













Photo by Bob Barton

Benthic Macroinvertebrate Sampling to Assess Aquatic Health

Community Science Institute
and
Stream Watchers


Mayfly

Taughannock Creek

Trumansburg Creek

Thank you Bill Coon!

Stream Watchers BMI

2012 VOLUNTEERS

Bill Coon
Jerry VanOrden
Cody VanOrden
Gerald VanOrden
Jonathan VanOrden
Bob Barton
John Wertis
Sarah Wertis

BMI = Benthic Macroinvertebrates

Larger-than-microscopic invertebrate animals that live in and on stream bottoms

Primarily aquatic insects, worms, clams, snails, and crustaceans


Riffle beetles

Why conduct BMI surveys?

Benthic macroinvertebrates are:

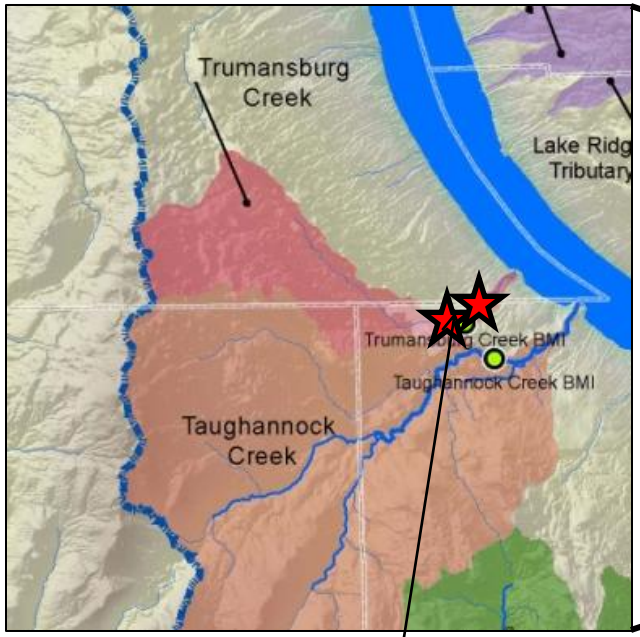
- abundant in most streams,
- relatively easy and inexpensive to sample,
- sensitive to environmental impacts, i.e., they can indicate effects of spills, intermittent discharges, and lapses in water treatment
- less mobile than fish, and thus cannot avoid discharges,
- indicators of overall, integrated water quality over time, including synergistic effects and substances lower than detectable limits,
- able to detect non-chemical impacts to the habitat, such as siltation or thermal changes

