Mount Hope River

Watershed Summary

Watershed Description and Maps

The Mount Hope River watershed covers an area of approximately 17,967 acres in the northeastern corner of Connecticut (Figure 1). The watershed is located primarily in Ashford, CT with portions extending into northeastern Mansfield, northwestern Chaplin, and southern Union, CT.

The Mount Hope River watershed includes one segment impaired for recreation due to elevated bacteria levels. This segment was assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and included in the CT 2010 303(d) list of impaired waterbodies. The other segment (CT3206-00_01) in the watershed is currently unassessed as of the writing of this document. This does not mean 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).

The Mount Hope River begins at the Morey Pond dam outlet at the Union-Ashford border just downstream of Route 84, flows southerly following Route 89, crosses Route 89 several times in Ashford, crosses Route 44 and the Ashford-Mansfield border into northeastern Mansfield, and ends at the inlet to Mansfield Hollow Reservoir just downstream of Atwoodville Road in Mansfield. The bacteria impaired segment (CT3206-00_02) consists of 9.99 miles of the river in Ashford (Figure 2). This impaired segment begins at the Morey Pond dam outlet at the Union-Ashford border just downstream of Route 84, flows southerly following Route 89 through Ashford, crosses Route 44, and ends at the last Route 89 (Mansfield Road) crossing in Ashford.

Impaired Segment Facts

Impaired Segment: Mount Hope River (CT3206-00_02)

Municipalities: Ashford

Impaired Segment Length (miles): 9.99

Water Quality Classification: Class AA

Designated Use Impairment: Recreation

Sub-regional Basin Name and Code: Mount Hope River, 3206

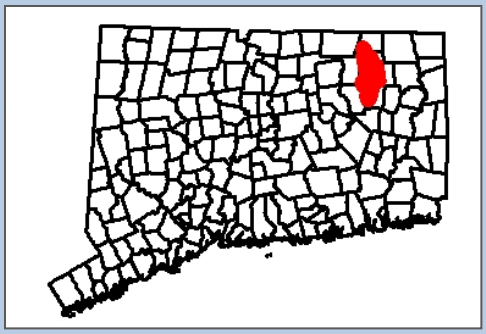
Regional Basin: Natchaug

Major Basin: Thames

Watershed Area (acres): 17,967

MS4 Applicable? No

Figure 1: Watershed location in Connecticut



The impaired segment of Mount Hope River has a water quality classification of AA. Designated uses include existing or proposed drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. As there are no designated beaches in this segment of the Mount Hope River, the specific recreation impairment is for non-designated swimming and other water contact related activities.

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

Waterbody ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation	Fish Consumption
CT3206-00_01	Mount Hope River-01	From mouth at Mansfield Hollow Reservoir inlet, (DS of Atwoodville Road), US to first Route 89 (Mansfield Road) crossing, near southern Ashford border.	5.66	FULL	U	FULL
CT3206-00_02	Mount Hope River-02	From first Route 89 (Mansfield Road) crossing, Ashford, US to headwaters at Morey Pond outlet dam, on Union/Ashford border.	9.99	U	NOT	FULL

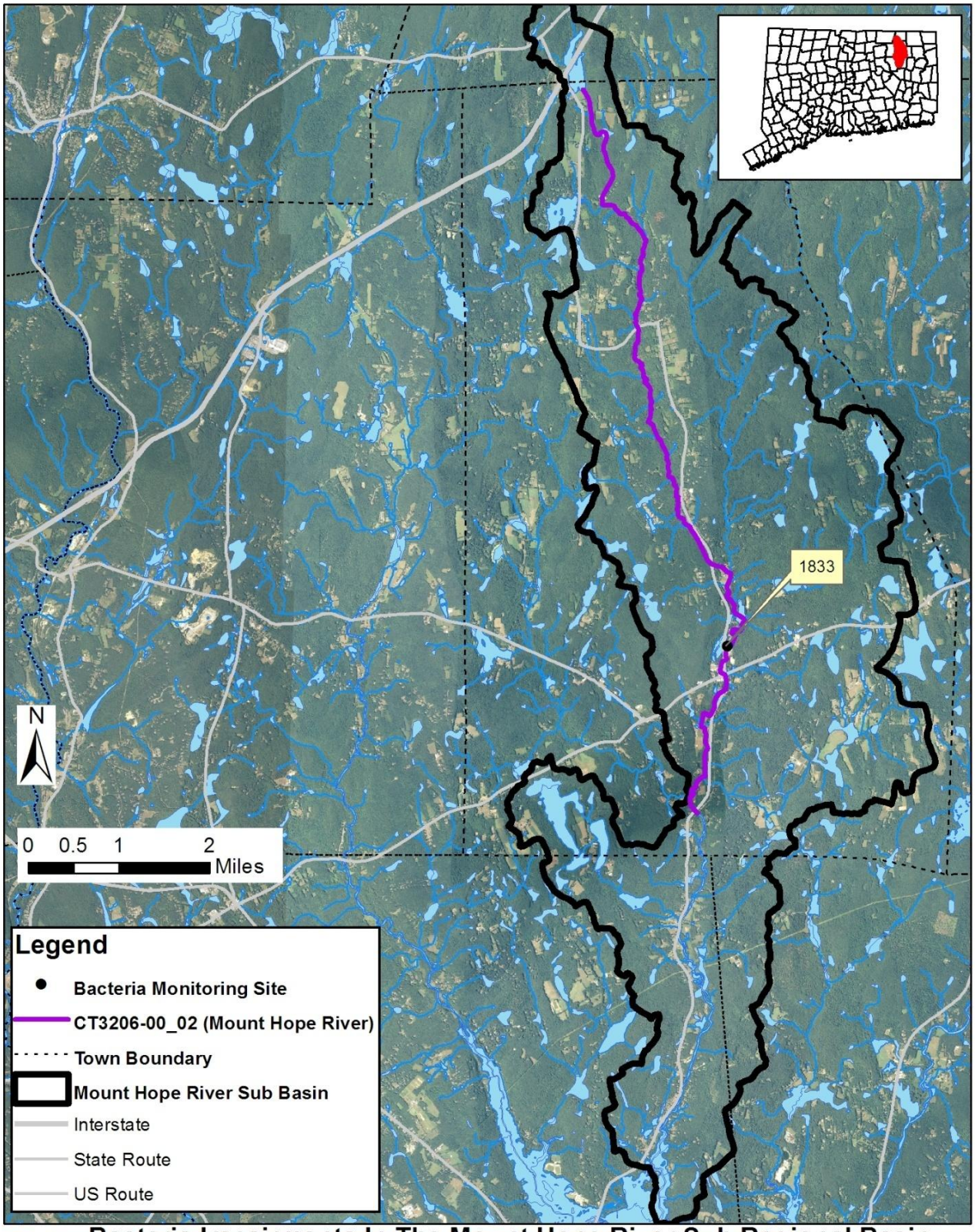
Shaded cells indicate impaired segment addressed in this TMDL

