceeded the WQS for *E. coli* once at Station 6064 in 2010 and twice at Station 6061 in 2010.

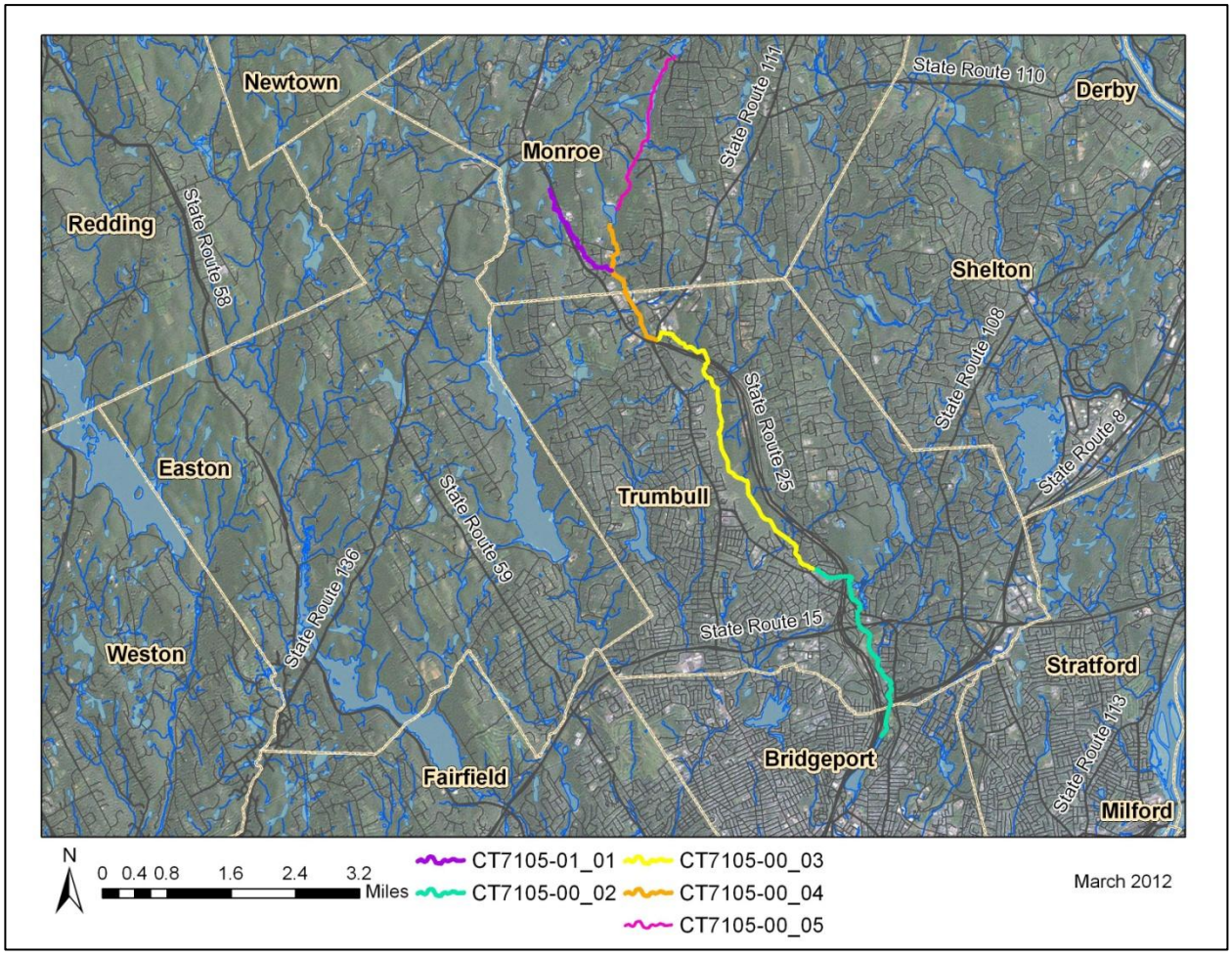
West Branch Pequonnock River (CT7105-01_01): As shown in Table 16, geometric mean values exceeded the WQS for *E. coli* at Station 6066 in 2010. Single sample values also exceeded the WQS for *E. coli* multiple times at Station 6066 in 2010.

Pequonnock River (Segment 5) (CT7105-00_05): As shown in Table 17, geometric mean values exceeded the WQS for *E. coli* at Station 6059 in 2009. Single sample values also exceeded the WQS for *E. coli* once at Station 6059 in 2009.

To aid in identifying possible bacteria sources, the geometric mean was also calculated for wet-weather and dry-weather sampling days for all stations on the Pequonnock River (Tables 13-17). Geometric mean values during both wet and dry-weather conditions were exceeded at Station 6062 on the Pequonnock River (Segment 2), Station 6066 on the West Branch Pequonnock River, and Station 6059 on the Pequonnock River (Segment 5). Geometric mean values during only wet-weather conditions were exceeded at Station 6065 on the Pequonnock River (Segment 2), Station 6060 on the Pequonnock River (Segment 3), and Station 6064 on the Pequonnock River (Segment 4).

Due to the elevated bacteria measurements presented in Tables 13-17, these impaired segments do not meet CT's bacteria WQS, were identified as impaired, and were or will be placed on the CT List of Waterbodies Not Meeting Water Quality Standards, also known as the CT 303(d) Impaired Waters List. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with State WQS.

Figure 5: Aerial map of the Pequonnock River



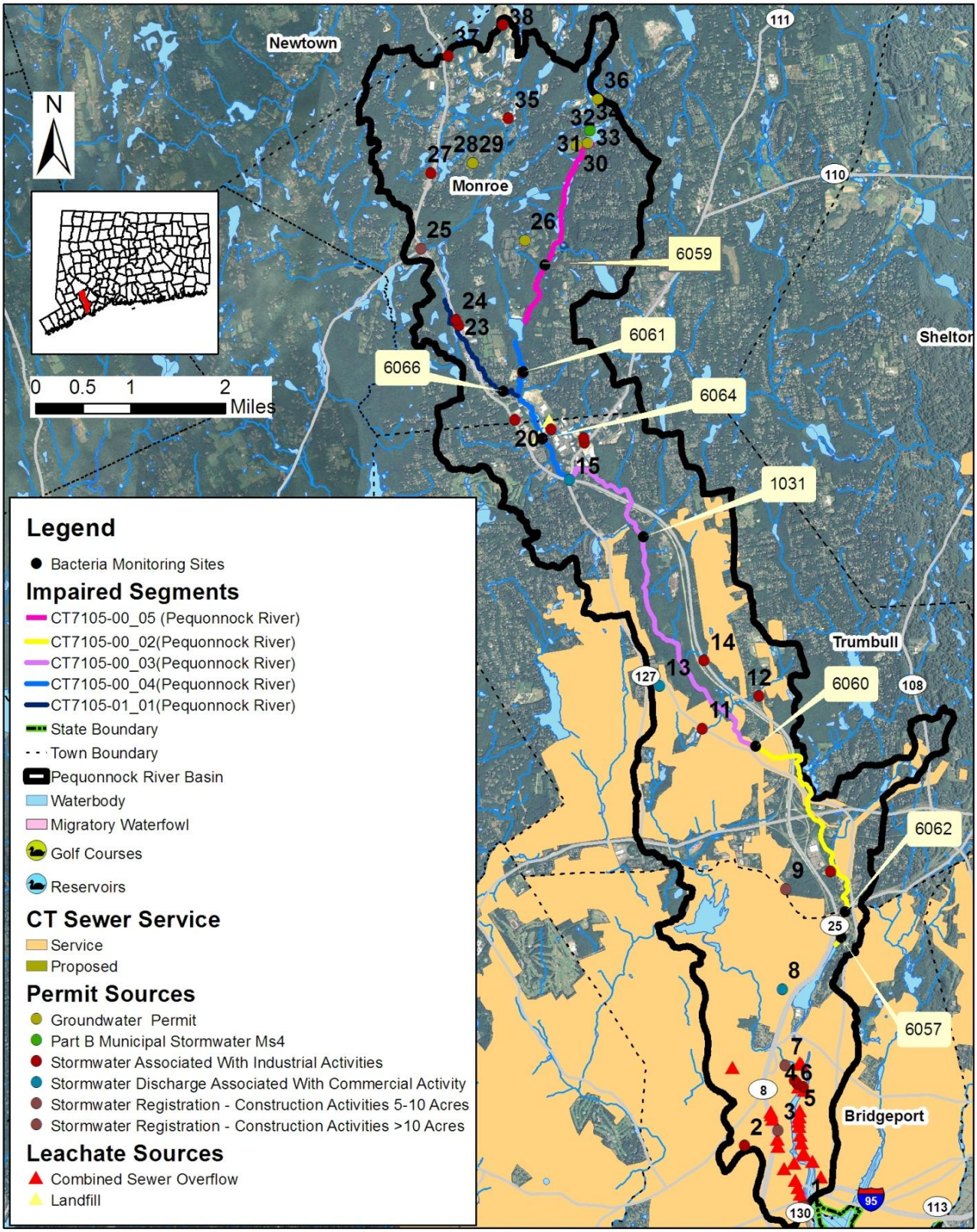
POTENTIAL BACTERIA SOURCES

Potential sources of indicator bacteria in a watershed include point and non-point sources, such as stormwater runoff, agriculture, sanitary sewer overflows (collection system failures), illicit discharges, and inappropriate discharges to the waterbody. Potential sources that have been tentatively identified in the Pequonnock River watershed based on land use (Figures 3 and 4) and a collection of local information for each of the waterbodies is presented in Table 3 and Figure 6. However, the list of potential sources is general in nature and should not be considered comprehensive. There may be other sources not listed here that contribute to the observed water quality impairment in the study segments. Further monitoring and investigation will confirm listed sources and discover additional ones. Some segments in this watershed are currently listed as unassessed by CT DEEP procedures. This does not suggest that there are no data or no impairments existing in the segments. For some, there are data from permitted sources and CT DEEP recommends that any elevated concentrations found from those permitted sources be addressed through voluntary reduction measures. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement these TMDLs.