http://www.dec.ny.gov/chemical/23847.html

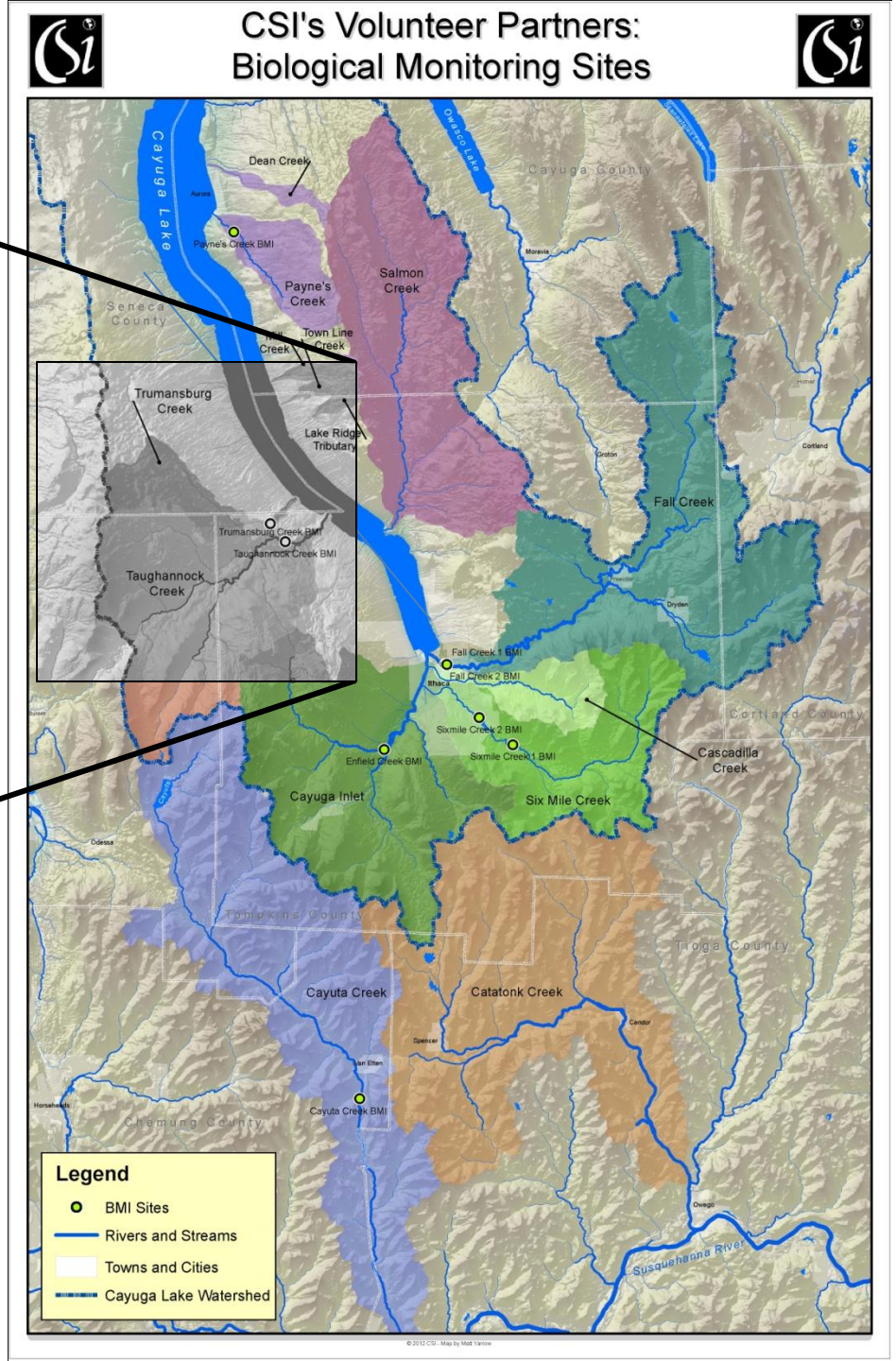
BMI

★ **Trumansburg Creek - 2012**, 2011

● Taughannock Creek - 2011, 2010



Trumansburg Wastewater Treatment




World - United States - NY - Tompkins Co. - Trumansburg
Trumansburg Creek
Lake St
King St
King St
Lake St
Lake St
© 2011 Microsoft Corporat


96
96
96
Taughannock Park Rd
Proskine Rd
Taughannock Creek
© AND © 2010 NAVTEQ Image courtesy of USGS © 2011
Pictometry Bird's Eye © 2010 MDA Geo
Pictometry Bird's Eye © 2010 Pictomet


Photo by Bob Barton

Assessing the Stream and Riparian Area

e.g. Air and water temperature, aquatic vegetation, Habitat description and condition…etc.

Evaluating the Substrate

Bedrock? Boulders? Cobbles? Gravel? Sand?
How embedded are the cobbles?

Calculating Average Stream Flow and Velocity

Collecting the Sample

2 Replicates

Removing the Sample from the Net

Preserving the Sample in Alcohol

Identification back at the lab!

Selecting a Subsample (for each replicate)

