



Bio-monitoring

Data Collection Packet
tier 2

In collecting samples, sorting, identifying and recording data, please strive to be as meticulous as possible, following the protocols as carefully and completely as possible and recording your data thoroughly and legibly. This is what gives all of our data its meaning. To this end, be sure to fill out the Sampling Protocol sheet (example on page 31 of this document) and strive for the highest level of QA/QC possible (see discussion on page 31).

Checklist

(for turning in results)
to be sure that we have everything we need to use your data

For Tier 2 Identification*:

- 2 completed "BMI Protocol" sheets (one for each replicate sample)
- 5 completed "Reporting Sheets for Sampling" - Physical Survey/Habitat Assessment pages (p.44-48 of HBRW guidance document)
- 4 Completed BMI Sorting Worksheets (4 metric worksheets optional)
- Containers of identified organisms preserved in 70% alcohol, each labeled with sampling location and sampling date
- Container of sorted but unidentified organisms preserved in 70% alcohol labeled with sampling location and sampling date

*As of the summer of 2013, tier 2 identification will be the default for CSI volunteer groups. Of course, volunteers who are capable and willing to identify organisms to family level are welcome to.

Contents

FOR SAMPLING

"Reporting Sheets for Sampling" (5 pages)

"BMI Protocol" Sheets (1 for each rep)

FOR SORTING & ID

"BMI Sorting Worksheets" (4 pages)

"BMI Protocol" Sheets (cont. 2 started for sampling)

"Metric Worksheets" (4 pages) - *optional*

Get more copies of worksheets from the CSI website or at the lab:

www.communityscience.org

607-257-6606

Site Drawing:

Draw a “bird’s-eye” sketch of your 200’ long river segment up and downstream from your sampling site, recording:

1. Your sampling sites – include where you collected chemical and BMI samples, and measured velocity and cross section area.
2. Direction of water flow – indicate with arrows.
3. Location and orientation of any photos taken.
4. In-stream habitat – riffles, pools, runs, large woody debris, boulders, organic material, aquatic plants, overhanging vegetation, etc.
5. Streambanks – steep & gently sloping areas, naturally vegetated, bare, eroding, clear-cut, or mowed areas, artificially protected areas, etc.
6. Channel – wide & narrow areas, meanders, shaded & exposed areas, unnatural alterations, dams, culverts, etc.
7. Human land uses – roads, houses, driveways, parking lots, storm drain pipes, sewage pipes, factories, farms, livestock crossings, recreational use, logging, etc.

Sampling Site Description: Describe exactly where you collected chemical and BMI samples and measured velocity and cross section area:

HBRW Tiers 2 & 3

Physical Survey / Habitat Assessment

Assess a 200 foot segment up & downstream from your sample site

School/Group _____ River/Stream _____
 Survey Site _____ Survey Date & Time _____
 Name of person(s) completing survey _____

Weather: Today _____ Temperature: Air _____ °C
 Past 2 days _____ Water _____ °C

Sampling Site Type (Select one from each row)									
Stream Size	Headwater Tributaries			Creeks and Streams			Larger Rivers		
Gradient	FAST (primarily riffle)			VARIED (pools and riffles)			SLOW (low gradient)		
Surrounding Land Use	Forested		Agricultural		Residential			Urban	
	dense	sparse	pasture-land	crop-land	rural	village	suburban	Residential	commercial/industrial

Stream Width: The stream is on average _____ meters wide and _____ meters deep.

Water Level: Compared to the height of the stream channel, the water level seems relatively: high medium low

Water Appearance/Odor:

Turbidity substantially greater than natural conditions: Yes No

Describe _____

Oily film, grease globules, or unusual odor or color present Yes No

Describe: _____

Algae or Weed Growth: Substantially greater than natural conditions: Yes No

Describe _____

Upstream Dam: Yes No How far upstream: _____

Average Velocity of Sampling Site:

0.45 – 0.75 m/sec is optimal for BMI collection

Average time it takes to flow 3 meters:

a) 3 m / _____ sec = v1 _____

b) 3 m / _____ sec = v2 _____

AVERAGE: _____ m/sec

Average Depth of Sampling Site: _____ meters

Assessment Factors: Circle the box that best applies for each assessment factor.

