Appendix A

Water Quality Investigation Summary

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Contract 12-05f
French River Watershed-Based Plan and Implementation Action

Eastern Connecticut Conservation District
August 25, 2015

Task 1d – Conduct Water Sampling

This project is funded in part by CT DEEP through a US EPA Clean Water Act §319 Nonpoint Source Program grant.

Introduction

The Eastern Connecticut Conservation District (ECCD) has received funding from CT DEEP through the Clean Water Act Section 319 Nonpoint Source program to conduct water quality sampling in the French River (CT3300-00_01) and Long Branch Brook (CT3300-02_01) in Thompson, Connecticut (Fig. 1). The purpose is to identify potential source*s* of bacteria that have resulted in the periodic inclusion of both waterbodies in the State of Connecticut's Impaired Waters (303d) list. ECCD will use the bacteria data to develop a subwatershed-based plan for the French River watershed.

Segment 01 of the French River (CT3300-00_01), located from the confluence of the French River with the Quinebaug River upstream to the outlet dam of North Grosvenordale Pond, has been listed in multiple cycles of the Connecticut Department of Energy and Environmental Protection's Integrated Water Quality Report to Congress, most recently in 2010, as impaired for recreation due to periodic high levels of the pathogen indicator bacteria *Escherichia coli* (*E. coli*). No specific pathogen sources have been identified. The French River, which has its headwaters in the central Massachusetts town of Leicester, also has several impaired segments in Massachusetts. These segments, including two just across the Connecticut-Massachusetts state line in Dudley and Webster, are impaired for recreation due to the presence of *E. coli.*

Long Branch Brook (CT3300-02_01), is a Class A stream that is a tributary to the French River. Long Branch Brook, like the French River, has its headwaters in Massachusetts, in nearby Webster, MA. Long Branch Brook is listed as impaired for recreation due the presence of *Escherichia coli* (*E. coli*). Potential pathogen sources include permitted and non-permitted stormwater, insufficient septic systems, agricultural activity, and nuisance wildlife and/or pets. In order to quantify bacteria levels and identify potential sources of bacteria to the French River and Long Branch Brook, ECCD conducted bacteria sampling during June and July of 2015.

Procedure

In March 2015, ECCD prepared and submitted a Water Quality Monitoring Plan to CT DEEP outlining the methods ECCD would employ to conduct water quality sampling of the French River and its tributary streams. Upon approval of the Water Quality Monitoring Plan by CT DEEP, ECCD, in partnership with The Last Green Valley (TLGV) Volunteer Water Quality Monitoring program, recruited local volunteers to participate in water quality sampling. A bacteria sampling workshop was held at the Thompson Public Library in Thompson, CT. in May 2015. The volunteers were trained to utilize sampling protocols specified in The Last Green Valley Volunteer Water Quality Monitoring Program Bacteria Sampling Quality Assurance Project Plan (QAPP). This QAPP (US EPA Tracking Number RFA #13504) was approved by CT DEEP and US Environmental Protection Agency (US EPA) in June 2012.

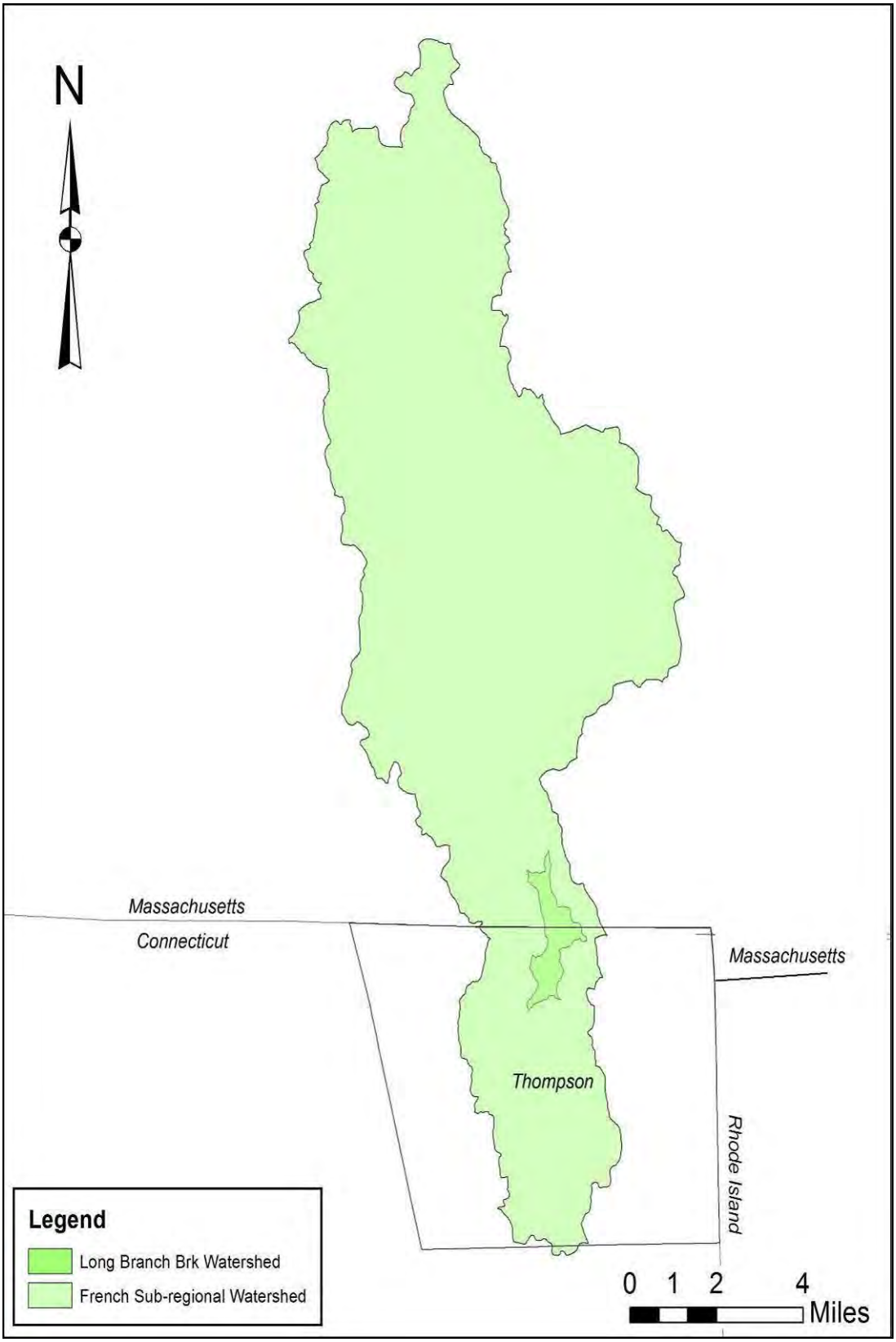


Figure 1. The French River sub-regional watershed in Massachusetts and Connecticut. The Long Branch Brook local watershed is depicted in dark green.

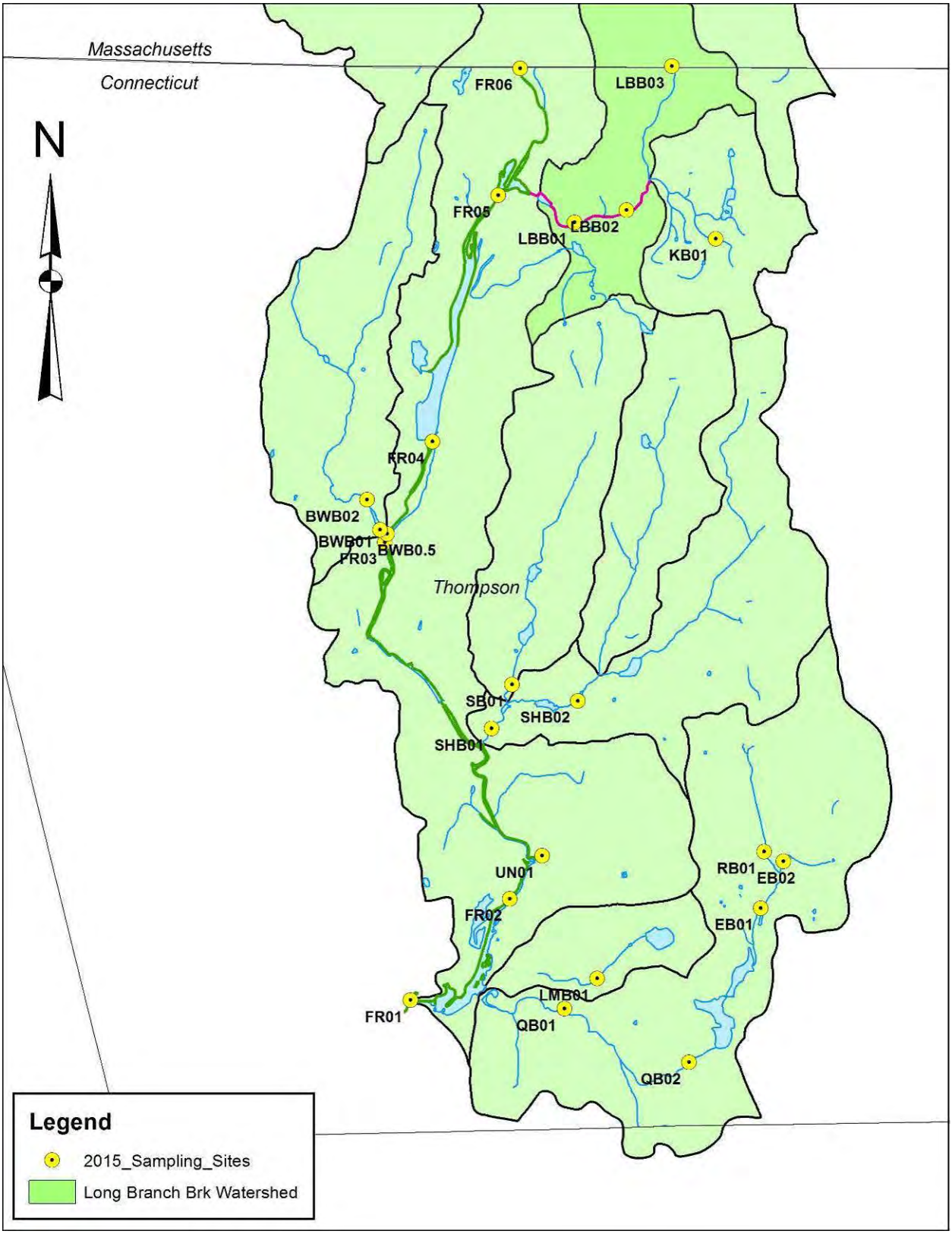


Figure 2. French River watershed bacteria sampling sites. Local watersheds are delineated.

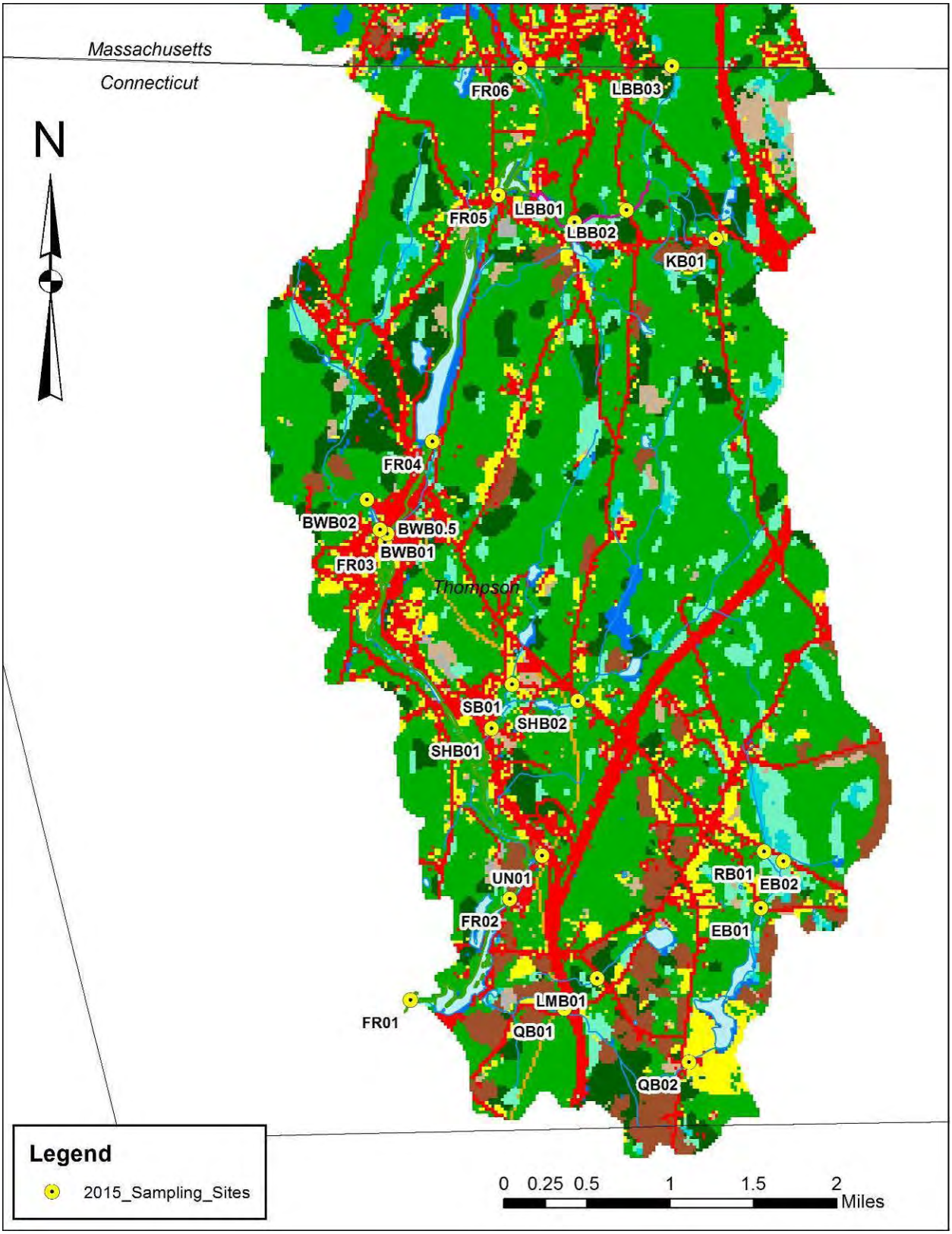


Figure 3. French River watershed bacteria sampling sites relative to land use/land cover (CLEAR 2010).

Prior to the commencement of water sample collection, ECCD identified eighteen sites along the French River and its tributaries to be sampled (Fig. 2). The sampling sites were selected to identify and quantify potential sources of bacterial contamination to the French River based on a review of local land use (Fig. 3) and recommendations made in the *French River Watershed Summary* appendix of CT DEEP's *A Statewide Total Maximum Daily Load Analysis for Bacteria Impaired Waters* (September 19, 2012). The sampling sites were numbered beginning with the downstream-most site on the French River (FR01, located 500 feet upstream of the confluence with the Quinebaug River) and proceeding upstream to the Massachusetts state line (FR06). Named tributaries were designated by their initials (eg. Long Branch Brook was called LBB), and followed the same downstream-to-upstream numbering convention if multiple sites existed. The one unnamed tributary was designated as "UN." In week 6, four additional sites (QB02, RB01, EB01 and EB02) were added upstream of the Quinatissett Brook site (QB01), in the southeast part of the watershed to bracket high bacteria levels documented at QB01. In the final week of sampling, an additional site at the confluence of Backwater Brook with the French River (BWB0.5) was added to document water conditions in response to a "sewage" odor in a nearby catch basin that discharges to Backwater Brook, bringing the total number of sampling sites to twenty-three.

The water samples were collected once a week for eight weeks, beginning June 9th and ending July 28th, utilizing the QAPP protocols in accordance with the approved monitoring plan. Water samples were collected by hand or via an extension pole, using sterilized 125 ml Nalgene collection bottles provided by the CT Department of Public Health. In order to ensure quality control, on each sampling day, one duplicate and one blank sample was collected for every ten samples collected. The locations of the duplicate and blank sample sites were determined using a random number generator. Butterfield's buffer solution was used for the blank sample. Water samples were placed on ice in a cooler during the sampling process. Water samples were delivered to Northeast District Department of Health (NDDH), in Brooklyn, CT., where they were picked up by a Connecticut Department of Public Health (DPH) courier and delivered to the DPH Laboratory in Rocky Hill, CT., for processing. Bacteria analysis results were reported to Northeast District Department of Health and relayed to ECCD by NDDH staff. Bacteria results were tabulated and evaluated by ECCD.

Results

The 2013 Connecticut Water Quality Standards establish water quality criteria for indicator bacteria, including *E. coli*, which is the preferred indicator bacterium for fresh waterbodies. For recreational contact, excluding designated and non-designated swimming areas, the single sample maximum is 576 colony-forming units (cfu) per 100 milliliters of water and the maximum sample set geometric mean is less than 126 cfu/100 ml.

Bacteria sampling results for the French River and its tributary streams are summarized in Table 1 and depicted in Fig. 4. A geometric mean was calculated for each sample set, with the exception of site BWB0.5, for which only one sample was obtained. Bacteria levels listed in **bold** font in the table below exceed the established water quality limits. Bacteria samples with (D = n) indicate a duplicate sample was collected at that site on that sampling day. Table 1 also

notes whether the sample was collected during wet (a rainfall in excess of 0.1 inches within 24 hours) or dry conditions. A simple statistical distribution of the sampling results was prepared, using a box and whicker plot of the data set (Fig. 5). Summaries of each individual sampling site are provided below, following Fig. 5.

Table 1. French River watershed bacteria sampling results.

Site	6/9/15	6/16/15	6/23/15	6/30/15	7/7/15	7/14/15	7/21/15	7/28/15	geomean
FR01	20	420	140	85	41	31	86	86	74
FR02	75	63	110	110	110	52	170 (D=160)	120	101
FR03	130	51	200	31	20 (D=10)	31	74	75 (D=41)	47
FR04	<10	10	73	<10	<10	<10	20	<10	14
FR05	41	230	63	20	31	63	63	75	57
FR06	75	300	74	52	52	150	52	96	87
LBB01	20	560	110 (D=52)	10	<10	84	20	10	36
LBB02	20	360	160	85	74	31	<10	41	56
LBB03	<10	280	170	63	20	98	52	63	61
KB01	84	**880**	98	85	31	63 (D=73)	20	110	83
SHB01	96	320	53	31 (D=20)	98	160	**1400**	320	124
SHB02	10	63	41	41	<10	20	31	<10	22
SB01	41	98	63	31	31	10 (D=10)	75	41 (D=20)	33
BWB0.5								**820**	---
BWB01	86	200 (D=230)	130	110	340	110	84	85	**135**
BWB02	20	73	41	110	<10	<10	41	41	32
UN01	10	150	120	41	10	73	20	31	37
LMB01	41 (D=30)	230	84	63	41	270	52	**830**	96
QB01	160	410	330	220	110	370	**790**	**1100**	**338**
QB02						**2100**	280 (D=170)	170	**361**
RB01						110	120	31	74
EB01						160	97	---	125
EB02						110	300	98	**148**
Wet/Dry	dry	wet	dry	dry	dry	dry	dry/wet*	dry	dry

* Began to rain midway through sampling

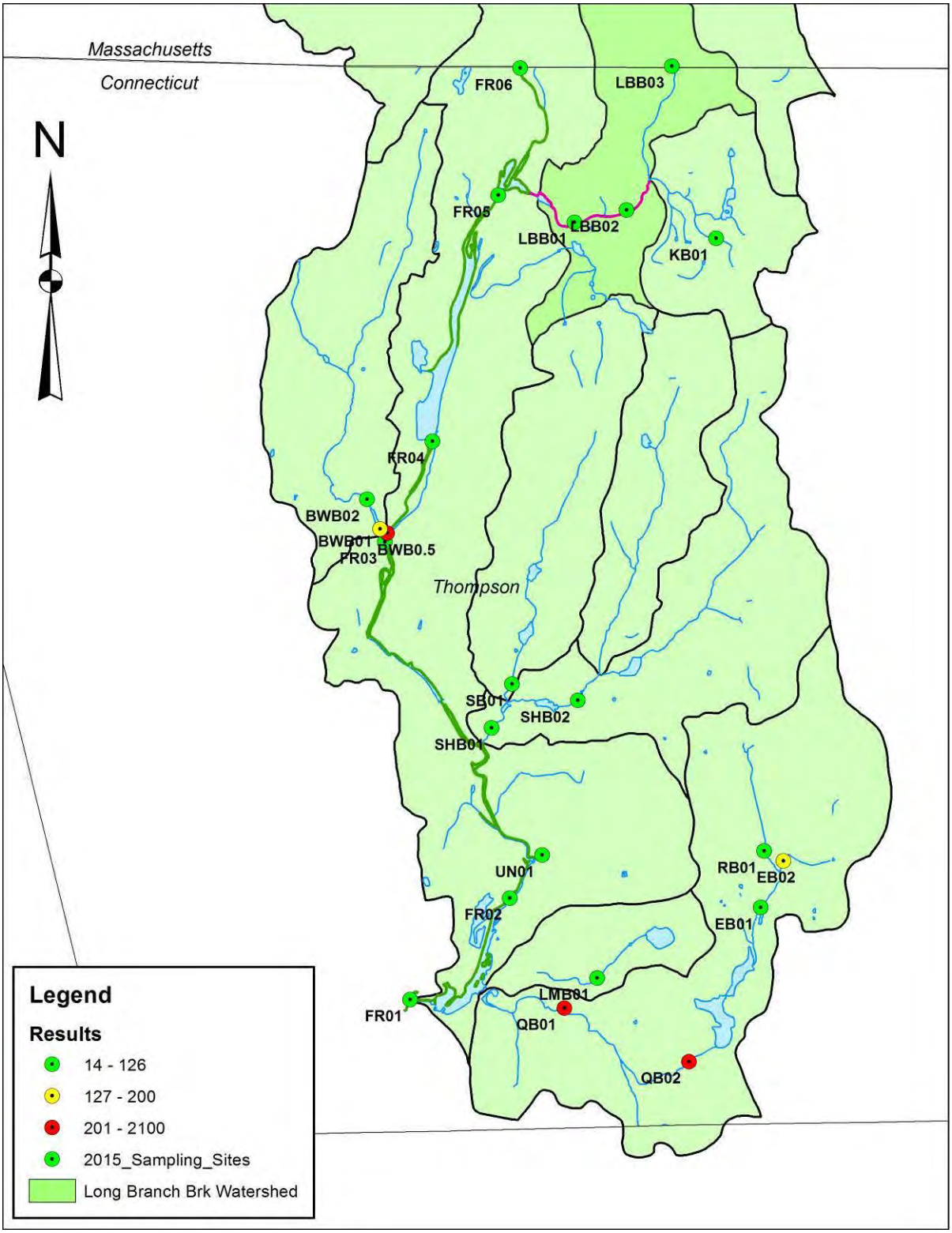


Figure 4. French River watershed bacteria sampling results. A green dot indicates the site may have had a single sample exceedance, but met established water quality criteria for the geometric mean; a yellow dot indicates that the site had no single sample exceedances but failed to meet the geometric mean criteria; and a red dot indicates the site exceeded both single sample and geometric mean criteria.

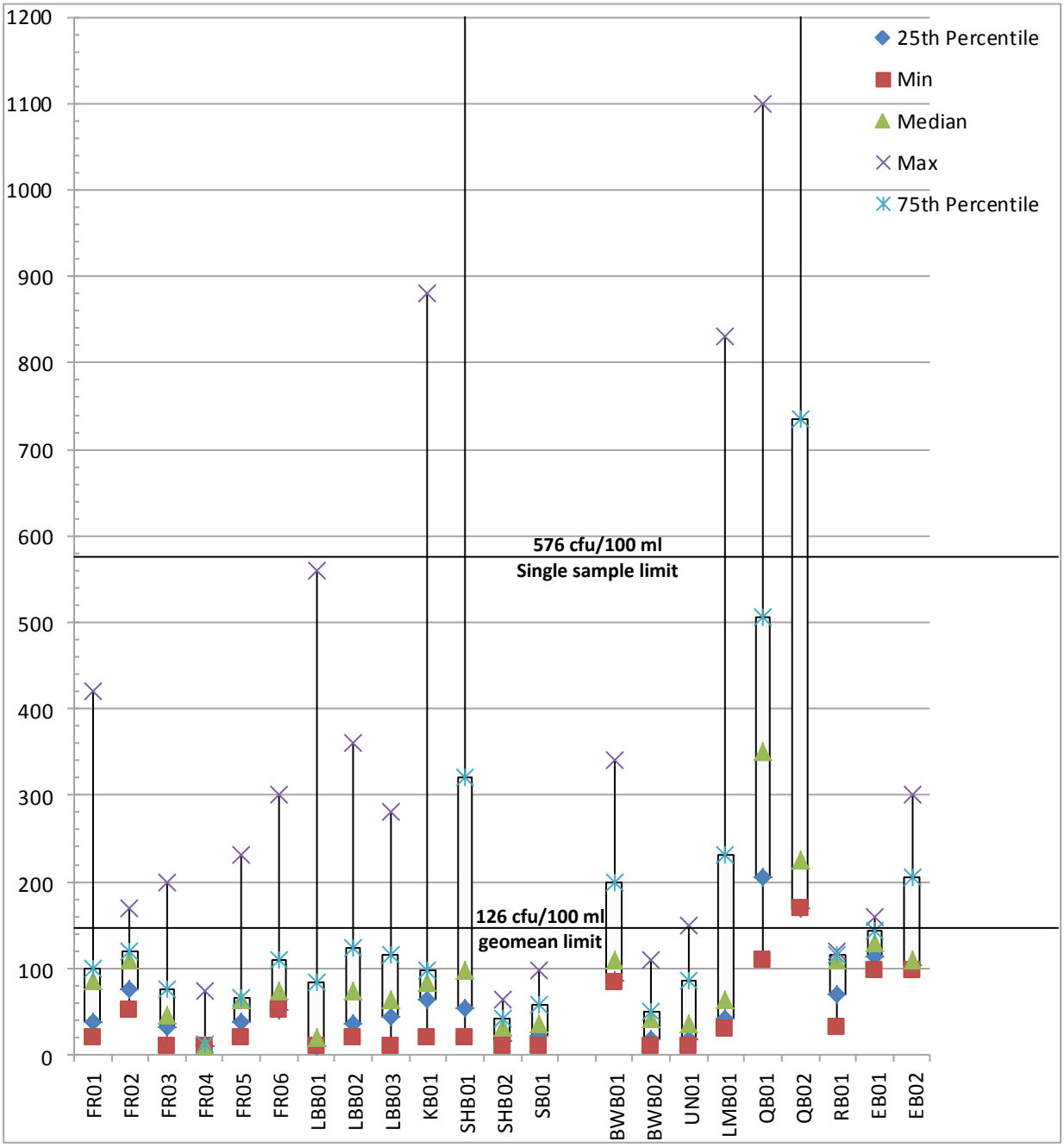


Figure 5. Statistical distribution of bacteria results by sampling site.