Table 3: Potential bacteria sources to the impaired segments of the Pequonnock River

Impaired Segment	Permit Source	Illicit Discharge	CSO/ SSO Issue	Failing Septic System	Agricultural Activity	Stormwater Runoff	Nuisance Wildlife/ Pets	Other
Pequonnock River (Segment 2) CT7105-00_02	**x**	**x**		**x**	**x**	**x**	**x**	
Pequonnock River (Segment 3) CT7105-00_03	**x**	**x**		**x**	**x**	**x**	**x**	
Pequonnock River (Segment 4) CT7105-00_04	**x**			**x**	**x**	**x**	**x**	**x**
West Branch Pequonnock River CT7105-01_01	**x**			**x**	**x**	**x**	**x**	
Pequonnock River (Segment 5) CT7105-00_05	**x**			**x**	**x**	**x**	**x**	

Figure 6: Potential sources in the Pequonnock River watershed at the sub-regional level



The potential sources map for the impaired basin was developed after thorough analysis of available data sets. If information is not displayed in the map, then no sources were discovered during the analysis. The following is the list of potential sources that were evaluated: problems with migratory waterfowl, golf course locations, reservoirs, proposed and existing sewer service, cattle farms, poultry farms, permitted sources of bacteria loading (surface water discharge, MS4 permit, industrial stormwater, commercial stormwater, groundwater permits, and construction related stormwater), and leachate and discharge sources (agricultural waste, CSOs, failing septic systems, landfills, large septic tank leach fields, septage lagoons, sewage treatment plants, and water treatment or filter backwash).

Point Sources

Permitted sources within the watershed that could potentially contribute to the bacteria loading are identified in Table 4. This table includes permit types that may or may not be present in the impaired watershed. A list of active permits in the watershed is included in Table 5. Additional investigation and monitoring could reveal the presence of additional discharges in the watershed. Available effluent data from each of these permitted categories found within the watershed are compared to the CT State WQS for the appropriate receiving waterbody use and type. When available, bacteria data results from these permitted sources are listed in Tables 6 and 7.

Table 4: General categories list of other permitted discharges

Permit Code	Permit Description Type	Number in watershed
CT	Surface Water Discharges	0
GPL	Discharge of Swimming Pool Wastewater	0
GSC	Stormwater Discharge Associated with Commercial Activity	2
GSI	Stormwater Associated with Industrial Activity	21
GSM	Part B Municipal Stormwater MS4	4
GSN	Stormwater Registration – Construction	4
LF	Groundwater Permit (Landfill)	0
UI	Underground Injection	7

Permitted Sources

As shown in Table 5, there are multiple permitted discharges in the Pequonnock River watershed. Bacteria data from 2001 – 2003 for several industrial permitted facilities are included in Table 6. Though this data cannot be compared to a water quality standard as Connecticut does not have a recreation WQS for fecal coliform bacteria, multiple samples from Vitramon (GSI000852) were above the maximum number the analytical method could detect. This discharge occurs along the Pequonnock River (Segment 4), and may be contributing to bacterial concentrations in the Pequonnock River.

Figure 6 also identified multiple CSOs in the southern portion of the watershed as the Pequonnock River outlets to Bridgeport Harbor. Although the CSOs are downstream of the impaired segments, they may contribute to future bacterial impairments of downstream segments. As discussed in Estuary 7: Bridgeport (Appendix 82), CSOs represent a likely source of bacterial contamination to the Bridgeport Estuary since overflowing CSOs will deposit raw sewage with high levels of bacteria into a receiving water. According to the 2005 Bridgeport Estuary Report, there are 148 CSO regulators, and wet-weather flows can bypass

through 71 outfall locations directly to the estuary. More information on CSOs can be found in the core TMDL document (Section 6.2.5).

Since the MS4 permits are not targeted to a specific location, but the geographic area of the regulated municipality, there is no one accurate location on the map to display the location of these permits. One dot will be displayed at the geographic center of the municipality as a reference point. Sometimes this location falls outside of the targeted watershed and therefore the MS4 permit will not be displayed in the Potential Sources Map. Using the municipal border as a guideline will show which areas of an affected watershed are covered by an MS4 permit.

Table 5: Permitted facilities within the Pequonnock River watershed

Town	Client	Permit ID	Permit Type	Site Name/Address	Map #
Bridgeport	Home Depot U.S.A., Inc.	GSC000189	Stormwater Discharge Associated With Commercial Activity	Home Depot #6213	8
Bridgeport	Hawie Manufacturing Co.	GSI001134	Stormwater Associated With Industrial Activities	Hawie Manufacturing Co.	5
Bridgeport	PSEG Power Connecticut, Llc	GSI001601	Stormwater Associated With Industrial Activities	Bridgeport Harbor Station	2
Bridgeport	Dattco, Inc.	GSI002031	Stormwater Associated With Industrial Activities	Dattco	6
Bridgeport	East Coast Auto Parts	GSI002136	Stormwater Associated With Industrial Activities	East Coast Auto Parts	4
Bridgeport	City Of Bridgeport	GSM000035	Part B Municipal Stormwater MS4	Bridgeport, City of	N/A
Bridgeport	Bridgeport Landing Development, Llc	GSN002170	Stormwater Registration - Construction Activities >10 Acres	Steelpointe Harbor	1
Bridgeport	City Of Bridgeport	GSN002241	Stormwater Registration - Construction Activities >10 Acres	Fairchild Wheeler Multi-Magnet High School	9
Bridgeport	United Rentals, Inc.	GSN001790	Stormwater Registration - Construction Activities 5-10 Acres	United Rentals	3
Bridgeport	Northeast Remsco Construction	GSN002194	Stormwater Registration - Construction Activities 5-10 Acres	New River Street Pump Station	7
Monroe	Sippin Brothers Oil Company, Inc.	GSI000254	Stormwater Associated With Industrial Activities	Sippin Brothers Oil Company, Inc.	23
Monroe	Vishay Vitramon, Inc.	GSI000852	Stormwater Associated With Industrial Activities	Vishay Vitramon, Inc.	20

Table 5: Permitted facilities within the Pequonnock River watershed (continued)

Town	Client	Permit ID	Permit Type	Site Name/Address	Map #
Monroe	Town Of Monroe	GSI001089	Stormwater Associated With Industrial Activities	Monroe Public Works Garage	22
Monroe	Cornell-Carr Co., Inc.	GSI001393	Stormwater Associated With Industrial Activities	Cornell-Carr Co., Inc.	27
Monroe	American Heat Treating, Inc.	GSI001849	Stormwater Associated With Industrial Activities	American Heat Treating, Inc.	35
Monroe	Northeast Laser and Electropolish, Llc	GSI001976	Stormwater Associated With Industrial Activities	Northeast Laser & Electropolish, Llc	24
Monroe	First Student, Inc.	GSI002130	Stormwater Associated With Industrial Activities	Monroe Public Works Garage	21
Monroe	M Cubed Technologies, Inc.	GSI002174	Stormwater Associated With Industrial Activities	M Cubed Technologies, Inc.	37
Monroe	H & H Processing, Llc	GSI002308	Stormwater Associated With Industrial Activities	H & H Processing, Llc	38
Monroe	Town Of Monroe	GSM000013 / 200902172	Part B Municipal Stormwater Ms4	Monroe, Town Of	N/A(34/32)
Monroe	State Of Connecticut Department Of Transportation	GSN002195	Stormwater Registration - Construction Activities 5-10 Acres	Intersection Improvements Along Route 25	25
Monroe	Town Of Monroe	UI0000300	Groundwater Permit	Monroe Middle School	36
Monroe	Castlewood Homeowners Association, Inc.	UI0000401	Groundwater Permit	Delmar Associates	30
Monroe	Castlewood Homeowners Association, Inc.	UI0000401	Groundwater Permit	Castlewood Association, Inc.	31
Monroe	Northbrook Tax District	UI0000004	Groundwater Permit	Northbrook Condominiums	28
Monroe	Great Oak Farm Homeowners Assoc., Inc.	UI0000098	Groundwater Permit	Great Oak Farm	26
Monroe	High Meadow Condominium Association, Inc	UI0000123	Groundwater Permit	High Meadows Senior Housing Project	33
Trumbull	The Stop & Shop Supermarket Company Llc	GSC000146	Stormwater Discharge Associated With Commercial Activity	Stop & Shop #620	13

Table 5: Permitted facilities within the Pequonnock River watershed (continued)

Town	Client	Permit ID	Permit Type	Site Name/Address	Map #
Trumbull	CT DOT	GSI000071	Stormwater Associated With Industrial Activities	Trumbull Salt Storage	14
Trumbull	First Student, Inc.	GSI001147	Stormwater Associated With Industrial Activities	First Student, Inc.	17
Trumbull	Mahle, Inc.	GSI001163	Stormwater Associated With Industrial Activities	Mahle, Inc.	12
Trumbull	Town Of Trumbull	GSI001644	Stormwater Associated With Industrial Activities	Trumbull Public Works Garage	11
Trumbull	Helicopter Support, Inc	GSI001744	Stormwater Associated With Industrial Activities	Helicopter Support, Inc.	10
Trumbull	Gardner Denver Nash Llc	GSI001872	Stormwater Associated With Industrial Activities	Gardner Denver Nash Llc	16
Trumbull	Town Of Trumbull	GSI002140	Stormwater Associated With Industrial Activities	Trumbull Transfer Station	19
Trumbull	Sun Products Corporation	GSI002223	Stormwater Associated With Industrial Activities	North American R&D Center	18
Trumbull	Town of Trumbull	GSM000107	Part B Municipal Stormwater MS4	Trumbull, Town of	N/A

Table 6: Industrial permits in the Pequonnock River watershed and available fecal coliform data (colonies/100 mL). The results cannot be compared to the water quality standard as there is no recreation standard for fecal coliform.

