Volunteer Biological Assessment Program
Stream Data Collection Report
The Ossipee Watershed
2017

Madison Elementary School, Lovell River, Ossipee, NH

Green Mountain Conservation Group
P.O. Box 95
196 Huntress Bridge Road
Effingham, NH 03882
(603) 539-1859
www.gmcg.org

Prepared by:
Dr. Karen Deighan, Education Coordinator, GMCG

GREEN MOUNTAIN
CONSERVATION GROUP

ACKNOWLEDGEMENTS

Volunteers of the Green Mountain Conservation Group (GMCG) collected the data presented in this report. GMCG would like to thank macroinvertebrate identification experts, teachers, parents, volunteers, and local businesses who helped make the Volunteer Biological Assessment Program possible in 2017. A special thank you to the following individuals, schools and businesses without whom this program would not be possible:

Maud Anderson
Stephanie Doyle
Norman Sizemore
Corey Lane
Judy Tumosa, NH Fish & Game
Indian Mound Golf Club, Ossipee
The Other Store, Tamworth
Miami Hair Salon & Beauty Boutique, Tamworth
Ossipee Golf Course, Ossipee, NH
The Community School, Tamworth, NH

Participating School Groups:
Effingham Elementary School
Ossipee Central School
Sandwich Central School
Madison Elementary School
KA Brett School

TABLE OF CONTENTS

ACKNOWLEDGEMENTS..... i

Introduction..... 4

Methods..... 4

Sampling Sites……. 5

Data Collection…… 5

Macro invertebrate sorting and identification……. 6

Biotic Index Computation…… 7

Supplementary Data……. 7

Results…….. 8

Water Quality……... 9

Summary…….. 9

Appendix A: Total number of macros at each site and map…… 11

Appendix B: Data Sheets…….16

Introduction

Since 1997, the New Hampshire Department of Environmental Services (DES) has conducted stream surveys to determine the health of aquatic ecosystems. As part of these efforts, DES has developed a preliminary screening protocol for 1st through 4th order streams that is appropriate for volunteers to evaluate the biological condition of aquatic macro invertebrate communities. The goals of the protocol are as follows:

- To educate the public about water quality issues as interpreted through biological assessments;
- To build a constituency of individuals who will practice sound water quality management at the local level; and
- To build public support for water quality protection.

For over ten years, Green Mountain Conservation Group has collaborated with DES with the Volunteer Biological Assessment Program (VBAP). GMCG offers the VBAP program to schools in the Ossipee Watershed. This program allows students to complete biological sampling of macro invertebrates in streams within the Ossipee Watershed.

During the fall of 2017, GMCG worked with students and teachers from five local schools across the watershed. They sampled five sites, collecting and analyzing macro invertebrates. Their results can be found in this report.

Methods

Prior to any sampling, a training session was held during a scheduled classroom period and consisted of the following components: macro invertebrate identification skills, macro invertebrate sampling techniques, biotic index computation, and exploring maps of the watershed. Additionally, student volunteers were trained to collect and record supplementary data consisting of both basic physical and chemical parameters of the streams.

Sampling Sites

Most sites were accessible, wadeable, approximately 200 feet in length, and contained appropriate sampling habitat (at least one riffle, one pool, and one run with mixed cobble substrate). Not all sites were equally accessible by students due to varying stream levels; students were included in sampling and taking measurements as much as possible.
Due to high water levels at the South River, only two samples were accessible. Sampling was scheduled throughout September and October and required three to four hours per site.

Data Collection

The data collection at each site and along the stream followed the same protocol. The protocol was as follows:

- A 500-micron mesh kicknet was placed perpendicular to stream flow and held firmly against the streambed with the opening of the net facing upstream to promote macro invertebrate collection.
- A collector would disturb the sample area (1/5 m^2) upstream of the net for a total of 60 seconds (30 second hand-scrub followed by a 30 second kick).
- The kicknet was carefully lifted out of the water and the contents of the net were emptied into a shallow container with a small amount of water. All organisms remaining on the net were carefully removed and added to the sample.
- The same process was repeated four additional times with each sample collected further upstream (spanning 200 feet). Collectively, active sampling time approximated five minutes within one square meter area at each sampling station.

The higher than normal water levels at the South River made it unsafe for students to collect samples along a 200-foot stretch of the stream. They took 5 samples along a 100-foot stretch of the South River.

Macroinvertebrate Sorting and Identification

For approximately 60 minutes, student volunteers removed macroinvertebrates from the selected portion of the sample with spoons or pipettes and placed them into separate containers according to common attributes. Student groups rotated among the sample portions to examine more completely each sample portion. After sorting, specimens were identified to various coarse taxonomic groups. The number of macroinvertebrates within each taxonomic group was identified, calculated, and recorded, see Table 1. Students were assisted by GMCG staff and/or trained volunteers with the process of identifying the macroinvertebrates in the sample.

