Acid Rain Monitoring Project

FY21 Annual Report

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Marie-Françoise Hatte
MA Water Resources Research Center
209 Ag Engineering, 250 Natural Resources Road
University of Massachusetts
Amherst, MA 01003-9295
wrrc.umass.edu

Introduction
This report covers the period January 1, 2021 to June 30, 2021, the twentieth year of Phase IV of the Acid Rain Monitoring Project. Phase I began in 1983 when around one thousand citizen volunteers were recruited to collect and help analyze samples from nearly half the state's surface waters. In 1985, Phase II aimed to do the same for the rest of the streams and ponds[1] in Massachusetts. The third phase spanned the years 1986-1993 and concentrated on a subsample of streams and ponds to document the effects of acid deposition to surface waters in the state. Over 800 sites were monitored in Phase III, with 300 citizen volunteers collecting samples and doing pH and ANC analyses. In 2001, the project was resumed on a smaller scale: about 60 volunteers are now involved to collect samples from approximately 150 sites, 26 of which are long-term sites with ion and color data dating back to Phase I. In the first years of Phase IV (2001-2003), 161 ponds were monitored for 3 years. Between Fall 2003 and Spring 2010, the project monitored 151 sites twice a year, mostly streams, except for the 26 long-terms sites that are predominantly ponds. Since 2011, reduced funding eliminated our October sampling and monitoring now occurs in April only. In 2011, we also stopped monitoring some of the streams in order to add and revisit ponds that were monitored in 2001-2003. This year is the ninth year of monitoring for those added ponds. No collection took place in 2020 as the covid-19 pandemic prevented entry of many laboratories used in this project.

Goals
The goals of this project are to determine the overall trend of sensitivity to acidification in Massachusetts surface waters and whether the 1990 Clean Air Act Amendment has resulted in improved water quality.

Methods
The sampling design was changed in 2011 to monitor both streams and ponds, and that design continues to date. In 2001-2003 mostly ponds were monitored. In Fall 2003 the sampling scheme switched to streams to evaluate their response to air pollution reductions. In 2011 the site list was modified to include both ponds and streams. Half of the streams monitored since 2003 were kept, and half of the ponds monitored in 2001-2003 were added back. The streams that were removed were chosen randomly within each county. Ponds that were reinstated on the sampling list were chosen at random within those counties and by ease of accessibility to replace the removed streams. Because those sites were chosen without a preconceived plan, they can be considered picked at random.

One collection took place this year, on **April 11, 2021**.

Methods were unchanged from previous years: Volunteer collectors were contacted six weeks before the collection to confirm participation. Clean sample bottles were sent to them in the mail, along with sampling directions, a field sheet/chain of custody form, and directions including latitude and longitude coordinates along with maps to the sampling sites. Volunteers collected a surface water sample at their sampling sites either from the bank or wading a short distance into the water body. They collected water one foot below the surface, upstream of their body, after rinsing their sample bottle three times with pond or stream water. If collecting by a bridge, they collected upstream of the bridge unless safety and access did not allow it. They filled in their field data sheet with date, time, and site code information, placed their samples on ice in a cooler and delivered the samples to their local laboratory right away. They were instructed to collect their samples as close to the lab analysis time as possible. In a few cases, samples were collected the day prior to analysis because the lab is not open on traditional "ARM Sunday." Previous studies by our research team have established that pH does not change significantly in 24 hours when the samples are refrigerated and stored in the dark.

One change was that Statewide Coordinator Travis Drury was replaced by Cameron Richards at UMass. This was Mr. Richards' first collection and coordinating labs and volunteer collectors for this project. Travis Drury is still providing advice when needed, and switched to being a sample collector, visiting several sites in Berkshire County this year (see cover photo).

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[1] Note: The term stream in this report refers to lotic waters (from creeks to rivers) and the term ponds refers to lentic waters (lakes and ponds, but not marshes)

Due to the persisting covid-19 pandemic, some laboratories who usually analyze samples for pH and alkalinity on a volunteer basis were not available this year: Ipswich Water Treatment Department, UMass Boston, and Bristol Community College did not participate this year. But three new laboratories were recruited to replace them: Fitchburg State University, MIT Sea Grant, and Dartmouth's Quittacas Water Treatment Plant. It should be noted that samples at Quittacas were analyzed by Charlie Kennedy, son of the late Jim Kennedy who was County Coordinator in Bristol County for many years, dating back to the early 80s when the Acid Rain Monitoring Project began.