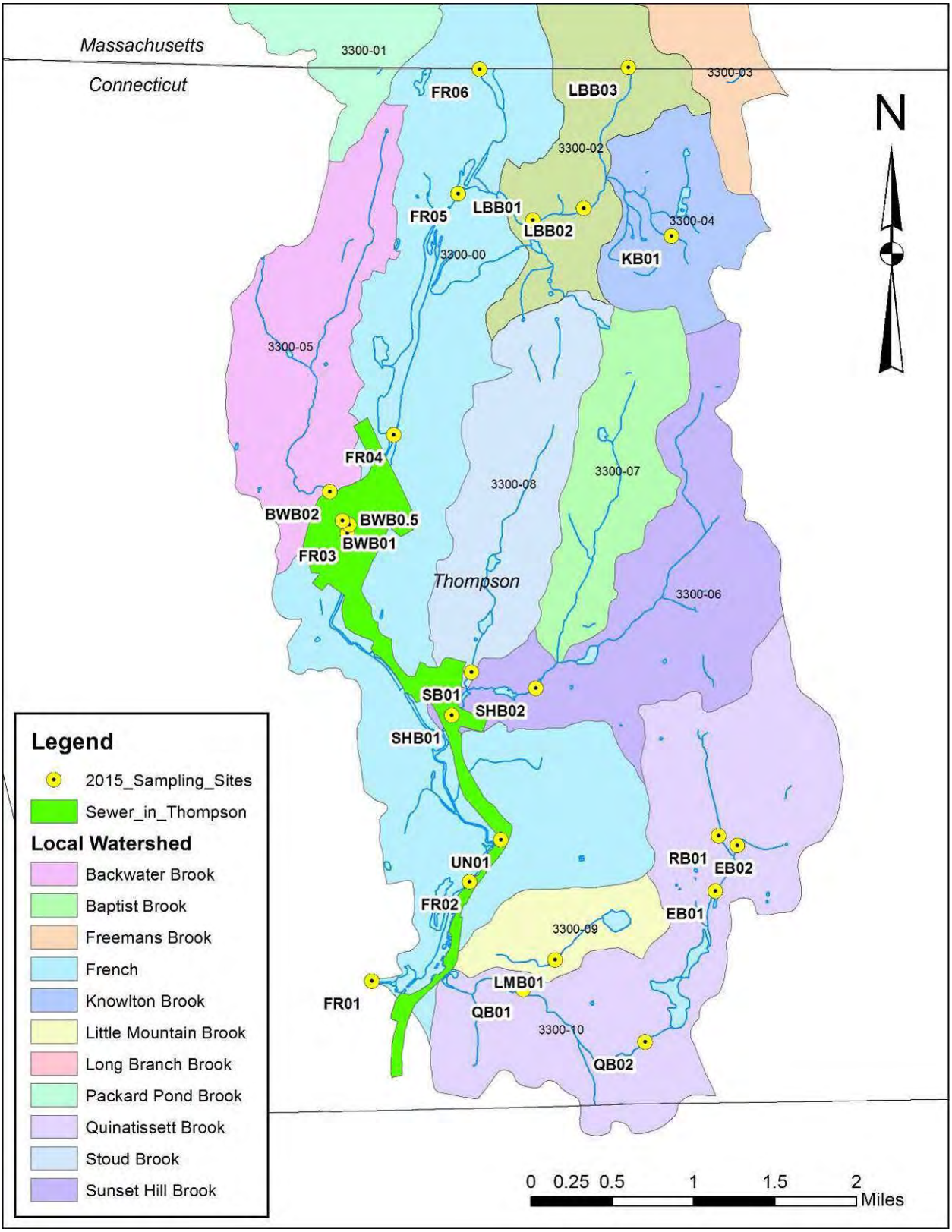


Figure 6. French River local watersheds with sewer service area (in green).

Bacteria Sampling Results by Sampling Site

The results of bacteria sampling by sampling site are provided below.

FR01 – French River upstream of the confluence with the Quinebaug River:

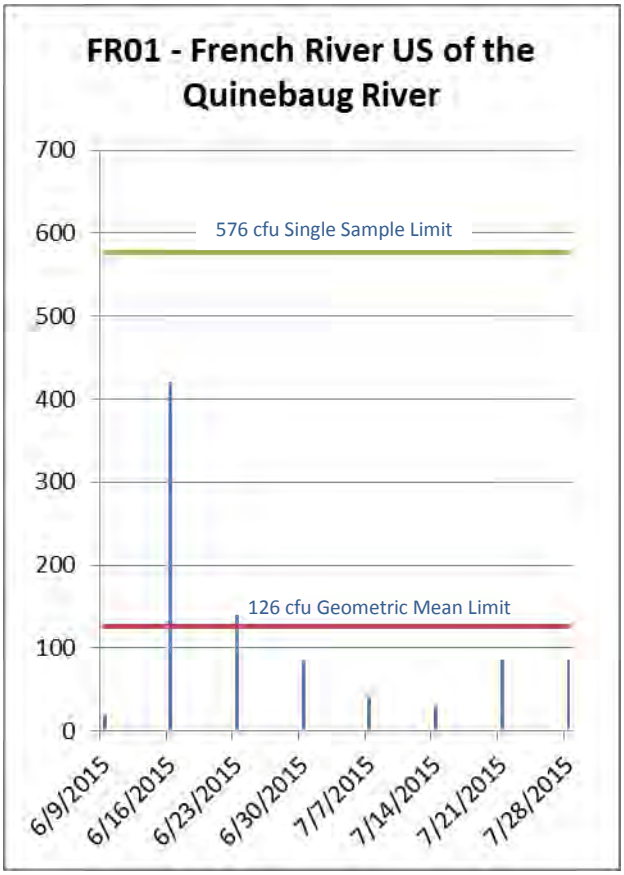


Figure 7. Graph of bacteria sampling results at FR01; downstream view of the French River at the sampling location; and an aerial (Google Earth) image of the sampling site location and vicinity.

FR01 is located on the French River, south of the US Army Corps of Engineers flood control dam at the West Thompson Lake (Quinebaug River) flood control facility. This is the southern-most sampling site on the French River, and is located approximately 500 feet upstream of the confluence with the Quinebaug River. This site was selected to document bacteria levels in the French River prior to its discharge into the Quinebaug River.

Eight water samples were collected at this site. All of the samples met the single sample Connecticut water quality standard of 576 cfu/100ml. The geometric mean for this site is 74, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

FR02 – French River at Route 12:

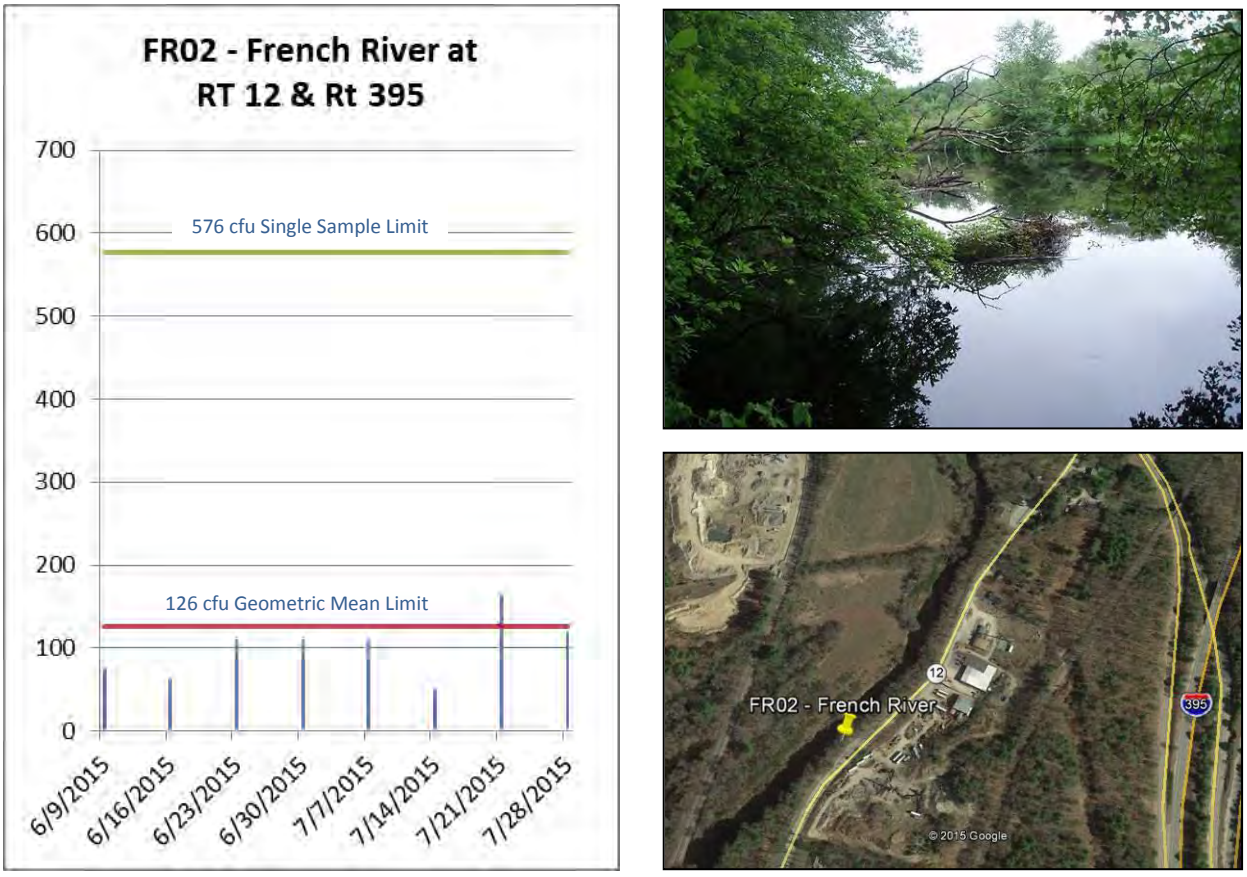


Figure 8. Graph of bacteria sampling results at FR02; downstream view of the French River at the sampling location; and an aerial image of the sampling site location and vicinity.

FR02 is located on the French River along State Route 12, approximately 1 mile upstream of FR01. This site is downstream of a stormwater outfall from Interstate Route 395 and the confluence of an unnamed stream that originates at or near a septic lagoon on the Marianapolis Preparatory School property, and was selected to document potential bacteria contributions from both locations. Land use in the vicinity of this site is mixed, with agricultural fields and a gravel quarry located on the west side of the river, and commercial/industrial uses along Route 12 on the east side of the river. Properties located along the Route 12 corridor are served by municipal sewers (Fig. 6).

Nine water samples were collected at this site, including one duplicate sample. All of the samples (100%) met the single sample Connecticut water quality standard of 576 cfu/100ml. The geometric mean for this site is 101, which did not exceed the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

FR03 – French River at Riverside Park in North Grosvenordale:

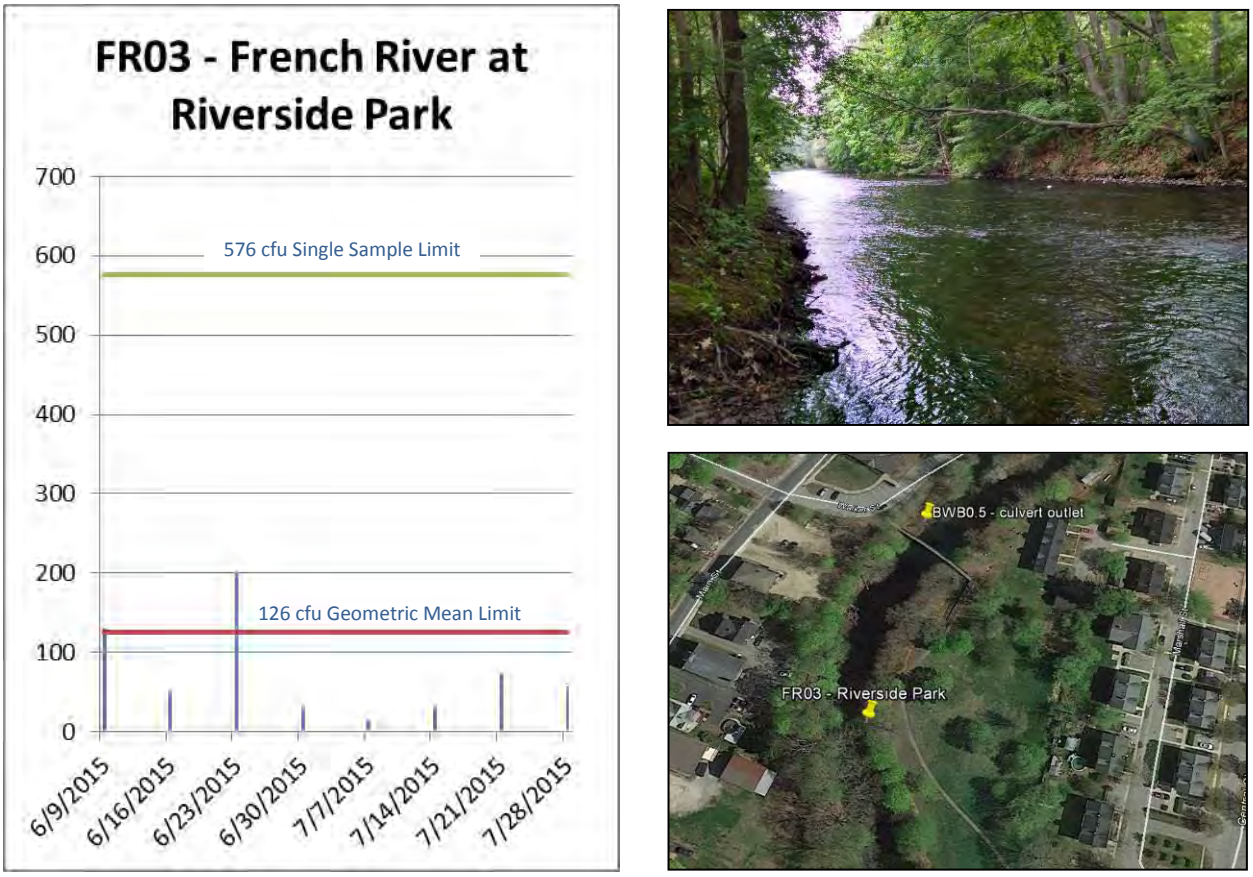


Figure 9. Graph of bacteria sampling results at FR03; downstream view of the French River at the sampling location; and an aerial image of the sampling site location and vicinity.

FR03 is located on the French River at Riverside Park in the North Grosvenordale section of Thompson. This river segment (CT3300-00_01), beginning at the outlet of North Grosvenordale Pond (approximately 3500 feet upstream) and continuing to the confluence with the Quinebaug River, has been periodically listed as impaired due to high bacteria levels. The sampling site is approximately 260 feet downstream of the confluence with Backwater Brook. North Grosvenordale in the immediate vicinity of this site is the most densely developed area in Thompson, and is one of Thompson's two designated MS-4 areas. This site was selected to document water quality impacts related to urban development.

Ten water samples were collected at this site, including two duplicate samples. All of the samples (100%) met the single sample Connecticut water quality standard of 576 cfu/100ml. The geometric mean for this site is 47, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

FR04 – French River at North Grosvenordale Pond:

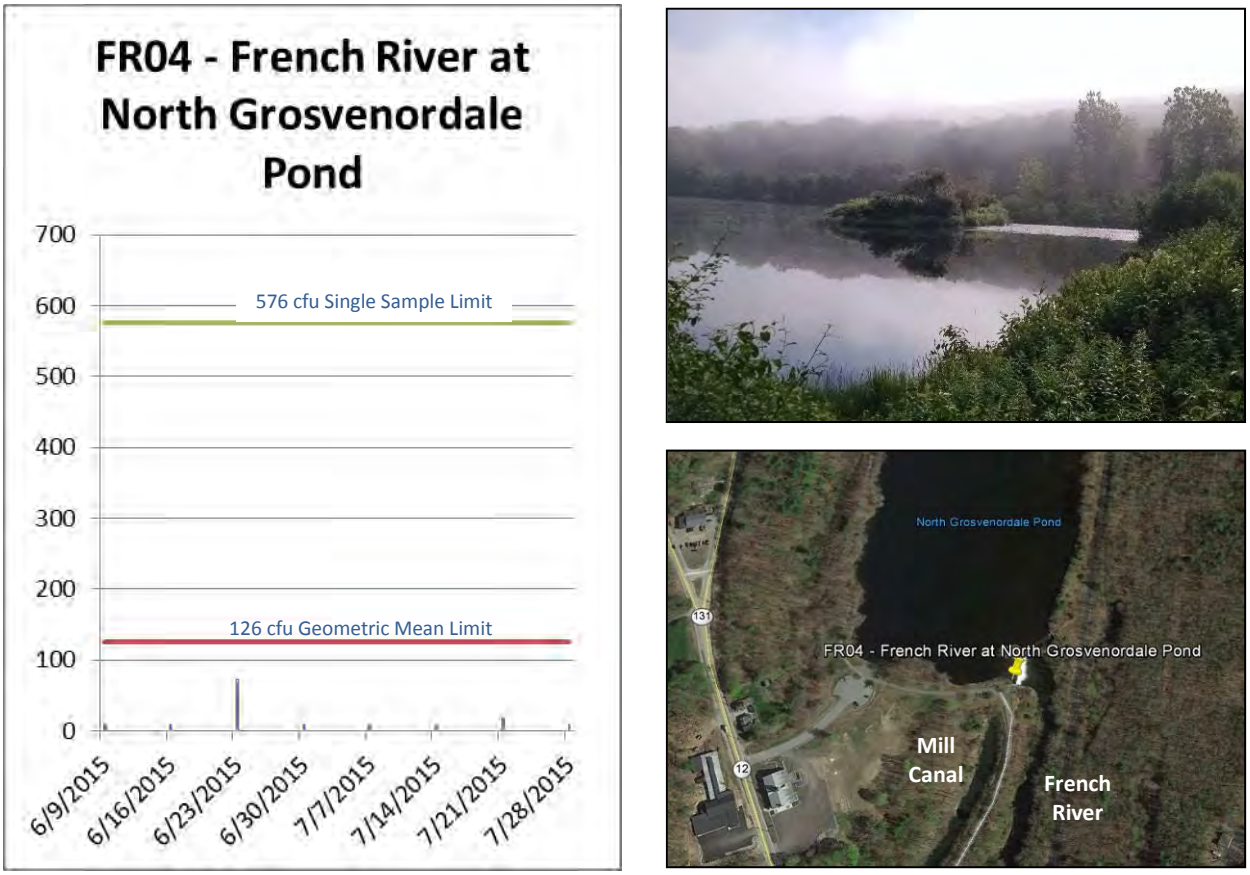


Figure 10. Graph of bacteria sampling results at FR04; view of the sampling site at the North Grosvenordale Pond spillway; and an aerial imagery of the sampling site location and vicinity.

FR04 is located just upstream of the outlet dam of North Grosvenordale Pond, an impoundment of the French River. Land cover in the vicinity and upstream of this site is comprised primarily of undeveloped tracts of forest land. The river segment (CT3300-00_01) from the outlet of this pond to the confluence with the Quinebaug River has periodically been listed as impaired for recreation due to high levels of bacteria. This site was selected to document water quality conditions upstream of the impaired segment.

Eight water samples were collected at this site. All of the samples (100%) met the single sample Connecticut water quality standard of 576 cfu/100ml. The geometric mean for this site is 14, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

FR05 – French River at Langers Pond/Wilsonville Road:

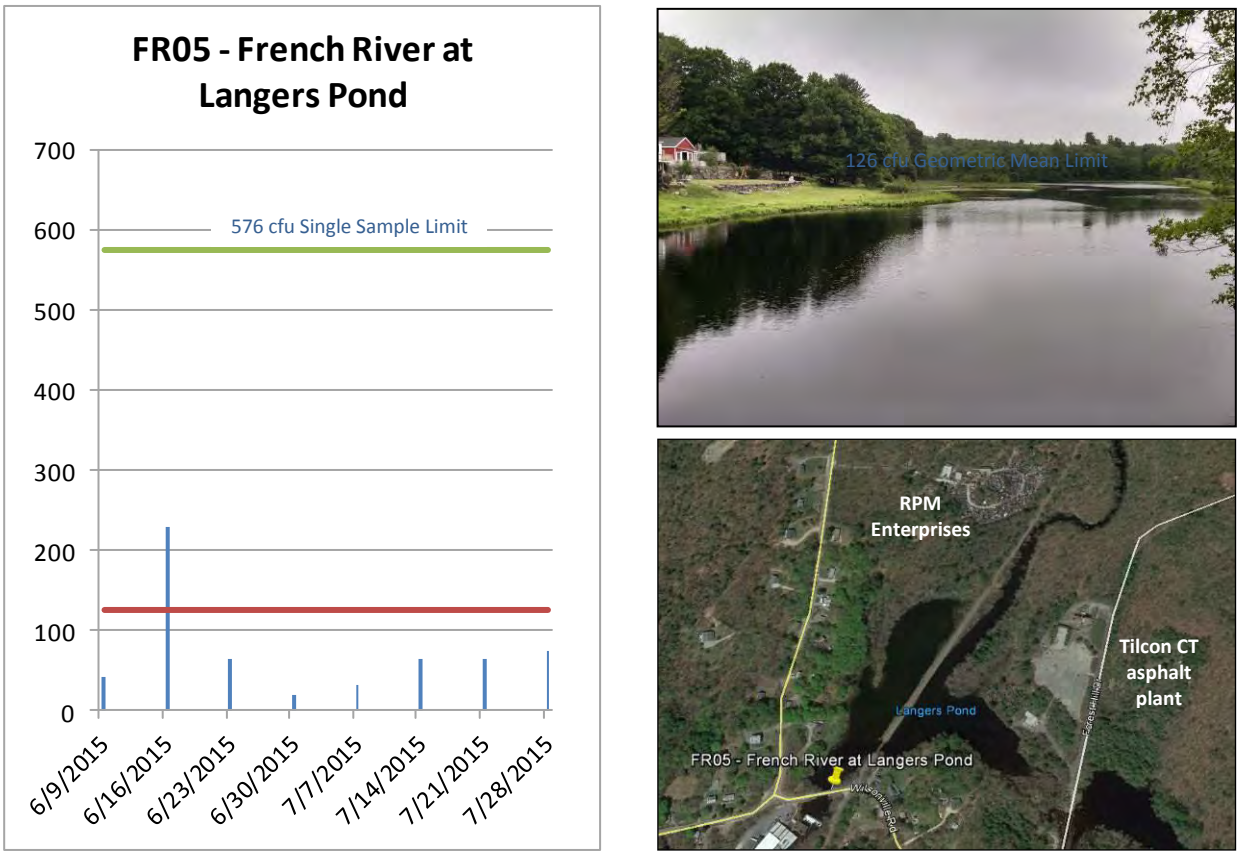


Figure 11. Graph of bacteria sampling results at FR05; upstream view of the French River at the sampling location; and an aerial image of the sampling site location and vicinity.

FR05 is located at the crossing of the French River at Wilsonville Road, at an impoundment known as Langers Pond. The sample was collected from the upstream side of the road crossing. Land cover in the vicinity of the French River from this site to the Massachusetts state line is primarily undeveloped and comprised of large forest tracts. However, two industrial sites of note are located adjacent to the river, including an inactive asphalt plant owned and operated by Tilcon Connecticut, and an automotive junk yard owned and operated by RPM Enterprises. The Tilcon plant has been inactive for a number of years. However, water quality data collected as part of the plant's NPDES industrial permit will be reviewed as part of the water quality investigation. The auto junk yard is located approximately 1800 feet upstream of sampling site, on the west side of the river.

Eight water samples were collected at this site. All of the samples (100%) met the single sample Connecticut water quality standard of 576 cfu/100ml. The geometric mean for this site is 57, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

FR06 – French River near the Massachusetts State Line:

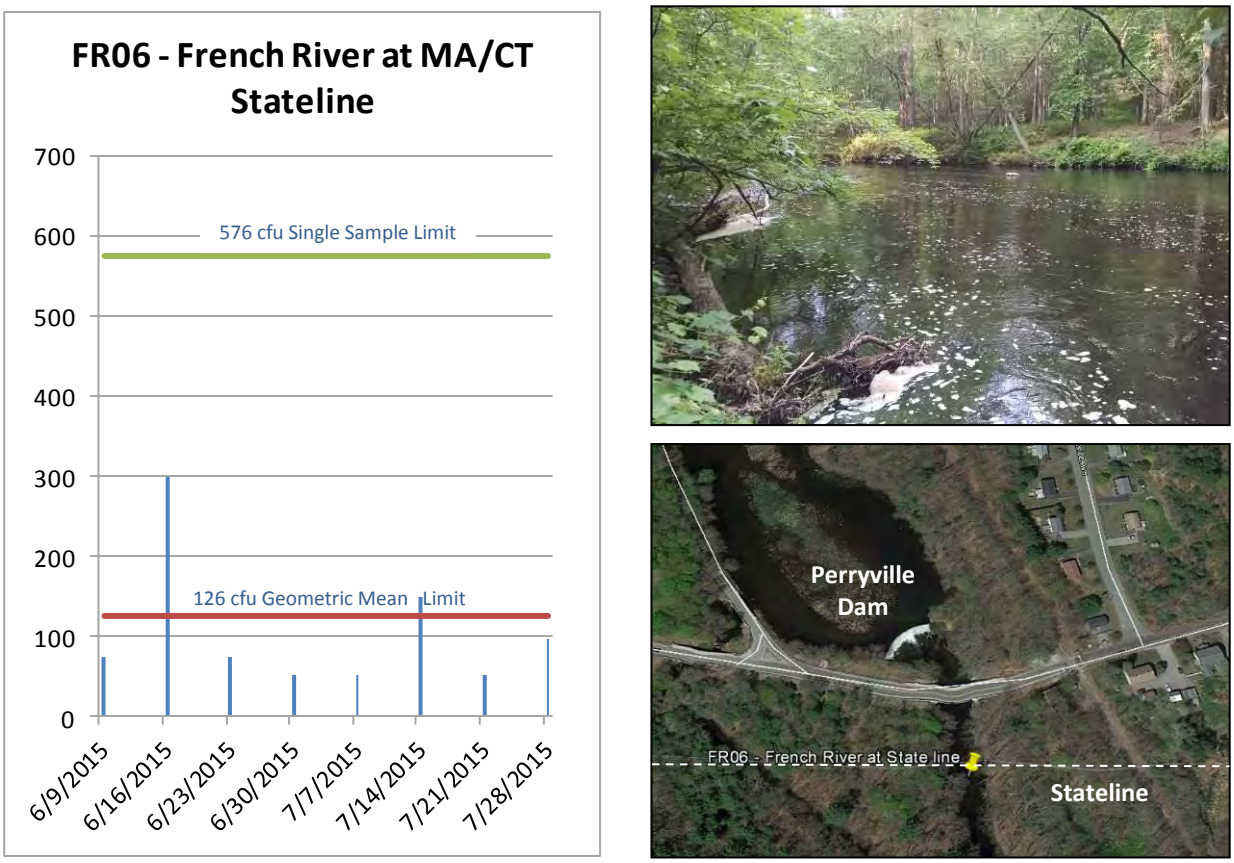


Figure 12. Graph of bacteria sampling results at FR06; downstream view of the French River at the sampling location; and an aerial image of the sampling site location and vicinity.

