



Cherry Brook Watershed Summary

Cherry Brook (Segment 1), Cherry Brook (Segment 2)

WATERSHED DESCRIPTION AND MAPS

The Cherry Brook watershed covers an area of approximately 8,848 acres in the mid-northern half of Connecticut, west of the Connecticut River (Figure 1). The watershed is located primarily in Canton, CT, and the headwaters extend into Granby and Barkhamsted, CT.

The Cherry Brook watershed includes two 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 Waters. Table 1 shows Cherry Brook (Segment 3) (CT4309-00_03) with an inconclusive assessment for recreation. The other segment (CT4309-02_01) in the watershed is currently unassessed for recreation as of the writing of this document. This does not mean that there are no potential issues on this segment, but indicates a lack of current data to evaluate the segment as part of the assessment process. An excerpt of the Integrated Water Quality Report is included in Table 1 to show the status of other waterbodies in the watershed (CTDEEP, 2010).

Cherry Brook begins just north of the Route 219 crossing in Barkhamsted, CT, flows parallel to Cherry Brook Road, crosses the Barkhamsted-Granby border then the Granby-Canton border, flows south parallel to Route 179 in Canton, CT, then ends at the confluence with the Farmington River at Albany Turnpike (Route 44) crossing in Canton, CT. The bacteria impaired segment, Cherry Brook (Segment 1) (CT4309-00_01), consists of 2.05 miles of river in Canton, CT (Figure 2). Cherry Brook (Segment 1) begins near the Barbourtown Road crossing in Canton, CT, and ends at the confluence with the Farmington River just downstream of the Albany Turnpike (Route 44). The bacteria impaired segment, Cherry Brook (Segment 2) (CT4309-00_02), consists of 0.66 miles of the river in Canton, CT (Figure 2). Cherry Brook (Segment 2) begins at the confluence with an unnamed tributary (an outlet stream from Linsey Pond) just upstream of the Meadow Road crossing, and ends at the Barbourtown Road crossing in Canton, CT.

Impaired Segment Facts

Impaired Segments:

1. Cherry Brook (Segment 1) (CT4309-00_01)
2. Cherry Brook (Segment 2) (CT4309-00_02)

Municipalities: Canton

Impaired Segment Length (miles): 4309-00_01 (2.05), 4309-00_02 (0.66)