Assessment Factor	Excellent	Good	Fair	Poor
Riffle size	Well-developed riffle, as wide as stream & as long as 2x stream width	Riffle as wide as stream but riffle length less than 2x stream width	Riffle not as wide as stream and length less than 2x stream width	Riffles or run virtually nonexistent
Substrate size (at BMI collection site)	Cobble predominates; boulders, gravel common	Cobble less abundant; boulders and gravel common	Gravel, boulders or bedrock prevalent; some cobble	Large boulders and bedrock or sand & silt prevalent; cobble lacking
Shelter for fish	Snags, submerged logs, undercut banks, or other stable habitat are found in over 50% of the site	Snags, submerged logs, undercut banks, or other stable habitat are found in 30-50% of the site	Snags, submerged logs, undercut banks, or other stable habitat are found in 10-30% of the site	Snags, submerged logs, undercut banks, or other stable habitat are found in less than 10% of the site
Embeddedness (at BMI collection site)	Rocks in stream <25% embedded; very little sand, silt, or mud	Rocks 25-50% embedded; can easily turn over rocks	Rocks 50-75% embedded and firmly stuck in sediments	Rocks >75% embedded; bottom mostly sand, silt, or mud
Flow pattern (deep is > 2 ft)	All 4 patterns present: slow/deep, fast/shallow, fast/deep, slow/shallow	Only 3 of 4 flow patterns present	Only 2 of 4 flow patterns present	Dominated by 1 flow pattern
Channel alteration	Stream straightening, dredging, artificial embankments, dams or bridge abutments absent or minimal; stream with meandering pattern	Some stream straightening, dredging, artificial embankments, or dams present, usually near bridge abutments; no recent channel alteration	Artificial embankments present to some extent on both banks; and 40-80% of stream site straightened, dredged, or otherwise altered	Banks shored with gabion or cement; over 80% of the stream site straightened and disrupted
Stream bank cover and stability *	Banks stable; no evidence of erosion; bank covered by vegetation or rock	Moderately stable; small areas of erosion; most of bank covered by vegetation or rock	Largely unstable; almost half of bank has areas of erosion or is not covered by vegetation or rock	Unstable, eroded; less than half of bank covered by vegetation or rock, or rock slumping into creek
Disruption of riparian bank coverage* (land bordering stream bank)	Mature trees and vegetation; most growing naturally; no disturbance by forestry, grazing, or mowing	Trees, woody plants, soft green plants dominate; some disruption but not affecting full plant growth potential	Obvious disruption; patches of bare soil, cultivated fields or closely cropped vegetation are the norm	Not much natural vegetation left or it has been removed to 3" or less in height
Width of riparian vegetation zone*	More than 35 yards wide; human activities have not impacted zone	Zone 12-35 yards wide; marginal impact from human activities	Zone 6-12 yards wide; impact from human activities evident	Zone less than 6 yards wide; lots of nearby human activities
Litter	No litter (metal or plastic) in area	Very little litter; accidentally dropped	Litter fairly common; purposely dropped	Lots of litter present; obviously dumped

*if the two banks are very different, assess the worst side

Given the assessment above, how would you rate your habitat overall? _____

Describe how land uses / human activities may be impacting the stream.

HBRW Tier 3

Stream Bottom Survey

Evaluate your specific BMI collection site (riffle area)

School/Group _____ River/Stream _____

Survey Site _____ Survey Date & Time _____

Name of person(s) completing survey _____

1. Set up 2-4 transects across the stream, in riffle habitats.
2. Starting at the water's edge, take one step at a time toward the opposite bank. With each step, reach over the toe of your wader with your forefinger without looking down and feel the substrate material closest to your large toe (could be mud or sand; does not have to be a rock). Pick it up (if possible), measure its size, and mark a tally in the appropriate column in the "Substrate Size Table" below.
3. If the substrate is a cobble, be careful as you pick it up out of the stream bottom so you can estimate how much it is covered up by silt or sand. Feel with your fingers for the edge of the cobble where it emerges from the silt or sand, and keep your fingers on that edge as you pick it up. Often there will be a "bathtub ring" line on the cobble where the level of the silt or sand was. There is also often algae growing on the top surface of the cobble down to that line. Estimate the percentage that the cobble is embedded and check the appropriate box in the "Cobble Embeddedness Table" below.
4. Continue until you have sampled approximately 50 substrate sizes and 20 cobbles.
5. In the "Substrate Size Table," total the tallies for each substrate type and record these numbers in the second row. Calculate the percentage of each substrate size by dividing the number of tallies by the total number (this should be approximately 50) and multiplying by 100.

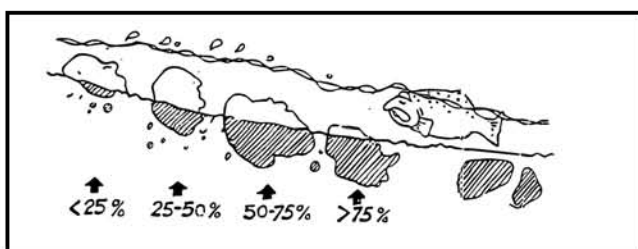
Substrate Size Table

Substrate Type	Silt/Clay/Mud (makes the water cloudy if disturbed)	Sand (up to 0.1")	Gravel (0.1-2")	Cobbles (2-10")	Boulders (>10")	Bedrock (solid rock covers stream bottom)
Tallies						
# of Tallies						
Percentage						