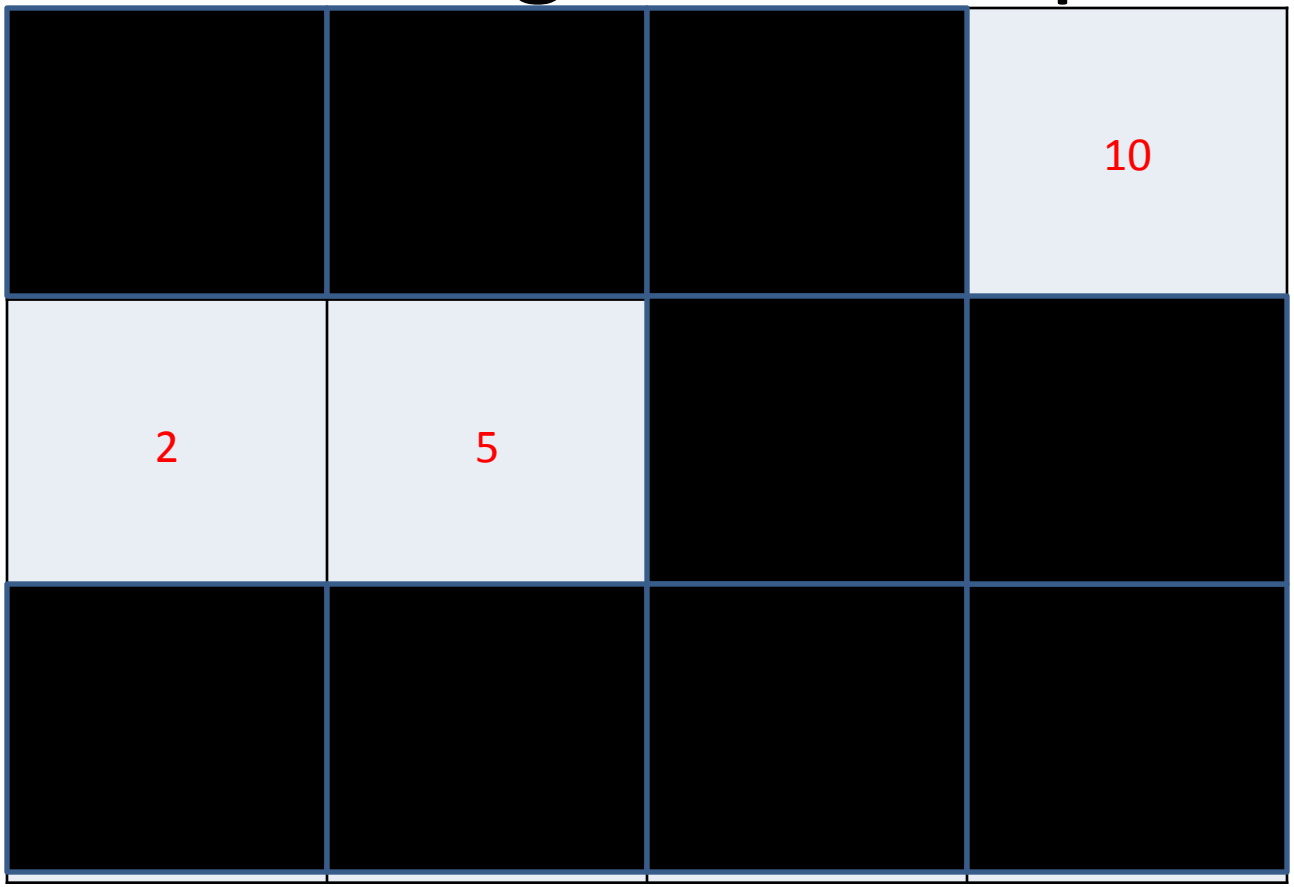
1	4	7	10
2	5	8	11
3	6	9	12

100 organisms and at least ¼ of the sample

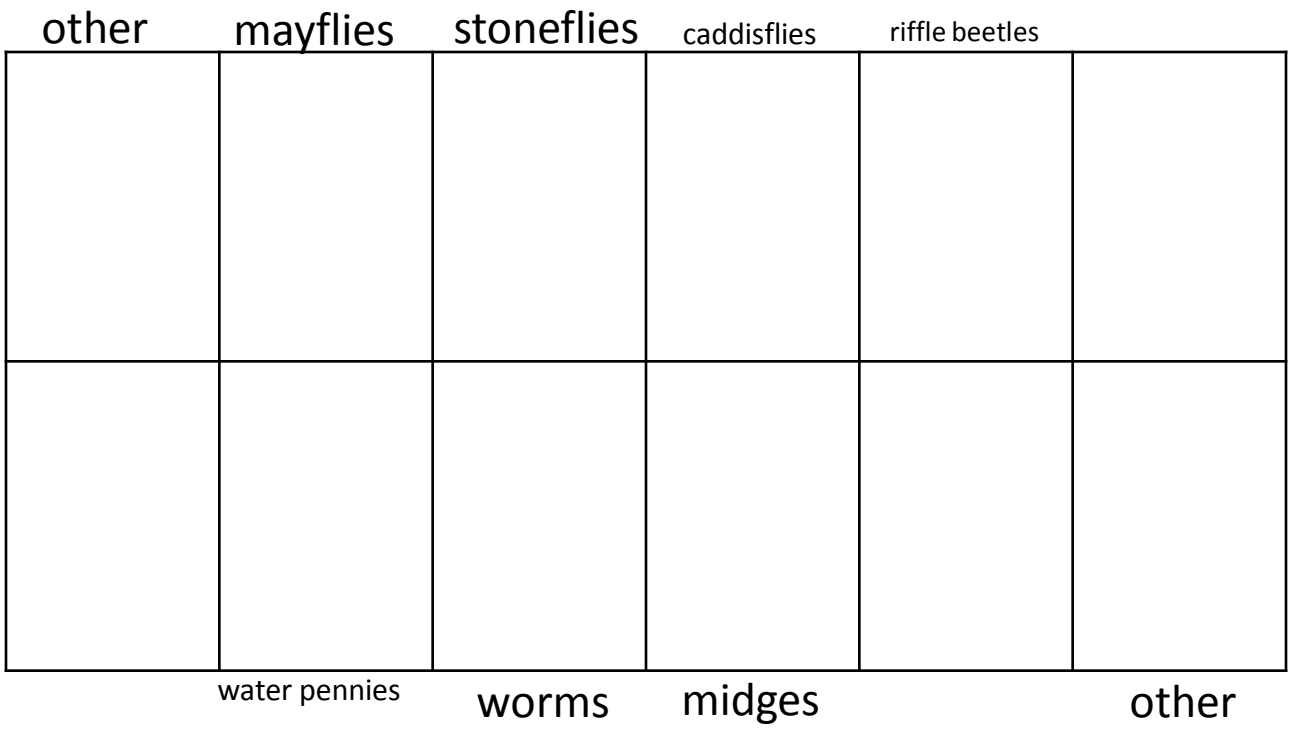
2,5,10

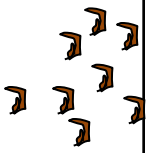
Identification back at the lab!

Selecting a Subsample (for each replicate)



100 organisms and at least ¼ of the sample


other
mayflies
stoneflies
caddisflies
riffle beetles
water pennies
worms
midges
other

other	mayflies	stoneflies	caddisflies	riffle beetles	
					
					
	water pennies	worms	midges		other


Dragonfly


Mayfly


Chironomid (midge)

Ephemeroptera (mayflies)
Plecoptera (stoneflies)
Trichoptera (caddisflies)
Odonata (dragonflies and damselflies)
Hemiptera (true bugs)
Coleoptera (beetles)
Megaloptera (alderflies, dobsonflies)
Chronomidae (midges)
Oligochaeta (worms)


Riffle beetles


Caddisfly larvae


Beetle larvae


Stonefly


Amphipod

HBRW Family Level Benthic Macroinvertebrate Data Analysis Sheet

Site: King Street, Trumansburg **River/Stream/County:** Trumansburg Creek

Date Sampled: 7/25/2012 **Name(s)** Rep 1: Bill Coon, Jerry VanOrden, Michi….rep 2:Bill Coon, Bob Barton

