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MRWC Stream BMI Monitoring Program

2014 Volunteer Report

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Executive Summary

Tributary streams are critical to the health of rivers and their watersheds. In 2014, MRWC conducted a pilot volunteer Benthic MacroInvertebrate (BMI) sampling program to provide water quality assessments of three tributary streams of the Millers River. Three different streams were evaluated by volunteers with professional assistance. The first year was a success, we hope to use the program more broadly within the watershed.

This effort is part of the development of the larger MRWC monitoring program: TribWatch which has the goal of collecting stream data from all named streams in the watershed. Having stream data from as many streams as possible will enable MRWC to better assess the overall watershed condition. TribWatch started with temperature sampling in 2013 and in 2014 began to phase in macroinvertebrate sampling and flow monitoring. Physiochemical sampling is a future step. Stream continuity surveys will be a restoration component of this new program.

Aquatic macroinvertebrates, aquatic insects and other aquatic invertebrates, are a very useful water quality monitoring tool. Different types of organisms have unique tolerances to water conditions and can indicate a stream's health. Collection and identification of macroinvertebrates provides valuable water quality information. MRWC's chosen sampling protocol is an efficient, volunteer friendly screening approach. Results from sampling provide a baseline. Good results document a healthy standard to maintain whereas poor results would trigger a request to MassDEP to perform a more detailed survey.

In the fall of 2014, MRWC collected macroinvertebrate samples from three streams of different stream order. Sample collection was done using a proven kick-net technique and were sorted using a modified volunteer method developed by CT DEEP. Vouchers of the collected samples were then professionally identified for use in analyzing stream condition. The protocol was a success for both how the collection process proceeded as well as the analysis review of the stream samples. The three streams monitored were found to have very good to exceptional BMI scores.

2014 marked the first year of what is hoped will continue to be a regular and ongoing effort. With the help of returning and new volunteers, the number of sites could be increased in 2015.

Our thanks to the following volunteers: Rinky Black, Guy Corbosiero, Bonnie Benjamin, Kevin Kelly, Gary Glover, Martine Wong, and MRWC's Ivan Ussach. Special thanks to Cathy Szal for her professional help and input.

*MRWC conducted a detailed series of grant funded professional BMI surveys in 2005-09. Data from this report has been used by MassDEP for assessment purposes. A full report of this effort can be viewed on the MRWC web site under resources.

Introduction/Purpose

One of MRWC's major roles of watershed stewardship is monitoring the condition of rivers and streams in the basin. This role is best served when the effort includes engaging local people as it promotes watershed awareness. Long term monitoring provides key trending information which is most useful in stewardship planning. MRWC's TribWatch program hopes to provide such information while engaging citizen scientists.

Benthic Macro Invertebrate (BMI) sampling is widely used in stream ecological assessments. Aquatic insects and other invertebrates are useful because they are in the stream for the aquatic portion of their life cycle, often a year or more. Significant disruptive forces that occur in the stream impact the macroinvertebrate community. Water chemistry measures the water quality at a moment in time, while the macroinvertebrates reflect the water quality conditions over the last year or more. These organisms have shown identifiable responses to ecological stressors such as pollution and sedimentation. Aquatic macroinvertebrates are simple to collect and with experience can be accurately identified. Collecting and identifying these organisms over a given stream reach using an approved protocol can then be used to gage the diversity and population density of a stream. This data can then be compared to other streams or streams determined to be a reference (non-impacted).

The collection process is straight forward and with proper training can be performed by volunteers. This is a rewarding activity for volunteers and engages watershed residents. MRWC has selected a proven volunteer protocol developed by CT DEEP. Once a voucher sample is assembled, it is then submitted to a professional aquatic biologist for detailed identification. The results help MRWC to determine the stream's relative health.

BMI sampling can be performed readily wherever the stream is accessible. This enables MRWC to visit streams across the watershed to create a baseline record of a stream's condition. Longer streams can be sampled at multiple sites, particularly if the land use c varies along its length. Streams can be revisited periodically to monitor any changes, particularly if any land use changes occur.

Approach

MRWC reviewed a MassDEP list of all streams in the watershed and the available data for each to determine possible BMI monitoring sites. MRWC also conducted a more formal BMI survey over the 2005-09 time period. The size/area, length, flow, and access to a stream were considered. To begin this program, MRWC chose streams with no previous BMI data. Ultimately, MRWC will visit both new and some previously studied sites each season. Depending on the number of volunteer teams that can be assembled, the goal will be to visit 3-6 sites each season.