Cobble Embeddedness Table

Cobble #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0-25%																				
25-50%																				
50-75%																				
75-100%																				

50% embeddedness indicates doubtful habitat for many macroinvertebrates, trout, and egg survival



Based on your results, estimate the average embeddedness of the whole site:

Average Embeddedness: _____ %
(record on physical survey/habitat assessment form)

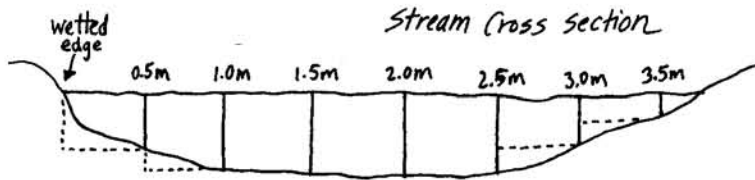
Flow Worksheet

School/Group _____ River/Stream _____ Site _____

Name of person(s) measuring flow _____ Date & Time _____

Area of the Stream's Cross-Section:

1. Stretch a tape measure from wetted edge to wetted edge.
2. At 0.5 meter intervals, across the entire width of the stream, measure the depth (in meters) and record in the table at right. (If stream is more than 10.5m wide, measure in 1m intervals).
3. Each segment you measured is like a small rectangle (see diagram below). The area of each rectangle equals its depth times its width. Since the width of each rectangle is 0.5 meter, the area of each rectangle is 0.5 times its depth, in square meters.



interval (m)	depth (m)	interval (m)	depth (m)
wetted edge	0	5.5	
0.5		6.0	
1.0		6.5	
1.5		7.0	
2.0		7.5	
2.5		8.0	
3.0		8.5	
3.5		9.0	
4.0		9.5	
4.5		10.0	
5.0		10.5	

4. The total cross section area of the stream is estimated by adding up the areas of all the rectangles. This is the same as adding up all the depths you measured and multiplying by 0.5. Record your total cross section area estimate in the box at right. (If measured at 1m intervals, simply add the depths).

Sum of depths

x .5 =

Total Cross Section Area

Velocity of the Stream's Water:

1. Record the distance of the marked course in the space below.
2. Record the number of seconds it takes the float to travel the marked course. Do this 9 times (3 times on the left side of the stream, 3 times in the center, and 3 times on the right side) and record the average time.
3. Calculate the average velocity by dividing the distance of the course by the average time. Convert to underwater velocity by multiplying by 0.85.

$$\left(\frac{\text{Distance (m)}}{\text{Average Time (sec)}} \right) \times 0.85 = \text{Average Underwater Velocity (m/sec)}$$

Left side	<input type="text"/>
	<input type="text"/>
	<input type="text"/>
Center	<input type="text"/>
	<input type="text"/>
	<input type="text"/>
Right side	<input type="text"/>
	<input type="text"/>
	<input type="text"/>
SUM:	<input type="text"/>
Avg. Time: (sum/9)	<input type="text"/> sec.

Flow:

The flow, or discharge of the stream, is the volume of water that moves past a site in a certain amount of time. Calculate the flow by multiplying the total cross section area by the average underwater velocity.

$$\text{Average Velocity (m/sec)} \times \text{Cross Section Area (m}^2\text{)} = \text{FLOW (m}^3\text{/sec)} \times 35.32 = \text{Compare to USGS Data (ft}^3\text{/sec)}$$

BMI Sorting (& EPT Richness) Worksheet

School/Group _____ River/Stream _____
 Site _____ Sampling Date _____
 Name of person(s) conducting analysis _____

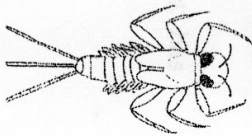
MAYFLIES *Ephemeroptera*

STONEFLIES *Ephemeroptera*

CADDISFLIES *Trichoptera*

Flatheaded Mayflies *Heptageniidae*

- body flattened and eyes on top of head
- often appear to have no neck
- legs often quite stocky



rep 1 rep 2

Common Stoneflies *Perlidae*

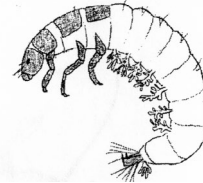
- branched gills where legs attach (under)



rep 1 rep 2

Netspinner Caddisflies *Hydropsychidae*

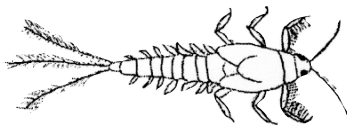
- branched gills on underside of abdomen
- top of all 3 thoracic segments sclerotized
- curves like a "C" when dead



rep 1 rep 2

Brushlegged Mayflies *Isonychiidae*

- long fringe of hairs on inner forelegs
- often larger than other mayflies
- streamlined teardrop shape from the side