Table 1. Total Macros Found Across the Watershed

Order	Common Name	Number of Macro Invertebrate Collected
Ephemerotera	Mayfly nymph	96
Plecoptera	Stonefly nymph	77
Trichoptera	Caddisfly larvae	128
Odonata	Dragonfly larvae	17
	Damselfly nymph	2
Diptera	Black fly larvae	1
	Midge larvae	2
	True flies	3
Megaloptera	Alderfly	5
	Hellgrammite	1
Coleoptera	Riffle Beetle	0
	Water Penny	13
Other	Crayfish	0
	Aquatic Worms	10
	Scuds	0
	Sowbug	0

Biotic Index Computation

Biotic scores are based on pollution tolerance values ranging from 0 to 8 and are assigned to individual taxonomic groups. More tolerant groups have higher tolerance values and less tolerant groups have lower values. A standardized computational worksheet was used to compute the biotic scores for each sample site (stream/river). Taxonomic-specific biotic scores for individual samples were computed by multiplying the number of individual organisms by their respective tolerance value; summing the taxonomic-specific biotic scores; and then dividing the sum by the total number of individuals identified in the respective sample. Final biotic scores correspond to three interim narrative categories:

- Excellent (0 to 3.5)
- Good (3.5 to 4.8)
- Fairly Poor (greater than 4.8).

Table 2 highlights the biotic score and the narrative category for each sampling site tested in the Ossipee Watershed. Four of the five scores fell in the excellent category and one fell in the good category, see Table 2.

Table 2. Biotic Scores of Sampling Sites

Sampling Site	**Biotic Score**	**Narrative Category**
South River, Parsonsfield, ME	3.07*	Excellent
Cold River, Sandwich, NH	3.07	Excellent
Swift River, Tamworth, NH	3.7	Good
Lovell River, Ossipee, NH	3.2	Excellent
Bearcamp River, Tamworth, NH	3.13	Excellent

*Due to high water levels, protocol could not be followed when collecting samples.

Supplementary Data

The water chemistry and physical parameters of the stream were recorded. Physical parameters recorded included width/depth of the stream, canopy cover, and observations of

nearby erosion or human influence. A multi-parameter submersible water quality probe was used to collect basic water chemistry data. This data included dissolved oxygen, conductivity, and water temperature, see Table 3. Turbidity samples and pH samples were also taken at each site.

Table 3. Average Chemical Parameters of Sampling Sites

Chemical Parameters	Average Measurement	Normal Range/Optimal Value
pH	6.69	6.5 to 7.4
Dissolved Oxygen	96.34%	100%
Conductivity	28.98	Low: 0 to 200
Turbidity	2.46	Under 5
Temperature	18.12	5 to 25 Celsius

