French and Quinebaug River Basins
2004 Water Quality Technical Memorandum

TM-41/42-5

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Table of Contents

List of Tables and Figures

Introduction

The watershed assessment process in Massachusetts is carried out on a 5-year cycle. In Year One, the Massachusetts Department of Environmental Protection Division of Watershed Management (DWM) coordinates with watershed groups, gathers background information and begins to formulate sampling needs for streams, rivers, ponds and lakes in pre-determined watersheds. During Year Two of the cycle, sampling sites and parameters are finalized and sampling is conducted. In Year Three, the finalized data are used for assessment reporting to comply with Section 305b of the Clean Water Act (CWA). Implementation of specific projects or programs to address water quality problems, and post-project evaluation are conducted in Year Four and Year Five, respectively.

As part of the DWM Year Two monitoring in 2004, the Division of Watershed Management's Assessment Monitoring Program was charged with increasing, both temporally and spatially, the percent coverage of assessed surface waters in the Commonwealth. Specifically, emphasis was placed on monitoring waters currently "unassessed" (i.e., there is no data) or "not assessed" (i.e., historical data exists but is greater than five years old). As part of the 2004 watershed assessments, biological monitoring, bacteria sampling, and habitat assessments were conducted to evaluate the biological health and recreational uses status of various portions of the French, and Quinebaug River watersheds. Water quality surveys were performed at 24 sites in the French and Quinebaug River watersheds and included measuring *in situ* parameters (e.g., dissolved oxygen, temperature, pH, specific conductance, and total dissolved solids) and collecting grab samples for bacteria analysis. This technical memorandum is designed to present final DWM-generated water quality monitoring data for use in watershed assessment reports and for reporting data to outside groups. The biological and habitat assessment data will be presented in a separate technical memorandum.

Project Objectives

The main objectives of monitoring in the French and Quinebaug River watersheds are: (a) to determine the biological health and recreational status of "unassessed" and "not assessed" rivers/streams within the watershed by conducting assessments based on biological (aquatic macroinvertebrates, fish, periphyton, bacteria) communities; and (b) to identify problem stream segments so that efforts can be focused on developing or modifying NPDES and Water Management Act permits, stormwater management, and control of other nonpoint source (NPS) pollution (MassDEP 2004a). Biological assessments were supplemented with a habitat assessment and *in-situ* water quality measurements (including dissolved oxygen, percent saturation, temperature, pH, depth, and specific conductivity) to evaluate water quality and habitat quality at each study site. The 2004 DWM monitoring efforts also included fecal coliform and *E. coli* bacteria sampling at all 24 stations. Bacteria data will provide information used in making assessments of the *Primary and Secondary Contact Recreation* uses.

Sampling design, data quality objectives, as well as quality assurance for this project may be found in: *Quality Assurance Project Plan 2004 Surface Water Quality Monitoring and Assessment CN 177.1 (*MassDEP 2004a).

Methods

Twenty-four stations (Figure 1) in the French and Quinebaug River watersheds were sampled monthly for *in situ* parameters in the summer, low flow months of June, July, and August. Sampling station descriptions are provided in Table 1. Additional information pertaining to station location (including detailed station maps), rationale, objectives, and sampling methods is available in *Quality Assurance Project Plan 2004 Surface Water Quality Monitoring and Assessment CN 177.1 (*MassDEP 2004a) and *2004 Biological Monitoring and Habitat Assessment QAPP CN187.1* (MassDEP 2004b). *In- situ* parameters were measured during pre-dawn hours and during the morning using multi-probe units that measure dissolved oxygen (DO), percent DO saturation, pH, conductivity, temperature, and total dissolved solids.

Between May and September wade-in grab samples were also collected monthly (n=5) from the 24 stations (Table 1) and sent to the Senator William X. Wall Experiment Station in Lawrence, MA where they were analyzed for *E. coli* and fecal coliform bacteria.

QA/QC decisions are imposed on the data following the guidelines of the DWM working SOP *Data Validation and Usability Standard Operating Procedure CN056.*2 (MassDEP 2005). Specifics related to data validation are available in the *2004 Data Validation Report* (MassDEP 2006 and in Tables 7 and 8). It should be noted that when the multi-probe depths are reported as less than 0.1 m, they are automatically qualified as potentially being in error (e.g., depth not calibrated by field crews). Additionally, if zero and/or negative depth readings occur more than once per survey date, then all negative/zero depth data is censored, and all other depth data for that survey is qualified (indicates that erroneous depth readings were not recognized in the field and that corrective action (field calibration of the depth sensor) was not taken, i.e., that all positive readings may be in error.)

Mine Brook in Webster was initially sampled in a large pool downstream from the Mine Brook Road culvert. However, dissolved oxygen concentrations were found to be unusually low for a high gradient stream (i.e., <2 mg/L). On 21 July, DWM staff conducted a special dissolved oxygen study of Mine Brook. The brook was sampled at five stations- upstream from the culvert, downstream from the culvert, and in the original sampling location. It was determined that the original location was NOT representative of the stream conditions and the sampling station was moved to ~ 30 feet upstream from Mine Brook Road. Additional discussions as to the cause of the low dissolved oxygen can be found in the station description section of this memorandum.

West Brook was initially sampled on private property (footbridge, station WS01A) upstream from Route 20. However, the station was moved to the Route 20 crossing (station WS01) after the owner decided the pre-dawn surveys were too intrusive.

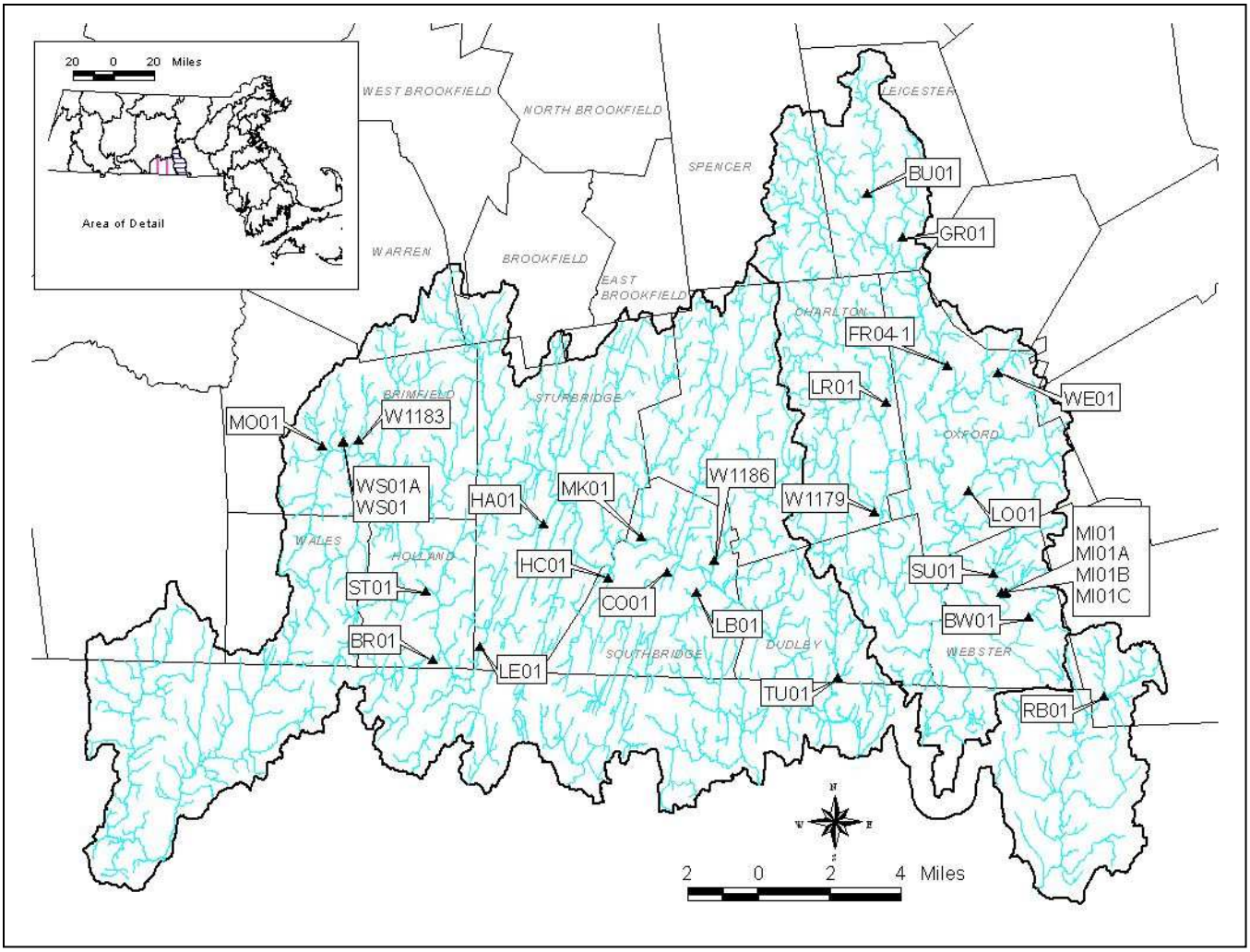
Table 1. Massachusetts Department of Environmental Protection Division of Watershed Management 2004 French and Quinebaug Watershed Water Quality Sampling Station Descriptions. Note: This table includes all the stations sampled on Mine Brook (including the special dissolved oxygen study) and both stations on West Brook.

Waterbody	Station ID#	Station Description	Parameters
Unnamed Tributary	W1183	Unnamed tributary to Mill Brook at Sturbridge Road (Route 20), Brimfield	Pre-dawn dissolved oxygen, temperature, pH, conductivity, total dissolved solids; fecal coliform and *E. coli* bacteria
Unnamed Tributary	CO01	Unnamed tributary to Quinebaug River, locally considered part of Cohasse Brook, approximately 700 feet upstream/southwest of Cisco Street, Southbridge	Same as above
Unnamed Tributary	W1186	Unnamed tributary to Quinebaug River west of Dresser Hill Road, approximately 2100 feet upstream of confluence with Quinebaug River, Southbridge	Same as above
Rocky Brook	RB01	In Douglas State Forest downstream of footbridge on the unnamed easterly extension of High Street, Douglas	Same as above
Tufts Branch	TU01	Route 197 (West Main Street) crossing, Dudley	Same as above
Lebanon Brook	LB01	East of Route 169, approximately 1900 feet upstream/southwest of Ashland Avenue, Southbridge	Same as above
McKinstry Brook	MK01	Pleasant Street crossing, Southbridge	Same as above
Hatchet Brook	HC01	Approximately 300 feet upstream/south of South Street, upstream of dam remnants, Southbridge	Same as above
Hamant Brook	HA01	Approximately 100 feet downstream/northeast of unnamed gravel pit access road, west off Shattuck Road, Sturbridge	Same as above
West Brook	WS01	Route 20 crossing, Brimfield	Same as above
West Brook	WS01A	Footbridge approximately 160 feet downstream/south of Main Street (Route 20), Brimfield	Same as above
Mountain Brook	MO01	Route 20 crossing, Brimfield	Same as above
Stevens Brook	ST01	Upstream/west at Mashapaug Road crossing, Holland	Same as above
Browns Brook	BR01	Approximately 850 feet upstream/west of May Brook Road crossing, Holland	Same as above
Leadmine Brook	LE01	South of Leadmine Road/Route 15 junction, northwest of Route 15 (Mashapaug Road) abandoned rest area, Sturbridge	Same as above
Unnamed Tributary	LO01	Main Street (Route 12) crossing of unnamed French River tributary locally known as Lowes Brook, Oxford	Same as above

Table 1 (Continued). Massachusetts Department of Environmental Protection Division of Watershed Management 2004 French and Quinebaug Watershed Water Quality Sampling Station Descriptions. Note: This table includes the all stations sampled on Mine Brook (including the special dissolved oxygen study) and both stations on West Brook.

Unnamed Tributary	W1179	Unnamed tributary to South Fork at the Potter Village Road crossing, Charlton	Same as above
French River	FR04-1	Southeast of the Clara Barton Road/Route 56 junction, approximately 300 feet downstream of powerlines, Oxford	Same as above
Sucker Brook	SU01	Sutton Road crossing, Webster	Same as above
Mine Brook	MI01C	Approximately 30 feet upstream/east of Mine Brook Road, Webster	Same as above; DO study
Mine Brook	MI01	In pooled area on downstream/west side of Mine Brook Road, Webster	Same as above; DO study
Mine Brook	MI01B	Approximately 137 feet downstream/west of Mine Brook Road, Webster	DO study
Mine Brook	MI01A	Approximately 550 feet downstream/west of Mine Brook Road, Webster	DO study
Browns Brook	BW01	Off the western end of Sylvester Drive, approximately 500 feet upstream/northeast of the Gore Road crossing, Webster	Pre-dawn dissolved oxygen, temperature, pH, conductivity, total dissolved solids; fecal coliform and *E. coli* bacteria
Little River	LR01	Turner Road crossing, Charlton	Same as above
Wellington Brook	WE01	West of Millbury Road, approximately 600 feet downstream of Chimney Pond outlet, Oxford	Same as above
Grindstone Brook	GR01	Huntoon Highway (Route 56) crossing, Leicester	Same as above
Burncoat Brook	BU01	Upstream of unnamed dirt road south off of Pine Street, approximately 600 feet downstream of Ballard Hill Pond outlet, Leicester	Same as above

Figure 1. Massachusetts Department of Environmental Protection Division of Watershed Management 2004 Water Quality Monitoring Station Locations in the French and Quinebaug Rivers Watershed.



Field sheets, raw data files, chain of custody forms, lab reports, and other metadata used in this report are stored and maintained by DWM in project files and the Water Quality Database in Worcester, MA.

Survey Conditions

To fulfill 305(b) assessment guidance, information on precipitation (National Weather Service undated) and stream discharge (Socolow *et al.* 2005) were analyzed to estimate hydrological conditions during the 2004 water quality sampling events in the French and Quinebaug Rivers Watershed. This review was conducted to estimate streamflow conditions in relation to the 7-day, 10-year (7Q10) low flow. Additionally, this review was used to determine whether fecal coliform bacteria data were representative of "wet" or "dry weather" sampling conditions. A sample is considered to be collected during dry weather when there has been little or no precipitation three days prior to sampling. Wet weather is defined as a precipitation event, generally greater than 0.25 inches of rain, within three days prior to sampling that results in a substantial increase in streamflow on the sampling date. Given limited resources, sampling the first flush (first few hours of discharge due to a rain event forecast to produce >0.25 inches of precipitation) was not possible. In cases where there is no clear distinction between wet and dry weather, best professional judgment is used.