Volunteer labs were sent any needed supplies (sulfuric acid titrating cartridge, electrode, buffers), two quality control (QC) samples, aliquot containers for long-term site samples, and a lab sheet one week to ten days before the collection. They analyzed the first QC sample (an unknown) in the week prior to the collection and called in their results to the Statewide Coordinator. If QC results were not acceptable, the volunteer analyst discussed possible reasons with the Statewide Coordinator and made modifications until the QC sample analysis gave acceptable results. On collection day or the day after, volunteer labs analyzed the second QC sample before and after the regular samples, and reported the results on their lab sheet along with the regular samples. Analyses were done on their pH-meters with KCl-filled combination pH electrodes. Acid neutralizing capacity (ANC) was measured with a double end-point titration to pH 4.5 and 4.2. Most labs used a Hach digital titrator for the ANC determination, but some used traditional pipette titration equipment. Aliquots were taken from 26 long-term sites to fill three 50mL tubes per site for later analysis of ions and color. These aliquots were kept refrigerated until retrieved by UMass staff.

This year all 26 long-term sites were sampled again. Aliquots, empty bottles, and results were collected by the ARM Statewide Coordinator and the Principal Investigator between one and three days after the collection.

The Principal Investigator reviewed the QC results for all labs and flagged data for any lab results that did not pass Data Quality Objectives (within 0.3 units for pH and within 3mg/L for ANC). pH and ANC data were entered by one ARM staff and proofread by another. Data were entered in a MS excel spreadsheet and uploaded into the web-based database at http://63.135.115.71/acidrainmonitoring/.
pH and alkalinity data were also posted on the ARM web page at https://wrrc.umass.edu/research/projects/acid-rain-monitoring-project/arm-2021-results.

Water Resources Research Center's Cameron Richards, with the help of senior student Faith Lawless, managed the Environmental Analysis Lab (EAL) and provided the QC samples for pH and ANC to all of the volunteer labs. EAL also provided analysis for color analysis for the long-term site samples. The UMass Extension Soils Laboratory analyzed the samples from the long-term sites for cations, and University of New Hampshire's Water Quality Analysis Laboratory, under the direction of Jody Potter, analyzed the samples from the long-term sites for anions.

Aliquots for the 26 long-term sites were analyzed for color on a spectrophotometer at UMass EAL within three days; anions within three months on an Ion Chromatograph; and cations within one month on an ICP at the UMass Extension Soils Laboratory on the UMass Amherst campus. The available data was sent via MS Excel spreadsheet to the Statewide Coordinator and uploaded into the web-based database.

The Project Principal Investigator plotted the data to check for data inconsistencies and gaps. She then analyzed the available April data from 1983 through 2021, using the statistical software JMP (http://www.jmp.com/software/) to run bivariate analyses of pH, ANC, color and ions against date. This yielded trends analyses with a fitted X Y line, using a 95% confidence interval.

Results

1. There are 149 on our list of sites, but only 145 sites --72 ponds and 73 streams-- were assigned to volunteer collectors (no volunteers were found for the remaining four sites). 142 sites were sampled this year, 70 ponds and 72 streams .

2. Of those, 19 ponds and 7 streams are "long-term" sites that are sampled every year and analyzed for color and a suite of ions in addition to pH and ANC.

3. There were no quality control problem this year. New labs did struggle with QC1, but the Statewide Coordinator and the Principal Investigator worked with them until the day of sampling to ensure that they could produce high quality results. A couple of labs were a little bit outside the acceptable range of quality control for alkalinity, but the margin was small enough that the Principal Investigator approved using all of the data in the statistical analyses.

4. For the ion analyses, both UNH and UMass analyzed the 26 long term site samples for Mg, Ca, Na, and K. This provided a comparison opportunity between the two labs, which agreed fairly well. We note that the Soils Lab's results are higher than UNH's for the four cations in almost all cases. Since we have been using the Soils Lab's data in the past, we continue to do so in order to maintain continuity in our trend analyses.