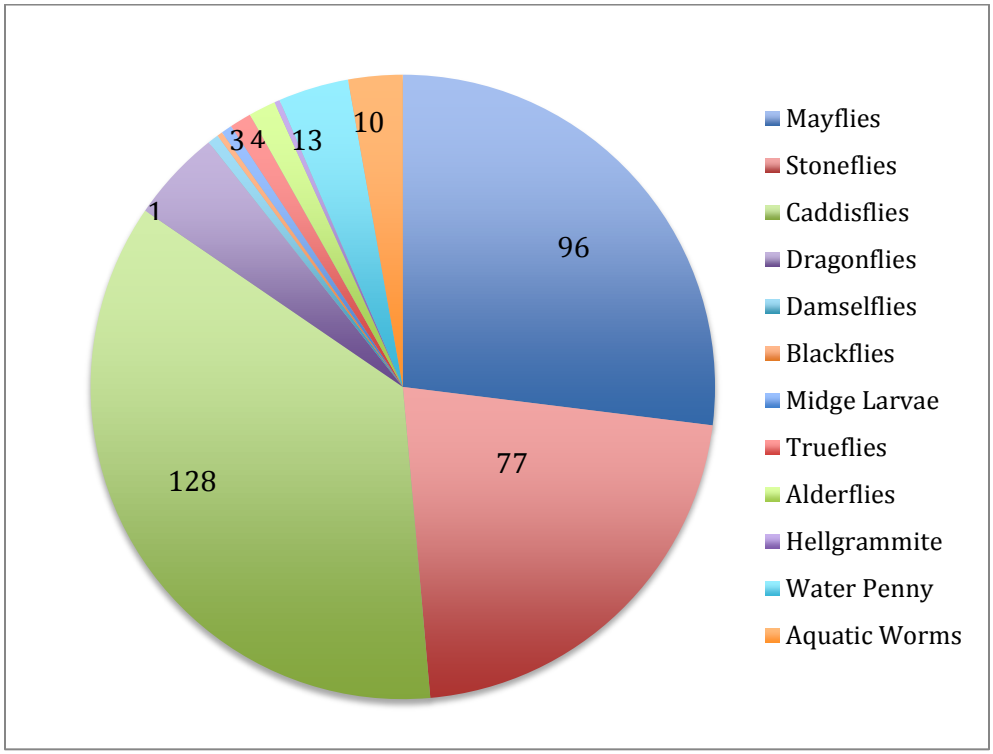
Water Quality Results

Basic water quality measures were collected at each of the sampling locations. The measures included chemical parameters, physical parameters, and calculating a biotic score for each of the sampling sites. All measures were within the range of expectation for streams in this area of New Hampshire. For more detailed water quality data on the water bodies in the Ossipee watershed, refer to the annual reports published by GMCG available online at gmcg.org.

Macroinvertebrate samples from each site were evaluated using the VBAP biotic score index utilizing taxa-specific tolerance values. A cumulative biotic score for all sites and

individual site-specific biotic scores were computed. The cumulative biotic score for all sites was 3.25 and corresponds to the "excellent" narrative category. See Table 2 for biotic scores for the individual streams. Overall, caddisfly nymphs were the most dominant taxon (36%), followed by mayfly nymph (27%) and stonefly nymphs (22%). Together, these three taxa comprised 85% of all individuals. In completing the sampling effort, volunteers collected and identified 353 macroinvertebrate.

Figure 1. Cumulative VBAP Data 2017



Summary and Future Recommendations

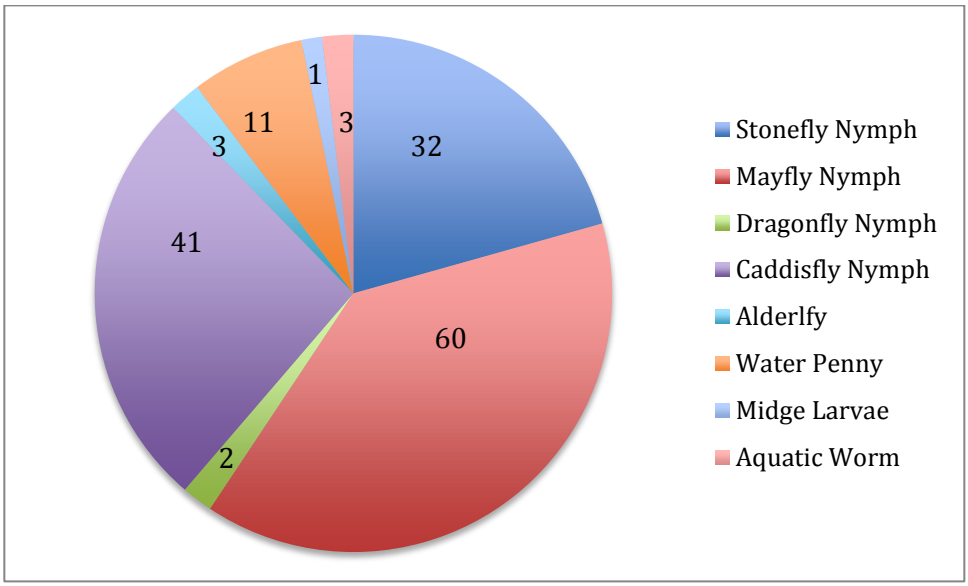
The documentation by volunteers of the invertebrate communities using the VBAP protocol during fall 2017 in the Ossipee watershed marked the eleventh year of 'screening' efforts to evaluate the status of aquatic communities. The sampling efforts included five sites in

the Ossipee Watershed. Macroinvertebrates are widely used as indicators of water quality that can show the effects of multiple pollutants over time. It is important to recognize that the results obtained from the VBAP protocol are not intended to represent formal water quality assessments, but rather, a basic indicator of aquatic community condition.

