Save Our Streams
A citizens volunteer stream monitoring program

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 ELK RIVER Survey date 09-12-08
Watershed ELK RIVER County WEBSTER
Latitude 38-28-39 Longitude 80-24-49 Directions BAKER ISLAND PARK, JUST OFF ROUTE 20 IN WEBSTER SPRINGS
Start/end times
Survey completed by WEBSTER COUNTY HS 9TH GRADE 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)	20	C	Conductivity			Alkalinity		
Dissolved oxygen	8.0	PPM	Nitrates	0.5	PPM	Iron		
pH	8.1		Turbidity	< 10	NTUs	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 odor	Water	Sediment	Surface foam	
Clear	X	None	X	None		X	None	
Murky		Brown		Fishy	X		Slight	X
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	X	Brown	X
Dark green	X	Scattered		**Hairy**	X	Black	
Brown	X	Moderate	X	Matted		Green	
Other (describe)		Heavy		Floating		White/gray	
						Orange/red	

Physical condition comments:

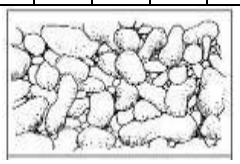
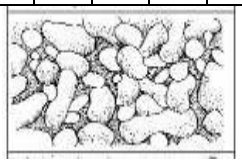
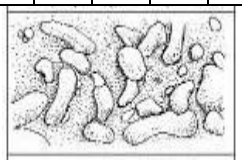
Weather (today and past 48-hours) VERY DRY AND HOT

Estimate 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). Determine 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.

1.	Riffle	Wetted Width (feet)	15	Depth (feet)	0.5
2.	Run	Wetted Width (feet)	19	Depth (feet)	0.9
3.	Pool	Wetted Width (feet)	27	Depth (feet)	1.9

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

		20 19 18 17 16	15 14 13 12 11	10 9 8 7 8	5 4 3 2 1
Embeddedness EVALUATED 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.
	13	**O**ptimal	**S**uboptimal	**M**arginal	**P**oor
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.
	13	**O**ptimal	**S**uboptimal	**M**arginal	**P**oor

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
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.
Left 7 Right 4		**O**ptimal	**S**uboptimal	**M**arginal	**P**oor
Riparian buffer width		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.
Left 2 Right 1		**O**ptimal	**S**uboptimal	**M**arginal	**P**oor

Totals	**40**	> 65	65 – 50	49 – 35	< 35
		Optimal	Suboptimal	Marginal	Poor

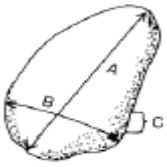
Habitat condition comments: PARK IS WELL MAINTAINED, WHICH INCLUDES MOWING. THE RIPARAIN AREAS ARE NOT ALLOWED TO DEVELOP AND BANK VEGETATION IS ALSO CROPPED.

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: 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	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
	10	Fine 15	Coarse 30	30	15		

Riffle only [X] 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. 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.

