LEVEL 1 SURVEY DATA SHEET

(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, velocity and estimate the water level. (**4**) Evaluate the physical and habitat conditions, and record information about known land use activities. (**5**) 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 five to record information about your collections and determine your score. (**6**) Sketch your reach or submit photographs and add any other comments that you feel are important. Note: A WVDNR **Scientific Collection Permit** is required for all benthic surveys.

Stream name _____ Survey date _____

Watershed _____ County _____

Latitude _____ Longitude _____ Directions _____

Start/end times _____

Survey completed by _____ Station code _____

Affiliation _____ E-mail _____

Mailing address _____ Phone number _____

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 (C/F)			Conductivity			Alkalinity		
Dissolved oxygen			Nitrates			Iron		
pH			Turbidity			Fecal/E-coli		

Additional tests (describe and record results) _____

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 odors	Water	Sediment	Surface foam	
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) _____

Indicate 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 depth from at least two of the channel's habitats (RUN, RIFFLE or POOL). Always complete the measurements from the deepest (thalweg) section of the feature.

1. Riffle — Wetted width (feet) _____ Depth (feet) _____
2. Run — Wetted width (feet) _____ Depth (feet) _____
3. Pool — Wetted width (feet) _____ Depth (feet) _____

Note: Width and depth measurements should be collected in multiple locations within the feature. The averages are recorded.

_____ How many measurements did you collect in each feature?

Discharge

Determine the **discharge** by using a flow meter or other methods such as the float or the velocity head rod (VHR) method. The more measurements collected the more accurate your results will be, but you should collect a minimum of five measurements. Discharge should always be measured from a **run**. Stretch your tape measure across the run and select a minimum of five positions along the tape to measure discharge. One measurement should be from the deepest part of the channel and the others should be on either side. If you use the float method move 10-20 feet upstream from the tape and float at least five times back to the tape. The float distance must be timed in seconds.

Discharge method used

☐ Float ☐ VHR ☐ Flow meter

Water Level

☐ Low ☐ Normal ☐ High ☐ Dry

Channel width _____ feet

Tape positions (ft)	Depth (ft)	Velocity (ft/sec)	VHR (Rise-inches)	Float (sec)	Discharge (cfs)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
Totals/Averages					

Cross Sectional Area (CSA) _____ ft^2

(CSA = Average Depth x Width)

Discharge = CSA x Velocity

= _____ x _____

= _____ cfs (ft^3/sec)

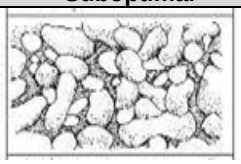
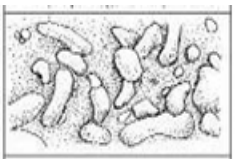
If you use a float record your distance below and the number of seconds, it took to travel the distance in the column indicated. **Float distance** (feet) _____

VHR rises and velocities

Rise (R)	Velocity	Rise (R)	Velocity
¼	1.2	3 ¼	4.2
½	1.6	3 ½	4.3
¾	2.0	3 ¾	4.5
1	2.3	4	4.6
1 ¼	2.6	4 ¼	4.8
1 ½	2.8	4 ½	4.9
1 ¾	3.1	4 ¾	5.0
2	3.3	5	5.2
2 ¼	3.5	5 ¼	5.3
2 ½	3.7	5 ½	5.4
2 ¾	3.8	5 ¾	5.5
3	4.0	6	5.7

VHR Velocity = $8 \times \sqrt{R}$, where R is rise in feet

Habitat conditions: Rate the habitat conditions by selecting 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. The **left** and **right** sides are determined by looking downstream.

Integrity rating	**Optimal**	**Suboptimal**	**Marginal**	**Poor**
Embeddedness (Evaluate in riffles)	 Fine sediments surrounds <10% of the spaces between the gravel, cobble, and boulders.	 Fine sediment surrounds 10-30% of the spaces between the gravel, cobble, and boulders.	 Fine sediment surrounds 30-60% of the spaces between the gravel, cobble, and boulders.	 Fine sediment surrounds > 60% of the spaces between the gravel, cobble, and boulders.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Sediment deposition	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.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Integrity rating	**Optimal**	**Suboptimal**	**Marginal**	**Poor**
Bank stability	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.
Right / Left	10 9 8	7 6	5 4 3	2 1
Riparian buffer width	Mainly undisturbed vegetation > 60 ft; no evidence of human impacts such as parking lots, roadbeds, 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.
Right / Left	10 9 8	7 6	5 4 3	2 1

Total points	> 70	70 - 55	54 - 40	< 40
	Optimal	Suboptimal	Marginal	Poor

Habitat comments: Use the space below to provide additional details and justification for the score/rating provided. Feel free to include photos and additional notes/attachments etc.