Water Quality Classification: Class A

Designated Use Impairment: Recreation

Sub-regional Basin Name and Code: Cherry Brook, 4309

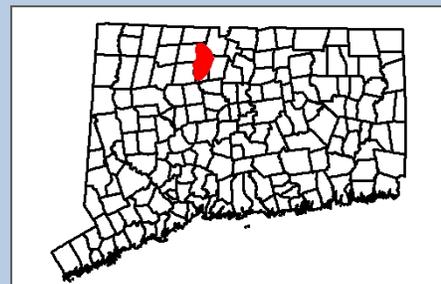
Regional Basin: Farmington

Major Basin: Connecticut

Watershed Area (acres): 8,848

MS4 Applicable? No

Figure 1: Watershed location in Connecticut

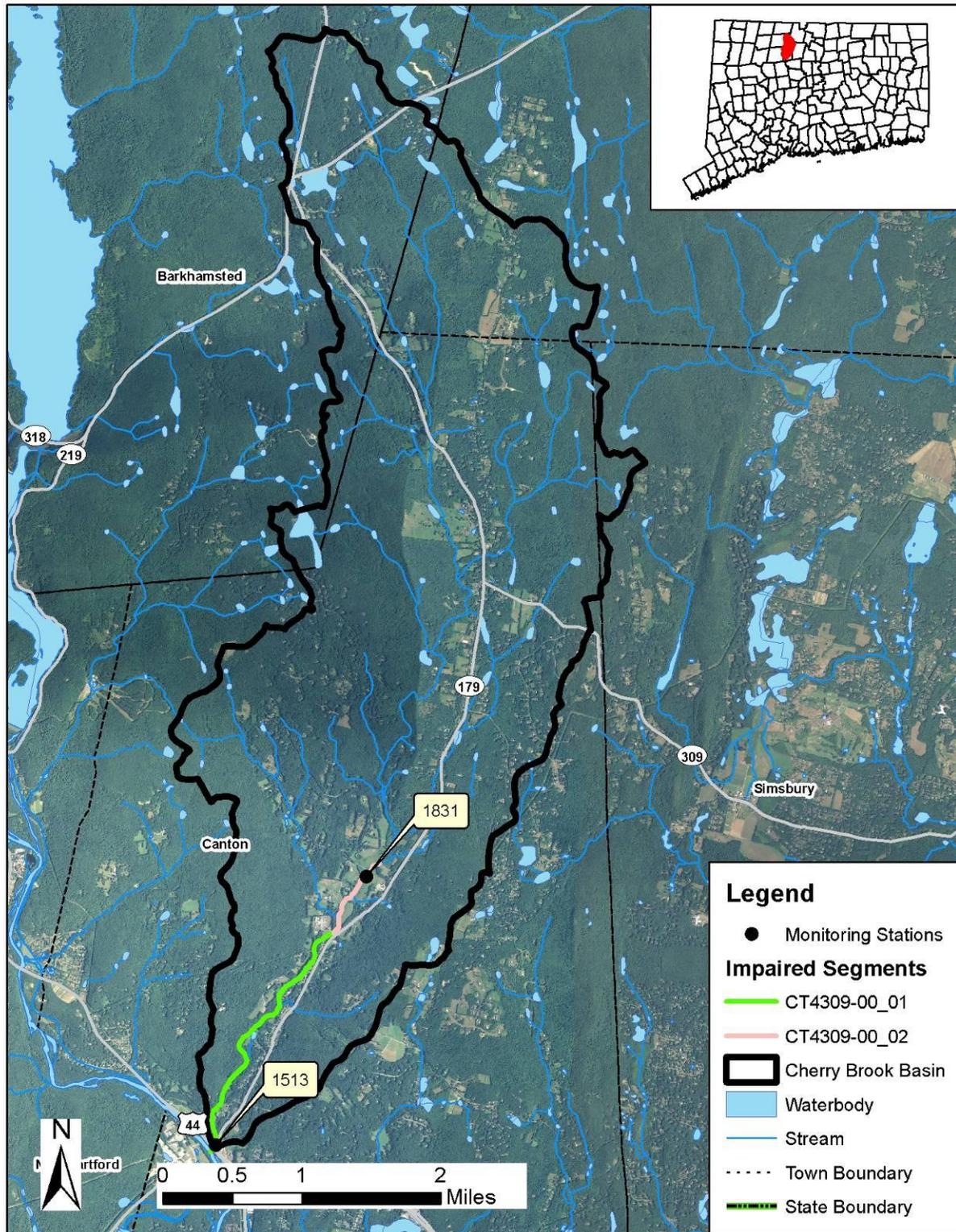


The two impaired segments of Cherry Brook have a water quality classification of A. Designated uses include potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. As there are no designated beaches in these segments of Cherry Brook, the specific impairment for recreation is for non-designated swimming and other contact water-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
CT4309-00_01	Cherry Brook (Canton)-01	From mouth at confluence with Farmington River (just DS of Albany Turnpike (Route 44) crossing), US to Barbourtown Road crossing, Canton.	2.05	FULL	NOT	FULL
CT4309-00_02	Cherry Brook (Canton)-02	From Barbourtown road crossing (segment-01), US to confluence with unnamed tributary (outlet stream for Linsey Pond), just US of Meadow Road crossing, Canton.	0.66	U	NOT	FULL
CT4309-00_03	Cherry Brook (Canton/Barkhamsted)-03	Confluence with unnamed tributary, just US of Meadow Road crossing and parallel to Route 179, Canton, US to HW, just US of Route 219 crossing, Barkhamsted.	6.64	FULL	INC	FULL
CT4309-02_01	Unnamed Tributary to Cherry Brook (Canton)-01	Mouth on Cherry Brook, just DS from Route 179 crossing, US to outlet of Tiltens Pond, just US of Route 179 crossing, Canton.	0.38	FULL	U	FULL
<p>Shaded cells indicate impaired segment addressed in this TMDL</p> <p>FULL = Designated Use Fully Supported</p> <p>NOT = Designated Use Not Supported</p> <p>U = Unassessed</p> <p>INC = Inconclusive Assessment</p>						

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



Bacteria Impairments In Cherry Brook Sub-Regional Basin

Map Data: DEEP Map Created: December 2011

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 nutrients and bacteria 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 Cherry Brook watershed consists of 72% forest, 13% urban, 8% agriculture, and 7% water land uses. While the majority of the watershed is forested, Cherry Brook flows through a large urban-agriculture corridor, particularly along Route 179 (Cherry Brook Road). Urban areas are concentrated around the main roads. The headwaters begin in a dense forested area just upstream of the Route 219 crossing. Cherry Brook crosses Route 219, passes a large construction site with exposed soil (as shown on recent aerial photos), and flows through dense forest in Granby and northern Canton, CT. As shown in Figure 4, a large agricultural area adjacent to Cherry Brook in northern Canton is possibly a commercial development area with mowed fields and a horse pasture. Cherry Brook moves into large lot residential plots in mixed forest before hitting a wetland complex near the agricultural area in southern Canton along Cherry Brook (Segment 2). Cherry Brook (Segment 2) continues downstream through hayfields, a livestock farm, and around the large parking lot of Cherry Brook Primary School. Cherry Brook (Segment 1) flows through large lot residential areas surrounded by hayfields before the urban intersection of Route 179 and Albany-Turnpike (Route 44) at the confluence with the Farmington River in Canton.

Figure 3: Land uses within the Cherry Brook watershed

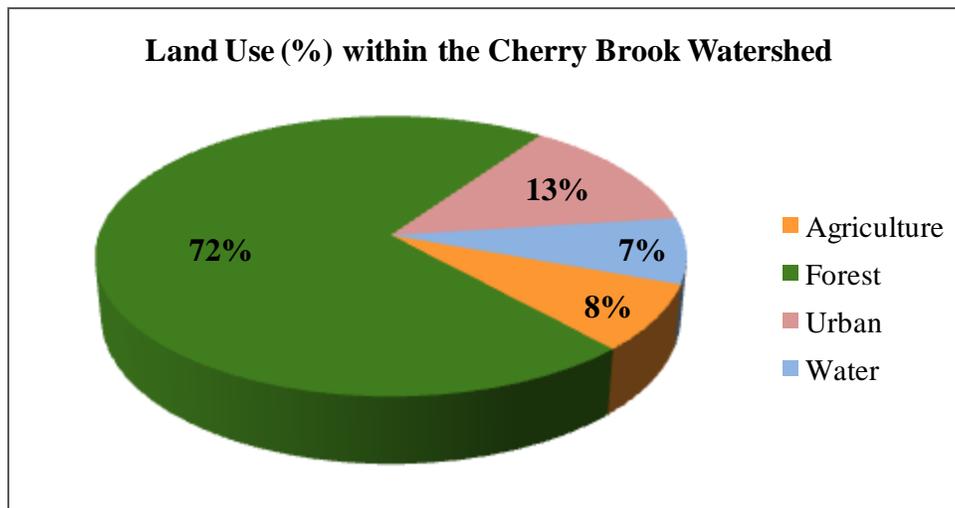
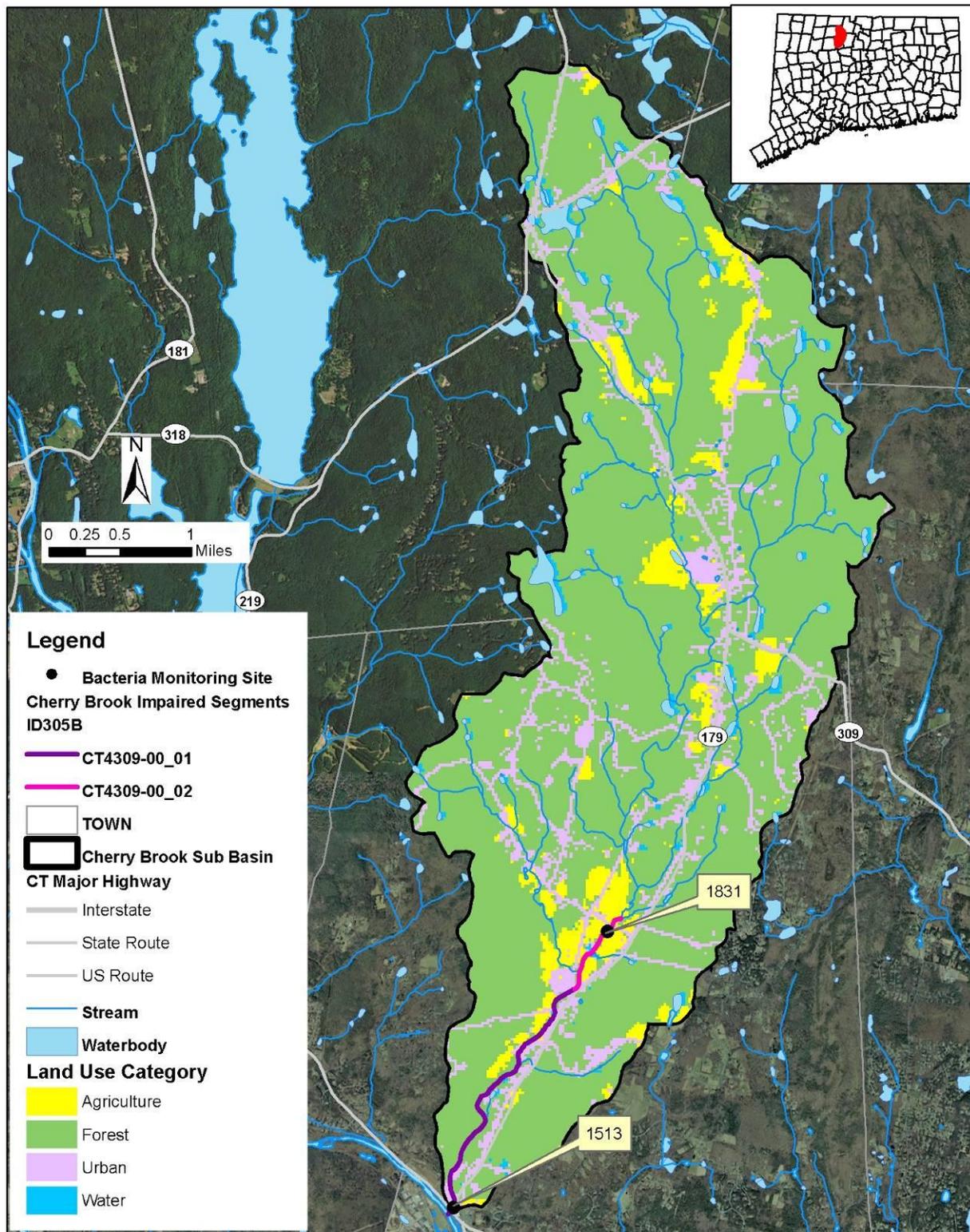