There are two United States Geological Survey (USGS) stream gages in the Quinebaug River Watershed (Figure 2) that were used in determining weather conditions for the 2004 DWM surveys. Gage #01123360, Quinebaug River below East Brimfield Dam at Fiskdale, MA is located 750 feet downstream

from the East Brimfield Dam and 2.4 miles upstream from the outlet of Cedar Pond in Fiskdale. USGS notes that records are good for this gage but that estimated daily discharge is poor. Flow is regulated by East Brimfield Lake (Socolow *et al.* 2005). Gage # 01123600, Quinebaug River below Westville Dam near Southbridge, MA is 200 feet downstream from the Westville Dam, one mile upstream from McKinstry Brook, and 1.3 miles west of Southbridge. USGS notes that records are considered good except those with discharges greater than 200 cfs and estimated daily discharge, which is considered poor (Socolow *et al.* 2005). Flow is regulated by the East Brimfield Lake and Westville Lake along with other mills and reservoirs upstream.

There are also three USGS stream gages in the French River Watershed that were not used in this report. These gages are real-time gages, however, data publication in water year reports was discontinued in 1981 for funding reasons. Gage #01125000, French River at Webster, MA, is located 50 ft upstream from Pleasant Street bridge in Webster, and 1.1 mi upstream from Potash Brook. Flow at this gage is regulated by mills, Lake Chaubunagungamaug (Webster Lake), Buffumville Lake and Hodges Village Reservoir, and smaller reservoirs upstream. Gage # 01124350, French River, below dam at Hodges Village, MA, is located 240 ft downstream from Hodges Village Dam, 0.8 mi west of Oxford, and 1.2 mi upstream from the Little River. The Hodges Village Reservoir regulates flow at this gage. Gage #01124500, Little River near Oxford, MA, is located 0.6 mi upstream from the mouth, 1.1 mi downstream from Buffumville Dam, and 1.5 mi west of Oxford. USGS notes that discharge records at this gage are considered poor due to backwater effects from beaver dams. Flow is also regulated by Buffumville Lake and by other reservoirs upstream.

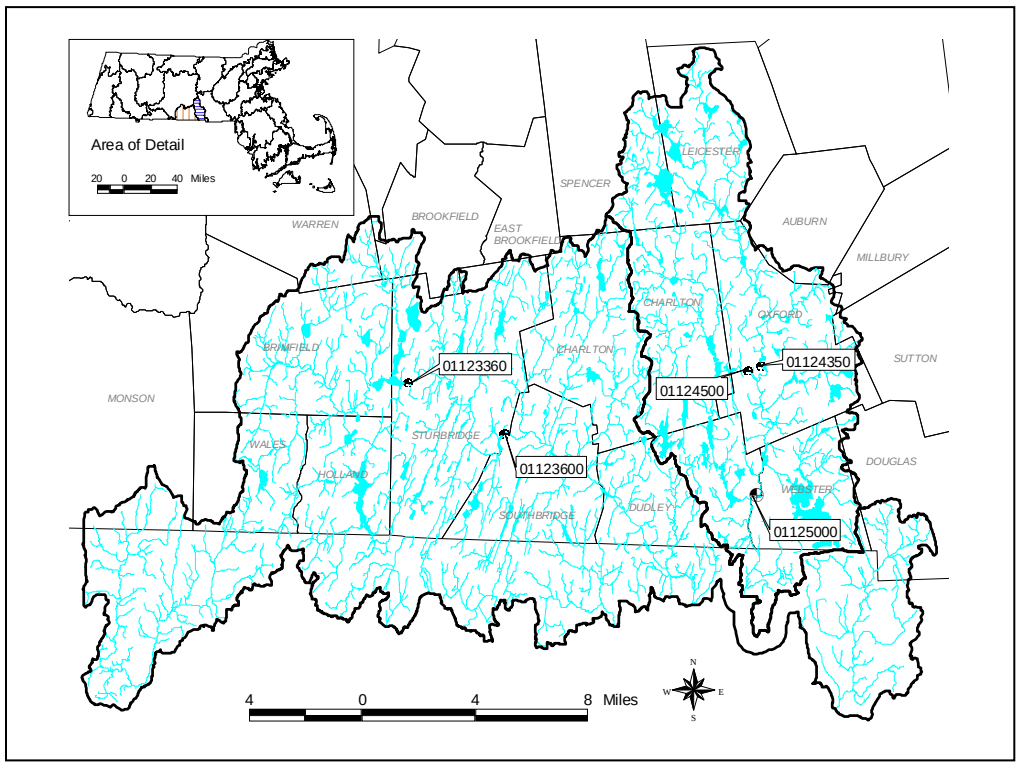


Figure 2. Location of USGS Stream Gages in the French and Quinebaug rivers Watershed

The Quinebaug River has a moderate slope of about 13 ft/mi from the headwaters area to the USGS streamflow-gaging station near the Massachusetts border in Quinebaug, Conn., a distance of about 29 river miles. The French River begins near Leicester, Mass., and flows southward to its confluence with the Quinebaug River in northeastern Connecticut. Together, the average daily discharge of the French and Quinebaug Rivers at the State line with Connecticut is about 300 million gallons or approximately 464 cubic feet per second (cfs) (USGS 2003).

Survey conditions are described below for each sampling event. No drought advisories were issued in 2004; USGS reports that streamflows were normal to above normal during May, June, July, August, and September 2004 (USGS 2005).

26 May 2004: Sampling crews reported overcast skies with temperatures around 55°F. On the day of sampling 0.21 inches of rain fell at the Worcester Airport (it is not known whether or not this occurred before or after sampling). Two days prior to sampling (24 May) 0.43 inches of rain was recorded at the airport. Streamflows in the Quinebaug River near Southbridge (gage #01123600) had been decreasing from 281 cfs to 186 cfs two days before the survey (Table 4, Figure 3). Flows increased on the 25th and 26th of May (up to 205 cfs). At the gage in Fiskdale (#01123360) flows were decreasing from 160 cfs five days prior to sampling to 105 cfs on the 24th of May. By the sample date flows increased slightly to 118 cfs (Table 4, Figure 3). Flows continued to increase in the Quinebaug River for another three days (Socolow *et al.* 2005). Samples collected during this survey will be interpreted as being representative of wet weather conditions.

16 June 2004: The sun was shining on field crews during this bacteria survey in mid-June. At the Worcester airport the rain gauge was generally dry with rain totaling 0.1 inches falling two days prior to sampling (Table 3). Streamflows at both USGS gages were decreasing. In Southbridge (gage #01123600) flows went from 106 cfs five days prior to sampling down to 83 cfs on the sample date. Near Fiskdale, streamflow was similar, going from 54 cfs down to 35 cfs (gage #01123360). Flows at both locations did not approach 7Q10 (Table 4). The bacteria samples collected on 16 June were collected during dry weather.

14 July 2004: Two sampling crews reported drizzle at the start of the July bacteria sampling event. One DWM crew reported overcast skies. As the day wore on, the drizzle gave way to just overcast/mostly cloudy skies. Five days prior to sampling, no precipitation was recorded at the Worcester Airport. However a storm dumped 0.37 inches of rain on the airport on the 10th of July and another storm event on the13th, deposited 0.43 inches of rain. Streamflows in the Quinebaug River increased slightly following the rain event on the 8th of July (increasing 2 cfs at gage # 01123360 and 7 cfs at gage #01123600 respectively). Flows then decreased thereafter until the sampling date. On the 15th of July, streamflows increased 1 and 3 cfs at the two gages respectively (Socolow *et al.* 2005). While there was no direct relationship observed between the precipitation event and an increase in streamflow at the gage downstream from the East Brimfield Dam (# 01123360), there was a response further downstream at the gage in Southbridge (#01123600). Flows at the East Brimfield Dam are manipulated by the flood control project and other dams upstream (e.g., outlet of Hamilton Reservoir). Given the amount of precipitation and the drizzle reported by field crews, it is best professional judgment that the bacteria data collected on the 14th of July were collected during wet weather conditions.

11 August 2004: Field crews reported overcast skies on the 11th of August. The previous day crews categorized the weather as clear to mostly cloudy. Only trace amounts of precipitation fell at the airport on the sample day. The five antecedent days were dry with little to no rainfall recorded (Table 3). Streamflows in the Quinebaug River decreased steadily (~20 cfs) over the five days preceding the survey. While flows did not approach 7Q10 at each gage, they were only about 3-4 times greater. This survey will be considered a dry weather event.

15 September 2004: The sun was shining on field crews in mid-September. Precipitation at the Worcester Airport was less than 0.1 inches over the course of the five days before the last French and Quinebaug bacteria survey (Table 3). At the gage at Fiskdale (# 01123360), flows went from 51 cfs on the 10th to 81 cfs on the 11th. This was likely the result of a precipitation event on the 9th of September, which deposited 1.43 inches of rain at the airport (Table 3). Streamflows then diminished to 34 cfs on the 15th.

Streamflow at the gage near Southbridge (#01123600) also increased three days prior (from 95 to 125 cfs) to the survey. However, by the survey date flows had receded to 73 cfs (Figure 6). Since there was no precipitation in the three days prior to the survey and flows were decreasing, the last French and Quinebaug bacteria survey was conducted during dry weather.

Table 2. Provisional precipitation data summaries for MassDEP DWM surveys obtained from the NOAA website http://www.erh.noaa.gov/box/dailystns.shtml for Worcester, MA.

French and Quinebaug Rivers Multiprobe Survey
Precipitation Data Summary (reported in inches of rain)

Survey Dates	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Sample Date
Worcester						
7/13/2004	0.26	0.00	0.37	0.00	0.00	0.43
8/10/2004	0.76	T	0.00	0.00	0.00	0.00
9/14/2004	1.43	0.07	0.00	0.00	0.00	0.00

French and Quinebaug Rivers Bacteria Survey
Precipitation Data Summary (reported in inches of rain)

Survey Dates	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Sample Date
Worcester						
5/26/2004	T	0.02	0.03	0.43	0.00	0.21
6/16/2004	0.00	0.00	0.00	0.01	0.00	0.00
7/14/2004	0.00	0.37	0.00	0.00	0.43	0.04
8/11/2004	T	0.00	0.00	0.00	0.00	T
9/15/2004	0.07	0.00	0.00	0.00	0.00	T

* trace amount of precipitation noted

Table 3. USGS gage data summaries in the Quinebaug River Watershed for the 2004 MassDEP DWM surveys (Socolow *et al*. 2005).

French and Quinebaug River Watersheds Surveys
USGS Flow Data Summary (reported in cfs)

Survey Dates	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Sample Date	Monthly Mean	POR* Monthly Mean
Quinebaug River below East Brimfield Dam at Fiskdale, MA (7Q10 = 6.2 cfs, Eames and Epstein 1988)								
Gage #01123360								
5/26/2004	160e	131	112	105	116	118	160	153
6/16/2004	54	50	44	40	39	35	53.3	124
7/14/2004	38	36	33	29	28	28	46.8	47.9
8/11/2004	36	35	31	27	22	19	40.9	45.5
9/15/2004	51	81	76	59e	44	34	92.0	44.6
Quinebaug River below Westville Dam near Southbridge. (7Q10 = 10.4 cfs, Eames and Epstein 1988)								
Gage #01123600								
5/26/2004	281	229	196	186	200	205	299	212
6/16/2004	106	100	97	88	85	83	104	172
7/14/2004	81	74	70	64	60	63	90.2	66.3
8/11/2004	70	68	62	56	50	45	75.1	55.3
9/15/2004	95e	120e	125e	100e	84	73	167	58.0

* Period of Record
e – Estimate

Figure 3. May 2004 stream flow versus precipitation graphs for the Quinebaug River.