Date of Lab Work

	1	2	
# Squares Picked	3	3	
Total # Squares in Tray Grid			12

Replicate #		1	2			
I	II	III	IV			
Families in Major Groups	T (1)	D 1	D 2	% D 1	% D 2	L
EPHEMEROPTERA (E)						
Baetidae	6			0	0	0
Baetiscidae	4			0	0	0
Caenidae	6	1	1	0.009	0.004	0.004
Ephemerellidae	2			0	0	0
Ephemeridae	4			0	0	0
Heptageniidae	3	6	5	0.056	0.02	0.02
Leptophlebiidae	4			0	0	0
Metretopodidae	2			0	0	0
Isonychiidae	2		2	0	0.008	0
Polymitarcyidae	2			0	0	0
Potomanthidae	4			0	0	0
Siphlonuridae	7			0	0	0
Tricorythidae	4	5		0.046	0	0
Other				0	0	0
				0	0	0
Subtotal E		12	8	0.111	0.032	
PLECOPTERA (P)						
Capniidae	3			0	0	0
Chloroperlidae	0			0	0	0
Leuctridae	0			0	0	0
Nemouridae	2			0	0	0
Peltoperlidae	0			0	0	0
Perlidae	3	7	34	0.065	0.136	0.065
Perlodidae	2			0	0	0
Pteronarcyidae	0			0	0	0
Taeniopterygidae	2			0	0	0
				0	0	0
Other				0	0	0
Subtotal P		7	34	0.065	0.136	
MEGALOPTERA (M)						
Corydalidae	4	3	1	0.028	0.004	0.004
Sialidae	4			0	0	0
				0	0	0
Other				0	0	0
Subtotal M		3	1	0.028	0.004	
LEPIDOPTERA (L)						
Pyralidae	5			0	0	0
				0	0	0
Other				0	0	0
Subtotal L		0	0	0	0	
COLEOPTERA (C)						
Dryopidae	5			0	0	0
Elmidae	5	20	76	0.185	0.304	0.185
Gyrinidae	4			0	0	0
Haliplidae	5			0	0	0
Psephenidae	4	19	12	0.176	0.048	0.048
				0	0	0
Other		1	1	0.009	0.004	0.004
Subtotal C		40	89	0.37	0.356	
ODONATA (O)						
Aeshnidae	5			0	0	0
Calopterygidae	6			0	0	0
Coenagrionidae	8			0	0	0
Cordulegastridae	3			0	0	0
Corduliidae	2			0	0	0
Gomphidae	4	4	2	0.037	0.012	0.012

Replicate #		1	2			
I	II	III	IV			
Families in Major Groups	T	D 1	D 2	% D 1	% D 2	L
TRICHOPTERA (T)						
Brachycentridae	2			0	0	0
Glossosomatidae	1			0	0	0
Helicopsychidae	3	2		0.019	0	0
Hydropsychidae	5	16	63	0.148	0.252	0.148
Hydroptilidae	6			0	0	0
Lepidostomatidae	1			0	0	0
Leptoceridae	4			0	0	0
Limnephilidae	4	1		0.009	0	0
Molannidae	6			0	0	0
Odontoceridae	0	12	36	0.111	0.144	0.111
Philopotamidae	3			0	0	0
Phryganeidae	4			0	0	0
Polycentropodidae	6		1	0	0.004	0
Psychomyiidae	2			0	0	0
Rhyacophilidae	1		3	0	0.012	0
Sericostomatidae	3			0	0	0
				0	0	0
Other				0	0	0
Subtotal T		31	103	0.287	0.412	
DIPTERA (D)						
Athericidae	4	1		0.009	0	0
Blephariceridae	0			0	0	0
Ceratopogonidae	6			0	0	0
Chironomidae	6	3	4	0.028	0.016	0.016
Tipulidae	4	3	1	0.028	0.004	0.004
Empididae	6			0	0	0
Simuliidae	5			0	0	0
Tabanidae	5	1	3	0.009	0.012	0.009
				0	0	0
				0	0	0
				0	0	0
Other				0	0	0
Subtotal D		8	8	0.074	0.032	
ISOPODA (I)						
Asellidae	8			0	0	0
				0	0	0
Other				0	0	0
Subtotal I		0	0	0	0	
DECAPODA (I)						
Cambaridae	6	3		0.028	0	0
Astacidae	6			0	0	0
Other				0	0	0
Subtotal I		3	0	0.028	0	
OTHER						
Oligochaeta	9			0	0	0
Hirudinea	7			0	0	0
Gastropoda	7			0	0	0
Pelecypoda	6			0	0	0
Turbellaria	6			0	0	0
Nemertea	8			0	0	0
Other			4	0	0.016	0
Subtotal Other		0	4	0	0.016	
TOTALS		108	250	1	1	

2 unknown caddis in each rep

	D[1]	D[2]	$\bar{D}$
Organism Density/Sample Unit	432	1000	716
EPT Richness	8	8	8
Total Family Richness	18	17	17.5
EPT/EPT+Chironomidae Ratio	0.94	0.97	0.958
Biotic Index	3.86	3.75	3.802
% Contribution of Dominant Family	19%	30%	0.245
% Model Affinity	50%	35%	0.424
% Similarity Between Replicates		0.631	FAIL

% COMPOSITION OF MAJOR GROUPS	$\bar{D}$	D[1]	D[2]
EPHEMEROPTERA	7%	11%	3%
PLECOPTERA	10%	6%	14%
TRICHOPTERA	35%	29%	41%
CHIRONOMIDAE	2%	3%	2%
OTHER DIPTERA	3%	5%	2%
COLEOPTERA	36%	37%	36%
ODONATA	2%	4%	1%
MEGALOPTERA	2%	3%	0%
LEPIDOPTERA	0%	0%	0%
AMPHIPODA	0%	0%	0%
ISOPODA	0%	0%	0%
OLIGOCHAETA	0%	0%	0%
GASTROPODA	0%	0%	0%
PELECYPODA	0%	0%	0%
OTHER	1%	0%	2%

Ephemeroptera	40	716%	11	3
Plecoptera	5	#####	6	14
Tricoptera	10	#####	29	41
Coleoptera	10	#####	37	36
Chironomidae	20	219%	3	2
Oligochaeta	5	0%	0	0
Other	10	934%	14	5

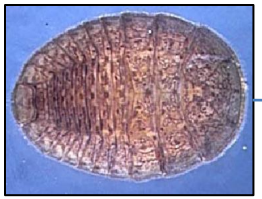
Enfield Creek Mouth
Downstream of
Robert H Treman State Park
(a bit before confluence with Inlet)