MRWC chose to use a volunteer friendly sampling protocol. A typical EPA RPB III protocol is too involved and complicated for volunteers. CT DEEP developed a volunteer protocol to screen stream conditions in Connecticut (presented at NEAEB). CT DEEP shared the program details with MRWC, which were readily modified to suit local conditions. MRWC prepared volunteer guides, assembled sampling kits, recruited volunteers, and held a training session. A volunteer professional biologist offered to perform macroinvertebrate identification of the voucher specimens.

The chosen approach is targeted to mid/high gradient streams where riffle habitat exists. This offers more reliable and consistent sampling results by volunteers. Low gradient streams are more challenging to sample and the protocol is applicable only in riffle habitats. The Millers River has many mid/high gradient streams so that this approach offers many opportunities for sampling.

The basic process is to place an aquatic kick net(rectangular frame with 590 u mesh) within the stream riffle, and then move the substrate above the net to free the macroinvertebrates living within and on the substrate. The current washes the macroinvertebrates into the net. The sample is placed in a sorting bin. The macroinvertebrates are then sorted by type into small trays, counted, and one is saved for the voucher. The voucher collection is sent for ID. MRWC scheduled three field sampling events in the fall. Fall is a good time to conduct such surveys due to the life cycle of aquatic macroinvertebrates.

Procedures/QC/Equipment

MRWC prepared a volunteer BMI sampling manual containing program information and outlining procedures for stream sampling. Data/field sheets were created for volunteers to record all observations and insects.

MRWC created a sampling kit which contained a variety of items needed for collection and sorting of the aquatic insects. Items ranged from a rectangular kick net (590 mesh size), collection basins, sorting basins, sorting tools, insect field guides, sample bottles, and sample preservative.

All volunteers received training on the use and care of the equipment. Volunteers were also acquainted to the macroinvertebrates they might find during a field day. Training covered the sorting process and recording needs.

MRWC staff conducted field site visits beforehand to determine access and the reach to be sampled. Teams then visited one site per field day, though two could be possible.

The basic sampling procedure was as follows:

1. Teams mobilized at the site, set up sorting area, reviewed kick sites.
2. Six kicks are performed at riffles over a 100+ foot length of stream.
3. Sites 1&2, 3&4, 5&6 are combined, each set dumped into a unique basin.
4. Volunteers sort through each basin, place like specimens into ice cube trays.
5. Each cube is counted and one of each type is placed into the voucher vial
6. The count is recorded onto the sites field data sheet.
7. Voucher is carefully labeled and sent to biologist for ID.

A site takes about 3-4 hours to sample.

Safety was always a high priority. If stream flows were too high, sampling would be postponed. Sampling can not be done too soon after a high flow event both due to safety concerns and scour of the macroinvertebrate community.

Sampling in 2014 was done in October, though it could have been done anytime from mid-summer onward.