Town	Location	Permit Number	Receiving Water	Sample Location	Sample Date	Result
Bridgeport	Hawie Manufacturing, Co.	GSI001134	Pequonnock River	New building loading dock	09/14/01	>600
Bridgeport	Hawie Manufacturing, Co.	GSI001134	Pequonnock River	SD Park City Building	09/14/01	>600
Bridgeport	Hawie Manufacturing, Co.	GSI001134	Pequonnock River	SD Park City Building	08/04/03	80
Bridgeport	CRRA-Bridgeport TRF Station	GSI000097	Pequonnock River	Outfall 001(A)	09/25/01	600
Bridgeport	CRRA-Bridgeport TRF Station	GSI000097	Pequonnock River	Outfall 001(A)	09/26/02	8,300
Monroe	Sippin Bros.	GSI000254	Pequonnock River	Outfall 1	05/02/02	20

Table 6: Industrial permits in the Pequonnock River watershed and available fecal coliform data (colonies/100 mL). The results cannot be compared to the water quality standard as there is no recreation standard for fecal coliform. (continued)

Town	Location	Permit Number	Receiving Water	Sample Location	Sample Date	Result
Monroe	Sippin Bros.	GSI000254	Pequonnock River	Outfall 1	09/26/02	600
Monroe	Vitramon	GSI000852	Pequonnock River	OF-1 roof, SE parking lot	07/26/01	0
Monroe	Vitramon	GSI000852	Pequonnock River	OF-1 roof, SE parking lot	11/05/02	4,400
Monroe	Vitramon	GSI000852	Pequonnock River	OF-2 near warehouse #2	07/26/01	TNTC
Monroe	Vitramon	GSI000852	Pequonnock River	OF-2 near warehouse #2	11/05/02	TNTC
Monroe	Vitramon	GSI000852	Pequonnock River	OF-3 SE parking lot	07/26/01	TNTC
Monroe	Vitramon	GSI000852	Pequonnock River	OF-3 SE parking lot	11/05/02	3,900
Trumbull	CRRA-Trumbull TRF Station-Enviro Express	GSI000159	Pequonnock River	Outfall (001)-north end	09/25/01	600
Trumbull	CRRA-Trumbull TRF Station-Enviro Express	GSI000159	Pequonnock River	Outfall (001)-north end	08/29/02	>600
TNTC = Too numerous to count, or above the maximum number that the analytical method can measure						

Municipal Stormwater Permitted Sources

Per the EPA Phase II Stormwater rule all municipal storm sewer systems (MS4s) operators located within US Census Bureau Urbanized Areas (UAs) must be covered under MS4 permits regulated by the appropriate State agency. There is an EPA waiver process that municipalities can apply for to not participate in the MS4 program. In Connecticut, EPA has granted such waivers to 19 municipalities. All participating municipalities within UAs in Connecticut are currently regulated under MS4 permits by CT DEEP staff in the MS4 program.

The US Census Bureau defines a UA as a densely settled area that has a census population of at least 50,000. A UA generally consists of a geographic core of block groups or blocks that exceeds the 50,000 people threshold and has a population density of at least 1,000 people per square mile. The UA will also include adjacent block groups and blocks with at least 500 people per square mile. A UA consists of all or part of one or more incorporated places and/or census designated places, and may include additional territory outside of any place. (67 FR 11663)

For the 2000 Census a new geographic entity was created to supplement the UA blocks of land. This created a block known as an Urban Cluster (UC) and is slightly different than the UA. The definition of a UC is a densely settled area that has a census population of 2,500 to 49,999. A UC generally consists of a geographic core of block groups or blocks that have a population density of at least 1,000 people per square mile, and adjacent block groups and blocks with at least 500 people per square mile. A UC consists of all or part of one or more incorporated places and/or census designated places; such a place(s)

together with adjacent territory; or territory outside of any place. The major difference is the total population cap of 49,999 people for a UC compared to >50,000 people for a UA. (67 FR 11663)

While it is possible that CT DEEP will be expanding the reach of the MS4 program to include UC municipalities in the near future they are not currently under the permit. However, the GIS layers used to create the MS4 maps in this Statewide TMDL did include both UA and UC blocks. This factor creates some municipalities that appear to be within an MS4 program that are not currently regulated through an MS4 permit. This oversight can explain a municipality that is at least partially shaded grey in the maps and there are no active MS4 reporting materials or information included in the appropriate appendix. While these areas are not technically in the MS4 permit program, they are still considered urban by the cluster definition above and are likely to contribute similar stormwater discharges to affected waterbodies covered in this TMDL.

As previously noted, EPA can grant a waiver to a municipality to preclude their inclusion in the MS4 permit program. One reason a waiver could be granted is a municipality with a total population less than 1000 people, even if the municipality was located in a UA. There are 19 municipalities in Connecticut that have received waivers, this list is: Andover, Bozrah, Canterbury, Coventry, East Hampton, Franklin, Haddam, Killingworth, Litchfield, Lyme, New Hartford, Plainfield, Preston, Salem, Sherman, Sprague, Stafford, Washington, and Woodstock. There will be no MS4 reporting documents from these towns even if they are displayed in an MS4 area in the maps of this document.

The list of US Census UCs is defined by geographic regions and is named for those regions, not necessarily by following municipal borders. In Connecticut the list of UCs includes blocks in the following Census Bureau regions: Colchester, Danielson, Lake Pocotopaug, Plainfield, Stafford, Storrs, Torrington, Willimantic, Winsted, and the border area with Westerly, RI (67 FR 11663). Any MS4 maps showing these municipalities may show grey areas that are not currently regulated by the CT DEEP MS4 permit program.

The Pequonnock River watershed is located primarily within the Towns of Monroe and Trumbull and the City of Bridgeport, CT. Within the watershed area, all three municipalities have designated urban areas, as defined by the U.S. Census Bureau and are required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the Connecticut Department of Energy and Environmental Protection (DEEP) (Figure 7). This general permit is only applicable to municipalities that are identified in Appendix A of the MS4 permit that contain designated urban areas and discharge stormwater via a separate storm sewer system to surface waters of the State. The permit requires municipalities to develop a Stormwater Management Plan (SMP) to reduce the discharge of pollutants as well as to protect water quality. The MS4 permit is discussed further in the "TMDL Implementation Guidance" section of the core TMDL document. Additional information regarding stormwater management and the MS4 permit can be obtained on CTDEEP's website (http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654).

Multiple MS4 outfalls have been sampled for *E. coli* bacteria in the watershed (Table 7). In Monroe, three MS4 outfalls were sampled from 2004 – 2008. One outfall exceeded the single sample WQS of 410 colonies/100 mL on 11/22/2005.

Figure 7: MS4 areas of the Pequonnock River watershed

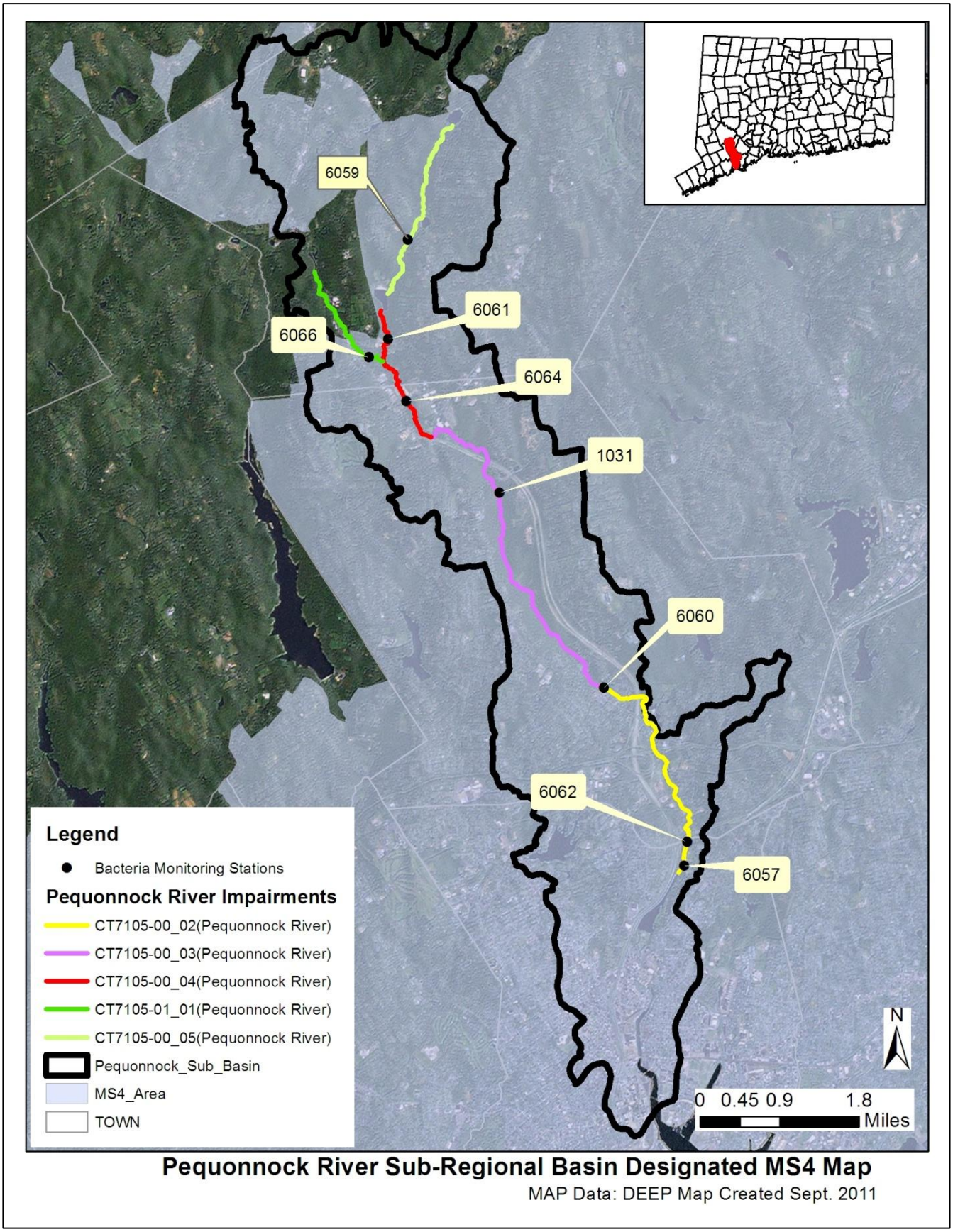


Table 7: List of MS4 sample locations and *E. coli* (colonies/100 mL) results in the Pequonnock River watershed