May 12, 2012

Common Name	*Scientific Name*	T	rep 1	rep 2
Mayflies	***EPHEMEROPTERA (E)***			
Small Minnow Mayfly	*Baetidae*	**6**	9	11
Spiny Crawler Mayfly	*Ephemerellidae*	**2**	39	49
Common Burrower Mayfly	*Ephemeridae*	**4**	1	0
Flatheaded Mayfly	*Heptageniidae*	**3**	38	71
Pronggill	*Leptophlebliidae*	**4**	1	0
Brushlegged Mayfly	*Isonychiidae*	**2**	4	3
Stoneflies	***PLECOPTERA (P)***			
Nemourid Stonefly	*Nemouridae*	**2**	6	5
Green Stonefly	*Chloroperlidae*	**0**	0	1
Rolledwinged Stonefly	*Leuctridae*	**0**	1	1
Common Stonefly	*Perlidae*	**3**	0	1
Caddisflies	***TRICHOPTERA (T)***			
Netspinner Caddisfly	*Hydropsychidae*	**5**	40	35
Fingernet Caddisfly	*Philopotamidae*	**3**	1	3
Flies	***DIPTERA***			
Midge	*Chironomidae*	**6**	66	83
Crane Fly	*Tipulidae*	**4**	16	12
Dance Fly	*Empididae*	**6**	2	1
Beetles	***COLEOPTERA***			
Riffle Beetle	*Elmidae*	**5**	7	8
Water Penny	*Psephenidae*	**4**	9	7
Dragonflies/Damselflies	***ODONATA***			
Clubtail Dragonfly	*Gomphidae*	**4**	1	1
	MEGALOPTERA			
Hellgrammite	*Corydalidae*	**4**	1	0
OTHER				
Leech	*Class - Hirudinea*	**7**	2	0
		TOTAL Organisms:	**244**	**292**

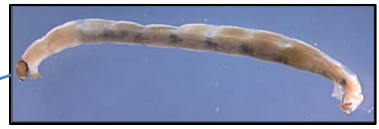





Common Name	*Scientific Name*	T	rep 1	rep 2
Mayflies	***EPHEMEROPTERA (E)***			
Small Minnow Mayfly	*Baetidae*	**6**	9	11
Spiny Crawler Mayfly	*Ephemerellidae*	**2**	39	49
Common Burrower Mayfly	*Ephemeridae*	**4**	1	0
Flatheaded Mayfly	*Heptageniidae*	**3**	38	71
Pronggill	*Leptophlebliidae*	**4**	1	0
Brushlegged Mayfly	*Isonychiidae*	**2**	4	3
Stoneflies	***PLECOPTERA (P)***			
Nemourid Stonefly	*Nemouridae*	**2**	6	5
Green Stonefly	*Chloroperlidae*	**0**	0	1
Rolledwinged Stonefly	*Leuctridae*	**0**	1	1
Common Stonefly	*Perlidae*	**3**	0	1
Caddisflies	***TRICHOPTERA (T)***			
Netspinner Caddisfly	*Hydropsychidae*	**5**	40	35
Fingernet Caddisfly	*Philopotamidae*	**3**	1	3
Flies	***DIPTERA***			
Midge	*Chironomidae*	**6**	66	83
Crane Fly	*Tipulidae*	**4**	16	12
Dance Fly	*Empididae*	**6**	2	1
Beetles	***COLEOPTERA***			
Riffle Beetle	*Elmidae*	**5**	7	8
Water Penny	*Psephenidae*	**4**	9	7
Dragonflies/Damselflies	***ODONATA***			
Clubtail Dragonfly	*Gomphidae*	**4**	1	1
	MEGALOPTERA			
Hellgrammite	*Corydalidae*	**4**	1	0
OTHER				
Leech	*Class - Hirudinea*	**7**	2	0
		TOTAL Organisms:	**244**	**292**



Sensitive Benthos

Mayflies
Stoneflies
Water Penny Beetles
Dobsonflies
Alderflies
Snipeflies
Mussels
Riffle Beetles


Stonefly


Dragonfly

Moderately Tolerant Benthos

Caddisflies
Damselflies
Dragonflies
Crayfish
Amphipods
Blackflies
Isopods
Craneflies


Worm

Pollution Tolerant Benthos

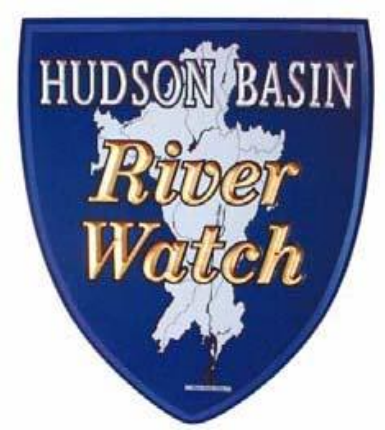
Midgeflies
Worms
Leeches
Pouch Snails

http://www.epa.gov/bioiweb1/

BMI Metrics

- Family Richness
- EPT Richness
- Family Biotic Index
- Percent Model Affinity

40% Mayfly
5% Stonefly
10% Caddisfly
10% Beetle
20% Non-biting Midge
5% Aquatic Earthworm
10% Other



non-impacted
slightly impacted
moderately impacted
severely impacted

THE COMMUNITY SCIENCE INSTITUTE

BMI RESULTS 2012

Hudson Basin River Watch Tier 3 Protocols (www.hudsonbasin.org)
(conforms to NYSDEC and EPA guidelines)

	Total Family Richness	Family Biotic Index	EPT Richness	Percent Model Affinity	BAP Value (Biological Assessment Profile)
Trumansburg Creek 7/25/12 42.541258N, 76.650769W King St (upstream of watwtr trtmnt)	**17.5** non-impacted	**3.80** non-impacted	**8.0** non-impacted	**42%** moderately impacted	**7.6** non-impacted

BAP is a composite index of aquatic habitat quality that incorporates Total Family Richness, Family Biotic Index, EPT Richness and Percent Model Affinity.

