



1. DETERMINE THE STREAM-REACH BOUNDARY. 2. NEAR THE LOWER END OF THE REACH (IN THE DEEPEST PORTION OF THE RUN), COLLECT WATER SAMPLES AND ANALYZE USING THE CHEMICAL TESTS YOU HAVE AVAILABLE. YOU MAY USE YOUR COLLECTION CONTAINER TO OBSERVE WATERCOLOR AND CLARITY AND TO DETERMINE WATER ODORS. 3. MEASURE THE WIDTH-DEPTH AND VELOCITY, AND ESTIMATE THE WATER LEVEL. 4. USING A **KICK-NET**, COLLECT A MINIMUM OF THREE BENTHIC MACROINVERTEBRATE SAMPLES FROM THE BEST RIFFLES OR RUNS WITHIN YOUR STREAM REACH. USE THE TALLY SHEET ON PAGE FOUR TO RECORD INFORMATION ABOUT YOUR COLLECTIONS. 5. EVALUATE THE PHYSICAL AND HABITAT CONDITIONS, AND RECORD INFORMATION ABOUT KNOWN LAND USE ACTIVITIES. 6. SKETCH YOUR REACH OR SUBMIT PHOTOGRAPHS WITH THE SURVEY, AND ADD ANY OTHER COMMENTS THAT YOU FEEL ARE IMPORTANT. NOTE: A **SCIENTIFIC COLLECTION PERMIT** FROM WVDNR IS REQUIRED FOR ALL BENTHIC SURVEYS.

Stream name \_\_\_\_\_ Survey date \_\_\_\_\_  
 Watershed \_\_\_\_\_ County \_\_\_\_\_  
 Latitude \_\_\_\_\_ Longitude \_\_\_\_\_ Directions (from road to x point) \_\_\_\_\_  
 Start/end times \_\_\_\_\_  
 Survey completed by \_\_\_\_\_ (School's Name) Station code \_\_\_\_\_  
 Affiliation With support by TMI Watershed Education Staff E-mail kwaddell@mountain.org  
 Mailing address 18 Woodlands Way Phone number 304 567 2632  
 address Circleville WV 26804

**WATER CHEMISTRY:** Use the boxes below to record the results of your water chemistry analysis; attach additional sheets if necessary.

	Result	units		Result	units		Result	units
Temperature (F)			Conductivity			Alkalinity		
Dissolved oxygen			Nitrates			Iron		
pH			Turbidity			Fecal/E-coli		
Additional tests (describe and record results)			Phosphates	units	//			

**PHYSICAL CONDITIONS:** Use the check boxes below to describe the conditions that closely resemble those of your stream. The extra lines are provided to write in any additional comments. You may see more than one type of condition; if so, be sure to indicate these on your survey (check all that apply). If multiple conditions are observed, always indicate the most dominant condition. Note: If the condition you observe is not listed, describe it in the comment section.

Water clarity	Water color	Water/Sediment odor	Surface foam
		Water Sediment	
Clear	None	None	None
Murky	Brown	Fishy	Slight
Milky	Black	Musky	Moderate
Muddy	Orange/red	Rotten egg	High
Other (describe)	Gray/White	Sewage	
	Green	Chemical	

Algae color	Algae abundance	Algae growth habit	Streambed color
Light green	None	Even coating	Brown
Dark green	Scattered	Hairy	Black
Brown	Moderate	Matted	Green
Other (describe)	Heavy	Floating	White/gray
			Orange/red

Physical condition comments: \_\_\_\_\_

Weather (today and past 48-hours) \_\_\_\_\_


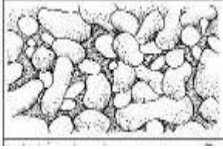


Circle estimate of the % of your reach that is shaded

> 80 Excellent	80 - 60 Good	60 - 40 Fair	< 40 Poor

**WIDTH AND DEPTH MEASUREMENTS:** Record the wetted width and average depth from at least two of the channel's habitats (RUN, RIFFLE or POOL). Record the average depth from a minimum of five measurements (one of these should be from the deepest part of the channel). The width should be measured from the widest section of the feature. Always do a run and complete velocity measure at same time

- 1. Riffle      Wetted Width <sup>(feet)</sup> \_\_\_\_\_      Depth <sup>(feet)</sup> \_\_\_\_\_
- 2. \*Run\*      Wetted Width <sup>(feet)</sup> \_\_\_\_\_      Depth <sup>(feet)</sup> \_\_\_\_\_
- 3. Pool      Wetted Width <sup>(feet)</sup> \_\_\_\_\_      Depth <sup>(feet)</sup> \_\_\_\_\_

**HABITAT CONDITIONS:** Rate the habitat conditions by choosing the best description, and then choose a score from the range within the description. Note: Bank stability and riparian buffer width are assessed on both the **LEFT** and **RIGHT** side of the stream.