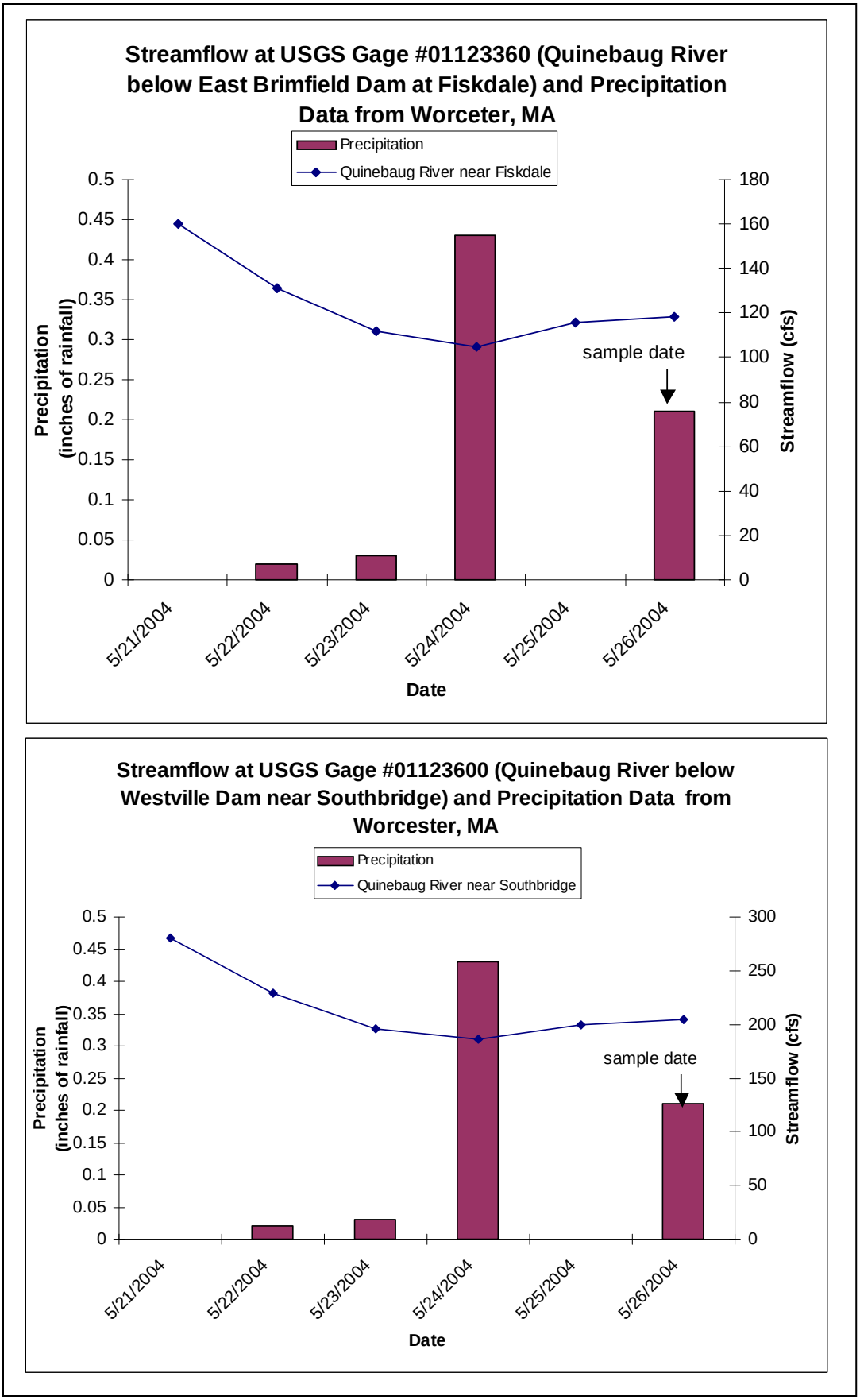
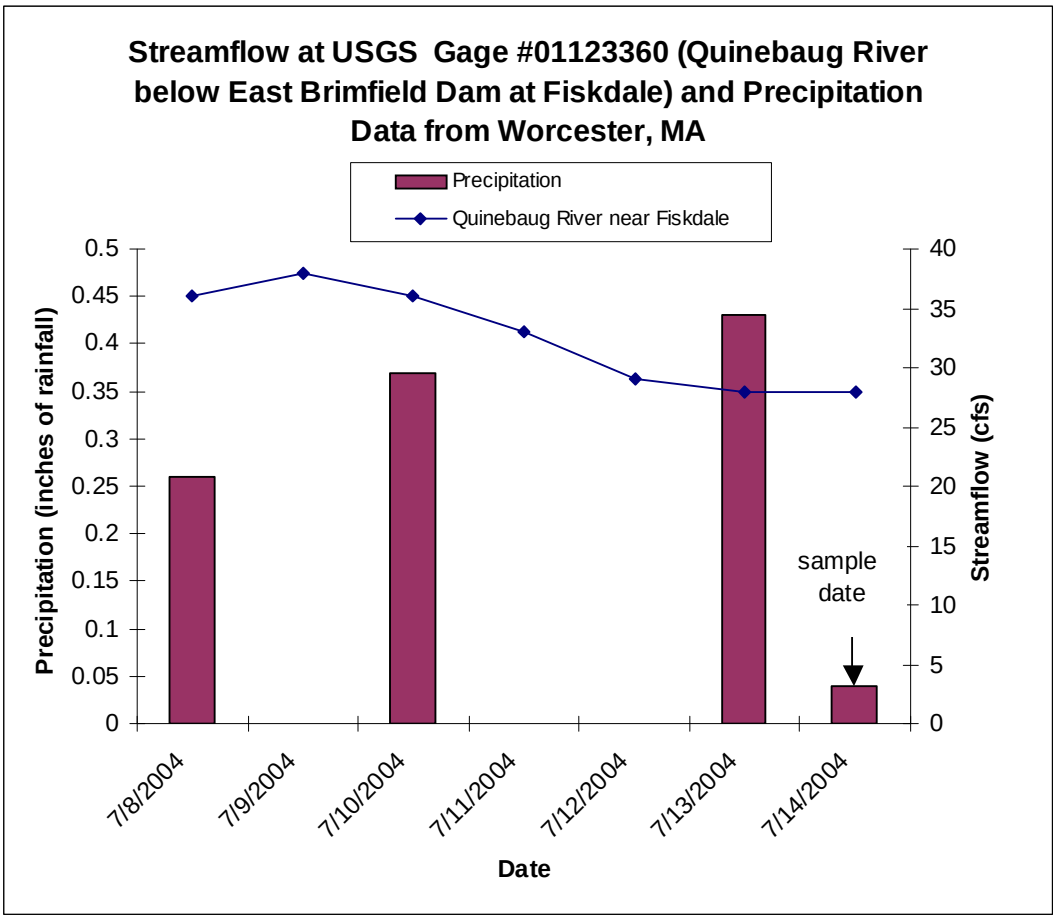


Figure 4. July 2004 streamflow versus precipitation graphs for the Quinebaug River.



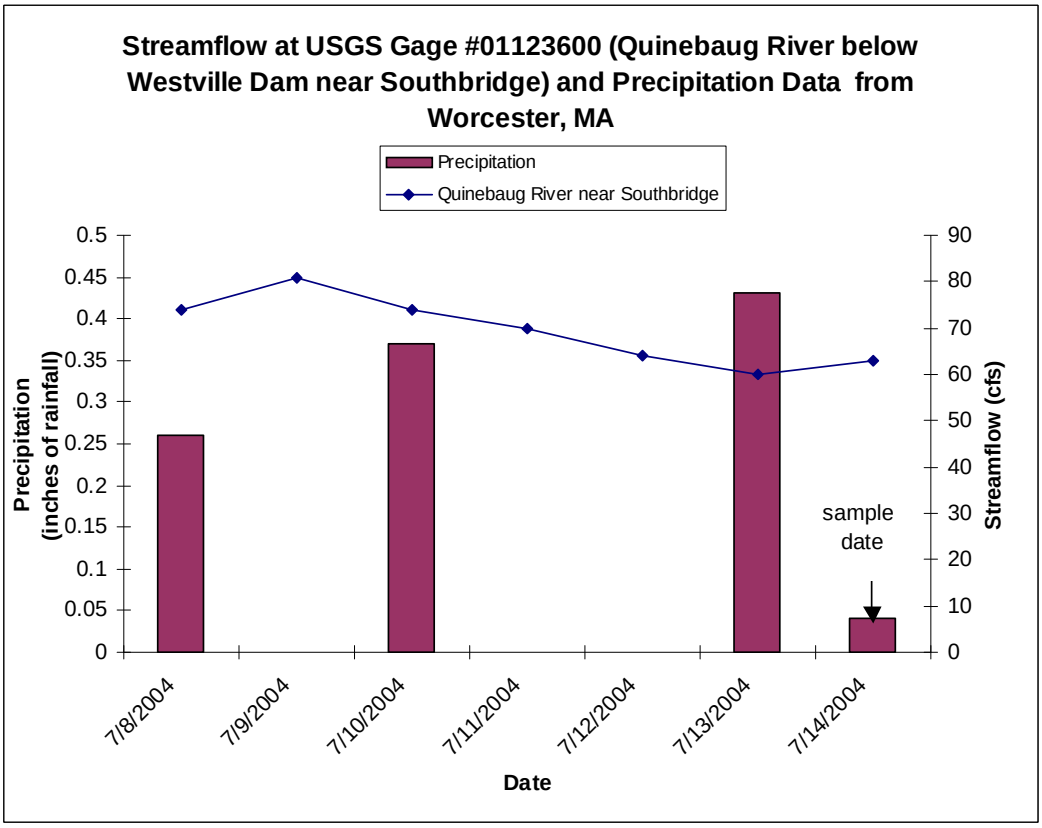
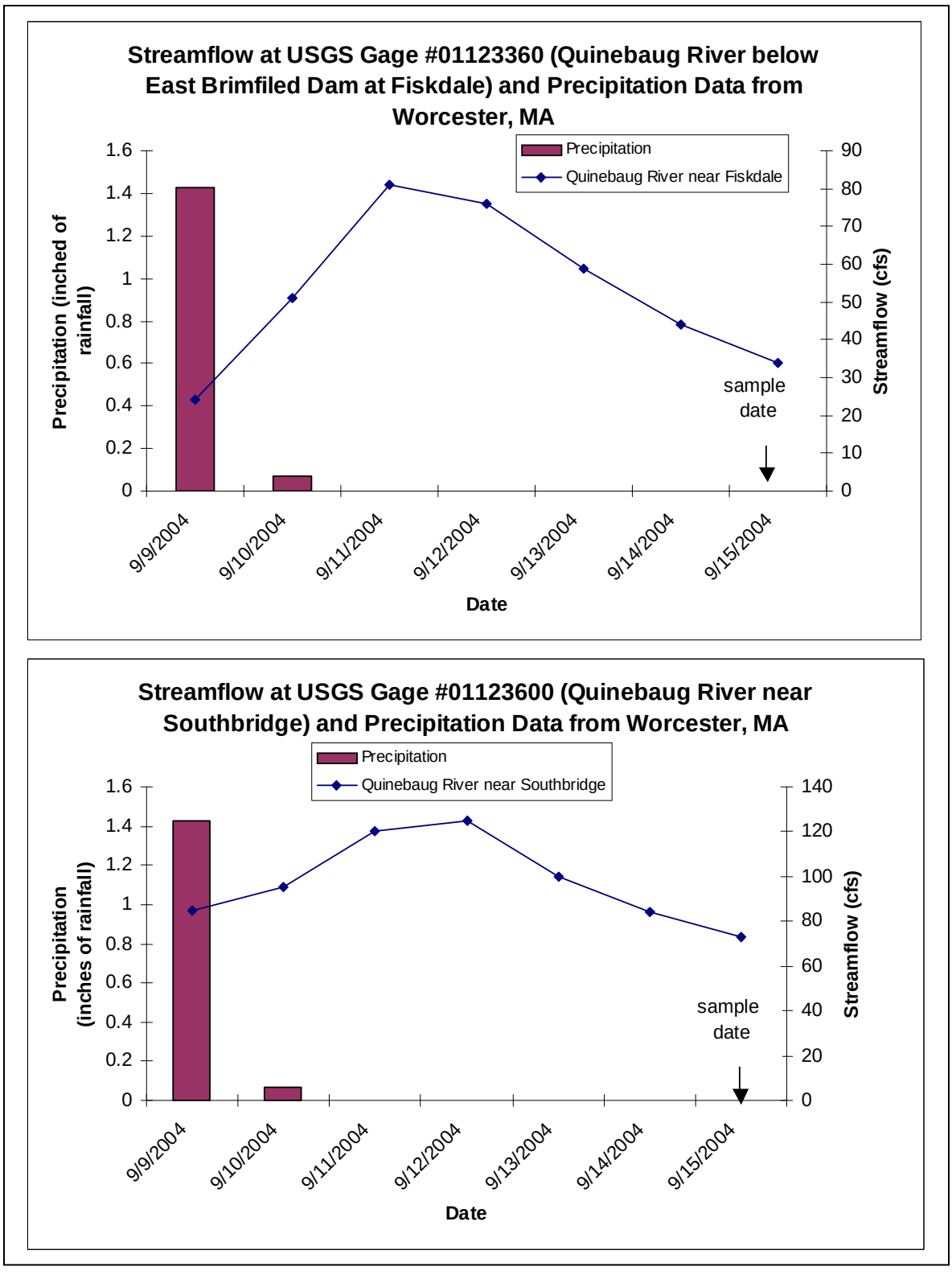


Figure 5. September 2004 stream flow versus precipitation graphs for the Quinebaug River.



Station Observations

Station W1183- Unnamed Tributary- Unnamed tributary to Mill Brook at Sturbridge Road (Route 20), Brimfield

This unnamed tributary originates at the outlet of Sherman Pond and terminates at the confluence with Mill Brook, traversing approximately 1.2 miles. The upstream drainage area encompasses 5.9 mi^2 and includes the watersheds of East Brook and Sessions Brook. The dominant land use in the drainage area is forest (87%), followed by low density residential (9%, clustered around Sherman Pond) and agricultural (8%) uses. 0.2 mi^2 of the drainage area is covered by impervious surfaces (4%).

This unnamed tributary had slightly to moderately turbid water during the sampling events. Water color varied from clear to light yellow/tan. Flows in the stream ranged from normal to 0.5 feet below the mean annual high water mark. No objectionable odors, scums, or deposits were noted. The principal substrate in this stream was sand, but cobble, gravel, and boulders were also present. Burreed (*Sparganium* sp.), *Arrow arum*, and pickerelweed were noted throughout the sampling season to cover less than 25% of the reach, mostly localized to the shoreline areas. There was no canopy cover at Station W1183 (i.e., 100% open). When recorded a thin brown film of periphyton was observed growing on the rocks and growing epiphytically on the aquatic plants in the run. Potential pollution sources included road runoff, lawns, and horse farms (upstream).

Station C001- Unnamed tributary to Quinebaug River- locally considered part of Cohasse Brook, approximately 700 feet upstream/southwest of Cisco Street, Southbridge

Cohasse Brook begins in a large wetland in Woodstock, CT. The brook flows in a north/northeasterly direction. The brook is impounded twice at Cohasse Brook Reservoir and Wells Pond. After traversing 4.9 miles, the brook empties into the Quinebaug River near the Route 169/198 rotary in Southbridge. The four square mile upstream drainage area is mostly forested (64%). However, in the areas immediately upstream from the sampling station, the land use is dominated by high-density residential properties and industrial uses. Pollution sources include runoff from roads, the Oak Ridge Cemetery (lawns), and the Cohasse Country Club (mile upstream). Cohasse Brook was sampled in the Oak Ridge Cemetery. Field crews were directed to park on Cohasse Road, walk over a low stonewall and into the cemetery, and enter the stream downstream from the concrete footbridge near the Vallaincourt and Kalis gravestones.

The water was clear and colorless. No scums or odors were noted. Trash was reported but it is unclear from fieldsheets as to the extent of coverage. Multiple crews noted improper disposal of yard waste (grass clippings) in the riparian zone. Substrates within the sampling reach were cobble and sand. Blacknose dace were observed swimming around the pool below the concrete footbridge. Field crews did not note any aquatic plants. Canopy cover was estimated to be 50%. Periphyton presence was generally not recorded at this site.

Station W1186- Unnamed Tributary- Unnamed tributary to Quinebaug River west of Dresser Hill Road, approximately 2100 feet upstream of confluence with Quinebaug River, Southbridge

This unnamed tributary to the Quinebaug River was sampled just downstream from an unnamed access road into a private gravel bed. The samples were collected downstream from the road, from the left bank. The drainage area upstream from the sampling station is eight square miles. Land use within the drainage area is 63% forest, 16% agriculture, and 13% residential.

The water was clear and colorless except on the May survey when it had a light yellow tint. Streamflows began to decline in June (0.2 feet below normal) and by August were 2 feet below the observed annual high water mark. Canopy cover was estimated to be 20%. No objectionable deposits or odors were not reported. Minnows were spotted in the sampling reach on three occasions. Natural foam was documented on the surface during the May survey. During the June survey the field crew reported an outfall pipe with iron floc located downstream from the bridge. This floc was localized to the right bank

area. Other potential pollution sources identified by the field crews included road runoff and the gravel operation. Aerial photographs show that there is a large area of cropland 0.3 miles upstream from the sampling station that could potentially contribute nutrients. Field crews did not note any aquatic plants. Periphyton presence was generally not recorded at this site.