rep 1 rep 2

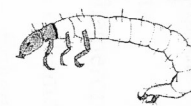
Other Stoneflies

-describe

rep 1 rep 2 rep 1 rep 2 rep 1 rep 2 rep 1 rep 2 rep 1 rep 2

Fingernet Caddisflies *Philopotamidae*

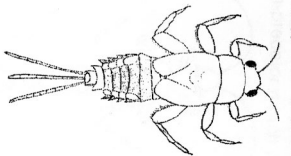
- orange heads, lighter bodies (in alcohol)
- meso- and meta-notum membranous
- T-shaped membranous labrum (seen from top)



rep 1 rep 2

Spiny Crawler Mayflies *Ephemerellidae*

- no gills on first few abdominal segments
- "tails" tend to be stiff and spiky
- "spines" on outer edge of abdomen



rep 1 rep 2

1. Sort and identify organisms to the level of order (stoneflies, caddisflies, beetles, true bugs, etc.). Within each order, try to distinguish different taxa and sort organisms accordingly.

2. Count the number of organisms of each taxa and mark a tally in the appropriate box next to the picture of the taxa. For taxa not pictured, make up your own description, write it in the "other" box for the appropriate order, and indicate with a tally the number of organisms found for that taxa.

3. To calculate an EPT Richness estimate, add up the number of different mayfly, caddisfly and stonefly taxa found. Count the number of boxes that have tallies, NOT the number of tallies. Record the EPT Richness estimates for each rep below and then take their average.

rep 1 EPT Richness = _____
 rep 2 EPT Richness = _____

Rep 1 EPT Richness + Rep 2 EPT Richness

2

EPT RICHNESS =

rep 1	rep 2
-------	-------

- >7 = non-impacted
- 3-7 = slightly impacted
- 1-2 = moderately impacted
- 0 = severely impacted

Other Caddisflies w/stone cases

-describe



rep 1 rep 2 rep 1 rep 2 rep 1 rep 2 rep 1 rep 2

Other Caddisflies w/square cases

-describe



rep 1 rep 2 rep 1 rep 2

Other Mayflies

-describe

rep 1 rep 2 rep 1 rep 2 rep 1 rep 2 rep 1 rep 2

Other Caddisflies

-describe


rep 1 rep 2 rep 1 rep 2 rep 1 rep 2 rep 1 rep 2

BMI Sorting Worksheet - p.2

School/Group _____ River/Stream _____
 Site _____ Sampling Date _____
 Name of person(s) conducting analysis _____


BETLES *Coleoptera*

Water Penny Beetle Larvae
Psephenidae
 -body flat
 -head and legs visible only from underside



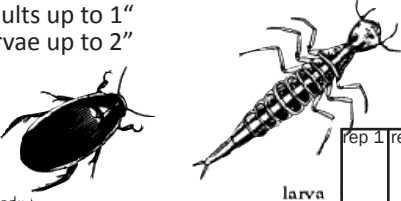
rep 1	rep 2
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Riffle Beetle
Elmidae
 -adults usually smaller than 1/8"
 -larvae are usually curved slightly



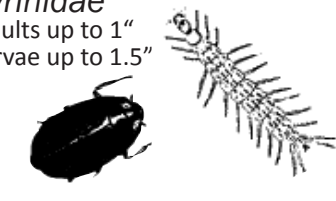
rep 1	rep 2
-------	-------

Predaceous Diving Beetle
Dytiscidae
 -adults up to 1"
 -larvae up to 2"



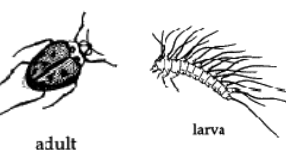
rep 1	rep 2
-------	-------

Whirligig Beetle
Gyrinidae
 -adults up to 1"
 -larvae up to 1.5"



rep 1	rep 2
-------	-------

Crawling Water Beetle
Haliplidae
 -1/4"-1/2"




rep 1	rep 2
-------	-------

Other Beetles
 -describe

rep 1	rep 2
-------	-------


TRUE FLIES *Diptera*

Non-biting Midge Larvae
Chironomidae
 -smaller than 1/2 "
 -paired prolegs at both ends
 -distinct head




rep 1	rep 2
-------	-------

Black Fly Larvae
Simuliidae
 -smaller than 1/2"
 -head has a pair of fans
 -lower abdominal segments are swollen




rep 1	rep 2
-------	-------

Cranefly Larvae
Tipulidae
 -wide variety of body shapes within family
 -end of abdomen with lobes and gills
 -can be up to 4" long



rep 1	rep 2
-------	-------

Watersnipe Fly Larvae
Athericidae
 -up to 3/4"
 -pairs of prolegs on underside of body
 -2 protrusions at end longer than prolegs
 -highly reduced head



rep 1	rep 2
-------	-------

Other True Flies
 -describe

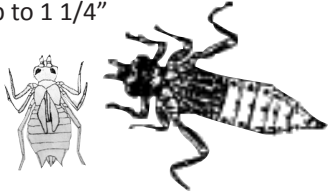
rep 1	rep 2
-------	-------

Other True Flies
 -describe

rep 1	rep 2	rep 1	rep 2
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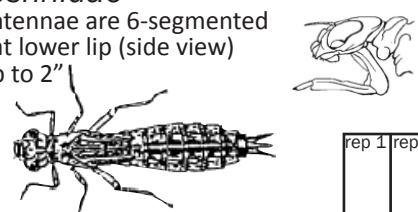
DRAGONFLIES/DAMSELFLIES *Odonata*