		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
<b>Embeddedness</b> EVALUATED IN RIFFLES																					
		<b>Optimal</b>					<b>Suboptimal</b>					<b>Marginal</b>					<b>Poor</b>				
<b>Sediment deposition</b>		Little or no formation of depositional features; < 20% of the reach affected. See below for examples					Some increase in depositional features; 20-40% of the reach affected.					Moderate amounts of depositional features; 40-60% of the reach affected.					Heavy amounts of deposition; > 60% of the reach affected.				
		<b>Optimal</b>					<b>Suboptimal</b>					<b>Marginal</b>					<b>Poor</b>				

The next two conditions are evaluated on both the left and the right sides of the stream.

		10	9	8	7	6	5	4	3	2	1						
<b>Bank stability</b>		Banks are stable; no evidence of erosion or bank failure; little or no potential for future problems; < 10% of the reach affected.				Banks are moderately stable; infrequent areas of erosion occur, mostly shown by banks healed over or a few bare spots; 10-30 % of the reach affected.				Banks are moderately unstable; 30-50% of the reach has some areas of erosion; high potential for erosion during flooding events.				Banks are unstable; many have eroded areas (bare soils) along straight sections or bends; obvious bank collapse or failure; > 50% affected.			
	L    R	<b>Optimal</b>				<b>Suboptimal</b>				<b>Marginal</b>				<b>Poor</b>			
<b>Riparian buffer width</b>		Mainly undisturbed vegetation > 60 ft; no evidence of human impacts such as parking lots, road beds, clear-cuts, mowed areas, crops, lawns etc.				Zone of undisturbed vegetation 40-60 ft; some areas of disturbance evident.				Zone of undisturbed vegetation 20-40 ft; disturbed areas common throughout the reach.				Zone of undisturbed vegetation < 20 ft; disturbed areas common throughout the entire reach.			
	L    R	<b>Optimal</b>				<b>Suboptimal</b>				<b>Marginal</b>				<b>Poor</b>			

**NOTE:** TO CALCULATE A SCORE BASED ON A 0-100 SCALE DIVIDE THE TOTAL BY 80 AND MULTIPLY BY 100. THIS IS THE SCORE THE SUMMARY SHEET CALCULATES.

<b>Totals</b>	> 80	80 - 65	64 - 50	< 50
	Optimal	Suboptimal	Marginal	Poor

Habitat condition comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

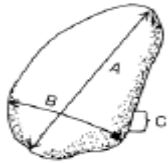
**SEDIMENT DEPOSITION** may cause the formation of islands, point bars (areas of increased deposition usually at the beginning of a meander that increase in size as the channel is diverted toward the outer bank) or shoals, or result in the filling of runs and pools. Usually deposition is evident in areas that are obstructed by natural or manmade debris and areas where the stream flow decreases, such as bends.

LEVEL-ONE SURVEY DATA SHEET

**STREAMBED COMPOSITION:** You should always collect information about the composition of your reach. You can either estimate the proportions or you use a **PEBBLE COUNT** for a more accurate measure of composition. At a minimum you should estimate composition of the riffles within your reach. The size categories are determined by the (B) axis measured in millimeters. Use the table below to record your data. Did you estimate  or count?

Silt/clay < 0.06	Sand 0.06 – 2	Gravel 2 - 64	Cobble 65 - 255	Boulder 256 - 1096	Bedrock > 1096	Woody debris
Very small; having a smooth slick feel	Very small; having a grainy feel	Pea to tennis ball	Tennis ball to basketball	Basketball to car size	Usually larger than a car; solid surface	Includes sticks, leaves etc

Riffle only  Entire reach  Estimates should be made from riffles only



(A) Long axis (**Length**)  
(B) Intermediate axis (**Width**)  
(C) Short axis (**Height**)

Pebble counts require two people, one in the stream and one on shore. The person in the stream walks upstream from bank to bank using a zigzag pattern. After each step the person reaches down without looking, picks up the first particle touched, and measures the intermediate axis with a ruler. The on-shore partner records the measurement. The process continues until 100 pebbles have been measured or the reach has been walked. For a quick estimate, the coordinator recommends that **50** be collected from the entire reach and **20** if collecting from riffles only. **Note:** Pebble counts are not required; they are optional and should only be completed once each year or less frequently.