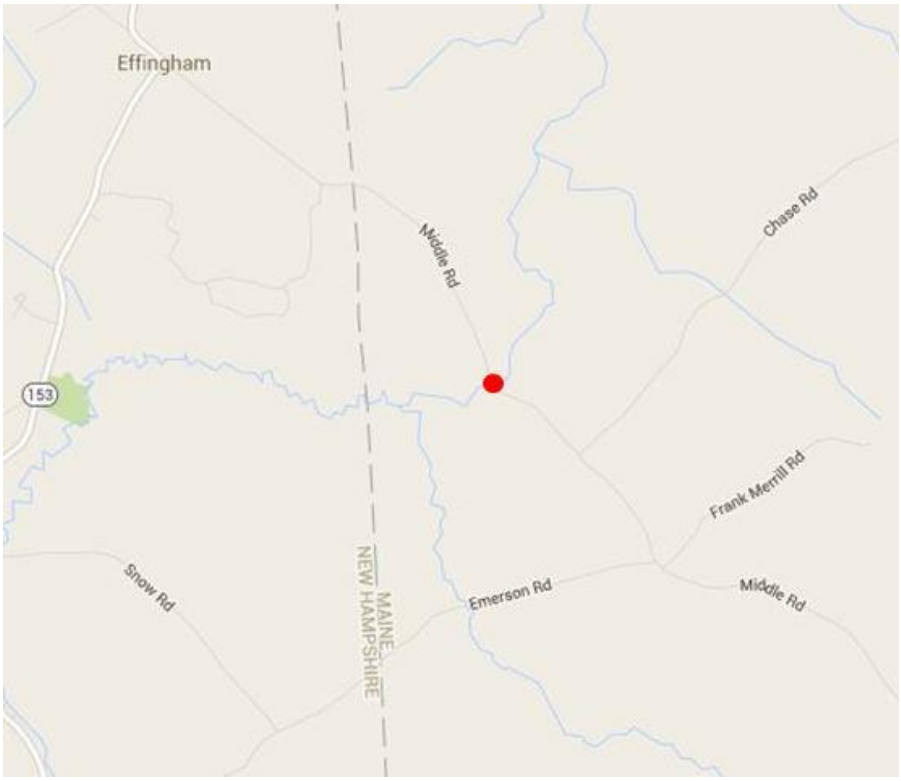
Ultimately, the results from the Volunteer Biological Assessment Program for 2017 build upon the efforts conducted by GMCG and NH DES. The results of the program serve as a basis for further monitoring and management practices to be put into use throughout the watershed. The Ossipee Watershed has a reputation for having great water quality overall and the VBAP results validate this statement. It is recommended that Green Mountain Conservation Group continue to work with schools in the Ossipee Watershed and continue to monitor the water quality of the local streams and rivers.