FR06 is located south of Perryville Road in Dudley, MA, approximately 100 feet south of the state line. This site was selected to establish baseline water quality as water entered Connecticut from Massachusetts.

Eight water samples were collected at this site. All of the samples (100%) met the single sample Connecticut water quality standard of 576 cfu/100ml. The geometric mean for this site is 87, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

LBB01 – Long Branch Brook at Wagher Road:

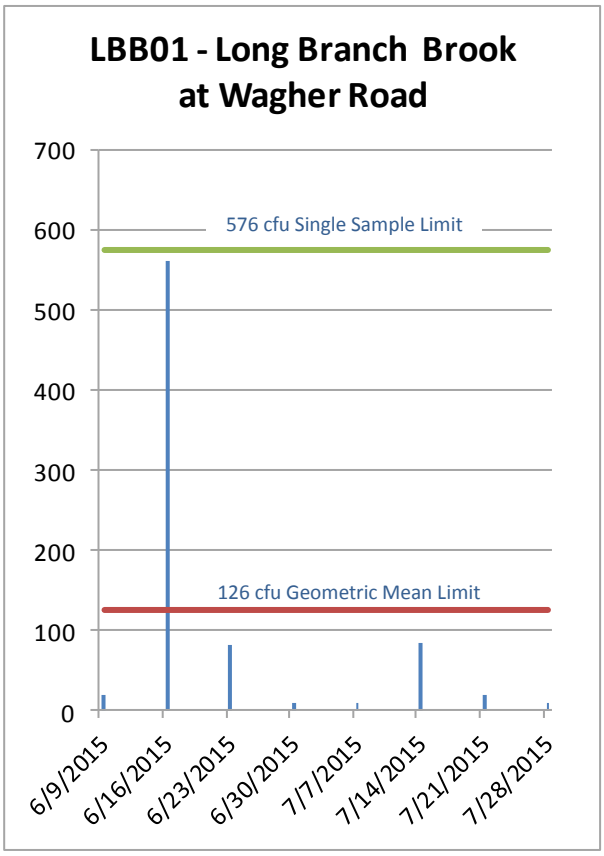


Figure 13. Graph of bacteria sampling results at LBB01; upstream view of Long Branch Brook at the sampling location; and an aerial image of the sampling site location and vicinity.

LBB01 is located at the Wagher Road crossing of Long Branch Brook. This site is located downstream of the CT DEEP probabilistic water quality monitoring site (6134), at which data that was used to determine the water quality impairment was collected. The surrounding area is rural residential and there is very little development between this site and LBB02, located approximately 1725 feet upstream. This site was selected to bracket water quality data at LBB02.

Nine water samples were collected at this site, including one duplicate sample. All of the samples (100%) met the Connecticut water quality standard of 576 cfu/100ml for single samples. The geometric mean for this site is 36, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

LBB02– Long Branch Brook at Labby Road:

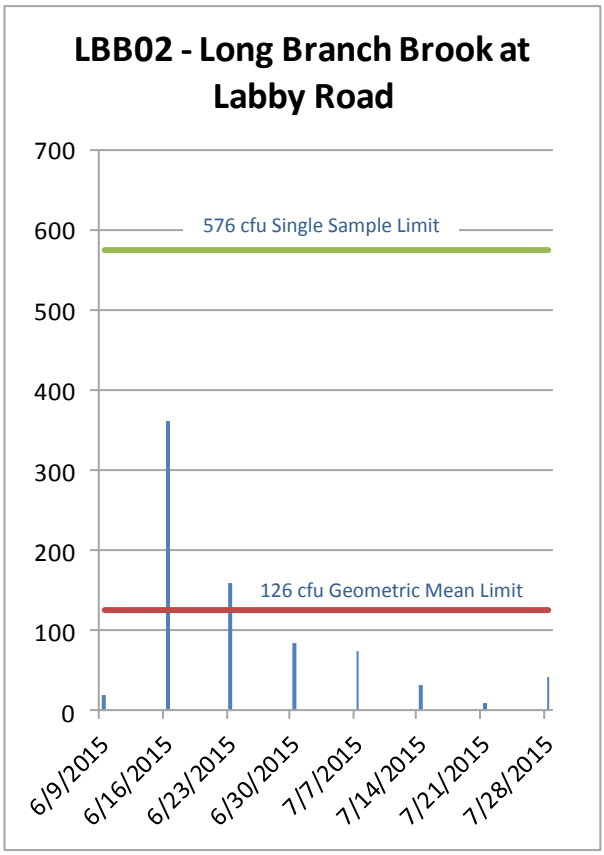


Figure 14. Graph of bacteria sampling results at LBB02; upstream view of Long Branch Brook at the sampling location; and an aerial image of the sampling site location and vicinity.

LBB02 is located at the crossing of Long Branch Brook at Labby Road. This site is just downstream of the CT DEEP probabilistic water quality monitoring site (6134), at which the data that was used to determine the water quality impairment was collected. The surrounding area is very sparsely developed. Long Branch Brook flows through undeveloped forest land between this site and LBB01, approximately 5000 feet upstream.

Eight water samples were collected at this site. All the samples (100%) met the single sample Connecticut water quality standard of 576 cfu/100ml. The geometric mean for this site is 56, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

LBB03 – Long Branch Brook at the Massachusetts State Line:

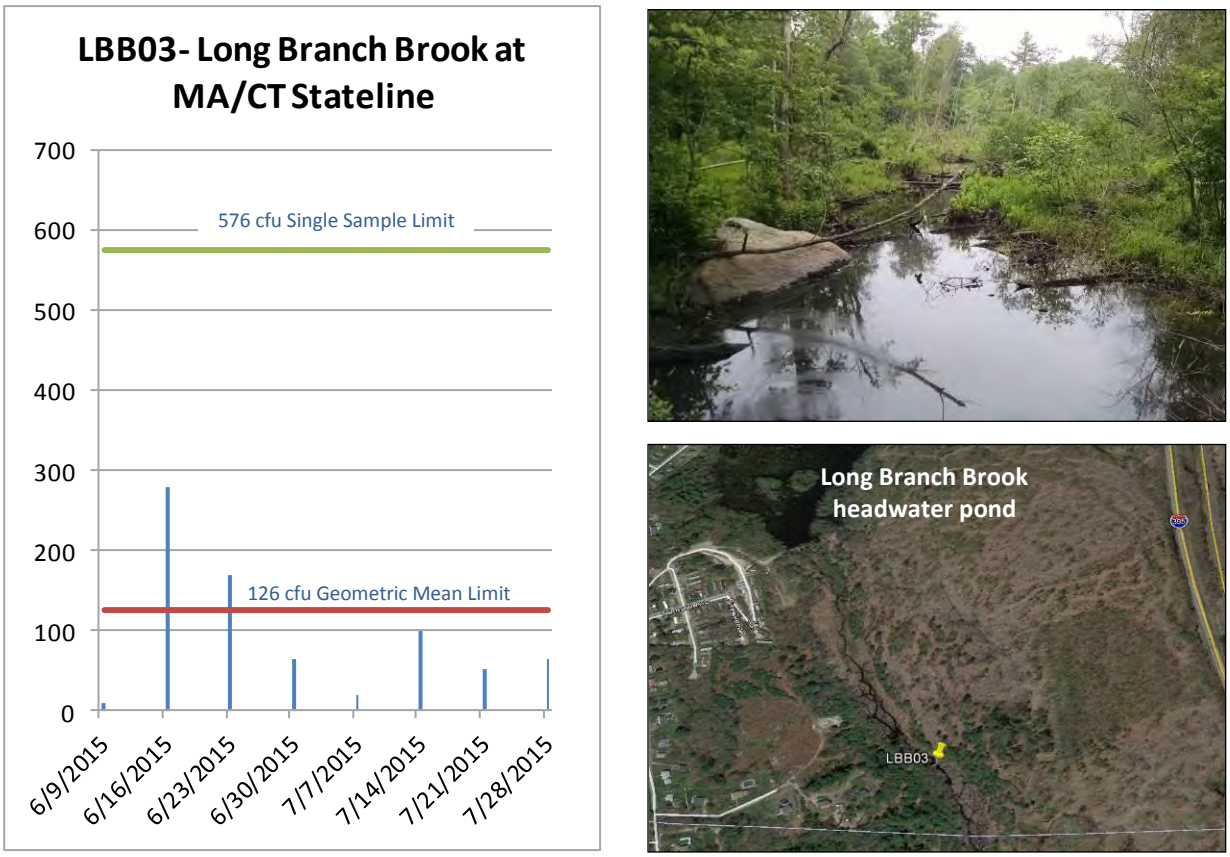


Figure 15. Graph of bacteria sampling results at LBB03; downstream view of Long Branch Brook at the sampling location; and an aerial image of the sampling site location and vicinity.

LBB03 is located on Long Branch Brook near the Connecticut-Massachusetts state line. This site is located between a sewered residential neighborhood to the west and Interstate Route 395 to the east. The area in the immediate vicinity of the sampling site is forested. The headwaters of Long Branch Brook are located approximately 1700 feet upstream. This site was selected to obtain baseline water quality conditions as the stream entered Connecticut.

Eight water samples were collected at this site. All the samples (100%) met the Connecticut water quality standard of 576 cfu/100ml for single samples. The geometric mean for this site is 61, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

KB01 – Knowlton Brook at Wilsonville Road:

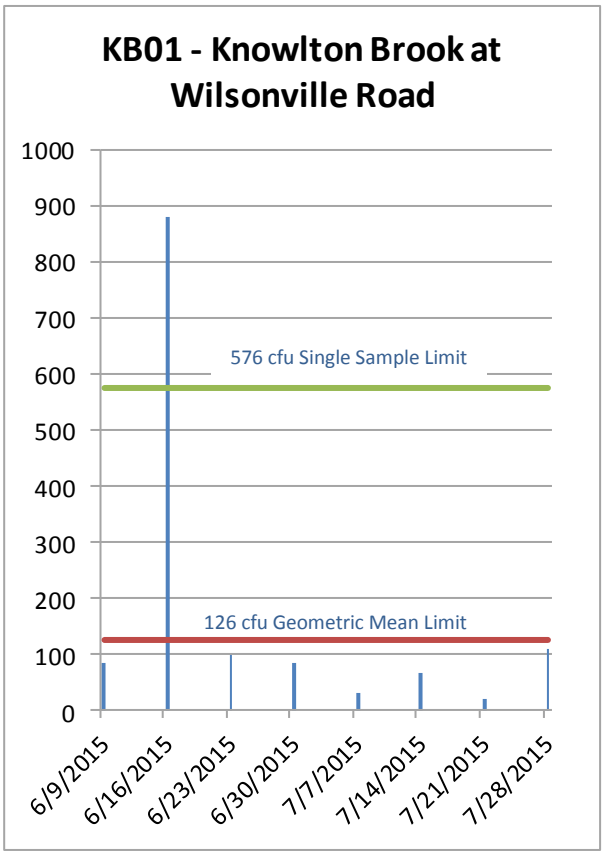


Figure 16. Graph of bacteria sampling results at KB01; downstream view of Knowlton Brook at the sampling location; and an aerial image of the sampling site location and vicinity.

KB01 is located at the Wilsonville Road crossing of Knowlton Brook. The surrounding area is rural residential and is primarily forested. Elevation relief in the vicinity of this site is very low. As a result, Knowlton Brook alternates between a defined channel and a scrub-shrub wetland and is very slow-moving. Knowlton Brook flows into Long Branch Brook approximately 3000 feet downstream of this site. This site was selected to document water quality being discharged to Long Branch Brook from the Knowlton Brook watershed.

Nine water samples were collected at this site, including one duplicate sample. Eight samples (89%) met the Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 83, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

SHB01– Sunset Hill Brook at Klondike Avenue:

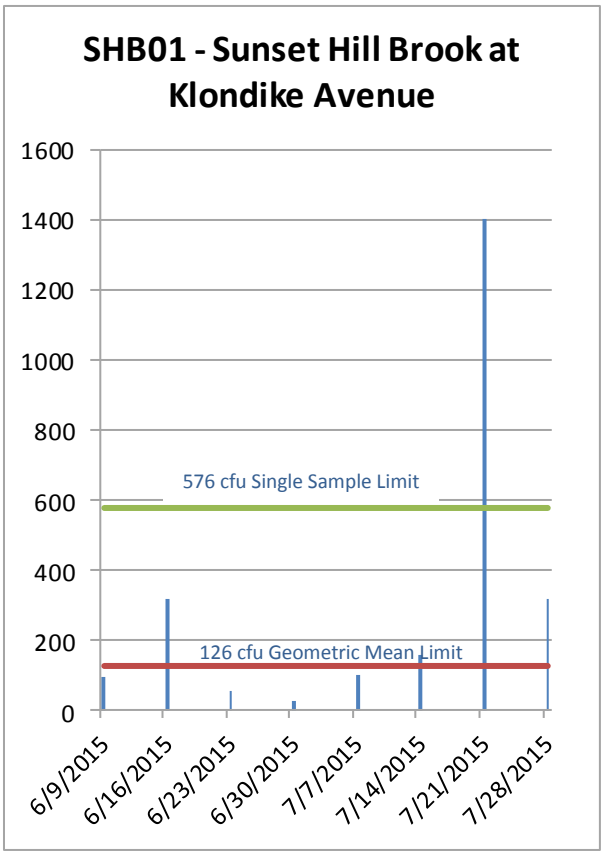


Figure 17. Graph of bacteria sampling results at SHB01; view of Sunset Hill Brook upstream of the sampling site; and an aerial image of the sampling site location and vicinity.

SHB01 is located at the crossing of Klondike Road with Sunset Hill Brook, approximately 700 feet upstream of the confluence with the French River. This site is also located approximately 525 feet downstream of a Connecticut Water Company public drinking water supply wellhead. This site is located in a suburban residential neighborhood which is served by municipal sewer (Fig. 6). This site was selected to document water quality contributions from the Sunset Hill Brook watershed to the French River.

Nine water samples were collected at this site, including one duplicate sample. Eight of the samples (89%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 124, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

SHB02 – Sunset Hill Brook at Thompson Hill Road (State Route 200):

Figure 18. Graph of bacteria sampling results at SHB02; view of the culvert at the sampling location that conveys Sunset Hill Brook under Thompson Hill Road; and an aerial image of the sampling site location and vicinity.

SHB02 is located at the crossing of Sunset Hill Brook with Thompson Hill Road, and is located approximately 3500 feet upstream of SHB01. Sunset Hill Brook is culverted under Thompson Hill Road via a 48 inch corrugated metal pipe a distance of approximately 160 feet. The area surrounding and upstream of the sampling site and is rural residential and is primarily forested. This site was selected to potentially isolate water quality contributions from the Baptist Brook watershed and the upper portions of the Sunset Hill Brook watershed (Fig. 6).

Eight water samples were collected at this site. All the samples (100%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 124, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

SB01 – Stoud Brook at Thompson Hill Road (State Route 200):

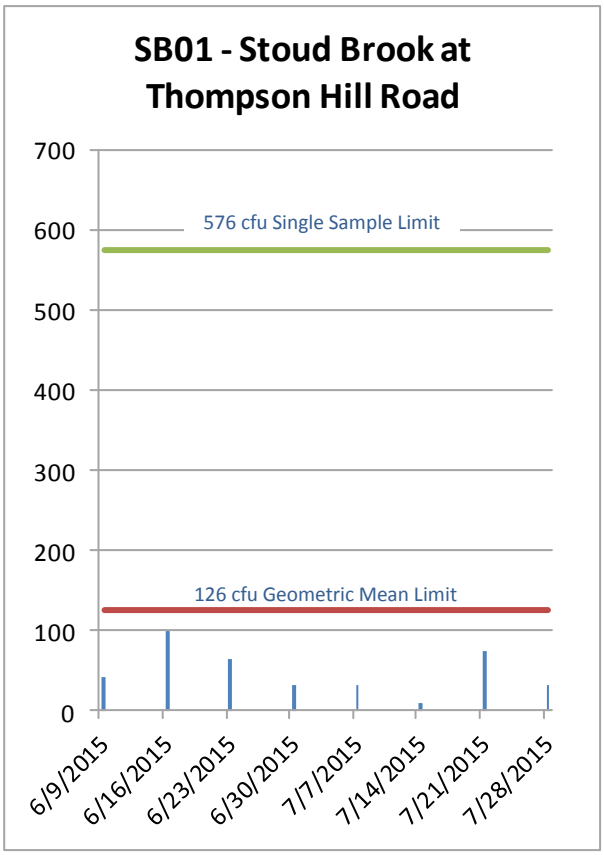


Figure 19. Graph of bacteria sampling results at SB01; view of Stoud Brook upstream of the sampling location; and an aerial image of the sampling site location and vicinity.

SB01 is located at the crossing of Stoud Brook at Thompson Hill Road (State Route 200), in a rural residential neighborhood. It is approximately 500 feet downstream of the Thompson Highway garage. There is a small impoundment approximately 100 feet upstream of the sampling site and a larger impoundment approximately 1250 feet upstream of the sampling site. This site was selected to isolate bacteria levels in Stoud Brook from composite water bacteria levels at SHB01, 1500 feet downstream.

Ten water samples were collected at this site. All the samples (100%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 33, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

BWB0.5 – Backwater Brook at the confluence with the French River:

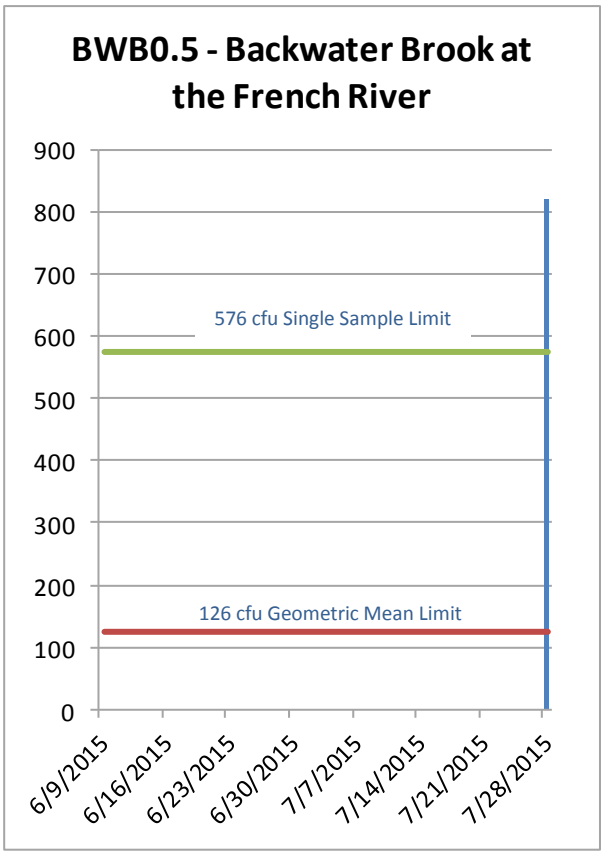


Figure 20. Graph of bacteria sampling results at BWB0.5; view of the culvert conveying Backwater Brook under the public library property and Main Street, just upstream of the sampling location; and an aerial image of the sampling site location and vicinity.

BWB0.5 is located at the outlet of a culverted segment of Backwater Brook, approximately ten feet upstream of the confluence with the French River. This sample was collected in an attempt to quantify water quality in response to a "sewage" odor from a nearby storm drain that is believed to discharge to this culverted segment of stream.

One water sample was collected at this site. At 820 cfu/100 ml, this sample exceeded the Connecticut water quality standard of 576 cfu/100 ml for single samples. Although only one sample was collected, an 85% bacteria reduction (based on a geometric mean of 820 cfu) is required at this site.

BWB01 – Backwater Brook near Main Street:

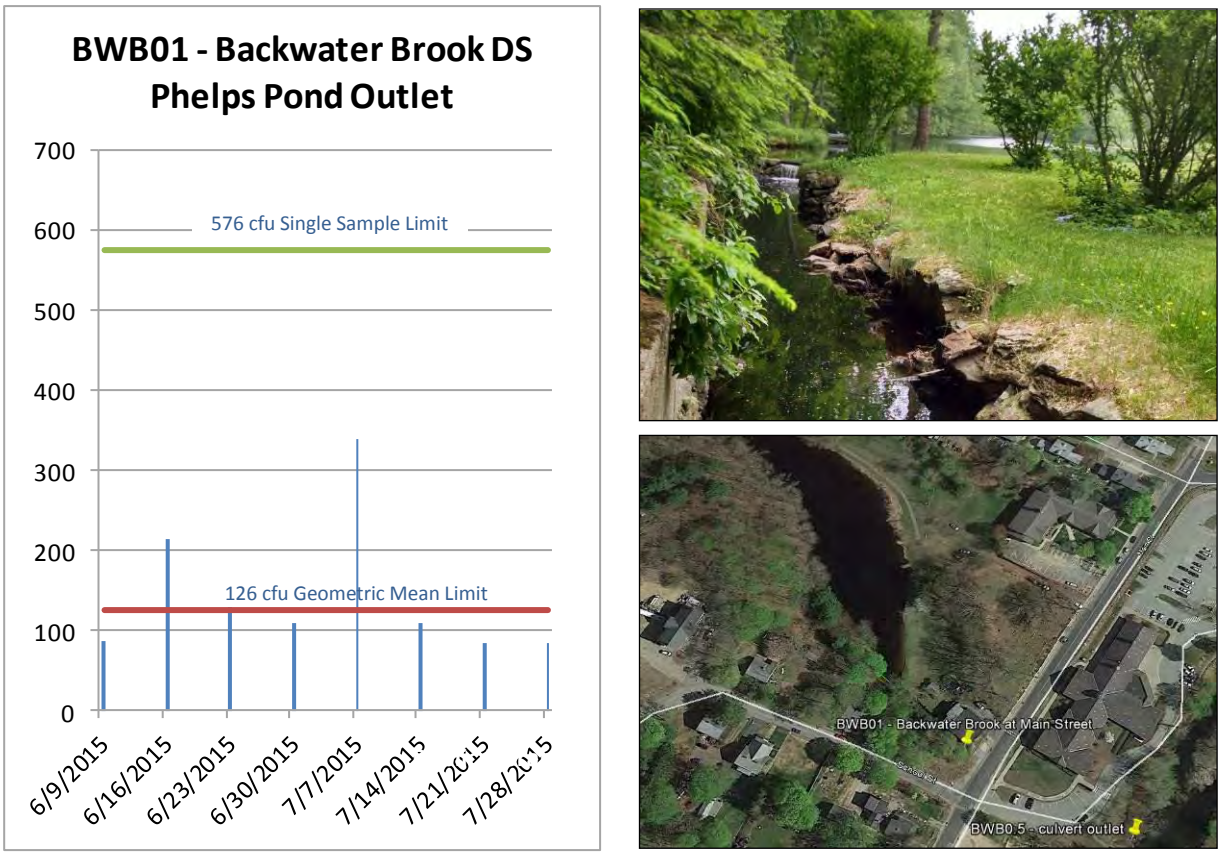


Figure 21. Graph of bacteria sampling results at BWB01; view of Backwater Brook upstream of the sampling location; and an aerial image of the sampling site location and vicinity.

BWB01 is located on Backwater Brook approximately 70 feet downstream of the outlet of Phelps Pond, and approximately 270 feet upstream of the confluence with the French River, near Main Street in North Grosvenordale. Phelps Pond is a Town-owned 3-acre impoundment of Backwater Brook. It is frequently utilized as a nesting and foraging habitat by a variety of waterfowl. North Grosvenordale in the vicinity of this site is the most densely developed area in Thompson, and is one of Thompson's two designated MS-4 areas. This area is served by municipal sewer (Fig. 6). BWB01 was selected to quantify bacteria levels in Backwater Brook upstream prior to its discharge to the French River.

Nine water samples were collected at this site. Eight of the samples (89%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 135, which exceeds the allowable geometric mean of 126 cfu/100 ml. A 7% bacteria reduction is required at this site.

BWB02 – Backwater Brook upstream of Phelps Pond:

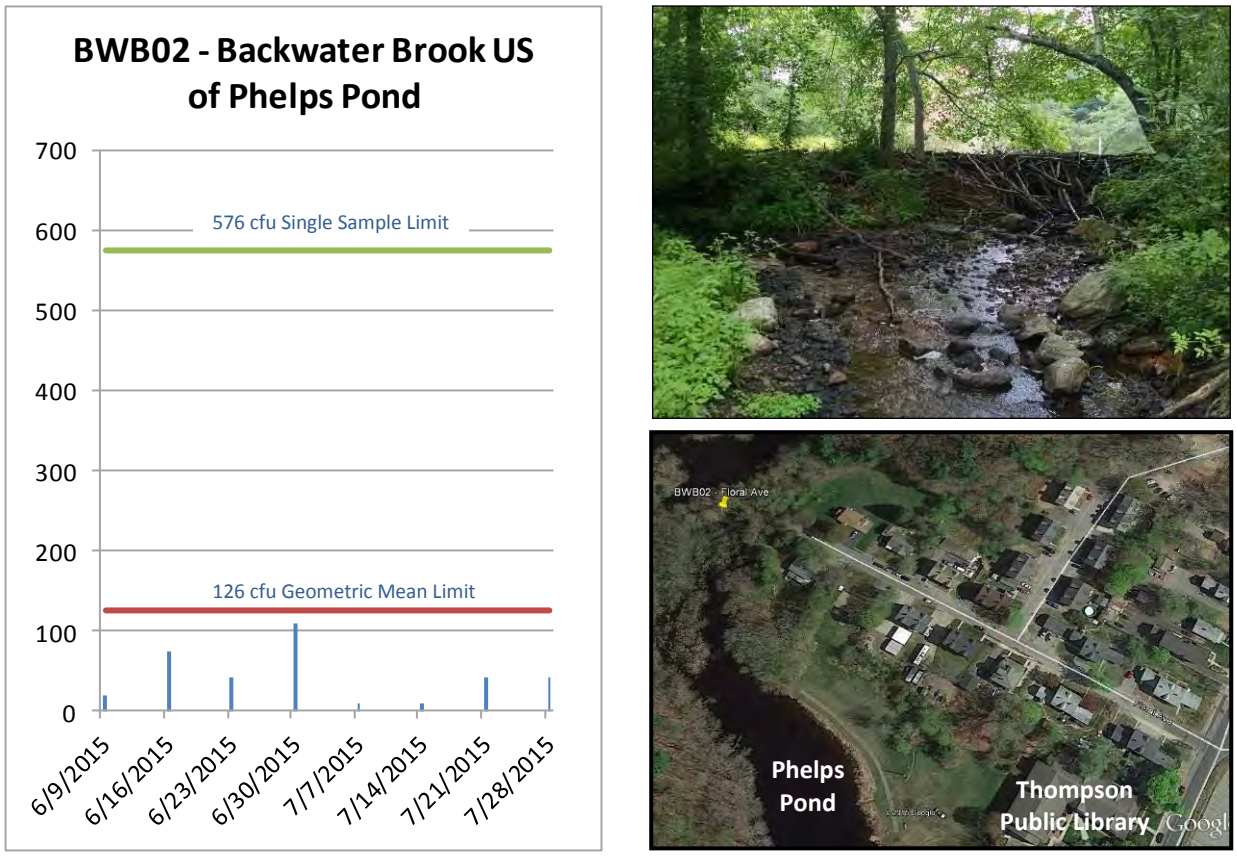


Figure 22. Graph of bacteria sampling results at BWB02; view of a beaver dam on Backwater Brook upstream of the sampling location; and an aerial image of the sampling site location and vicinity.