Club-tail Dragonfly
Gomphidae
 -antennae are 4-segmented (4th tiny)
 -up to 1 1/4"



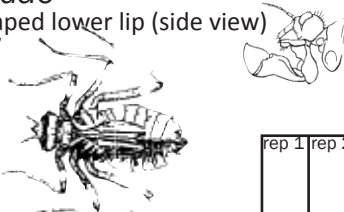
rep 1	rep 2
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Darner Dragonfly
Aeshnidae
 -antennae are 6-segmented
 -flat lower lip (side view)
 -up to 2"



rep 1	rep 2
-------	-------

Skimmer Dragonfly
Libellulidae
 -scoop-shaped lower lip (side view)
 -up to 1.5"




rep 1	rep 2
-------	-------

Other Dragonflies
 -describe

rep 1	rep 2
-------	-------

Damselfly
Various Families
 -3 oar-shaped tails (gills)
 -up to 1 1/4"



Damselflies
 -describe

rep 1	rep 2	rep 1	rep 2
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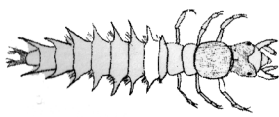
Note: sizes do not include tails

BMI Sorting Worksheet - p.3

School/Group _____ River/Stream _____
 Site _____ Sampling Date _____
 Name of person(s) conducting analysis _____


DOBSONFLIES +ALDERFLIES Megaloptera

Hellgrammite (Dobsonfly)
Corydalidae
 -abdomen ends in 2 prolegs (2 hooks ea.)
 -up to 4"



rep 1	rep 2
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Alderfly
Sialidae
 -abdomen ends in long anal filament
 -up to 1"



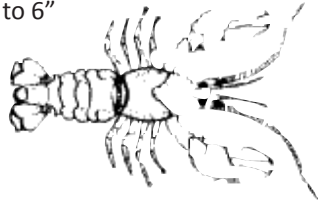
rep 1	rep 2
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Other Megaloptera
 -describe

rep 1	rep 2
-------	-------


CRUSTACEANS

Crayfish
 Order - *Decapoda*
 -up to 6"




rep 1	rep 2
-------	-------

Scud
 Order - *Amphipoda*
 -up to 1/2"



rep 1	rep 2
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Aquatic Sowbug
 Order - *Isopoda*
 -up to 3/4"



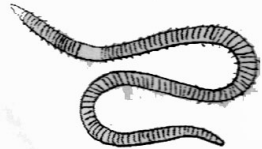
rep 1	rep 2
-------	-------

Other Crustaceans
 -describe

rep 1	rep 2
-------	-------


AQUATIC WORMS

Aquatic Earthworms
 Class - *Oligochaeta*
 -worm-like bodies with >14 segments
 -short bristles (sometimes very small)
 -up to 2"



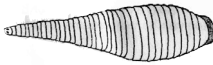
rep 1	rep 2
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Flatworms
 Class - *Turbellaria*
 -bodies NOT segmented
 -may look like a shrivelled piece of leather
 -up to 3/4"



rep 1	rep 2
-------	-------

Leeches
 Class - *Hirudinea*
 - < segments than Oligochaeta
 -suckers at both ends
 -no bristles/hairs
 -up to 2"



rep 1	rep 2
-------	-------

Other Aquatic Worms
 -describe

rep 1	rep 2
-------	-------

Rep 1 - # of squares picked = _____ ; total # of squares in grid = _____

Rep 2 - # of squares picked = _____ ; total # of squares in grid = _____

* Be sure to fill in these numbers so that we can estimate organism density in each replicate sample.