Figure 4: GIS map featuring land use for the Cherry Brook watershed at the sub-regional level



Cherry Brook Sub-Regional Basin Land Use Map

MAP Data: DEEP
Map Created Sept. 2011

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 impaired segments in the Cherry Brook watershed

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT4309-00_01	Cherry Brook	1513	Route 44	Canton	41.836503	-72.929494
CT4309-00_02	Cherry Brook	1831	Meadow Road	Canton	41.864700	-72.908500

The two impaired segments of Cherry Brook (Segments 1 and 2) are Class A freshwater rivers (Figure 5). Their applicable designated uses are potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. Water quality analyses were conducted using data from one sampling location on Cherry Brook (Segment 1) (Station 1513) from 2008-2009, and from one sampling location on Cherry Brook (Segment 2) (Station 1831) from 2006-2009.

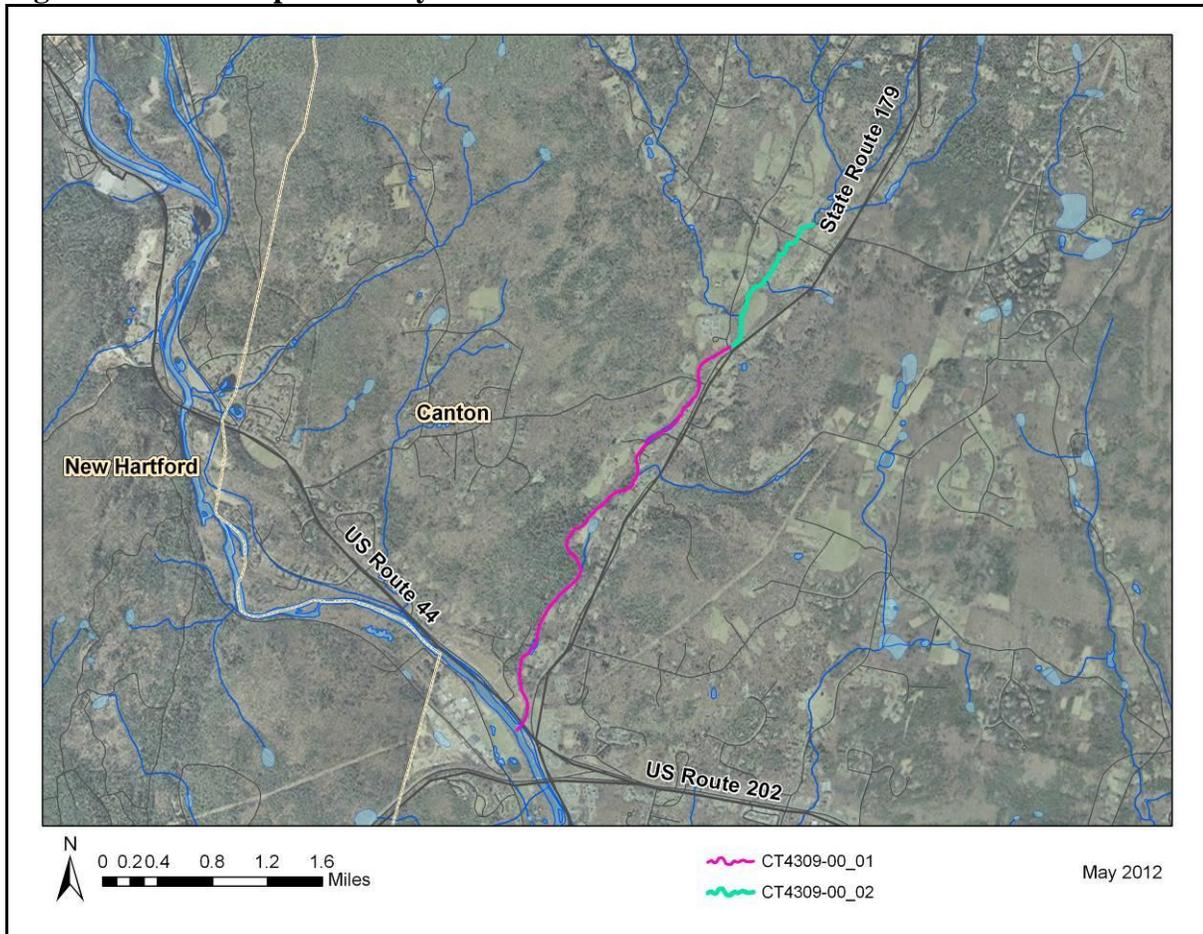
For Cherry Brook (Segment 1), the water quality criteria for *E. coli*, along with bacteria sampling results for Station 1513 from 2008-2009 are presented in Table 5. The annual geometric mean was calculated for Station 1513 and exceeded the WQS for *E. coli* in both sampling years. Single sample values at this station also exceeded the WQS for *E. coli* multiple times in 2008 and once in 2009.

For Cherry Brook (Segment 2), the water quality criteria for *E. coli*, along with bacteria sampling results for Station 1831 from 2006-2009 are presented in Table 6. The annual geometric mean was calculated for Station 1831 and exceeded the WQS for *E. coli* in all sampling years. Single sample values at this station also exceeded the WQS for *E. coli* multiple times in all sampling years.

To aid in identifying possible bacteria sources, the geometric mean was also calculated for each station for wet-weather and dry-weather sampling days, where appropriate (Tables 5-7). For Cherry Brook (Segments 1), only wet geometric mean values at Stations 1513 exceeded the WQS for *E. coli*. For Cherry Brook (Segment 2), both wet and dry geometric mean values at Station 1831 exceeded the WQS for *E. coli*.

Due to the elevated bacteria measurements presented in Tables 5-7, these segments of Cherry Brook did not meet CT's bacteria WQS, were identified as impaired, and were 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 water bodies to comply with state WQS.