Appendix A

Total Number of Macroinvertebrates

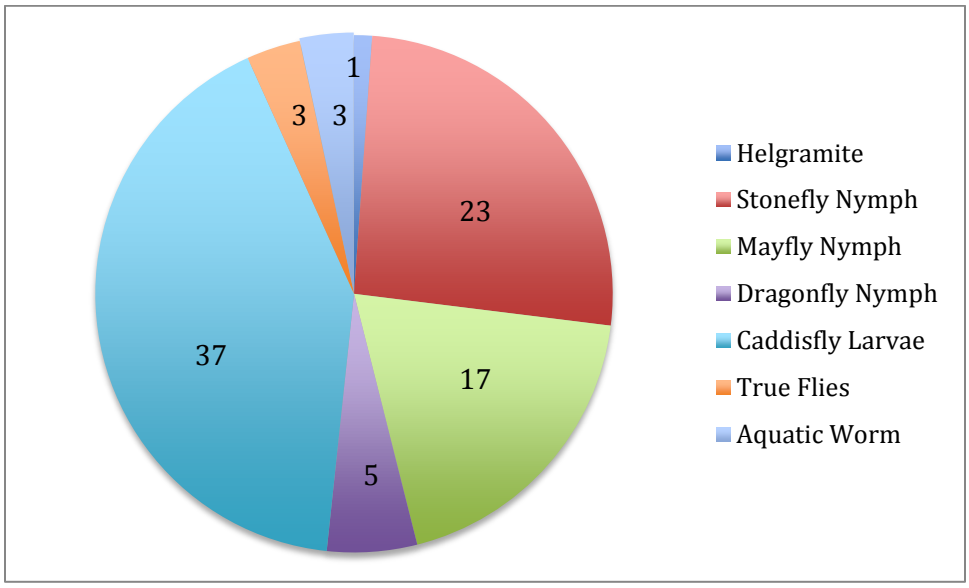


South River, Parsonsfield, ME

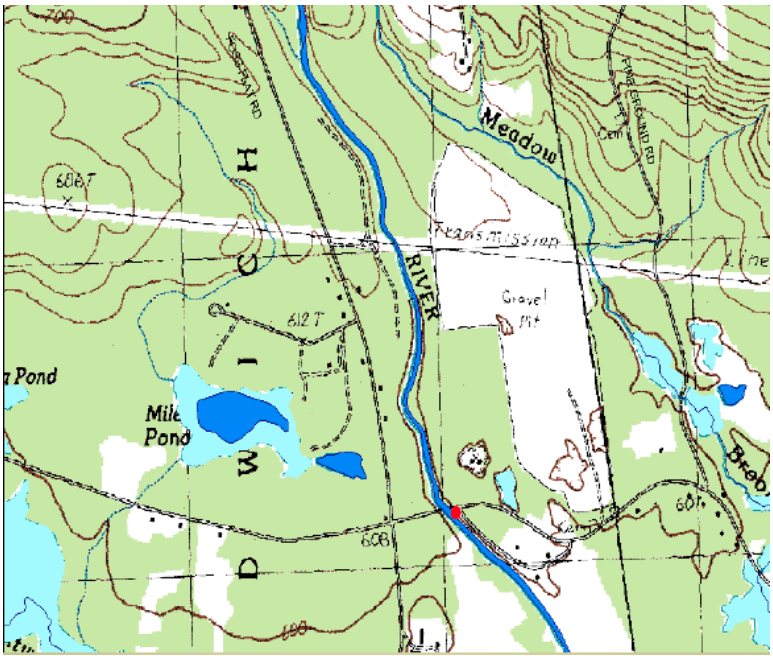


South River, Parsonsfield, ME. Sampled by Effingham Elementary School

Total Number of Macroinvertebrates

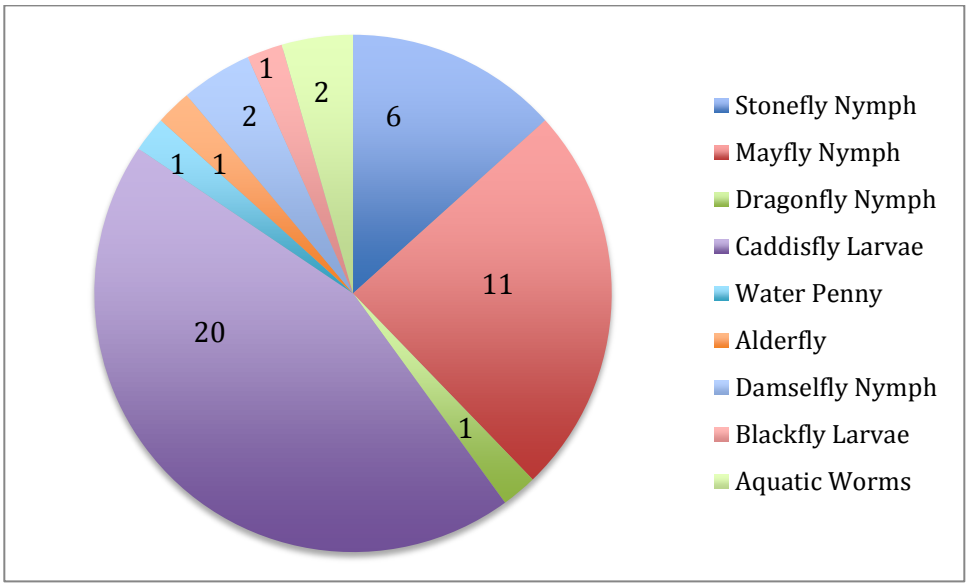


Cold River, Sandwich NH

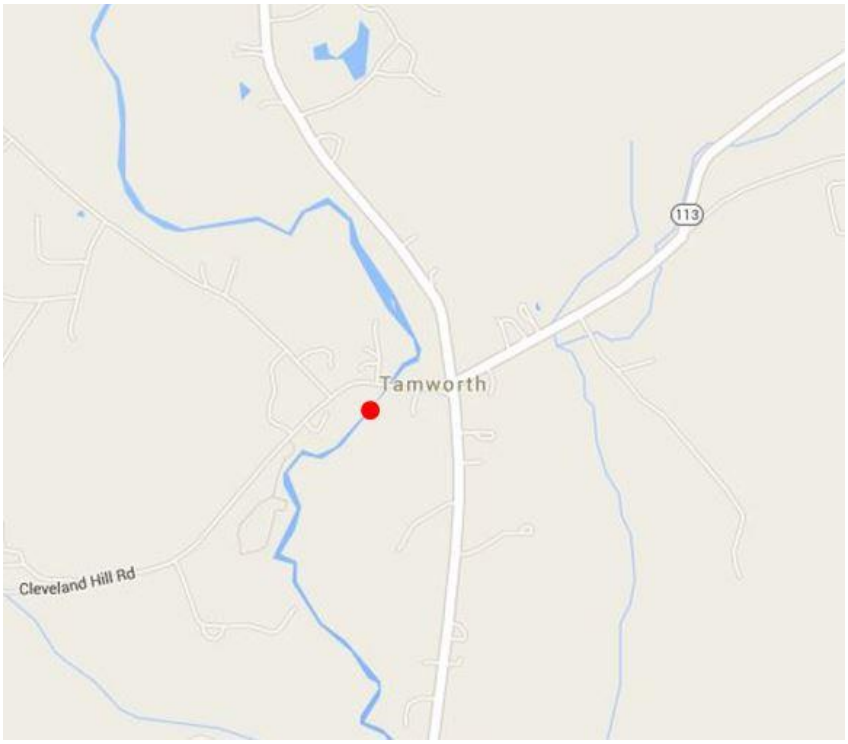


Cold River, Sandwich, NH. Sampled by Sandwich Central School

Total Number of Macroinvertebrates

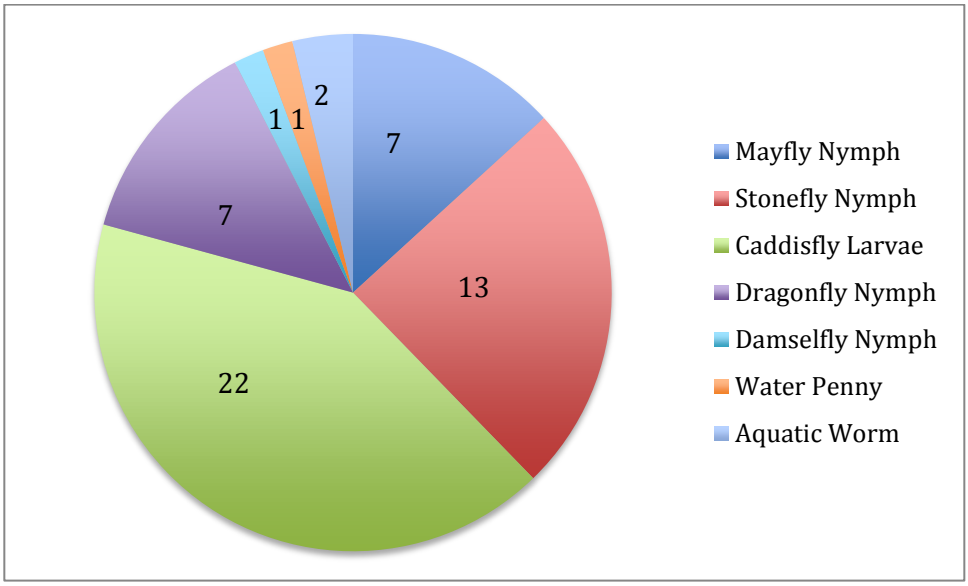


Swift River, Tamworth, NH

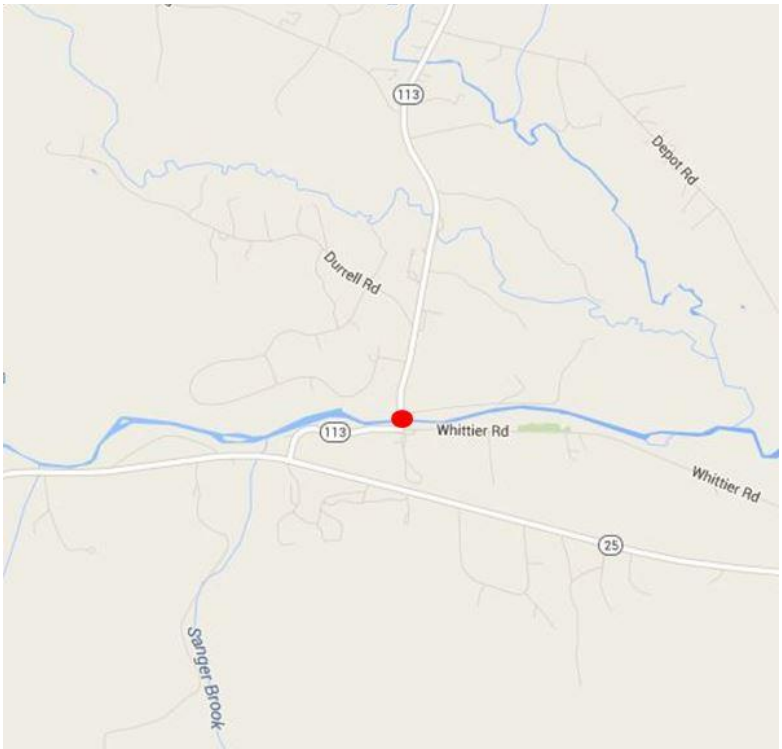


