Sucker Brook Monitoring Report 2016-2017

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For: **The Webster Lake Association**

Background

During summer and early fall of 2016 and 2017, a research group at Plymouth State University collected water chemistry data and macroinvertebrate samples at ten different sites across New Hampshire for a project called "Hot and Salty: Assessing ecological stress in New Hampshire streams at community, population, and molecular levels." The project aimed to assess the impact of road deicers and stream temperature on stream biota, using benthic macroinvertebrates as bio-indicators of ecological stress. I was the graduate research assistant on the project; I collected samples in 2017 and analyzed data for 2016 and 2017.

Because one of our monitoring locations was Sucker Brook, located in the Webster Lake Watershed, I received $1000 from the Pamela and John F. Marrapese "Keep NH Lakes Clear" Endowed Scholarship in Summer 2017 to help cover my expenses while I worked on the project. In thanks for this scholarship, I have put together this report to share our findings with the Webster Lake Association in the hopes that it will be helpful for future management activities.

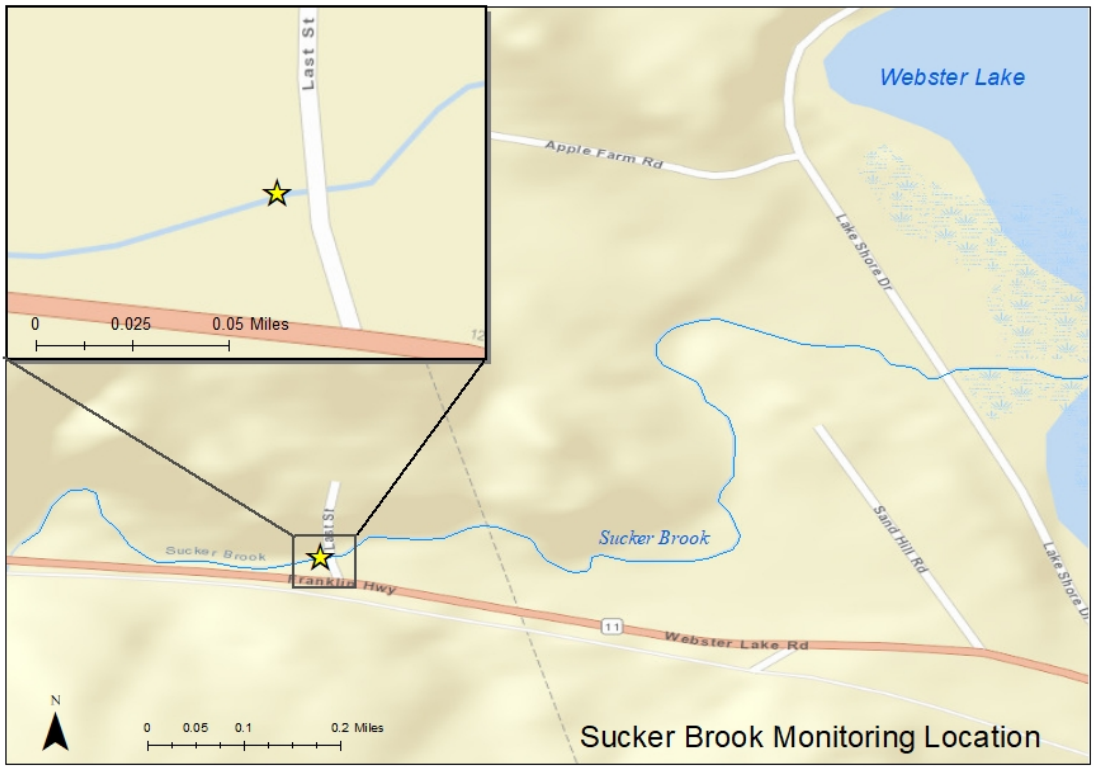

Figure 1: Sucker Brook monitoring location for the "Hot and Salty" project.

Methods

Once a month, during summer and early fall of 2016 and 2017, our team of faculty, graduate students, and undergraduate students would visit each of our ten monitoring sites to collect water quality data. These sites were chosen to represent a gradient of chloride and thermal stress in New Hampshire; locations ranged from a pristine site in the White Mountains to a degraded site just downstream of a construction project in Durham. Sucker Brook was expected to have a low-moderate amount of thermal and chloride stress.

We collected water chemistry data such as pH, water temperature, and dissolved oxygen and collected a grab sample of stream water to send to a University of New Hampshire lab to measure chloride concentration. Macroinvertebrates were collected using a kick net method; one field crewmember held a net while another kicked the substrate immediately upstream of the net to dislodge macroinvertebrates. Ten sections of the stream along a 100-meter section (about 50m upstream and downstream of the Last St. crossing) were kicked. After each kick, macroinvertebrates were picked off the net and placed into a bottle of 70% ethanol and later identified down to family.