FULL = Designated Use Fully Supported

NOT = Designated Use Not Supported

U = Unassessed

Figure 2: GIS map featuring general information of the Mount Hope 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 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 Mount Hope River watershed consists of 75% forest, 10% urban, 8% agriculture, and 7% water land uses. The headwaters of the Mount Hope River are largely forested with agricultural fields and small hobby farms adjacent to the impaired segment, which continues through fairly large uninterrupted forested tracts interspersed with rural residential development. A horse farm and other agricultural fields are located along Waterfall and Hnath Road near the Mount Hope River. The impaired segment flows through urban development as it nears Route 89, passing Ashford School and a trailer park. Just downstream of James Road near Route 89, the stream crosses through livestock pasture with about 175 meters of unvegetated and exposed stream bank. The Mount Hope River continues downstream past a gravel pit site with exposed soil, Warrenville School, a construction site with exposed soil, Earl W. Smith Senior Center, Ashford Recreation Commission, various commercial businesses, and a community park with recreation fields, basketball courts, a playground, and a volleyball court. Just before the last Route 89 crossing in Ashford, the impaired segment passes three fenced livestock or horse pastures, one with a large agricultural pond immediately adjacent to the stream.

Figure 3: Land use within the Mount Hope River watershed

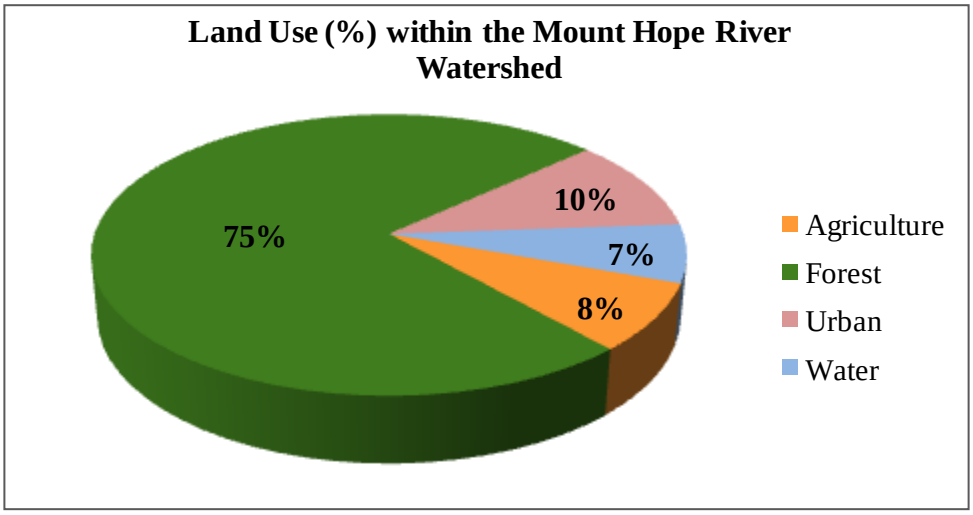
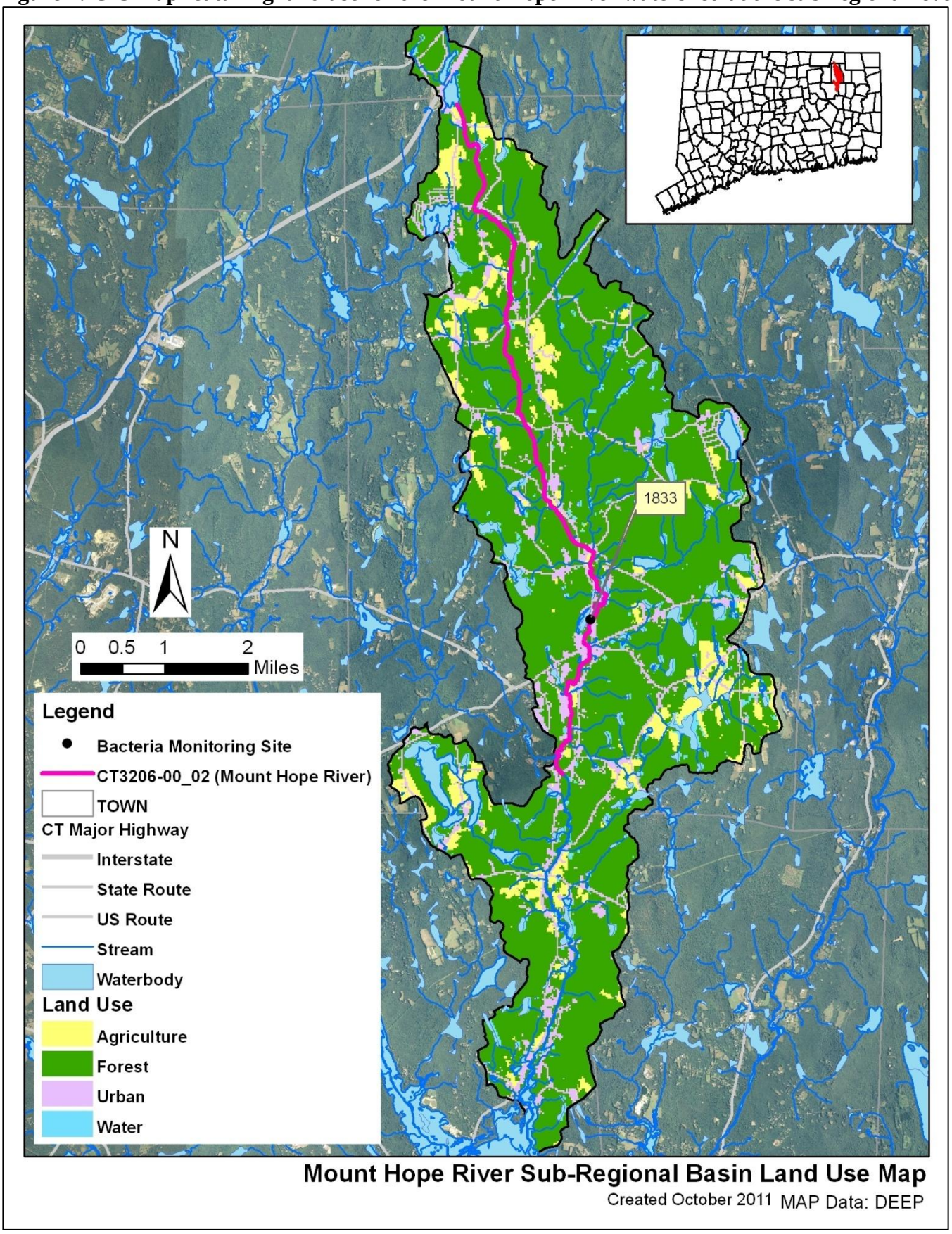