Town	Location	MS4 Type	Receiving Waters	Sample Date	Result
Monroe	WS 3:(11)-Pepper Street between Commerce Drive and Gardner Road	Industrial	Pequonnock River	11/12/04	198
		Industrial	Pequonnock River	11/22/05	450
		Industrial	Pequonnock River	12/01/06	220
		Industrial	Pequonnock River	03/28/08	272
Monroe	WS 5:(10)-Pastor's Walk, rear side yard of #5	Commercial	Pequonnock River	11/12/04	176
		Commercial	Pequonnock River	11/22/05	340
		Commercial	Pequonnock River	12/01/06	80
		Commercial	Pequonnock River	03/28/08	86
Monroe	WS4:(21)-Fan Hill Road, between #596 and #602	Industrial	Pequonnock River	11/12/04	14
		Industrial	Pequonnock River	11/22/05	20
		Industrial	Pequonnock River	12/01/06	10
		Industrial	Pequonnock River	03/28/08	178
Shaded cells indicate an exceedance of single-sample based water quality criteria (410 colonies/100 mL)					

Non-point Sources

Non-point source pollution (NPS) comes from many diffuse sources and is more difficult to identify and control. NPS pollution is often associated with land-use practices. Examples of NPS that can contribute bacteria to surface waters include insufficient septic systems, pet and wildlife waste, agriculture, and contact recreation (swimming or wading). Potential sources of NPS within the Pequonnock River watershed are described below. The 2011 Pequonnock River Watershed Based Plan describes many of these sources in greater detail (http://www.ct.gov/dep/lib/dep/water/watershed_management/wm_plans/pequonnock/pequonnock_wbpfinal.pdf).

Stormwater Runoff from Developed Areas

The majority of the Pequonnock River watershed is developed. Approximately 60% of the land use in the watershed is considered urban, and this area is concentrated around the impaired segments in Trumbull and Bridgeport (Figures 2 and 9). Urban areas are often characterized by impervious cover, or surface areas such as roofs and roads that force water to run off land surfaces rather than infiltrate the soil. Studies have shown a link between increasing impervious cover and degrading water quality conditions in a watershed (CWP, 2003). In one study, researchers correlated the amount of fecal coliform to the percent of impervious cover in a watershed (Mallin *et al*., 2000).

As shown in Figure 8, the majority of the Pequonnock River watershed has more than 16% impervious surfaces, particularly around the Pequonnock River (Segments 2 and 3). The northern section of the watershed in Monroe has a lower percentage of impervious cover between 7 – 11%, particularly around the West Branch Pequonnock River and the Pequonnock River (Segment 5) (Figure 9). Geometric mean values exceeded the WQS for *E. coli* during wet-weather for all the impaired segments, which suggests

that stormwater runoff may be a source of bacteria to the Pequonnock River (Table 13). Stormwater pollution sources include fertilizer runoff, failing and insufficient septic systems, horse farms, golf courses, and impervious surfaces.

Figure 8: Range of impervious cover (%) in the Pequonnock River watershed

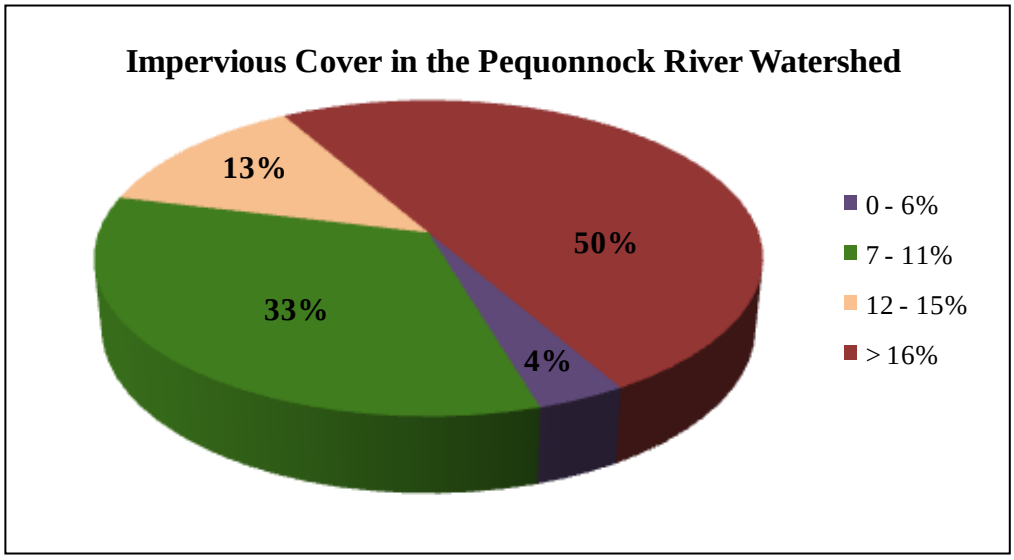
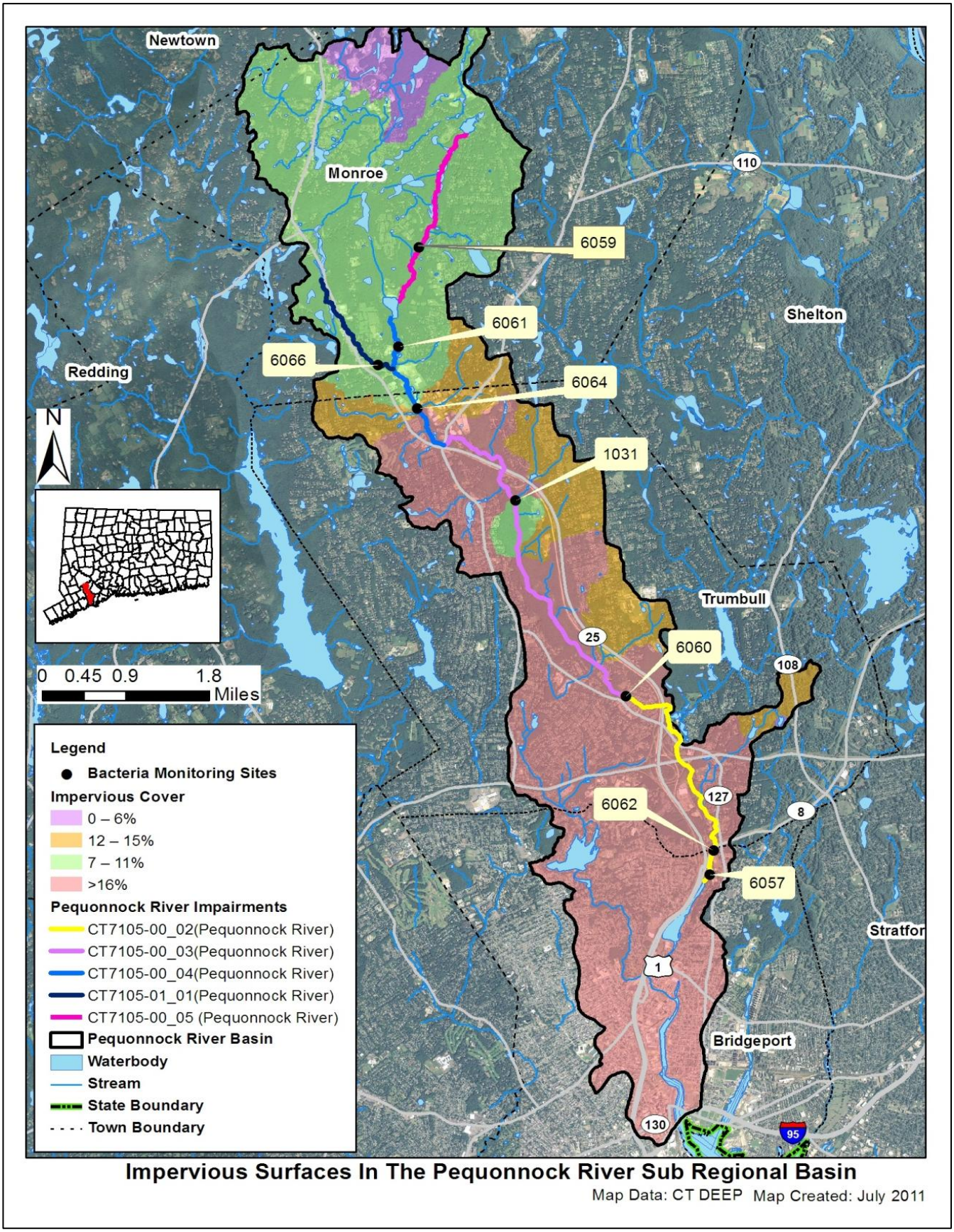


Figure 9: Impervious cover (%) for the Pequonnock River sub-regional watershed



Insufficient Septic Systems

As shown in Figure 6, the northern portion of the Pequonnock River watershed relies on onsite wastewater treatment systems, such as septic systems. Properly managed septic systems and leach fields have the ability to effectively remove bacteria from waste. If systems are not maintained, the waste will not be adequately treated and may result in bacteria reaching nearby surface and ground water.