Figure 2: Picking macros off the kick net in Sucker Brook

Once the macroinvertebrates were identified down to family, common biomonitoring metrics (percent EPT, percent Ephemeroptera, percent Plecoptera, percent Tricoptera, percent Chironomidae, and percent Diptera) were calculated for each sample. These metrics allow for easier comparisons between sites and between different sampling months and years at the same site. A summary of the water chemistry data and macroinvertebrate metrics are in the next section.

It is important to note that our research protocol was not identical to the Volunteer River Assessment Program protocol, and we may have used different equipment. Therefore, our data is useful for examining how these water quality parameters change over the months and years, but it should not be combined with VRAP data.

Water Quality Data

Water Quality Parameters				
Date Sampled	Chloride (mg/L)	Water Temp (C)	Dissolved Oxygen (mg/L)	pH
Class B Standard	**<230**	**NA**	**>5.0**	**6.5-8.0**
6/9/16	5.35	14.8	9.14	7.76
7/8/16	-	17.6	8.73	6.9
8/8/16	13.4	14.9	8.18	7.83
9/8/16	10.90	17.8	7.72	7.27
10/6/16	12.66	12.1	9.27	7.75
6/23/17	6.09	19.4	8.33	7.30
7/18/17	7.12	20.7	7.74	7.60
9/30/17	9.81	11.4	10.29	7.90

Figure 1: Water quality data collected at our Sucker Brook site on Last Street. Dashes indicate that the water sample was unable to be analyzed. Class B New Hampshire Surface Water Quality standards were not exceeded for any parameter on any sampling date.

Macroinvertebrate Metrics

Macroinvertebrate Family Richness					
Date	**Total FR**	**EPT FR**	**Ephemeroptera FR**	**Plecoptera FR**	**Tricoptera FR**
6/9/16	15	10	3	3	4
7/8/16	17	11	4	2	5
8/8/16	17	10	4	2	4
9/8/16	18	11	4	3	4
10/6/16	17	10	3	3	4
6/23/17	22	14	4	5	5
7/18/17	23	15	5	4	6
9/30/17	19	13	4	5	4

Figure 2: Macroinvertebrate family richness (FR) is used to assess the biodiversity of macroinvertebrate orders by counting the number of families collected on each sampling day. In our study, we looked at the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Tricoptera (caddisflies). EPT is the combined family richness of these three orders. Since these orders are intolerant to pollution, higher family richness is desired. We found an average of four mayfly families, three stonefly families, and five

caddisfly families at the Sucker Brook site, which is at or slightly under the family richness we found at our most pristine sites.

Macroinvertebrate Relative Abundance						
Date	**% EPT**	**% Ephemeroptera**	**% Plecoptera**	**% Tricoptera**	**% Diptera**	**% Chironomidae**
6/9/16	80.4	44.48	11.6	24.31	8.01	2.2
7/8/16	70.6	18.53	13.24	38.82	10	4.7
8/8/16	53.5	18.02	13.37	22.09	13.95	8.7
9/8/16	74.5	9.04	18.62	46.81	8.51	2.7
10/6/16	77	25.95	20.41	30.61	17.2	1.7
6/23/17	82.3	34.09	23.18	25	7.73	1.82
7/18/17	67	28.19	12.78	25.99	11.89	4.85
9/30/17	90.3	34.27	13.31	42.74	3.63	1.61

Figure 3: Macroinvertebrate relative abundance is the percent composition of each order or family of interest. Ephemeroptera, Plecoptera, and Tricoptera are orders intolerant to pollution, so a high relative abundance of these orders is desired. % EPT is the combined percentage of these three orders. Sucker Brook relative abundance values for Ephemeroptera, Plecoptera, and Tricoptera are about 10% lower than we see at our most pristine sites. Diptera is a tolerant order and Chironomidae is a particularly tolerant family in this order, so a low relative abundance of these are desired. Sucker Brook relative abundance values for Diptera and Chironomidae are consistent with our most pristine sites.

Conclusion

Although most of our project sites had low levels of chloride and thermal stress, Sucker Brook was certainly one of our higher quality streams. Macroinvertebrate composition showed high abundance and family diversity of orders intolerant to pollution, and low abundance of orders and families tolerant to pollution. This indicates that there aren't high levels of pollution in the stream. We never detected that pH, chloride, or dissolved oxygen levels were outside the Class B New Hampshire Surface Water Quality standards. At this time, I have no significant concerns about Sucker Brook based on the water quality parameters and macroinvertebrate biomonitoring metrics we monitored.

Photo Credits

1) Cover photo taken from the Sucker Brook VRAP website: https://www.des.nh.gov/organization/divisions/water/wmb/vrap/sucker/index.htm
2) Figure 2 was taken by Amy Villamagna, Plymouth State University.