Figure 4: GIS map featuring land use for the Mount Hope River watershed at the sub-regional level



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 Segment in the Mount Hope River watershed

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT3206-00_02	Mount Hope River	1833	North of Route 44/89 intersection	Ashford	41.868468	-72.160773

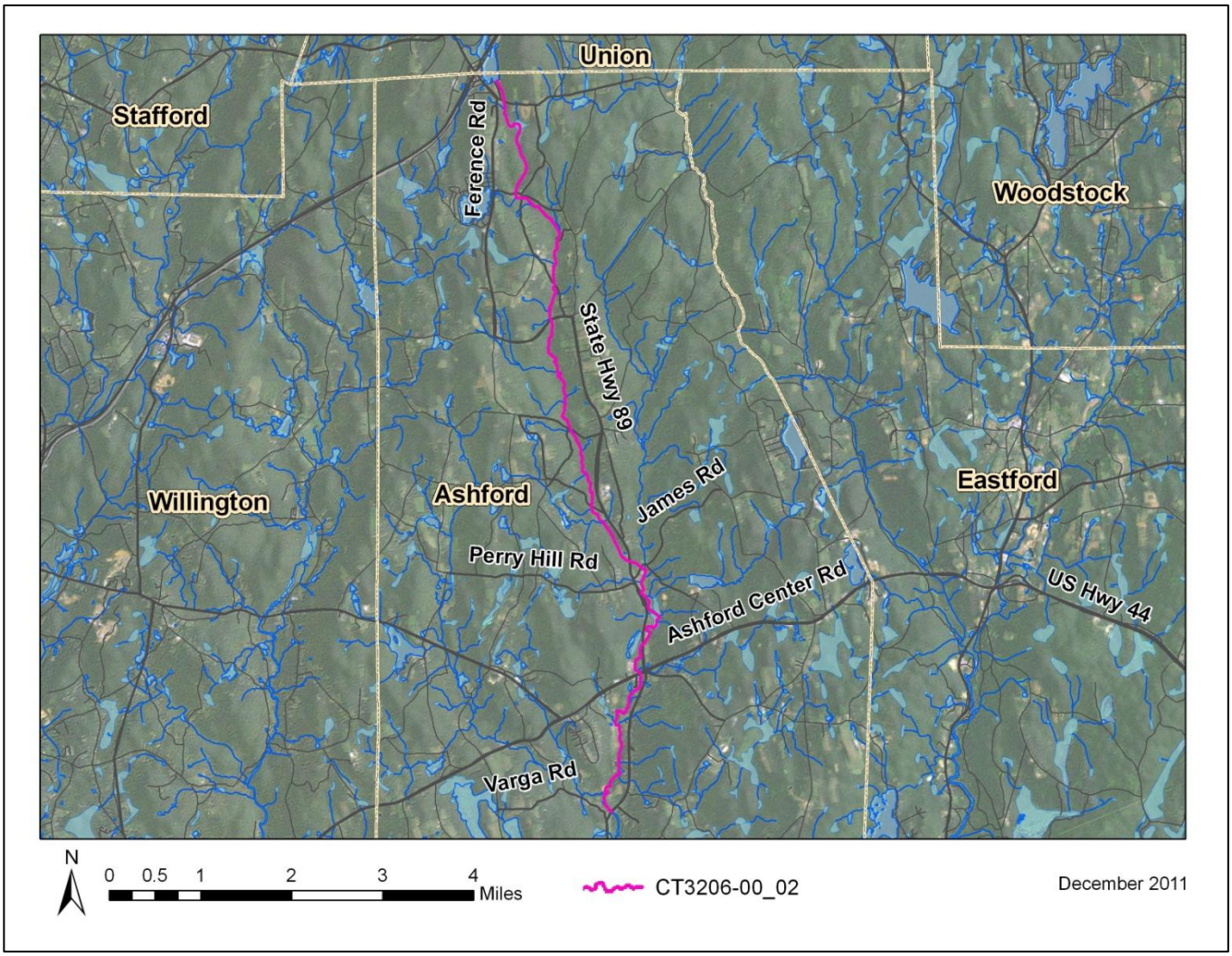
The Mount Hope River (CT3206-00_02) is a Class AA freshwater river (Figure 5). Its applicable designated uses are existing or potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. Water quality analyses were conducted using data from one sampling location from 2006-2009 (Station 1833) (Table 2).

The water quality criteria for *E. coli*, along with bacteria sampling results for Station 1833 from 2006-2009, are presented in Table 8. The annual geometric mean was calculated for Station 1833 and exceeded the WQS for *E. coli* in 2008 and 2009. Single sample values at this station also exceeded the WQS for *E. coli* multiple times each year on at least one sampling date.

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 (Table 8). For Mount Hope River, only wet geometric mean values at Station 1833 exceeded the WQS for *E. coli*.