Figure 5: Aerial map of Cherry Brook



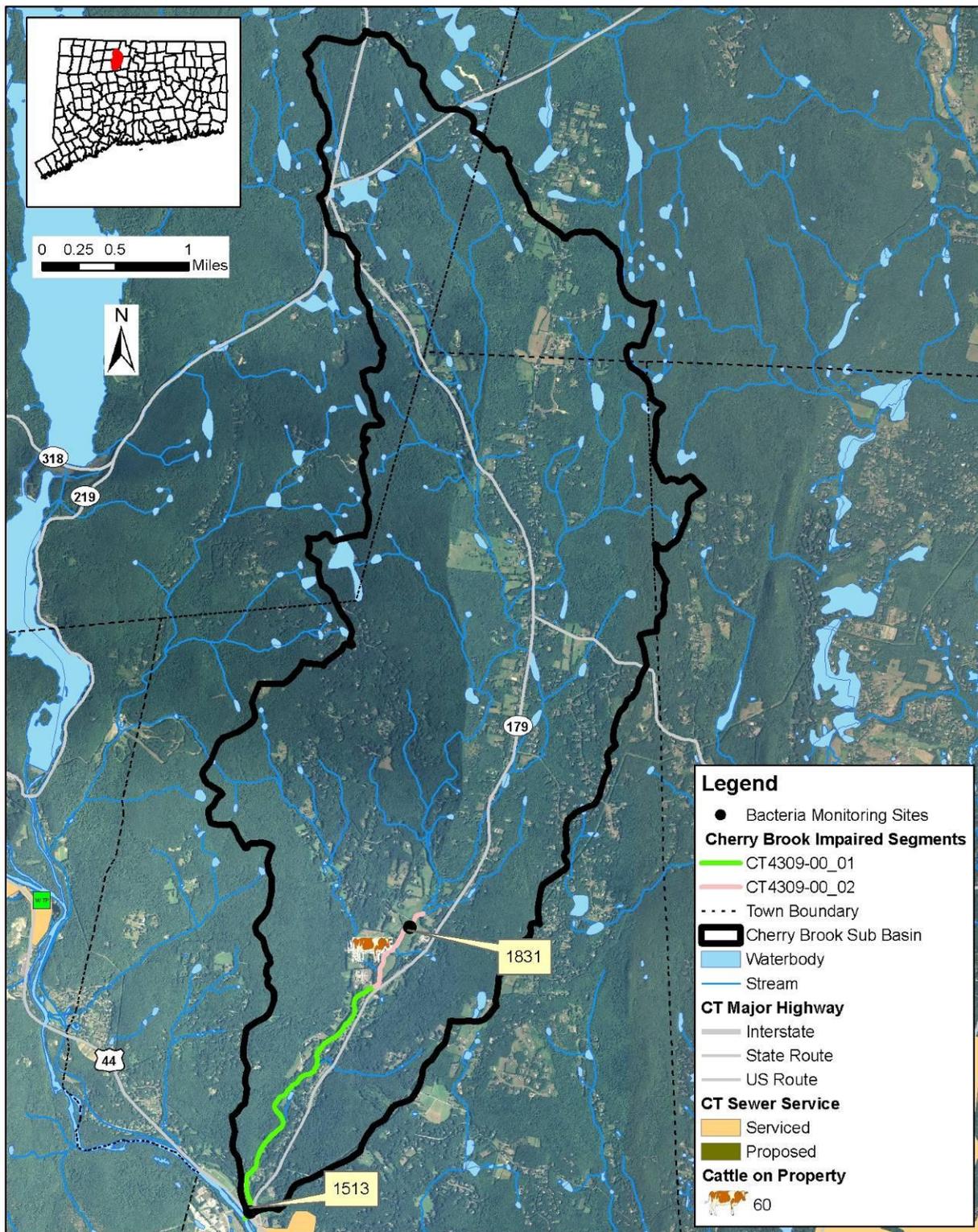
POTENTIAL BACTERIA SOURCES

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 Cherry Brook watershed based on land use (Figures 3 and 4) and a collection of local information for the impaired waterbody is presented in Table 3 below and shown in 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 segment. Further monitoring and investigation will confirm listed sources and discover additional sources. Some segments in this watershed are currently listed as unassessed by CT DEEP procedures. This does not suggest that there are no potential issues on this segment, but indicates a lack of current data to evaluate the segment as part of the assessment process. For some segments, 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 in the Cherry Brook watershed

Impaired Segment	Permit Source	Illicit Discharge	CSO/SSO Issue	Failing Septic System	Agricultural Activity	Stormwater Runoff	Nuisance Wildlife/Pets	Other
Cherry Brook CT4309-00_01				x	x	x	x	
Cherry Brook CT4309-00_02				x	x	x	x	

Figure 6: Potential sources in the Cherry Brook watershed at the sub-regional level



Potential Bacteria Sources In The Cherry Brook Sub Regional Basin

Map Data: CT DEEP Map Created: August 2011

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 it is because no examples of that specific source were discovered to be present during the analysis of the basin. The following is the list of potential sources that were evaluated during analysis of the impaired basin: 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. Future investigation and monitoring may reveal the presence of 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.

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	0
GSI	Stormwater Associated with Industrial Activity	0
GSM	Part B Municipal Stormwater MS4	1
GSN	Stormwater Registration – Construction	0
LF	Groundwater Permit (Landfill)	0
UI	Underground Injection	0

Permitted Sources

The only permitted discharges into the impaired segments of Cherry Brook are registered under the Town of Canton's MS4 permit. The Town of Canton has not submitted any monitoring data under the MS4 program at locations that discharge into Cherry Brook.

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.

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.