**LAND USE:** Indicate the land uses that you believe may be having an impact on your stream station. Use the letters (**S**) streamside, (**M**) within ¼ mile and (**W**) somewhere in the watershed, to indicate the approximate location of the disturbance and the numbers (**1**) slight, (**2**) moderate or (**3**) high, to represent the level of disturbance.

	swm	123		swm	123		swm	123
Active construction			Pastureland			Single-family residences		
Mountaintop mining			Cropland			Sub-urban developments		
Deep mining			Intensive feedlots			Parking lots, strip-malls etc.		
Abandoned mining			Unpaved Roads			Paved Roads		
Logging			Trash dumps			Bridges		
Oil and gas wells			Landfills			Other (describe)		
Recreation (parks, trails etc.)			Industrial areas					

Pipes?  Yes  No

Describe the types of pipes observed and indicate if there is any discharge from the pipes. Also describe the colors and odors of the discharge, and provide any other land-use comments \_\_\_\_\_

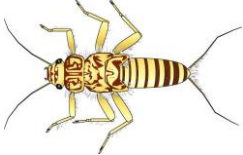
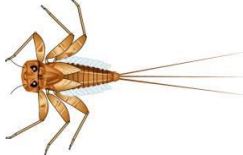

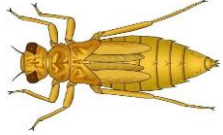
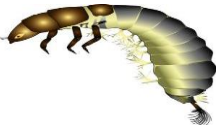

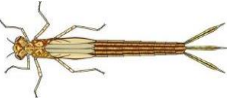












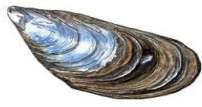


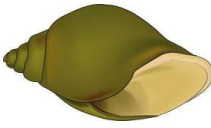




**PHOTOGRAPH AND SKETCH THE STUDY REACH:** Use the space below to draw your study reach. Indicate the direction of flow, sample locations and important features of the reach. Choose at least two locations from which to take your photos and submit your photos with your survey data sheet.

**TMI photos:** 1. X point with landmark in frame. 2. X point to top of reach. 3. Top of the reach to the X point. 4. Important features of the reach. 5. 5 photos of kids having fun.

Birds-eye view sketch

LEVEL-ONE SURVEY DATA SHEET

**BENTHIC MACROINVERTEBRATES:** Use the table below to record information about your collections. Record their abundance using these codes: **(A)** > 50, **(C)** 5 – 50 and **(R)** < 5 and also record the number of different kinds. The # of kind's box indicates groups in which multiple kinds (**FAMILIES**) are possible. Note: Always record the # OF KINDS when necessary. Illustrations courtesy of the **Cacapon Institute**; Jennifer Gillies, artist.  **IF YOU CAN IDENTIFY THE FAMILY**

 Stoneflies <input type="checkbox"/> Common <input type="checkbox"/> Perlodid <input type="checkbox"/> Giant <input type="checkbox"/> Roachlike <input type="checkbox"/> Sm Winter Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Mayflies <input type="checkbox"/> Flathead <input type="checkbox"/> Common Borrower <input type="checkbox"/> Pronggilled <input type="checkbox"/> Sm Minnow <input type="checkbox"/> Spiny Crawler <input type="checkbox"/> Brushlegged Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Caddisflies <input type="checkbox"/> Northern <input type="checkbox"/> Saddle <input type="checkbox"/> Humpless <input type="checkbox"/> Snail Total Number _____ <b># OF KINDS</b> <input type="text"/>
 Dragonflies <input type="checkbox"/> Clubtail <input type="checkbox"/> Darner <input type="checkbox"/> Skimmer Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Common netspinner Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Caddisflies Total number <input type="text"/> # OF "OTHER" KINDS <input type="text"/>
 Damselflies <input type="checkbox"/> Broadwinged <input type="checkbox"/> Spreadwinged <input type="checkbox"/> Narrowwinged Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Riffle beetle Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Water penny Total number <input type="text"/> # OF "OTHER" KINDS <input type="text"/>
 Fishfly/Hellgrammite Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Alderfly Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Other Beetles/Bugs Total number <input type="text"/> # OF KINDS <input type="text"/>
 Midges Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Black fly Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Crane fly Total number <input type="text"/> # OF "OTHER" KINDS <input type="text"/>
 Watersnipe fly Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Other True flies <input type="checkbox"/> Biting Midge <input type="checkbox"/> Dance <input type="checkbox"/> Horse/Deer <input type="checkbox"/> Netwinged Midge Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Crayfish Total number <input type="text"/> # OF "OTHER" KINDS <input type="text"/>
 Clams <input type="checkbox"/> Asian <input type="checkbox"/> Fingernail Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Mussel Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Scud/Sideswimmer Total number <input type="text"/> # OF "OTHER" KINDS <input type="text"/>
 Operculate snails <input type="checkbox"/> Bithyniid <input type="checkbox"/> Viviparid <input type="checkbox"/> Hydrobiid <input type="checkbox"/> Pleuroccoid Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Non-operculate snails <input type="checkbox"/> Physid <input type="checkbox"/> Ancyloid <input type="checkbox"/> Planorbid Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Aquatic sowbug Total number <input type="text"/> # OF "OTHER" KINDS <input type="text"/>
 Aquatic worm Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Leech Total Number _____ <b># OF KINDS</b> <input type="text"/>	 Flatworm Total number <input type="text"/> # OF "OTHER" KINDS <input type="text"/>