BMI Sorting Worksheet - p.4

School/Group _____ River/Stream _____
 Site _____ Sampling Date _____
 Name of person(s) conducting analysis _____

MOLLUSKS

Snail - flat spiral
 Class - *Gastropoda*



rep 1 rep 2

Gilled Snail - left-opening
 Class - *Gastropoda*



rep 1 rep 2

Gilled Snail - right-opening
 Class - *Gastropoda*



rep 1 rep 2

Fingernail Clam
 Class - *Bivalvia*
 -up to 1/2"



rep 1 rep 2

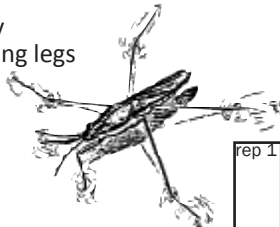
Other Mollusks
 -describe

rep 1 rep 2

TRUE BUGS *Megaloptera*

Water Strider
Gerridae

-narrow body
 -extremely long legs
 -up to 1 1/2"



rep 1 rep 2

Water Boatman
Corixidae

-distinct pattern on wings
 -rostrum short, blunt and triangular
 -up to 1"



rep 1 rep 2

Backswimmer
Notonectidae

-up to 1"



rep 1 rep 2

Giant Water Bug
Belostomatidae
 -up to 1 1/2"



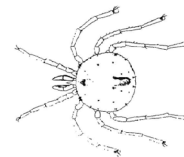
rep 1 rep 2

Other True Bugs
 -describe

rep 1 rep 2

OTHER

Water Mites
 Class - *Arachnida* (Order *Acari*)
 -4 pairs of legs



rep 1 rep 2

Other
 -describe

rep 1 rep 2

Other
 -describe

rep 1 rep 2

Other
 -describe

rep 1 rep 2

Other
 -describe

rep 1 rep 2

To calculate a Taxa Richness estimate, add up the number of different taxa found. Count the number of boxes that have tallies for all 4 Sorting Worksheets (NOT the number of tallies). Record the Taxa Richness estimate in the box on this page.

TAXA RICHNESS =

rep 1	rep 2
-------	-------

Major Group Biotic Index Worksheet

School/Group _____ River/Stream _____
 Site _____ Sampling Date _____
 Name of person(s) conducting analysis _____

Major Group	A # of Organisms in Sub-sample		B Group Tolerance Value	C Biotic Value for Group	
	rep 1	rep 2		rep 1	rep 2
Stoneflies			1		
Mayflies			2		
All Caddisflies except netspinner			2		
Gilled Snails			3		
Dobsonflies, Alderflies			4		
Dragonflies			4		
Crane Flies			4		
Watersnipe Flies			4		
Water Penny Beetle Larvae			4		
Whirligig Beetles			4		
Other Beetles			5		
Net Spinner Caddisflies			5		
Black Flies			5		
Non-biting Midges			6		
Damselflies			6		
Water Mites			6		
Crayfish			6		
Clams			6		
Scuds			7		
Other Snails (not gilled)			7		
Leeches			7		
Sowbugs			8		
Aquatic Earthworms			9		
TOTALS	D1	D2		E1	E2

Instructions: Using the "BMI Sorting Worksheets," count the number of organisms for each major group identified in your sub-sample and record in column A (do this separately for each replicate sample). Sum the totals of column A for rep one and rep 2 and record in D1 and D2. Multiply the number of organisms in each major group by the group tolerance value (column B) and record in column C (for each rep). Sum the totals of column C for rep 1 and rep 2 and record in E1 and E2. For the Biotic Index Score, divide E1 by D1 and E2 by D2 and then take the average.

Rep 1 Biotic Index Score = $\frac{E1 \text{ (total biotic value)}}{D1 \text{ (total \# organisms in your sub-sample)}}$ = _____

Rep 2 Biotic Index Score = $\frac{E2 \text{ (total biotic value)}}{D2 \text{ (total \# organisms in your sub-sample)}}$ = _____

BIOTIC INDEX = $\frac{\text{Rep 1 Biotic Index Score} + \text{Rep 2 Biotic Index Score}}{2}$ =

Biotic Index	0-4.5 non-impacted	4.51-5.50 slightly impacted	5.51-7.00 moderately impacted	7.01-10 severely impacted
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% Composition + Model Affinity Worksheet

School/Group _____ River/Stream _____

Site _____ Sampling Date _____

Name of person(s) conducting analysis _____

Percent Composition = $\frac{\text{\# Individuals of Major Group}}{\text{Total \# of all organisms in sub-sample}} \times 100 = \underline{\hspace{2cm}}$

REP 1

Major Group	# Individuals of Major Group in rep 1		Total # of all organisms in sub-sample rep 1		Percent Composition	NYSDEC Model Community	Absolute Difference
Mayfly		÷	T1= _____	x 100 =		40%	
Stonefly		÷	T1= _____	x 100 =		5%	
Caddisfly		÷	T1= _____	x 100 =		10%	
Midge		÷	T1= _____	x 100 =		20%	
Beetle		÷	T1= _____	x 100 =		10%	
Aquatic Earthworms		÷	T1= _____	x 100 =		5%	
Others		÷	T1= _____	x 100 =		10%	
Rep 1 Total # organisms	T1					Rep 1 Sum =	

