



HEALTHY LAND. CLEAN WATER. VIBRANT COMMUNITY.

2017 Mad River Watershed Report to LaRosa

Summary

In 2017, Mad River Watch program volunteers drew samples on six dates at 33 sites on June 12, June 26, July 10, July 25, August 7, and August 23. 12 sample sites were located on the main stem of the Mad River, 20 on tributaries, and one on Blueberry Lake.

The Friends of the Mad River lab analyzed samples from 12 of our 33 sites for *E. coli* (using the IDEXX QuantiTray method), and collected other information on each sampling date including temperature and flow (data from USGS gauge in Moretown).

Through the LaRosa partnership, samples from 24 of 33 sites, 5 on the main stem of the Mad River and 19 on tributaries were analyzed for phosphorus, nitrogen, and turbidity.

Vermont Water Quality Standards

The Vermont Water Quality Standards set the allowable limits for *E. coli*, total Phosphorus, turbidity, total nitrogen for the Class B2 (cold water fishery) waters of the Mad River and its tributaries as follows:

Total Phosphorus

Not to exceed 12 µg/l

Total Nitrogen

Not to exceed 5 mg/l

Turbidity

Not to exceed 25 NTU

E. coli

Not to exceed 235 per milliliter; this is considered a “Beach Action Value” that corresponds to 8 illnesses per 1,000 swimmers and is slightly more conservative than EPA’s base recommendation of 410 *E. coli* per milliliter

Phosphorus

Of the total of 145 samples analyzed for total Phosphorus, 68 samples (47 percent) exceeded the standard of 12 µg/l. This is a slight decrease from last year, where 48 percent of samples had exceeded the water quality standard, yet the flow conditions during sampling varied between sampling seasons.

Table 1. 2017 Total Phosphorus at 25 sites in the Mad River Watershed (µg/l)

		6/12/2017	6/26/2017	7/10/2017	7/25/2017	8/7/2017	8/23/2017
FLOW CONDITION -->		LS	HD	HS	HD	LD	HD
FLOW CATEGORY/LEVEL --> (Generalized Across Sites)		MB	MF	MB	MB	MB	HB
SITE LOCATION	SITE #						
Warren Store (Freeman Brook)	4	5.22	11.4	9.24	8.67	< 5	11.1
Bottom of Sugarbush Acces Rd (Clay Brk)	8	< 5	17.4	9.06	15.8	6.72	15.5
Route 100 crossing (Folsom Brook)	10	12.3	16.5	17.6	21.6	13.8	53.4
"Dip" on East Warren Rd. (N. Folsom Brook)	10.6	8.24	10.4	11.6	10.7	6.48	18.4
Yurt Property (Folsom Brook)	10.8	7.66	12.3	12.2	12.5	10.2	27.6
Sugarbush Health Club (Rice Brook)	11	5.77	5.9	13.6	5.18	< 5	10.7
Inferno Road Crossing (Clay Brook)	12	< 5	5.45	5.66	< 5	< 5	8.08
German Flats, Rt 17 (Chase Brk)	16	< 5	7.98	6.35	5.71	13.6	9.81
German Flats, Rt 17 (Mill Brk)	17	< 5	6.38	6.84	5.77	< 5	9.17
Battleground Condos (Mill Brk)	17.1	< 5	5.16	5.17	< 5	< 5	7.64
Mill Brook	18.1	< 5	15.5	9.4	5.41	5.08	11.4
Waitsfield Covered Bridge (Mad River)	20	< 5	9.46	8.33	9.32	< 5	24.8
Joslin Hill Road Culvert (High Bridge Brook)	20.1	9.26	17.7	18	34.5	15	36.4
High Bridge Brook North Split	20.1-1	12.3	24.7	16	48.2	17.7	55.2
High Bridge Brook North Split US	20.1-12	9.97	13.4	13.6	24.7	12.8	27.9
High Bridge Brook South Split	20.1-2	9.65	14.5	21.1	40.6	11.9	25
Route 100 Bridge (Shepard Brook)	24	5.16	9.61	9.45	8.75	15.5	11.6
Route 100 Bridge (Dowsville Brook)	25	7.43	12.4	17.6	14.6	11.1	16.3
North Road near Moretown (Mad River)	26	< 5	22.9	17.4	11.3	9.16	34.5
Moretown Village Swim Access (Mad River)	27	5.53	17.1	20.1	19	12.7	51.2
Ward Clapboard Mill (Mad River)	28	6.72	13.5	20.3	19.6	15.4	55.7
Near Stevens Brook Road (Welder Brook)	28.05	< 5	15.1	15.3	15.1	13.9	15.5
Welder Brook Upstream	28.05-1	11	123	10.2	8.07	6.75	8.04
Lover's Lane Bridge (Mad River)	31	5.94	22.8	23.7	30.1	38.4	40.4
Mouth of Old Center Fayston Rd Brook	OCFRB				35.3		