Station RB01- Rocky Brook- in Douglas State Forest downstream of footbridge on the unnamed easterly extension of High Street, Douglas

Rocky Brook starts as an intermittent stream to the northeast of Chamberlain Pond in Webster and flows for 2.5 miles through the Douglas State Forest before crossing the state border into Connecticut. The drainage area is 4.7 mi^2. Land use within the drainage area is 94% forest, 2% wetlands, and 2% low density residential. The sampling station was just downstream from a large wetland. Access was gained by walking around Gate #19 in the Douglas State Forest, and proceeding down the dirt trail to the bridge over the brook.

The sampling reach was almost completely shaded by canopy cover. Substrates consisted of boulder, cobble, and gravel. The water was clear with a reddish/yellow tint indicative of tannins and lignins associated with the upstream wetland. Moss was the only plant noted within the sampling reach. Sparse periphyton densities were noted on the first sampling day but were generally unobservable or not recorded. On three occasions the water had a musty odor. Naturally occurring foam was also noted on the field sheets. No objectionable deposits were observed. An eastern brook trout was seen during the September pre-dawn multiprobe survey. Road runoff 0.4 miles upstream and an old railroad grade appear to be the only potential sources of pollution to Rocky Brook.

Station TU01- Tufts Branch- Route 197 (West Main Street) crossing, Dudley

Tufts Branch was sampled upstream from Route 197. Field crews were instructed to park on Dave's Way and then walk back to the bridge. Samples were collected from the right bank, upstream from the bridge. Land use in the 2.4 mi^2 upstream drainage area is dominated by forest (49%) with followed by agriculture (30%) and residential properties (16%). Five percent of the area is covered by impervious surfaces.

Water levels in the stream were low from the beginning; in May levels were reported to be 0.5 feet below the observed high water line and dipped to three feet below the high water line by September. The water was described as clear, colorless, and odorless. No aquatic plants were reported in the stream. Loose floc was noted on the rocks in the riffles in July while a sparse coverage of thin film was documented in August. No objectionable deposits or odors were noted and no scums were noted with the exception of a natural foam, that was noted on two occasions. Lawns impacted the riparian area on the left bank while the right riparian zone was comprised of woods with a thick understory. Canopy cover was estimated to be 50%. The right bank was undercut. A storm drain half filled with sand was located upstream from the Route 197 bridge, but downstream from the sampling location.

Station LB01- Lebanon Brook- East of Route 169, approximately 1900 feet upstream/southwest of Ashland Avenue, Southbridge

Lebanon Brook is another stream that originates in Woodstock, CT and flows north into Massachusetts. The Massachusetts portion of the brook is 4.7 miles long. Near the confluence with the Quinebaug River, the natural flow pattern of Lebanon Brook has been disturbed by human influence- the Providence and Worcester Railroad and Route 131 have redirected the streambed, causing it to take an almost 90-degree turn to the west, channeling the brook under the railroad tracks and road, before taking a 180-degree bend across from the Southbridge Waste Water Treatment Plant. Station access was obtained behind Bermer Tool and Dye at 94 Ashland Street in Southbridge. Field crews walked down an old ATV trail ~565 feet. The drainage area upstream from the sampling station is 9.7 mi^2. Land use in the Massachusetts portion of the drainage area is 75% forest and 12% low-density residential properties.

Flows in Lebanon Brook were generally 1.5 feet below the observed high water mark. The water was clear with a light yellow/tan color. Field crews did not note any aquatic plants at this site. Thin film and filamentous algae sparsely covered the boulder/cobble substrates during the July sampling events.

Canopy cover was estimated at approximately 50%. Gravel and sand were also part of the substrate composition. No objectionable deposits or odors were noted. Foam was noted on all of the daytime sampling events, however, it is the belief of the field crews that this was natural. To the southeast of the sampling station is a pasture. Road and house construction were noted to be the likeliest sources of pollution to the brook at the sampling station. Downstream, road runoff from parking lots and roads is a potential source of pollution.

Station MK01- McKinstry Brook- Pleasant Street crossing, Southbridge

McKinstry Brook originates in a wetland south of North Sturbridge Road in Charlton and flowing in a southerly direction for approximately seven miles until discharging into the Quinebaug River in Southbridge. Land use in the drainage area is 74% forest, 9% residential, 4% wetlands, 4% open land, and 4% transportation. The upstream drainage area is 8.2 mi^2. Seven percent of the drainage area is covered by impervious surfaces. The sampling station was accessed through a small playground, ~50 feet upstream from Pleasant Street on the left bank. Potential pollution sources, in addition to the garbage dumping, included an upstream landfill, construction, and an airport.

Water clarity varied from clear to slightly turbid. The water was a light yellow/tan color. Substrates in the sampling reach were composed of boulders, cobble, gravel, and sand. No odors or scums were reported. Trash was present in the stream in limited areas. Field crews did not note any aquatic plants at this site. Sparse to moderate coverages of green and brown filamentous algae and film periphyton were documented attached to boulders and cobble in the riffle zone during the sampling season. The canopy cover was estimated to be approximately 25%.

Station HC01- Hatchet Brook- Approximately 300 feet upstream/south of South Street, upstream of dam remnants, Southbridge

There are four water supply reservoirs along Hatchet Brook that supply drinking water to residents of the Town of Southbridge- Hatchet Pond, No. 5 Reservoir, No. 4 Reservoir, and No. 3 Reservoir. The sampling station is located approximately one mile downstream from No. 3 Reservoir and 0.4 miles upstream from the confluence with the Quinebaug River. Access was obtained by walking around the Southbridge Water Department gate on South Street, walking upstream to an old blown out dam. The 3.6 mi^2 upstream drainage area is predominantly forested (85%). Low to medium-density residential properties account for 6% of the land use. Only three percent of the drainage area is covered by impervious surfaces.

The water was clear with a light yellow/tan color. Moss was the most noted plant species noted on substrates in the sampling reach during the sampling season. Canopy cover was estimated to be ~90%. The substrates were comprised of cobble, gravel, boulder, and sand. There were no objectionable odors, scums, or deposits. No pollution sources were identified.

Station HA01- Hamant Brook- Approximately 100 feet downstream/northeast of unnamed gravel pit access road, west off Shattuck Road, Sturbridge

Station HA01 was accessed through a gravel bed, approximately 360 feet upstream from an unnamed impoundment. Samples were collected from the right bank looking downstream. The headwaters of this stream begin as an unnamed stream located just west of Interstate 84 in Sturbridge. The land use for the 2.5mi^2 upstream drainage area is 73% forest, 14% transportation (I-84) and 4% wetlands. There is 0.3 mi^2 of impervious surfaces (12%). The riparian area surrounding this station was described as forest.

Substrates in Hamant Brook were comprised of cobble, gravel, and sand. The water was generally slightly to moderately turbid on each of the eight sampling events. Water color varied from clear to grayish to light yellow/tan. No objectionable deposits or odors were noted by field crews. Foam was noted on three occasions but it is believed to be natural. Field crews did not note any aquatic plants at this site. Very dense, brown, film periphyton was observed on the rocks in the riffle areas during the June sampling date, while film periphyton coverage was moderate and sparse in July and August respectively. Very dense coverage of moss was noted on the September sampling date. Canopy cover was estimated at

90%. Dirt bike tracks were evident crossing the stream, contributing to slight erosion, as were undercut banks. Visual observations of flows in Hamant Brook were perceived to be low in May, July, August, and September when compared to the high water mark on the stream bank. Potential pollution sources identified by field crews include storm water runoff from I-84 and Shattuck Road, the sand and gravel operation, sediment from eroding footpaths, septic systems, and agricultural inputs associated with boarding horses.

Station WS01A- West Brook- Footbridge approximately 160 feet downstream/south of Main Street (Route 20), Brimfield and **Station WS01**- Route 20 crossing, Brimfield

West Brook begins as an intermittent stream in a former gravel pit just east of Warren Road in Brimfield. The brook flows south for approximately 2.5 miles where it confluences with Mill Brook. The drainage area upstream from station WS01 is 1.3 mi^2. Land use within the drainage area is 63% forest and 17% residential and agricultural. 5.9% of the area is covered by impervious surfaces. Much of the area surrounding the sampling location houses the Brimfield Antiques Show. Potential pollution sources included the lawns, parking areas, and livestock holding areas of the adjacent fairgrounds as well as lawns, road runoff, and agriculture.

The May and June bacteria samples and the July multiprobe sampling were conducted at Station WS01A. Station WS01A was located upstream from Route 20 on private property. During the June pre-dawn multiprobe sampling the owner requested that the station be moved. Subsequent samples were taken by accessing the brook from the downstream side of Route 20 (Station WS01).

Flows in West Brook at Station WS01A were normal. In May the water was slightly turbid. On the remaining surveys, the water was clear. No colors, odors, scums, or objectionable deposits were noted by field crews. The riparian area at this station consisted of mowed fields straight down to the water's edge. Burrreed (*Sparganium* sp.), an emergent aquatic plant, covered less than 25% of the sampling reach. Canopy cover was absent (i.e., 100% open). Moderate to dense film periphyton attached to rocks was noted during all three surveys. Filamentous green periphyton first appeared on the rock substrates in June and was present through the remaining sampling events. The substrates were composed of sand, gravel, and cobble.

At WS01, the water was clear and colorless. No scums, odors, or deposits were reported. The aquatic plant burreed covered 25-50% of the sampling reach. Loose floc and film periphyton were noted. There was also no canopy cover at this sampling station.The substrates at this station were gravel, sand, and cobble. Flows were reported to be 0.5 feet below the observed high water mark (i.e., low) to normal.

Station MO01- Mountain Brook- Route 20 crossing, Brimfield

Mountain Brook begins as a high gradient stream to the northeast of Steerage Rock in Brimfield. Approximately one mile upstream from Route 20, the gradient lessens and the brook meanders through wetland areas. The upstream drainage area (1.3 mi^2) is primarily forested (96%) with commercial (3%) and low density residential (2%) land uses centered along the Route 20 corridor. The sampling station was located downstream from Route 20 due to the presence of a small pond that flows into the brook on the upstream side of the road. Samples were collected from the left bank and were considered to be representative of the brook; flows from the pond make up a small percentage of the flow at the sampling station.

Flows in Mountain Brook ranged from normal to one foot below the observed high water mark. The water was generally clear and colorless with no odors, scums, or other objectionable deposits. Sparse to moderate amounts of burreed and arrowhead were also observed in the sampling reach throughout the sampling season. The sediments were sand and mud. Film, floc, and filamentous periphyton were present to varying degrees throughout the season. Canopy cover was between 80-90% (i.e., 10% open). Pollution sources included road runoff and adjacent lawns (grass clippings were present on the bank and in the stream).

Station ST01- Stevens Brook, Upstream/west at Mashapaug Road crossing, Holland

Stevens Brook begins as the outlet of a small, unnamed pond west of New City Road in Tolland, CT and ultimately discharges into Hamilton Reservoir in Holland, MA. The sampling station was located just upstream from where the stream empties into the reservoir, just west of Mashapaug Road. Downstream/east of Mashapaug Road is a backwater area where the reservoir and brook mingle. The brook was sampled from the left bank very close to the bridge, as the land is posted, and upstream from the backwater. The 4.3 mi^2 upstream drainage area is primarily forested (88%) with areas of agriculture (6%) and residential (5%) land use. Impervious surfaces cover 2.8% of the drainage area.

The water in the brook was clear to slightly turbid and appeared to have a reddish or light yellow/tan color. Flows in Stevens Brook were reported to be 0.25 to 1 foot below the observed high water mark. There were no aquatic plants present, although <25% of the rocks in the riffle areas were covered with a thin film of brown periphyton throughout the sampling season. Additionally sparse to dense coverage of moss were noted during the sampling season. Canopy cover was estimated at 90%. The substrates were comprised of boulders, cobble, gravel, and sand. Field crews did not note objectionable odors or deposits, sedimentation, or erosion. Potential pollution sources include adjacent residences (lawn maintenance, septic systems, pet wastes), and road runoff.

Station BR01- Browns Brook, Approximately 850 feet upstream/west of May Brook Road crossing, Holland

Browns Brook originates as the outlet of a small unnamed pond in the Nipmuck State Forest in Union, CT. This stream was sampled 0.2 miles upstream from the where it discharges into Hamilton Reservoir in the Town of Holland. The upstream drainage area is 5.5 mi^2 and in Massachusetts is 88% principally forest and agricultural land with some residential properties. Only 2.6% of the area is covered with impervious surfaces. The sampling station was accessed by walking down a dirt path ~35 feet to the stream. Samples were collected off the left bank.

The water in Browns Brook was clear and varied in color from clear to light yellow to reddish to brownish. No objectionable deposits, scums or odors were noted. Field crews did not note any aquatic plants at this site. Sparse coverage of thin film algae and mosses were noted throughout the sampling season. Canopy cover was estimated to be 100%. Water levels were estimated to be 0.25 to 2 feet below the observed high water mark. Road runoff from nearby May Brook Road could impact water quality. Downstream from the sampling location, potential pollution sources include septic systems from two houses.

Station LE01- Leadmine Brook, South of Leadmine Road/Route 15 junction, northwest of Route 15 (Mashapaug Road) abandoned rest area, Sturbridge

Access to Station LE01 was obtained by walking down to the brook through an abandoned rest area off Interstate 84 in Sturbridge. The samples were collected from the left bank. The headwaters of this stream begin at the outlet Leadmine Pond. The stream ends as the inlet to an unnamed pond (adjacent to Mashapaug Pond in Union, CT. The 2.5 mi^2 upstream drainage area is 87% forested and 7% residential. 3.6% of the drainage area consists of impervious surfaces.

Substrates were comprised of boulder, cobble, and gravel with some areas of sand and gravel. The red tinted water was clear with no odors. No objectionable deposits were found in the stream. Foam was noted throughout the sampling season but is believed to be natural. Throughout the sampling season flows in Leadmine Brook were observed by field crews to be approximately 0.5-1.0 feet below the high water mark visible on the stream bank. Field crews did not note any aquatic plants at this site. Moderate to sparse brown, thin film periphyton was noted on the rocks in the riffle areas during the sampling season. Canopy cover was estimated to be 95%. Field crews did not note bank erosion. There were no potential pollution sources identified within the sample reach.

Station LO01- Unnamed Tributary- Main Street (Route 12) crossing of unnamed French River tributary locally known as Lowes Brook, Oxford

This unnamed tributary begins as the outlet of Lowes Pond and flows for 1.3 miles until the confluence with the French River just north of Harwood Street in Oxford. Land use in the 7.1 mi^2 drainage area upstream from the sampling station is 57% forest, 16% residential, and 8% agricultural with 9.2% of the area being covered by impervious surfaces. Station access was acquired downstream from Route 12. Potential pollution sources downstream from the sampling station include road runoff (storm water outfall present) and parking lot runoff. The area upstream from Route 12 surrounding the brook is primarily forest and offers good buffering.