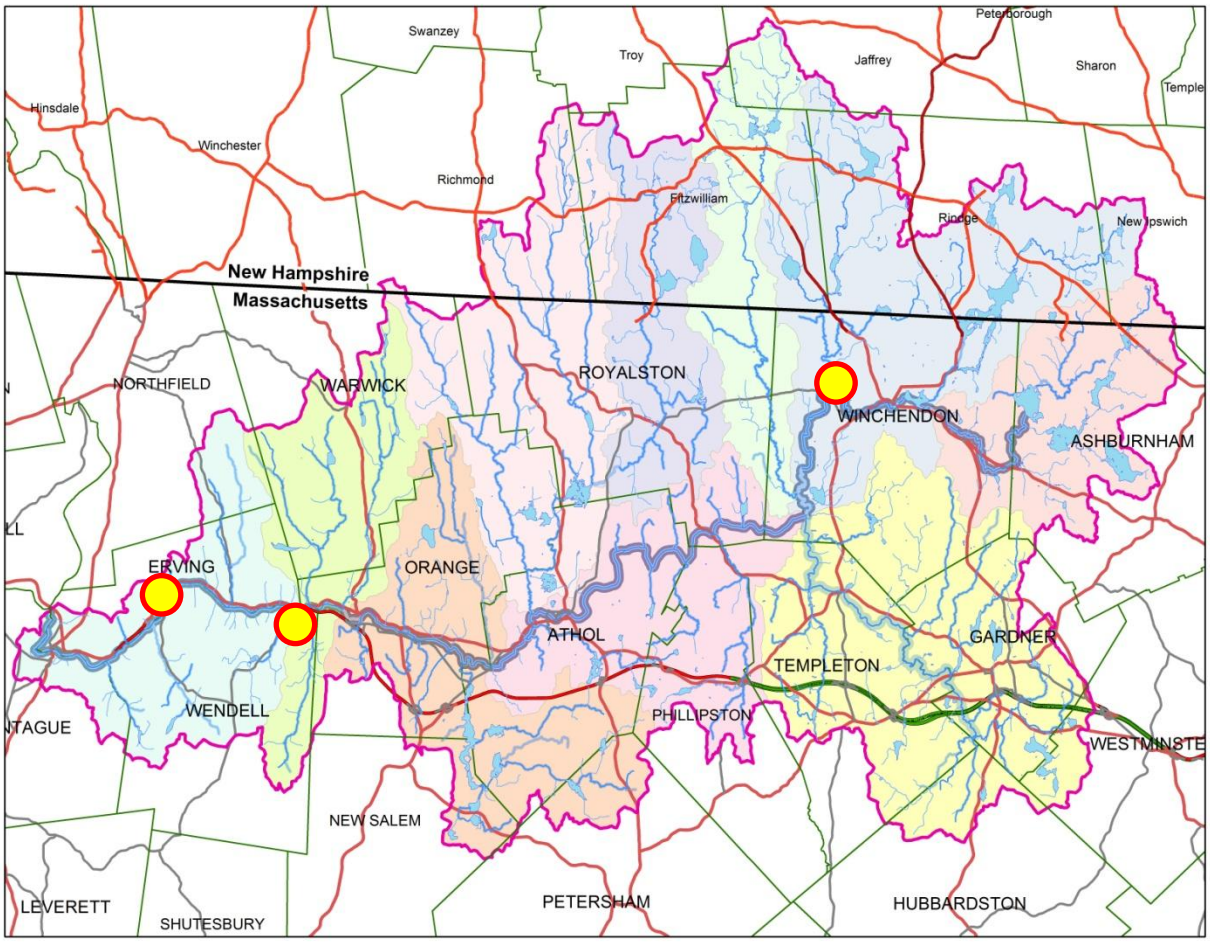
2014 Sampling Sites

Listed below are the streams and sites sampled, followed by a map of their location within the watershed.

Table 1: 2014 BMI Streams

Stream	town	location	Lat	Lon	order
Briggs Bk	Erving/Farley	Above Rt 2	42.600943	-72.437099	1st
Osgood Bk	Wendell	Above Millers confluence	42.595115	-72.365280	2nd
Tarbell Bk	Winchendon	Royalston Rd	42.698178	-72.086454	3rd

Map 1: 2014 BMI Sampling Sites



Results and Interpretation

Using the noted BMI technique, the three streams monitored were found to have very good to exceptional water quality.

Briggs Brook is a small tributary, which flows south off the slope of Northfield Mountain near Farley Village in Erving into the Millers River. It is a first order stream with a watershed area of 0.39 square miles, 11.1% slope, a total streams length 0.69 miles, is 79.67% forested with 4.37% urban land cover and 0.44% impervious area (USGS). The banks were stable and well canopied. The substrate was cobble dominated. The brook was one to three feet wide with a one inch riffle. Under these sampling conditions, a somewhat limited macroinvertebrate community might be expected. The BMI finding suggests excellent water quality.

Osgood Brook is a second order stream. It flows from Wendell Center northerly to the Millers River at Wendell Depot. It has a 3.77 square mile watershed, 4.77% slope, total streams length of 7.4 miles, is 81.6% forested with 6.35% urban land cover and 0.35% impervious cover (USGS). The banks were stable and well vegetated. The cobble dominated substrate was partially moss covered with periphytic diatoms covering much of the submerged substrate. The substrate was not silty. The BMI indicates exceptional water quality in Osgood Brook.

Tarbell Brook is a third order stream. It flows out of Pearly Pond in W Rindge, NH, south to the Millers River in Winchendon, MA. It has a 24.5 square mile watershed, 2.37% slope, a total streams length 47 miles, is 73.44% forested with 4.66 urban land cover and 0.78% impervious area (USGS), The banks were in good condition overall, but there were areas of significant bank loss. The stream was partially canopied in the reach sampled. Heavy bluegreen algae periphytic growthwas found in areas. The stream was more productive than the other two sampled. The large hydrophychid caddisfly component of the macrobenthic community is indicative of the increased productivity. Using the BMI, Tarbell Brook was found to have very good water quality.

BMI Sampling Results Summary:

	Briggs	Osgood	Tarbell
	1st Order	2nd order	3rd order
EPT#	11	14	11
Richness	19	24	19
Score	4	6	3
Rating	EXCELLENT	EXCEPTIONAL	VERY GOOD
Note:	trout fry found		

Rating note: 1-2 is good, 3-V good, 4-5 is excellent and 5 or more is exceptional. Score is the number of high water quality preferring species.