BWB02 is located on Backwater Brook approximately 300 feet upstream of Phelps Pond, off the end of Floral Avenue. This site is located upstream of dense residential development and was selected to bracket water quality observations at BWB01. The watershed upstream of BWB01 is primarily forested with scattered rural residential development.

Eight water samples were collected at this site. All the samples (100%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 32, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

UN01 – Unnamed stream at State Route 12 and Interstate Route 395:

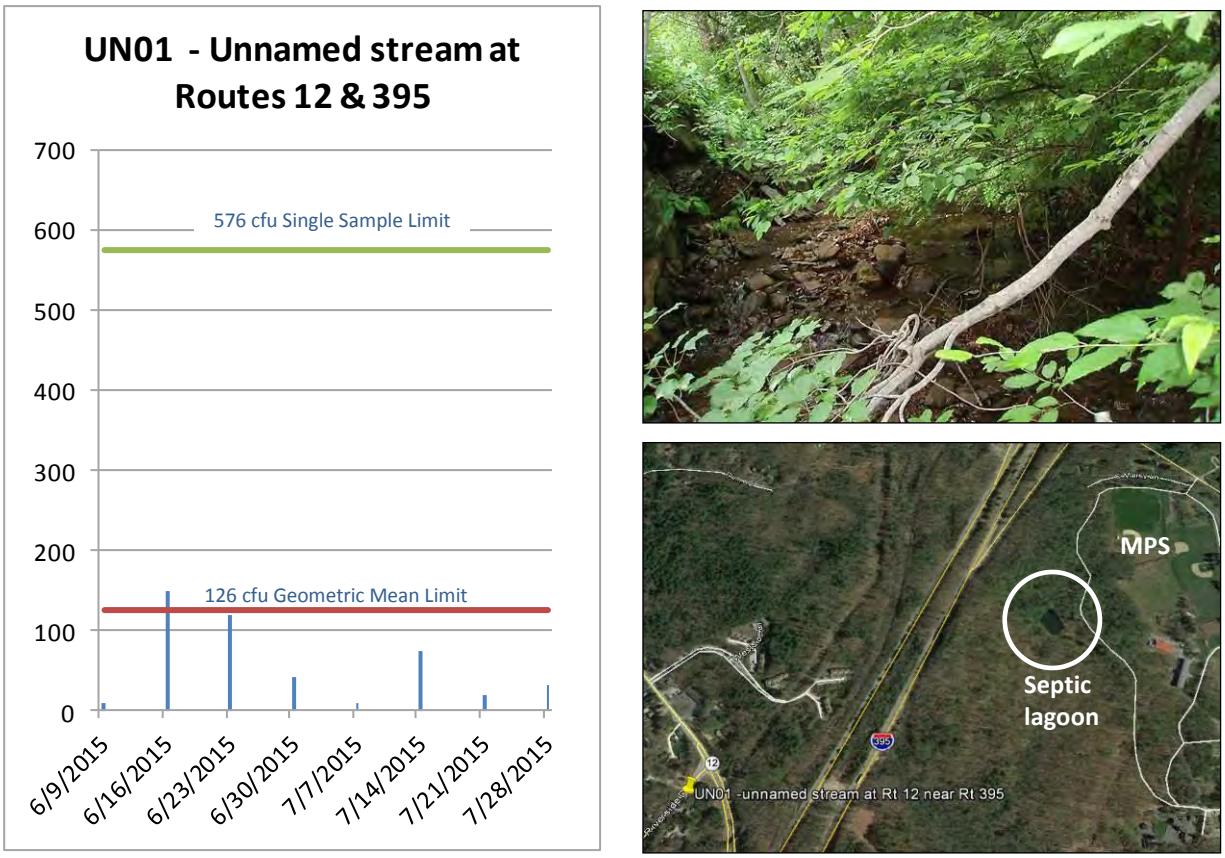


Figure 23. Graph of bacteria sampling results at UN01; view of the unnamed stream upstream of the sampling location; and an aerial image of the sampling site location and vicinity.

UN01 is located on an unnamed stream that originates at the Marianapolis Preparatory School (MPS) property on Thompson Hill, approximately 2700 feet upstream. This stream is suspected of periodically receiving effluent from a septic lagoon. Connection of MPS to the municipal sewer system was underway at the time of this water quality investigation. This stream also receives stormwater runoff from an off-ramp of Interstate Route 395.

Eight water samples were collected at this site. All the samples (100%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 37, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

LMB01 – Little Mountain Brook at Robbins Road:

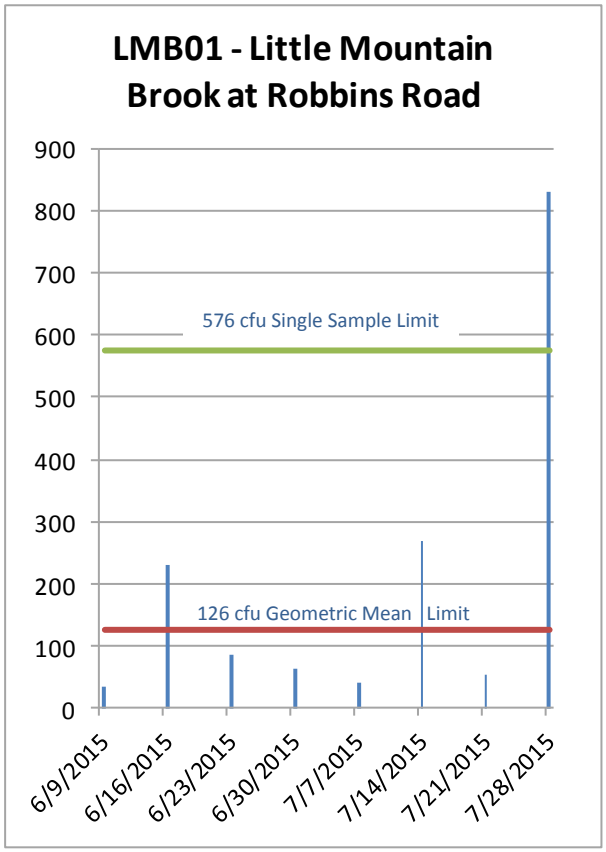


Figure 24. Graph of bacteria sampling results at LMB01; view of Little Mountain Brook at the sampling location; and an aerial image of the sampling site location and vicinity.

LMB01 is located on Little Mountain Brook downstream of the Robbins Road crossing. Little Mountain Brook originates in a small pond known locally as Duck Pond. Land use is in the vicinity of Duck Pond and Little Mountain Brook is a mix of hayfields and rural residential development. This site was selected to quantify bacteria levels in Little Mountain Brook prior to its discharge to the French River.

Nine water samples were collected at this site. Eight of the samples (89%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 96, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site.

QB01 – Quinatissett Brook at Ballard Road:

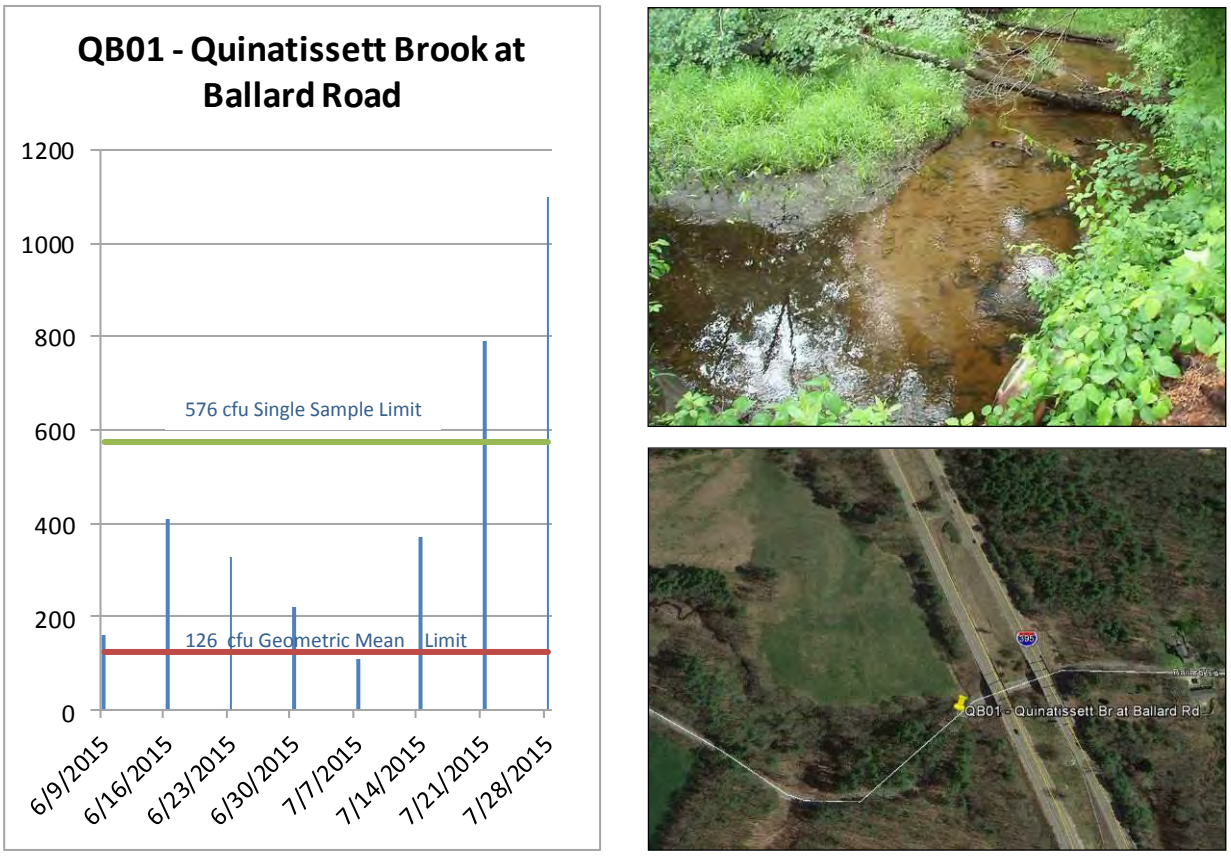


Figure 25. Graph of bacteria sampling results at QB01; view of Quinatissett Brook downstream of the sampling location; and an aerial image of the sampling site location and vicinity.

QB01 is located on Quinatissett Brook at the crossing of Ballard Road. This site is located downstream of agricultural and rural residential land uses. It was selected to characterize bacteria levels in Quinatissett Brook prior to its discharge to the French River.

Eight water samples were collected at this site. Six of the samples (75%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 338, which exceeds the allowable geometric mean of 126 cfu/100 ml. A 63% bacteria reduction is required at this site.

QB02 – Quinatissett Brook at Quinatissett Golf Course, County Home Road (State Route 21):

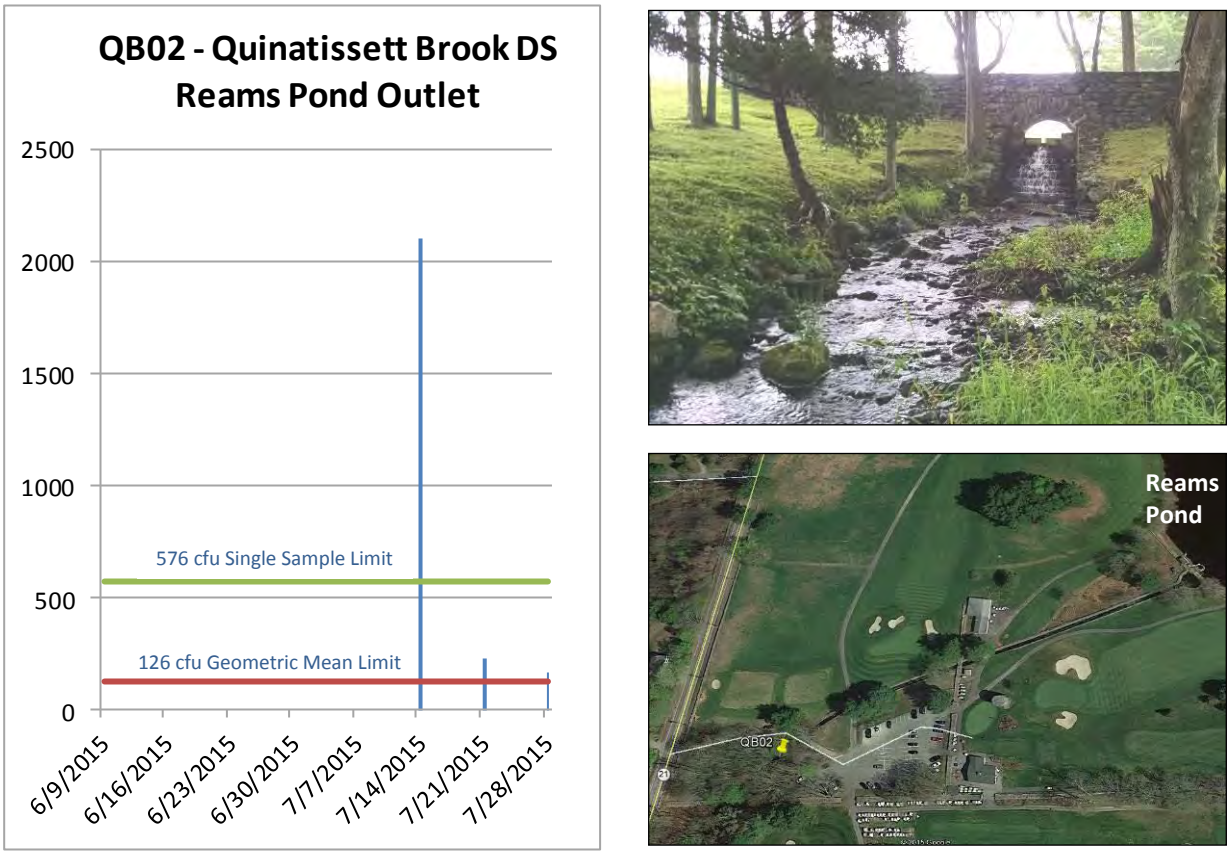


Figure 26. Graph of bacteria sampling results at QB02; view of Quinatissett Brook upstream of the sampling location; and an aerial image of the sampling site location and vicinity.

QB02 is located on Quinatissett Brook approximately 950 feet downstream of the outlet of Reams Pond at the Quinatissett Golf Course on County Home Road (RT 21). This site was added in week six of sampling to bracket upstream bacteria levels that were documented at QB01.

Four water samples were collected at this site. Three samples (75%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 361, which exceeds the allowable geometric mean of 126 cfu/100 ml. A 65% bacteria reduction is required at this site. It should be noted that only four samples were collected from this site during the sampling period, which does not constitute a reliable sample set.

RB01 – Ross Brook at Quaddick Road:

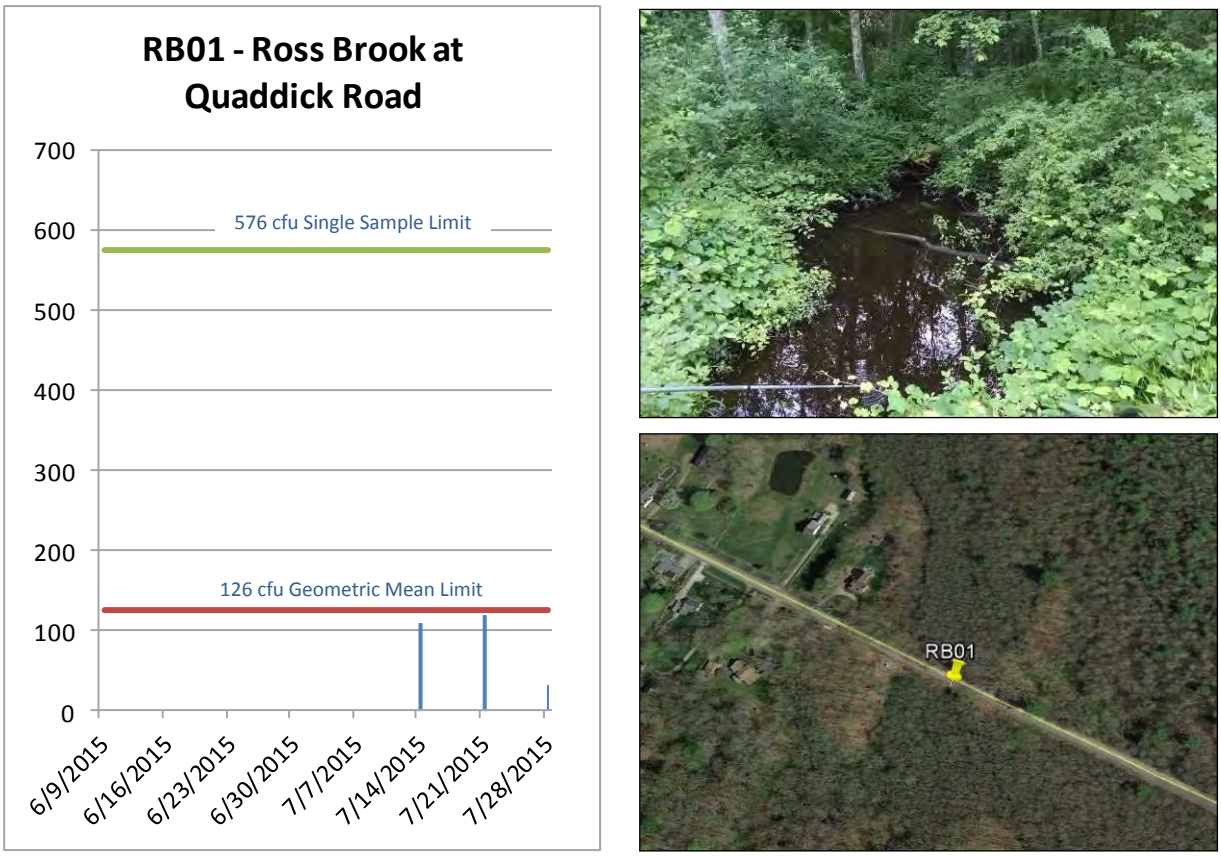


Figure 27. Graph of bacteria sampling results at RB01; downstream view of Ross Brook at the sampling location; and an aerial image of the sampling site location and vicinity.

RB01 is located on Ross Brook at the crossing of Quaddick Road, at the southern end of an extensive red maple wetland known locally as Thompson Meadows. This site was added in week six of sampling to bracket bacteria levels that were documented at QB01, and to isolate potential bacteria sources from nearby Elliott Brook (Ross Brook and Elliott Brook merge a short distance downstream of this site and flow into Reams Pond). There is scattered rural development upstream of this site.

Three water samples were collected at this site. All the samples (100%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 74, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site. It should be noted that only three samples were collected from this site during the sampling period, which does not constitute a reliable sample set.

EB01 – Elliott Brook at Chase Road:

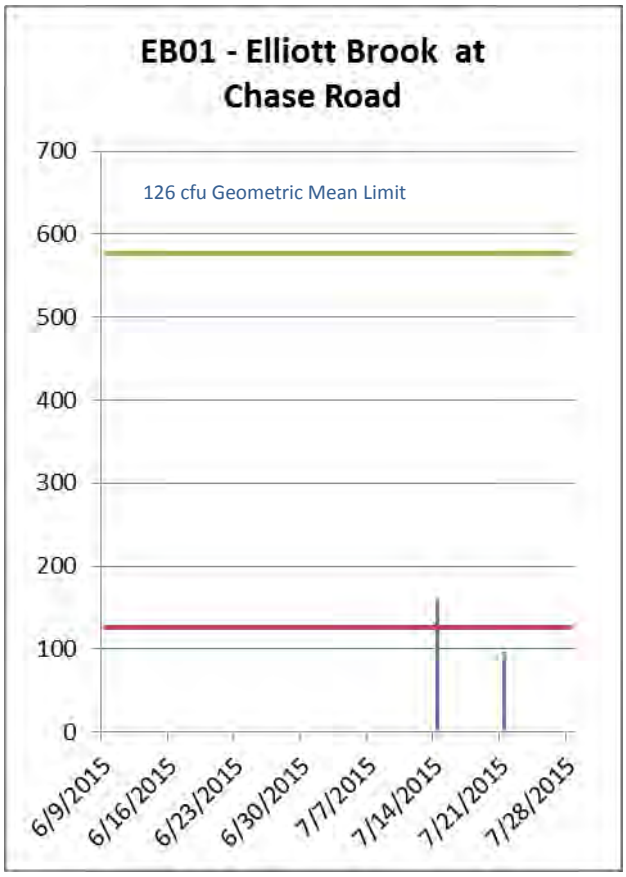


Figure 28. Graph of bacteria sampling results at EB01; view of Elliott Brook at the sampling location; and an aerial image of the sampling site location and vicinity.

EB01 is located at the crossing of Chase Road. This site was added in week six of sampling to bracket bacteria levels that were documented at QB01. This site is located downstream of the confluence of Elliott Brook and Ross Brook.

Two samples were collected at this site. Both samples (100%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 125, which is within the allowable geometric mean of 126 cfu/100 ml. No bacteria reduction is required at this site. It should be noted that only two samples were collected from this site during the sampling period, and do not constitute a reliable sample set.

EB02 – Elliott Brook at Quaddick Road:

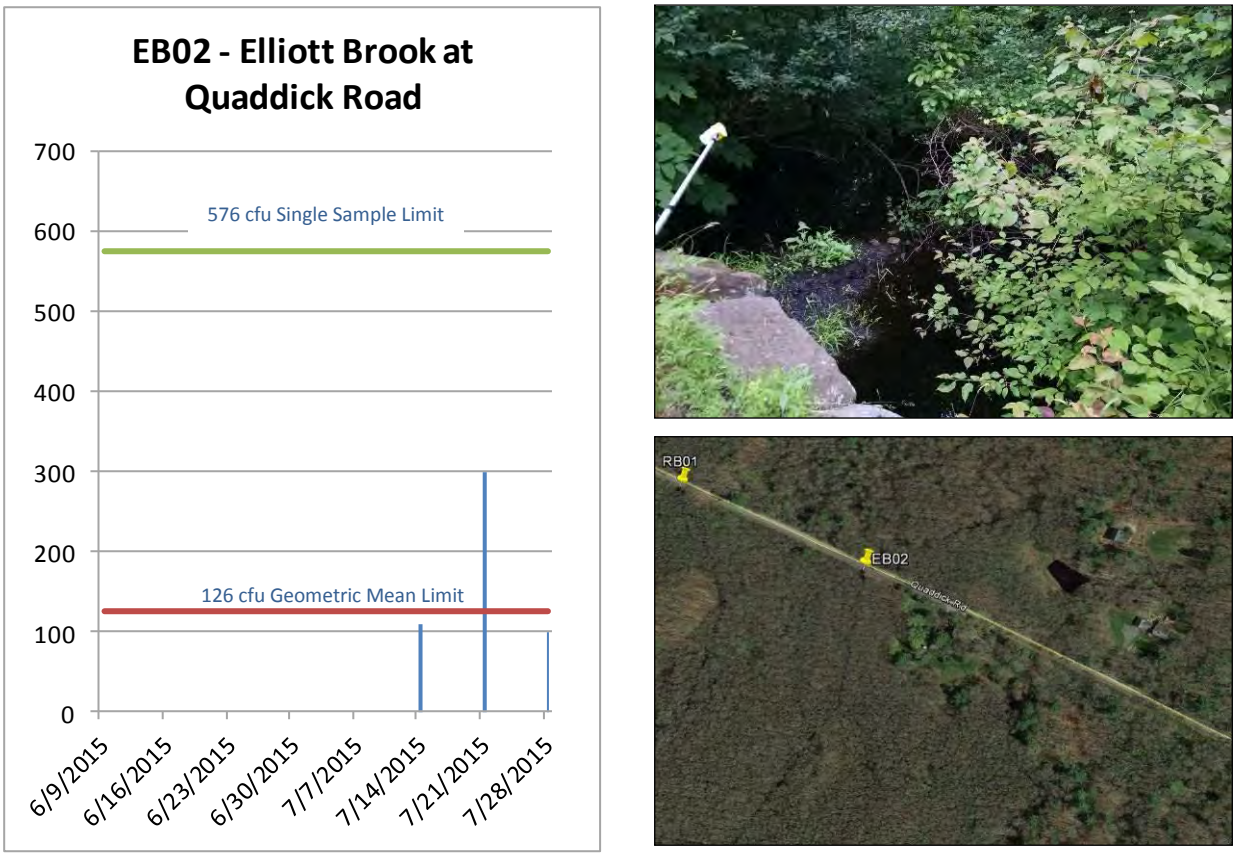


Figure 29. Graph of bacteria sampling results at EB02; view of Elliott Brook at the sampling location; and an aerial image of the sampling site location and vicinity.

EB02 is located on Elliott Brook at the Quaddick Road stream crossing. This site was added in week six of sampling to bracket bacteria levels that were documented at QB01. EB02 is approximately 1650 feet upstream of EB01, and is upstream of the confluence of Ross Brook with Elliott Brook. This site was selected to isolate potential bacteria contributions originating in Elliott Brook from those originating in Ross Brook (Fig. 6). There is scattered rural development upstream of this site.

Three samples were collected at this site. All the samples (100%) met Connecticut water quality standard of 576 cfu/100 ml for single samples. The geometric mean for this site is 148, which exceeds the allowable geometric mean of 126 cfu/100 ml. A 15% bacteria reduction is required at this site. It should be noted that only three samples were collected from this site during the sampling period, and do not constitute a reliable sample set.

Discussion

Bacteria levels at two of the eighteen primary sampling sites failed to meet Connecticut water quality standards for the geometric mean for each sample set. These sites included Backwater Brook downstream of Phelps Pond (BWB01, geomean = 135), near Main Street in North Grosvenordale, and Quinatissett Brook at Ballard Road (QB01, geomean = 338).