Two sites, at the North and North Upstream sites on High Bridge Brook (20.1-1 and 20.1-12) were in violation on six and five of the sampling days, regardless of the flow conditions. This indicates that the areas upstream of these sites are consistently contributing to the phosphorus input into the watershed. These two sites were located since 2016 to pinpoint High Bridge Brook (HBB) sources and both these are on the North split of HBB, suggesting further analysis on the North split.

On June 26 (15 violations), July 25 (13 violations), & August 23 (15 violations), the highest number of violations were recorded. The FMR flow conditions those days were High and Declining, based on Moretown USGS Gage information, following a storm event that had occurred just prior to sampling. With lower flows (that indicate little stormwater runoff), it appears that phosphorus isn't reaching the streams.

Based on this year's sampling, it would appear that Welder Brook's Phosphorus problem originates downstream of the new US site (28.05-1) and the original site just above the Main Stem.

Nitrogen

Out of 144 samples taken and analyzed for Total Nitrogen, none exceeded the standard of 5 mg/l. The highest value found during the sampling season was 1.04 mg/l at Folsom Brook (10); samples from both Folsom Brook sites on each sampling day are generally higher than elsewhere in the watershed. This was our second year of sampling for total nitrogen, and these results are consistent with 2016.

Table 2. 2017 Total Nitrogen at 25 sites in the Mad River Watershed (mg/l)

		6/12/2017	6/26/2017	7/10/2017	7/25/2017	8/7/2017	8/23/2017
FLOW CONDITION -->		LS	HD	HS	HD	LD	HD
FLOW CATEGORY/LEVEL --> (Generalized Across Sites)		MB	MF	MB	MB	MB	HB
SITE LOCATION	SITE #						
Warren Store (Freeman Brook)	4	0.38	0.51	0.76	0.5	0.69	0.54
Bottom of Sugarbush Acces Rd (Clay Brk)	8	0.32	0.38	0.37	0.36	0.53	0.35
Route 100 crossing (Folsom Brook)	10	0.48	0.63	0.6	0.44	0.63	0.81
"Dip" on East Warren Rd. (N. Folsom Brook)	10.6	0.8	0.92	0.68	0.47	0.89	1.04
Yurt Property (Folsom Brook)	10.8	0.13	0.18	0.17	0.23	0.25	0.46
Sugarbush Health Club (Rice Brook)	11	0.2	0.2	0.22	0.24	0.32	0.31
Inferno Road Crossing (Clay Brook)	12	0.23	0.19	0.21	0.26	0.3	0.26
German Flats, Rt 17 (Chase Brk)	16	0.22	0.19	0.22	0.23		0.29
German Flats, Rt 17 (Mill Brk)	17	0.15	0.13	0.15	0.25	0.28	0.27
Battleground Condos (Mill Brk)	17.1	0.19	0.15	0.19	0.37	0.32	0.26
Mill Brook	18.1	0.19	0.16	0.18	0.24	0.31	0.28
Waitsfield Covered Bridge (Mad River)	20	0.19	0.18	0.29	0.3	0.34	0.37
Joslin Hill Road Culvert (High Bridge Brook)	20.1	0.33	0.28	0.28	0.31	0.43	0.39
High Bridge Brook North Split	20.1-1	0.28	0.24	0.3	0.3	0.33	0.37
High Bridge Brook North Split US	20.1-12	0.23	0.17	0.18	0.27	0.29	0.4
High Bridge Brook South Split	20.1-2	0.37	0.33	0.24	0.33	0.49	0.42
Route 100 Bridge (Shepard Brook)	24	0.1	< 0.1	0.11	0.19	0.22	0.24
Route 100 Bridge (Dowsville Brook)	25	0.12	< 0.1	0.1	0.18	0.26	0.21
North Road near Moretown (Mad River)	26	0.27	0.16	0.48	0.35	0.5	0.35
Moretown Village Swim Access (Mad River)	27	0.27	0.17	0.31	0.36	0.51	0.43
Ward Clapboard Mill (Mad River)	28	0.24	0.2	0.3	0.34	0.25	0.44
Near Stevens Brook Road (Welder Brook)	28.05	0.2	0.51	0.17	0.24	0.28	0.29
Welder Brook Upstream	28.05-1	0.19	0.21	0.17	0.26	0.32	0.3
Lover's Lane Bridge (Mad River)	31	0.25	0.2	0.29	0.38	0.48	0.44
Mouth of Old Center Fayston Rd Brook	OCFRB		0.12				