BAP
10-7.5 =Non-Impact
7.5-5 =Slight Impact
5-2.5 =Moderate Impact
2.5-0 =Severe Impact

non-impacted
slightly impacted
moderately impacted
severely impacted

THE COMMUNITY SCIENCE INSTITUTE

BMI RESULTS - Streamwatch

Hudson Basin River Watch Tier 3 Protocols (www.hudsonbasin.org)
(conforms to NYSDEC and EPA guidelines)

	Total Family Richness	Family Biotic Index	EPT Richness	Percent Model Affinity	BAP Value (Biological Assessment Profile)
Trumansburg Creek 7/25/12 42.541258N, 76.650769W King St (upstream of watwtr trtmnt)	**17.5** non-impacted	**3.80** non-impacted	**8.0** non-impacted	**42%** moderately impacted	**7.6** non-impacted
Trumansburg Creek 6/2/12 42.540714N, 76.649079W just dwnstrm of Tburg watwtr trtmnt	**14.5** non-impacted	**5.87** moderately impacted	**7.0** slightly impacted	**37%** moderately impacted	**5.8** slightly impacted

BAP is a composite index of aquatic habitat quality that incorporates Total Family Richness, Family Biotic Index, EPT Richness and Percent Model Affinity.

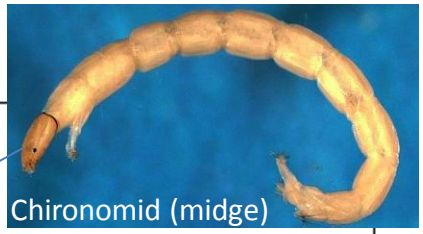
BAP
10-7.5 =Non-Impact
7.5-5 =Slight Impact
5-2.5 =Moderate Impact
2.5-0 =Severe Impact

Trumansburg Creek 7/25/2012

Upstream from WWTP (King Street bridge)