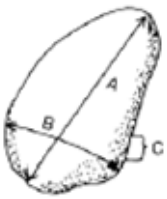
Sediment deposition may cause the formation of islands, point bars (areas of increased deposition usually at the beginning of a meander that increase in size as the channel is diverted toward the outer bank) or shoals or result in the filling of runs and pools. Usually, deposition is evident in areas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

Streambed composition

Collect information about the composition of your reach by either estimating proportions or conducting a pebble count for a more accurate measure of composition. At a minimum, estimates of composition should occur in the riffles within your reach. Use the table on page four to record your data. Did you estimate ___ or do a pebble count ___ ? Indicate which with an **X**

Silt/clay	Sand	Gravel		Cobble	Boulder	Bedrock	Woody debris
< 0.06	0.06 – 2	2 - 24	25 - 64	65 - 255	256 - 1096	> 1096	
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
		Fine	Coarse				
Totals							

Riffle only ☐ Entire reach ☐



(A) Long axis
(B) Intermediate axis
(C) Short axis

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. You should divide the gravel category into fine and coarse to get a more accurate measure. 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.

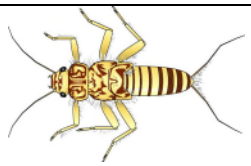
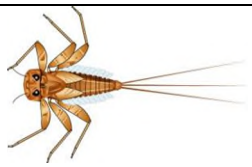
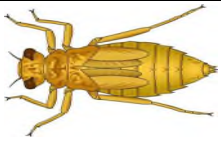
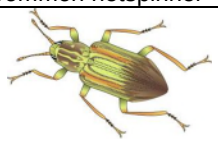
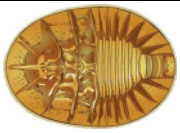
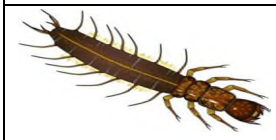
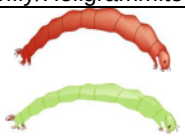
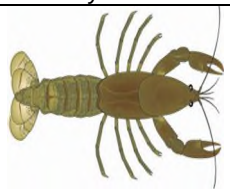
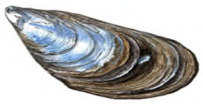
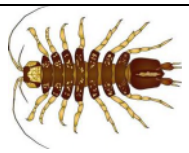
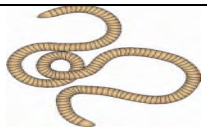
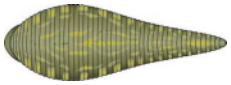
Active construction			Pastureland			Single-family residences		
Mountaintop mining			Cropland			Sub-urban developments		
Deep mining			Intensive feedlots			Parking lots, strip-malls etc.		
Abandoned mining			Unpaved Roads			Paved Roads		
Logging			Trash dumps			Bridges		
Oil and gas wells			Landfills			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 reach**: Use the space below to draw a **bird's eye view** 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.

Benthic macroinvertebrates (**BMIs**) 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 record the number of different kinds. The # of kind's box indicates groups in which multiple kinds (*families*) are possible. Always record the **# of kinds** when necessary. Note: **Counts** can be substituted for abundance.

 Stoneflies		 Mayflies		 Caddisflies	Case-builders
 Dragonflies		 Common netspinner		 Caddisflies	Net-spinners / Free-living
 Damselflies		 Riffle beetle		 Water penny	
 Fishfly/Hellgrammite		 Alderfly		 Other Beetles/Bugs	Beetles / True bugs
 Midges		 Black fly		 Crane fly	
 Watersnipe fly		 Other True flies		 Crayfish	
 Clams		 Mussel		 Scud/Sideswimmer	
 Operculate snails		 Non-operculate snails		 Aquatic sowbug	
 Aquatic worm		 Leech		 Flatworm	

Illustration's courtesy of the Cacapon Institute; Jennifer Gillies, artist.

Other aquatic life observed or collected: _____

Note: Depending on the reach collection techniques may vary. Check with the Coordinator in advance to determine the best method to employ.

Stream Score: After the sorting and identifications is complete, the BMIs are assessed using three metrics. First, transform your abundance rating into numbers using this code (**A** = **6; C** = **3**; **R** = **1**) and follow the instructions below to complete all calculations. For **counts** substitute the numbers for abundance. Note: **shading** indicates that multiple kinds are possible within the group.

1. **Biotic Index**: Multiply the abundance/count 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/count total.
2. **Total Taxa**: Calculate the total number of kinds (i.e., families).
3. **EPT Taxa**: Calculate the total kinds (families) of stoneflies, mayflies, and 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**.

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

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

Integrity score and rating

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

Submit a clear copy or the original data sheet to the coordinator at address provided. The coordinator will review your data and return it with comments and/or a summary. **Always keep a copy of your records**. Questions? Contact the Coordinator by email: saveourstreams@wv.gov.

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