Bacteria levels at BWB01 were generally low (84 – 230 cfu/100 ml, with one higher measurement of 340 cfu/100 ml on 7/7/15). None of the samples exceeded the single sample limit of 576 cfu/100 ml. A comparison of bacteria levels at BWB01 to precipitation data collected by the Army Corps of Engineers at nearby West Thompson Lake (Fig. 30) indicates that bacteria levels spike immediately after precipitation. For example, a bacteria level of 215 (the average of 200 and 230 cfu/100 ml, the second value being a sample duplicate) was documented on 6/16/15, one day after a rainfall of 1.4 inches. In the absence of rainfall within 24 or so hours of sampling, bacteria levels in the stream water were generally low, indicating that stormwater runoff may be the primary vector for bacteria transport to Backwater Brook. The exception to this observation is a somewhat aberrant bacteria level of 340 cfu/100 ml collected on 7/7/15, during a period of dry weather. This value may be reflective of a bacteria plug from Phelps Pond due to waterfowl activity or other disturbance, or may be the result of sampling error. It should be noted that several domestic ducks were observed being kept at a property immediately upstream of the sampling site.

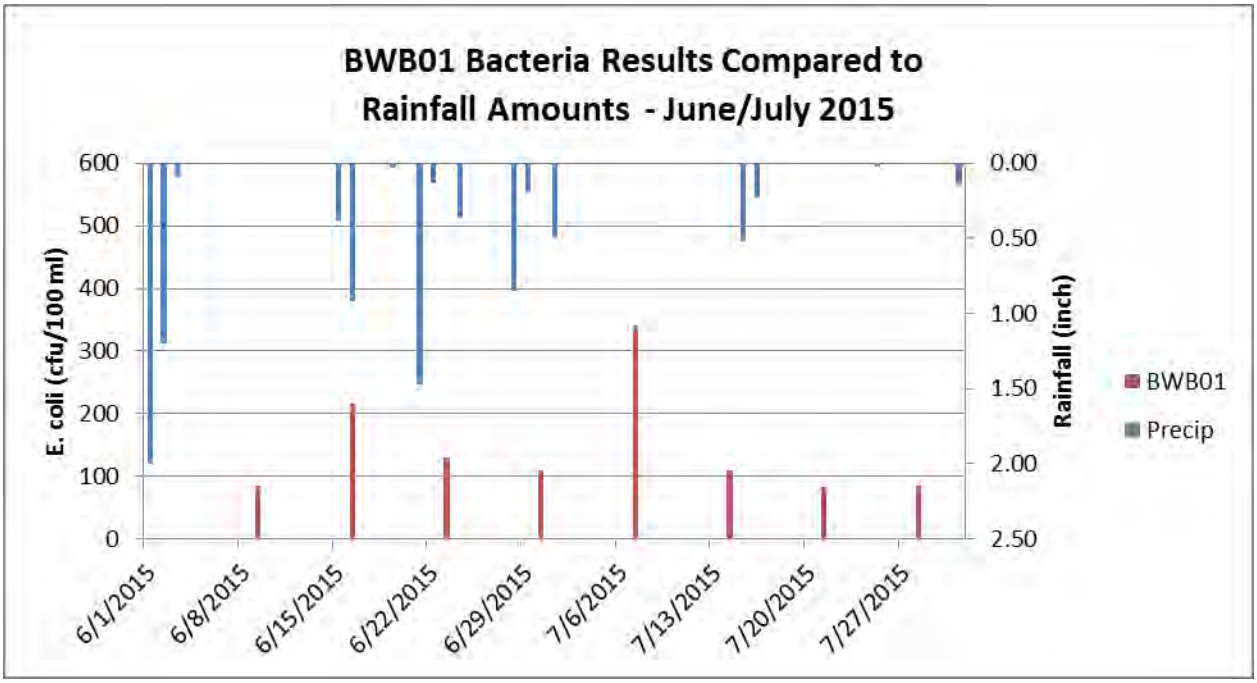


Figure 30. Comparison of bacteria levels at BWB01 (Backwater Brook downstream of Phelps Pond) to occurrence of rainfall.

A second sampling location on Backwater Brook, BWB02, upstream of Phelps Pond, was selected to bracket potential impacts of waterfowl known to utilize the pond for foraging and nesting, and to establish water quality upstream of the municipal sewer service area. Bacteria levels at this site were very low (geomean = 32), indicating that upstream bacteria contributions were insignificant.

A single water sample was collected at a third site on Backwater Brook (BWB0.5) on the final day of sample collection (7/28/15). ECCD staff and water quality volunteers noted a foul odor emanating from a storm drain behind the library (Fig. 31). Backwater Brook is culverted a distance of approximately 250 feet under Main Street and the Thompson Public Library property, before it discharges to the French River (Fig. 31). It is believed that a portion of the storm drain system serving the library parking lot may be tied into the culverted section of stream. A water sample was collected at the outlet of the culvert to determine if discharge from the storm drain system was contributing to bacteria load in Backwater Brook. This single dry weather sample yielded a bacteria level of 820 cfu/100 ml, indicating that further investigation into the layout of the storm drain system at the library should be conducted.

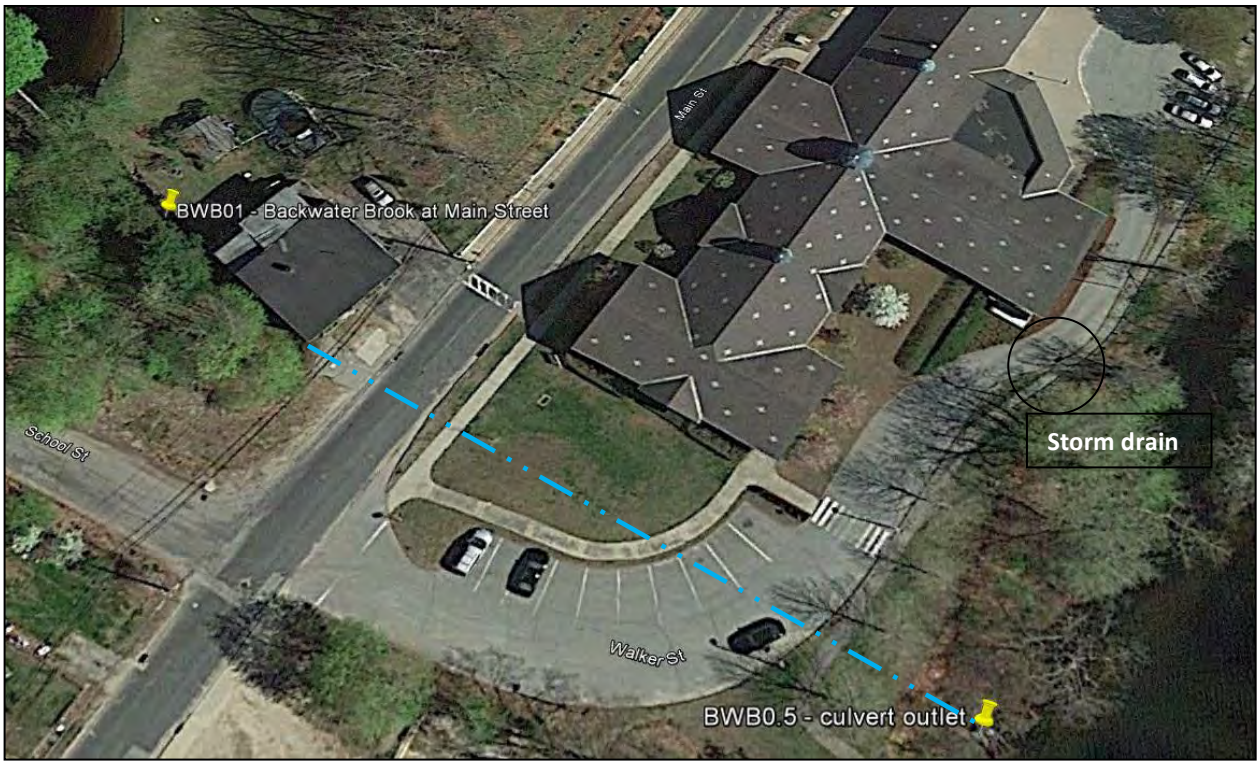


Figure 31. Culverted segment of Backwater Brook (dashed line). Approximately 250 feet of the stream is culverted under Main Street and the Thompson Public Library property.

Bacteria levels in Quinatissett Brook at Ballard Road (QB01) were generally higher than those observed at other sites in the French River watershed (Table 1), and dry weather samples collected on July 21st and 28th exceeded the single sample limit (Fig. 32). Typically, dry weather bacteria spikes indicate point sources, illicit discharges or base flow-related conditions such as

septic system failures. However, there is little nearby development, so potential sources of, or contributing to, the observed bacteria levels are not immediately apparent.

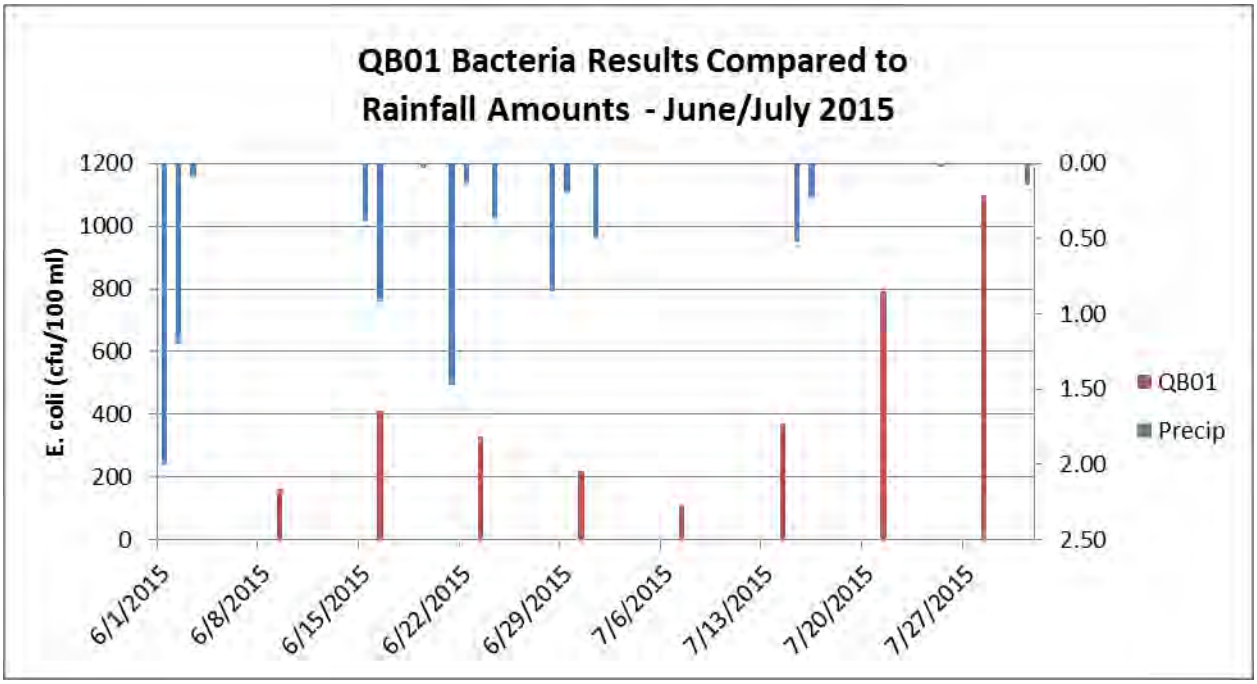


Figure 32. Comparison of bacteria levels at QB01 (Quinatissett Brook at Ballard Road) to occurrence of rainfall.

In order to bracket the bacteria levels observed at QB01, four additional upstream sampling sites were added in week six of sampling. These sites, QB02, RB01, EB01 and EB02 were selected to isolate potential bacteria sources below Reams Pond at the Quinatissett Golf Course (Quinatissett Brook - QB02), upstream of Reams Pond at Chase Road (Elliott Brook - EB01), and at two tributaries (Ross Brook – RB01, and Elliott Brook – EB02) upstream of the Chase Road site (Fig. 2).

The geometric mean of water samples collected at QB02, approximately 950 feet downstream of the outlet of Reams Pond, was 361 cfu/100 ml, which exceeded the established limit of 126 cfu/100 ml for the geometric mean of a sample set. A water sample collected on July 14th during a heavy shower yielded a bacteria level of 2100 cfu/100 ml, exceeding the single sample limit and indicating that pollutants conveyed in stormwater flow may be a significant source of bacteria loading to Reams Pond and Quinatissett Brook.

Potential bacteria sources to Reams Pond and Quinatissett Brook upstream of QB02 include agricultural land along the northeast shoreline, and Quinatissett Golf Course along the southeast, south and southwest shorelines. The shoreline of Reams Pond in the vicinity of the golf course is cleared with the greens extending to the water's edge, potentially creating attractive foraging conditions for waterfowl (Fig. 33). ECCD will follow up with golf course managers to determine if nuisance waterfowl is an issue at the facility.

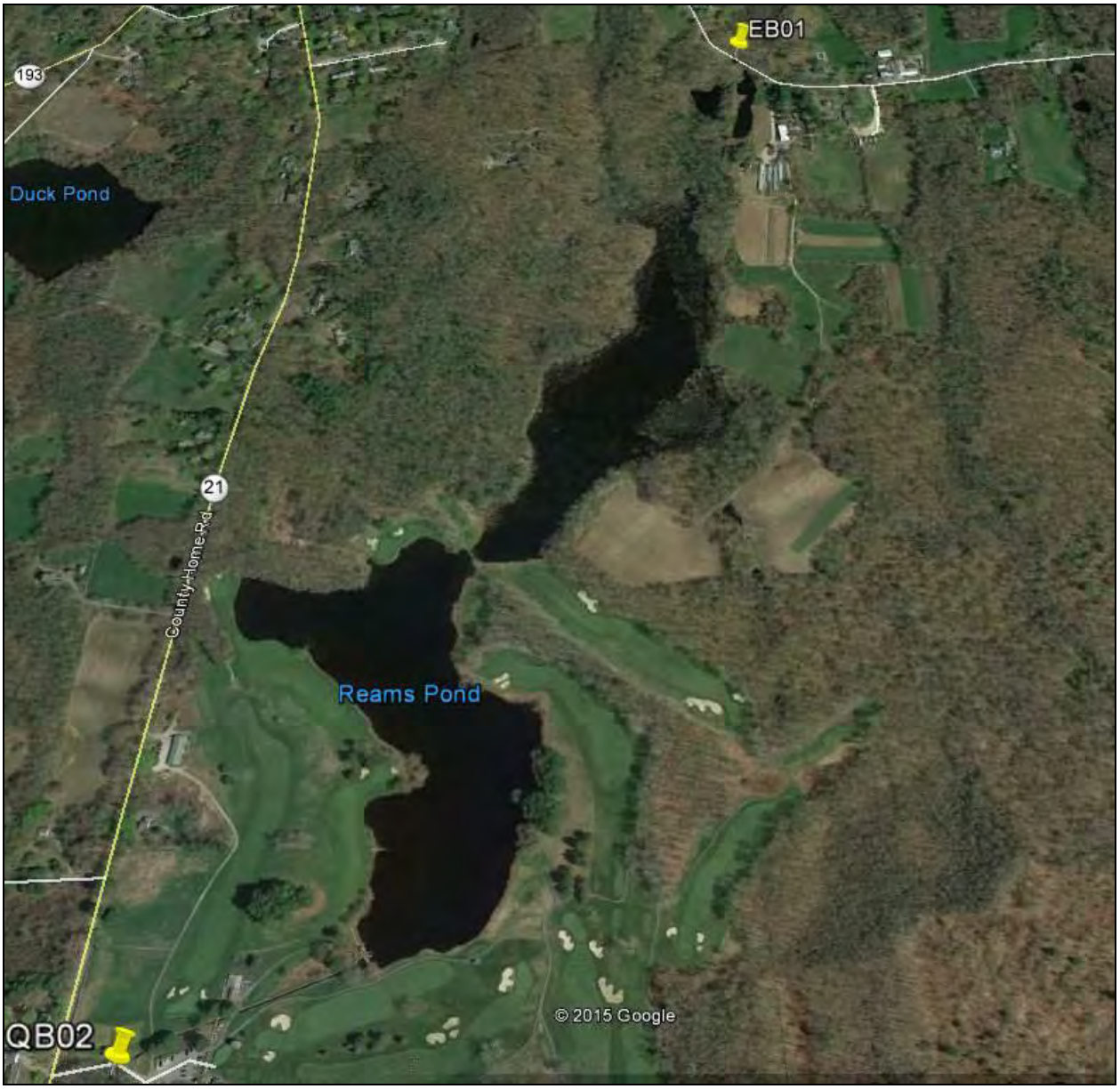


Figure 33. View of land use along Reams Pond, between QB02 and EB01.

Sampling site EB01, located on Elliott Brook at Chase Road, is upstream of the golf course and the agricultural land, and was selected to bracket potential bacteria contributions from those two land uses. The area upstream of EB01 is a forested wetland, with rural residential development along the road frontage. The geometric mean at EB01 was 125 cfu/100 ml, which was within the allowable geometric mean of 126 cfu/100 ml. It should be noted that only two samples were collected at this site, and that the stream was dry on the final day of sampling.

Finally, water samples were collected during the last three weeks of sampling at Ross Brook (RB01) and Elliott Brook (EB02) at Quaddick Road, to isolate bacteria contributions to the lower sampling sites from each of these tributaries. The area upstream of both sites is comprised of a large tract of undeveloped forested wetland known locally as Thompson Meadows. The geomean at RB01 was 74 cfu/100 ml, which was within the allowable geometric mean of 126

cfu/100 ml. The geomean at EB02 was 148 cfu/100 ml, which exceeded the allowable geometric mean. There were no obvious nearby conditions such as residential development or agricultural land that might have contributed to the documented bacteria levels in the stream. However, water levels in the stream were extremely low, and it is possible that low flow and ponding conditions may have concentrated background bacteria levels.

Bacteria levels at all six sampling sites along the French River, from the Massachusetts state line to the confluence with the Quinebaug River, including segment 01 of the French River (CT3300-00_01), were within allowable limits for both geomean and single samples. Segment 01 has been listed in multiple cycles of the DEEP's Integrated Water Quality Report to Congress, most recently in 2010, as impaired for recreation due to periodic high levels of *E. coli*. Likewise, bacteria levels in Long Branch Brook (CT3300-02_01), which was listed in the 2014 Integrated Water Quality Report as impaired for recreation due the presence of *E. coli*, were within allowable limits for both geomean and single samples.

Conclusion

In June and July of 2015, ECCD and TLGV water quality monitoring volunteers collected water samples from a total of twenty-three sites along the French River and its tributaries in Thompson, Connecticut. The water samples were analyzed by the CT Department of Public Health's Microbiology Laboratory for fecal bacteria (*E. coli*) content. A review of the bacteria analysis data indicates that Quinatissett Brook (CT3300-10) and Backwater Brook (CT3300-05) do not currently meet State of Connecticut water quality standards for recreational use. However, the French River, including segment 01 (CT3300-00_01), which has been listed in multiple cycles of the Connecticut Department of Energy and Environmental Protection's Integrated Water Quality Report to Congress, most recently in 2010, and Long Branch Brook (CT3300-02_01), which was listed in the 2014 *Integrated Water Quality Report to Congress* as impaired for recreation due the presence of bacteria, both met established water quality standards.

References

Connecticut, Department of Environmental Protection, *2010 Integrated Water Quality Report*, Final - May 31, 2011, Hartford, CT.

Connecticut, Department of Energy and Environmental Protection, *2014 State Of Connecticut Integrated Water Quality Report*, Draft – July 2014, Hartford, CT.

Connecticut, Department of Energy and Environmental Protection, *Water Quality Standards,* October 2013, Hartford, CT.

Appendix B

Priority Restoration List Report

EASTERN CONNECTICUT CONSERVATION DISTRICT, INC.

238 West Town Street
Norwich, CT 06360-2111
(860) 887-4163, Ext. 400

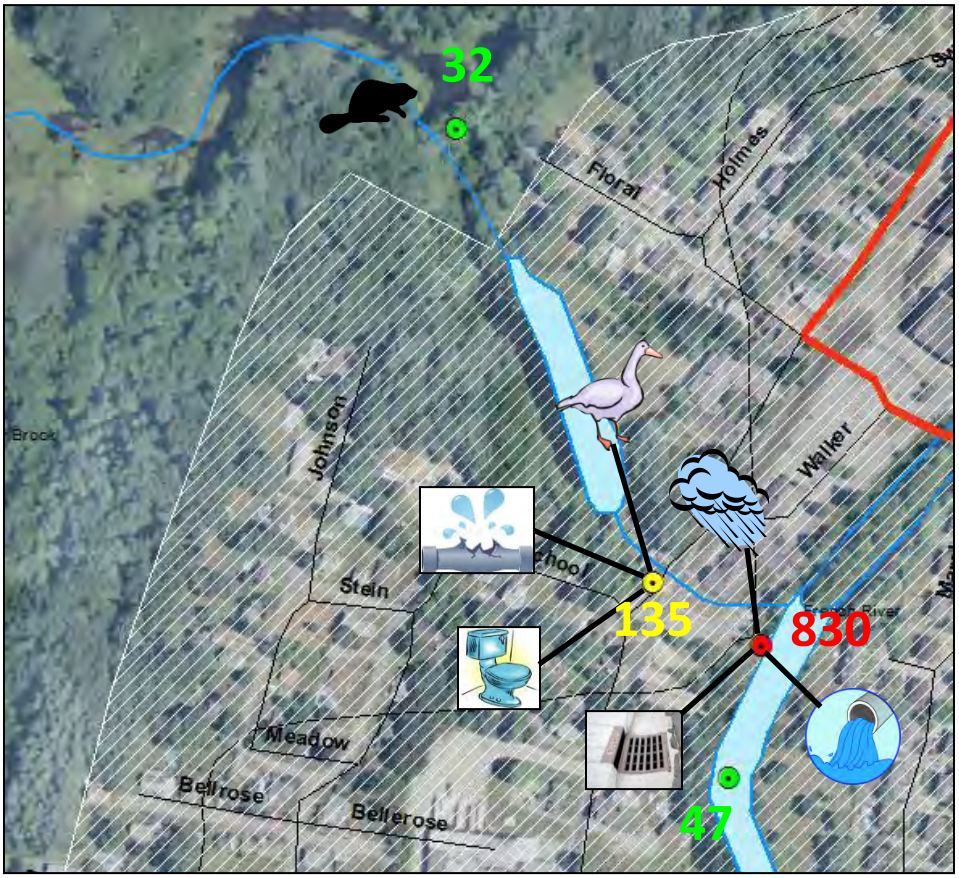
139 Wolf Den Road
Brooklyn, CT 06234
(860) 774-9600

www.ConserveCT.org/eastern

Contract 12-05f
French River Watershed-Based Plan and Implementation Action

Eastern Connecticut Conservation District
March 25, 2016
Revised April 7, 2016

Task 1f – Develop a Priority Restoration List



This project is funded in part by CT DEEP through a US EPA Clean Water Act §319 Nonpoint Source Program grant.

Introduction

The Eastern Connecticut Conservation District (ECCD) received funding from the Connecticut Department of Energy and Environmental Protection (CT DEEP) through the Clean Water Act Section 319 Nonpoint Source program to conduct a water quality investigation of the French River (CT3300-00_01) and Long Branch Brook (CT3300-02_01, a local watershed located within the French River regional watershed) in Thompson, Connecticut (Fig. 1). The purpose of the investigation is to identify potential sources of fecal bacteria that have impacted water quality and resulted in the periodic inclusion of both waterbodies in the State of Connecticut's Impaired Waters (303d) list. Information collected during the course of this investigation will be used to develop a watershed management plan for the portion of the French River watershed located in Connecticut.

In addition to the impaired stream segments in Connecticut, the French River, which has its headwaters in the central Massachusetts town of Leicester, also has several impaired segments in Massachusetts. These segments, including two just across the Connecticut-Massachusetts state line in Dudley and Webster, are impaired for recreation due to the presence of *E. coli.* Additional information about these impaired waters can be obtained at: http://iaspub.epa.gov/tmdl_waters10/attains_impaired_waters.control?p_state=MA.

In order to address potential fecal bacteria sources from across the state line that may contribute to fecal bacteria levels noted in both the French River and Long Branch Brook in Connecticut, ECCD has consulted with Massachusetts Department of Environmental Protection (MADEP) staff to conduct a complementary water quality investigation in Massachusetts. To conduct this investigation, ECCD proposes to partner with The Last Green Valley, Inc. through Volunteer Water Quality Monitoring Program participants based in Dudley (The French River Connection) and Webster (Webster Lake Association), Massachusetts, the Towns of Dudley and Webster and the Central Massachusetts Regional Planning Commission.

For the purposes of Task 1f – *Develop a priority restoration list*, upon completion of water quality sampling in 2015, ECCD reviewed the water quality data in order to identify bacteria "hot spots," or localized stream segments with high fecal bacteria levels. ECCD identified two fecal bacteria hot spots in the French River watershed within Thompson, Connecticut. ECCD evaluated the land uses surrounding these areas to identify potential fecal bacteria sources for further investigation, and developed a priority restoration list for use within the watershed plan.

Procedure

In June and July 2015, ECCD and volunteers from The Last Green Valley Volunteer Water Quality Monitoring Program collected water samples from twenty-three locations on the French River and perennial tributary streams within the Connecticut portion of the regional watershed for fecal bacteria analysis (Fig. 2). The selection of the water sampling sites was based in part on information and recommendations made in the *Statewide Total Maximum Daily Load (TMDL) Analysis for Bacteria Impaired Waters* (CT DEEP, 2012), and the accompanying *French River Watershed Summary Report* (CT DEEP, 2012). Data collection was conducted in accordance with a water quality monitoring plan submitted to DEEP in March 2015, utilizing sampling protocols specified in The Last Green Valley Volunteer Water Quality Monitoring Program Bacteria Sampling Quality Assurance Project Plan (QAPP). This QAPP (US EPA Tracking Number RFA #13504) was approved by CT DEEP and US Environmental Protection Agency (US EPA) in June 2012.

Water samples were processed by the Connecticut Department of Public Health (DPH) Microbiology Laboratory in Rocky Hill, CT and forwarded to ECCD for review. Bacteria results were tabulated and evaluated by ECCD (Table 1). The 2013 Connecticut Water Quality Standards establish water quality criteria for indicator bacteria, including *E. coli*, which is the preferred indicator bacterium for fresh waterbodies. For recreational contact, excluding designated and non-designated swimming areas, the single sample maximum is 576 colony-forming units (cfu) per 100 milliliters of water and the maximum sample set geometric mean is less than 126 cfu/100 ml.

ECCD reviewed the bacteria data to identify "hot spots," areas where stream fecal bacteria levels consistently exceeded established water quality standards. ECCD considered sampling sites to be hot spots if the geometric mean exceeded established limits, and if one or more single sample results also exceeded established limits. Upon identification of fecal bacteria hot spots, ECCD reviewed the surrounding land uses (Fig. 3) in order to identify possible bacteria sources, including the presence of agriculture, livestock, pets, wildlife, stormwater runoff, underperforming septic systems, sewer line leaks and illicit discharges.