Gravel, silt, mud, and cobble make up the substrates found in this unnamed tributary. At the beginning of the sampling season through July flows in this stream were estimated to be normal to high by field crews when compared to the observed high water mark. However, in August and September flows dropped significantly exposing more substrates. Duckweed and watermeal were present as early as the May survey and continued throughout the sampling events. It is likely that the aquatic plants originated in Lowes Pond, approximately 0.4 miles upstream. Canopy cover was estimated to be 90-95%. A moderate coverage of thin film algae was noted during one July survey date and a sparse coverage of moss was noted in September. Generally periphyton was not noted or not recorded. The water was generally clear with no colors, odors, scums, or objectionable deposits. There was evidence of bank erosion, especially during high water on both the left and right banks.

Station W1179- Unnamed Tributary- Unnamed tributary to South Fork at the Potter Village Road crossing, Charlton

This unnamed tributary was accessed downstream from Potter Village Road in Charlton. Immediately upstream is the Hylka Construction's sand and gravel yard. The samples were collected from the left bank. The water was clear with no odors or turbidity. The upstream drainage area was not calculated for this tributary which originates as an outlet of South Charlton Reservoir, flows through three small unnamed ponds, through a steep gorge, under Potter Village Road, before its confluence with the South Fork, a total distance of 1.2 miles. Land use along the tributary includes medium density residential properties, forest, open land, and the gravel operation.

No objectionable deposits were noted in stream, however, a television set, scrap metal, and a radiator were observed on the bank. Foam, believed to be natural, was found on two occasions while generally no scum was noted. No water odors were noted by field crews during sampling. While sand comprised between 10 and 20% of the substrates at the sampling location, bedrock was dominant (~40%). No aquatic plants were observed. Periphyton in terms of thin film and filamentous forms were recorded at various times throughout the course of sampling. Canopy cover was estimated to be ~80%.

Station FR04-1- French River - Southeast of the Clara Barton Road/Route 56 junction, approximately 300 feet downstream of powerlines, Oxford

Station FR04-1 was accessed via the Oxford Mills parking lot. Crews walked down the path and under the powerlines. An alternate way to access the station was from the utility company's access road off of Route 56 (not used by crews). Land use upstream from the sampling station includes low and medium density residential, forest, industrial and commercial uses.

The water was generally clear with no colors, odors, scums, or objectionable deposits. Substrates were comprised of boulders, cobbles, and gravel. The water level in this portion of the French River ranged from normal to two feet below the observed high water mark. During the sampling season moss was noted on the boulders and cobble, as was a thin layer of film periphyton. Canopy cover was approximately 95% (estimated percent open sky 5%). Potential pollution sources include a large sand and gravel operation downstream from the sampling station, road runoff from Clara Barton Road upstream from the sampling location and runoff from Route 56 downstream from the station. It should be noted that the gravel trucks enter and leave the pit via an access road off Clara Barton Road, which runs parallel to the western bank of the French River.

Station SU01- Sucker Brook- Sutton Road crossing, Webster

Sucker Brook starts as the outlet of a small, unnamed pond directly south of Nipmuck Pond in Webster. The brook flows in a west/southwest direction for 1.4 miles before it enters Club Pond. The drainage area upstream from the sampling location is 2.3 mi^2. Forest accounts for 83% of the land use within the drainage area, while residential properties account for 9%. Approximately 5% of the area is covered by impervious surfaces. Sucker Brook was sampled on the upstream side of Sutton Road.

There was a closed canopy of deciduous trees within the sampling reach. Substrates within the brook consisted of cobble, gravel, sand, and boulders. With the exception of the August sampling event, the steam was generally clear of turbidity and the water was not colored. No odors were detected. In August, flows in the brook were extremely low, with the stream looking more like isolated pools and 95% of the substrates exposed. The water depth in the pools was approximately three inches. The pooled water was slightly turbid with a reddish color. With the exception of sheen/scums noted at this site no objectionable deposits were noted. A sheen/scum was noted on the surface of the water in August and orange/rust-colored flocculent masses were observed on the rocks. Samples of floc were collected and determined to be bacteria. In September, flows had increased slightly (to 1.5 feet below the observed annual high water mark) however, the bacterial masses still remained. Field crews did not note any aquatic plants at this site. Dense to very dense coverage of moss was noted at this site during the survey season. Potential pollution sources include road runoff, lawns, and septic systems. It is unclear as to the outlet control practices of Nipmuck Pond and two other unnamed impoundments of Sucker Brook and whether or not the practices contributed to the low instream flows in August.

Stations MI01, MI01A, MI01B, MI01C- Mine Brook, Webster

Mine Brook is a high gradient stream originating in the Douglas Woods. The brook flows for 1.4 miles before discharging into Club Pond. The drainage area upstream from sampling station MI01C is one square mile and is 99% forested. Potential pollution sources include road runoff, green lawns, and septic systems. Color ortho photographs also show an orchard upstream and east of the sampling location.

During the May, June, and July surveys Mine Brook was sampled at Station MI01, in the large pool, downstream from Mine Brook Road, Webster. At station MI01, the water was clear and colorless. The substrates were cobble, gravel, and boulder. A large sand/gravel bar had formed on the right bank ~5 feet downstream from the road. There were no objectionable odors, scums, or deposits. Amphibians were noted in the pool. A hydrofracting company withdrew about 3,000 gallons from the brook immediately following the May survey.

During the July multiprobe survey, it was discovered that the dissolved oxygen levels (<2 mg/L) and pH (5.27 SU) in the pool were exceptionally low and the substrates were covered with a gray floc. Subsequently, a special dissolved oxygen study was conducted on 21 July 2004. Mine Brook was sampled at four stations- MI01A, MI01, MI01B, and MI01C. The floc at station MI01 was stirred up, but did not travel downstream, even after five minutes. The floc was collected and brought back to the DWM laboratory. Based on visual observations, it is best professional judgment that the floc is from treatment of the dirt road surfaces, although it was never chemically tested. Limestone is sometimes used on gravel or dirt roads to reduce dust.

Station MI01A- approximately 550 feet downstream/west of Mine Brook Road, Webster was accessed through a private residence off Shawn Lane. The riparian area was forested and maple trees were the dominant vegetation. There was ~95% canopy cover over the station. Boulders and cobble dominated the substrates. There was some moss present on the rocks, but otherwise no aquatic plants were observed. Mayfly and caddisfly larvae were found on the rocks. The system appeared to be very flashy with a high water mark evident three feet above the stream bed. There was evidence of dirt bikes crossing the stream. Old yard waste and Christmas trees were ~10 feet from the edge of the brook.

Station MI01B was located 137 feet downstream from Mine Brook Road. This station was accessed by walking along the stream bank from the road. At this station, carpet moss was much more abundant on the exposed substrates. Additionally, dense periphyton was reported covering the submerged boulder

and cobble substrates, even with a 90% closed canopy. Samples were taken and it was determined that the sample contained cyanobacter (blue-green algae) - *Lyngbya* with lots of mucilaginous material, fungal hyphae, pollen, filamentous algae *Ulothrix* and a few red colored filaments that looked like spore cases. The riparian zone was 18 meters wide and consisted of natural vegetation- mountain laurel, maple, red oak, and hemlock.

Station MI01C is located ~30 feet upstream from Mine Brook Road and ten feet downstream from an old stone dam. This station would become the sampling location for the remainder of the surveys. In the pools there was sparse algal cover, however in the riffles, dense algae covered the substrates. Filamentous green algae was also observed 10 feet upstream from the sampling location where an adjacent landowner had cleared away riparian vegetation, allowing direct sunlight into the stream. DWM field crews did not note any aquatic plants at this site during sampling. The water was always clear and colorless with no odors, scums, or objectionable deposits. Substrates were comprised of boulders and cobbles.

Station BW01- Browns Brook- Off the western end of Sylvester Drive, approximately 500 feet upstream/northeast of the Gore Road crossing, Webster

Browns Brook is another high gradient stream originating from an unnamed pond north of Douglas Road and west of the Webster/Douglas town line. This station was chosen to examine possible impacts on the biota associated with a former hazardous materials release site at the Rte 16 Auto Salvage. The drainage area upstream from the sampling station is approximately 1.2 mi^2 with 82% of the land use being forest and 13% being residential.The 21e site is currently in Phase V of the five phase Massachusetts Contingency Plan with a Class C Remedial Action Outcome. This means that the site has been temporarily cleaned, but must be reassessed every five years as contaminants still remain on site. This station was accessed through a private residence off the end of Sylvester Drive.

Substrates were boulder and cobble with some clay. The field crews reported no odors, scums, or objectionable deposits. Moderate to dense film, filamentous, and floc periphyton were observed on the substrates during the sampling season. There was a mostly closed canopy over the sampling reach. In July sparse emergent plants were noted but generally field crews did not note aquatic plants. Flows in Browns Brook ranged from normal to one foot below the mean annual high water mark. In addition to the 21 e site, other pollution sources included septic systems, lawns, and road runoff.

Station LR01- Little River- Turner Road crossing, Charlton

The Little River was sampled 0.3 miles upstream from Buffimville Lake at the Turner Road crossing in Charlton. Samples were collected upstream from the bridge on the left bank. The drainage area upstream from the sampling location is 10.4 mi^2. Forest (72%) dominates the land use in the upstream drainage area, followed by residential (13%) and agriculture at (6%). The river originates in a wetland area west of Charlton Road in Spencer and flows 8.6 miles to the sampling station.

During all surveys, the water was a light yellow/tan color (result of upstream wetland). The water was slightly turbid on two occasions. No objectionable deposits or odors were reported by field crews. Natural foam (dissolved organic compounds) was observed on four of the sampling events. The water level in the river dropped from 0.5 feet above the annual high water line in May to three feet below in the line in July. Flows remained below normal through the September sampling event. Field crews did not note any aquatic plants at this site. Filamentous green algae were documented on the substrates in June, but brown film periphyton was observed in July and August. Canopy cover was estimated to be 40%. Substrates were comprised mostly of boulders and cobble. Potential pollution sources include lawns and road runoff.

Station WE01- Wellington Brook- West of Millbury Road, approximately 600 feet downstream of Chimney Pond outlet, Oxford

Wellington Pond begins in a wetland south of Eddy Pond/Cedar Street and west of Interstate 395 in Auburn. The river flows for a little over three miles, passing through a small unnamed impoundment, Chimney Pond, under I-395 at exit 5, and through a large wetland in Cedar Swamp, before its confluence with the French River. Station WE01 was accessed by driving down a dirt road that leads to the railroad tracks just north of 79 Millbury Road. Crews then crossed over the tracks and walked down a path to the remnants of an old stone dam. Substrates in Wellington Brook were cobble, boulder, and gravel.

The left bank at this site was channelized. Moss and loose floc periphyton were observed during the sampling season. Canopy cover was estimated to be around 50%. The water was clear and generally colorless. Flows ranged from normal to two feet below the observed high water mark. On 16 June, the water level was very low and flows were estimated to be less than 1 cfs. 75% of the substrates were exposed. The field crew examined the outlet of Chimney Pond, 0.1 miles upstream. The outlet consists of a concrete apron in the shape of a trapezoid. One inch of water was over the apron, trickling down into the brook. There was quite a bit of scum and algae on the concrete. Lily pads and an oil sheen were present on the surface of the pond. On 13 July the field crew noted that the water was barely flowing and that the stream was mainly isolated deep pools with greater than 80% of the substrates exposed. On 19 August, the multiprobe unit was only covered by 0.5 inches of water. No odors were detected emanating from the brook. Instream trash in the form of a 55 gallon drum, railroad ties, and tires were observed, however, the trash was mostly localized to one area. Scums were generally not noted by DWM field crews. On 11 August an orange mucous-like substance was documented upstream from the sampling location. This mass was similar to the one observed in Sucker Brook and was identified as bacteria. Land use in the area upstream from the sampling station is a mixture of forest and low density residential.

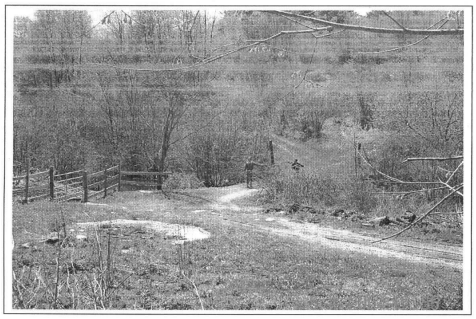
Station GR01- Grindstone Brook- Huntoon Highway (Route 56) crossing, Leicester

Grindstone Brook originates at the outlet of Henshaw Pond in Leicester, flowing generally southwest for a distance of approximately 2.3 miles, passing through Great Cedar Swamp, before discharging into Rochdale Pond. The sampling station was located approximately 30 feet downstream from the Route 56 culverts. An electric fence and posted signs prevented field crews from sampling the brook upstream from Route 56. The riparian area surrounding the site was a deciduous/conifer mixed forest. The 2.8 mi^2 drainage area upstream from Station GR01 is 67% forested, 15% residential, 8% open land, and 4% agricultural. Impervious surfaces cover 6.4% of the drainage area.

Substrates in the sampling reach were cobble, boulder, gravel, and sand. Water levels ranged from two feet below normal to 0.5 feet above normal. The water was clear with a yellow to reddish tint. Moss on the substrates was the only aquatic plant or periphyton observed at this location on Grindstone Brook. There was almost a full canopy covering the stream (estimated 5% open sky). Natural foam was noted during most surveys. No objectionable deposits or odors were reported Potential pollution sources include road runoff (outfall pipes were noted to be flowing into a drainage swale that entered the brook downstream from the sampling location), the pastureland upstream from Route 56.

Station BU01- Burncoat Brook- Upstream of unnamed dirt road south off of Pine Street, approximately 600 feet downstream of Ballard Hill Pond outlet, Leicester

Burncoat Brook flows from the outlet of Bouchard Pond through wetlands to Town Meadow Brook, a distance of approximately one mile. The drainage area upstream from the sampling location is 3.8 mi^2 and includes the watersheds for Burncoat Pond, Cedar Meadow Pond, and Bouchard Pond. Forest accounts for 58% of the land use in this drainage area, while residential and agriculture account for approximately 12% each. Five percent of the drainage area is covered by impervious surfaces.