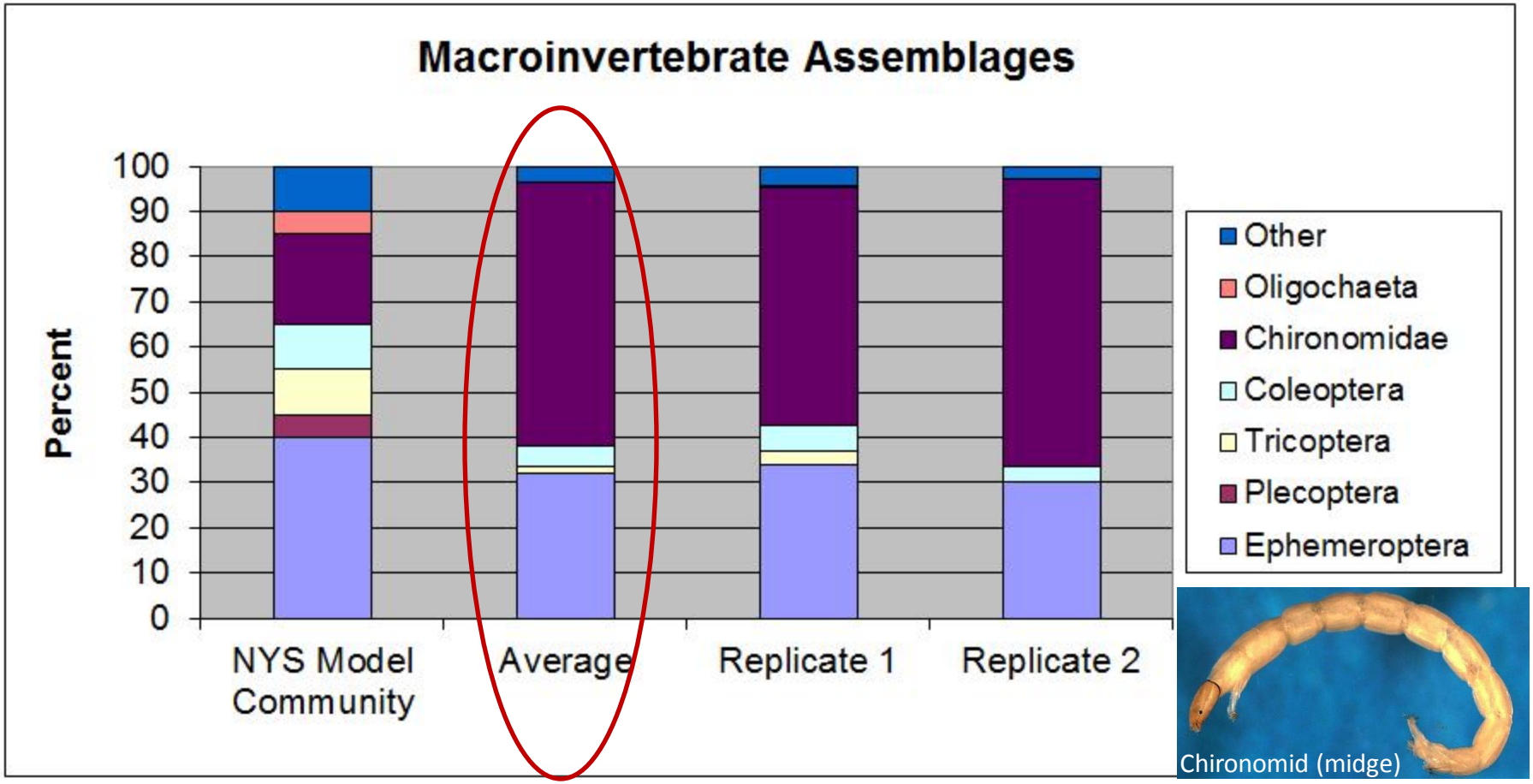
Trumansburg Creek 6/2/2012

Downstream from WWTP



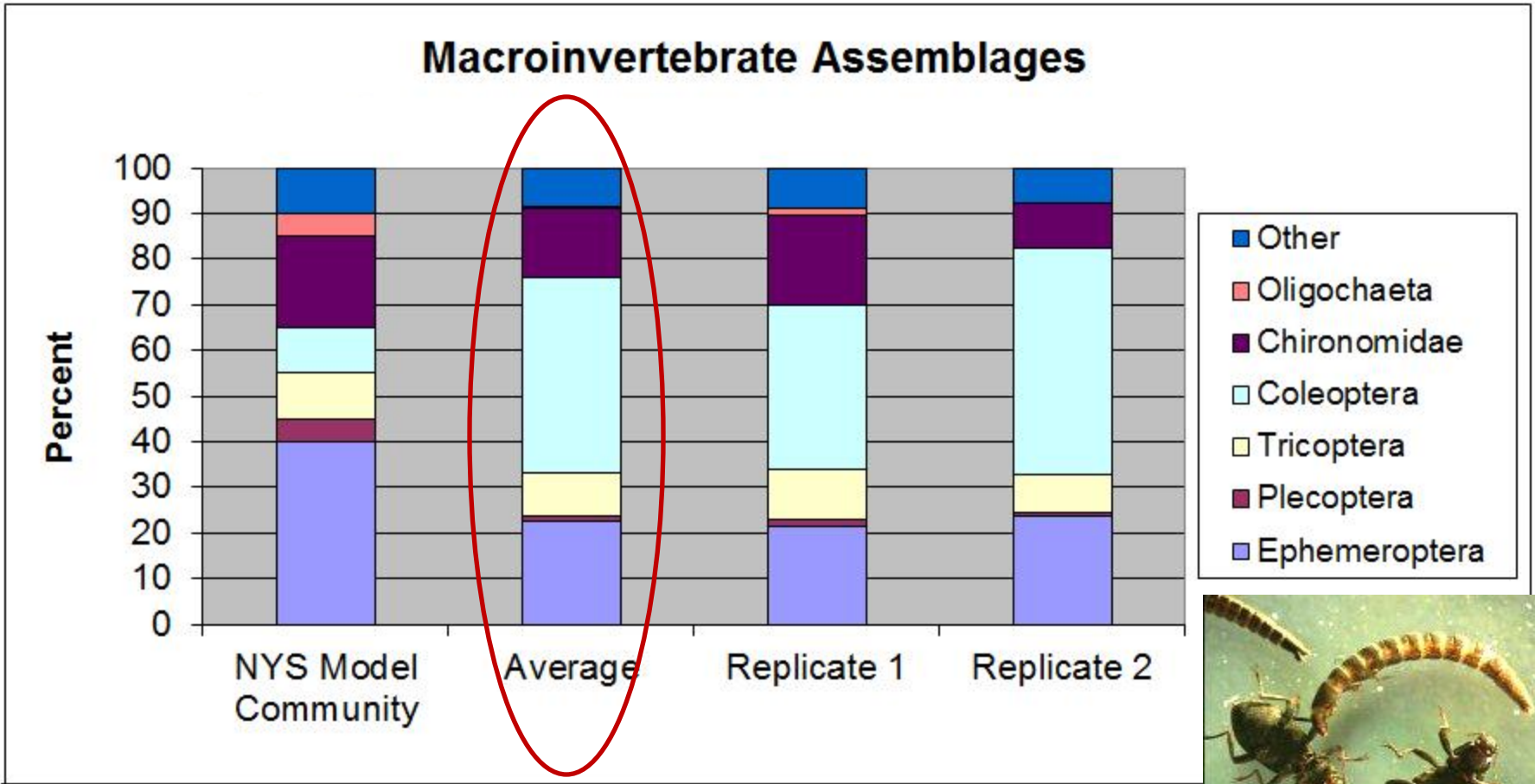
Trumansburg Creek 6/4/2011

Downstream from WWTP



Chironomid (midge)

Taughannock Creek 7/30/2011



Riffle beetles

non-impacted
slightly impacted
moderately impacted
severely impacted

THE COMMUNITY SCIENCE INSTITUTE

BMI RESULTS - Streamwatch

Hudson Basin River Watch Tier 3 Protocols (www.hudsonbasin.org)
(conforms to NYSDEC and EPA guidelines)

	Total Family Richness	Family Biotic Index	EPT Richness	Percent Model Affinity	BAP Value (Biological Assessment Profile)
Trumansburg Creek 7/25/12 42.541258N, 76.650769W King St (upstream of watwtr trtmnt)	**17.5** non-impacted	**3.80** non-impacted	**8.0** non-impacted	**42%** moderately impacted	**7.6** non-impacted
Trumansburg Creek 6/2/12 42.540714N, 76.649079W just dwnstrm of Tburg watwtr trtmnt	**14.5** non-impacted	**5.87** moderately impacted	**7.0** slightly impacted	**37%** moderately impacted	**5.8** slightly impacted

BAP is a composite index of aquatic habitat quality that incorporates Total Family Richness, Family Biotic Index, EPT Richness and Percent Model Affinity.

