

LEVEL II LOW GRADIENT SURVEY



(1) Determine your stream-reach boundary; this is a stream length up to 100-meters, which may be more or less under certain circumstances. (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) For low-gradient streams you must collect macroinvertebrates from a combination of habitats to be representative; multiple samples (at least 10) should be collected throughout the reach. Make sure to use the appropriate net(s). (5) Evaluate the physical and habitat conditions; 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 for evaluating the conditions of your stream study site.

Stream name \_\_\_\_\_ Survey date \_\_\_\_\_  
 Watershed \_\_\_\_\_ Station code \_\_\_\_\_  
 Latitude \_\_\_\_\_ Longitude \_\_\_\_\_ Directions to site \_\_\_\_\_

Survey completed by \_\_\_\_\_  
 Current weather conditions \_\_\_\_\_  
 Past weather conditions (last 3-days) \_\_\_\_\_  
 Affiliation \_\_\_\_\_ Email \_\_\_\_\_  
 Mailing address \_\_\_\_\_ Phone number \_\_\_\_\_

**WATER CHEMISTRY:** Uses the spaces below to record the results of your water quality analysis; attach additional sheets if necessary.

	Result	units		Result	units		Result	units
Temperature (C/F)			Conductivity			Alkalinity		
Dissolved oxygen			Nitrates			Metals (describe)		
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	Watercolor	Water/sediment odor	Surface foam
		Sediment    Water	
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

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

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**SHADING**

Estimate the percentage of your reach that is shaded; indicate by checking its box.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
> 80	80-60	60-40	< 40
Excellent	Good	Marginal	Poor

**WIDTH AND DEPTH:** Record the wetted width and depth of the channel's habitats (riffles, runs and pools). Record the average depth from a minimum of four measurements (one of these should be from the deepest part of the habitat). The width should be measured from the widest section of the feature.

Riffle	Width (feet)	_____	Depth (feet)	_____
Run	Width (feet)	_____	Depth (feet)	_____
Pool	Width (feet)	_____	Depth (feet)	_____

**CHANNEL PROFILES:** Width and depth measurements can be used to create a cross section profile within your reach. Choose a location in your reach across one of the channel types above. Stretch a tape from bank to bank and anchor it at both ends. Move from left to right facing in an upstream direction; measure the distance from the stream bottom to the top of the tape at selected intervals (i.e. every foot). Record your measurements in the table below. The table provides enough spaces for 20 measurements; if more are necessary you can create your own table on a separate piece of paper. Your tape measure will probably not start at zero so make sure to record the actual position of the tape as you measure across the channel.

Width intervals

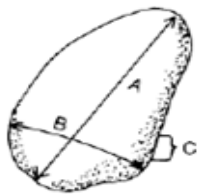
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

Depth measurements

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

**Pebble count:** Collect a minimum of 100-particles from your reach using a Zigzag method, percent habitat method or specific transects (e.g. every 10-meter). If you do not complete a pebble count, **always estimate** streambed composition from the riffles/runs chosen for your macroinvertebrate sample collections.

Indicate your method from the choices below.	Size Classes (Intermediate axis in millimeters)						
	Silt/clay < 0.06	Sand 0.06 – 2	Fine Gravel 2 – 24	Coarse Gravel 25 – 64	Cobble 65 – 255	Boulder 256 – 1096	Bedrock > 1096
Zigzag							
% Habitat							
10-m Transects							
Woody Debris Includes sticks, roots, leaves etc.							
<b>Totals</b>							



- (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 slowly walks upstream from bank to bank using one of the methods above. 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.

**HABITAT CONDITIONS:** Score each habitat condition using the scales provided. Add all of the scores to determine your overall habitat score and integrity rating. Provide additional comments that you feel are important.

Channel sinuosity	The bends in the stream increase the stream length 3-4 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2-3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1-2 times longer than if it was in a straight line.	Channel is straight; waterway has been channelized for a long distance.
	Score	20   19   18   17   16	15   14   13   12   11	10   9   8   7   6
Channel substrate composition	Mixture of substrate materials with gravel and firm sand prevalent. Root mats, vegetation, or other cover also very common.	Mixture of soft sand, mud, or clay; mud may be dominant. Some root mats, vegetation, or other cover present.	All mud, clay, or sand bottom. Little or no root mats, vegetation, or other cover.	Hardpan clay or bedrock; no cover of any kind for aquatic life.
	Score	20   19   18   17   16	15   14   13   12   11	10   9   8   7   6
Channel alterations	Stream has a normal pattern and profile. No channelization, dredging or artificial structures.	Some straightening, artificial embankments or dams present. No evidence of recent alteration activities.	Artificial embankments present on most of the banks; > 50% of the reach is straightened, dredged, or otherwise altered.	Banks stabilized with gabion baskets, concrete, or large rocks; > 80% of the reach has been altered.
	Score	20   19   18   17   16	15   14   13   12   11	10   9   8   7   6

The conditions below are assessed on the right and left banks. The **LEFT** and **RIGHT** sides are determined by looking downstream.