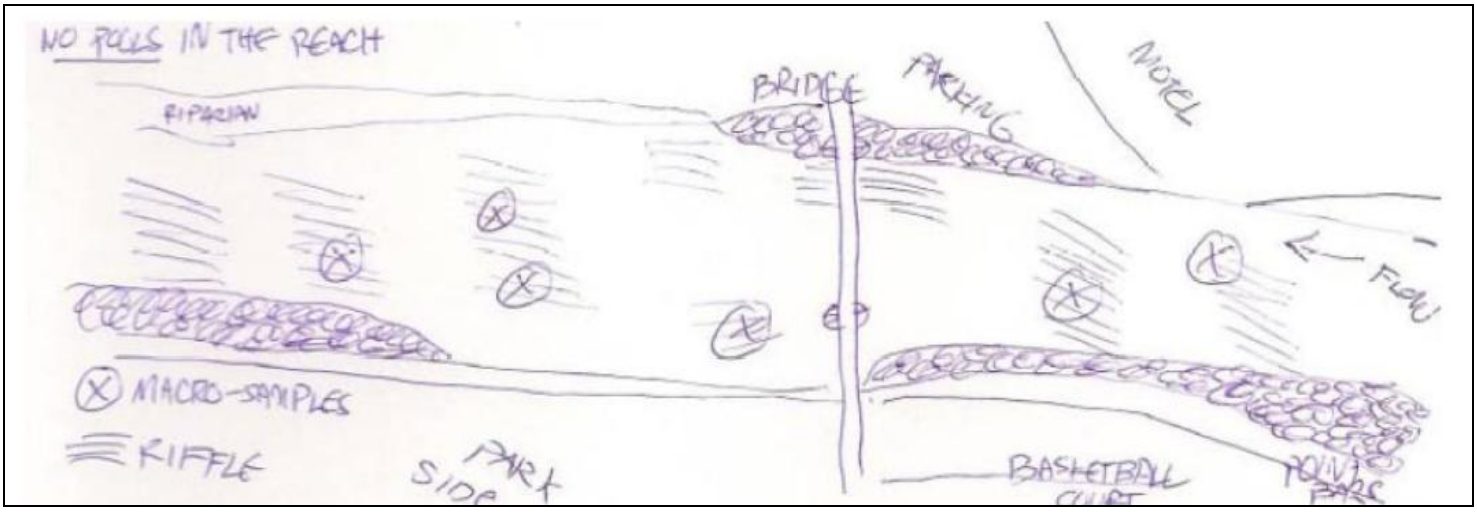
LAND USE: Indicate the land uses that you believe may be having an impact on your stream station. Use the letters (**S**) streamside, (**M**) within ¼ mile and (**W**) somewhere in the watershed, to indicate the approximate location of the disturbance and the numbers (**1**) slight, (**2**) moderate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

Active construction			Pastureland			Single-family residences	2	M
Mountaintop mining			Cropland			Sub-urban developments		
Deep mining			Intensive feedlots			Parking lots, strip-malls etc.	2	S
Abandoned mining			Unpaved Roads			Paved Roads	2	M
Logging			Trash dumps			Bridges	2	S
Oil and gas wells			Landfills			Other (describe)		
Recreation (parks, trails etc.)	3	S	Industrial areas					

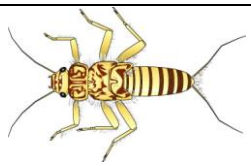
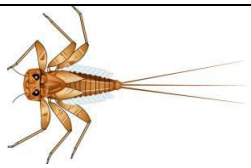
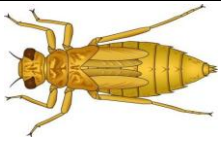
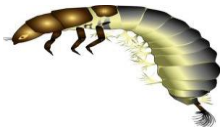
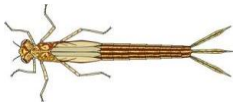
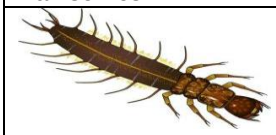
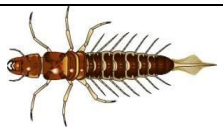
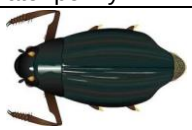
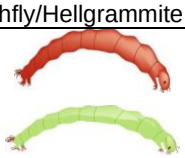
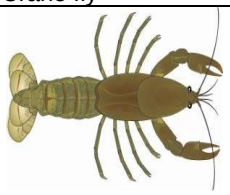
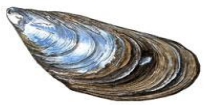
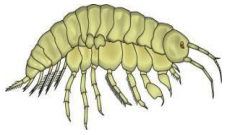
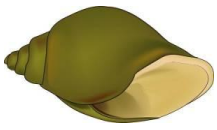
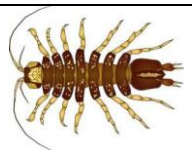
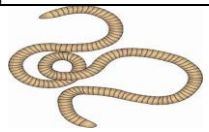
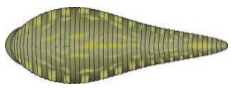
Pipes? **Yes** No

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 PROBABLY STORMWATER PIPES; THERE WAS NO DISCHARGE; ABUNDANT PAVED SURFACES NEARBY

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.