BAP
10-7.5 =Non-Impact
7.5-5 =Slight Impact
5-2.5 =Moderate Impact
2.5-0 =Severe Impact

non-impacted
slightly impacted
moderately impacted
severely impacted

THE COMMUNITY SCIENCE INSTITUTE

BMI RESULTS - Streamwatch

Hudson Basin River Watch Tier 3 Protocols (www.hudsonbasin.org)
(conforms to NYSDEC and EPA guidelines)

	Total Family Richness	Family Biotic Index	EPT Richness	Percent Model Affinity	BAP Value (Biological Assessment Profile)
Trumansburg Creek 7/25/12 42.541258N, 76.650769W King St (upstream of watwtr trtmnt)	**17.5** non-impacted	**3.80** non-impacted	**8.0** non-impacted	**42%** moderately impacted	**7.6** non-impacted
Trumansburg Creek 6/2/12 42.540714N, 76.649079W just downstrm of Tburg watwtr trtmnt	**14.5** non-impacted	**5.87** moderately impacted	**7.0** slightly impacted	**37%** moderately impacted	**5.8** slightly impacted
Trumansburg Creek 6/4/11 42.5 N, 76.6 W just downstrm of Tburg watwtr trtmnt	**14** non-impacted	**4.85** slightly impacted	**6** slightly impacted	**62%** slightly impacted	**7.1** slightly impacted

BAP is a composite index of aquatic habitat quality that incorporates Total Family Richness, Family Biotic Index, EPT Richness and Percent Model Affinity.

BAP
10-7.5 =Non-Impact
7.5-5 =Slight Impact
5-2.5 =Moderate Impact
2.5-0 =Severe Impact

non-impacted
slightly impacted
moderately impacted
severely impacted

THE COMMUNITY SCIENCE INSTITUTE

BMI RESULTS - Streamwatch

Hudson Basin River Watch Tier 3 Protocols (www.hudsonbasin.org)
(conforms to NYSDEC and EPA guidelines)

	Total Family Richness	Family Biotic Index	EPT Richness	Percent Model Affinity	BAP Value (Biological Assessment Profile)
Trumansburg Creek 7/25/12 42.541258N, 76.650769W King St (upstream of watwtr trtmnt)	**17.5** non-impacted	**3.80** non-impacted	**8.0** non-impacted	**42%** moderately impacted	**7.6** non-impacted
Trumansburg Creek 6/2/12 42.540714N, 76.649079W just downstrm of Tburg watwtr trtmnt	**14.5** non-impacted	**5.87** moderately impacted	**7.0** slightly impacted	**37%** moderately impacted	**5.8** slightly impacted
Trumansburg Creek 6/4/11 42.5 N, 76.6 W just downstrm of Tburg watwtr trtmnt	**14** non-impacted	**4.85** slightly impacted	**6** slightly impacted	**62%** slightly impacted	**7.1** slightly impacted
Taughannock Creek 7/30/11 42.529682 N, 76.635175 W ~500' downstrm of Rte 96 bridge	**19** non-impacted	**4.44** non-impacted	**9.5** non-impacted	**66%** non-impacted	**8.7** non-impacted

BAP is a composite index of aquatic habitat quality that incorporates Total Family Richness, Family Biotic Index, EPT Richness and Percent Model Affinity.

BAP
10-7.5 =Non-Impact
7.5-5 =Slight Impact
5-2.5 =Moderate Impact
2.5-0 =Severe Impact

non-impacted
slightly impacted
moderately impacted
severely impacted

THE COMMUNITY SCIENCE INSTITUTE

BMI RESULTS 2012

Hudson Basin River Watch Tier 3 Protocols (www.hudsonbasin.org)
(conforms to NYSDEC and EPA guidelines)

	Total Family Richness	Family Biotic Index	EPT Richness	Percent Model Affinity	BAP Value (Biological Assessment Profile)
Trumansburg Creek 7/25/12 42.541258N, 76.650769W King St (upstream of watwtr trtmnt)	17.5 non-impacted	3.80 non-impacted	8.0 non-impacted	42% moderately impacted	7.6 non-impacted
Trumansburg Creek 6/2/12 42.540714N, 76.649079W just dwnstrm of Tburg watwtr trtmnt	14.5 non-impacted	5.87 moderately impacted	7.0 slightly impacted	37% moderately impacted	5.8 slightly impacted
Enfield Creek - Mouth 5/12/12 42°23.889' N, 76°32.782'W just upstrm of rte 13 bridge	17.0 non-impacted	4.20 non-impacted	10.0 non-impacted	84% non-impacted	9.3 non-impacted
*** Six Mile Creek 9/11/12** 42.396300N, 76.334333W Slaterville 600 Rd.	21.0 non-impacted	3.76 non-impacted	12.5 non-mpacted	73% non-mpacted	9.1 non-impacted
Salmon Creek 6/5/12 42.539959N, 76.543486W Myers Point	18.0 non-impacted	4.88 slightly impacted	9 non-impacted	70% non-impacted	8.4 non-impacted
Paines Creek 5/15/12 42.726766N, 76.684675W just upstrm of Moonshine Rd (extinct bridge)	12.5 slightly impacted	5.19 slightly impacted	6.5 slightly impacted	77% non-impacted	7.2 slightly impacted
W.Branch Owego Creek 9/30/12 42.3424 N, 76.2444 W angler's access	20.0 non-impacted	3.99 non-impacted	10.0 non-impacted	68% non-impacted	9.0 non-impacted

* Samples Analyzed Live

BAP is a composite index of aquatic habitat quality that incorporates Total Family Richness, Family Biotic Index, EPT Richness and Percent Model Affinity.


Thank You Volunteers!
Interested in Helping Out?
Contact Bill Coon
wfcoon@yahoo.com
Photos by Bob Barton


Photo by Bob Barton


Photo by Bob Barton


Photo by Bob Barton