Based on the review of potential bacteria sources, ECCD prepared a prioritized restoration list identifying possible stormwater management practices that could be implemented to improve water quality at each site. The priority restoration list was presented to French River stakeholders at a project status meeting at the Thompson Town Hall on February 29th. Stakeholders present included the Thompson first selectman, municipal land use staff and an

Inland Wetlands Commissioner. Additional stakeholders including several key watershed land managers/owners and town staff were not able to attend. The project partners/stakeholders reviewed the draft priority restoration list and discussed potential bacteria sources and management actions at each of the bacteria hot spots. Based on that discussion, ECCD prepared the French River priority restoration list presented as Table 2.

Results

ECCD identified two stream segments where in-stream fecal bacteria levels consistently exceeded established water quality standards for both single samples and the geometric mean; Quinatissett Brook (sampling sites QB02 and QB01), from the confluence with the French River to the outlet of Reams Pond, and Backwater Brook (sampling sites BWB01 and BWB0.5), from the confluence with the French River to the outlet of Duhamel Pond (Fig. 4). ECCD reviewed the surrounding land uses in order to identify possible fecal bacteria sources (Fig. 5), and prepared a prioritized restoration list identifying possible stormwater management practices that could be implemented to improve water quality at each site (Table 2).

Eighteen of the remaining nineteen sampling sites, including sampling sites at the two stream segments that were listed as impaired, the French River (CT3300-00_01, from the confluence with the Quinebaug River to the outlet of North Grosvenordale Pond) and Long Branch Brook (CT3300-02_01), met established water quality standards. The remaining sampling site, EB02, located on Elliott Brook at Quaddick Road, did not meet the established water quality standard for the sample set geometric mean, although the individual water samples did meet the single sample criteria. However, since only three samples were collected at this site, additional sampling should be conducted to provide a more comprehensive data set for evaluation.

Discussion

ECCD identified two stream segments that did not meet Connecticut water quality standards for recreational use due to high levels of indicator fecal bacteria. These two stream segments, Backwater Brook downstream of Duhamel Pond (BWB01, geomean = 135 cfu/100ml), near Main Street in North Grosvenordale, and Quinatissett Brook downstream of Reams Pond at Quinatissett Golf Course (QB02, geomean = 361 cfu/100ml), were designated priority restoration sites. Each site was evaluated to identify potential fecal bacteria sources, and potential mitigative activities have been proposed.

Quinatissett Brook at Ballard Road (QB01, geomean = 338 cfu/100ml) also failed to meet Connecticut water quality standards for the geometric mean, and had several single sample exceedances, but it is unclear if documented bacteria levels at that site are the result of bacterial loading from nearby sources or reflective of bacteria levels documented at QB02, located approximately 5500 feet upstream. It should be noted that ECCD added sampling site QB02 (as well as several sampling sites upstream of QB02) six weeks into the sampling cycle to bracket and/or isolate the bacteria levels documented at QB01. As a result, the geomean of 361 cfu/100ml is comprised of 3 sampling events and may not constitute a reliable sampling set.

Priority Restoration Site #1 - Backwater Brook: Backwater Brook is located in the North Grosvenordale section of Thompson, a densely developed industrial-era mill village. Surrounding land use is predominantly suburban/urban residential, with intermixed small and medium-sized commercial businesses. North Grosvenordale is served by municipal sewer and a storm drain system that discharges to the French River. BWB01 is located on a channelized segment of Backwater Brook approximately 75 feet downstream of the outlet of Duhamel Pond, a small (±2 acre) town-owned impoundment of Backwater Brook. The pond is used by a small number of waterfowl, including several domestic ducks. A short distance downstream of the sampling site, Backwater Brook is culverted ±250 feet under Main Street and the Thompson Public Library property before it daylights near the French River (Fig. 6). The library site was redeveloped in 1994, following the destruction (in the 1970s) of many of the previous structures on-site by a fire. Much of the existing infrastructure, including a public right-of-way (Walker Road) and sewer and water lines, was discontinued as part of the site redevelopment (Fig. 7). A walking path along the French River (the DEEP-funded French River Walk) passes through the library parcel. This path is well-used by residents and is popular with dog walkers. It has been observed that dog owners are not diligent about cleaning up after their animals and dog feces are commonly found along the walking path, the lawn at the library and also on sidewalks along Main Street, which is served by storm drains that discharge to both Backwater Brook and the French River.

Based on an evaluation of land use in the vicinity of Backwater Brook, suspected sources of fecal bacteria (Fig. 8) that were documented in Backwater Brook include:

- waterfowl observed at Duhamel Pond;
- unauthorized/un-sewered properties;

- sewer line leaks, including the abandoned sewer main and laterals on the library parcel;
- grey water (which is waste water from domestic sources such as kitchen, bathroom, or laundry, but **not** the toilet) discharges to old septic systems or dry wells;
- fecal bacteria contained in stormwater runoff, including canine fecal bacteria; and
- illicit discharges to the existing storm drain system. An illicit discharge is a discharge to the storm drain system that is not composed of stormwater. This could include the discharge of household waste (grey and black water), automotive chemicals such as gasoline, oil or antifreeze, and carwash waste water.

Suggested management activities include:

- manage animal waste and waterfowl at Duhamel Pond;
- verify that all properties abutting Duhamel Pond are properly connected to the sanitary sewer system;
- conduct sewer main inspections/regular maintenance; verify the abandoned sewer main at the former Walker Road is not conveying waste;
- identify/verify presence of greywater discharges;
- reduce, infiltrate and/or treat stormwater runoff from surrounding developed area (roads, sidewalks, driveways, buildings, parking lots) prior to discharge to Backwater Brook and the French River;
- encourage dog owners/walkers to clean up after their pets; and
- identify and eliminate illicit discharges to the existing storm drain network.

Priority Restoration Site #2 - Quinatissett Brook: Quinatissett Brook is located in the southeast corner of Thompson. The Quinatissett Brook watershed is predominantly rural, with intermixed rural residential development, agricultural land and large tracts of forest. There are a variety of livestock (including horses, cattle, goats and sheep) scattered throughout the watershed; one small commercial agriculture operation (farm stand) that grows vegetables and flowers; and numerous fields that produce silage and hay. A golf course (Quinatissett Golf Course) is located along the southern end of Reams Pond on State Route 21 (County Home Road). Residences are served by on-site septic systems and private drinking water wells. Storm drainage is sporadic; most roads are crowned to shed storm water to the shoulders.

Quinatissett Brook begins at the outlet of Reams Pond, a ±30 acre impoundment of Elliott Brook, and flows west approximately 1¾ miles to the French River. Land along the northeast

shore of Reams Pond is under cultivation by the farm stand. The farm stand owner has reported that he does not spread manure on the fields, but instead uses commercial fertilizers. Beef cattle are pastured in a field adjacent to an unnamed stream that flows into Elliott Brook south of sampling site EB01 on Chase Road. This stream was not sampled. Several horses are enclosed in a paddock located on the north side of Chase Road, upstream of EB01 and to the west of Elliott Brook. The paddock slopes to a wetland area adjacent to and contiguous with Elliott Brook. Both of these sites may be sources of fecal bacteria.

Quinatissett Golf Course wraps around the southern shore of Reams Pond. The shoreline along the greens is managed to the water's edge, potentially creating attractive foraging conditions for waterfowl. Golf course managers report periodic use of the greens by Canada geese, although not in large numbers. Golf course managers have also reported that the age and location of the club house septic system is unknown. As the French River watershed-based plan is developed, additional research into this subsurface waste system should be conducted by ECCD or other project partners. Soils at the golf course include Canton and Charlton soils and Sutton fine sandy loams. These moderately well-drained soils are shallow, have seasonally high groundwater, and overlay basal till, potentially creating conditions wherein incomplete renovation of septic leachate may occur.

Once Quinatissett Brook flows under State Route 21, it winds through a rural residential neighborhood (Robbins Road and Ballard Road), intermixed with agricultural fields and pastures, prior to discharging to the French River. Cultivated fields on the west side of RT 21, across from Quinatissett Golf Course, are used to grow silage and hay. A wetland system adjacent to these fields drains under Robbins Road to Quinatissett Brook. The farmer who manages these fields reports he uses commercial fertilizers including Milorganite. Milorganite is the trade name of a commercial fertilizer that is derived from wastewater treatment bio-solids and is produced by the Milwaukee Metropolitan Sewerage District. Milorganite is superheated during the manufacturing process to kill pathogens, and as a result, is not considered a bacteria source.

Livestock kept or pastured in the vicinity of Quinatissett Brook on Robbins and Ballard Roads includes horses and goats. Sheep are pastured at a property on State Route 21 at the Putnam town line, in the vicinity of an unnamed stream that flows to Quinatissett Brook. This stream was not sampled for bacteria content. It should be noted that bacteria levels at QB01, located at the Ballard Road crossing of Quinatissett Brook, may not be caused by bacteria loading from

nearby land use activities, but may be reflective of higher bacteria levels derived from sources at or upstream of Reams Pond.

Based on an evaluation of land use in the vicinity of Quinatissett Brook (Fig. 9), suspected sources of fecal bacteria include:

- underperforming/failing septic system at Quinatissett Golf Course;
- underperforming/failing septic systems on Robbins Road and Ballard Road;
- waterfowl at Reams Pond;
- livestock upstream of Reams Pond; and
- livestock on RT 21, Robbins Road and Ballard Road.

Suggested management activities include:

- dye test of the septic system at Quinatissett Golf Course;
- bacteria DNA test and other investigations, as needed, to determine possible bacteria host(s);
- waterfowl management at the golf course; and
- promotion of pasture and animal manure best management practices among livestock owners.

In addition to the site-specific fecal bacteria sources provided above, the *French River Watershed TMDL Summary* (CT DEEP, 2012) identifies several potential non-point sources of bacteria in the watershed as a whole, including:

- stormwater run-off from developed areas;
- insufficient septic systems and illicit discharges;
- agricultural activities; and
- wildlife and domestic animal waste.

To address the potential non-point sources of bacteria throughout the Connecticut portion of the French River watershed, the Summary recommends:

- the use of Low Impact Development (LID) and Best Management Practices (BMPs), including of the use of riparian buffer zones, to control stormwater runoff in developed and agricultural areas;

- the evaluation of municipal education and outreach programs regarding animal waste;
- the development of a system to monitor septic systems;
- continued monitoring of permitted sources, including the Tilcon Connecticut Inc. operation (currently inactive), and the Town of Thompson Muncipal Stormwater MS4 permit; and
- municipal compliance with the MS4 program.

Conclusion

In summer of 2015, ECCD and TLGV water quality monitoring volunteers collected water samples from twenty-three sites along the French River and its tributaries in Thompson, Connecticut following an approved water monitoring plan and Quality Assurance Project Plan. The water samples were analyzed by the CT Department of Public Health's Microbiology Laboratory for fecal bacteria (*E. coli*) content. Segment 01 (CT3300-00_01) of the French River, which extends from the confluence with the Quinebaug River to the outlet of North Grosvenordale Pond, and which has been listed in multiple cycles of the CT DEEP's Integrated Water Quality Report to Congress (most recently in 2010) met water quality standards for recreational activities. Long Branch Brook (CT3300-02_01), which was listed in the 2014 *Integrated Water Quality Report to Congress* as impaired for recreation due to the presence of fecal bacteria, also met established water quality standards for recreational activities, which is supportive of the DEEP recommendation for delisting.

However, a review of the bacteria data indicates that Quinatissett Brook (CT3300-10) downstream of Reams Pond, and Backwater Brook (CT3300-05) downstream of Duhamel Pond do not currently meet State of Connecticut water quality standards for recreational use. ECCD evaluated land uses in the vicinity of each stream to identify possible bacteria sources. Based on the land use evaluation, ECCD and watershed stakeholders prepared a priority restoration list identifying possible management actions to address the bacteria sources. This priority restoration list will be used to develop management recommendations in the French River watershed management plan, and to provide guidance on measuring progress and making adjustments to the overall watershed management efforts.

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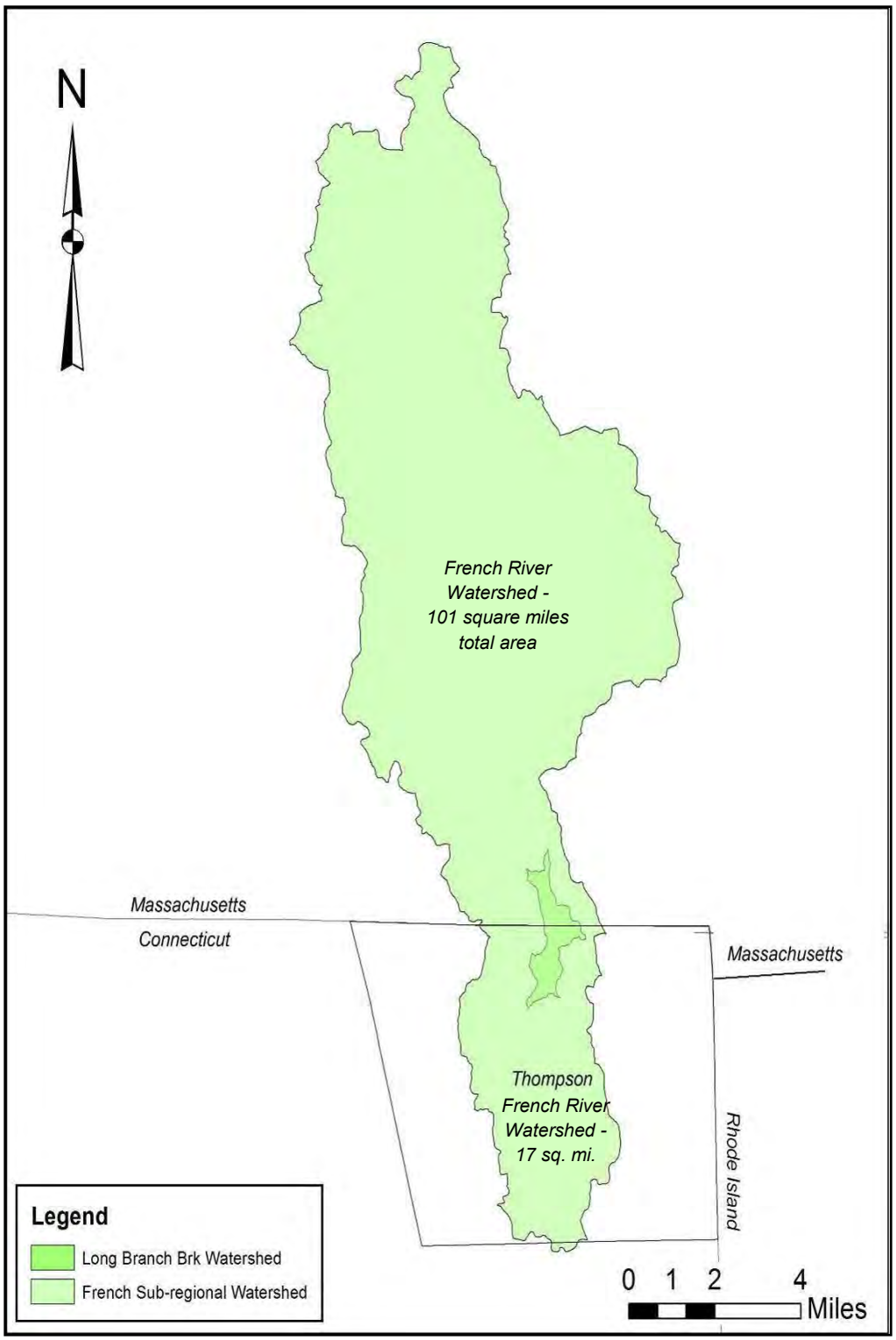

Figure 1. The French River sub-regional watershed in Massachusetts and Connecticut. The Long Branch Brook local watershed is depicted in dark green.

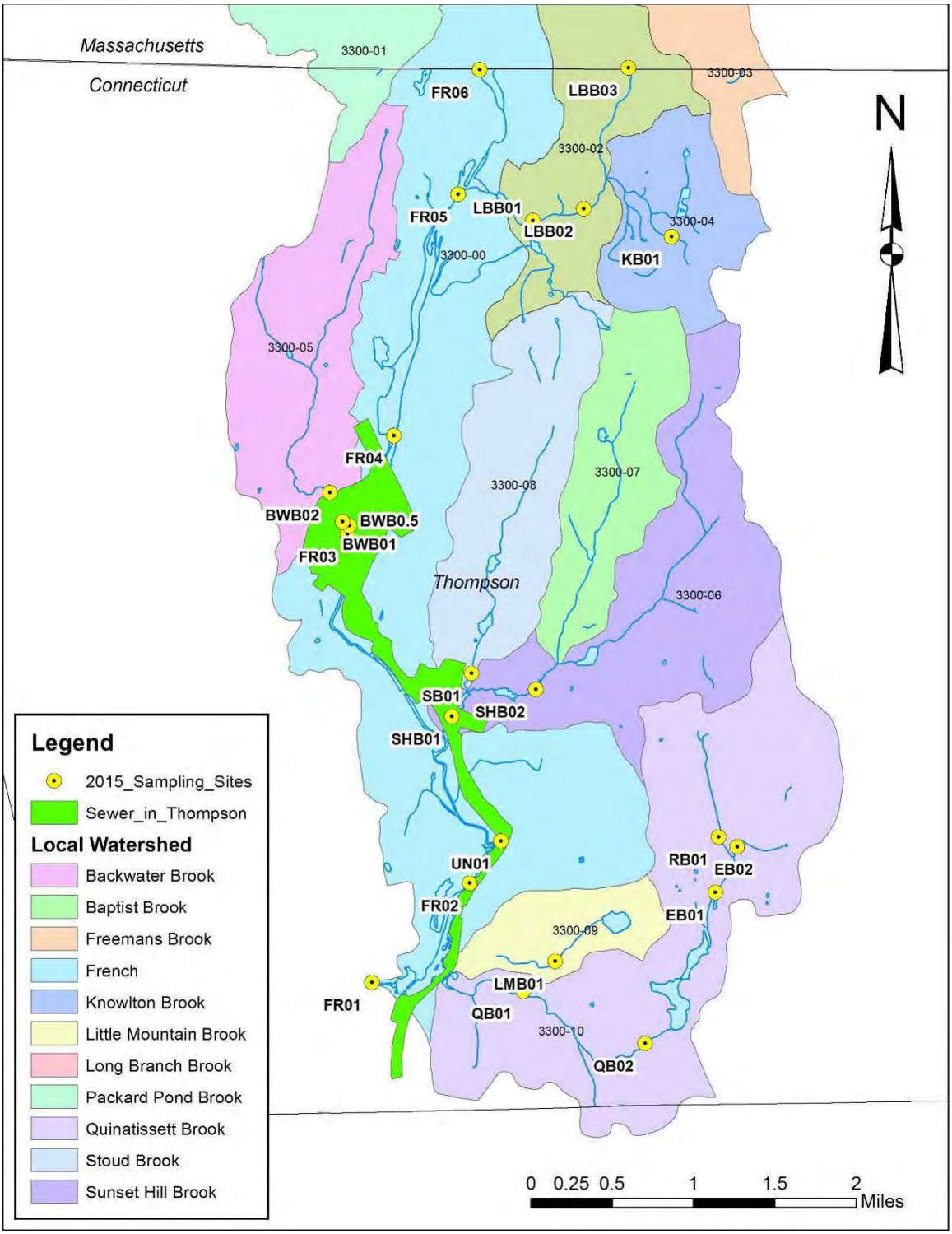

Figure 2. French River watershed fecal bacteria sampling sites. Local watersheds are delineated. The municipal sewer district is depicted in green.

Table 1. French River watershed fecal bacteria sampling results.

Site	6/9/15	6/16/15	6/23/15	6/30/15	7/7/15	7/14/15	7/21/15	7/28/15	geomean
FR01	20	420	140	85	41	31	86	86	74
FR02	75	63	110	110	110	52	170 (D=160)	120	101
FR03	130	51	200	31	20 (D=10)	31	74	75 (D=41)	47
FR04	<10	10	73	<10	<10	<10	20	<10	14
FR05	41	230	63	20	31	63	63	75	57
FR06	75	300	74	52	52	150	52	96	87
LBB01	20	560	110 (D=52)	10	<10	84	20	10	36
LBB02	20	360	160	85	74	31	<10	41	56
LBB03	<10	280	170	63	20	98	52	63	61
KB01	84	**880**	98	85	31	63 (D=73)	20	110	83
SHB01	96	320	53	31 (D=20)	98	160	**1400**	320	124
SHB02	10	63	41	41	<10	20	31	<10	22
SB01	41	98	63	31	31	10 (D=10)	75	41 (D=20)	33
BWB0.5								**820**	---
BWB01	86	200 (D=230)	130	110	340	110	84	85	**135**
BWB02	20	73	41	110	<10	<10	41	41	32
UN01	10	150	120	41	10	73	20	31	37
LMB01	41 (D=30)	230	84	63	41	270	52	**830**	96
QB01	160	410	330	220	110	370	**790**	**1100**	**338**
QB02						**2100**	280 (D=170)	170	**361**
RB01						110	120	31	74
EB01						160	97	---	125
EB02						110	300	98	**148**
Wet/Dry	dry	wet	dry	dry	dry	dry	dry/wet*	dry	dry

* Began to rain midway through sampling

The 2013 Connecticut Water Quality Standards establish water quality criteria for indicator bacteria, including *E. coli*, which is the preferred indicator bacterium for fresh waterbodies. For recreational contact, excluding designated and non-designated swimming areas, the single sample maximum is 576 colony-forming units (cfu) per 100 milliliters of water and the maximum sample set geometric mean is less than 126 cfu/100 ml.

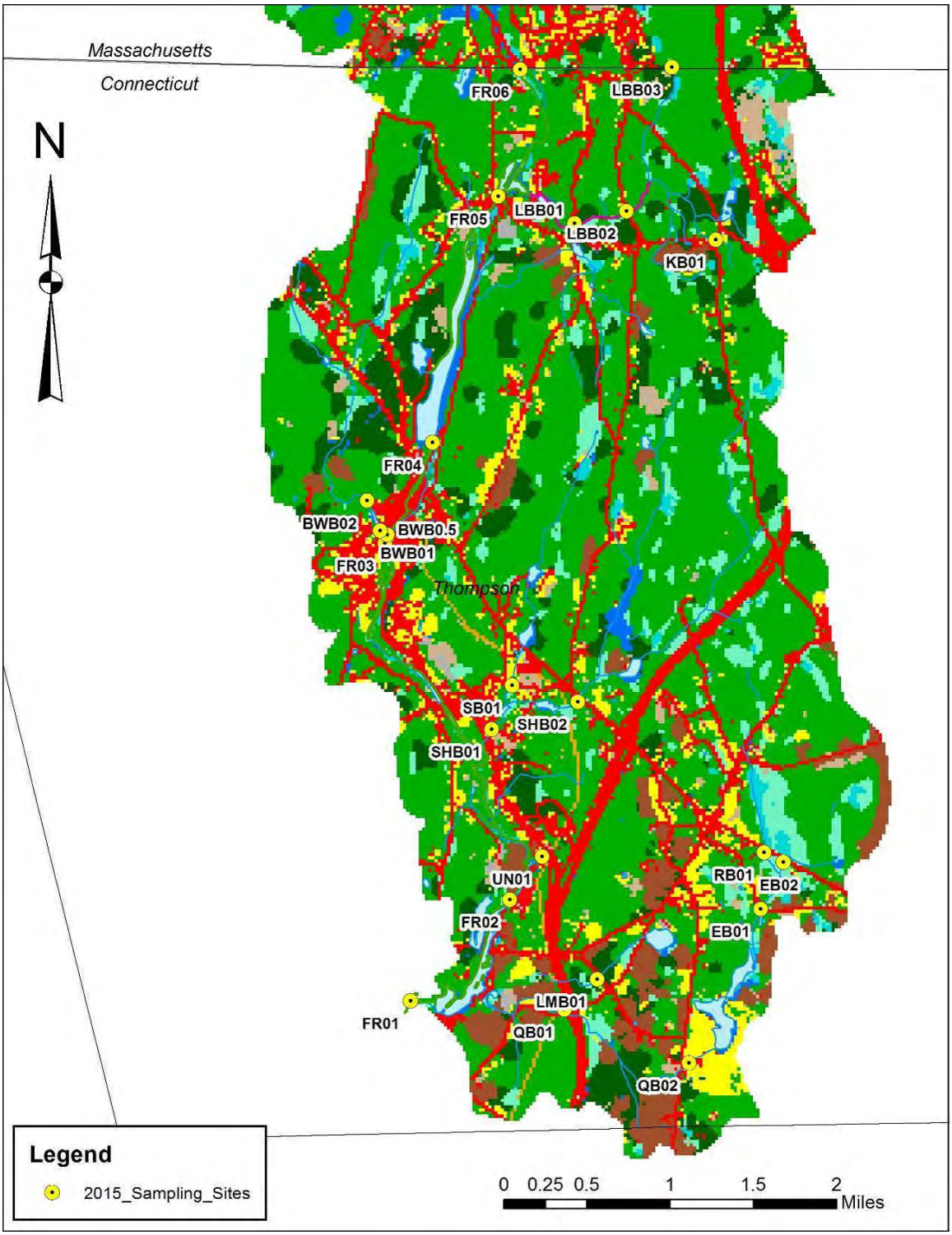

Figure 3. French River watershed bacteria sampling sites relative to land use/land cover (CLEAR 2010).