Turbidity

Among the 145 samples taken and analyzed for turbidity, 3 did not meet turbidity standard of 25 NTU. The reason we added the Mouth of Old Center Fayston Rd Brook (OCFRB) site was because it was reported to us that this brook was very turbid and had been so for some time. Upstream clay veins are thought to be involved, though haven't yet been fully pinpointed. This site also exceeded the phosphorus standard at this one time of sampling.

Table 3. Turbidity at 25 sites in the Mad River Watershed (NTU)

		6/12/2017	6/26/2017	7/10/2017	7/25/2017	8/7/2017	8/23/2017
FLOW CONDITION -->		LS	HD	HS	HD	LD	HD
FLOW CATEGORY/LEVEL --> (Generalized Across Sites)		MB	MF	MB	MB	MB	HB
SITE LOCATION	SITE #						
Warren Store (Freeman Brook)	4	0.81	1.33	0.87	0.96	0.53	1.46
Bottom of Sugarbush Acces Rd (Clay Brk)	8	1.19	11.6	3.12	9.38	1.13	7.01
Route 100 crossing (Folsom Brook)	10	1.6	0.99	1.13	1.27	0.81	2.83
"Dip" on East Warren Rd. (N. Folsom Brook)	10.6	0.52	0.66	0.95	1.07	0.55	1.55
Yurt Property (Folsom Brook)	10.8	0.57	1.42	0.44	0.78	0.86	1.62
Sugarbush Health Club (Rice Brook)	11	0.21	0.51	0.53	0.71	0.5	2.33
Inferno Road Crossing (Clay Brook)	12	0.25	0.42	0.41	0.61	0.47	0.55
German Flats, Rt 17 (Chase Brk)	16	0.23	0.48	0.25	0.47	0.55	1.07
German Flats, Rt 17 (Mill Brk)	17	0.24	0.34	0.39	0.66	0.88	0.77
Battleground Condos (Mill Brk)	17.1	< 0.2	0.25	0.34	0.41	0.27	1.24
Mill Brook	18.1	0.75	1.54	3.01	1.22	0.84	3.11
Waitsfield Covered Bridge (Mad River)	20	0.53	2.63	1.8	3.25	0.71	7.31
Joslin Hill Road Culvert (High Bridge Brook)	20.1	1.34	2.84	4.71	20.5	2.34	12.2
High Bridge Brook North Split	20.1-1	0.78	4.02	5.57	21.9	2.11	23.1
High Bridge Brook North Split US	20.1-12	0.59	0.74	0.65	2.42	0.72	2.52
High Bridge Brook South Split	20.1-2	2.62	2.23	2.68	24.2	1.68	8.07
Route 100 Bridge (Shepard Brook)	24	0.69	1.15	1.17	1.62	9.34	1.74
Route 100 Bridge (Dowsville Brook)	25	1.19	5.03	11.4	8.15	0.59	10.1
North Road near Moretown (Mad River)	26	0.97	7.29	7.07	5.85	1.43	18.4
Moretown Village Swim Access (Mad River)	27	1.04	4.04	7.8	7.92	2.08	20.9
Ward Clapboard Mill (Mad River)	28	1.82	5.08	8.13	14.8	6.54	26.8
Near Stevens Brook Road (Welder Brook)	28.05	0.52	1.74	2.88	2.22	2.25	2.46
Welder Brook Upstream	28.05-1	1.54	82.1	1.05	1.29	0.65	0.73
Lover's Lane Bridge (Mad River)	31	0.93	5.42	13.9	16.9	4.28	16
Mouth of Old Center Fayston Rd Brook	OCFRB				29.4		