REP 2

Major Group	# Individuals of Major Group in rep 2		Total # of all organisms in sub-sample rep 2		Percent Composition	NYSDEC Model Community	Absolute Difference
Mayfly		÷	T2= _____	x 100 =		40%	
Stonefly		÷	T2= _____	x 100 =		5%	
Caddisfly		÷	T2= _____	x 100 =		10%	
Midge		÷	T2= _____	x 100 =		20%	
Beetle		÷	T2= _____	x 100 =		10%	
Aquatic Earthworms		÷	T2= _____	x 100 =		5%	
Others		÷	T2= _____	x 100 =		10%	
Rep 2 Total # organisms	T2					Rep 2 Sum =	

Using the “BMI Sorting Worksheets,” count the number of organisms for each major group identified in your sub-sample and record in the first column (do this separately for each replicate sample). Sum the total number of organisms in your sub-sample (T1 or T2). For each major group, divide the number of individuals of that group by the total number in your sub-sample. Multiply by 100 to calculate percent composition. To Calculate the absolute difference between percentages for the NYSDEC model community and your sub-sample subtract the lower percent from the higher percent. For each replicate, multiply the sum by 0.5 and subtract this number from 100 to find the Percent Model Affinity. Take the average of your results for rep 1+2 for your final PMA value. Note that impact level is only relevant to summer sampling. For a visual comparison, graph the percent composition in the “Graphing Percent Composition Worksheet.”

Rep 1 Percent Model Affinity = $100 - (\text{sum of absolute differences } \boxed{\hspace{1cm}} \times 0.5) = \underline{\hspace{2cm}}$

Rep 2 Percent Model Affinity = $100 - (\text{sum of absolute differences } \boxed{\hspace{1cm}} \times 0.5) = \underline{\hspace{2cm}}$

PERCENT MODEL AFFINITY = $\frac{\text{Rep 1 PMA} + \text{Rep 2 PMA}}{2} = \boxed{\hspace{2cm}}$

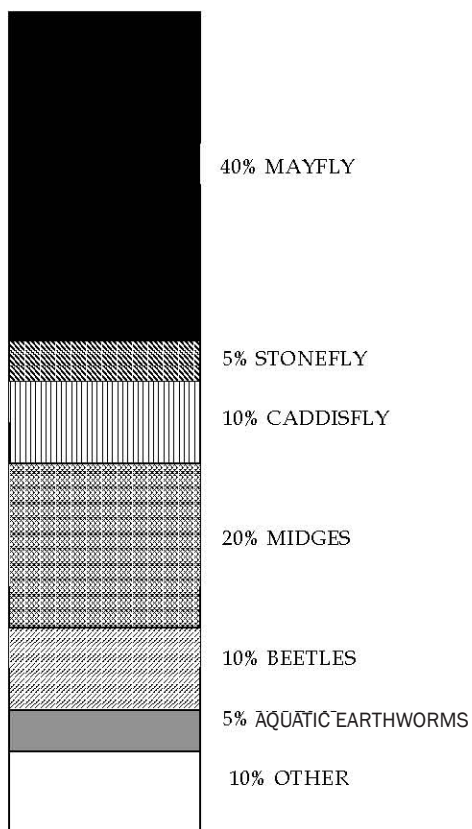
Percent Model Affinity (PMA)	>64% non-impacted	50-64% slightly impacted	35-49% moderately impacted	<35% severely impacted
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HBRW Tier 2

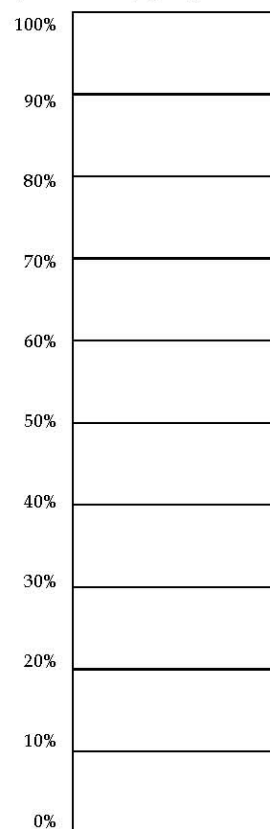
Graphing Percent Composition Worksheet

Attach this graph to the appropriate Percent Composition Worksheet

NY "model community"



Your Sample:
(color in appropriate %'s)



HBRW Tier 2

BMI Major Group Percent Similarity Worksheet

School/Group _____ River/Stream _____ Site _____
 Sampling Date _____ Name of person(s) conducting analysis _____

Major Group	Replicate 1 (or volunteer group results)	Replicate 2 (or outside evaluator's results)	Lesser of 2 Values
Stonefly			
Mayfly			
All Caddisfly except netspinner			
Gilled Snail			
Dobsonfly, Alderfly			
Dragonfly			
Crane Fly			
Watersnipe Fly			
Water Penny Beetle Larvae			
Whirligig Beetle			
Other Beetles			
Net Spinner Caddisfly			
Black Fly			
Midge			
Damselfly			
Water Mites			
Crayfish			
Clam			
Scud			
Other Snails (not Gilled)			
Leech			
Sowbug			
Aquatic Earthworm			
SUM	100%	100%	

Percent Similarity 

Instructions:

1. Determine the percent composition of each major group in each replicate and record in the second and third columns, accordingly. Each column must add up to 100.
2. For each major group, compare the percent composition of the first replicate with that of the second replicate. Find the lesser of the two values, and record in the fourth column.
3. Sum all of the lesser values to get the percent similarity of the two samples. A percent similarity of 75% or greater is the goal for Tier 2.