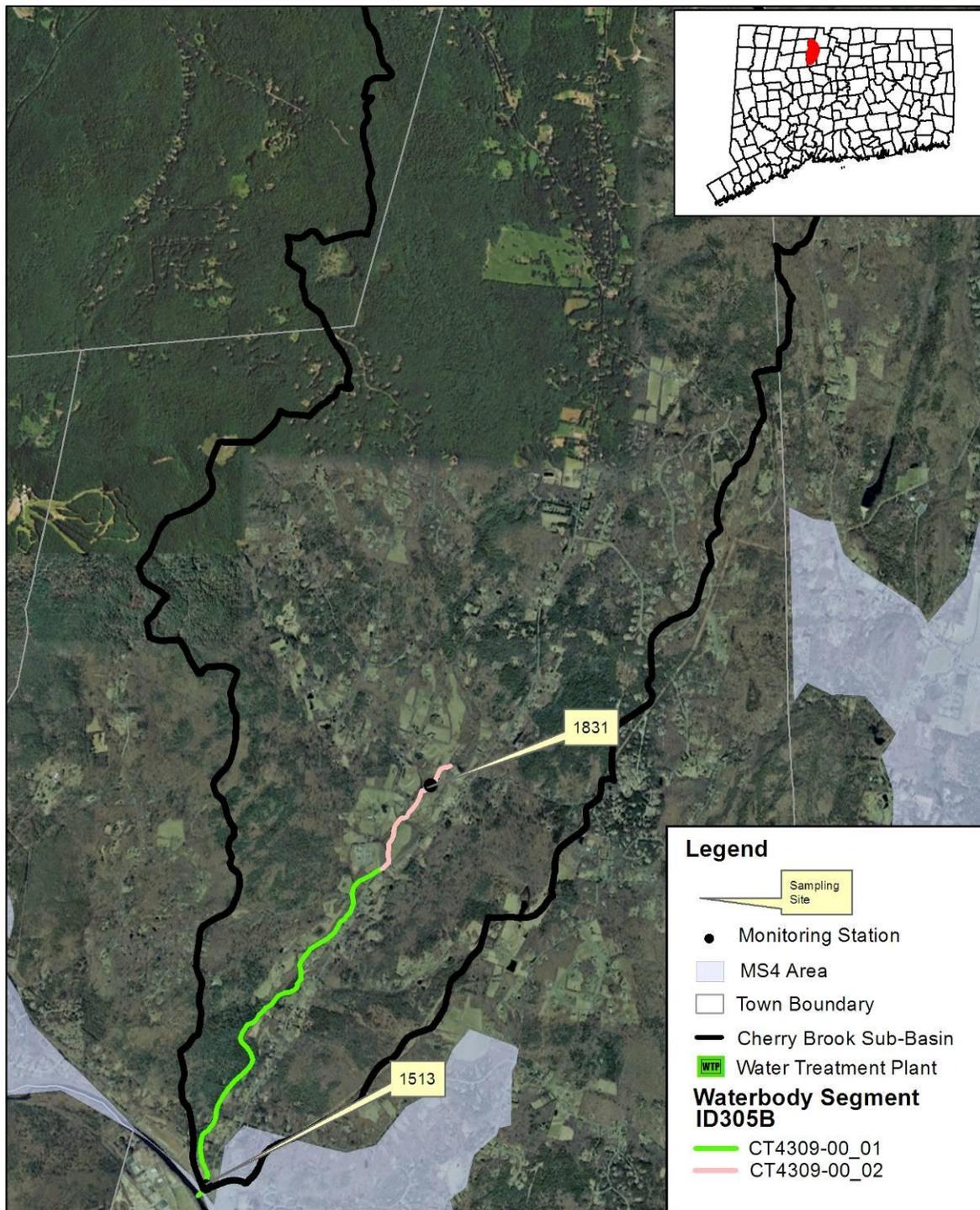
Information regarding stormwater management and the MS4 permit can be obtained on CTDEEP's website

(http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654).

Publicly Owned Treatment Works

As shown in Figure 7, there are no publicly owned treatment works (POTW), or wastewater treatment plants, in the Cherry Brook watershed, and therefore POTWs are not a potential source of loading to the impaired segments of the Cherry Brook watershed.

Figure 7: MS4 areas of the Cherry Brook watershed



Cherry Brook Sub-Regional Basin Designated MS4 Map

MAP Data: DEEP
Map Created Sept. 2011

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 Cherry Brook watershed are described below.

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. Agricultural land use makes up 8% of the Cherry Brook watershed, and the impaired segments of the Cherry Brook watershed flow through an agriculture corridor consisting of hayfields and cattle farms, particularly along Cherry Brook (Segment 2). As identified in Figure 6, there is a cattle farm with approximately 60 head of cattle along Cherry Brook (Segment 2).

Insufficient Septic Systems and Illicit Discharges

As shown in Figure 6, the entire Cherry Brook watershed relies on onsite wastewater treatment systems, such as septic systems. Insufficient or failing septic systems can be significant sources of bacteria by allowing raw waste to reach surface waters. Cherry Brook (Segment 2) exceeded the dry-weather geometric mean limit for *E. coli*, which may indicate nearby failing septic systems. 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 Town of Canton is part of the Farmington Valley Health District (<http://www.fvhd.org/>).

There are no areas within the Cherry Brook watershed that are serviced by the municipal sewer system (Figure 6). Therefore, sewer system leaks and other illicit discharges or connections are not a potential source of bacteria to nearby surface waters in the Cherry Brook watershed.

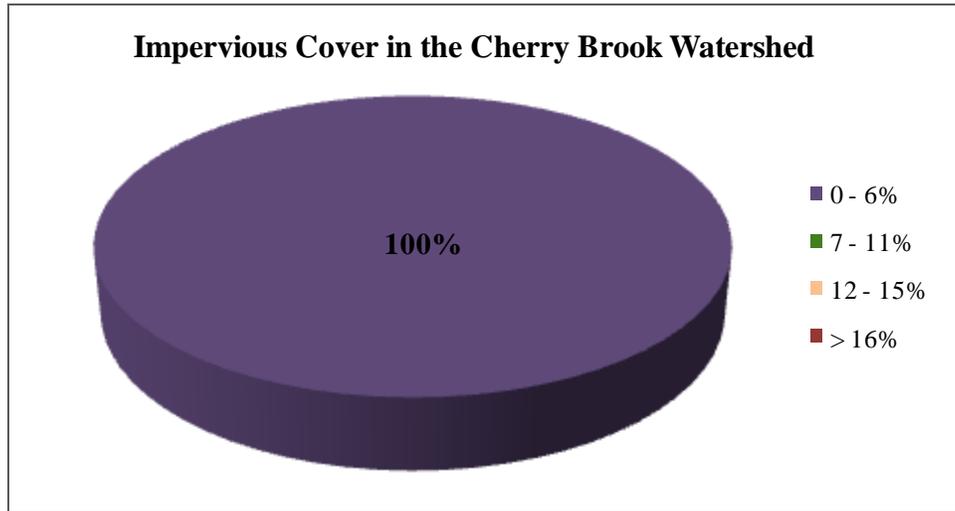
Stormwater Runoff from Developed Areas

While the majority of the Cherry Brook watershed is undeveloped, approximately 13% of the land use in the watershed is urban, and the impaired segments of Cherry Brook run along Route 179, which is characterized by significant urban and agricultural development (Figures 4 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 into 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 Figures 8 and 9, 100% of the Cherry Brook watershed contains less than 6% impervious cover, which is a reflection of the 72% forested land use depicted in Figure 4. As indicated above, Cherry Brook flows through an urban-agriculture corridor with development along Route 179; therefore, stormwater runoff pollution from adjacent urban development may be a higher contributor of bacterial

contamination than the summarized statistics for land use and impervious cover reveal. Water quality data taken at all stations along Cherry Brook exceeded wet-weather geometric mean limits, which suggests that stormwater runoff may be a source of bacteria to Cherry Brook (Tables 5-7). Stormwater pollution sources include fertilizer runoff, leaky septic systems, horse farms, golf courses, and impervious surfaces.