The Ward Clapboard Mill (28) and Welder Brook Upstream (28.05-1) site violations appear to be anomalies or sampling error, though the Old Center Fayston Rd Brook (OCFRB) site was observed to be a turbidity problem and sampled for this reason.

E. coli

Of the 72 samples analyzed, 5 had unfavorable values of *E. coli* for recreation (235 *E. coli* per 100 milliliters). Four of these violations were on the sampling date of August 23 when FMR's flow condition of the Mad River was High and Declining. These four violations were on the Mad River (in Waitsfield and Moretown) and include: Tremblay Road (21.5), Meadow Bridge Road (23), the Moretown Village Swim Access (27), and the Ward Swimhole (29). The fifth violation was on July 25, when flow conditions were also High and Declining, on the Mad River at the Ward Swimhole (29).

E. coli concentrations for Blueberry Lake were very low, ranging from 6.3 to 35 *E. coli* per 100 mL.

Table 4. 2017 *E. coli* at 12 sites in the Mad River Watershed (*E. coli*/100 ml)

		6/12/2017	6/26/2017	7/10/2017	7/25/2017	8/7/2017	8/23/2017
		LS	HD	HS	HD	LD	HD
		MB	MF	MB	MB	MB	HB
SITE LOCATION	SITE #						
Blueberry Lake	BBL	20.1	26.2	6.3	36.4	35.0	29.8
Warren Falls (Mad River)	1	3.0	9.8	11.0	52.0	24.3	34.5
Bobbin Mill (Lincoln Brook)	2	6.3	4.1	5.2	47.1	19.9	38.8
Warren Store (Freeman Brook)	4	12.2	25.6	25.6	80.1	35.0	74.8
Warren Riverside Park (Mad River)	7	5.2	6.3	8.4	30.1	45.7	45.5
Lareau Swimhole (Mad River)	19	34.2	43.2	3.0	118.2	68.3	102.6
Couples Club Field (Mad River)	19.2	6.3	35.9	15.3	35.4	52.9	51.2
Waitsfield Covered Bridge (Mad River)	20	6.3	38.9	28.8	27.5	38.3	46.0
Tremblay Road (Mad River)	21.5	8.4	21.6	12.8	12.5	20.4	547.5
Meadow Road Bridge (Mad River)	23	20.1	53.0	16.8	123.2	9.5	980.4
Moretown Village Swim Access (Mad River)	27	52.9	32.3	Not Available	224.7	125.0	1046.2
Ward Swimhole (Mad River)	29	14.2	78.8	Not Available	365.4	77.2	686.7