5. The network of volunteers was maintained and kept well informed on the condition of Massachusetts surface waters so that they would be able to participate effectively in the public debate. This was accomplished by e-mail and telephone communications, as well as through updates via an internet listserv. 61 volunteers participated in this year's collection. Several new volunteer collectors were recruited to replace retiring volunteers via personal connections, participating professors recruiting students, and by word of mouth. There were 10 volunteer labs across the state, in addition to the EAL at UMass Amherst, in charge of pH and ANC analyses (Table 1).

Table 1: Volunteer Laboratories

Analyst Name	Affiliation	Town
Amanda Moulton	MDC Quabbin Lab	Belchertown
Dave Bennett	Cushing Academy	Ashburnham
Bob Bentley	Analytical Balance Laboratory	Middleborough
Dave Christensen	Westfield State University	Westfield
Devon Avery	Upper Blackstone Water Pollution Abatement District	Millbury
Sue Tower	Springfield Water and Sewer Commission	Westfield
Charlie Kennedy	Quittacas Water Treatment Plant	Dartmouth
Cathy Wilkins & MF Hatte	Deerfield River Watershed Association	Heath & Greenfield
Cameron Richards	UMass Amherst Environmental Analysis Lab	Amherst
Aisling O'Connor	Fitchburg State University	Fitchburg
Carolina Bastidas	MIT	Cambridge

6. The ARM web site and searchable database were maintained and updated. 2021 pH, ANC, color, and ion data were added to the web database via the uploading tool created in previous years. Our database manager consultant Bob English edited the data upload utility to allow for data beyond the year 2020.

7. The data collected was analyzed for trends in pH and ANC in April months (142 sites) and for color and ions (26 sites), using the JMP® Statistical Discovery Software (http://www.jmp.com/software/). Trend analyses (scatter plots, regression, and correlation) were run on pH, ANC, color, and each ion separately for each site, predicting concentration vs. time.

Data Analysis Results

pH and ANC

Table 2 displays the number of sites that show a significant change over time for pH or ANC. If the difference was not statistically significant (p>0.05), the sites are tabulated in the 'No Change' category.

Table 2: Trend analysis results for pH and ANC, April 1983 – April 2021 (Number of sites)

	All sites		Ponds		Streams	
	pH	ANC	pH	ANC	pH	ANC
Increased	51	64	24	37	27	27
Decreased	5	1	0	0	5	1
No Change	86	77	46	33	40	44
Total	142	142	70	70	72	72

Those results are graphed as percentages of all sites in Figure 1.