Due to the elevated bacteria measurements presented in Table 8, this segment of the Mount Hope River did not meet CT's bacteria WQS, was identified as impaired, and was 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 Mount Hope River



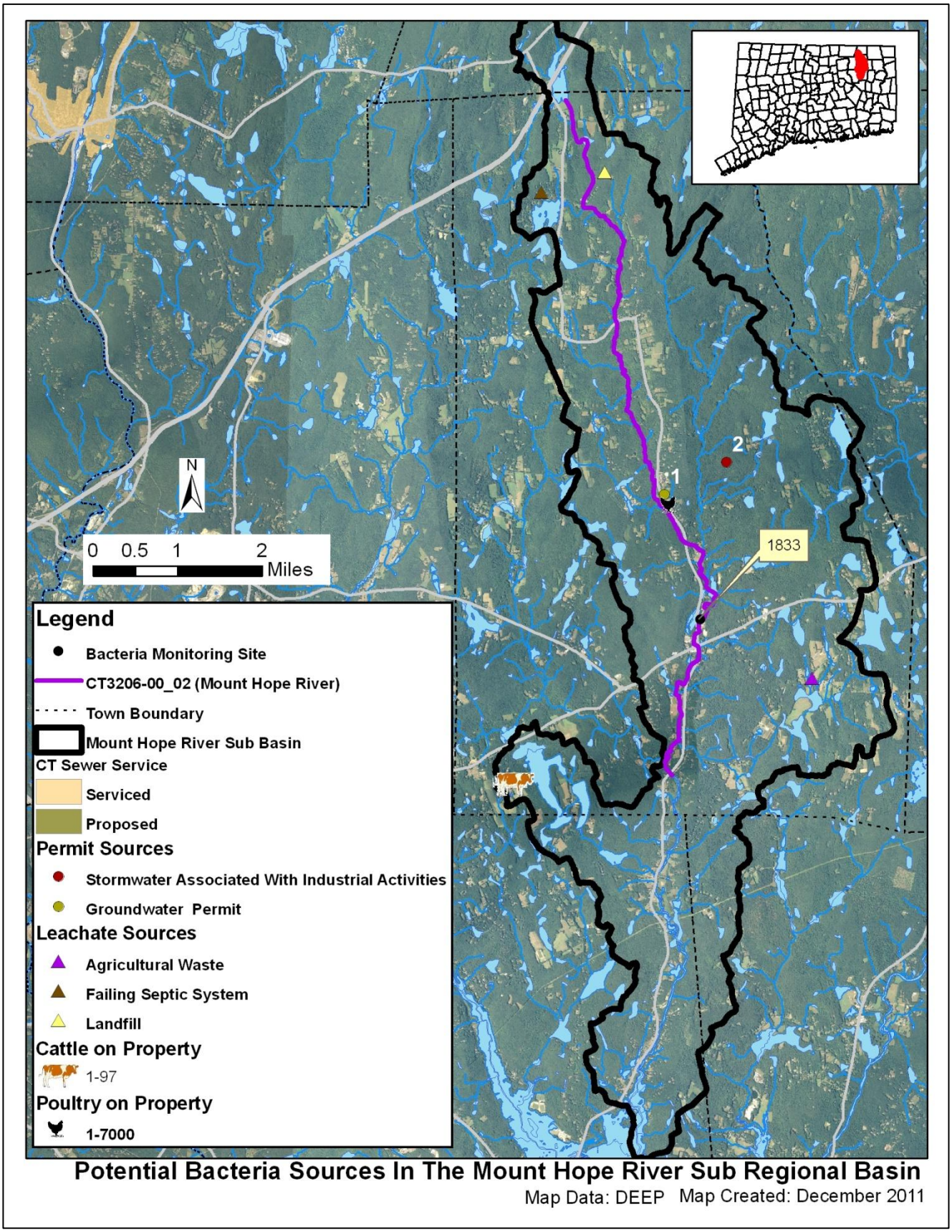
POTENTIAL BACTERIA SOURCES

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 Mount Hope River 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 Mount Hope River watershed

Impaired Segment	Permit Source	Illicit Discharge	CSO/ SSO Issue	Failing Septic System	Agricultural Activity	Stormwater Runoff	Nuisance Wildlife/Pets	Other
Mount Hope River CT3206-00_01	**x**			**x**	**x**	**x**	**x**	**x**

Figure 6: Potential sources in the Mount Hope 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 may 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.

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

Permitted Sources

As shown in Table 5, there are multiple permitted discharges in the Mount Hope River watershed. Bacteria data are currently not available for any of the permitted discharges in the watershed. 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 Mount Hope River watershed

Town	Client	Permit ID	Permit Type	Site Name/Address	Map #
Ashford	State Of Connecticut Department Of Transportation	GSI000001	Stormwater Associated With Industrial Activities	Ashford Salt Storage	2
Ashford	Town Of Ashford	UI0000218	Groundwater Permit	Ashford Elementary School	1

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.