Other aquatic life observed or collected: \_\_\_\_\_

**STREAM SCORE**

After the sorting and identifications is complete, the macroinvertebrates are assessed using four **metrics**. First, transform your abundance rating into numbers using this code (**A = 6; C = 3; R = 1**), **OR enter the exact count**, follow the instructions below to complete all calculations. **Note:** The **SHADING** indicates that multiple kinds are possible within the group.

- Biotic Index:** Multiply the abundance number by the tolerance value to calculate the tolerance score. Add the entire tolerance score column and the abundance column. Divide the tolerance total by the abundance total.
- Total Taxa:** Calculate the total number of kinds.
- EPT Taxa:** Calculate the total number of kinds from the stoneflies, mayflies, and all caddisflies.

The final step is to determine a **point value** for each metric. These points are added together to determine your overall **stream score** and integrity rating. **Note: Don't forget to record the number of kinds.** If only 1 kind was found record a "1"

BENTHIC MACROINVERTEBRATES	Abundance	Tolerance Value	Tolerance Score	Number of Kinds
Stoneflies (Order <b>Plecoptera</b> )		2		
Mayflies (Order <b>Ephemeroptera</b> )		3		
Case-building caddisflies (Order <b>Trichoptera</b> )		3		
Other Net-spinning caddisflies (Order <b>Trichoptera</b> )		4		
Common netspinner (Family <b>Hydropsychidae</b> )		5		
Free-living caddisfly (Family <b>Rhyacophilidae</b> )		3		
Dragonflies (Sub-order <b>Anisoptera</b> )		4		
Damselflies (Sub-order <b>Zygoptera</b> )		7		
Riffle beetle (Family <b>Elmidae</b> )		4		
Water penny (Family <b>Psephenidae</b> )		3		
Other Beetles (Order <b>Coleoptera</b> )		6		
True Bugs (Order <b>Hemiptera</b> )		8		
Hellgrammite (Family <b>Corydalidae</b> )		3		
Alderfly (Family <b>Sialidae</b> )		6		
Non-biting midge (Family <b>Chironomidae</b> )		9		
Black fly (Family <b>Simuliidae</b> )		6		
Crane fly (Family <b>Tipulidae</b> )		4		
Watersnipe fly (Family <b>Athericidae</b> )		3		
Other True flies (Order <b>Diptera</b> )		7		
Water mite (Order <b>Hydrachnida</b> )		6		
Crayfish (Family <b>Cambaridae</b> )		5		
Sideswimmer (Family <b>Gammaridae</b> )		5		
Aquatic sowbug (Family <b>Asellidae</b> )		7		
Operculate snails (Sub-class <b>Prosobranchia</b> )		5		
Non-operculate snails (Sub-class <b>Pulmonata</b> )		7		
Clams (Order <b>Veneroida</b> )		6		
Mussel (Family <b>Unionidae</b> )		4		
Aquatic worm (Class <b>Oligochaeta</b> )		10		
Leech (Class <b>Hirudinea</b> )		10		
Flatworm (Class <b>Turbellaria</b> )		7		
<b>Other invertebrates</b> (describe)	Total Abundance		Total Tolerance	Total Taxa (# OF KINDS)