Quality Control

Table 5. Field Duplicate Relative Percent Differences

Site #	Date	TP (ug P/L)			TN (mg-N/l)			Turbidity (NTU)			Notes
		Actual	Duplicate	% Difference (<30%)	Actual	Duplicate	% Difference (<20%)	Actual	Duplicate	% Difference (<15%)	
10.8	6/12/2017	7.66	8.39	9%	0.13	0.12	8%	0.57	0.41	33%	
20.1-1	6/12/2017	12.3	12.3	0%	0.28	0.26	7%	0.78	0.76	3%	
10	6/12/2017	12.3	15.3	22%	0.48	0.46	4%	1.6	0.82	64%	
18.1	6/26/2017	15.5	6.67	80%	0.16	0.17	6%	1.54	1.29	18%	
27	6/26/2017	17.1	20.5	18%	0.17	0.21	21%	4.04	3.44	16%	
8	7/10/2017	9.06	7.78	15%	0.37	0.4	8%	3.12	2.32	29%	
20	7/10/2017	8.33	8.83	6%	0.29	0.33	13%	1.8	1.71	5%	
24	7/10/2017	9.45	9.71	3%	0.11	0.15	31%	1.17	1.45	21%	
16	7/25/2017	5.71	5.04	12%	0.23	0.23	0%	0.47	0.36	27%	
10.6	7/25/2017	10.7	10.2	5%	0.47	0.47	0%	1.07	1.09	2%	
4	8/7/2017	8.79	8.03	9%	0.69	0.77	11%	0.53	0.24	75%	* TP blank and duplicate swapped
20.1	8/7/2017	15	13.7	9%	0.43	0.46	7%	2.34	2.02	15%	
28.05	8/7/2017	13.9	14.6	5%	0.28	0.3	7%	2.25	1.82	21%	
17.1	8/23/2017	7.64	8.07	5%	0.26	0.43	49%	1.24	0.83	40%	
25	8/23/2017	16.3	15.7	4%	0.21	0.22	5%	10.1	9.2	9%	
Seasonal Average				13%			12%			25%	

		Final E. Coli (mpn/100ml)		
		Actual	Duplicate	% Difference (<125%)
7	6/12/2017	5.2	6.26	18%
27	6/26/2017	32.3	52.84	48%
19	7/10/2017	3	17.31	141%
20	7/10/2017	28.8	33.1	14%
23	7/25/2017	123.2	344.8	95%
29	8/7/2017	77.2	191.79	85%
4	8/7/2017	35	28.82	19%
19.2	8/23/2017	51.2	307.59	143%
Seasonal Average				70%

Table 6. Blank Comparisons

Site #	Date	TP (ug P/L)	TN (mg-N/l)	Turbidity (NTU)	Final E. Coli (mpn/100ml)	Notes
10	6/12/2017	< 5	< 0.1	< 0.2		
10.8	6/12/2017	< 5	< 0.1	< 0.2		
20.1-1	6/12/2017	< 5	< 0.1	< 0.2		
7	6/12/2017				6.32	*likely duplicate
18.1	6/26/2017	< 5	< 0.1	< 0.2		
27	6/26/2017	< 5	< 0.1	0.65		*likely contamination
19	7/10/2017				< 1	
20	7/10/2017	< 5	< 0.1	< 0.2	< 1	
24	7/10/2017	< 5	< 0.1	< 0.2		
8	7/10/2017	< 5	< 0.1	< 0.2		
10.6	7/25/2017	< 5	< 0.1	0.35		*likely contamination
16	7/25/2017	< 5	< 0.1	< 0.2		
23	7/25/2017				< 1	
20.1	8/7/2017	< 5	< 0.1	< 0.2		
28.05	8/7/2017	< 5	< 0.1	< 0.2		
29	8/7/2017				< 1	
4	8/7/2017	< 5	< 0.1	< 0.2	< 1	*blank and duplicate swapped; adjusted here
17.1	8/23/2017	< 5	< 0.1	< 0.2		
19.2	8/23/2017				< 1	
25	8/23/2017	< 5	< 0.1	< 0.2		

Total Phosphorus

The seasonal relative percent difference (RPD) of phosphorus field duplicate samples for the six sampling dates was 13%, which is within the estimated range of precision specified in the Quality Assurance Project Plan (QAPP) – less than or equal to 30% RPD. One field sample duplicate taken on June 26 when flow conditions were High and Declining showed a difference of 80%. This large difference may have been due to sampling procedure (timing) and the variation in flow regime.

Field blanks were also collected at each site during sampling. All field blanks had only trace phosphorus.

Data completeness for the 2017 season is 100%.

Total Nitrogen

The average relative percent difference (RPD) of nitrogen field duplicate samples for the six sampling dates was 12%, within the estimated range of precision specified by the Quality Assurance Project Plan (QAPP) – less than or equal to 20% RPD. Three field sample duplicates showed RPDs greater than 20%.