For Comparing Outside Evaluator and Volunteer Group Analyses: Use the same procedure above for each replicate being compared. Use the second column for your group's results and the third column for the outside evaluator's results. Check the box below and indicate for which replicate this percent similarity was calculated.

This Percent Similarity is between volunteer group and outside evaluator's results.
 It is calculated for Replicate # _____

Required

Si BMI Protocol Sheet

School/Group _____ River/Stream _____
 Site _____ Replicate _____ Sampling Date _____
 Name of person(s) conducting analysis _____

Sampling Protocol

QAQC Level A	QAQC Level B & C
<input type="checkbox"/> Used 18"x8" net with mesh size between 0.8-0.9 mm <input type="checkbox"/> Sampled in a riffle 0.45-0.75 m/sec and > 1 meter deep <input type="checkbox"/> Sampled 5-meter-long diagonal transect in 5 minutes <input type="checkbox"/> Nets thoroughly cleaned of organisms between samples <input type="checkbox"/> Physical/habitat survey attached <input type="checkbox"/> Sampling spots labeled on sketches in physical survey	<input type="checkbox"/> Checked all boxes under A <input type="checkbox"/> Two replicates collected from at least one site per sampling day (required for B and C) <input type="checkbox"/> Whole replicate samples preserved in alcohol (required for C)

Describe sampling methods if different from above (indicate mesh size if not 0.8-0.9 mm):

Sample Analysis Protocol

Selected and analyzed a sub-sample (Tiers 2 & 3)
 Total number of organisms in sub-sample (minimum of 100 organisms recommended) _____
 Describe procedure for selecting sub-sample:

Equipment used for ID: (circle) none ___X magnifier ___X dissecting scope (indicate power)

Author & title of reference used to identify macroinvertebrates _____

Voucher specimens used (optional) List of specimens attached

Number and percent of organisms in sub-sample that you believe you have:

Positively identified _____ number _____% of total
 Tentatively identified _____ number _____% of total
 Not identified _____ number _____% of total

BMI Data Reporting Sheet attached Raw BMI worksheets attached

QAQC Level C only:

Name & phone of outside evaluator _____

Outside lab's results attached (raw data and Percent Similarity Worksheet)

Be sure to fill out another "BMI Protocol Sheet" for your second replicate sample.

Sample Status Log

	By Whom	Date	Notes
Turned in to Lab			Accepted by _____
Rep 1 Sorting			
Rep 1 ID			
Rep 2 Sorting			
Rep 2 ID			



BMI Protocol Sheet

School/Group _____ River/Stream _____
 Site _____ Replicate _____ Sampling Date _____
 Name of person(s) conducting analysis _____

Sampling Protocol

QAQC Level A	QAQC Level B & C
<input type="checkbox"/> Used 18"x8" net with mesh size between 0.8-0.9 mm <input type="checkbox"/> Sampled in a riffle 0.45-0.75 m/sec and > 1 meter deep <input type="checkbox"/> Sampled 5-meter-long diagonal transect in 5 minutes <input type="checkbox"/> Nets thoroughly cleaned of organisms between samples <input type="checkbox"/> Physical/habitat survey attached <input type="checkbox"/> Sampling spots labeled on sketches in physical survey	<input type="checkbox"/> Checked all boxes under A <input type="checkbox"/> Two replicates collected from at least one site per sampling day (required for B and C) <input type="checkbox"/> Whole replicate samples preserved in alcohol (required for C)

Describe sampling methods if different from above (indicate mesh size if not 0.8-0.9 mm):

Sample Analysis Protocol

Selected and analyzed a sub-sample (Tiers 2 & 3)

Total number of organisms in sub-sample (minimum of 100 organisms recommended) _____

Describe procedure for selecting sub-sample:

Equipment used for ID: (circle) none ___X magnifier ___X dissecting scope (indicate power)

Author & title of reference used to identify macroinvertebrates _____

Voucher specimens used (optional)

List of specimens attached

Number and percent of organisms in sub-sample that you believe you have:

Positively identified _____ number _____ % of total

Tentatively identified _____ number _____ % of total

Not identified _____ number _____ % of total

BMI Data Reporting Sheet attached

Raw BMI worksheets attached

QAQC Level C only:

Name & phone of outside evaluator _____

Outside lab's results attached (raw data and Percent Similarity Worksheet)