Bank stability	Banks are stable; no evidence of erosion or bank failure; little or no potential for future problems.	Banks are moderately stable; infrequent areas of erosion occur, mostly shown by banks healed over.	Banks are moderately unstable; 60% of the reach has areas of erosion; high potential for erosion during flooding events.	Banks are unstable; many have eroded areas along straight sections or bends; obvious bank collapse or failure; > 60% of the reach has erosion scars.
	Left	10   9   8   7   6	5   4   3	2   1
	Right	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.
	Left	10   9   8   7   6	5   4   3	2   1
	Right	10   9   8   7   6	5   4   3	2   1

<b>Total Score</b>	> 85	85 - 70	69 - 50	< 50
	Optimal	Suboptimal	Marginal	Poor

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

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**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			

Land use comments: \_\_\_\_\_ Pipes? 

Yes	No
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Describe the types of pipes observed and indicate if there is any discharge from the pipes. Also describe the color and odor of the discharge. \_\_\_\_\_

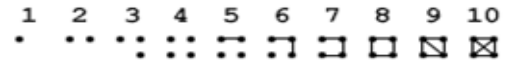
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**PHOTOGRAPH AND SKETCH YOUR REACH:** Use the space below or a separate piece of paper to draw your study reach. Indicate the direction of flow, north, sample locations and important features of the reach. Photographs are an excellent method for tracking changes, especially changes related to the condition of the habitat. Choose a minimum of two permanent locations from which to take your photos. Submit your photos with your survey data sheet.

**BENTHIC MACROINVERTEBRATES**

Assess your macroinvertebrate collections by counting and identifying to the family-level if possible. Use the table to record your collections data. Although streamside identification is possible at this level, WV Save Our Stream's recommends preserving your samples using a full count or standard sub-sampling procedure in a well-lit and more comfortable setting.

The dot-dash tally method is a convenient way to record your data. Each dot or dash represents one tally.



**INSECT GROUPS**

Patterned stoneflies  Taxa <input type="text"/> Total <input type="text"/>	Winter stoneflies  Taxa <input type="text"/> Total <input type="text"/>	Roach-like stonefly  Total <input type="text"/>
Giant stonefly  Total <input type="text"/>	Brown stonefly  Total <input type="text"/>	Spiny crawler mayfly  Total <input type="text"/>
Square-gilled mayfly  Total <input type="text"/>	Minnow mayflies  Taxa <input type="text"/> Total <input type="text"/>	Flatheaded mayfly  Total <input type="text"/>
Brush-legged mayfly  Total <input type="text"/>	Burrowing mayflies  Taxa <input type="text"/> Total <input type="text"/>	Net-spinning caddisflies  Taxa <input type="text"/> Total <input type="text"/>
Case-building caddisflies  Taxa <input type="text"/> Total <input type="text"/>	Free-living caddisfly  Total <input type="text"/>	Common netspinner  Total <input type="text"/>
Dragonflies  Taxa <input type="text"/> Total <input type="text"/>	Damselflies  Taxa <input type="text"/> Total <input type="text"/>	Riffle beetle  Total <input type="text"/>
Long-toed beetle  Total <input type="text"/>	Water penny  Total <input type="text"/>	Other beetles and True bugs  Taxa <input type="text"/> Total <input type="text"/>
Hellgrammite/Fishfly  Total <input type="text"/>	Alderfly  Total <input type="text"/>	Aquatic moth  Total <input type="text"/>

The table continues on the next page.

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Non-biting midge           Total <input type="text"/>	Black fly           Total <input type="text"/>	Crane fly           Total <input type="text"/>
Watersnipe fly           Total <input type="text"/>	Dance fly           Total <input type="text"/>	Dixid midge           Total <input type="text"/>
Net-wing midge           Total <input type="text"/>	Horse fly           Total <input type="text"/>	Other fly larva           Taxa <input type="text"/> Total <input type="text"/>

**NON-INSECT GROUPS**

Crayfish           Total <input type="text"/>	Scud/Sideswimmer           Total <input type="text"/>	Aquatic sowbug           Total <input type="text"/>				
Water mite           Total <input type="text"/>	Operculate snails           Taxa <input type="text"/> Total <input type="text"/>	Non-operculate snails           Taxa <input type="text"/> Total <input type="text"/>				
Pea clam           Total <input type="text"/>	Asian clam           Total <input type="text"/>	Mussel           Total <input type="text"/>				
Flatworms           Total <input type="text"/>	Aquatic worms           Total <input type="text"/>	Leeches           Total <input type="text"/>				
Other aquatic invertebrates           Taxa <input type="text"/> Total <input type="text"/>	Comments: _____ _____ _____ _____					
		<table border="1"> <thead> <tr> <th>Total Taxa</th> <th>Total Number</th> </tr> </thead> <tbody> <tr> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </tbody> </table>	Total Taxa	Total Number	<input type="text"/>	<input type="text"/>
Total Taxa	Total Number					
<input type="text"/>	<input type="text"/>					

Describe other aquatic life (e.g., fish, amphibians) collected or observed, as well as other indications that the reach is being used by other animals (i.e. birds, mammals, reptiles).