Swift River (downstream), Tamworth, NH. Sampled by Ossipee Central School

Total Number of Macroinvertebrates

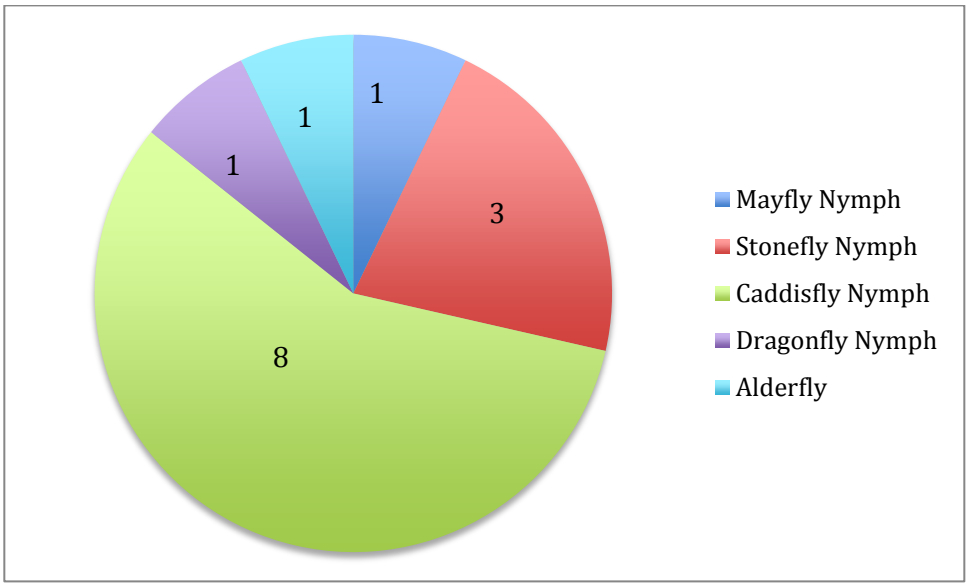


Bearcamp River, Tamworth, NH

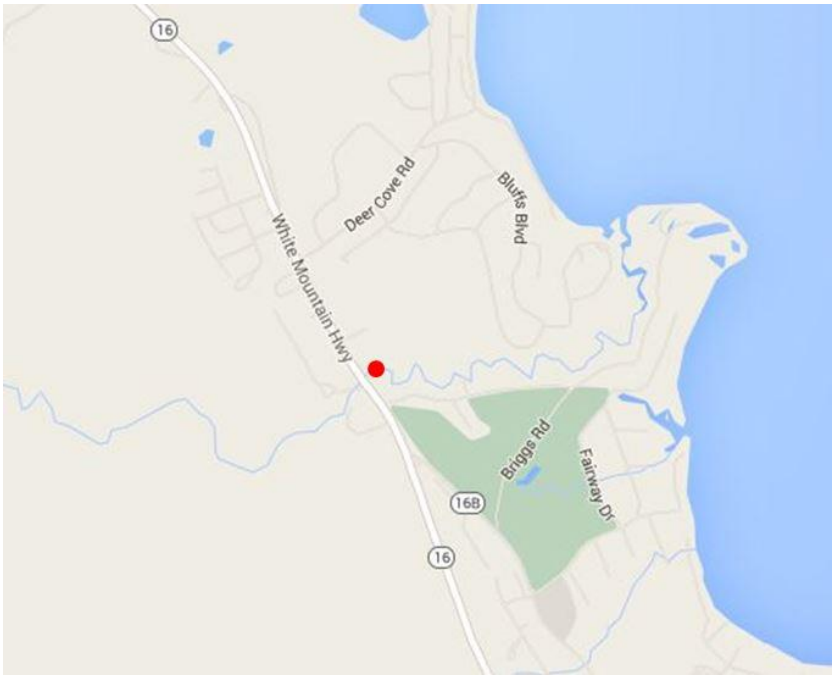


Bearcamp River, Tamworth, NH. Sampled by KA Brett School

Total Number of Macroinvertebrates



Lovell River, Ossipee, NH



Lovell River, Ossipee, NH. Sampled by Madison Elementary School

Appendix B

Site 2. South River, Parsonsfield, ME. Tested by Effingham Elementary School.

Order	Common Name	Value	*	Found	=	Score	Score	Category
Ephemeroptera	Mayfly Nymph	3	*	60	=	180		
Plecoptera	Stonefly Nymph	1	*	32	=	32		
Trichoptera	Caddisfly Larvae	4	*	41	=	164		
Odonata	Dragonfly Nymph	3	*	3	=	9		
	Damselfly Nymph	7	*		=	0		
Diptera	Black fly larvae	7	*		=	0		
	Midge larvae	6	*	2	=	12		
	Most True flies	4	*		=	0		
Megaloptera	Alderfly	4	*	3	=	12		
	Hellgrammite	0	*		=	0		
Coleoptera	Riffle beetle	4	*		=	0		
	Water Penny	4	*	11	=	44		
	Beetle & Beetle-like	7	*		=	0		
Others	Crayfish	6	*		=	0		
	Snails	7	*		=	0		
	Aquatic Worms	8	*	3	=	24		
	Scuds	8	*		=	0		
	Sowbugs	7	*		=	0		
	Clams and Mussels	7	*		=	0		
Totals				**155**		**477**	**3.07**	**Excellent**

Site 3. Cold River, Sandwich, NH. Tested by Sandwich Central School.