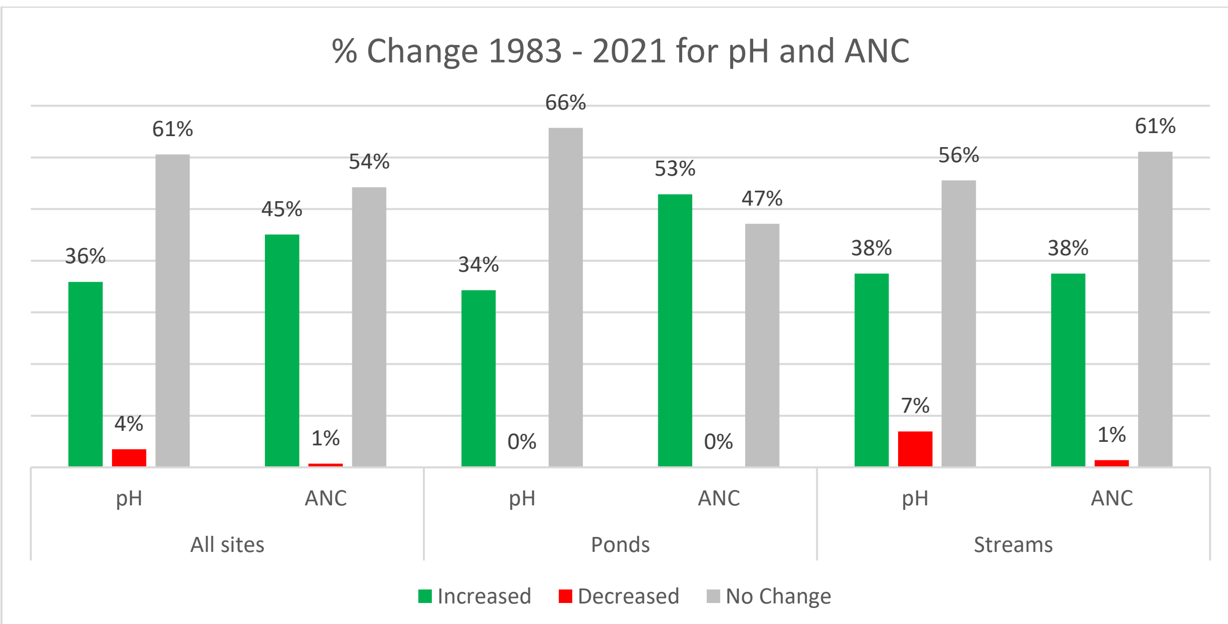

Figure 1. Percent change in number of sites for pH and ANC, from trend analysis, April 1983-2018

This trend analysis indicates that for most sites, neither pH nor ANC changed significantly over time. However, for those sites that show a significant change, many more show an increase than a decrease in value: 36% of the sites saw an increase in pH (32% in 2019, 30% in 2018) and 45% had an increase in ANC (38% in 2019, 33% in 2018). It can be noted that more sites are exhibiting an increase in pH and ANC each year of the past 3 years.

Again this year we see a much higher percentage of ponds exhibiting an increase in ANC compared to streams (53% vs. 38%), and like in 2018 (but not in 2019), more streams had a higher pH than in the past than ponds (38% vs. 34%). As far as decreases in pH are concerned, the situation is similar to that of 2019: more streams saw a drop in pH (7% this year, 8% in 2019) than ponds (0% this year and 3% in 2019), while no ponds and 1% of streams saw a decrease in ANC.

The 2020-2021 winter preceding the sample collection did not have large amounts of snowfall, but it must be noted that we sampled later than usual this year (second instead of first weekend of April) and by then all snowpack had melted, and our results again do not indicate an acid pulse due to snowmelt.

Ions and color

Trend analyses were run for 26 long-term sites that were analyzed for eleven ions and for color. Results are shown in Table 3 and Figure 2. Note that the trend period is 1985-2021.

Table 3: Trends for number of sites with increases or decreases in ion concentration and color April 1985 – April 2021

	Increased	Decreased	No Change
Color	23	0	3
Cl	17	0	9
NO3	1	0	25
SO4	0	24	2
Mg	5	0	21
Mn	0	11	15
Fe	0	7	19
Cu	2	0	24
Al	1	4	21
Ca	4	1	21
Na	15	0	11
K	16	0	10