Figure 8: Range of impervious cover (%) in the Cherry Brook watershed

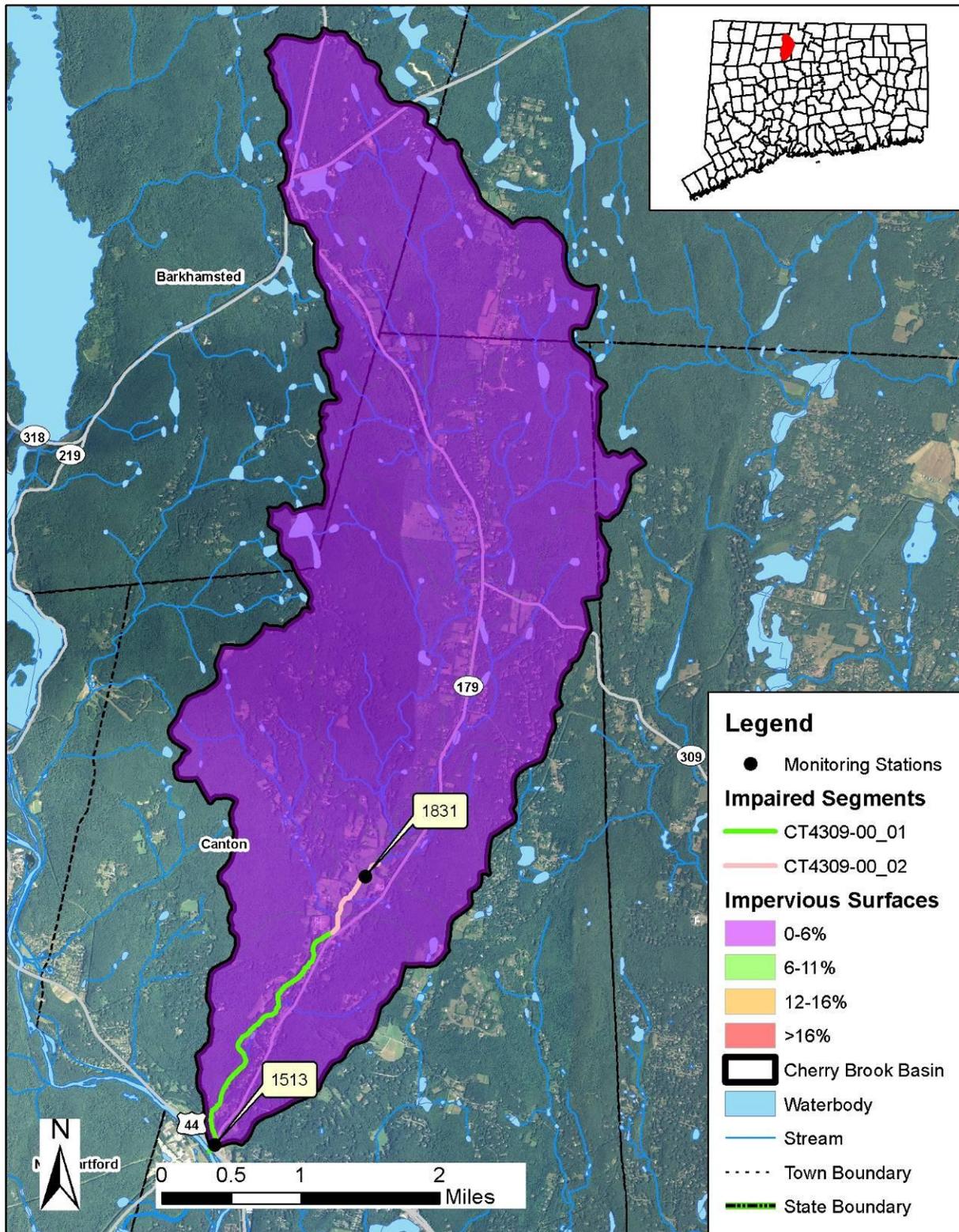


Wildlife and Domestic Animal Waste

Wildlife and domestic animals within the Cherry Brook watershed represent another potential source of bacteria. Wildlife, including waterfowl, may be a significant bacteria source to surface waters. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. These physical land alterations can exacerbate the impact of these natural sources on water quality (USEPA, 2001). The majority of the Cherry Brook watershed is undeveloped and wildlife waste may be a potential source of bacteria. Cherry Brook also runs through large portions of large-lot residential development adjacent to the impaired segments, so pet waste may also be a direct potential source of bacteria.

Northern headwaters of Cherry Brook flow adjacent to several open agricultural fields and through a horse farm estate with ponds and direct access to an exposed portion of Cherry Brook. 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.

Figure 9: Impervious cover (%) for the Cherry Brook sub-regional watershed



Impervious Surfaces In Cherry Brook Sub-Regional Basin

Map Data: DEEP Map Created: December 2011

Additional Sources

There may be other sources not listed here or identified in Figure 6 that contribute to the observed water quality impairment in Cherry Brook. 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