High geometric means during dry-weather may indicate that illicit discharges such as leaking septic systems may be contributing to the bacterial impairment in a river segment. As shown in Tables 13-17, the geometric mean during dry-weather conditions exceeded the WQS for *E. coli* at the Pequonnock River (Segment 2 and 5) and the West Branch Pequonnock River, suggesting that insufficient septic systems may be contributing to bacterial concentrations in the impaired segments.

In Connecticut, local health directors or health districts are responsible for keeping track of any reported insufficient or failing septic systems in a specific municipality. The Towns of Monroe and Trumbull do not have a specific health director and are part of the Trumbull-Monroe health district (http://www.tmhd.org/). The Town of Bridgeport relies primarily on a sanitary sewer system, though some residents rely on septic systems. The Town of Bridgeport has a full-time health director (http://www.bridgeportct.gov).

Wildlife and Domestic Animal Waste

Wildlife and domestic animals within the Pequonnock River watershed represent another potential source of bacteria to the impaired waterbodies. Wildlife, including waterfowl, may be a significant bacteria source to surface waters. Elevated bacteria levels that are due solely to a natural population of wildlife are not subject to the WQS. Any exacerbation of wildlife population sizes or residency times influenced by human activities are subject to the CT WQS and TMDL provisions. The Pequonnock River Watershed Based Plan (2011) identified fecal material from nuisance waterfowl such as mute swans and Canada geese as a source of NPS. With the construction of roads and drainage systems, these wildlife wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface waterbody. As such, these physical land alterations can exacerbate the impact of natural sources on water quality (USEPA, 2001). As the majority of the watershed is undeveloped, wildlife waste may be a potential source of bacteria in the Pequonnock River watershed.

The Tashua Recreation Area, Indian Ledge Park, Unity Park, and Beardsley Park are located within the Pequonnock River watershed along the impaired segments. Geese and other waterfowl are known to congregate in open areas including recreational fields, agricultural crop fields, and golf courses. In addition to creating a nuisance, large numbers of geese can also create unsanitary conditions on the grassed areas and cause water quality problems due to bacterial contamination associated with their droppings. Large populations of geese can also lead to habitat destruction as a result of overgrazing on wetland and riparian plants.

Although the southern portion of the watershed is more developed, there is a significant amount of residential development in the northern portion of the Pequonnock River watershed. Waste from domestic animals, such as dogs, may also be contributing to bacteria concentrations in these impaired segments of the Pequonnock River watershed.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in many areas of the State. Runoff from agricultural fields may contain pollutants such as bacteria and nutrients (USEPA,

2011a). This runoff can include pollutants from farm practices such as storing manure, allowing livestock to wade in nearby waterbodies, applying fertilizer, and reducing the width of vegetated buffer along the shoreline. Although agricultural land use occupies only a small portion of the watershed, these agricultural operations are located near the impaired segments of the Pequonnock River (Figure 4). Agricultural runoff from these farms and others in the area is a potential source of bacteria to the Pequonnock River.

Additional Sources

A landfill was identified in Figure 6 near Segment 4 of the Pequonnock River, and may be a concern for water quality impairment. There may be other sources not listed here or identified in Figure 6 that contribute to the observed water quality impairment in the Pequonnock River watershed. Further monitoring and investigation will confirm the listed sources and discover additional ones. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement this TMDL.

Land Use/Landscape

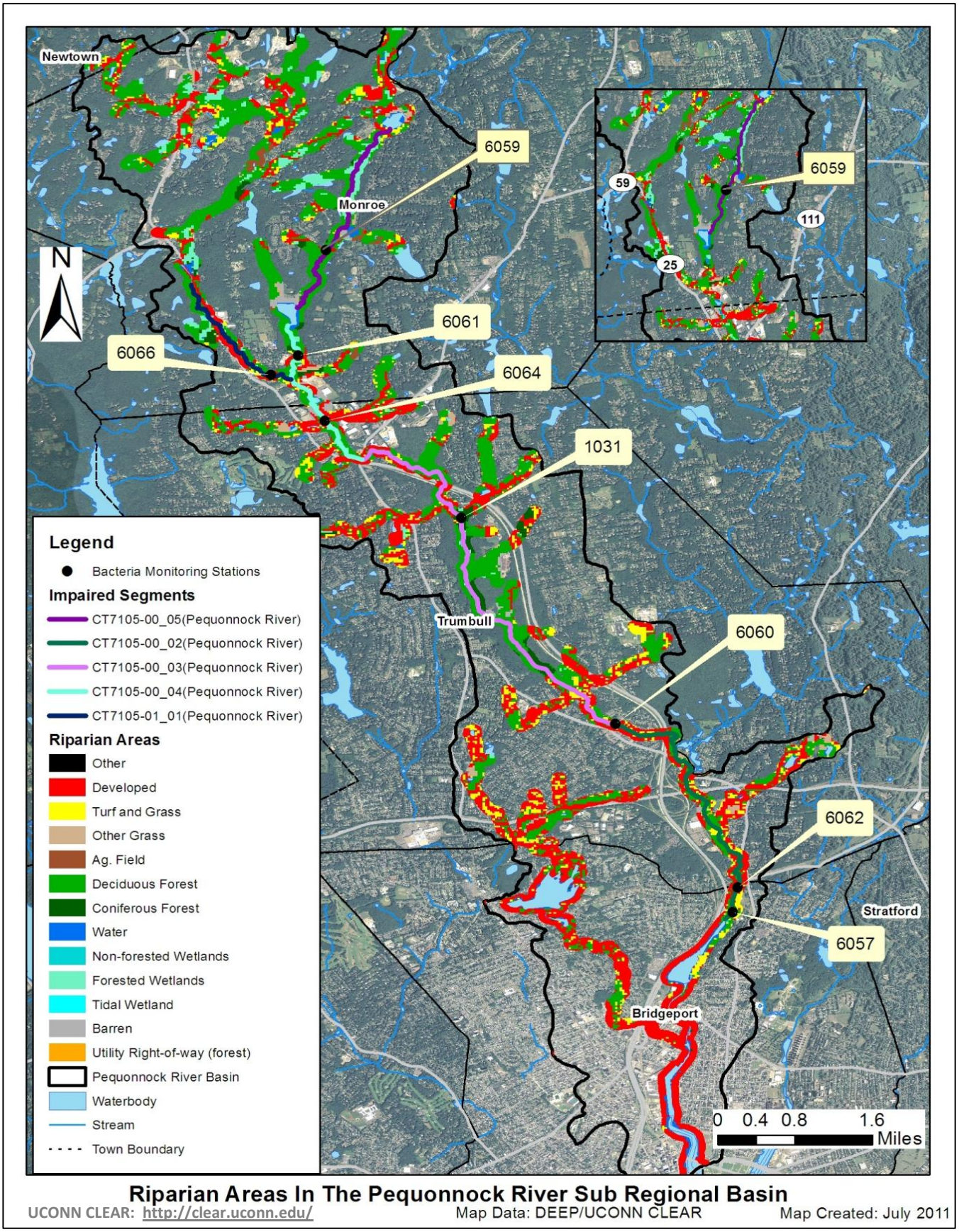
Riparian Buffer Zones

The riparian buffer zone is the area of land located immediately adjacent to streams, lakes, or other surface waters. The boundary of the riparian zone and the adjoining uplands is gradual and not always well-defined. However, riparian zones differ from the uplands because of high levels of soil moisture, frequent flooding, and the unique assemblage of plant and animal communities found there. Through the interaction of their unique soils, hydrology, and vegetation, natural riparian areas influence water quality as contaminants are taken up into plant tissues, adsorbed onto soil particles, or modified by soil organisms. Any change to the natural riparian buffer zone can reduce the effectiveness of the natural buffer and has the potential to contribute to water quality impairment (USEPA, 2011b).

The CLEAR program at UCONN has created streamside buffer layers for the entire State of Connecticut (http://clear.uconn.edu/) which have been used in this TMDL. Analyzing this information can reveal potential sources and implementation opportunities at a localized level. The land use directly adjacent to a waterbody can have direct impacts on water quality from surface runoff sources.

Riparian zones for the northern portion of the watershed and the mid portion through the Pequonnock River Valley State Park are characterized by forested areas with some agriculture (Figure 10). As previously noted, waste from wildlife in non-developed areas can contribute bacteria to nearby waterbodies. However, the majority of the impaired segments have a developed riparian zone. Developed areas within the riparian zone likely contribute pollutants such as bacteria to the waterbody due to a lack of vegetated buffer to treat this runoff.

Figure 10: Riparian buffer zone information for the Pequonnock River watershed



Riparian Areas In The Pequonnock River Sub Regional Basin

UCONN CLEAR: http://clear.uconn.edu/ Map Data: DEEP/UCONN CLEAR Map Created: July 2011

CURRENT MANAGEMENT ACTIVITIES

The Towns of Monroe and Trumbull and the City of Bridgeport have developed and implemented programs to protect water quality from bacterial contamination. In 2011, the Pequonnock River Watershed Based Plan was completed (http://www.ct.gov/dep/lib/dep/water/watershed_management/wm_plans/pequonnock/pequonnock_wbpfinal.pdf). This document outlines current actions in the watershed and recommends future actions necessary to maintain or improve water quality.

CT DEEP's Non-Point Source Pollution Program administers a Non-Point Source Grant Program with funding from EPA under Section 319 of the Clean Water Act (319 grant). Three 319 grants were awarded in the watershed in 2008 and 2009 for completion of a watershed based plan, and a two phased bacterial study of the Pequonnock River. In fact, much of the data used for this TMDL document are from 2009-2010 data collected by Earthplace efforts on the Pequonnock River. More information about these projects can be found online: http://www.depdata.ct.gov/maps/nps/npsmap.htm.

The municipalities within the watershed area have developed and implemented programs to protect water quality from bacterial contamination. As indicated previously, portions of the watershed in Monroe, Trumbull, and Bridgeport 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) to reduce the discharge of pollutants in stormwater to improve 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 in the new development and redevelopment.
6. Pollution prevention/good housekeeping for municipal operations.