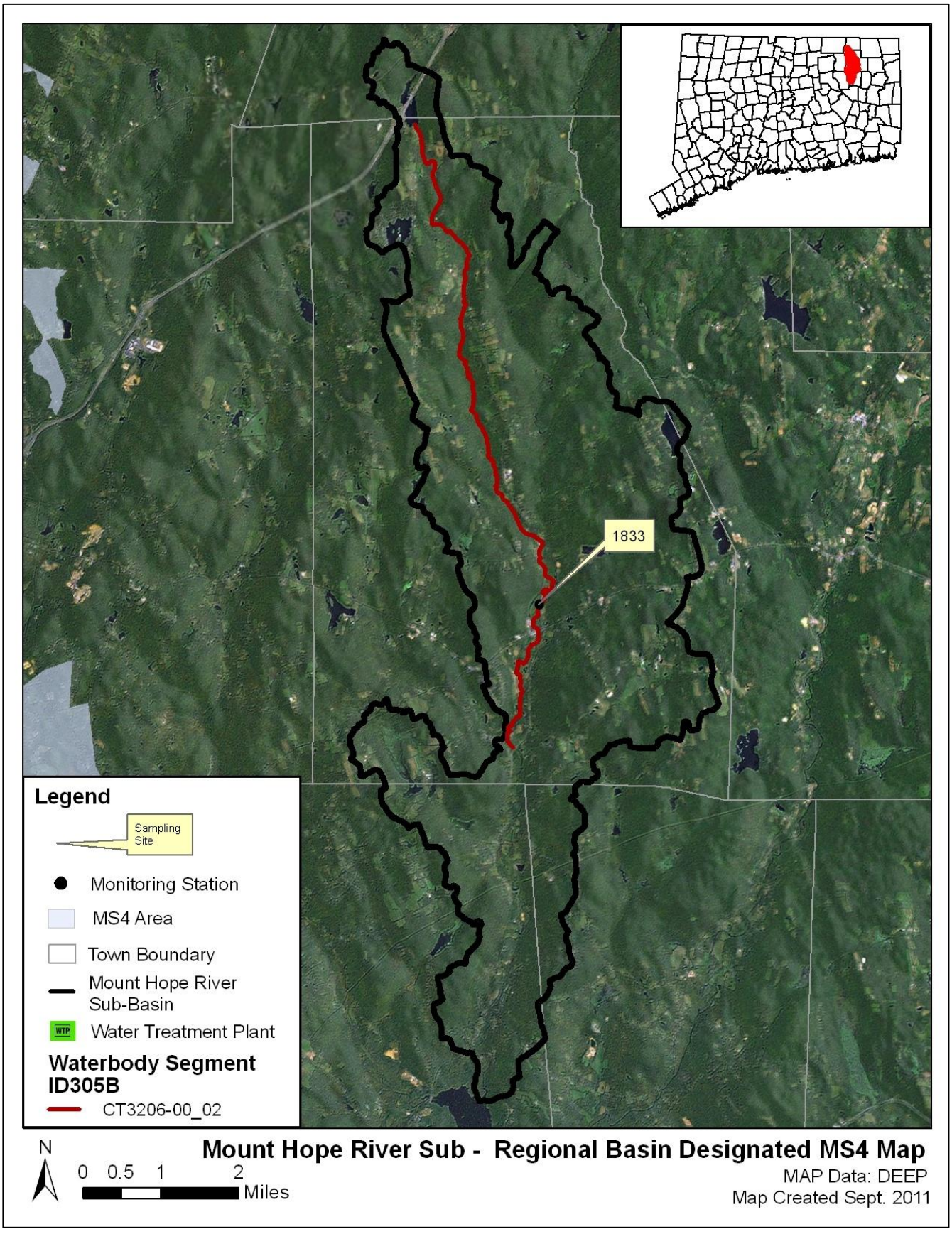
The list of US Census UCs is defined by geographic regions and is named for those regions, not necessarily by following municipal borders. In Connecticut the list of UCs includes blocks in the following Census Bureau regions: Colchester, Danielson, Lake Pocotopaug, Plainfield, Stafford, Storrs, Torrington, 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 impaired segment of the Mount Hope River watershed is located within the Town of Ashford, CT. As there are no urbanized locations as defined by the U.S. Census Bureau within this area, the town is not an MS4 area and is not required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the CT DEEP (Figure 7). 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 Mount Hope River watershed, and therefore, POTWs are not a potential source of loading to the Mount Hope River.

Figure 7: MS4 areas of the Mount Hope River watershed



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 Mount Hope River watershed are described below. The 2007 Mount Hope River Watershed: Watershed-Based Plan of Conservation: Phase IA describes many of these sources in greater detail (http://nwc.ctgaia.net/drupal/NWCReports/MtHope_PlanOfConservation.pdf).

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 Mount Hope River watershed. There are multiple agricultural fields and livestock farms located in the upper reaches of the Mount Hope River watershed. A horse farm was identified along Waterfall Road, along with a livestock or horse pasture downstream of James Road with approximately 175 meters of exposed stream bank. Three additional livestock or horse pastures were identified upstream of the end of the impaired segment, one of which has an agricultural pond adjacent to the Mount Hope River. As shown in Figure 6, a chicken farm is located upstream of the second Route 89 crossing with roughly 1-7,000 chickens, and a cattle farm is located near Knowlton Pond along a tributary that connects to the Mount Hope River downstream of the impaired segment with 1-97 cattle. The 2007 Mount Hope Watershed Based Plan of Conservation and Figure 6 also identified an agricultural waste site off Bebbington Brook, a tributary to the Mount Hope River downstream of the intersection of Route 89 and Route 44, as a potential source of bacterial contamination.

Wildlife and Domestic Animal Waste

Wildlife and domestic animals within the Mount Hope River 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). As the majority of the watershed is undeveloped, wildlife waste is a potential source of bacteria to the Mount Hope River. The impaired segment of the Mount Hope River also passes through rural residential development and a community park with open recreational fields, which may attract dog owners. As such, waste from domestic animals, such as dogs, may also be contributing to bacteria concentrations in the Mount Hope River.

Several schools, including Ashford Elementary School and Warrenville School, and a community park are located within the Mount Hope River watershed along the impaired segment, and contain large open recreational fields (Figure 6). 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.

Insufficient Septic Systems and Illicit Discharges

As shown in Figure 6, the entire Mount Hope River 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. A failing septic system was identified around Lake Chaffee along a tributary flowing to the upper portion of the impaired segment of the Mount Hope River (Figure 6). The 2007 Mount Hope Watershed Based Plan of Conservation also identified failing septic systems as a potential problem within the Mount Hope watershed. 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 Ashford is part of the Eastern Highlands Health District (http://www.ehhd.org).

Stormwater Runoff from Developed Areas

Although the majority of the Mount Hope River watershed is undeveloped, the lower half of the impaired segment flows near and crosses Route 89, which is interspersed with patches of urban development. Approximately 10% of the land use in the watershed is considered urban, and includes schools, recreational fields, commercial businesses, and a trailer park (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 Figure 8, the entire Mount Hope River watershed contains less than 6% impervious cover, but the lower half of the impaired segment near the intersection of Route 89 and Route 44 flows through patches of urban development (Figure 9). Water quality data taken at Station 1833, located within the urbanized portion of the watershed, exceeded the wet-weather geometric mean limit, which suggests that stormwater runoff may be a source of bacteria to the Mount Hope River (Table 8). Stormwater pollution sources include fertilizer runoff, leaky septic systems, horse farms, golf courses, and impervious surfaces.