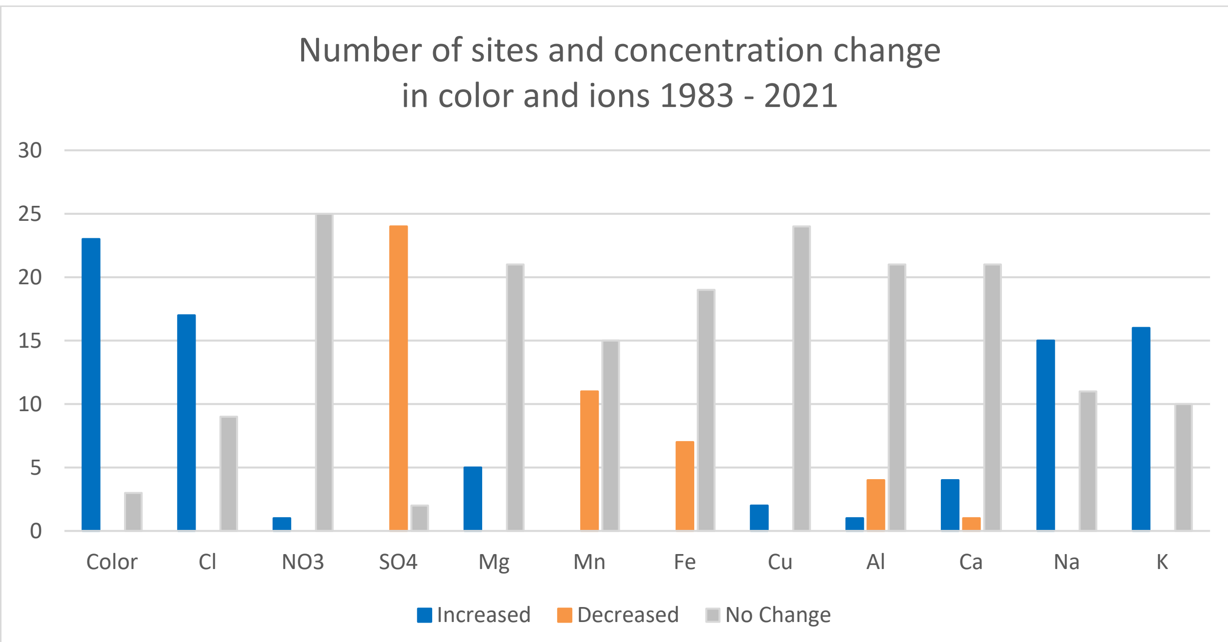

Figure 2: Results of trend analysis for ions and color at 26 long-term sites, April 1985-2021. Shown is how many sites showed an increase (blue), decrease (orange), or no significant change (grey) over the period 1985 – 2021

Results are similar to previous years, except for nitrate (NO_3). In 2019, 10 sites showed a statistically significant increase in NO3, while in 2021 only one site did. The source of nitrates being overwhelmingly vehicle emissions, the decrease might have been caused by the decrease in vehicular traffic in the early part of the pandemic. However, previous trends may have been influenced by unusually high values in 2014, which will be scrutinized again. It will be interesting to see if nitrate levels go back up in next year's results. While there are still more sites that show no significant change either up or down, some ions show significant increases or decreases over the years. Sodium (Na) and potassium (K) are the cations with the most increases, with manganese and iron showing the most decreases.

For anions, we continue to see a very significant downward trend in Sulfate (24 sites). Nitrates, as noted above, is showing no increases this year, except at one site.

Color is still increasing in most of our sites, which is consistent with a recovery of natural alkalinity.

Discussion

The continued trend in decreasing sulfate confirms that the Clean Air Amendment of 1990 is having a positive effect in the quality of the Commonwealth's surface water quality. Road salting in the winter continues to affect the concentration of sodium and chloride in the water bodies. Continued monitoring will help tease out whether nitrate pollution is increasing or whether previous trends were affected by the analyses of 2014.

Acknowledgements

Thank you to all of the project's volunteers who make this project possible by collecting samples all over the state under any weather conditions, and who spend many hours in the lab analyzing samples.

Thank you to Sarah Brown-Anson for the cover page photo of Travis Drury collecting a sample from Belmont Reservoir on April 11, 2021.

Appendix

Table A-1: April 11, 20121pH and Alkalinity data

Name	Palsite	Town	pH	Alkalinity
Aldrich Brook	5131425	Millville	5.77	1
Angeline Brook	9560000	Westport	5	-0.3
Anthony Brook	2105425	Dalton	6.82	5.6
Ashby Reservoir	81001	Ashby	6.66	3.9
Ashfield Pd;Ashfield L;	33001	Ashfield	7.5	39.2
Babcock Brook	3107625	Tolland	5.9	1.4
Bagg Brook	3417750	West Springfield	7.93	103
Baker Brook	3524050	Gardner	5.96	2.5
Bartlett Pond Brook	8146000	Leominster	5.51	0.5
Barton Brook	2105350	Dalton	7.58	31.4
Bassett Brook	6236100	Raynham	6.36	7.3
Bassett Pond	35002	New Salem	5.76	0.9
Beagle Club Pond	371	Dartmouth	7	10.8
Beaman Brook	3523825	Winchendon	6.33	3.1
Beaver Brook	6235800	Easton	6.88	17.3
Belmont Res;Steam Sawmi	21010	Hindsdale	5.49	0.5
Benton Brook	3107375	Otis	6.34	7.5
Bickford Pd;Ropers Res	36015	Hubbardston	6.59	2.3
Bilodeau Brook	2105750	Hindsdale	7.49	29.4
Black Brook	3522675	Warwick	6.65	27.1
Black Brook	9253700	Hamilton	6.4	2.3
Blossom Brook	6134700	Fall River	4.4	-2.4
Blue Hills Reservoir	73004	Quincy	7.2	14.5
Boston Brook	9253925	Middleton	6.96	29.9
Bozrah Brook	3315325	Hawley	7.22	20.5
Brass Mill Pond	34011	Williamsburg	7.4	14.2
Bread And Cheese Brook	9560150	Westport	6.1	2.8
Buck Pond	32012	Westfield	7.37	21
Bungay River	5233750	North Attleborough	6.83	19.4
Cadwell Creek	3626575	Pelham	6.33	1.6
Cady Brook	2105725	Hindsdale	6.97	20.9
Cheshire Res. North	11002	Cheshire	8.23	92.5
Clear Run Brook	5334150	Seekonk	6.84	38.3
Cloverdale Street Pond	36036	Rutland	6.72	6.9
Cobble Mtn. Reservoir	32018	Blandford	7.27	10
Coes Reservoir	51024	Worcester	6.3	16
College Pond	95030	Plymouth	6.41	2.5
Cowee Pd;Marm Johns Pd	35013	Gardner	5.68	0.9
Cronin Brook	5132625	Grafton	6.4	14