Metrics	Results	Points	10	8	6	4	2
1. Total Taxa		6	> 18	18 - 15	14 - 11	10 - 7	< 7
2. EPT Taxa		4	> 10	10 - 8	7 - 5	4 - 2	< 2
3. Biotic Index		2	< 3.5	3.5 - 4.3	4.4 - 5.6	5.7 - 6.5	> 6.5

Integrity Rating Scale

STREAM SCORE

> 24	24 - 19	18 - 13	< 13
Optimal	Suboptimal	Marginal	Poor



LEVEL-ONE SURVEY DATA SHEET

**TMI AWSM Discharge data sheet**

**Discharge:** Determine the discharge by using the float. Discharge should always be **measured from a run**. Collect at least 5 measurements (in the thalweg and two on each side). To convert inches into feet divide by 12. For example, if your depth measurement was 6-inches the result in feet would be 0.5.  
 If you have additional time or a HS group compare the result to discharge calculated to the velocity head rod method (VHR).  
**Ave. stream depth will need to be calculated for either method.**

**Float Method** Water Level Low \_\_\_\_\_ Medium \_\_\_\_\_ High \_\_\_\_\_ No flow \_\_\_\_\_

pt.	location along stream width (ft)	Stream depth (ft)	Float Distance (ft) 10 ft minimum	Float time (sec) Time to travel taped distance	Velocity (ft/sec)	Discharge (cfs) Stream width x ave depth x velocity
1	2 ft	.5 ft	1	10 ft	20 sec	0.5
2	4 ft	1 ft	2	10 ft	10 sec	1
3	6 ft	1.5 ft	3	10 ft	5 sec	2
4	8 ft	1 ft	4	10 ft	15 sec	0.67
5	10 ft	.5 ft	5	10 ft	25 sec	0.4
<b>Stream width:</b>		sum: 4.5 ft			sum: 4.57 ft/sec	<b>Discharge:</b>
_____ ft x		ave: .9 ft	→		x ave: .91 ft/sec	= 13.1 cfs

pt.	location along stream width (ft)	Stream depth (ft)	Float Distance (ft) 10 ft minimum	Float time (sec) Time to travel taped distance	Velocity (ft/sec)	Discharge (cfs) Stream width x ave depth x velocity
1			1			
2			2			
3			3			
4			4			
5			5			
<b>Stream width:</b>		sum: _____ ft			sum: _____ ft/sec	<b>Discharge:</b>
_____ ft x		ave: _____ ft	→		x ave: _____ ft/sec	= _____ cfs

**Velocity Head Rise Method**

pt.	location along stream width (ft)	Stream depth, parallel to current (in)	Rise (in)	Record velocity from the chart (ft/sec)
1	2 ft	.5 ft	1/4	1.2
2	4 ft	1 ft	1	2.3
3	6 ft	1.5 ft	2	3.3
4	8 ft	1 ft	1 1/4	2.6
5	10 ft	.5 ft	3/4	2.0
				Ave vel _____

Rise	Velocity	Rise	Velocity
1/4	1.2	3 1/4	4.2
1/2	1.6	3 1/2	4.3
3/4	2.0	3 3/4	4.5
1	2.3	4	4.6
1 1/4	2.6	4 1/4	4.8
1 1/2	2.8	4 1/2	4.9
1 3/4	3.1	4 3/4	5.0
2	3.3	5	5.2
2 1/4	3.5	5 1/4	5.3
2 1/2	3.7	5 1/2	5.4
2 3/4	3.8	5 3/4	5.5
3	4.0	6	5.7

**Velocities are in ft/sec.**

pt.	location along stream width (ft)	Stream depth, stick parallel to current (in)	Rise (in)	Record velocity from the chart (ft/sec)
1				
2				
3				
4				
5				
				Ave vel _____ x ave depth from chart above x stream width = _____

Adapted from WV DEP SOS program by Kevin Stitzinger. Updated 10/3/13 Stored in KS\_Documents file "Blank Survey Summary Sheets - 2013"

Submit a clear copy or the original data sheet to the coordinator at address below. The Coordinator will review your survey and return it with comments or return a summary with comments. **ALWAYS KEEP A COPY FOR YOUR RECORDS.**

West Virginia Dept. of Environmental Protection  
 Save Our Streams Program  
 601 57<sup>th</sup> Street, SE  
 Charleston, WV 25304

For more information visit the program's website at: <http://www.dep.wv.gov/sos>