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

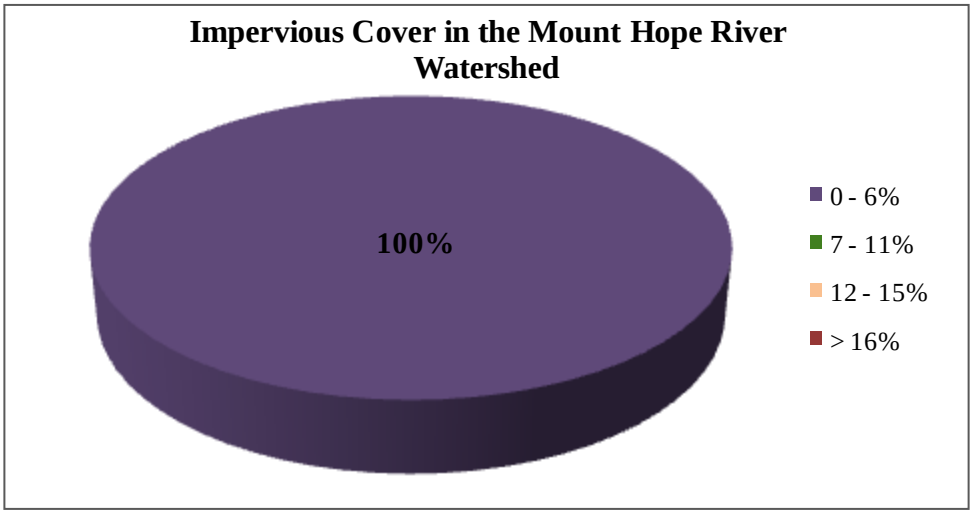
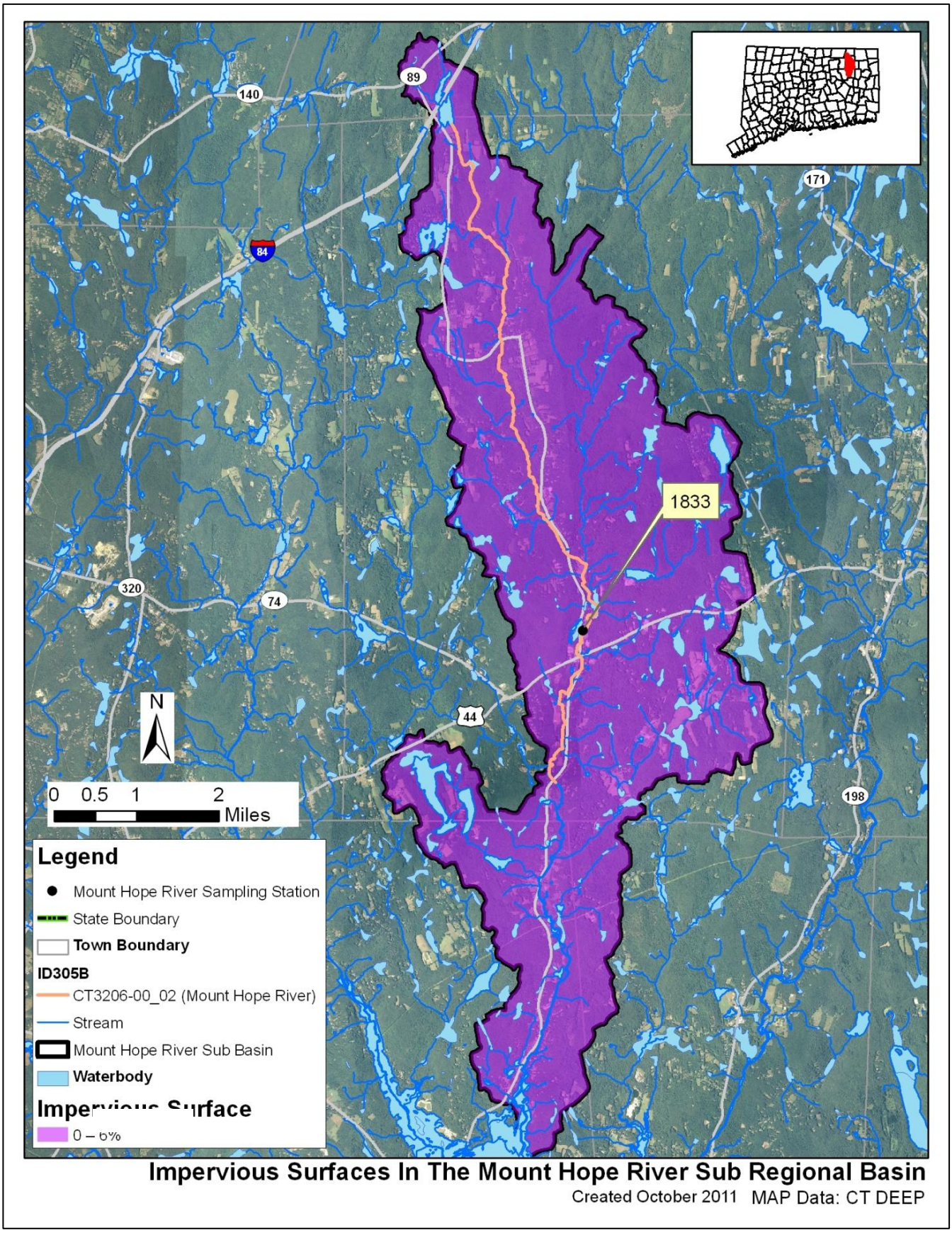


Figure 9: Impervious cover (%) for the Mount Hope River sub-regional watershed



Additional Sources

As shown in Figure 6 and identified in the 2007 Mount Hope Watershed Based Plan of Conservation, two potential leachate sources include a landfill within 1,000 feet of the impaired segment near the headwaters, and an industrial permit for the Ashford Salt Storage shed located on a potential aquifer site along a tributary upstream of the intersection with Route 89 and Route 44. A groundwater permit near the identified chicken farm in Figure 6 upstream of the second Route 89 crossing at Ashford Elementary School may also be a potential source of bacterial contamination. The 2007 Mount Hope Watershed Based Plan of Conservation also addressed road maintenance from sand, salt, herbicides, petroleum, and heavy metal products, and biocides from home maintenance to be of particular concern for water quality.