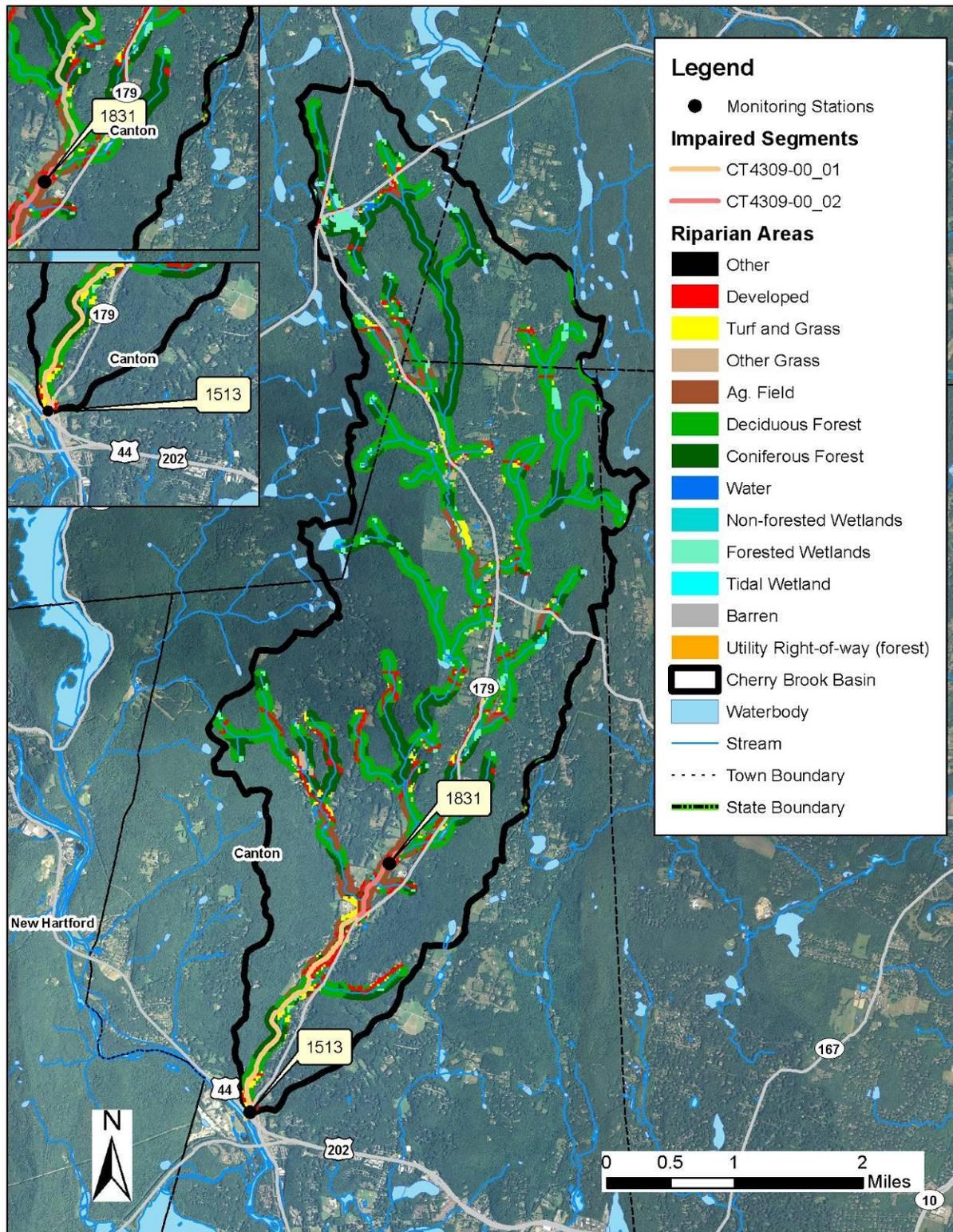
Riparian Buffer Zones

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 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.

The riparian zone for Cherry Brook (Segment 1) is characterized by mixed forested land use with greater urban development and turf/grass near its confluence with the Farmington River (Figure 10). Riparian areas along Cherry Brook (Segment 2) are characterized almost solely by agricultural land use with small tracts of residential development. Riparian areas along the northern section of the Cherry Brook watershed are dominated by mixed forested land use with intermittent portions of agricultural, turf/grass, and developed land uses. As previously noted, if not properly treated, runoff from developed areas may contain pollutants such as bacteria and nutrients.

Figure 10: Riparian buffer zone information for the Cherry Brook watershed



Riparian Areas In Cherry Brook Sub-Regional Basin

UConn CLEAR: <http://clear.uconn.edu/>

Map Data: DEEP/UConn CLEAR Map Created: December, 2011

CURRENT MANAGEMENT ACTIVITIES

As indicated previously, Canton is 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 new development and redevelopment.
6. Pollution prevention/good housekeeping for municipal operations.

Each town is also required to submit an annual update outlining the steps they are taking to meet the six minimum measures. The most recent updates that address bacterial contamination in the watershed are summarized in Table 5.

Table 5: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Canton, CT (Permit # GSM000084)

Minimum Measure	Canton Annual Report (2007)
Public Outreach and Education	1) Developing educational materials for public education with the Canton Land Trust, the Metropolitan District Commission, the Farmington River Watershed Association, the Connecticut Conference of Municipalities, the River's Alliance, the Roaring Brook Nature Center, and the Capitol Region Council of Governments. 2) Sponsored a BMP workshop for homeowners in 2007. Rain barrels and other stormwater runoff reduction devices were available.
Public Involvement and Participation	1) Installed 500 storm drain inlet markers provided by CT DEEP. 2) Currently re-writing stormwater regulations to incorporate the General Permit requirements, 2002 CT E&S Guidelines, and 2004 CT Stormwater Quality Manual.
Illicit Discharge Detection and Elimination	1) Completed mapping of all pipe outlets greater than 12 inches in diameter. 2) Sewer and Highway Departments will visually screen storm drainage inlets and outlets for illicit discharges.

Table 5: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Greenwich, CT (Permit # GSM000084) (continued)

Minimum Measure	Canton Annual Report (2007)
Construction Site Stormwater Runoff Control	1) Current regulations regarding disturbances of land one half acre or larger are being updated.
Post Construction Stormwater Management	1) Will incorporate 2004 CT Stormwater Quality Manual into existing regulations.
Pollution Prevention and Good Housekeeping	1) Conducted annual street sweeping and catch basin cleaning. 2) Continues to evaluate and prioritize system upgrades and repairs. 3) Participated in Household Hazardous Waste Day and Electronic Waste Disposal Day.

RECOMMENDED NEXT STEPS

Future mitigative activities are necessary to ensure the long-term protection of Cherry Brook and have been prioritized below.

1). Ensure there are sufficient buffers on agricultural lands along Cherry Brook.

Agricultural land use represents 8% of the Cherry Brook watershed, and is particularly concentrated along Route 179 and the impaired segments of Cherry Brook. The noted horse pasture in the northern section of the Cherry Brook basin and the cattle farm along Cherry Brook (Segment 2) identified in Figure 6 may be a concern for water quality. 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 farming activities within the watershed. These plans should focus on ensuring that there are sufficient stream buffers, that fencing exists to restrict access to livestock and horses to streams and wetlands, and that animal waste handling, disposal, and other appropriate practices are in place.

2). Develop a system to monitor septic systems.

The entire Cherry Brook watershed relies on septic systems, and dry-weather geometric mean exceedance at Station 1831 along Cherry Brook (Segment 2) may indicate nearby failing septic systems. If not already in place, Canton, Granby, and Barkhamsted should establish programs to ensure that existing septic systems are properly operated and maintained, create an inventory of existing septic systems, and consider a requiring regular inspection of systems. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard systems within a reasonable timeframe can be adopted. The municipalities should also develop a program to assist citizens with the replacement and repair of older and failing systems.

3). Evaluate the municipalities' education and outreach programs regarding animal waste.

As most of the Cherry Brook watershed is forested with developed residential and agricultural areas along Route 179 adjacent to Cherry Brook, any education and outreach program should highlight the

importance of managing waste from horses, dogs, and other pets, and not feeding waterfowl and wildlife. The municipalities and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of Cherry Brook 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 Cherry Brook 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.

4). Identify areas along the developed portions of Cherry Brook to implement Best Management Practices (BMPs) to control stormwater runoff.

As noted previously, 13% of the Cherry Brook watershed is considered urban, particularly near the impaired segments of Cherry Brook, and all stations along Cherry Brook exceeded wet-weather geometric mean limits. As such, stormwater runoff is likely contributing bacteria to the waterbodies. It may be beneficial to investigate the impact that the large parking lot of Cherry Brook Primary School has on the adjacent Cherry Brook (Segment 2). To identify other areas that are contributing bacteria to the impaired segments, the municipalities should conduct wet-weather sampling at any stormwater outfalls that discharge directly to the impaired segments in the Cherry Brook watershed. To treat stormwater runoff, the municipalities should identify areas along the impaired segment 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.

5). Monitoring of permitted sources.