The sampling station was located on private property off Pine Street in Leicester. This property has an active farm- two horses are boarded in a paddock immediately

adjacent to the stream. The fenced portion of the horse area allows direct access to the water by the animals. Cows also graze the property. Cows came up to the sampling crew and fresh cow patties were frequently observed on the dirt path as well as the bridge. The cattle also have direct access to the brook. The station was accessed with permission by hopping the fence at the road and walking down the dirt path to a bridge over the brook. An uncovered manure pile was stored at the top of the hill, near the fence. Samples were taken from the upstream side of the bridge/culvert.

The water in Burncoat Brook was generally clear and colorless. Water levels ranged from 2 feet below the observed high water mark to one foot above the mark. Foam was observed on every sampling event, however, it is likely naturally occurring. In stream there were no objectionable deposits. In June the water was noted to have a rotten eggs smell but generally no water odors were noted at this site. At the sampling station there was no evidence of erosion, but downstream from the bridge, the horses had trampled away the left bank. Pickerelweed and sedges were present in the reach immediately upstream from the culvert/bridge. No periphyton was observed at the upstream sampling station. There was a partial canopy cover at this station (estimated ~80-85% percent open sky).

Elevated bacteria counts were obtained in June (Table 6) when there were numerous cow patties on the bridge. Slightly elevated counts were also reported in August (Table 6). It was expected that counts would be much higher, leading to impairment of the *Primary Contact Recreation Use*. It is probable that if the sampling location had been downstream of the horse paddock, counts would have been much higher.

Water Quality Data

In-situ multi-probe data results are presented in Table 5. Physico-chemical data are presented in Table 6.

The procedures used to accept, accept with qualification or censor data are based on the DWM SOP for data validation (MassDEP, 2006) and are in addition to separate quality assurance activities and laboratory validation performed by WES. The following criteria were excerpted from the Data Validation Report for the Year 2004 Project Data (MassDEP, 2006).

Multiprobe

In lieu of verifying in the electronic record that the Multi-probe was depth-calibrated prior to use, both general and specific criteria are used to accept, qualify or censor of Depth readings, as follows:

General Depth Criteria: Apply to each OWMID#

- Clearly erroneous readings due to faulty depth sensor: Censor (i)
- Negative and zero depth readings: Censor (i); (likely in error)
- 0.1 m depth readings: Qualify (i); (potentially in error)
- 0.2 and greater depth readings: Accept without qualification; (likely accurate)

Specific Depth Criteria: Apply to entirety of depth data for survey date

- If zero and/or negative depth readings occur more than once per survey date, censor all negative/zero depth data, and qualify all other depth data for that survey (indicates that erroneous depth readings were not recognized in the field and that corrective action (field calibration of the depth sensor) was not taken, i.e., that all positive readings may be in error.)

Multi-probe record acceptance criteria: Within each set of records for individual OWMID #s, accept the final line of data for each depth where the change in depth from the previous accepted-record-depth is greater than 0.2 meters.

The criterion used in 2004 to accept, qualify or censor Conductivity (and the dependent, calculated estimates for TDS and Salinity) readings was based on exceedance of the calibration standard concentration. For exceedances greater than two times the standard, the conductivity reading was typically censored. Readings above the calibration standard were qualified whenever the reading was less than two times the calibration standard. In cases where readings fell far below the calibration standard concentration (e.g., measured value of 100 µS/cm using 6668 calibration standard), no censoring or qualification was imposed.

For D.O. values less than 0.2 mg/L, 2004 data were accepted without qualification and reported as "<0.2". Similarly for % saturation, values less than 2% were accepted without qualification and reported as "<2%".

For all parameters taken at the same location and whose range for 3-5 successive readings fluctuated beyond the range (+/-) of probe accuracy, the data was typically qualified or censored (depending on the degree of fluctuation) with "u" (unstable). Data exhibiting significant, continuous movement in one direction and that did not appear to reach equilibrium was also qualified or censored.

For instances where temperature has been censored, data for Conductivity, pH and D.O. are typically qualified. (Multi-probe readings for Conductivity, pH and dissolved oxygen are internally-corrected for temperature; conductivity is temperature-compensated to 25°C, D.O. readings are adjusted about 5% per degree C to account for changes in oxygen solubility and membrane permeability, and pH is compensated for electrode effects due to variable sample temperatures.) In cases where temperature has only been qualified, no qualification of data for conductivity, pH and D.O. is imposed.

Criteria for acceptance of discrete water quality samples were as follows:

- For simplicity, samples that were "lost", "missing", "spilled" and "not analyzed" were 'censored' using the 'm' (method not followed) qualifier.

- Sampling/Analysis Holding Time: Each analyte has a standard holding time that has been established to ensure sample/analysis integrity. Refer to DWM Standard Operating Procedure CN# 1.2 for a complete listing. If the standard holding time was exceeded, this criterion is violated and the data may be censored, depending on the extent of exceedance. For minor exceedances (e.g., < than 20% of the holding time), the data is typically qualified ("h" for minor holding time violation).

- Quality Control Sample Frequency: At a minimum, one field blank and one replicate must be collected for every ten samples by any given sampling crew on any given date. If less than 10% blanks and replicates were collected, the data are typically qualified with "f". If blanks were omitted and duplicates taken, typically no data are qualified, as long as there are no documented historical problems for the survey-specific samplers or station locations with regard to field contamination. If blanks were taken but duplicates were not, the data may be qualified with "f". Typically, no censoring of data takes place for insufficient QC sample frequencies only.

- Field Blanks: Field blanks were prepared at the DWM Worcester Laboratory. Reagent grade water was transported into the field in a sample container where it was transferred into a different sample container directly or via a sampling device (equipment blank) using the same methods as for its corresponding field sample (e.g., blank samples were preserved in the same way). All blanks were submitted to the WES laboratory "blind". If the field blank results were greater than the MDL (indicating potential sampling error, airborne contaminants, dirty equipment, etc.), the data may be censored or qualified, depending on extent and other factors.

- Field Replicates: In 2004, field duplicate samples for rivers were taken as co-located, simultaneous duplicates. As a result, these duplicate results include any spatial, natural variability present between side-by-side samples (which should be minimal in most cases where site selection has accounted for uniform mixing). Duplicate lake samples were sequential and therefore also include any temporal variability.

Samples were submitted to WES laboratory "blind".. Results were compared to specific criteria contained in a 2004 QAPP document. If the criteria are not met, the sample/duplicate data may be censored or qualified, depending on extent of exceedance and other factors. Arguably, very poor precision of field duplicate samples reflects poor reproducibility for entire surveys and/or analytical batch runs, and should result in censoring or qualification of the entire survey/batch data.

Results of Field and/or Lab Audits and Miscellaneous Survey Information: If, based on the results of field evaluation of implementation of field sampling SOPs, samples are deemed to have been taken incorrectly or to not represent station conditions at the time of sampling, then individual or survey-based sample results may be qualified or censored. Likewise, the results of QC audits of lab(s) analytical accuracy (and precision) for specific parameters are evaluated. If results indicate poor accuracy or repeatability, batch run data may be qualified or censored. In addition, information from survey personnel regarding sample integrity and representativeness may lead to decisions to qualify or censor data.

Table 4. 2004 MassDEP DWM French and Quinebaug River Basins *In-situ* Multi-probe Data.

Unique_ID: W1183 Station: W1183, Mile Point: 0.421
Description: [unnamed tributary to Mill Brook at Sturbridge Road (Route 20), Brimfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0077	03:42	0.6 m	20.7 m	6.3 im	176 m	114 m	3.6 im	40 im
08/10/04	42-0150	03:40	0.5	19.7	6.3	173	112	4.1 u	45 u
09/14/04	42-0221	03:08	0.5	18.9	6.3	159	103	4.4	47

Unnamed Tributary
Unique_ID: W1169 Station: CO01, Mile Point: 0.395
Description: [unnamed tributary to Quinebaug River, locally considered part of Cohasse Brook, approximately 700 feet upstream/southwest of Cisco Street, Southbridge]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0080	02:00	0.5	19.3	7.2	97.0	63.0	8.9	96
08/10/04	42-0153	02:37	0.2	18.9	7.4 c	104	66.8	8.4 u	92 u
09/14/04	42-0224	01:44	0.3	17.5	7.2 c	108	69.3	8.9 u	94 u

Unnamed Tributary
Unique_ID: W1186 Station: W1186, Mile Point: 0.392
Description: [unnamed tributary to Quinebaug River west of Dresser Hill Road, approximately 2100 feet upstream of confluence with Quinebaug River, Southbridge]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0082	02:56	0.2	17.2	7.2 u	164	107	9.2	95
08/10/04	42-0155	03:46	0.2	16.3	7.5 c	149	95.0	9.1	95
09/14/04	42-0226	02:36	0.3	15.6	7.4 c	161	103	9.5	96

ROCKY BROOK (Saris: 4129025)
Unique_ID: W1187 Station: RB01, Mile Point: 0.586
Description: [in Douglas State Forest downstream of footbridge on the unnamed easterly extension of High Street, Douglas]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0093	04:59	0.2	18.6	5.1	29.1	18.6	4.4 u	48 u
08/10/04	42-0166	04:47	0.1 i	18.3	5.2	31.0	20.0	4.0	42
09/14/04	42-0237	03:55	0.2 i	17.2	5.2	32.0	21.0	4.5	46

TUFTS BRANCH (Saris: 4129050)
Unique_ID: W1172 Station: TU01, Mile Point: 0.214
Description: [Route 197 (West Main Street) crossing, Dudley]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0083	03:29	0.2	18.5	7.3	123	80.0	8.5	91
08/10/04	42-0156	04:16	0.1 i	17.1	7.4 c	121	77.1	8.3 u	87 u
09/14/04	42-0227	03:03	0.3	16.7	7.4 c	125	79.9	8.9	90

LEBANON BROOK (Saris: 4129075)
Unique_ID: W1171 Station: LB01, Mile Point: 0.933
Description: [east of Route 169, approximately 1900 feet upstream/southwest of Ashland Avenue, Southbridge]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0081	02:28	0.4	20.3	7.0 u	43.0	28.0	8.7	97
08/10/04	42-0154	03:11	0.2	19.3	7.2 c	43.3	27.7	8.6 u	95 u
09/14/04	42-0225	02:11	0.4	18.0	6.9 c	43.2	27.6	9.0 u	96 u

" c " = greater than calibration standard used for pre-calibration, or outside the acceptable range about the calibration standard. Typically used for conductivity (>718, 1,413, 2,760, 6,668 or 12,900 uS/cm) or turbidity (>10, 20 or 40 NTU). It can also be used for TDS and Salinity calculations based on qualified ("c") conductivity data, or that the calculation was not possible due to censored conductivity data (TDS and Salinity are calculated values and entirely based on conductivity reading). See Section 4.1 (MassDEP 2006) for acceptance criteria.

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey checks outside typical acceptance ranges for the low ionic and deionized water checks, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses. Where documentation on unit pre-calibration is lacking, but SOPs at the time of sampling dictated pre-calibration prior to use, then data are considered potentially inaccurate

" m " = method not followed; one or more protocols contained in the DWM Multi-probe SOP not followed, ie. operator error (eg. less than 3 readings per station (rivers) or per depth (lakes), or instrument failure not allowing method to be implemented.

" u " = unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. See Section 4.1 for acceptance criteria.

Table 4 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins *In-situ* Multi-probe Data.

MCKINSTRY BROOK (Saris: 4129175)
Unique_ID: W1170 Station: MK01, Mile Point: 0.171
Description: [Pleasant Street crossing, Southbridge]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0079	01:38	0.2	18.6	6.7	348	226	7.2	77
08/10/04	42-0152	02:12	0.2	17.9	6.8	332	212	7.4 u	79 u
09/14/04	42-0223	01:22	0.3	16.7	6.7	347	222	7.9 u	82 u

HATCHET BROOK (Saris: 4129200)
Unique_ID: W1168 Station: HC01, Mile Point: 0.357
Description: [approximately 300 feet upstream/south of South Street, upstream of dam remnants, Southbridge]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0078	01:08	0.2	17.1	7.0 u	156	102	8.8	92
08/10/04	42-0151	01:40	0.2	16.1	7.3 c	168	107	8.7 u	89 u
09/14/04	42-0222	00:54	0.3	15.9	7.4 c	136	87.1	9.4	95

HAMANT BROOK (Saris: 4129275)
Unique_ID: W1174 Station: HA01, Mile Point: 0.886
Description: [approximately 100 feet downstream/northeast of unnamed gravel pit access road, west off Shattuck Road, Sturbridge]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0071	01:04	0.2	19.6	7.2	544	354	8.6	94
08/10/04	42-0144	01:25	0.2	18.3	7.2 c	571	371	8.9	95
09/14/04	42-0215	00:53	0.2	16.6	7.0 u	564	366	9.4	96

WEST BROOK (Saris: 4129400)
Unique_ID: W1205 Station: WS01, Mile Point: 0.368
Description: [Route 20 crossing, Brimfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
08/10/04	42-0149	03:24	0.2	19.0	6.8	111	72.0	7.2	78
09/14/04	42-0220	02:52	0.2	17.2	6.7	101	66.0	7.6	79

WEST BROOK (Saris: 4129400)
Unique_ID: W1180 Station: WS01A, Mile Point: 0.337
Description: [footbridge approximately 160 feet downstream/south of Main Street (Route 20), Brimfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0076	03:28	0.2	20.0	6.9	124	80.0	6.9	76

MOUNTAIN BROOK (Saris: 4129425)
Unique_ID: W1181 Station: MO01, Mile Point: 0.191
Description: [Route 20 crossing, Brimfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0075	03:07	0.2	19.4	6.6	33.0	22.0	6.2	67
08/10/04	42-0148	03:05	0.2	18.2	6.7 u	35.0	23.0	7.0	74
09/14/04	42-0219	02:37	0.2	16.2	6.6	35.0	23.0	7.5 u	76 u

STEVENS BROOK (Saris: 4129500)
Unique_ID: W1173 Station: ST01, Mile Point: 0.031
Description: [upstream/west at Mashapaug Road crossing, Holland]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0074	02:34	0.3	18.7	7.3	78.0	51.0	8.9	95
08/10/04	42-0147	02:40	0.3	17.8	7.3 c	71.0	46.0	9.1	96
09/14/04	42-0218	02:04	0.2	16.7	7.2	61.0	39.0	9.5	97

" c " = greater than calibration standard used for pre-calibration, or outside the acceptable range about the calibration standard. Typically used for conductivity (>718, 1,413, 2,760, 6,668 or 12,900 uS/cm) or turbidity (>10, 20 or 40 NTU). It can also be used for TDS and Salinity calculations based on qualified ("c") conductivity data, or that the calculation was not possible due to censored conductivity data (TDS and Salinity are calculated values and entirely based on conductivity reading). See Section 4.1 (MassDEP 2006) for acceptance criteria.