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

Table 8: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Monroe, CT (Permit # GSM000013)

Minimum Measure	Monroe Annual Report Update (2010)
Public Outreach and Education	1) Local Eagle Scouts began catch basin stenciling program. 2) Continued Adopt-a-Road program. 3) Continued dispersing handouts about stormwater to the public. 4) Continued use of the town's website for stormwater information. 5) Involved local school custodians in stormwater training.

Table 8: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Monroe, CT (Permit # GSM000013) (continued)

Minimum Measure	Monroe Annual Report Update (2010)
Public Involvement and Participation	1) Held seven radio broadcasts announcing their Stormwater Management Plan.
Illicit Discharge Detection and Elimination	1) Mapped all stormwater outfalls. 2) Continued IDDE program – no illicit discharges were detected. 3) Continued mandatory outfall sampling. 4) Currently reviewing draft illicit discharge ordinance.
Construction Site Stormwater Runoff Control	1) Continued inspections by the Engineering Department on all construction sites.
Post-Construction Stormwater management	No updates
Pollution Prevention and Good Housekeeping	1) Continued street sweeping program 2) Continued annual catch basin inspection and cleaning program.

Table 9: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Trumbull, CT (Permit # GSM000107)

Minimum Measure	Trumbull Annual Report Update (2009)
Public Outreach and Education	1) Continued to stencil all storm drains (Boy Scouts and other volunteers). 2) Public education materials to be mailed with yearly tax bill. 3) Yearly flyer to all selectmen will include information about MS4.
Public Involvement and Participation	No updates
Illicit Discharge Detection and Elimination	1) Mapped 100% of stormwater outfalls and continued to update map. 3) Continued enforcement of illicit discharge ordinance
Construction Site Stormwater Runoff Control	1) Continued enforcement of construction guidelines at the beginning of new construction projects.
Post-Construction Stormwater management	1) Continued enforcement of post-construction guidelines at the beginning and end of new construction projects. 2) New developments may require particulate separators.
Pollution Prevention and Good Housekeeping	1) Continued annual street sweeping. 2) Continued annual catch basin inspection and cleaning. 3) Repaired and upgraded catch basins and outfalls as needed.

Table 10: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Bridgeport, CT (Permit # GSM000035)

Minimum Measure	Bridgeport Annual Report Update (2010)
Public Outreach and Education	1) MS4 information distributed in WPCA tax bill.
Public Involvement and Participation	1) Continued catch basin stenciling program.
Illicit Discharge Detection and Elimination	1) Mapped all 12" storm drains.
Construction Site Stormwater Runoff Control	1) Reviewed and updated all land use regulations to meet MS4 requirements.
Post Construction Stormwater management	1) Continued to develop long term maintenance program for BMPs.
Pollution Prevention and Good Housekeeping	1) All roads swept 6 times per year (minimum). 2) All catch basins and outfalls inspected and cleaned. 3) Identified sewer lines in need of repair and obtained funding to line 30,000 linear feet of sewer.

RECOMMENDED NEXT STEPS

The municipalities within the Pequonnock River watershed 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 Pequonnock River and have been prioritized below. Some of these actions are provided in more detail in the 2011 Pequonnock River Watershed Based Plan (http://www.ct.gov/dep/lib/dep/water/watershed_management/wm_plans/pequonnock/pequonnock_wbpfinal.pdf).

1) Continue monitoring of permitted sources and conducting routine water quality monitoring throughout the Pequonnock River watershed.

Previous sampling of discharge from permitted sources within the watershed has shown elevated levels of fecal coliform bacteria, an indicator of bacterial pollution (Tables 6 and 7). The Pequonnock River Watershed Based Plan (2011) prioritized continued water quality monitoring to assess impacts from potential point and non-point pollution sources in the watershed, measure progress toward meeting watershed management goals, and ultimately support removal of the Pequonnock River from the impaired waters list.

Further monitoring will provide information essential to better locate, understand, and reduce pollution sources. If any current monitoring is not done with appropriate bacterial indicator based on the receiving water, then a recommended change during the next permit reissuance is to include the appropriate indicator species. If facility monitoring indicates elevated bacteria, then implementation of permit required, and voluntary measures to identify and reduce sources of bacterial contamination at the facility are an additional recommendation. Regular monitoring should be established for all permitted sources to ensure compliance with permit requirements and to determine if current requirements are adequate or if additional measures are necessary for water quality protection.

Section 6(k) of the MS4 General Permit requires a municipality to modify their Stormwater Management Plan to implement the TMDL within four months of TMDL approval by EPA if stormwater within the municipality contributes pollutant(s) in excess of the allocation established by the TMDL. For discharges to impaired waterbodies, the municipality must assess and modify the six minimum measures of its plan, if necessary, to meet TMDL standards. Particular focus should be placed on the following plan components: public education, illicit discharge detection and elimination, stormwater structures cleaning, and the repair, upgrade, or retrofit of storm sewer structures. The goal of these modifications is to establish a program that improves water quality consistent with TMDL requirements. Modifications to the Stormwater Management Plan in response to TMDL development should be submitted to the Stormwater Program of DEEP for review and approval.

Table 11 details the appropriate bacteria criteria for use as waste load allocations established by this TMDL for use as water quality targets by permittees as permits are renewed and updated, within the Pequonnock River Watershed.

For any municipality subject to an MS4 permit and affected by a TMDL, the permit requires a modification of the SMP to include BMPs that address the included impairment. In the case of bacteria related impairments municipal BMPs could include: implementation or improvement to existing nuisance wildlife programs, septic system monitoring programs, any additional measures that can be added to the required illicit discharge detection and elimination (IDDE) programs, and increased street sweeping above basic permit requirements. Any non-MS4 municipalities can implement these same types of initiatives in effort to reduce bacteria source loading to impaired waterways.

Any facilities that discharge non-MS4 regulated stormwater should update their Pollution Prevention Plan to reflect BMPs that can reduce bacteria loading to the receiving waterway. These BMPs could include nuisance wildlife control programs and any installations that increase surface infiltration to reduce overall stormwater volumes. Facilities that are regulated under the Commercial Activities Stormwater Permit should report any updates to their SMP in their summary documentation submitted to DEEP.

Table 11. Bacteria (e.coli) TMDLs, WLAs, and LAs for Recreational Use

		Instantaneous *E. coli* (#/100mL)						Geometric Mean *E. coli* (#/100mL)	
Class	**Bacteria Source**	**WLA[6]**			**LA[6]**			**WLA[6]**	**LA[6]**
	Recreational Use	1	2	3	1	2	3	**All**	**All**
A	Non-Stormwater NPDES	0	0	0				0	
	CSOs	0	0	0				0	
	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]	
	Stormwater (non-MS4)				235[7]	410[7]	576[7]		126[7]
	Wildlife direct discharge				235[7]	410[7]	576[7]		126[7]
	Human or domestic animal direct discharge[5]				235	410	576		126

(1) **Designated Swimming.** Procedures for monitoring and closure of bathing areas by State and Local Health Authorities are specified in: Guidelines for Monitoring Bathing Waters and Closure Protocol, adopted jointly by the Department of Environmental Protections and the Department of Public Health. May 1989. Revised April 2003 and updated December 2008.

(2) **Non-Designated Swimming.** Includes areas otherwise suitable for swimming but which have not been designated by State or Local authorities as bathing areas, waters which support tubing, water skiing, or other recreational activities where full body contact is likely.

(3) **All Other Recreational Uses.**

(4) Criteria for the protection of recreational uses in Class B waters do not apply when disinfection of sewage treatment plant effluents is not required consistent with Standard 23. (Class B surface waters located north of Interstate Highway I-95 and downstream of a sewage treatment plant providing seasonal disinfection May 1 through October 1, as authorized by the Commissioner.)

(5) Human direct discharge = swimmers

(6) Unless otherwise required by statute or regulation, compliance with this TMDL will be based on ambient concentrations and not end-of-pipe bacteria concentrations

(7) Replace numeric value with "natural levels" if only source is naturally occurring wildlife. Natural is defined as the biological, chemical and physical conditions and communities that occur within the environment which are unaffected or minimally affected by human influences (CT DEEP 2011a). Sections 2.2.2 and 6.2.7 of this Core Document deal with BMPs and delineating type of wildlife inputs.

2) Identify areas in the Pequonnock River watershed to implement Low Impact Development (LID) and Best Management Practices (BMPs) to control stormwater runoff.

As noted previously, 60% of the Pequonnock River watershed is considered urban and the towns within the Pequonnock River watershed are MS4 communities regulated by the MS4 program. Portions of the watershed in Trumbull and Bridgeport near the impaired segments have an impervious cover greater than 16%. As such, stormwater runoff is likely contributing bacteria to the Pequonnock River.

The Pequonnock River Watershed Based Plan (2011) made specific recommendations to reduce the impacts of stormwater runoff on water quality. The plan recommends adopting LID techniques throughout the watershed. LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as

preserving and recreating natural landscape features, and minimizing imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product. Recommended actions throughout the watershed include:

- Implement LID demonstration projects at highly visible locations throughout the watershed;
- Highlight private development projects that utilize LID techniques;
- Provide education and outreach programs (seminars, training workshops, web resources, etc.) for developers, designers, land use commissioners, municipal staff and the public;
- Incorporate LID stormwater requirements into local land use plan regulations;
- Explore the feasibility of implementing a stormwater fee in the watershed.

The plan also recommends specific BMPs in Monroe, Trumbull, and Bridgeport. The southern portion of the watershed is more heavily developed and many of these BMPs are located in the downstream sections of the river. Towns within the watershed should review the recommendations in the plan to protect and help mitigate impacts to downstream sections. BMPs that would affect the water quality in the impaired segments of the Pequonnock River are listed in Table 12.