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

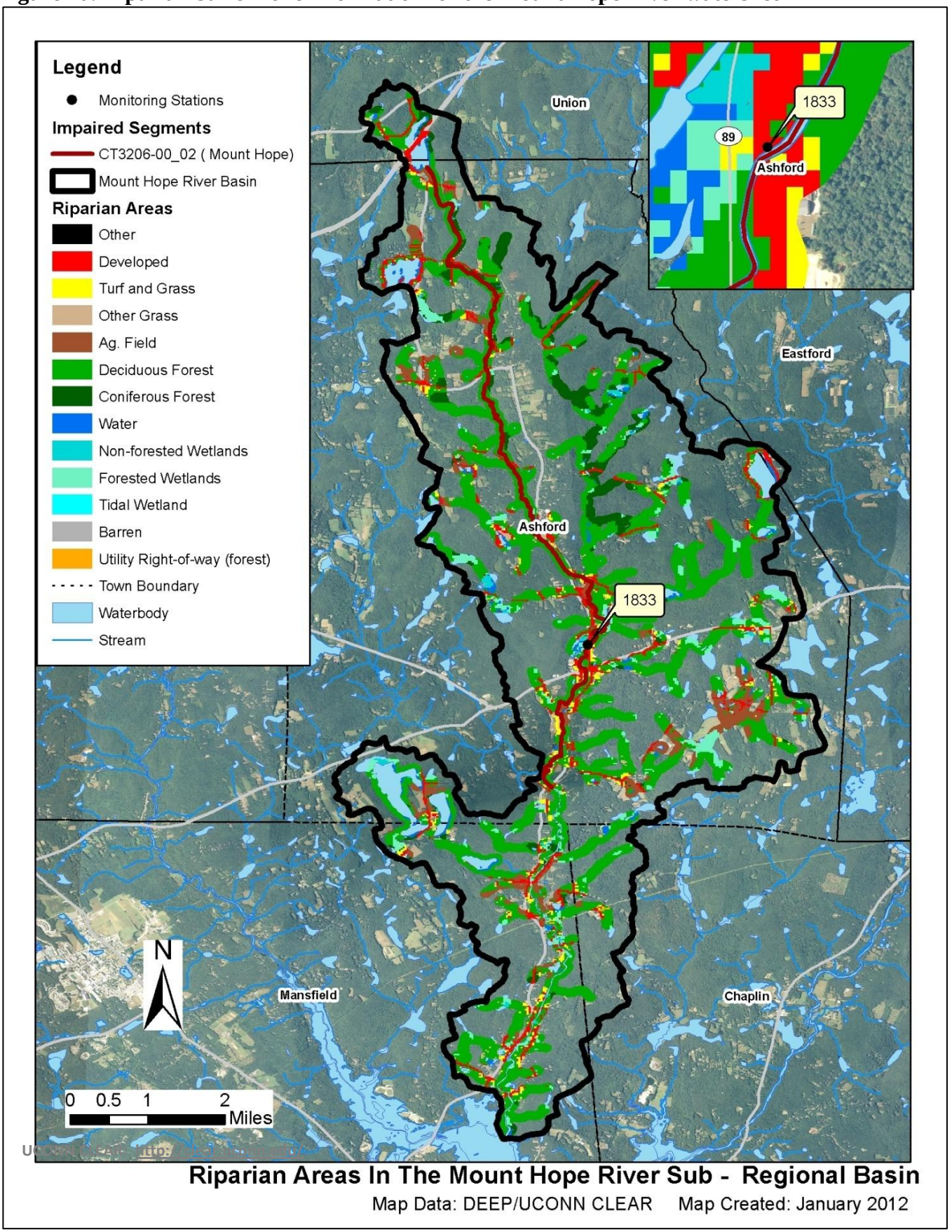
Riparian Buffer Zones

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 majority of the riparian zone for the upper half of the impaired segment of the Mount Hope River is characterized by forested and agricultural land use (Figure 10). The riparian zone for the lower half of the impaired segment is characterized by developed land use with portions of agricultural, turf/grass, and forested land use. As previously noted, if not properly treated, runoff from developed and agricultural areas may contain pollutants such as bacteria and nutrients.

Figure 10: Riparian buffer zone information for the Mount Hope River watershed



CURRENT MANAGEMENT ACTIVITIES

In 2007, the Mount Hope River Watershed-Based Plan of Conservation was completed (http://nwc.ctgaia.net/drupal/NWCReports/MtHope_PlanOfConservation.pdf). This document briefly outlines potential bacterial sources 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). A $32,000 grant was awarded under this program to CT DEEP Fisheries and NRCS to restore and stabilize over 1,000 feet of stream channel and riparian habitat, control cattle access through fencing, restore in-stream habitat for fish and improve water quality, and incorporate soil bioengineering and geomorphology techniques into restoration design and construction (http://www.depdata.ct.gov/maps/nps/npsmap.htm).

RECOMMENDED NEXT STEPS

Future mitigative activities are necessary to ensure the long-term protection of the Mount Hope River and have been prioritized below. Some of these actions are provided in more detail in the 2007 Mount Hope River Watershed: Watershed-Based Plan of Conservation: Phase IA (NWC, 2007).

1) Ensure there are sufficient buffers on agricultural lands along the Mount Hope River.

Agricultural land use represents 8% of the Mount Hope River watershed, and is a concern for water quality, especially with several identified horse and livestock farms adjacent to the impaired segment (Figure 6). The 2007 Mount Hope River Watershed-Based Plan of Conservation recommended that the agricultural waste site identified in Figure 6 should be further investigated for onsite remediation (Table 6). 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 to streams and wetlands, and that animal waste handling, disposal, and other appropriate Best Management Practices (BMPs) are in place. It appears that the NRCS is already using a 319 grant to work with several agricultural producers to restrict livestock from exposed stream banks.

2) Monitor permitted sources.

Two of the permitted facilities listed in Table 5, a groundwater permit at Ashford Elementary School and an industrial permit at the Ashford Salt Storage shed, have been recommended for monitoring and remediation by the 2007 Mount Hope River Watershed-Based Plan of Conservation (Table 6). A landfill near the headwaters of the impaired segment, a gravel pit with exposed soil upstream of the Route 89 and Route 44 crossing, and a construction site with exposed soil downstream of the Route 89 and Route 44 crossing should also be monitored for potential contamination (Table 6). 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.