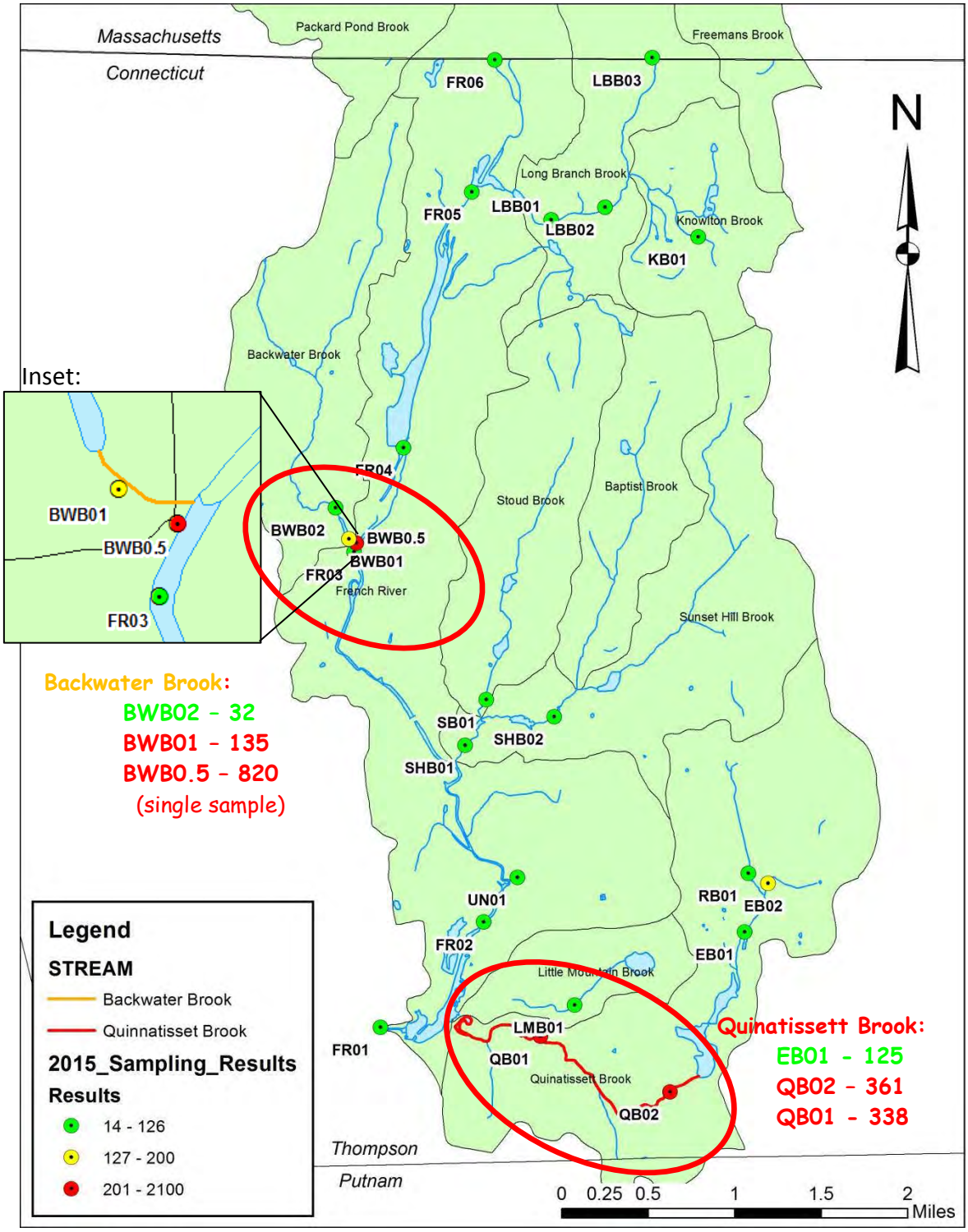

Figure 4. Fecal bacteria hot spots identified in the French River watershed in Thompson, CT. The inset depicts the segment of Backwater Brook (shown in orange) between Duhamel Pond and the French River that did not meet water quality standards.

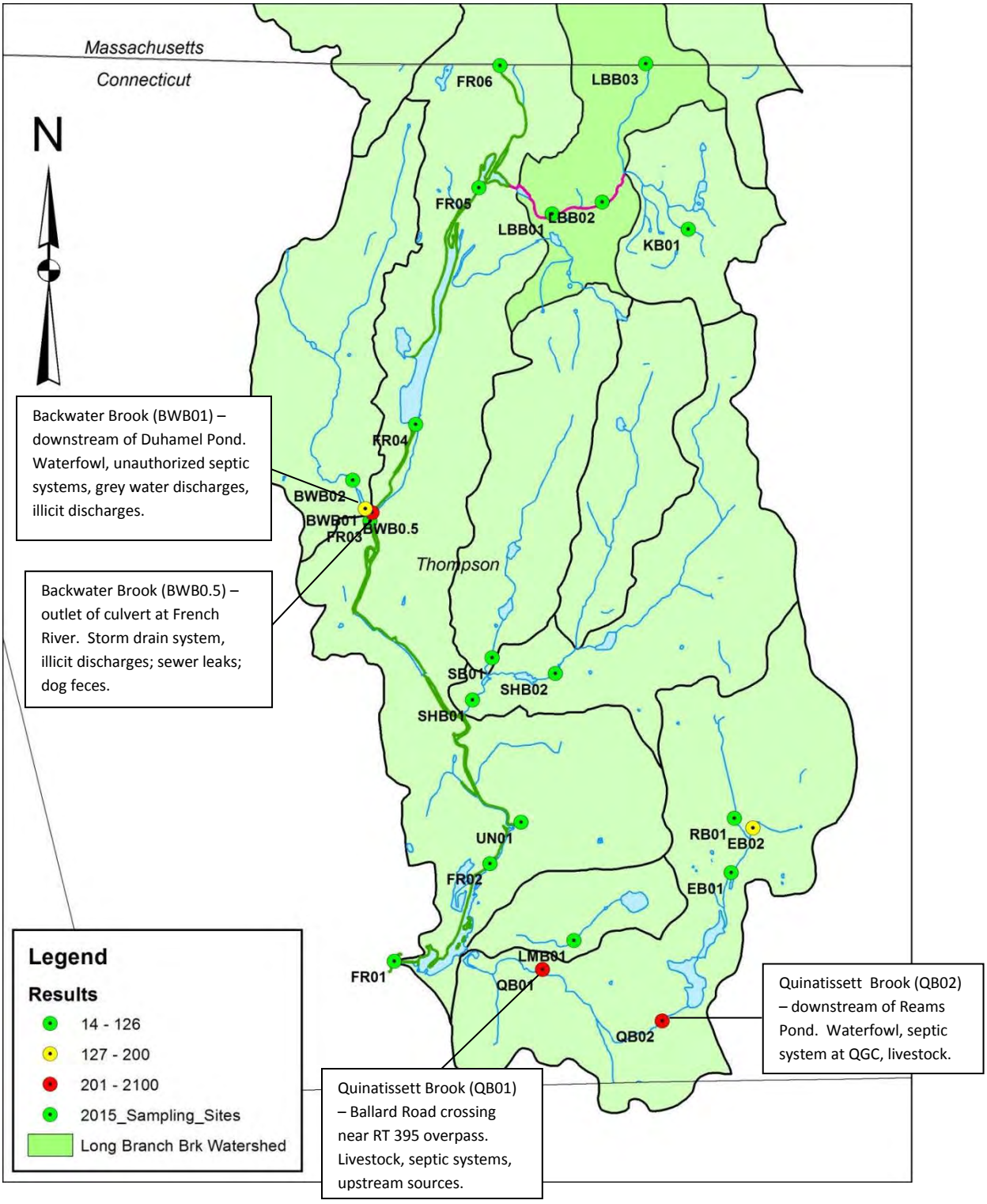

Figure 5. Potential fecal bacterial sources associated with the fecal bacteria hot spots identified at Backwater Brook and Quinatissett Brook in Thompson, CT.

Table 2. French River Priority Restoration List

Priority Site	Site/ Waterbody	Site Location	Possible Bacteria Source	Bacteria Geomean (cfu/100ml)*	Reduction Needed	Suggested Management Action(s)	Suggested Responsible Stakeholder
1a	Backwater Brook (BWB01)	downstream of the Duhamel Pond outlet near Main Street, North Grosvenordale	Waterfowl; unauthorized/ un-sewered properties; grey water discharges; illicit discharges	135	7%	Investigate if any properties abutting pond are not sewered; grey water and illicit discharges; manage waterfowl; install streamside buffers	Residents/ property owners; Town DPW/ sewer authority; NDDH; CLEAR
1b	Backwater Brook at French River (BWB0.5)	end of culvert at French River, Thompson Public Library property, ~30 ft north (upstream) of foot bridge to Riverside Park	Main St and library storm drain systems; illicit discharges; sewer leaks; dog feces; stormwater runoff	820 (single sample)	42% (single sample)	Investigate storm drain connections to culverted brook; illicit discharges; sewer lines; dog waste management; stormwater management; promote/ demonstrate LID practices and principals	Residents/ property owners; Town DPW/ sewer authority; NDDH; CLEAR
2a	Quinatissett Brook (QB02)	downstream of Reams Pond at Quinatissett Golf Course, County Home Road (State RT 21)	Septic system at golf course of unknown location, age and design; waterfowl; livestock on Chase Road	361	186.5%	Septic system dye test; locate/upgrade septic system; bacteria DNA test; manage waterfowl; promote manure BMPs	Property/ livestock owners; golf course mgrs; Agriculture Comm.; NDDH
2b	Quinatissett Brook (QB01)	at Ballard Road crossing, near Interstate RT 395 overpass	horses on Robbins Road; goats on Ballard Road; sheep on RT 21 at Putnam town line; older or underperforming septic systems; remnant bacteria signal from upstream sources (Reams Pond)	338	168%	Promote pasture/manure BMPs; identify/evaluate failing/ underperforming septic systems; develop septic system monitoring program; conduct bacteria DNA test to ID source	Property/ livestock owners; NDDH; Agriculture Committee; UConn Extension

* The 2013 Connecticut Water Quality Standards establish water quality criteria for indicator bacteria, including *E. coli*, which is the preferred indicator bacterium for fresh waterbodies. For recreational contact, excluding designated and non-designated swimming areas, the single sample maximum is 576 colony-forming units (cfu) per 100 milliliters of water and the maximum sample set geometric mean is less than 126 cfu/100 ml.

Figure 6. Culverted segment of Backwater Brook (dashed line). Approximately 250 feet of the stream is culverted under Main Street and the Thompson Public Library property.

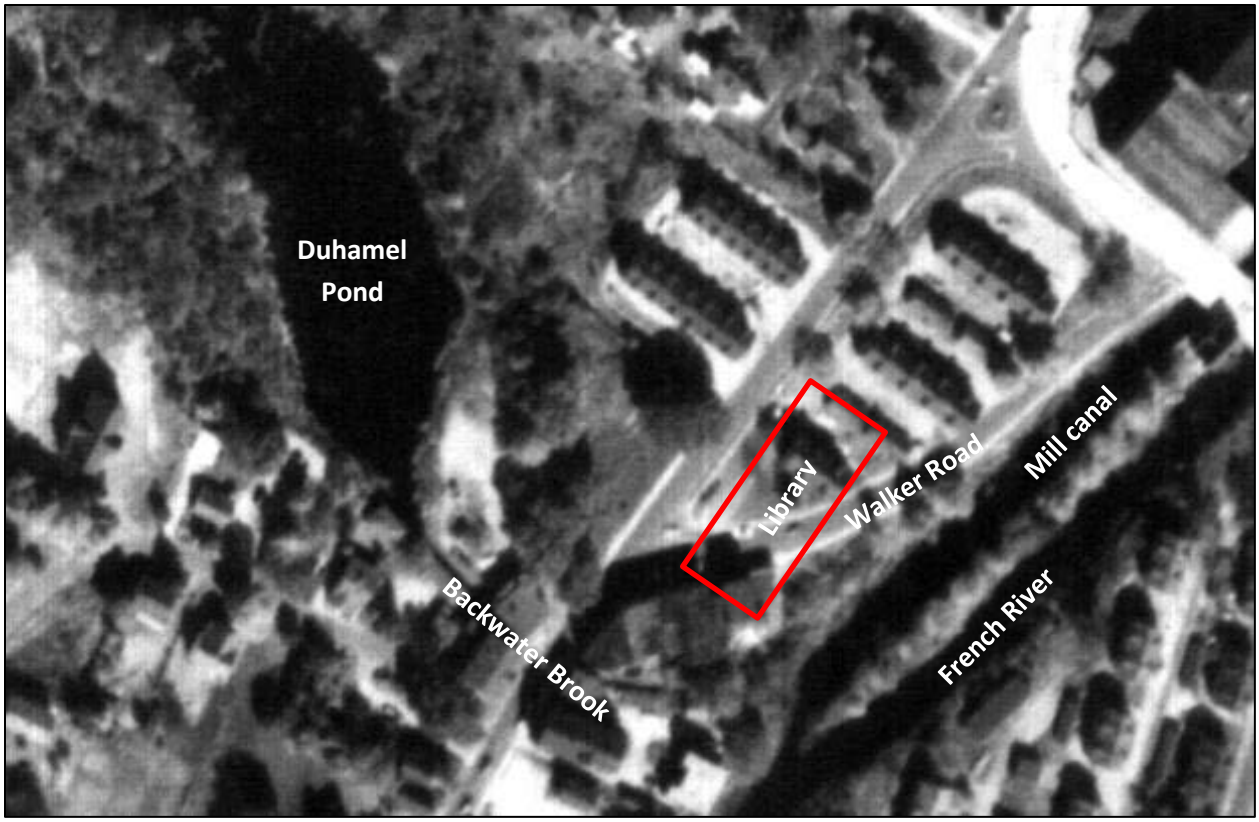

Figure 7. Aerial image of the Thompson Public Library site circa 1963, depicting previous site development (Univ. CT MAGIC Library). The location of the public library is outlined in red.

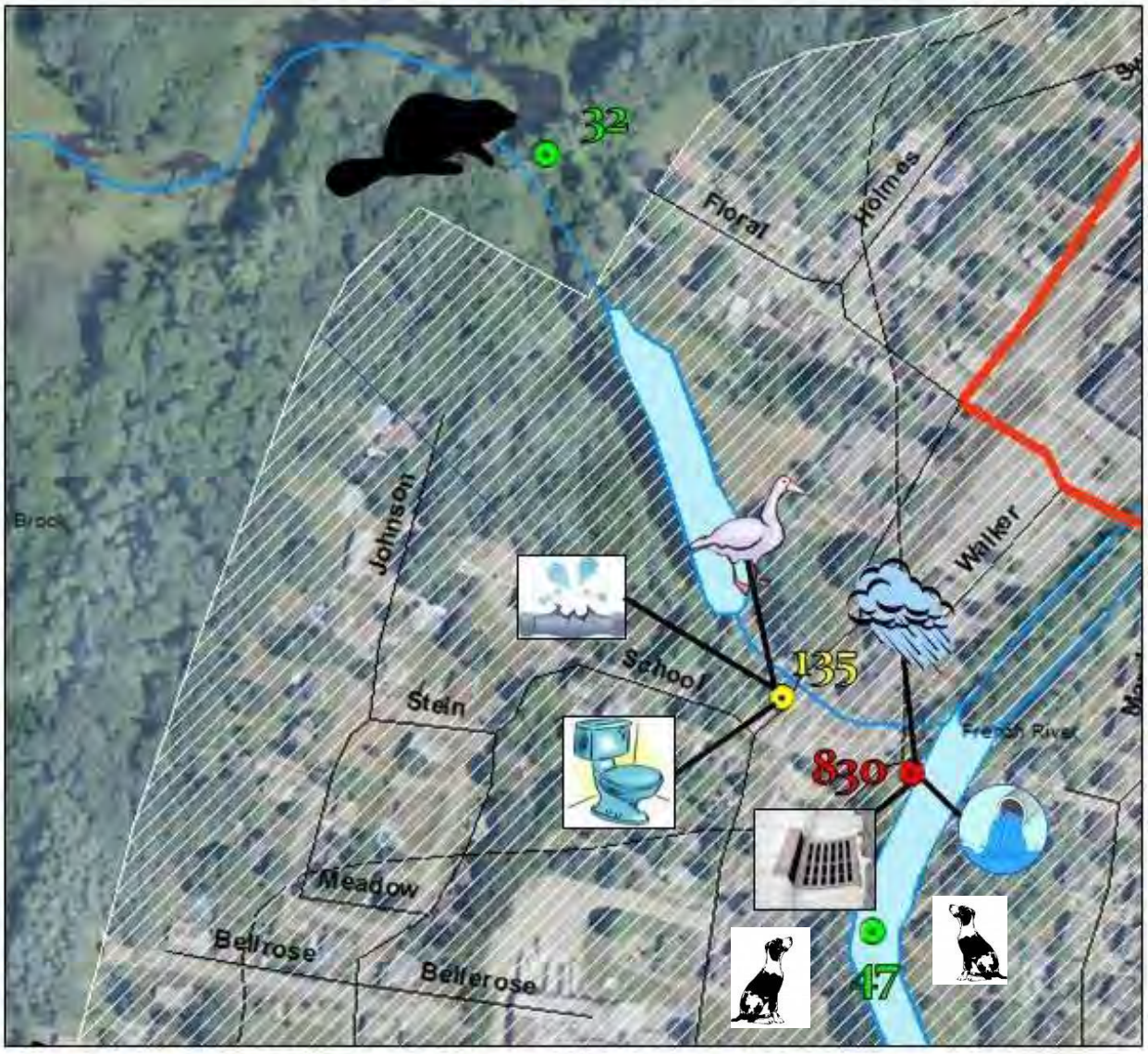

Figure 8. Possible fecal bacteria sources in the vicinity of Backwater Brook in North Grosvenordale. The hatched area depicts the extent of the municipal sewer service area.

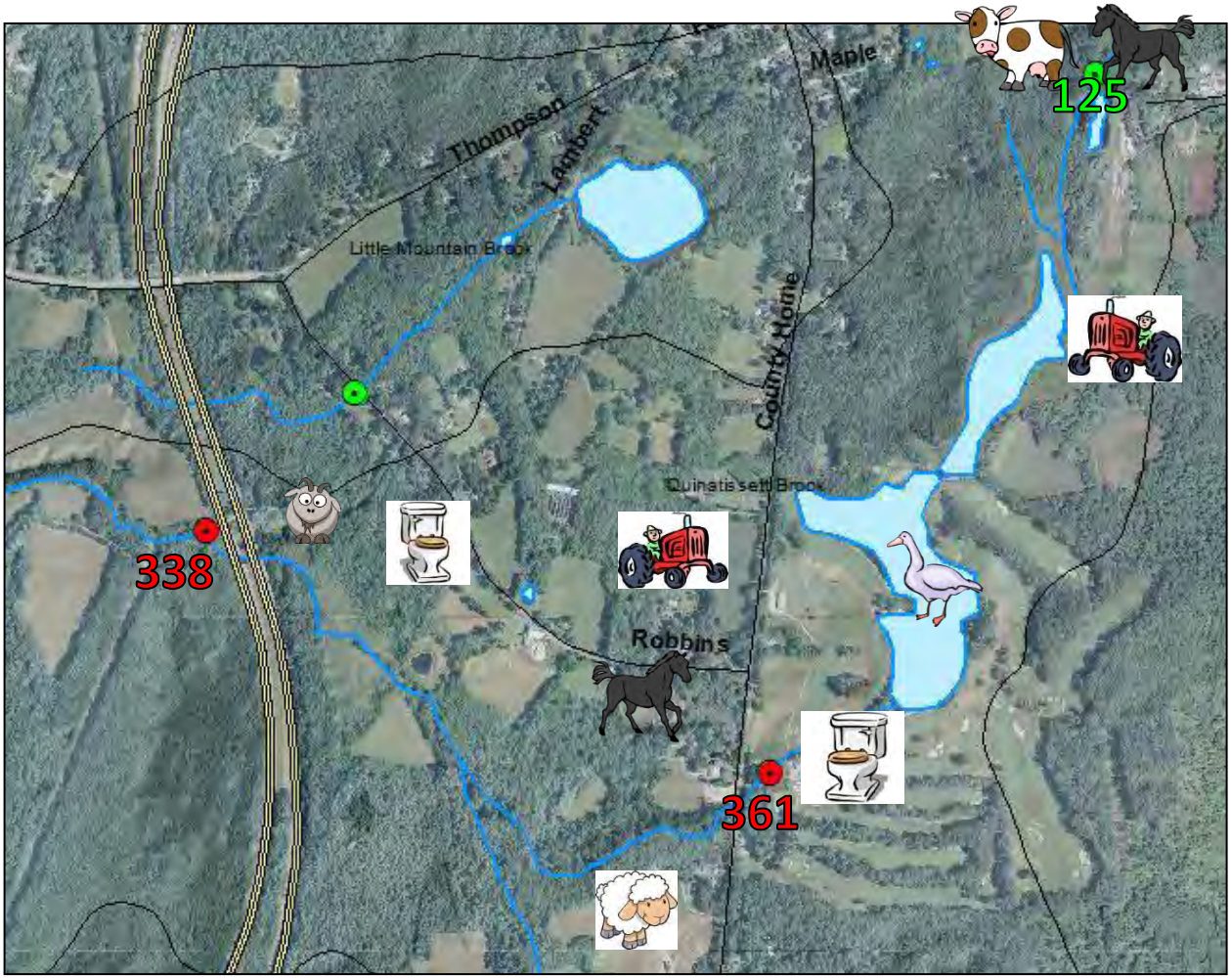

Figure 9. Possible fecal bacteria sources in the vicinity of Quinatissett Brook.

Appendix C

Windshield Survey Results

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
Central Street River Mill Village	Town of Thompson/ privately owned	CT3300-00 French Main Stem	41°59'0.59"N	71°53'54.54"W	IC/stormwater/NPS	runoff from roofs, roads, parking areas goes directly to French River	green streets/LID practices including tree filters, rain barrels, rain gardens, pervious pavers/grids, other LID
Chase Road	privately owned residence	CT3300-10 Quinatissett Brook	41°57'4.46"N	71°51'24.65"W	nutrients/bacteria	horses in paddock adjacent to, and that slopes to, Elliott Brook	practice manure BMPs, pasture management
Chase Road	privately owned residence	CT3300-10 Quinatissett Brook	41°57'9.76"N	71°51'29.91"W	nutrients/bacteria	beef cattle on Chase Road in pasture adjacent to tributary to Elliott Brook	practice manure BMPs, pasture management
Fairway Drive	privately owned residence	CT3300-02 Long Branch Brook	42° 0'29.98"N	71°52'45.83"W	riparian buffer/nutrients	very green pond - duckweed	reduce fertilizer use/ re-establish riparian vegetation
Floral Drive (ROW)	Town of Thompson	CT3300-00 French Main Stem	41°59'12.24"N	71°54'6.37"W	NPS/stormwater/ trash/debris	stormwater runs to end of street; forms gully to Backwater Brook	water diversion/install infiltration practice
Greek Village - Market Street (ROW)	Town of Thompson/ privately owned	CT3300-00 French Main Stem	41°58'59.19"N	71°53'49.88"W	IC/stormwater/NPS	no stormwater mgmt/leak-offs to storm drains by RR tracks discharge to French River	install infiltration practices; rain barrels; rain gardens; pervious pavers
Heritage Circle (ROW)	Town of Thompson	CT3300-07 Baptist Brook	41°59'44.44"N	71°52'12.15"W	NPS/stormwater	runoff from road	install tree filters/swm practice at cul de sac
Johnson Street (ROW)	Town of Thompson	CT3300-00 French Main Stem	41°59'8.38"N	71°54'10.41"W	stormwater/NPS/ trash/debris	stormwater runs to end of street; overland flow to Backwater Brook	water diversion/install infiltration practice
12-26 Main Street	St Joseph Catholic Society	CT3300-00 French Main Stem	41°58'43.76"N	71°54'7.19"W	IC/stormwater/NPS	runoff from roofs, parking lots, lawns	identify opportunities to install bio-retention practices

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
2 Main Street	Superior Bakery Inc.	CT3300-00 French Main Stem	41°58'57.36"N	71°54'7.53"W	stormwater/erosion /NPS	runoff from dirt parking lot/driveway	install water diversion; infiltration practice
Main Street - dirt lot next to library	Privately owned	CT3300-00 French Main Stem	41°59'1.90"N	71°54'2.51"W	stormwater/erosion /NPS	runoff from dirt parking lot/driveway	install water diversion; infiltration practice
Riverside Park 35 Marshall Street	Town of Thompson	CT3300-00 French Main Stem	41°58'45.39"N	71°53'59.96"W	stormwater runoff/NPS/ riparian buffer	maintenance and re-establishment of riparian buffer; invasive plant management	remove invasive species, set up management plan, replant with native species
Riverside Park 35 Marshall Street	Town of Thompson	CT3300-00 French Main Stem	41°58'45.39"N	71°53'59.96"W	stormwater/NPS/trash & debris	trash/floatables from outfalls	clean-up (conducted annually by TT); education; trash separators in cbs
Reardon Road	privately owned	CT3300-00 French Main Stem	41°57'56.06"N	71°53'35.31"W	stormwater/manure / nutrients/bacteria	road runoff/ephemeral stream through horse paddock; manure stockpile	water diversion; exclusionary fencing; rotational grazing; manure BMPs; composting
307 Reardon Road	Thompson Rail Business Park LLC.	CT3300-00 French Main Stem	41°57'39.51"N	71°53'33.86"W	stormwater/erosion / sedimentation	sediment at entrance tracked onto roadway	Industrial SWGP; maintain anti-tracking pad; maintain on-site swm practices
15 Red Bridge Road	Thompson Little League Complex - Town of Thompson	CT3300-00 French Main Stem	41°58'47.33"N	71°54'23.81"W	stormwater/NPS/ nutrients	stormwater runoff from parking lots; maintenance of baseball fields	water diversions; install infiltration practice; athletic field BMPs
Riverside Drive (RT 12) State-owned ROW	CT Department of Transportation	CT3300-00 French Main Stem	NA	NA	IC/stormwater/NPS	storm drainage from RT 12 discharges to French River	stormwater retrofits as practicable to provide water quality and volume treatment prior to discharge to French River

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
North Grosvenordale and Grosvenordale - former mill housing along RT 12 corridor	privately owned	CT3300-00 French Main Stem	NA	NA	IC/stormwater/NPS	stormwater runoff from impervious surfaces; small lots; densely developed	pursue opportunities for outreach/education/installation of rain gardens, rain barrels, bio-swales, etc.
274 Riverside Drive (RT 12)	privately owned (former restaurant)	CT3300-00 French Main Stem	41°56'54.46"N	71°53'17.00"W	IC/stormwater/NPS	large parking lot; former structure right on river bank; minimal riparian buffer	incorporate LID into site redevelopment; re-establish riparian buffer
327 Riverside Drive (RT 12)	privately owned (construction business)	CT3300-00 French Main Stem	41°57'9.06"N	71°53'5.49"W	stormwater/NPS	extensive dirt construction yard; much stockpiled material and construction equipment	Industrial SWGP; manage stockpiled material; re-establish vegetation on bare areas; install stormwater detention practice
630 Riverside Drive (RT 12)	former Belding Corticelli Mill	CT3300-00 French Main Stem	41°58'8.02"N	71°53'34.41"W	IC/stormwater/NPS	redevelopment	incorporate LID into redevelopment design
693 Riverside Drive (RT 12)	Dunkin Donuts	CT3300-00 French Main Stem	41°58'22.45"N	71°53'47.88"W	IC/stormwater/NPS	runoff from roof and parking lot	water diversion/infiltration practices/LID
693 Riverside Drive (RT 12)	Quite Corner Package Store	CT3300-00 French Main Stem	41°58'21.39"N	71°53'46.79"W	IC/stormwater/NPS	runoff from roof and parking lot	water diversion; infiltration practices; other LID practices
694 Riverside Drive (RT 12)	privately owned (former mill)	CT3300-00 French Main Stem	41°58'20.90"N	71°53'48.34"W	IC/stormwater/NPS	redevelopment	incorporate LID into redevelopment design
700 Riverside Drive (RT 12)	privately owned (former mill site)	CT3300-00 French Main Stem	41°58'21.75"N	71°53'49.89"W	stormwater/NPS	redevelopment of burnt-down/ demolished mill property	incorporate LID into new design