Table 12: Recommended structural BMPs from the 2011 Pequonnock River Watershed Based Plan

Location	Town	Recommended BMPs
Wolfe Park	Monroe	Stormwater retrofit demonstration project.
Wolfe Park	Monroe	Increase vegetated buffer in the Wolfe Park area.
Upstream of Wolfe Park	Monroe	Improve stream bank scour upstream of Wolfe Park.
Stepney Elementary School	Monroe	Install bioretention swales, pervious pavement, and woodland edge plantings.
Bart Shopping Center	Monroe	Install green gutters and pervious pavement for LID retrofit.
Beardsley Park	Monroe	Restore riparian zone of Bunnell's Pond and install pervious pavement, and bioretention swales.
Trumbull Public Library	Trumbull	Install LID retrofits such as tree box filters.
Old Mine Park	Trumbull	Construct grass drainage swale and rain garden.

To identify other areas that are contributing bacteria to the impaired segments, the Towns of Monroe and Trumbull should conduct wet-weather sampling at stormwater outfalls that discharge directly to the impaired segments of the Pequonnock River watershed. Outfalls that have previously shown high bacteria concentrations should be prioritized for BMP installation (Table 6). To treat stormwater runoff, all watershed towns should identify areas along the developed sections of the river to install BMPs designed to encourage stormwater to infiltrate into 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.

3) Develop a system to monitor septic systems.

Residents of the northern half of the Pequonnock River watershed rely on septic systems. Towns within the watershed should establish a program to ensure that existing septic systems are properly operated and maintained. For instance, communities can create an inventory of existing septic systems through

mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of the sub-standard systems within a reasonable timeframe could be adopted. Towns can also develop programs to assist citizens with the replacement and repair of older and failing systems.

The Pequonnock River Watershed Based Plan (2011) recommends that the Towns of Monroe and Trumbull work with the Trumbull-Monroe Health District to identify and map areas with failing or insufficient septic systems and other potential problem areas, particularly in areas that could result in system discharge to the storm sewer system or directly to surface water bodies and in areas near the impaired segments of the Pequonnock River.

4) Evaluate municipal education and outreach programs regarding animal waste.

Any education and outreach program in the watershed should highlight the importance of not feeding waterfowl and wildlife and managing waste from horses, dogs, and other pets. The towns and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of the impaired segments 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 Pequonnock 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-uses areas, enacting ordinances requiring the clean-up of pet waste, and targeting educational and outreach programs in problem areas.

5) Ensure there are sufficient buffers on agricultural lands along the Pequonnock River.

If not already in place, 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, 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 near the impaired segments of the Pequonnock River (Figure 4).

BACTERIA DATA AND PERCENT REDUCTIONS TO MEET THE TMDL

Table 13: Pequonnock River Bacteria Data

Waterbody ID: CT7105-00_02

Characteristics: Freshwater, Class A, Potential Public Drinking Water Supply, 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: **82%**

Single Sample: **98%**

Data: 2009-2010 from Earthplace volunteer monitoring, 2012 TMDL Cycle

Single sample *E. coli* data (colonies/100 mL) from all stations on the Pequonnock River (Segment 2) with annual geometric means calculated

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
6062	Just before Bunnell's Pond at Beardsley Park	5/5/2009	1460	wet	133
6062	Just before Bunnell's Pond at Beardsley Park	5/20/2009	64	dry	
6062	Just before Bunnell's Pond at Beardsley Park	6/3/2009	68	dry	
6062	Just before Bunnell's Pond at Beardsley Park	6/17/2009	84	dry	
6062	Just before Bunnell's Pond at Beardsley Park	7/15/2009	168	dry	
6062	Just before Bunnell's Pond at Beardsley Park	7/29/2009	232	wet	
6062	Just before Bunnell's Pond at Beardsley Park	8/12/2009	76	dry	
6062	Just before Bunnell's Pond at Beardsley Park	8/26/2009	140	dry	
6062	Just before Bunnell's Pond at Beardsley Park	9/9/2009	88	dry	
6062	Just before Bunnell's Pond at Beardsley Park	9/23/2009	88	dry	

Single sample *E. coli* data (colonies/100 mL) from all stations on the Pequonnock River (Segment 2) with annual geometric means calculated (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
6062	Just before Bunnell's Pond at Beardsley Park	5/13/2010	160	wet	**374* (66%)**
6062	Just before Bunnell's Pond at Beardsley Park	5/27/2010	1360	dry	
6062	Just before Bunnell's Pond at Beardsley Park	6/10/2010	**1500* (73%)**	wet	
6062	Just before Bunnell's Pond at Beardsley Park	6/24/2010	800	dry	
6062	Just before Bunnell's Pond at Beardsley Park	7/8/2010	232	dry	
6062	Just before Bunnell's Pond at Beardsley Park	7/29/2010	212	dry	
6062	Just before Bunnell's Pond at Beardsley Park	8/12/2010	140	dry	
6062	Just before Bunnell's Pond at Beardsley Park	8/26/2010	340	wet	
6062	Just before Bunnell's Pond at Beardsley Park	9/9/2010	200	dry	
6062	Just before Bunnell's Pond at Beardsley Park	9/23/2010	440	dry	
6057	Bunnell's Pond near inlet	5/5/2009	264	wet	53
6057	Bunnell's Pond near inlet	5/20/2009	28	dry	
6057	Bunnell's Pond near inlet	6/3/2009	20	dry	
6057	Bunnell's Pond near inlet	6/17/2009	148	dry	
6057	Bunnell's Pond near inlet	7/15/2009	260	dry	
6057	Bunnell's Pond near inlet	7/29/2009	84	wet	
6057	Bunnell's Pond near inlet	8/12/2009	8	dry	
6057	Bunnell's Pond near inlet	8/26/2009	28	dry	
6057	Bunnell's Pond near inlet	9/9/2009	42	dry	
6057	Bunnell's Pond near inlet	9/23/2009	40	dry	
6057	Bunnell's Pond near inlet	5/13/2010	340	wet	**707* (82%)**
6057	Bunnell's Pond near inlet	6/10/2010	3660	wet	
6057	Bunnell's Pond near inlet	6/24/2010	680	dry	
6057	Bunnell's Pond near inlet	7/8/2010	400	dry	
6057	Bunnell's Pond near inlet	7/29/2010	128	dry	
6057	Bunnell's Pond near inlet	8/12/2010	72	dry	
6057	Bunnell's Pond near inlet	8/26/2010	3260	wet	
6057	Bunnell's Pond near inlet	9/9/2010	240	dry	
6057	Bunnell's Pond near inlet	9/23/2010	**18000* (98%)**	dry	

Shaded cells indicate an exceedance of water quality criteria

†Average of two duplicate samples

**** Weather conditions for selected data taken from Hartford because local station had missing data**

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

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for all stations on the Pequonnock River (Segment 2)

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
6062	Just before Bunnell's Pond at Beardsley Park	2009-2010	5	15	223	488	172
6057	Bunnell's Pond near inlet	2009-2010	5	14	181	618	117

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gages at Tweed_New Haven_KHVN in New Haven, CT.

Table 14: Pequonnock River Bacteria Data

Waterbody ID: CT7105-00_03

Characteristics: Freshwater, Class A, Potential Public Drinking Water Supply, 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: **50%**

Single Sample: **49%**

Data: 2006, 2009-2010 from Earthplace volunteer monitoring, 2012 TMDL Cycle

Single sample *E. coli* data (colonies/100 mL) from all stations on the Pequonnock River (Segment 3) with annual geometric means calculated

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
6060	Daniel's Farm Road Bridge	5/5/2009	168	wet	75
6060	Daniel's Farm Road Bridge	5/20/2009	20	dry	
6060	Daniel's Farm Road Bridge	6/3/2009	96	dry**	
6060	Daniel's Farm Road Bridge	6/17/2009	72	dry	
6060	Daniel's Farm Road Bridge	7/15/2009	68	dry**	
6060	Daniel's Farm Road Bridge	7/29/2009	100	wet**	
6060	Daniel's Farm Road Bridge	8/12/2009	68	dry	
6060	Daniel's Farm Road Bridge	8/26/2009	144	dry**	
6060	Daniel's Farm Road Bridge	9/9/2009	72	dry	
6060	Daniel's Farm Road Bridge	9/23/2009	52	dry	

Single sample *E. coli* data (colonies/100 mL) from all stations on the Pequonnock River (Segment 3) with annual geometric means calculated (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
6060	Daniel's Farm Road Bridge	5/13/2010	134	wet	**253* (50%)**
6060	Daniel's Farm Road Bridge	5/27/2010	680	wet**	
6060	Daniel's Farm Road Bridge	6/10/2010	**800* (49%)**	wet	
6060	Daniel's Farm Road Bridge	6/24/2010	340	wet	
6060	Daniel's Farm Road Bridge	7/8/2010	212	dry	
6060	Daniel's Farm Road Bridge	7/29/2010	440	dry	
6060	Daniel's Farm Road Bridge	8/12/2010	80	dry**	
6060	Daniel's Farm Road Bridge	8/26/2010	228	dry	
6060	Daniel's Farm Road Bridge	9/9/2010	104	dry	
6060	Daniel's Farm Road Bridge	9/23/2010	244	dry**	
1031	Downstream Whitney Avenue in Town Park	11/2/2006	440	wet	NA

Shaded cells indicate an exceedance of water quality criteria

†Average of two duplicate samples

**** Weather conditions for selected data taken from Hartford because local station had missing data**

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

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for all stations on the Pequonnock River (Segment 3)

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
6060	Daniel's Farm Road Bridge	2009-2010	6	14	138	273	103
1031	Downstream Whitney Avenue in Town Park	2006	1	0	NA	NA	NA

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gages at Danbury Station in Fairfield, CT.