" u " = unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. See Section 4.1 for acceptance criteria.

Table 4 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins In-situ Multi-probe Data.

BROWNS BROOK (Saris: 4129525)
Unique_ID: W1176 Station: BR01, Mile Point: 0.174
Description: [approximately 850 feet upstream/west of May Brook Road crossing, Holland]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0073	02:10	0.2	18.7	7.3	56.0	36.0	9.1	98
08/10/04	42-0146	02:18	0.2	18.1	7.4 c	57.0	37.0	9.2	98
09/14/04	42-0217	01:44	0.3	16.7	7.3 u	52.0	34.0	9.7	100

LEADMINE BROOK (Saris: 4129575)
Unique_ID: W1182 Station: LE01, Mile Point: 0.742
Description: [south of Leadmine Road/Route 15 junction, northwest of Route 15 (Mashapaug Road) abandoned rest area, Sturbridge]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0072	01:41	0.2	19.7	6.5	100	65.0	7.1	78
08/10/04	42-0145	01:55	0.2	18.9	6.6 u	94.0	61.0	7.5	80
09/14/04	42-0216	01:21	0.3	17.5	6.4 u	87.0	56.0	7.8	82

Unnamed Tributary
Unique_ID: W1175 Station: LO01, Mile Point: 0.888
Description: [Main Street (Route 12) crossing of unnamed French River tributary locally known as Lowes Brook, Oxford]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0089	02:51	0.3	23.1	6.7	97.0	62.1	7.0	83
08/10/04	42-0162	02:57	0.1 i	21.2	6.9	156	102	7.4	83
09/14/04	42-0233	02:15	## i	19.4	6.9	289	188	6.9	74

Unnamed Tributary
Unique_ID: W1179 Station: W1179, Mile Point: 0.228
Description: [unnamed tributary to South Fork at the Potter Village Road crossing, Charlton]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0084	04:13	0.2	18.5	7.1	120	78.0	8.9	95
08/10/04	42-0157	04:44	0.2	18.4	7.2 c	114	72.7	8.6 u	93 u
09/14/04	42-0228	03:29	0.3	19.2	7.1 c	116	74.5	9.0	98

FRENCH RIVER (Saris: 4230075)
Unique_ID: W1165 Station: FR04-1, Mile Point: 12.646
Description: [southeast of the Clara Barton Road/Route 56 junction, approximately 300 feet downstream of powerlines, Oxford]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0088	02:15	0.2	21.4	7.1 c	225	144	7.5 u	86 u
08/10/04	42-0161	02:24	0.1 i	20.4	7.0 c	200	130	7.5	83
09/14/04	42-0232	01:44	0.1 i	19.1	6.9	176	114	7.5	81

SUCKER BROOK (Saris: 4230200)
Unique_ID: W1178 Station: SU01, Mile Point: 0.266
Description: [Sutton Road crossing, Webster]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0090	03:30	0.1 i	19.5	6.2	99.6	63.7	7.0 u	77 u
08/10/04	42-0163(Pooled)	03:28	0.1 ir	16.7 r	6.2 r	127 r	83.0 r	1.9 ru	19 ru
09/14/04	42-0234	02:41	0.1 i	17.6	6.4	128	83.0	7.5	79

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey checks outside typical acceptance ranges for the low ionic and deionized water checks, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses. Where documentation on unit pre-calibration is lacking, but SOPs at the time of sampling dictated pre-calibration prior to use, then data are considered potentially inaccurate

" m " = method not followed; one or more protocols contained in the DWM Multi-probe SOP not followed, ie. operator error (eg. less than 3 readings per station (rivers) or per depth (lakes), or instrument failure not allowing method to be implemented.

" u " = unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. See Section 4.1 for acceptance criteria.

" r " = data not representative of actual field conditions

Table 4 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins *In-situ* Multi-probe Data.

MINE BROOK (Saris: 4230225)
Unique_ID: W1343 Station: MI01C, Mile Point: 0.245
Description: [approximately 30 feet upstream/east of Mine Brook Road, Webster]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/21/04	42-0137	10:37	0.3	16.8	6.0	28.0	19.0	9.0	92
07/21/04	42-0138	10:54	0.3	16.7	5.9	29.0	19.0	8.6	88
08/10/04	42-0164	03:49	0.1 i	15.3	6.0 u	31.0	20.0	7.8	78
09/14/04	42-0235	03:01	0.1 i	15.3	5.8	19.0	12.0	7.2	72

MINE BROOK (Saris: 4230225)
Unique_ID: W1184 Station: MI01, Mile Point: 0.233
Description: [in pooled area on downstream/west side of Mine Brook Road, Webster]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0091	03:57	0.4	14.1 u	5.3	31.8	20.4	1.4 u	14 u
07/21/04	42-0135(Pooled)	09:55	0.4 r	14.5 r	5.3 r	38.0 r	25.0 r	0.8 ru	8 ru

MINE BROOK (Saris: 4230225)
Unique_ID: W1342 Station: MI01B, Mile Point: 0.212
Description: [approximately 137 feet downstream/west of Mine Brook Road, Webster]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/21/04	42-0136	10:16	0.2	16.6	6.1	29.0	19.0	9.4	97

MINE BROOK (Saris: 4230225)
Unique_ID: W1341 Station: MI01A, Mile Point: 0.134
Description: [approximately 550 feet downstream/west of Mine Brook Road, Webster]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/21/04	42-0134	09:30	0.2	16.9	6.1	28.0	18.0	9.6	99

BROWNS BROOK (Saris: 4230250)
Unique_ID: W1185 Station: BW01, Mile Point: 0.287
Description: [off the western end of Sylvester Drive, approximately 500 feet upstream/northeast of Gore Road crossing, Webster]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0092	04:23	0.1 i	16.0	6.8	141	89.9	9.4	96
08/10/04	42-0165	04:13	0.1 i	16.2	6.9 u	178	116	9.2	93
09/14/04	42-0236	03:22	## i	15.4	6.9 u	177	115	9.4	94

LITTLE RIVER (Saris: 4230275)
Unique_ID: W1167 Station: LR01, Mile Point: 3.843
Description: [Turner Road crossing, Charlton]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0085	04:38	0.3	20.7	6.4	288	187	5.1	57
08/10/04	42-0158	05:09	0.2	19.1	6.4	254	162	5.1 u	56 u
09/14/04	42-0229	03:57	0.3	17.5	6.2	250	160	4.1	43

WELLINGTON BROOK (Saris: 4230325)
Unique_ID: W1166 Station: WE01, Mile Point: 1.941
Description: [west of Millbury Road, approximately 600 feet downstream of Chimney Pond outlet, Oxford]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0094	05:39	0.2	16.6	6.7	177	113	7.0 u	73 u
08/10/04	42-0167	05:36	## ir	16.8 r	6.6 ru	175 r	114 r	7.1 r	73 r
09/14/04	42-0238	04:40	0.1 i	16.2	6.7	181	117	7.7	78

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey checks outside typical acceptance ranges for the low ionic and deionized water checks, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses. Where documentation on unit pre-calibration is lacking, but SOPs at the time of sampling dictated pre-calibration prior to use, then data are considered potentially inaccurate

" u " = unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. See Section 4.1 for acceptance criteria.

" r " = data not representative of actual field conditions

" ## " = Censored data (i.e., data that has been discarded for some reason).

Table 4 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins *In-situ* Multi-probe Data.

GRINDSTONE BROOK (Saris: 4230350)
Unique_ID: W1177 Station: GR01, Mile Point: 0.337
Description: [Huntoon Highway (Route 56) crossing, Leicester]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0087	01:37	0.3	17.0	6.8	166	106	8.4 u	88 u
08/10/04	42-0160	01:45	0.2	16.5	6.8	166	108	8.6	88
09/14/04	42-0231	01:10	0.1 i	15.6	6.7	169	110	8.9	89

BURNCOAT BROOK (Saris: 4230400)
Unique_ID: W1164 Station: BU01, Mile Point: 0.214
Description: [upstream of unnamed dirt road south off of Pine Street, approximately 600 feet downstream of Ballard Hill Pond outlet, Leicester]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25℃	TDS	DO	SAT
		(24hr)	(m)	(℃)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/13/04	42-0086	00:57	0.3	21.0	7.0 c	129	82.3	7.5	84
08/10/04	42-0159	01:08	0.2	19.6	6.7 u	129	84.0	7.8	85
09/14/04	42-0230	00:38	0.3 i	19.1	6.7	131	85.0	7.8	84

" c " = greater than calibration standard used for pre-calibration, or outside the acceptable range about the calibration standard. Typically used for conductivity (>718, 1,413, 2,760, 6,668 or 12,900 uS/cm) or turbidity (>10, 20 or 40 NTU). It can also be used for TDS and Salinity calculations based on qualified ("c") conductivity data, or that the calculation was not possible due to censored conductivity data (TDS and Salinity are calculated values and entirely based on conductivity reading). See Section 4.1 (MassDEP 2006) for acceptance criteria.

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey checks outside typical acceptance ranges for the low ionic and deionized water checks, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses. Where documentation on unit pre-calibration is lacking, but SOPs at the time of sampling dictated pre-calibration prior to use, then data are considered potentially inaccurate

" u " = unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. See Section 4.1 for acceptance criteria

Table 5. 2004 MassDEP DWM French and Quinebaug River Basins Bacteria Data.

French and Quinebaug (2004)

Unnamed Tributary
Unique_ID: W1183 Station: W1183, Mile Point: 0.421
Description: [unnamed tributary to Mill Brook at Sturbridge Road (Route 20), Brimfield]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0017	42-0018	**	280 e	330 e
5/26/2004	42-0018	42-0017	**	310 e	350 e
6/16/2004	42-0047	42-0048	10:25	1100	900
6/16/2004	42-0048	42-0047	10:25	1000	980
7/14/2004	42-0101	42-0102	09:44	1400	1400
7/14/2004	42-0102	42-0101	09:44	1300 e	1500 e
8/11/2004	42-0174	42-0175	10:17	2800	2800
8/11/2004	42-0175	42-0174	10:17	2200 e	2400 e
9/15/2004	42-0245	42-0246	09:55	680 e	740 e
9/15/2004	42-0246	42-0245	09:55	720	690

Unnamed Tributary
Unique_ID: W1169 Station: CO01, Mile Point: 0.395
Description: [unnamed tributary to Quinebaug River, locally considered part of Cohasse Brook, approximately 700 feet upstream/southwest of Cisco Street, Southbridge]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0022	--	09:30	950 e	980 e
6/16/2004	42-0052	--	09:18	1300	950
7/14/2004	42-0106	--	08:56	1500	1200
8/11/2004	42-0179	--	08:47	2000 e	4000 e
9/15/2004	42-0250	--	09:00	2200	1800

Unnamed Tributary
Unique_ID: W1186 Station: W1186, Mile Point: 0.392
Description: [unnamed tributary to Quinebaug River west of Dresser Hill Road, approximately 2100 feet upstream of confluence with Quinebaug River, Southbridge]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0024	--	10:07	32	19
6/16/2004	42-0054	--	09:51	52 e	58 e
7/14/2004	42-0108	--	09:40	200	170
8/11/2004	42-0181	--	09:25	13	13
9/15/2004	42-0252	--	09:30	20	13

ROCKY BROOK (Saris: 4129025)
Unique_ID: W1187 Station: RB01, Mile Point: 0.586
Description: [in Douglas State Forest downstream of footbridge on the unnamed easterly extension of High Street, Douglas]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0039	--	11:18	65	52
6/16/2004	42-0069	--	10:17	32	32
7/14/2004	42-0130	--	10:18	6 e	19 e
8/11/2004	42-0194	42-0196	10:10	<6 e	13 e
8/11/2004	42-0196	42-0194	10:10	13	<6
9/15/2004	42-0267	--	10:12	<6	<6

" ** " = Missing data (i.e., data that should have been reported)
" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.

Table 5 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins Bacteria Data.

TUFTS BRANCH (Saris: 4129050)
Unique_ID: W1172 Station: TU01, Mile Point: 0.214
Description: [Route 197 (West Main Street) crossing, Dudley]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0025	--	10:27	32 e	58 e
6/16/2004	42-0055	--	10:10	180 e	230 e
7/14/2004	42-0109	--	10:00	290	240
8/11/2004	42-0182	--	09:45	58 e	90 e
9/15/2004	42-0253	--	09:50	52	13

LEBANON BROOK (Saris: 4129075)
Unique_ID: W1171 Station: LB01, Mile Point: 0.933
Description: [east of Route 169, approximately 1900 feet upstream/southwest of Ashland Avenue, Southbridge]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0023	--	09:50	410 e	450 e
6/16/2004	42-0053	--	09:36	58	26
7/14/2004	42-0107	--	09:20	58 e	100 e
8/11/2004	42-0180	--	09:06	100	84
9/15/2004	42-0251	--	09:20	130 e	150 e

MCKINSTRY BROOK (Saris: 4129175)
Unique_ID: W1170 Station: MK01, Mile Point: 0.171
Description: [Pleasant Street crossing, Southbridge]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0021	--	09:10	170	150
6/16/2004	42-0051	--	09:05	290 e	360 e
7/14/2004	42-0105	--	08:40	330	270
8/11/2004	42-0178	--	08:35	330 e	470 e
9/15/2004	42-0249	--	08:50	5800	4200

HATCHET BROOK (Saris: 4129200)
Unique_ID: W1168 Station: HC01, Mile Point: 0.357
Description: [approximately 300 feet upstream/south of South Street, upstream of dam remnants, Southbridge]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0020	--	08:45	32 e	39 e
6/16/2004	42-0050	--	08:45	71 e	97 e
7/14/2004	42-0104	--	08:25	190 e	200 e
8/11/2004	42-0177	--	08:20	480 e	610 e
9/15/2004	42-0248	--	08:30	130	110

HAMANT BROOK (Saris: 4129275)
Unique_ID: W1174 Station: HA01, Mile Point: 0.886
Description: [approximately 100 feet downstream/northeast of unnamed gravel pit access road, west off Shattuck Road, Sturbridge]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0011	--	**	13 e	39 e
6/16/2004	42-0041	--	08:37	45 e	52 e
7/14/2004	42-0095	--	08:11	45	32
8/11/2004	42-0168	--	08:13	6 e	13 e
9/15/2004	42-0239	--	08:25	13	<6

" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.

Table 5 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins Bacteria Data.