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
706 Riverside Drive (RT 12)	privately owned	CT3300-00 French Main Stem	41°58'24.66"N	71°53'52.72"W	stormwater volume	stream from school overflows during heavy rains causing road flooding	install bio-retention/storm-water wetland on west side of RT 12
near 715/785 Riverside Drive (RT 12)	Town of Thompson or privately owned	CT3300-00 French Main Stem	41°58'26.09"N	71°53'52.41"W	stormwater volume	stream from school overflows during heavy rains causing road flooding	install retention practices on east side RT 12 to slow/detain stormwater
785 Riverside Drive (RT 12	Town Hall Town of Thompson	CT3300-00 French Main Stem	41°58'44.82"N	71°53'57.44"W	IC/stormwater/NPS	runoff from roof and parking lot	install water diversion and infiltration practices; green roofs
Mary R. Fisher Elementary School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	IC/stormwater/NPS	runoff from small parking lot travels overland across grass to double storm drain.	install infiltration basin. Install tree filter in leak-off upgrade of catch basin.
Mary R. Fisher Elementary School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	NPS/stormwater	failed level spreader south of playground	re-install/repair to restore intended function
Mary R. Fisher Elementary School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	IC/stormwater/NPS	extensive parking lots/heat island	install trees in parking lot islands
Mary R. Fisher Elementary School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	IC/NPS/stormwater	extensive parking lots	install tree filters
Mary R. Fisher Elementary School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/erosion /NPS	bare/compacted/ eroded soil	seed bare spots/parking guidance/install riprap filter strips/install pervious plastic grids

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
Mary R. Fisher Elementary School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	NPS/stormwater	yard drain by entrance to Early Childhood Center	install rain garden
Mary R. Fisher Elementary School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/erosion /NPS	erosion along driveway to high school	water diversion; install riprap; reseed; parking exclusion
Mary R. Fisher Elementary School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/erosion /NPS	erosion on hillside in play yard on driveway to high school	water diversion; erosion mat; re-establish grass
Thompson Middle School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	IC/stormwater/NPS	runoff from roofs, parking lots, lawns	identify opportunities to install bio-retention practices
Thompson Middle School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/erosion /NPS	bare ground/erosion along edge of driveways	seed bare spots/parking guidance or exclusions/ install pervious plastic grids
Thompson Middle School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	IC/stormwater/NPS	grassy area by top of driveway to middle school entrance	install grassed swale with check dams to control runoff; parking exclusion
Tourtellotte Memorial High School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/erosion /NPS	erosion along-side of driveway to high school	install check dams to slow flow
Tourtellotte Memorial High School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	IC/NPS/stormwater	extensive parking lots/heat island	install trees in parking lot islands

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
Tourtellotte Memorial High School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	IC/NPS/stormwater	extensive parking lots	install tree filters
Tourtellotte Memorial High School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/erosion /NPS	erosion on steep hill	repair with erosion mat/allow grass to grow higher
Tourtellotte Memorial High School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/erosion /NPS	bare/compacted/eroded soil along driveways and walking paths	seed bare spots/parking guidance/install riprap filter strips/install pervious plastic grids
Tourtellotte Memorial High School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	IC/NPS/stormwater	erosion along sidewalk to rear of high school from maintenance yard driveway; water runs down edge of sidewalk	water diversion; erosion mat; re-establish grass; deep sump catch basins; hydro-dynamic separator (HDS)
Tourtellotte Memorial High School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/NPS	catch basin in lawn before steep hill at Admin. Bldg/high school	grassed rain garden - use existing catch basin as overflow or install standpipe
Tourtellotte Memorial High School 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/NPS	grassed traffic island at entrance to HS/exit to RT 12	grassed rain garden - use existing catch basin as overflow or install standpipe
Administrative Building 785 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°58'36.34"N	71°53'53.19"W	stormwater/NPS	parking spaces in front of Administration Building	divert runoff - install rip rap strip and swale to allow infiltration
831 Riverside Drive (RT 12)	N. Grosv'dale Post Office - US Postal Service	CT3300-00 French Main Stem	41°58'47.47"N	71°53'55.68"W	IC/stormwater/NPS	runoff from roof and parking lot	water diversion; infiltration practices; other LID practices

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
835 Riverside Drive (RT 12)	Hometown Bank	CT3300-00 French Main Stem	41°58'48.70"N	71°53'55.26"W	stormwater/NPS	roofs/parking lots	infiltration practices; rain gardens
854 Riverside Drive (RT 12)	Cumberland Farms (VHS Realty, Inc)	CT3300-00 French Main Stem	41°58'51.88"N	71°53'54.74"W	stormwater, trash/debris	stormwater outfalls from Cumberland Farms store and RT 12 discharge to French River through Riverside Park	install settling basin/infiltration practice on adjacent lot
862 Riverside Drive (RT 12)	Community Fire Department	CT3300-00 French Main Stem	41°58'54.94"N	71°53'51.46"W	IC/stormwater/NPS	wash vehicles; runoff goes directly to storm drain	establish wash station, connect to sanitary sewer
915 Riverside Drive (RT 12)	privately owned (former hardware store)	CT3300-00 French Main Stem	41°59'5.88"N	71°53'49.85"W	IC/stormwater/NPS	redevelopment; large dirt parking lot adjacent to French River	incorporate LID into redevelopment design
929 Riverside Drive (RT 12)	The River Mill	CT3300-00 French Main Stem	41°59'11.47"N	71°53'51.37"W	stormwater/NPS	extensive roofs, dirt and paved parking lots	incorporate LID /infiltration practice into redevelopment; tree filters; curb bump-outs on River Road; impervious pavers; reduction of unneeded paved surfaces
Thompson Public Library 934 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°59'5.64"N	71°53'58.69"W	IC/stormwater/NPS	impervious cover throughout developed area of parcel	replace existing brick pavers with pervious pavers
Thompson Public Library 934 Riverside Drive (RT 12)	Town of Thompson	CT3300-00 French Main Stem	41°59'5.64"N	71°53'58.69"W	invasive plants	invasive plant species on canal bank	remove invasive species, establish management plan, replant with native species
948 Riverside Drive (RT 12) - driveway to water tower	Connecticut Water Company (lessee)	CT3300-00 French Main Stem	41°59'13.43"N	71°53'54.48"W	erosion/stormwater	runoff from water tower area has created a large erosion gully and deposited large sediment pile on edge on RT 12	install water diversion at top of driveway

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
Riverside Drive (RT 12) - driveway to the Riverwalk by Knights of Columbus	Town of Thompson	CT3300-00 French Main Stem	41°59'29.12"N	71°53'47.57"W	stormwater/NPS	maintenance of existing stormwater infrastructure filled with weeds and sediment	maintain existing riprap swales
1020 Riverside Drive (RT 12)	Thomas Commons	CT3300-00 French Main Stem	41°59'26.76"N	71°53'50.80"W	stormwater/erosion /NPS	runoff from dirt parking lot/driveway to storm drain	water diversion/install infiltration practice
1056 Riverside Drive (RT 12)	Thompson Auto Care	CT3300-00 French Main Stem	41°59'35.51"N	71°53'53.93"W	stormwater/NPS	auto-associated pollutants	Industrial SWGP; BMPs
1366 Riverside Drive (RT 12)	Acts ll Ministries	CT3300-00 French Main Stem	42° 0'44.16"N	71°53'28.54"W	IC/stormwater/NPS	runoff from parking lot	bio-retention/infiltration practices
1495 Riverside Drive (RT 12)	RPM, Inc.	CT3300-00 French Main Stem	42° 1'10.93"N	71°53'5.41"W	stormwater/NPS	auto-associated pollutants	Industrial SWGP; BMPs
Robbins Road	privately owned	CT3300-10 Quinatissett Brook	41°56'42.55"N	71°52'36.13"W	stormwater/manure /nutrients/bacteria	horses in pasture adjacent to Little Mountain Brook	manure BMPs; pasture mgmt
School Street	privately owned	CT3300-05 Backwater Brook	41°59'5.27"N	71°54'4.40"W	nutrients/bacteria	domestic ducks/geese	manure/waste BMPs; composter
Thompson Road (near RT 12)	Airline Trail - State of CT	CT3300-09 Little Mountain Brook	41°56'50.74"N	71°53'6.73"W	stormwater/erosion	runoff from airline trail causing slope erosion and sedimentation	water diversion, slope reinforcement
347 Thompson Road	Thompson Congregational Church	CT3300-10 Quinatissett Brook	41°57'29.61"N	71°51'45.09"W	IC/stormwater/NPS	runoff from large roof area, parking lot	runoff diversion; bio-retention/infiltration practices

Location	Owner (if known)	Sub-watershed	Latitude	Longitude	Pollutant or Condition	Description	Recommendation
445 Thompson Road	business on east side Thompson Rd	CT3300-10 Quinatissett Brook	41°57'51.47"N	71°51'31.82"W	IC/stormwater/NPS	runoff from large roof area, parking lot	runoff diversion; bio-retention/infiltration practices
459 Thompson Road	business on east side Thompson Rd	CT3300-10 Quinatissett Brook	41°57'54.66"N	71°51'29.23"W	IC/stormwater/NPS	runoff from large parking lot	runoff diversion; bio-retention/infiltration practices
646 Thompson Road	NUMA Tool Co.	CT3300-06 Sunset Hill Brook	41°58'30.16"N	71°50'55.59"W	IC/stormwater/NPS	runoff from large parking/storage areas and buildings	runoff diversion; bio-retention/infiltration practices
293 Thompson Hill Road	Marianapolis Preparatory School	CT3300-00 French Main Stem	41°57'29.16"N	71°52'1.94"W	IC/stormwater/NPS/ bacteria	large lawns; parking lots; roof areas; septic lagoon	lawn BMPs; adoption/incorporation of LID practices; connection to municipal sewer
1405 Wilsonville Road	Matty's Transportation	CT3300-00 French Main Stem	42° 0'44.50"N	71°53'16.23"W	IC/stormwater/NPS	all parking lot runoff goes to French River	water diversions/ infiltration/ structural controls
Wilsonville Road	Playground - Town of Thompson	CT3300-02 Long Branch Brook	42° 0'32.99"N	71°52'42.71"W	stormwater/NPS/erosion	dirt parking lot/compacted/large puddle at entrance	water diversion/install infiltration practice

Appendix D

Watershed Model Loading Data

French River Sub-watershed (CT 3300-00) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	1,285	190	29,995	55,797	226	7	8	3	15
MDR (1-4du/acre)	**775**	114	18,073	33,620	136	4	5	2	9
HDR (>4du/acre)	218	32	5,089	9,466	38	1	1	1	3
Multi-family	151	22	3,526	6,560	27	1	1	<1	2
Commercial	287	30	5,885	12,475	50	2	1	1	3
Industrial	324	37	11,931	13,426	54	2	2	1	4
Roadways	5,236	569	305,060	207,510	839	28	25	35	55
Forest	6,002	480	240,080	28,810	279	32	21	27	8
Rural	0	0	0	0	0	0	0	0	0
Pasture/Hay	836	127	18,170	7,086	21	4	6	2	2
Cropland	67	10	1,450	566	2	<1	<1	<1	<1
Open Water	2,047	80	24,785	0	0	11	3	3	<1
Total Primary Sources	***17,228***	***1,692***	***664,043***	***375,315***	***1,673***	**-**	**-**	**-**	-
Secondary Sources Loads									
Septic Systems	488	81	3,255	739	0	3	4	<1	<1
Stream Channel Erosion	0	0	212,691	0	0	<1	<1	24	<1
Hobby Farms/Livestock	158	46	0	1,200	0	1	2	<1	<1
Total Secondary Sources	***646***	***127***	***215,946***	***1,939***	***0***	-	-	-	-
Load Reductions Existing Practices	***-899***	***-470***	***0***	***23***	***-99***	***5***	***21***	***0***	***0***
Total Load	**18,772**	**2,289**	**879,990**	**377,231**	**1,772**	100%	100%	100%	100%

Packard Pond Brook Sub-watershed (CT 3300-01)* Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	372	55	8,671	16,129	65	8	9	4	17
MDR (1-4du/acre)	370	55	8,642	16,076	65	8	9	4	17
HDR (>4du/acre)	131	19	3,056	5,684	23	3	3	1	6
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0
Roadways	1,252	136	72,965	49,633	201	27	22	35	52
Forest	1,315	105	52,590	6,311	62	30	18	25	7
Rural	0	0	0	0	0	0	0	0	0
Pasture/Hay	230	35	5,000	1,950	60	5	6	2	2
Cropland	0	0	0	0	0	0	0	0	0
Open Water	447	17	5,410	0	0	10	3	3	<1
Total Primary Sources	***4,148***	***427***	***157,003***	***96,044***	***423***	-	-	-	-
Secondary Sources Loads									
Septic Systems	181	30	1,207	274	0	4	5	1	<1
Stream Channel Erosion	0	0	50,392	0	0	<1	<1	24	<1
Hobby Farms/Livestock	0	0	0	0	0	0	0	0	0
Total Secondary Sources	***181***	***30***	***51,599***	***274***	***0***	-	-	-	-
Load Reductions Existing Practices	***-258***	***-149***	***0***	***7***	***0***	***6***	***25***	***0***	***0***
Total Load	**4,586**	**607**	**208,601**	**96,311**	**453**	100%	100%	100%	100%

*Packard Pond Brook Sub-watershed (CT 3300-01) discharges to the French River in Massachusetts and most development is located in Massachusetts.

Long Branch Brook Sub-watershed (CT 3300-02) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	311	46	7,254	13,493	55	6	7	3	13
MDR (1-4du/acre)	249	37	5,801	10,791	44	5	6	2	10
HDR (>4du/acre)	15	2	356	662	3	<1	<1	<1	1
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	88	9	1,799	3,814	15	2	1	1	4
Industrial	0	0	0	0	0	0	0	0	0
Roadways	1,602	174	93,311	63,473	257	30	26	37	60
Forest	1,835	147	73,410	8,809	91	34	22	29	8
Rural	90	14	1,960	764	2	2	2	1	1
Pasture/Hay	35	5	760	296	1	1	1	<1	<1
Cropland	0	0	0	0	0	0	0	0	0
Open Water	259	10	3,131	0	0	5	1	1	<1
Total Primary Sources	***4,483***	***444***	***187,782***	***102,103***	***467***	-	-	-	-
Secondary Sources Loads									
Septic Systems	174	29	1,161	597	0	3	4	<1	1
Stream Channel Erosion	0	0	60,056	0	0	<1	<1	24	<1
Hobby Farms/Livestock	525	83	0	2,513	0	10	12	<1	2
Total Secondary Sources	***699***	***112***	***61,217***	***3,110***	***0***	-	-	-	-
Load Reductions Existing Practices	***-183***	***-113***	***0***	***25***	***-17***	***3***	***17***	***0***	***<1***
Total Load	**5,366**	**670**	**248,998**	**105,189**	**485**	**100%**	**100%**	**100%**	**100%**

Freemans Brook Sub-watershed (CT 3300-03)* Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	403	59	9,394	17,475	71	8	9	4	14
MDR (1-4du/acre)	588	87	13,730	25,541	103	12	13	6	21
HDR (>4du/acre)	106	16	2,482	4,616	19	2	2	1	4
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	287	30	5,883	12,470	50	6	5	3	10
Industrial	52	6	1,898	2,136	9	1	1	1	2
Roadways	1,397	152	81,394	55,366	224	29	23	37	45
Forest	1,174	94	46,960	5,635	55	24	14	21	5
Rural	23	4	500	195	1	<1	<1	<1	<1
Pasture/Hay	14	2	310	121	0	<1	<1	<1	<1
Cropland	0	0	0	0	0	0	0	0	0
Open Water	433	17	5,239	0	0	9	9	2	<1
Total Primary Sources	***4,477***	***466***	***167,790***	***123,556***	***532***	**-**	**-**	**-**	**-**
Secondary Sources Loads									
Septic Systems	5	1	30	7	0	<1	<1	<1	<1
Stream Channel Erosion	0	0	54,338	0	0	<1	<1	24	<1
Hobby Farms/Livestock	0	0	0	0	0	0	0	0	0
Total Secondary Sources	***5***	***1***	***54,368***	***7***	***0***	-	-	-	-
Load Reductions Existing Practices	***-338***	***-194***	***0***	***36***	***-30***	***7***	***29***	***0***	***<1***
Total Load	**4,819**	**661**	**222,157**	**123,527**	**562**	**100%**	**100%**	**100%**	**100%**

*Freemans Brook Sub-watershed (CT 3300-03) discharges to the French River in Massachusetts.

Knowlton Brook Sub-watershed (CT 3300-04) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	92	14	2,150	4,000	16	4	5	2	10
MDR (1-4du/acre)	1	0	31	57	0	<1	<1	<1	<1
HDR (>4du/acre)	0	0	0	0	0	0	0	0	0
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0
Roadways	752	82	43,800	29,794	121	31	30	34	71
Forest	1,104	88	44,150	5,298	51	45	32	34	13
Rural	177	27	3,850	1,502	4	7	10	3	4
Pasture/Hay	116	18	2,520	983	3	5	7	2	2
Cropland	0	0	0	0	0	0	0	0	0
Open Water	106	4	1,287	0	0	4	1	1	<1
Total Primary Sources	***2,348***	***233***	***97,788***	***41,633***	***195***	**-**	**-**	**-**	**-**
Secondary Sources Loads									
Septic Systems	64	11	426	457	0	3	4	<1	1
Stream Channel Erosion	0	0	30,912	0	0	<1	<1	24	<1
Hobby Farms/Livestock	0	0	0	13	0	<1	<1	<1	<1
Total Secondary Sources	***64***	***11***	***31,338***	***470***	***0***	-	-	-	-
Load Reductions Existing Practices	***-51***	***-27***	***0***	***1***	***-9***	***2***	***10***	***0***	***<1***
Total Load	**2,464**	**271**	**129,126**	**42,103**	**204**	**100%**	**100%**	**100%**	**100%**

Backwater Brook Sub-watershed (CT 3300-05) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	106	16	2,485	4,622	19	3	4	1	8
MDR (1-4du/acre)	70	10	1,630	3,032	12	2	3	1	5
HDR (>4du/acre)	9	1	215	400	2	<1	<1	<1	1
Multi-family	27	4	634	1,179	5	1	1	<1	2
Commercial	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0
Roadways	912	99	53,132	36,142	146	24	25	26	63
Forest	2,353	188	94,130	11,296	107	61	48	46	20
Rural	74	11	1,600	624	2	2	3	1	1
Pasture/Hay	0	0	0	0	0	0	0	0	0
Cropland	0	0	0	0	0	0	0	0	0
Open Water	88	3	1,070	0	0	2	1	1	<1
Total Primary Sources	***3,640***	***333***	***154,895***	***57,294***	***292***	-	-	-	-
Secondary Sources Loads									
Septic Systems	87	15	582	237	0	2	4	<1	<1
Stream Channel Erosion	0	0	48,441	0	0	<1	<1	24	<1
Hobby Farms/Livestock	0	0	0	13	0	<1	<1	<1	<1
Total Secondary Sources	***88***	***15***	***49,023***	***251***	***0***	-	-	-	-
Load Reductions Existing Practices	***-109***	***-47***	***0***	***3***	***-6***	***3***	***12***	***0***	***0***
Total Load	**3,836**	**395**	**203,918**	**57,541**	**298**	**100%**	**100%**	**100%**	**100%**

Sunset Hill Brook Sub-watershed (CT 3300-06) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	279	41	6,505	12,101	49	5	7	2	14
MDR (1-4du/acre)	214	32	4,998	9,297	38	4	5	2	11
HDR (>4du/acre)	14	2	320	596	2	<1	<1	<1	1
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0
Industrial	63	7	2,325	2,617	11	1	1	1	3
Roadways	1,629	177	94,908	64,559	261	30	30	36	77
Forest	2,590	207	103,610	12,433	139	48	35	39	15
Rural	116	18	2,530	987	3	2	3	1	1
Pasture/Hay	60	9	1,310	511	2	1	2	<1	1
Cropland	0	0	0	0	0	0	0	0	0
Open Water	302	12	3,658	0	0	6	2	1	<1
Total Primary Sources	***5,268***	***505***	***220,165***	***103,101***	***505***	-	-	-	-
Secondary Sources Loads									
Septic Systems	188	31	1,255	1,687	0	4	5	<1	2
Stream Channel Erosion	0	0	69,807	0	0	<1	<1	26	<1
Hobby Farms/Livestock	276	43	0	1,300	0	5	7	<1	2
Total Secondary Sources	***464***	***74***	***71,061***	***2,987***	***0***	-	-	-	-
Load Reductions Existing Practices	***379***	***-14***	***27,471***	***22,464***	***78***	***-7***	***2***	***-10***	***-27***
Total Load	**5,353**	**593**	**263,755**	**83,624**	**426**	**100%**	**100%**	**100%**	**100%**

Baptist Brook Sub-watershed (CT 3300-07) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	63	9	1,463	2,721	11	3	4	1	14
MDR (1-4du/acre)	0	0	0	0	0	0	0	0	0
HDR (>4du/acre)	0	0	0	0	0	0	0	0	0
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0
Roadways	209	23	12,168	8,277	33	9	11	11	43
Forest	1,500	120	60,000	7,200	74	61	57	56	38
Rural	54	8	1,180	460	1	2	4	1	2
Pasture/Hay	55	8	1,200	468	1	2	4	1	2
Cropland	0	0	0	0	0	0	0	0	0
Open Water	512	20	6,200	0	0	21	10	6	<1
Total Primary Sources	***2,393***	***189***	***82,211***	***19,127***	***121***	-	-	-	-
Secondary Sources Loads									
Septic Systems	47	8	310	70	0	2	4	<1	<1
Stream Channel Erosion	0	0	25,324	0	0	<1	<1	23	<1
Hobby Farms/Livestock	0	0	0	0	0	0	0	0	0
Total Secondary Sources	***47***	***8***	***25,635***	***70***	***0***	-	-	-	-
Load Reductions Existing Practices	***-25***	***-14***	***0***	***6***	***-3***	***1***	***7***	***0***	***0***
Total Load	**2,465**	**210**	**107,846**	**19,191**	**123**	**100%**	**100%**	**100%**	**100%**

Stoud Brook Sub-watershed (CT 3300-08) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	190	28	4,432	8,244	33	6	9	3	30
MDR (1-4du/acre)	31	5	722	1,342	5	1	2	1	5
HDR (>4du/acre)	0	0	0	0	0	0	0	0	0
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0
Roadways	313	34	18,224	12,396	50	10	11	13	44
Forest	2,005	160	80,200	9,624	95	65	52	57	34
Rural	161	25	3,500	1,365	4	5	8	2	5
Pasture/Hay	76	12	1,650	644	2	2	4	1	2
Cropland	0	0	0	0	0	0	0	0	0
Open Water	274	11	3,317	0	0	9	4	2	<1
Total Primary Sources	***3,049***	***274***	***112,044***	***33,615***	***190***	-	-	-	-
Secondary Sources Loads									
Septic Systems	106	18	708	161	0	3	6	1	1
Stream Channel Erosion	0	0	34,503	0	0	<1	<1	24	<1
Hobby Farms/Livestock	0	0	0	0	0	0	0	0	0
Total Secondary Sources	***106***	***18***	***35,211***	***161***	***0***	-	-	-	-
Load Reductions Existing Practices	***85***	***-19***	***6,237***	***5,867***	***17***	***-3***	***6***	***4***	***-21***
Total Load	**3,070**	**310**	**141,018**	**27,909**	**173**	**100%**	**100%**	**100%**	**100%**

Little Mountain Brook Sub-watershed (CT 3300-09) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	138	20	3,220	5,990	24	7	8	3	15
MDR (1-4du/acre)	78	12	1,828	3,400	14	4	5	2	9
HDR (>4du/acre)	0	0	0	0	0	0	0	0	0
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	6	1	118	250	1	<1	<1	<1	1
Industrial	0	0	0	0	0	0	0	0	0
Roadways	753	82	43,858	29,833	121	39	33	47	77
Forest	397	32	15,860	1,903	19	20	13	17	5
Rural	202	31	4,400	1,716	5	10	12	5	4
Pasture/Hay	154	23	3,340	1,303	4	8	9	4	3
Cropland	41	6	890	347	1	2	2	1	1
Open Water	163	6	1,969	0	0	8	2	2	<1
Total Primary Sources	***1,931***	***213***	***75,482***	***44,742***	***190***	-	-	-	-
Secondary Sources Loads									
Septic Systems	86	14	575	130	0	4	6	1	<1
Stream Channel Erosion	0	0	24,344	0	0	<1	<1	26	<1
Hobby Farms/Livestock	13	4	0	100	0	1	2	<1	<1
Total Secondary Sources	***99***	***18***	***24,919***	***230***	***0***	-	-	-	-
Load Reductions Existing Practices	***82***	***-20***	***7,823***	***6,300***	***14***	***-4***	***8***	***-8***	***-16***
Total Load	**1,948**	**251**	**92,578**	**38,673**	**175**	**100%**	**100%**	**100%**	**100%**

Quinatissett Brook Sub-watershed (CT 3300-10) Modeled Annual Pollutant Loads by Source.

NPS Pollutant Source	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)	Fecal Coliform (billion/yr)	Runoff Volume (ac-ft/yr)	TN (% load)	TP (% load)	TSS (% load)	Fecal coliform (% load)
Primary Sources Loads									
LDR (<du/acre)	474	70	11,065	20,584	83	5	7	3	19
MDR (1-4du/acre)	7	1	175	325	1	<1	<1	<1	<1
HDR (>4du/acre)	0	0	0	0	0	0	0	0	0
Multi-family	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0
Roadways	1,767	192	102,941	70,023	283	20	19	28	66
Forest	3,488	279	139,500	16,740	192	40	28	38	16
Rural	303	46	6,580	2,566	9	3	5	2	2
Pasture/Hay	1,049	160	22,800	8,892	31	12	16	6	8
Cropland	27	4	580	226	1	<1	<1	<1	<1
Open Water	863	34	10,447	0	0	10	3	3	<1
Total Primary Sources	***7,977***	***786***	***294,087***	***119,356***	***601***	-	-	-	-
Secondary Sources Loads									
Septic Systems	346	58	2,310	858	0	4	6	1	1
Stream Channel Erosion	0	0	92,380	0	0	<1	<1	25	<1
Hobby Farms/Livestock	578	130	0	3,600	0	7	13	<1	3
Total Secondary Sources	***924***	***188***	***94,690***	***4,458***	***0***	-	-	-	-
Load Reductions Existing Practices	***233***	***-40***	***21,700***	***17,284***	***32***	***-3***	***4***	***-6***	***-16***
Total Load	**8,668**	**1,014**	**367,078**	**106,530**	**569**	**100%**	**100%**	**100%**	**100%**