Table 15: Pequonnock River Bacteria Data

Waterbody ID: CT7105-00_04

Characteristics: Freshwater, Class A, Potential Public Drinking Water Supply, 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: **11%**

Single Sample: **85%**

Data: 2009-2010 from Earthplace volunteer monitoring, 2012 TMDL Cycle

Single sample *E. coli* data (colonies/100 mL) from all stations on the Pequonnock River (Segment 4) with annual geometric means calculated

Station Name	Station Location	Date	Result	Wet/ Dry	Geomean
6064	Spring Hill Bridge DS of confluence with unnamed brook	5/5/09	136	wet	69
6064	Spring Hill Bridge DS of confluence with unnamed brook	5/20/09	60	dry	
6064	Spring Hill Bridge DS of confluence with unnamed brook	6/3/09	84	dry**	
6064	Spring Hill Bridge DS of confluence with unnamed brook	6/17/09	48	dry	
6064	Spring Hill Bridge DS of confluence with unnamed brook	7/15/09	60	dry**	
6064	Spring Hill Bridge DS of confluence with unnamed brook	7/29/09	116	wet**	
6064	Spring Hill Bridge DS of confluence with unnamed brook	8/12/09	64	dry	
6064	Spring Hill Bridge DS of confluence with unnamed brook	8/26/09	96	dry**	
6064	Spring Hill Bridge DS of confluence with unnamed brook	9/9/09	44	dry	
6064	Spring Hill Bridge DS of confluence with unnamed brook	9/23/09	40	dry	

Single sample *E. coli* data (colonies/100 mL) from all stations on the Pequonnock River (Segment 4) with annual geometric means calculated (continued)

Station Name	Station Location	Date	Result	Wet/ Dry	Geomean
6064	Spring Hill Bridge DS of confluence with unnamed brook	5/13/10	400	wet	**141* (11%)**
6064	Spring Hill Bridge DS of confluence with unnamed brook	5/27/10	370	wet**	
6064	Spring Hill Bridge DS of confluence with unnamed brook	6/10/10	92	wet	
6064	Spring Hill Bridge DS of confluence with unnamed brook	6/24/10	220	wet	
6064	Spring Hill Bridge DS of confluence with unnamed brook	7/8/10	**1080* (62%)**	dry	
6064	Spring Hill Bridge DS of confluence with unnamed brook	7/29/10	80	dry	
6064	Spring Hill Bridge DS of confluence with unnamed brook	8/12/10	28	dry**	
6064	Spring Hill Bridge DS of confluence with unnamed brook	8/26/10	92	dry	
6064	Spring Hill Bridge DS of confluence with unnamed brook	9/9/10	24	dry	
6064	Spring Hill Bridge DS of confluence with unnamed brook	9/23/10	196	dry**	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	5/5/09	28	wet	24
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	5/20/09	30	dry	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	6/3/09	50	dry**	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	6/17/09	20	dry	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	7/15/09	20	dry**	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	7/29/09	8	wet**	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	8/12/09	100	dry	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	8/26/09	20	dry**	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	9/9/09	12	dry	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	9/23/09	16	dry	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	5/13/10	16	wet	116
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	5/27/10	220	wet**	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	6/10/10	40	wet	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	6/24/10	40	wet	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	7/29/10	**2800* (85%)**	dry	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	8/12/10	72	dry**	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	8/26/10	92	dry	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	9/9/10	28	dry	
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	9/23/10	1280	dry**	

Shaded cells indicate an exceedance of water quality criteria

†Average of two duplicate samples

**** Weather conditions for selected data taken from Hartford because local station had missing data**

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

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for all stations on the Pequonnock River (Segment 4)

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
6064	Spring Hill Bridge just downstream from confluence with unnamed brook	2009-2010	6	14	99	190	75
6061	East Branch of Pequonnock at Purdy Hill Road Bridge	2009-2010	6	13	50	33	61
Shaded cells indicate an exceedance of water quality criteria							
Weather condition determined from rain gages at Danbury Station in Fairfield, CT.							

Table 16: Pequonnock River Bacteria Data

Waterbody ID: CT7105-01_01

Characteristics: Freshwater, Class A, Potential Public Drinking Water Supply, 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: **46%**

Single Sample: **38%**

Data: 2009-2010 from Earthplace volunteer monitoring, 2012 TMDL Cycle

Single sample *E. coli* data (colonies/100 mL) from Station 6066 on the West Branch Pequonnock River with annual geometric means calculated

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
6066	West Branch of Pequonnock at Maple Drive Bridge	5/5/2009	40	wet	102
6066	West Branch of Pequonnock at Maple Drive Bridge	5/20/2009	60	dry	
6066	West Branch of Pequonnock at Maple Drive Bridge	6/3/2009	80	dry**	
6066	West Branch of Pequonnock at Maple Drive Bridge	6/17/2009	52	dry	
6066	West Branch of Pequonnock at Maple Drive Bridge	7/15/2009	108	dry**	
6066	West Branch of Pequonnock at Maple Drive Bridge	7/29/2009	92	wet**	
6066	West Branch of Pequonnock at Maple Drive Bridge	8/12/2009	128	dry	
6066	West Branch of Pequonnock at Maple Drive Bridge	8/26/2009	196	dry**	
6066	West Branch of Pequonnock at Maple Drive Bridge	9/9/2009	212	dry	
6066	West Branch of Pequonnock at Maple Drive Bridge	9/23/2009	236	dry	

Single sample *E. coli* data (colonies/100 mL) from Station 6066 on the West Branch Pequonnock River with annual geometric means calculated (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geomean
6066	West Branch of Pequonnock at Maple Drive Bridge	5/13/2010	140	wet	**235* (46%)**
6066	West Branch of Pequonnock at Maple Drive Bridge	5/27/2010	590	wet**	
6066	West Branch of Pequonnock at Maple Drive Bridge	6/10/2010	360	wet	
6066	West Branch of Pequonnock at Maple Drive Bridge	6/24/2010	500	wet	
6066	West Branch of Pequonnock at Maple Drive Bridge	7/8/2010	**660* (38%)**	dry	
6066	West Branch of Pequonnock at Maple Drive Bridge	7/29/2010	172	dry	
6066	West Branch of Pequonnock at Maple Drive Bridge	8/12/2010	184	dry**	
6066	West Branch of Pequonnock at Maple Drive Bridge	8/26/2010	300	dry	
6066	West Branch of Pequonnock at Maple Drive Bridge	9/9/2010	100	dry	
6066	West Branch of Pequonnock at Maple Drive Bridge	9/23/2010	56	dry**	

Shaded cells indicate an exceedance of water quality criteria

[†]Average of two duplicate samples

**** Weather conditions for selected data taken from Hartford because local station had missing data**

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

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for Station 6066 on the West Branch Pequonnock River

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
6066	West Branch of Pequonnock at Maple Drive Bridge	2009-2010	6	14	155	195	141

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gages at Danbury Station in Fairfield, CT.

Table 17: Pequonnock River Bacteria Data

Waterbody ID: CT7105-00_05

Characteristics: Freshwater, Class A, Potential Public Drinking Water Supply, 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: **31%**

Single Sample: **15%**

Data: 2009 from Earthplace volunteer monitoring, 2012 TMDL Cycle

Single sample *E. coli* data (colonies/100 mL) from Station 6059 on the Pequonnock River (Segment 5) with annual geometric means calculated

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	5/5/2009	212	wet	**182* (31%)**
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	5/20/2009	**480* (15%)**	dry	
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	6/3/2009	66	dry**	
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	6/17/2009	80	dry	
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	7/15/2009	240	dry**	
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	7/29/2009	148	wet**	
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	8/12/2009	220	dry	
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	8/26/2009	228	dry**	
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	9/9/2009	204	dry	
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	9/23/2009	200	dry	

Shaded cells indicate an exceedance of water quality criteria

**** Weather conditions for selected data taken from Hartford because local station had missing data**

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

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for Station 6059 on the Pequonnock River (Segment 5)

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
6059	Cutler Farm Rd. before river's entrance at Wolfe Park	2009	2	8	182	177	183

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gauges in Danbury, CT and at Hartford Bradley International Airport

REFERENCES

Bridgeport - Annual Assessment of the Shellfish Growing Waters in the City of Bridgeport, CT (2005). Department of Agriculture/Bureau of Aquaculture, Milford, CT.

Costa, Joe (2011). Calculating Geometric Means. Buzzards Bay National Estuary Program. **Online**: http://www.buzzardsbay.org/geomean.htm

CTDEEP (2010). State of Connecticut Integrated Water Quality Report. **Online:** http://www.ct.gov/dep/lib/dep/water/water_quality_management/305b/ctiwqr10final.pdf

CTDEEP (2011). State of Connecticut Water Quality Standards. **Online:** http://www.ct.gov/dep/lib/dep/water/water_quality_standards/wqs_final_adopted_2_25_11.pdf

CWP (2003). Impacts of Impervious Cover on Aquatic Systems. Center for Watershed Protection. **Online**: http://clear.uconn.edu/projects/tmdl/library/papers/Schueler_2003.pdf

Federal Register 67 (March 15, 2002) 11663-11670. Urban Area Criteria for Census 2000.

Fuss & O'Neill. (2011). Pequonnock River Watershed Based Plan. **Online:** http://www.ct.gov/dep/lib/dep/water/watershed_management/wm_plans/pequonnock/pequonnock_wbpfinal.pdf

Mallin, M.A., K.E. Williams, E.C. Escham, R.P. Lowe (2000). Effect of Human Development on Bacteriological Water Quality in Coastal Wetlands. Ecological Applications 10: 1047-1056.

USEPA (2001). Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water. **Online**: http://www.epa.gov/safewater/sourcewater/pubs/fs_swpp_petwaste.pdf.

USEPA (2011a). Managing Nonpoint Source Pollution from Agriculture. **Online:** http://water.epa.gov/polwaste/nps/outreach/point6.cfm

USEPA (2011b). Riparian Zone and Stream Restoration. **Online:** http://epa.gov/ada/eco/riparian.html

USEPA (2011c). Land Use Impacts on Water. Online: http://epa.gov/greenkit/toolwq.htm