Table 6 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 Mount Hope 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 6. 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**
AA	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	546		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.

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

As most of the Mount Hope River watershed is undeveloped with portions of the impaired segment flowing through residential development and a community park, 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 town and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of the Mount Hope River that are frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. In addition, any educational program should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in the Mount Hope River 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) Develop a system to monitor septic systems.

The entire Mount Hope River watershed relies on septic systems, and a failing septic system along Lake Chaffee near the headwaters of the impaired segment was identified in Figure 6. If not already in place, Ashford should establish a program to ensure that existing septic systems are properly operated and maintained, and 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 sub-standard systems within a reasonable timeframe can be adopted. Ashford can also develop a program to assist citizens with the replacement and repair of older and failing systems.

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

As noted previously, 10% of the Mount Hope River watershed is considered urban, and the impaired segment flows along the development surrounding Route 89, especially near the intersection of Route 89 and Route 44. Located upstream of this intersection, Station 1833 exceeded the geometric mean during wet-weather. As such, stormwater runoff is most likely contributing bacteria to the waterbodies. The 2007 Mount Hope River Watershed-Based Plan of Conservation made recommendations to reduce the impacts of stormwater runoff on water quality (NWC, 2007). The plan recommended multiple areas for installation of BMPs, which are listed in Table 7.

Table 7: Recommended structural BMPs in Ashford from the 2007 Mount Hope River Watershed Based Plan of Conservation

Location	Town	Recommended BMPs
Major roads near Mount Hope River	Ashford	Implement new regulations to reduce the impact of sand, salt, herbicides, petroleum, and heavy metals.
Agricultural waste site along Bebbington Brook, a tributary to Mount Hope River	Ashford	Conduct onsite remediation to eliminate runoff waste to the tributary.
Landfill near headwaters of Mount Hope River	Ashford	Monitor source and conduct onsite remediation to reduce potential groundwater pollution.
Ashford Salt Storage shed along tributary to Mount Hope River	Ashford	Monitor source and conduct onsite remediation to reduce impact to potential aquifer site.

To identify other areas that are contributing bacteria to the impaired segments, the towns should conduct wet-weather sampling at stormwater outfalls that discharge directly to the impaired segment of the Mount Hope River watershed. Outfalls that show high bacteria concentrations should be prioritized for BMP installation (Table 5). To treat stormwater runoff, the towns 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.

BACTERIA DATA AND PERCENT REDUCTIONS TO MEET THE TMDL

Table 8: Mount Hope River Bacteria Data

Waterbody ID: CT3206-00_02

Characteristics: Freshwater, Class AA, Existing or Proposed Drinking Water Supplies, 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: **38%**

Single Sample: **84%**

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

Single sample *E. coli* (colonies/100 mL) data from Station 1833 on the Mount Hope River with annual geometric means calculated

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1833	North of Route 44/89 intersection	6/14/2006	52	dry	107
1833	North of Route 44/89 intersection	6/28/2006	80	wet	
1833	North of Route 44/89 intersection	7/3/2006	20	dry**	
1833	North of Route 44/89 intersection	7/25/2006	86	dry**	
1833	North of Route 44/89 intersection	8/3/2006	880	wet	
1833	North of Route 44/89 intersection	8/10/2006	180	dry	
1833	North of Route 44/89 intersection	8/16/2006	580	wet	
1833	North of Route 44/89 intersection	8/22/2006	140†	wet	
1833	North of Route 44/89 intersection	8/31/2006	63	dry	
1833	North of Route 44/89 intersection	9/6/2006	74	wet	
1833	North of Route 44/89 intersection	9/12/2006	47†	dry	

Single sample *E. coli* (colonies/100 mL) data from Station 1833 on the Mount Hope River with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1833	North of Route 44/89 intersection	6/6/2007	230	wet	122
1833	North of Route 44/89 intersection	6/13/2007	120	dry	
1833	North of Route 44/89 intersection	6/21/2007	459†	dry	
1833	North of Route 44/89 intersection	6/27/2007	20	dry	
1833	North of Route 44/89 intersection	7/11/2007	63	dry	
1833	North of Route 44/89 intersection	7/23/2007	98	dry	
1833	North of Route 44/89 intersection	8/2/2007	98	dry	
1833	North of Route 44/89 intersection	8/16/2007	190	dry	
1833	North of Route 44/89 intersection	8/23/2007	190	dry	
1833	North of Route 44/89 intersection	8/28/2007	130†	dry	
1833	North of Route 44/89 intersection	5/22/2008	400	wet	164
1833	North of Route 44/89 intersection	6/4/2008	63	dry	
1833	North of Route 44/89 intersection	6/11/2008	260	dry	
1833	North of Route 44/89 intersection	6/16/2008	170	wet	
1833	North of Route 44/89 intersection	6/23/2008	110	dry	
1833	North of Route 44/89 intersection	7/7/2008	92†	dry	
1833	North of Route 44/89 intersection	7/31/2008	160	dry	
1833	North of Route 44/89 intersection	8/6/2008	**2500* (84%)**	dry	
1833	North of Route 44/89 intersection	8/14/2008	75	dry	
1833	North of Route 44/89 intersection	8/20/2008	41	dry	
1833	North of Route 44/89 intersection	6/3/2009	210	dry	**204* (38%)**
1833	North of Route 44/89 intersection	6/10/2009	120	wet	
1833	North of Route 44/89 intersection	6/25/2009	150	dry	
1833	North of Route 44/89 intersection	7/15/2009	79†	dry	
1833	North of Route 44/89 intersection	7/22/2009	325†	wet	
1833	North of Route 44/89 intersection	7/29/2009	123†	dry	
1833	North of Route 44/89 intersection	8/13/2009	330	dry	
1833	North of Route 44/89 intersection	8/20/2009	590	dry	
1833	North of Route 44/89 intersection	9/2/2009	260	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 geometric mean values for Station 1833 on Mount Hope River

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
1833	North of Route 44/89 intersection	2006-2009	10	30	142	219	123
Shaded cells indicate an exceedance of water quality criteria							
Weather condition determined from rain gage at West Thompson Lake, Grosvenor Dale in Thompson, CT							

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