(**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**) If you use a two-pole **kick-net**, collect a minimum of three benthic macro-invertebrate samples from the best riffle or runs within your stream reach. Use the table on page five to record information about your collections. (**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. Note: A scientific collection permit it required for all benthic collections.

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 _____ E-mail _____
Mailing address _____ Phone number _____

WATER CHEMISTRY: Use the spaces 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. If the condition you observe is not listed, describe it in the comment section.

Water clarity		Water color		Water/Sediment odor			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: _____

Estimate the percentage of your reach that is shaded.

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

CIRCLE YOUR ESTIMATE

WIDTH AND DEPTH: Record the wetted width and depth of the channel's habitats (riffles, runs or pools). Choose two or more channel features to measure. 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

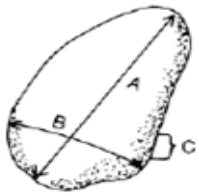
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

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 that were 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							
Totals							

Woody Debris

Includes sticks, roots, leaves etc.



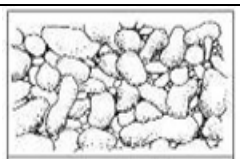
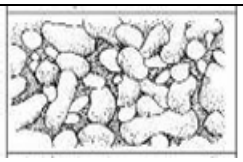
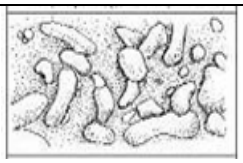
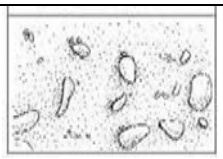
(A) Long axis (**Length**)
(B) Intermediate axis (**Width**)
(C) Short axis (**Height**)

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 onshore 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. Feel free to describe additional features that you feel are important.

Sediment deposition		Little or no formation of depositional features; < 20% of the reach affected.					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.				
Score		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Embeddedness should be evaluated prior to or during your macroinvertebrate collections.

Embeddedness		 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.				
Score		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Riffle frequency		Occurrence of riffles very frequent, making up > 60% of the reach; habitat variety is key in streams with continuous riffles; note the presence and/or absence of bends and other structures.					Occurrence of riffles relatively frequent, making up 40-60% of the reach; bends and/or other structures may provide additional habitat.					Occurrence of riffles infrequent, making up 20-40% of the reach; there are occasional riffles and bends, but the distances between such areas have greatly increased.					Occurrence of riffles < 20%; mostly all flat water throughout the reach; if riffles are present they are generally shallow and have very little cobble.				
Score		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Attachment sites for invertebrates		Well developed riffles and runs; riffles are as wide as the stream and their lengths is twice that of the stream's width; cobble is prevalent, boulders and gravel also may be common.					Riffles are as wide as the stream but their length is less than twice the stream's width; cobble less abundant, gravel, boulders and other substrates maybe more common.					Riffle and runs lacking; if riffles are present they are not as wide as the stream nor is their length twice the stream's width; cobble rare, other substrate (esp. fines) more common.					Riffles and runs virtually nonexistent; large boulders and/or bedrock may be prevalent; or the reach may be mainly flat water throughout with finer sediments.				
Score		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Velocity/depth regimes		All four velocity/depth combinations present; slow-shallow, slow - deep, fast-shallow and fast-deep.					3 of 4 velocity/depth combinations present; fast currents generally dominate (score lower if they are absent).					2 of 4 velocity/depth combinations present (score lower if fast current areas are absent).					Stream reach dominated by one velocity/depth regime (usually slow-shallow or slow-deep).				
Score		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Channel flow status		Water reaches the base of both lower banks, and a minimal amount of channel substrate is exposed.					Water fills > 75% of the channel; < 25% of the channel substrate is exposed.					Water fills 25-75% of the channel; much of the riffle areas are exposed.					Very little water in the channel; mostly present as only standing pools.				
Score		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Channel alterations		Stream straightening, dredging, artificial embankments, dams, bridge abutments etc. absent or minimal; stream has a natural pattern.					Some type of channel alteration present, usually in areas of bridge abutments; no evidence of recent channel alterations.					Artificial embankment structures present, at least to some extent, on both sides of the stream; 40-80% of the reach has been altered.					Stream banks are shored with gabions, rip/rap, cement etc.; > 80% of the reach has been disrupted.				
Score		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Continue your assessment on the next page

The last three conditions are assessed on both sides of the channel.