Name	Palsite	Town	pH	Alkalinity
Crystal Lake	36043	Palmer	6.02	0.94
Dorothy Brook	5132700	Worcester	6.27	37
Duck Pond	84083	Groton	6.71	5
East Br Swift River	3627200	Petersham	5.96	2.3
East Brimfield Res	41014	Brimfield	7.04	11
East Oxbow Brook	3314925	Charlemont	6.94	7.2
Ezekiel Pond	95051	Plymouth	6.78	2.8
Fiske Pond	34023	Wendell	5.53	1.1
Flat Brook	3627500	Ware	6.64	8.93
Fox Brook	3106825	Granville	6.51	4
French River	4230075	Oxford	5.95	16
Godfrey Brook	7240375	Milford	6.32	36
Great Pond	96117	Wellfleet	5.97	0.5
Greenwood Pond	35026	Templeton	5.68	1
Grove Pond	81053	Ayer	7.08	22.8
Gulf Brook	8143675	Pepperell	7.39	13
Hartwell Brook	3315075	Charlemont	7.47	27.8
Hatches Creek	9661525	Eastham	6.47	7.5
Hawley Reservoir	34031	Pelham	6.29	2.2
Heald Pond	81056	Pepperell	7.31	14.6
Hedges Pond	94065	Plymouth	6.37	1.3
Hinsdale Brook	3313175	Shelburne	7.9	61.4
Holden Res 1;Upper Hold	51063	Holden	6	2
Hop Brook	3627000	New Salem	6.81	6.6
Indian Pond	94072	Kingston	6.22	21.2
Ipswich River	9253500	Ipswitch	6.94	30.5
Johnson Pd; Factory Pd	62097	Raynham	6.16	3.7
Kenny Brook	3523750	Royalston	6.43	2.4
Kickamuit River	6134500	Swansea	6.55	11
Kilburn Brook	2105700	Peru	7.07	12.4
King Phillip Brook	6134725	Fall River	4.56	-1.7
Kinnacum Pond	96163	Wellfleet	5.22	-0.1
Kinsman Brook	3314450	Heath	7.16	17.9
L Rohunta; South Basin	35107	Athol	6.38	3.8
L Wampanoag; Nashua Res	81151	Ashburnham	6.05	1.5
Lake Denison	35017	Winchendon	6.09	3.1
Lake Garfield	21040	Monterey	7.64	51
Lake Lorraine	36084	Springfield	6.71	15
Lake Watatic	35095	Ashburnham	6.72	4.3
Lake Wyola; Locks Pond	34103	Shutesbury	6.41	2.2
Little River	3208725	Westfield	7.34	15
Little Sandy Pond	95092	Plymouth	6.46	1.7