Order	Common Name	Value	*	Found	=	Score	Score	Category
Ephemeroptera	Mayfly Nymph	3	*	17	=	51		
Plecoptera	Stonefly Nymph	1	*	23	=	23		
Trichoptera	Caddisfly Larvae	4	*	37	=	148		
Odonata	Dragonfly Nymph	3	*	5	=	15		
	Damselfly Nymph	7	*	0	=	0		
Diptera	Black fly larvae	7	*	0	=	0		
	Midge larvae	6	*	0	=	0		
	Most True flies	4	*	3	=	12		
Megaloptera	Alderfly	4	*	0	=	0		
	Hellgrammite	0	*	1	=	0		
Coleoptera	Riffle beetle	4	*	0	=	0		
	Water Penny	4	*	0	=	0		
	Beetle & Beetle-like	7	*	0	=	0		
Others	Crayfish	6	*	0	=	0		
	Snails	7	*	0	=	0		
	Aquatic Worms	8	*	3	=	24		
	Scuds	8	*	0	=	0		
	Sowbugs	7	*	0	=	0		
	Clams and Mussels	7	*	0	=	0		
Totals				**89**		**273**	**3.07**	**Excellent**

Site 5. Swift River (downstream), Tamworth, NH. Tested by Ossipee Central School.

Order	Common Name	Value	*	Found	=	Score	Score	Category
Ephemeroptera	Mayfly Nymph	3	*	11	=	33		
Plecoptera	Stonefly Nymph	1	*	6	=	6		
Trichoptera	Caddisfly Larvae	4	*	20	=	80		
Odonata	Dragonfly Nymph	3	*	1	=	3		
	Damselfly Nymph	7	*	2	=	14		
Diptera	Black fly larvae	7	*	1	=	7		
	Midge larvae	6	*	0	=	0		
	Most True flies	4	*	0	=	0		
Megaloptera	Alderfly	4	*	0	=	0		
	Hellgrammite	0	*	0	=	0		
Coleoptera	Riffle beetle	4	*	0	=	0		
	Water Penny	4	*	1	=	4		
	Beetle & Beetle-like	7	*	0	=	0		
Others	Crayfish	6	*	0	=	0		
	Snails	7	*	0	=	0		
	Aquatic Worms	8	*	2	=	16		
	Scuds	8	*	0	=	0		
	Sowbugs	7	*	0	=	0		
	Clams and Mussels	7	*	0	=	0		
Totals				**44**		**163**	**3.7**	**Good**

Site 7. Lovell River, Ossipee, NH. Tested by Madison Elementary School

Order	Common Name	Value	*	Found	=	Score	Score	Category
Ephemeroptera	Mayfly Nymph	3	*	1	=	3		
Plecoptera	Stonefly Nymph	1	*	3	=	3		
Trichoptera	Caddisfly Larvae	4	*	8	=	32		
Odonata	Dragonfly Nymph	3	*	1	=	3		
	Damselfly Nymph	7	*	0	=	0		
Diptera	Black fly larvae	7	*	0	=	0		
	Midge larvae	6	*	0	=	0		
	Most True flies	4	*	0	=	0		
Megaloptera	Alderfly	4	*	1	=	4		
	Hellgrammite	0	*	0	=	0		
Coleoptera	Riffle beetle	4	*	0	=	0		
	Water Penny	4	*	0	=	0		
	Beetle & Beetle-like	7	*	0	=	0		
Others	Crayfish	6	*	0 0	=	0		
	Snails	7	*	0	=	0		
	Aquatic Worms	8	*	0	=	0		
	Scuds	8	*	0	=	0		
	Sowbugs	7	*	0	=	0		
	Clams and Mussels	7	*	0	=	0		
Totals				**14**		**45**	**3.2**	**Excellent**

Site 9. Bearcamp River, Tamworth, NH. Tested by KA Brett School.

Order	Common Name	Value	*	Found	=	Score	Score	Category
Ephemeroptera	Mayfly Nymph	3	*	7	=	21		
Plecoptera	Stonefly Nymph	1	*	13	=	13		
Trichoptera	Caddisfly Larvae	4	*	22	=	88		
Odonata	Dragonfly Nymph	3	*	7	=	21		
	Damselfly Nymph	7	*	0	=	0		
Diptera	Black fly larvae	7	*	0	=	0		
	Midge larvae	6	*	0	=	0		
	Most True flies	4	*	0	=	0		
Megaloptera	Alderfly	4	*	0	=	0		
	Hellgrammite	0	*	0	=	0		
Coleoptera	Riffle beetle	4	*	0	=	0		
	Water Penny	4	*	1	=	4		
	Beetle & Beetle-like	7	*	0	=	0		
Others	Crayfish	6	*	0	=	0		
	Snails	7	*	0	=	0		
	Aquatic Worms	8	*	2	=	16		
	Scuds	8	*	0	=	0		
	Sowbugs	7	*	0	=	0		
	Clams and Mussels	7	*	0	=	0		
Totals				**52**		**163**	**3.13**	**Excellent**