Bank vegetative protection		> 90% of the banks are covered by natural vegetation; all levels (trees, shrubs and herbs) represented; disruption from grazing, mowing etc. minimal or absent; all plants allowed to grow naturally.		70-90% of the banks covered by natural vegetation; one level of plants may be missing or not well represented; some disruption of vegetation evident; > 50% of the potential plant height remains.			50-70% of the banks covered by natural vegetation; patches of bare soil may be present and closely cropped vegetation is common; < 50% of the potential plant heights remains.			< 50% of the banks covered by natural vegetation; disruption is high; vegetation has been removed or the potential plant heights are greatly reduced.	
Left		10	9	8	7	6	5	4	3	2	1
Right		10	9	8	7	6	5	4	3	2	1
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 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; > 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

Total Score		Excellent	Very good	Good	Marginal	Poor
		> 170	170 - 150	149 - 120	119 - 90	< 90
		Optimal	Suboptimal		Marginal	Poor

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.

Habitat comments: _____

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					

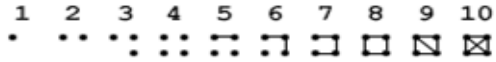
Land use comments: _____ Pipes? Yes | No

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. _____

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 **below** 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 ☐ Total ☐	Winter stoneflies Taxa ☐ Total ☐	Roach-like stonefly Total ☐
Giant stonefly Total ☐	Brown stonefly Total ☐	Spiny crawler mayfly Total ☐
Square-gilled mayfly Total ☐	Minnow mayflies Taxa ☐ Total ☐	Flatheaded mayfly Total ☐
Brush-legged mayfly Total ☐	Burrowing mayflies Taxa ☐ Total ☐	Net-spinning caddisflies Taxa ☐ Total ☐
Case-building caddisflies Taxa ☐ Total ☐	Free-living caddisfly Total ☐	Common netspinner Total ☐
Dragonflies Taxa ☐ Total ☐	Damselflies Taxa ☐ Total ☐	Riffle beetle Total ☐
Long-toed beetle Total ☐	Water penny Total ☐	Other beetles (true bugs) Taxa ☐ Total ☐
Hellgrammite/Fishfly Total ☐	Alderfly Total ☐	Aquatic moth Total ☐

CONTINUE ON THE NEXT PAGE

Non-biting midge Total	Black fly Total	Crane fly Total
Watersnipe fly Total	Dance fly Total	Dixid midge Total
Net-wing midge Total	Horse fly Total	Other fly larva Taxa Total

NON-INSECT GROUPS

Crayfish Total	Scud/Sideswimmer Total	Aquatic sowbug Total
Water mite Total	Operculate snails Taxa Total	Non-operculate snails Taxa Total
Pea clam Total	Asian clam Total	Mussel Total
Flatworms Total	Aquatic worms Total	Leeches Total
Other aquatic invertebrates Taxa Total	Comments:	

Total Taxa	Total Number

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).

BIOLOGICAL INTEGRITY

The SHADED boxes indicate that multiple **FAMILIES** are possible; tolerance values (TV) 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				4	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			
	Non-Insect Groups								
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.

Total Number	**Total Tolerance**	**Total Kinds**

Comments: _____

BSVs	**Metrics**	Results	Points	**10**	**8**	**6**	**4**	**2**
18	Total Taxa			> 18	18 - 15	14 - 11	10 - 7	< 7
10	EPT Taxa			> 10	10 - 8	7 - 5	4 - 2	< 2
3.00	Biotic Index			< 3.5	3.5 – 4.5	4.6 – 5.4	5.5 – 6.5	> 6.5
90.0	% EPT Abundance			> 80	80 - 70	69.9 - 60	59.9 - 40	< 40
80.0	% Dominance			< 10	10 - 15	15.1 - 25	25.1 - 50	> 50
2.0	% Tolerant			< 2	2 - 10	10.1 - 15	15.1 - 20	> 20

Stream Score _____

Integrity Rating

> 48	48 - 36	35 – 24	< 24
Optimal	Suboptimal	Marginal	Poor

Best standard values (BSVs) are determined from reference conditions. These are used to calculate metric scores on a 0-100 scale. WV Save Our Streams can provide methods and tools for making these calculations. Email saveourstreams@wv.gov for more information.

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** (VHR). Discharge is 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 was 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. Use the table to record your measurements.

Discharge method used

Float	Velocity Head Rod	Flow meter

Water Level

Low	Normal	High	Dry

Channel width _____ feet

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^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) _____

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

Submit the original or a clear copy of your survey to the **Citizen's Monitoring Coordinator**. The information will be reviewed and returned; however, it may take a month or more for survey reviews to be completed. Always keep a copy of your own records.

For more information go to: https://go.wv.gov/sos