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**STREAM METRICS:** The table below is provided to help you score the benthic community within your stream reach. The shaded boxes indicate that multiple **families** are possible; tolerance values are provided.

TV	Macroinvertebrates	Totals	Tolerance score	Number of kinds	TV	Macroinvertebrates	Totals	Tolerance score	Number of kinds
1	Patterned stoneflies				6	Aquatic moth			
2	Winter stoneflies				5	Riffle beetle			
1	Roach-like stonefly				5	Long-toed beetle			
1	Giant stonefly				3	Water penny			
2	Little brown stonefly				5	Whirligig beetle			
3	Spiny crawler mayfly				7	Other beetles/bugs			
5	Square-gilled mayflies				3	Hellgrammite/Fishfly			
4	Minnow mayflies				6	Alderfly			
3	Flatheaded mayfly				9	Non-biting midge			
3	Brush-legged mayfly				6	Black fly			
5	Burrowing mayflies				5	Crane fly			
4	Net-spinning caddisflies				3	Watersnipe fly			
3	Case-building caddisflies				6	Dance fly			
5	Common netspinner				5	Dixid midge			
3	Free-living caddisfly				2	Net-wing midge			
4	Dragonflies				7	Horse fly			
7	Damselflies				8	Other fly larva			
<b>Non-Insect Groups</b>									
5	Crayfish				5	Pea clam			
5	Scud/Sideswimmer				6	Asian clam			
7	Aquatic sowbug				4	Mussel			
6	Water mite				5	Operculate snails			
10	Aquatic worms				7	Non-operculate snails			
10	Leeches				Other invertebrates				
7	Flatworms								
Complete your calculations using the metrics below. These metrics are combined to determine your overall score and integrity rating.	<b>Total Number</b>	<b>Total Tolerance</b>	<b>Total Kinds</b>	Comments: _____ _____ _____					

Metrics	Results	Points	10	8	6	4	2
1 Total Taxa			> 18	18 - 15	14 - 11	10 - 7	< 7
2 CEOT Taxa			> 10	10 - 8	7 - 5	4 - 2	< 2
3 Biotic Index			< 3.5	3.5 - 4.5	4.6 - 5.4	5.5 - 6.5	> 6.5
4 % EPT Abundance			> 80	80 - 70	69.9 - 60	59.9 - 40	< 40
5 % Dominance			< 10	10 - 15	15.1 - 25	25.1 - 50	> 50
6 % Tolerant			< 2	2 - 10	10.1 - 15	15.1 - 20	> 20
<b>Stream Score</b>			<b>Integrity Rating</b>				
			> 48	48 - 36	35 - 24	< 24	
			Optimal	Suboptimal	Marginal	Poor	

**DISCHARGE:** Determine the discharge by using a flow meter (if available) or other methods such as the float method or the velocity head rod method. Discharge should always be measured from a run (area of the channel with fast moving water with no breaks in the surface such as protruding rocks). The more measurements collected the more accurate your discharge results will be. To convert inches into feet, divide by 12. For example, if your depth measurement were 6-inches the result in feet would be 0.5. Indicate the methods chosen to measure the discharge and use the tables to record your results.

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Discharge method used

Float

Velocity Head Rod

Flow meter

Channel width \_\_\_\_\_ feet

Water Level

Low

Normal

High

Dry

Distance (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					

Average Depth \_\_\_\_\_ feet

Cross Sectional Area (CSA) \_\_\_\_\_ ft<sup>2</sup>  
(CSA = Average Depth x Width)

**Discharge = CSA x Velocity**  
 = \_\_\_\_\_ x \_\_\_\_\_  
 = \_\_\_\_\_ cfs (ft<sup>3</sup>/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)** \_\_\_\_\_

Use the table below to determine **VHR velocity** from the rises recorded above. The rises below are in inches.

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

Additional comments: \_\_\_\_\_

Submit an original or clear copy of your survey to the [coordinator](#) at the address provided below.

WV Department of Environmental Protection  
 WV Save Our Streams Program  
 47 School Street, Suite 301  
 Philippi, WV 26416