Field blanks were also taken at each sampling. All field blanks only had trace amounts of nitrogen, suggesting that no environmental factors affected the actual samples.

Data completeness for the 2017 season is 99.3% because a 8/7/17 sample container leaked.

Turbidity

The average relative percent difference (RPD) of turbidity field duplicate samples for the six sampling dates was 25%, which is above the estimated range of precision specified in the QAPP (less than or equal to 15% RPD). This large difference may have been due to sampling procedure (timing) and the variation in flow regime.

Data completeness for the 2017 season is 100%.

E. coli

The seasonal relative percent difference (RPD) of *E. coli* field duplicate samples for the six sampling dates was 70%, which is within the estimated range of precision specified in the Quality Assurance Project Plan (QAPP) – less than or equal to 125% RPD.

DEC Flow and Level

In 2015, the Vermont DEC formalized a protocol to capture flow data and make qualitative observations on the flow condition at their respective sites. The Mad River Watch program has historically used a different categorization, based on the Moretown USGS Gage discharge information. Volunteers determine flow to be Low (L), Medium (M), or High (H), as well as the level to be Base (B), Flooding (F), or Hydro (H) conditions. These observations are made and recorded at each site during sampling and then generalized across the watershed to more easily make comparisons.

Table 7 illustrates the DEC Flow Category and Level and time of observation.