Name	***Palsite***	***Town***	***pH***	***Alkalinity***
Long Pond	21062	Great Barrington	7.86	81.7
Lord Brook	3316550	Rowe	6.91	5.4
Lynde Brook Reservoir	51090	Leicester	6.28	13
Maynard Brook	3626475	Oakham	5.87	2
Mcgovern Brook	8144725	Lancaster	7.36	17.6
Mill River	3419825	Conway	7.64	38.7
Millham Brook	8247475	Marlborough	6.36	36
Moores Pond; Lake Moore	35048	Warwick	6.57	3.3
Mulberry Meadow	6235775	Easton	6.81	9.8
Mystic Pond	84043	Methuen	7.14	25.8
N Watuppa L;N Watuppa R	61004	Fall River	5.36	0.6
New Long Pond	95112	Plymouth	6.29	1.8
Nipmuck Pond	42039	Webster	5.51	3
Noquockoke L;South Basi	95170	Dartmouth	6.18	3.8
North River	3314100	Colrain	7.54	23.6
Notch Pond	72088	Medfield	4.99	1
Phoenix Pond; Double Pd	81100	Shirley	7.24	22.6
Plain Street Pond	52032	Mansfield	6.5	11.2
Plainfield Pond	33017	Plainfield	6.46	3.6
Quabbin Res.Station 202	36129	Belchertown	6.63	4.47
Rattlesnake Brook	6235125	Freetown	5.36	0.2
Robbins Brook	3524250	Winchendon	6.03	1.3
Robbins Pond	81111	Harvard	8.52	46.9
Robinson Brook	8143825	Pepperell	7.67	27.8
Rocky Run	5334100	Rehoboth	6.51	9.2
Round Meadow Brook	5131275	Mendon	5.92	1
Round Pond	96264	Brewster	5.31	0.7
Sandy Pond	81117	Ayer	7.3	9.6
Scarboro Pond	34080	Belchertown	6.44	4.2
Sewall Brook	5132600	Boylston	6.26	18
Shingle Brook	3313850	Shelburne	7.5	60.6
Shingle Island Brook	188	Freetown	5.91	2.3
Sleepy Hollow Brook	2104200	Richmond	8.09	190.7
Spectacle Pond	95142	Wareham	6.8	5
Storrow Pond	72115	Westwood	6.25	4.1
Stump Pond	35085	Gardner	5.85	2.2
Sucker Brook	3625975	New Braintree	6.59	6.4
Thompsons Pond	36155	Spencer	6.29	8
Todd Brook	3316050	Charlemont	6.35	1.9
Torrey Creek	5334075	Seekonk	6.26	15.5
Towne Brook	3524200	Royalston	5.93	1.7
Trout Pond 2; Demming Pd	31042	Tolland	6.13	2.3

Name	Palsite	Town	pH	Alkalinity
Tully Pond	35089	Orange	6.21	3.5
Turner Pd;Turners Mill	95151	New Bedford	4.59	-1.8
Underwood Brook	3314650	Heath	7.03	4.4
Upper Attitash Pond	84072	Amesbury	7.42	20.3
Upper Mystic Lake	71043	Winchester	7.78	40.8
Upper Naukeag Lake	35090	Ashburnham	6.24	1.6
Upper Spectacle Pond	31044	Sandisfield	6.74	8.6
Valley Brook	3107700	Granville	6.19	3.1
Vincent Brook	3314550	Colrain	7.4	17.7
Walker Brook	3210300	Becket	7.17	16.8
Wallis Res/Whitin Reservoir	51179	Douglas	5.47	0
Wellington Brook	4230325	Oxford	6.25	24
West Br Swift River	3626800	Shutesbury	6.08	1.5
West Br Ware River	3628175	Hubbardston	6.49	3.14
Whitehall Reservoir	82120	Hopkinton	6.3	10
Wilder Brook	3523950	Gardner	5.05	-0.2
Williams River	2104100	West Stockbridge	8	134.3
Winnecunnet Pd;Winnecon	62213	Norton	6.83	10.6
Wright Pd; Upper Wright	81160	Ashby	6.45	2.9

Table A-2: 2021 Sample Collectors

Adam McLaughlin	Marc Hoechstetter
Andrea Donlon	Marie-Francoise Hatte
Barbara Allen	Mary Thomas
Bill Eykamp	Matthew Palmer
Bill Frenette	Matthew Richards
Bill Lafley	Max Nyquist
Bob Bentley	Michael Rosser
Caleb Walk	Mike Sperry
Cathy Pierce	Paul Godfrey
Charlie Kennedy	Paul Kaplan
Cindy Carvill	Richard Greene
Dan Crocker	Rob Whitaker
David Nelson	Robert Natario
Debra Lavergne	Rory Kallfelz
Denise Prouty	Sarah Brown-Anson
Elicia Andrews	Shauna Macuga
Emily Crawford	Sonny Crawford
Eric Decker	Sophie Brown
Gail Gray	Sue Tower
Gene Chague	Steven Peterson
Glenn Krevosky	Timothy McCaul
Henry Barbaro	Tom Trainor
Jan Chague	Theresa Richards
Jeff Arps	Travis Drury
Jim Hoberg	Trish Garrigan
John Kennedy	Trouble Mandeson
Joshua Medeiros	Victoria Dumont
Joy Livergood	Virginia Davidson
Ken Guertin	Veronica Loya
Lara Mataac	Zachary Peters
Lauren Gaherty	