WEST BROOK (Saris: 4129400)
Unique_ID: W1205 Station: WS01, Mile Point: 0.368
Description: [Route 20 crossing, Brimfield]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
7/14/2004	42-0100	--	09:38	87 e	120 e
8/11/2004	42-0173	--	10:07	84	58
9/15/2004	42-0244	--	09:44	160	110

WEST BROOK (Saris: 4129400)
Unique_ID: W1180 Station: WS01A, Mile Point: 0.337
Description: [footbridge approximately 160 feet downstream/south of Main Street (Route 20), Brimfield]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0016	--	**	65 e	100 e
6/16/2004	42-0046	--	10:15	52	52

MOUNTAIN BROOK (Saris: 4129425)
Unique_ID: W1181 Station: MO01, Mile Point: 0.191
Description: [Route 20 crossing, Brimfield]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0015	--	**	6 e	39 e
6/16/2004	42-0045	--	10:00	90	84
7/14/2004	42-0099	--	09:26	220 e	350 e
8/11/2004	42-0172	--	09:50	32 e	45 e
9/15/2004	42-0243	--	09:26	39 e	58 e

STEVENS BROOK (Saris: 4129500)
Unique_ID: W1173 Station: ST01, Mile Point: 0.031
Description: [upstream/west at Mashapaug Road crossing, Holland]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0014	--	**	52 e	71 e
6/16/2004	42-0044	--	09:40	20 e	40 e
7/14/2004	42-0098	--	09:06	45 e	130 e
8/11/2004	42-0171	--	09:24	110	58
9/15/2004	42-0242	--	09:17	90 e	97 e

BROWNS BROOK (Saris: 4129525)
Unique_ID: W1176 Station: BR01, Mile Point: 0.174
Description: [approximately 850 feet upstream/west of May Brook Road crossing, Holland]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0013	--	**	39 e	58 e
6/16/2004	42-0043	--	09:23	52	26
7/14/2004	42-0097	--	08:50	110	110
8/11/2004	42-0170	--	09:01	270	250
9/15/2004	42-0241	--	09:00	13	6

LEADMINE BROOK (Saris: 4129575)
Unique_ID: W1182 Station: LE01, Mile Point: 0.742
Description: [south of Leadmine Road/Route 15 junction, northwest of Route 15 (Mashapaug Road) abandoned rest area, Sturbridge]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0012	--	**	13	13
6/16/2004	42-0042	--	09:03	58	45
7/14/2004	42-0096	--	08:30	26	<6
8/11/2004	42-0169	--	08:44	13	6
9/15/2004	42-0240	--	08:48	32	26

" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.

Table 5 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins Bacteria Data.

Unnamed Tributary
Unique_ID: W1175 Station: LO01, Mile Point: 0.888
Description: [Main Street (Route 12) crossing of unnamed French River tributary locally known as Lowes Brook, Oxford]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0033	--	10:08	130	130
6/16/2004	42-0063	--	09:22	52 e	71 e
7/14/2004	42-0120	--	09:15	87	80
8/11/2004	42-0190	--	09:15	210	150
9/15/2004	42-0261	--	09:20	110	87

Unnamed Tributary
Unique_ID: W1179 Station: W1179, Mile Point: 0.228
Description: [unnamed tributary to South Fork at the Potter Village Road crossing, Charlton]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0026	--	11:05	26	6
6/16/2004	42-0056	--	10:30	13 e	39 e
7/14/2004	42-0110	--	10:20	32	32
8/11/2004	42-0183	--	10:03	13 e	19 e
9/15/2004	42-0254	--	10:10	45	45

FRENCH RIVER (Saris: 4230075)
Unique_ID: W1165 Station: FR04-1, Mile Point: 12.646
Description: [southeast of the Clara Barton Road/Route 56 junction, approximately 300 feet downstream of powerlines, Oxford]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0032	--	09:45	260 e	300 e
6/16/2004	42-0062	--	09:05	120 e	150 e
7/14/2004	42-0118	--	08:53	300 e	310 e
8/11/2004	42-0189	--	09:00	39	26
9/15/2004	42-0260	--	09:02	19 e	32 e

SUCKER BROOK (Saris: 4230200)
Unique_ID: W1178 Station: SU01, Mile Point: 0.266
Description: [Sutton Road crossing, Webster]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0034	--	10:25	6 e	32 e
6/16/2004	42-0064	--	09:37	400 e	600 e
7/14/2004	42-0122	--	09:30	100 e	130 e
8/10/2004	42-0163(Pooled)	--	03:27	--	--
8/11/2004	42-0191	--	09:30	32 e	58 e
9/15/2004	42-0262	--	09:35	1400	510

MINE BROOK (Saris: 4230225)
Unique_ID: W1343 Station: MI01C, Mile Point: 0.245
Description: [approximately 30 feet upstream/east of Mine Brook Road, Webster]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
8/11/2004	42-0192	--	09:40	6	<6
9/15/2004	42-0263	--	09:45	13	<6

" -- " = No data (i.e., data not taken/not required)
" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.

Table 5 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins Bacteria Data.

MINE BROOK (Saris: 4230225)
Unique_ID: W1184 Station: MI01, Mile Point: 0.233
Description: [in pooled area on downstream/west side of Mine Brook Road, Webster]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0035	--	10:33	<6 e	19 e
6/16/2004	42-0065	--	09:50	13	<6
7/14/2004	42-0124	--	09:37	<6	<6
7/21/2004	42-0135(Pooled)	--	09:49	--	--

BROWNS BROOK (Saris: 4230250)
Unique_ID: W1185 Station: BW01, Mile Point: 0.287
Description: [off the western end of Sylvester Drive, approximately 500 feet upstream/northeast of Gore Road crossing, Webster]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0036	42-0037	10:55	270	39
5/26/2004	42-0037	42-0036	11:00	240	52
6/16/2004	42-0066	42-0067	09:58	<6	<6
6/16/2004	42-0067	42-0066	09:58	6	6
7/14/2004	42-0126	42-0128	10:00	39	6
7/14/2004	42-0128	42-0126	10:00	19	19
8/11/2004	42-0193	--	09:50	73 e	130 e
9/15/2004	42-0264	42-0265	09:52	77 e	110 e
9/15/2004	42-0265	42-0264	09:52	90 e	120 e

LITTLE RIVER (Saris: 4230275)
Unique_ID: W1167 Station: LR01, Mile Point: 3.843
Description: [Turner Road crossing, Charlton]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0027	42-0028	11:30	180 e	200 e
5/26/2004	42-0028	42-0027	11:32	210	190
6/16/2004	42-0057	42-0058	10:50	110 e	190 e
6/16/2004	42-0058	42-0057	10:50	170	120
7/14/2004	42-0112	42-0111	10:45	67	60
7/14/2004	42-0111	42-0112	10:50	39 e	52 e
8/11/2004	42-0184	42-0185	10:25	19	13
8/11/2004	42-0185	42-0184	10:30	19	19
9/15/2004	42-0255	42-0256	10:35	13 e	26 e
9/15/2004	42-0256	42-0255	10:40	<6 e	13 e

WELLINGTON BROOK (Saris: 4230325)
Unique_ID: W1166 Station: WE01, Mile Point: 1.941
Description: [west of Millbury Road, approximately 600 feet downstream of Chimney Pond outlet, Oxford]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0040	--	11:50	13 e	27 e
6/16/2004	42-0070	--	10:45	6 e	13 e
7/14/2004	42-0132	--	10:50	<6	6
8/11/2004	42-0197	--	10:40	6	6
9/15/2004	42-0268	--	10:40	6	6

GRINDSTONE BROOK (Saris: 4230350)
Unique_ID: W1177 Station: GR01, Mile Point: 0.337
Description: [Huntoon Highway (Route 56) crossing, Leicester]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0031	--	09:15	170	71
6/16/2004	42-0061	--	08:45	400 e	600 e
7/14/2004	42-0116	--	08:32	5800	4000
8/11/2004	42-0188	--	08:40	890 e	900 e
9/15/2004	42-0259	--	08:45	220 e	370 e

" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.

Table 5 (Continued). 2004 MassDEP DWM French and Quinebaug River Basins Bacteria Data.

BURNCOAT BROOK (Saris: 4230400)
Unique_ID: W1164 Station: BU01, Mile Point: 0.214
Description: [upstream of unnamed dirt road south off of Pine Street, approximately 600 feet downstream of Ballard Hill Pond outlet, Leicester]

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0030	--	08:45	97	97
6/16/2004	42-0060	--	08:25	1500 e	1700 e
7/14/2004	42-0114	--	08:15	180	130
8/11/2004	42-0187	--	08:05	240 e	270 e
9/15/2004	42-0258	--	08:25	77	77

" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.

Quality Control Data

Table 6 presents the quality control data that was collected by DWM during the 2004 French and Quinebaug surveys. Table 7 presents the field duplicate data collected by DWM during the 2004 surveys.

Table 6. 2004 MassDEP DWM French and Quinebaug Rivers Watershed Field Blank Data.

Date	OWMID	QAQC	Time	Fecal	E.coli
			(24hr)	CFU/100ml	CFU/100ml
5/26/2004	42-0019	Blank	**	<6	<6
6/16/2004	42-0049	Blank	10:30	<6	<6
7/14/2004	42-0103	Blank	09:44	<6	<6
8/11/2004	42-0176	Blank	10:25	<6	<6
9/15/2004	42-0247	Blank	10:01	<6	<6
5/26/2004	42-0038	Blank	11:05	<6	<6
6/16/2004	42-0068	Blank	10:02	<6	<6
7/14/2004	42-0129	Blank	10:05	<6	<6
8/11/2004	42-0195	Blank	09:55	<6	<6
9/15/2004	42-0266	Blank	10:00	<6	<6
5/26/2004	42-0029	Blank	11:25	<6	<6
6/16/2004	42-0059	Blank	10:47	<6	<6
7/14/2004	42-0113	Blank	10:40	<6	<6
8/11/2004	42-0186	Blank	10:20	<6	<6
9/15/2004	42-0257	Blank	10:30	<6	<6

" ** " = Missing data (i.e., data that should have been reported)

Table 7. 2004 MassDEP DWM French and Quinebaug Rivers Watershed Field Duplicate Data.

Unnamed Tributary
Unique_ID: W1183 Station: W1183, Mile Point: 0.421
Description: [unnamed tributary to Mill Brook at Sturbridge Road (Route 20), Brimfield]

Date	OWMID	QAQC	Time	Log10(Fecal)	Log10(E.coli)
			(24hr)	CFU/100mL	CFU/100mL
05/26/04	42-0017	42-0018	**	2.447	2.519
05/26/04	42-0018	42-0017	**	2.491	2.544
Relative Percent Difference				***1.8%***	***1.0%***
06/16/04	42-0047	42-0048	10:25	3.041	2.954
06/16/04	42-0048	42-0047	10:25	3.000	2.991
Relative Percent Difference				**1.4%**	**1.2%**
07/14/04	42-0101	42-0102	09:44	3.146	3.146
07/14/04	42-0102	42-0101	09:44	3.114	3.176
Relative Percent Difference				**1.0%**	**0.9%**
08/11/04	42-0174	42-0175	10:17	3.447	3.447
08/11/04	42-0175	42-0174	10:17	3.342	3.380
Relative Percent Difference				**3.1%**	**2.0%**
09/15/04	42-0245	42-0246	09:55	2.833	2.869
09/15/04	42-0246	42-0245	09:55	2.857	2.839
Relative Percent Difference				**0.9%**	**1.1%**

ROCKY BROOK (Saris: 4129025)
Unique_ID: W1187 Station: RB01, Mile Point: 0.586
Description: [in Douglas State Forest downstream of footbridge on the unnamed easterly extension of High Street, Douglas]

Date	OWMID	QAQC	Time	Log10(Fecal)	Log10(E.coli)
			(24hr)	CFU/100mL	CFU/100mL
08/11/04	42-0194	42-0196	10:10	0.778	1.114
08/11/04	42-0196	42-0194	10:10	1.114	0.778
Relative Percent Difference				**35.5%**	**35.5%**

BROWNS BROOK (Saris: 4230250)
Unique_ID: W1185 Station: BW01, Mile Point: 0.287
Description: [off the western end of Sylvester Drive, approximately 500 feet upstream/northeast of Gore Road crossing, Webster]

Date	OWMID	QAQC	Time	Log10(Fecal)	Log10(E.coli)
			(24hr)	CFU/100mL	CFU/100mL
05/26/04	42-0036	42-0037	10:55	2.431	1.591
05/26/04	42-0037	42-0036	11:00	2.380	1.716
Relative Percent Difference				**2.1%**	**7.6%**
06/16/04	42-0066	42-0067	09:58	0.778	0.778
06/16/04	42-0067	42-0066	09:58	0.778	0.778
Relative Percent Difference				**0.0%**	**0.0%**
07/14/04	42-0126	42-0128	10:00	1.591	0.778
07/14/04	42-0128	42-0126	10:00	1.279	1.279
Relative Percent Difference				**21.8%**	**48.7%**
09/15/04	42-0264	42-0265	09:52	1.886	2.041
09/15/04	42-0265	42-0264	09:52	1.954	2.079
Relative Percent Difference				**3.5%**	**1.8%**

" ** " = Missing data (i.e., data that should have been reported).

Table 7 (Continued). 2004 MassDEP DWM French and Quinebaug Rivers Watershed Field Duplicate Data.

LITTLE RIVER (Saris: 4230275)
Unique_ID: W1167 Station: LR01, Mile Point: 3.843
Description: [Turner Road crossing, Charlton]

Date	OWMID	QAQC	Time	Log10(Fecal)	Log10(E.coli)
			(24hr)	CFU/100mL	CFU/100mL
05/26/04	42-0027	42-0028	11:30	2.255	2.301
05/26/04	42-0028	42-0027	11:32	2.322	2.279
Relative Percent Difference				**2.9%**	**1.0%**
06/16/04	42-0057	42-0058	10:50	2.041	2.279
06/16/04	42-0058	42-0057	10:50	2.230	2.079
Relative Percent Difference				**8.9%**	**9.2%**
07/14/04	42-0112	42-0111	10:45	1.826	1.778
07/14/04	42-0111	42-0112	10:50	1.591	1.716
Relative Percent Difference				**13.8%**	**3.6%**
08/11/04	42-0184	42-0185	10:25	1.279	1.114
08/11/04	42-0185	42-0184	10:30	1.279	1.279
Relative Percent Difference				**0.0%**	**13.8%**
09/15/04	42-0255	42-0256	10:35	1.114	1.415
09/15/04	42-0256	42-0255	10:40	0.778	1.114
Relative Percent Difference				**35.5%**	**23.8%**

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