Table 7. DEC Flow Category and Level

SITE LOCATION	SITE #	6/12/2017		6/26/2017		7/10/2017		7/25/2017		8/7/2017		8/23/2017	
		Time Sampled (24 h)	DEC Flow Level & Category	Time Sampled (24 h)	DEC Flow Level & Category	Time Sampled (24 h)	DEC Flow Level & Category	Time Sampled (24 h)	DEC Flow Level & Category	Time Sampled (24 h)	DEC Flow Level & Category	Time Sampled (24 h)	DEC Flow Level & Category
Blueberry Lake	BBL	7:30	HB	7:35 AM	MF	7:45	MB	6:45	LB	9:20	LB	7:05	HF
Warren Falls (Mad River)	1	8:00	MB	7:40 AM	MF	7:55	MB	7:05	MB	8:10	LB	7:20	MB
Bobbin Mill (Lincoln Brook)	2	8:10	MB	7:50 AM	MF	8:05	MB	7:12	MB	8:55	LB	7:35	MB
Warren Store (Freeman Brook)	4	8:30	MB	8:00 AM	MF	8:20	MB	7:20	MB	8:35	LB	7:45	MB
Warren Riverside Park (Mad River)	7	9:00	MB	8:10 AM	MF	8:35	MB	7:29	MB	8:25	LB	8:00	MB
Bottom of Sugarbush Access Rd (Clay Brk)	8	9:10	MB	8:20 AM	HF	8:50	MB	7:36	MB	8:15	LB	8:10	HF
Route 100 crossing (Folsom Brook)	10	9:20	MB	8:30 AM	HF	9:05	MB	7:44	MB	7:00	LB	8:20	HF
"Dip" on East Warren Rd. (Folsom Brook N)	10.6	7:25	MB	8:05 AM	MH	8:20	MB	8:00	MB	7:40	LB	6:55	MF
Folsom Brook (S tributary)	10.8	7:40	MB	8:28 AM	MH	8:33	MB	8:15	MB	7:50	LB	7:15	MF
Sugarbush Health Club (Rice Brook)	11	7:25	MB	7:33 AM	HF	7:37	MB	7:27	MB	7:49	MB	6:54	HB
Inferno Road Crossing (Clay Brook)	12	7:10	MB	7:22 AM	MB	7:30	HF	7:20	HF	7:40	MB	6:48	HB
German Flats, Rt 17 (Chase Brk)	16	7:45	MB	7:45 AM	MB	7:47	MB	7:37	MB	8:05	MB	7:10	HB
German Flats, Rt 17 (Mill Brk)	17	7:50	MB	7:50 AM	MB	7:50	MB	7:45	MB	8:12	MB	7:12	HB
Mill Brook east of MRG	17.1	8:05	MB	7:55 AM	MB	7:59	MB	7:55	MB	8:24	MB	7:25	HB
Mill Brook	18.1	8:20	MB	8:00 AM	MF	8:10	MB	8:07	MF	8:39	MB	7:43	HB
Lareau Swimhole (Mad River)	19	7:00	MB	7:30 AM	MB	6:55	MB	6:15	MB	7:12	MB	7:49	HB
Couples Club Field (Mad River)	19.2	7:10	MB	7:40 AM	MB	7:09	MB	6:24	MB	7:25	MB	8:00	HB
Waitsfield Covered Bridge (Mad River)	20	7:50	MB	6:45 AM	MF	6:45	MB	6:45	MHB	6:30	MB	7:10	MF
Joslin Hill Road Culvert (High Bridge Brook)	20.1	6:10	MB	7:05 AM	MF	7:15	MB	7:05	MHB	6:50	LB	6:35	MF
High Bridge Brook North	20.1-1	5:40	MB	7:20 AM	MF	7:25	MB	7:10	MHB	7:10	LB	6:50	MF
High Bridge Brook North US	20.1-12	6:30	MB	7:40 AM	MF	7:45	MB	7:35	MB	7:30	LB	6:15	MF
High Bridge Brook Mid	20.1-2	6:00	MB	7:30 AM	MF	7:30	HB	7:20	MHB	7:20	LB	7:00	MF
Tremblay Road (Mad River)	21.5	8:05	MB	8:45 AM	MB	7:16	MB	6:38	MB	7:36	MB	8:15	HB
Meadow Road Bridge (Mad River)	23	8:15	MB	8:55 AM	MB	7:25	MB	6:47	MB	7:47	MB	8:20	HB
Route 100 Bridge (Shepard Brook)	24	8:20	MB	9:08 AM	MB	7:32	MB	7:00	MB	8:01	MB	8:25	HB
Route 100 Bridge (Dowsville Brook)	25	8:30	MB	9:20 AM	MB	7:48	MB	7:08	MB	8:11	MB	8:35	HB
North Road near Moretown (Mad River)	26	8:11	LB	7:53 AM	MF	11:44	MF	9:52	MF	9:05	MB	8:50	No Record
Moretown Village Swim Access (Mad River)	27	8:00	MB	7:42 AM	MF	12:00	MF	9:46	MF	8:56	MF	8:45	No Record
Ward Clapboard Mill (Mad River)	28	7:50	MB	7:37 AM	MF	12:08	MF	9:40	MF	8:50	MF	8:37	No Record
Near Stevens Brook Road (Welder Brook)	28.05	7:45	LB	7:22 AM	MF	12:25	MF	9:22	MF	8:38	MF	8:30	No Record
Welder US (Welder Brook)	28.05-1	7:35	MB	7:12 AM	MF	12:33	MF	9:28	MF	8:30	MB	8:24	No Record
Ward Swimhole (Mad River)	29	7:17	LB	7:02 AM	MF	-	MF	9:16	MF	8:15	MB	8:12	No Record
Lover's Lane Bridge (Mad River)	31	7:05	MB	6:47 AM	MF	-	-	9:10	MF	8:06	MB	8:05	No Record

Conclusions

Based on our analysis of the sampled total phosphorus data we would conclude that the sites at the North (20.1-1) and North Upstream (20.1-12) of High Bridge Brook represent areas where phosphorus inputs are significant enough to justify further monitoring and source research. Further analysis and source research of Welder Brook between downstream 28.05 and upstream 28.05-1 are important in 2018.

Nitrogen loading in the watershed does not appear to be an issue, as there were no violations of the water quality standards in 2016 or 2017. However, as this was only our second year sampling for total nitrogen, it is unclear if further sampling should be conducted in order to produce a historical record, and determine if any trends are apparent. Both Folsom Brook sites would benefit from further analysis.

Sampling in the watershed during 2017 did not indicate many big turbidity challenges, though it will be important to watch the Old Center Fayston Rd Brook in 2018.

Only 5 of the 70 samples for *E. coli* were greater than 235 organisms/100ml, each during a High and Declining flow condition, which may have flushed materials containing *E. coli* organisms into the River from the adjacent land.