Table A-2: April 11, 2021 color and ion concentration for 26 long term sites. Ion concentrations are in mg/L, color in PCU

Palsite	Site name	Cl	NO3	SO4	Mg	Mn	Fe	Cu	Al	Ca	Na	K	Color
9560000	Angeline Brook	9.73	0.03	1.31	1.27	0.00	0.21	0.02	0.56	2.16	9.37	2.62	294
81001	Ashby Reservoir	34.01	0.02	1.53	0.76	0.00	0.11	0.02	0.05	2.76	19.58	2.76	56
21010	Belmont Reservoir	3.13	0.04	1.15	0.23	0.01	0.01	0.02	0.14	0.57	1.26	2.11	19
9560150	Bread And Cheese Brook	34.84	0.31	2.44	1.97	0.00	0.24	0.02	0.25	5.18	29.89	3.32	257
3626575	Cadwell Creek	9.16	0.03	1.66	0.59	0.00	0.01	0.02	0.08	1.75	6.67	1.74	35
32018	Cobble Mtn. Reservoir	14.98	0.05	1.06	1.15	0.00	0.05	0.02	0.04	2.50	10.57	2.12	45
95030	College Pond	7.53	0.00	1.14	0.88	0.00	0.01	0.02	0.04	0.79	5.20	1.88	28
36043	Crystal Lake	4.53	0.01	0.18	0.23	0.00	0.01	0.02	0.04	0.33	1.32	2.12	58
3627200	East Br Swift River	10.15	0.03	1.38	0.72	0.00	0.14	0.03	0.06	2.69	8.74	2.92	94
95051	Ezekiel Pond	31.01	0.08	1.52	1.43	0.00	0.02	0.02	0.04	2.15	21.71	3.01	32
96117	Great Pond	26.95	0.00	1.56	2.03	0.00	0.01	0.02	0.04	0.90	16.34	2.90	18
34031	Hawley Reservoir	12.86	0.02	1.64	0.75	0.00	0.01	0.02	0.05	3.00	9.88	2.16	35
94065	Hedges Pond	15.14	0.00	1.34	1.37	0.00	0.01	0.03	0.04	0.98	10.12	2.84	30
96163	Kinnacum Pond	18.50	0.00	0.68	1.55	0.02	0.01	0.03	0.04	0.41	12.23	2.98	71
36084	Lake Lorraine	38.36	0.00	0.80	1.24	0.00	0.08	0.03	0.04	4.45	26.30	7.60	78
34103	Lake Wyola	7.05	0.03	1.19	0.49	0.00	0.05	0.03	0.05	1.90	6.36	2.64	49
95092	Little Sandy Pond	23.24	0.25	1.23	1.17	0.00	0.01	0.02	0.04	1.30	17.27	3.32	23
61004	N Watuppa Lake	24.15	0.00	2.11	1.11	0.26	0.34	0.03	0.23	2.85	17.30	2.80	24
42039	Nipmuck Pond	8.67	0.00	1.44	0.41	0.00	0.01	0.02	0.09	1.55	7.16	2.17	182
36129	Quabbin Res.Station 202	8.88	0.02	1.23	0.68	0.00	0.01	0.02	0.04	2.38	6.36	2.76	18
6235125	Rattlesnake Brook	8.07	0.00	1.93	0.83	0.02	0.23	0.02	0.33	2.05	7.03	2.28	207
188	Shingle Island Brook	13.31	0.12	2.37	1.48	0.02	0.38	0.02	0.26	3.70	11.45	3.27	266
35090	Upper Naukeag Lake	16.72	0.03	0.78	0.40	0.00	0.01	0.02	0.04	1.20	13.72	2.53	35
3626800	West Br Swift River	5.31	0.01	1.46	0.39	0.00	0.03	0.02	0.06	1.41	4.19	2.20	40
82120	Whitehall Reservoir	36.59	0.00	1.50	1.40	0.00	0.02	0.02	0.04	4.56	23.74	2.96	46
81160	Wright Pond	13.46	0.03	0.94	0.51	0.01	0.20	0.02	0.06	1.46	10.66	2.72	66