The Town of Canton could choose to monitor some MS4 discharges into the Cherry Brook Basin to locate potential sources of bacterial contamination within the watershed and to track progress towards meeting TMDL goals.

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. Table 5 details the appropriate waste load allocations established by this TMDL for use as waste load allocations for use as water quality targets for permittees as permits are renewed and updated, within the Cherry Brook 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 5. Bacteria (e.coli) TMDLs, WLAs, and LAs for recreational uses

Class	Bacteria Source	Instantaneous <i>E. coli</i> (#/100mL)						Geometric Mean <i>E. coli</i> (#/100mL)	
		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) These values can be “as naturally occurs” if the only pollutant source is 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.

Bacteria Data and Percent Reductions to Meet the TMDL

Table 6: Cherry Brook Bacteria Data

Waterbody ID: CT4309-00_01

Characteristics: Freshwater, Class A, Potential Drinking Water Supplies, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, Navigation, 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: **38%**

Single Sample: **89%**

Data: 2008-2009 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle

Single sample *E. coli* (colonies/100 mL) data from Station 1513 on Cherry Brook (Segment 1) with annual geometric mean calculated

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1513	Route 44 crossing	6/2/2008	63	dry	192
1513	Route 44 crossing	6/16/2008	109	wet	
1513	Route 44 crossing	6/30/2008	3654* (89%)	wet	
1513	Route 44 crossing	7/14/2008	465	wet	
1513	Route 44 crossing	7/28/2008	1081	wet	
1513	Route 44 crossing	8/11/2008	521	wet	
1513	Route 44 crossing	8/25/2008	109	dry	
1513	Route 44 crossing	9/16/2008	85	dry	
1513	Route 44 crossing	9/23/2008	30	dry	
1513	Route 44 crossing	9/30/2008	86	dry	
1513	Route 44 crossing	10/7/2008	85	dry	

Shaded cells indicate an exceedance of water quality criteria

† Average of two duplicate samples

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

Single sample *E. coli* (colonies/100 mL) data from Station 1513 on Cherry Brook (Segment 1) with annual geometric mean calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1513	Route 44 crossing	6/8/2009	455	dry	202* (38%)
1513	Route 44 crossing	6/22/2009	201	wet	
1513	Route 44 crossing	7/6/2009	75	dry	
1513	Route 44 crossing	7/20/2009	175	dry	
1513	Route 44 crossing	8/3/2009	359	wet	
1513	Route 44 crossing	8/31/2009	158	dry	

Shaded cells indicate an exceedance of water quality criteria

† Average of two duplicate samples

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

Wet and dry weather geometric mean values for Station 1513 on Cherry Brook (Segment 1)

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
1513	Route 44 crossing	2008-2009	7	10	196	497	102

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gage at the Hartford Bradley International Airport

BACTERIA DATA AND PERCENT REDUCTIONS TO MEET THE TMDL

Table 7: Cherry Brook Bacteria Data

Waterbody ID: CT4309-00_02

Characteristics: Freshwater, Class A, Potential Drinking Water Supplies, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, Navigation, 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: **79%**

Single Sample: **98%**

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

Single sample *E. coli* (colonies/100 mL) data from Station 1831 on Cherry Brook (Segment 2) with annual geometric mean calculated

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1831	Upstream of Meadow Road crossing	6/14/2006	52	wet	501
1831	Upstream of Meadow Road crossing	6/28/2006	7700	wet	
1831	Upstream of Meadow Road crossing	7/3/2006	52	dry	
1831	Upstream of Meadow Road crossing	7/25/2006	1750 [†]	dry	
1831	Upstream of Meadow Road crossing	8/3/2006	4400	dry	
1831	Upstream of Meadow Road crossing	8/10/2006	320	dry	
1831	Upstream of Meadow Road crossing	8/16/2006	1200	wet	
1831	Upstream of Meadow Road crossing	8/22/2006	290	dry	
1831	Upstream of Meadow Road crossing	8/31/2006	106 [†]	dry	
1831	Upstream of Meadow Road crossing	9/6/2006	85	dry	
1831	Upstream of Meadow Road crossing	9/12/2006	3100	dry	

Shaded cells indicate an exceedance of water quality criteria

[†]Average of two duplicate samples

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

Single sample *E. coli* (colonies/100 mL) data from Station 1831 on Cherry Brook (Segment 2) with annual geometric mean calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1831	Upstream of Meadow Road crossing	6/6/2007	130	wet	315
1831	Upstream of Meadow Road crossing	6/13/2007	780	dry	
1831	Upstream of Meadow Road crossing	6/21/2007	41	dry	
1831	Upstream of Meadow Road crossing	6/27/2007	350	dry	
1831	Upstream of Meadow Road crossing	7/11/2007	230	wet	
1831	Upstream of Meadow Road crossing	7/23/2007	260	wet	
1831	Upstream of Meadow Road crossing	8/2/2007	330	dry	
1831	Upstream of Meadow Road crossing	8/16/2007	17000	dry	
1831	Upstream of Meadow Road crossing	8/23/2007	130	dry	
1831	Upstream of Meadow Road crossing	8/28/2007	150	dry	
1831	Upstream of Meadow Road crossing	5/22/2008	41 [†]	dry	
1831	Upstream of Meadow Road crossing	6/4/2008	960	wet	
1831	Upstream of Meadow Road crossing	6/11/2008	143 [†]	dry	
1831	Upstream of Meadow Road crossing	6/16/2008	750	wet	
1831	Upstream of Meadow Road crossing	6/23/2008	2150 [†]	wet	
1831	Upstream of Meadow Road crossing	7/7/2008	370 [†]	dry	
1831	Upstream of Meadow Road crossing	7/31/2008	1900	wet	
1831	Upstream of Meadow Road crossing	8/6/2008	24000* (98%)	wet	
1831	Upstream of Meadow Road crossing	8/14/2008	290	dry	
1831	Upstream of Meadow Road crossing	8/20/2008	170	dry	
1831	Upstream of Meadow Road crossing	6/3/2009	47 [†]	dry	237
1831	Upstream of Meadow Road crossing	6/10/2009	130	wet	
1831	Upstream of Meadow Road crossing	6/25/2009	170 [†]	dry	
1831	Upstream of Meadow Road crossing	7/15/2009	170	dry	
1831	Upstream of Meadow Road crossing	7/22/2009	1100	wet	
1831	Upstream of Meadow Road crossing	7/29/2009	230	wet	
1831	Upstream of Meadow Road crossing	8/20/2009	560	dry	
1831	Upstream of Meadow Road crossing	9/2/2009	400	dry	
Shaded cells indicate an exceedance of water quality criteria					
[†]Average of two duplicate samples					
*Indicates single sample and geometric mean values used to calculate the percent reduction					

Wet and dry weather geometric mean values for Station 1831 on Cherry Brook (Segment 2)

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
1831	Upstream of Meadow Road crossing	2006-2009	15	32	402	712	292
<p>Shaded cells indicate an exceedance of water quality criteria</p> <p>Weather condition determined from rain gage at the Hartford Bradley International Airport</p>							

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