E

P

T

EPT = Ephemeroptera, Plecoptera, and Trichoptera (mayflies, stoneflies, caddisflies) are the water quality sensitive component of the macroinvertebrate community. Higher counts are indicative of higher water quality conditions, except in very small streams.

Richness is the number of different types of macroinvertebrates found. The higher richness values indicate a healthier stream, unless the stream is very small.

Evaluation and Future Efforts

This BMI pilot program was a success. The results of this first pilot effort indicate a very workable program for MRWC to continue to use to generate useful water quality data. The field day feedback made it clear that the volunteers enjoyed the field work.

MRWC can refine this program by optimizing the field datasheets to the ecoregion of the Millers River. MRWC had used the CT DEEP sheets which use data from the Connecticut ecoregion.

2014 sampling occurred in October, MRWC could consider starting sampling sooner in the season, perhaps late August through early October.

Appendices

Spread sheets: voucher & counts

#1 Voucher Results - ID + BI

(lower BI # means more water quality sensitive organism)

		Osgood Brook	Briggs Brook	Tarbell Brook	New BI
Scientific Name	**Common Name**	Oct. 4, 2014	Oct. 9, 2014	Oct. 11, 2014	
Ephemeroptera	**Mayflies**				
Paraleptophlebia		x	x		1
Baetis		x (2 species)	x	x	6
Stenonema		x	x	x	3
Eurylophella		x			2
Plecoptera	**Stoneflies**				
Chloroperlidae		x			0
Acroneura		x	x	x	0
Paragnetina				x	1
Peltoperlidae		x	x		0
Isoperla				x	2
Malirekus			x		2
Taeniopterygidae				x	3
Trichoptera	**Caddisflies**				
Chimarra				x	4
Dolophiloides		x	x		0
Glossosoma		x			0
Diplectrona		x	x	x	0
Ceratopsyche		x		x	5
Macrosternum				x	5
Brachycentrus		x		x	1
Rhycophila		x	x (3 species)		1
Megaloptera	**Fishflies & Dobsonflies**				
Corydalus	Dobsonfly			x	4
Nigronia	Fishfly	x	x	x	4
Sialis	Fishfly	x	x	x	6
Coleoptera	**Beetles**				
Elmidae	Riffle beetles	x		x	
Psephenidae	Water pennies			x	
Odonata	**Dragonflies**				
Corydulegaster			x		3
Gomphidae		x			
Aeshnidae		x	x	x	
Diptera	**Flies**				
Tipulidae	Crane flies				
Dicranota		x		x	3
Hexatoma			x		2
Tipula		x			6
Dixidae			x		1
Simuliidae	Blackflies	x	x	x	
Chironomidae	Midges	x			
Oligochaeta	**Worms**	x			
Gastropoda	**Snails**		x		
	EPT	14	11	11	
	Richness	24	19	19	

#2 BMI Quantity Summary

MRWC Rapid Bioassessment 2014-Quantity Summary

Scientific Name	Common Name	Osgood Brook Oct. 4, 2014	Briggs Brook Oct. 9, 2014	Tarbell Brook Oct. 11, 2014
Ephemeroptera	**Mayflies**			
Paraleptophlebia		Few	Few	
Baetis		Few	Few	Many
Stenonema		Some	Some	Few
Eurylophella		Some		
Plecoptera	**Stoneflies**			
Chloroperlidae		Few		
Acroneura		Many	Few	Many
Paragnetina				Many
Peltoperlidae		Some	Few	
Isoperla				Many
Malirekus			Few	
Taeniopterygidae				Few
Trichoptera	**Caddisflies**			
Chimarra				Many
Dolophiloides		Many	Some	
Glossosoma		Few		
Diplectrona		Few	Few	Few
Ceratopsyche		Some		Many
Macrosternum				Many
Brachycentrus		Few		Many
Rhycophila		Few	Some	
Megaloptera	**Fishflies & Dobsonflies**			
Corydalus	Dobsonfly			Some
Nigronia	Fishfly	Many	Few	Few
Sialis	Fishfly	Some	Few	Few
Coleoptera	**Beetles**			
Elmidae	Riffle beetles	Many		Some
Psephenidae	Water pennies			Few
Odonata	**Dragonflies**			
Corydulegaster			Few	
Gomphidae		Some		
Aeshnidae		Some	Few	Few
Diptera	**Flies**			
Tipulidae	Crane flies			
Dicranota		Few		Some
Hexatoma		Few	Few	
Tipula		Few		
Dixidae			Few	
Simuliidae	Blackflies	Few	Few	Few
Chironomidae	Midges	Some		
Oligochaeta	**Worms**	Few		
Gastropoda	**Snails**		Few	

Note: Few < 5, Some 5-15, Many >15