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

 Stoneflies	C 3	 Mayflies	C 4	 Caddisflies	Case-builders R 1
 Dragonflies	C 1	 Common netspinner	C	 Caddisflies	Net-spinners C 1 / Free-living
 Damselflies		 Riffle beetle	R	 Water penny	C
 Fishfly/Hellgrammite	C	 Alderfly		 Other Beetles/Bugs	Beetles / True bugs
 Midges	C	 Black fly		 Crane fly	
 Watersnipe fly	C	 Other True flies		 Crayfish	A
 Clams		 Mussel		 Scud/Sideswimmer	
 Operculate snails		 Non-operculate snails		 Aquatic sowbug	
 Aquatic worm	R	 Leech		 Flatworm	

Other aquatic life observed or collected: COLLECTED THE ELK RIVER CRAYFISH (CAMBARUS ELKENSIS). OBSERVED SEVERAL KINDS OF SHINERS AND DARTERS.

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**) and follow the instructions below to complete all calculations. Note: The **SHADING** indicates that multiple kinds are possible within the group.

1. **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.
2. **Total Taxa**: Calculate the total number of kinds.
3. **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**.

BENTHIC MACROINVERTEBRATES	Abundance	Tolerance Value	Tolerance Score	Number of Kinds
Stoneflies (Order Plecoptera)	3	2	6	3
Mayflies (Order Ephemeroptera)	3	3	9	4
Case-building caddisflies (Order Trichoptera)	1	3	3	1
Net-spinning caddisflies (Order Trichoptera)	3	4	12	1
Common netspinner (Family Hydropsychidae)	3	5	15	1
Free-living caddisfly (Family Rhyacophilidae)		3		
Dragonflies (Sub-order Anisoptera)	3	4	12	1
Damselflies (Sub-order Zygoptera)		7		
Riffle beetle (Family Elmidae)	1	4	4	1
Water penny (Family Psephenidae)	3	3	9	1
Other Beetles (Order Coleoptera)		6		
True Bugs (Order Hemiptera)		8		1
Hellgrammite (Family Corydalidae)	3	3	9	
Alderfly (Family Sialidae)		6		1
Non-biting midge (Family Chironomidae)	3	8	24	
Black fly (Family Simuliidae)		6		
Crane fly (Family Tipulidae)		4		1
Watersnipe fly (Family Athericidae)	3	3	9	
Other True flies (Order Diptera)		7		
Water mite (Order Hydrachnida)		6		1
Crayfish (Order Decapoda)	6	5	30	
Sideswimmer (Order Amphipoda)		5		
Aquatic sowbug (Order Isopoda)		7		
Operculate snails (Sub-class Prosobranchia)		5		
Non-operculate snails (Sub-class Pulmonata)		7		
Clams (Order Veneroida)		6		
Mussel (Family Unionidae)		4		1
Aquatic worm (Class Oligochaeta)	1	10	10	1
Leech (Class Hirudinea)		10		
Flatworm (Class Turbellaria)		7		
Other invertebrates (describe)	Total Abundance		Total Tolerance	Total Taxa (# OF KINDS)
	36		152	18

Metrics	Results	Points	10	8	6	4	2
1. Total Taxa	18	8	> 18	18 - 15	14 - 11	10 - 7	< 7
2. EPT Taxa	10	8	> 10	10 - 8	7 - 5	4 - 2	< 2
3. Biotic Index	4.22	8	< 3.5	3.5 – 4.5	4.6 – 5.4	5.5 – 6.5	> 6.5

STREAM SCORE	24

Integrity Rating Scale

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

Tolerance values (TVs): TVs are general numbers that represent the tolerance of most of the group. It should be noted that tolerance ranges vary for certain Mayflies (a few kinds range from 4-5), Beetles (a few kinds are 5), other True flies (a few kinds are 6; Net-wing midge TV = 2) and Operculate snails (a few kinds are less than 5).

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 discharge results will be; however, 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
	X	

Water Level

Low	Normal	High	Dry
X			

Channel width 15 feet

Tape positions (ft)	Depth (ft)	Velocity (ft/sec)	VHR (Rise-inches)	Float (sec)	Discharge (cfs)
1	2.4" = 0.2 ft	3.1	1 ¾		
2	10.8" = 0.9 ft	2.8	1 ½		
3	7.2" = 0.6 ft	3.3	2		
4	6.0" = 0.5 ft	2.6	1 ¼		
5	1.2" = 0.1 ft	1.2	¼		
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
Totals/Averages	0.46	2.6			

Cross Sectional Area (CSA) 6.9 ft^2

(CSA = Average Depth x Width)

Discharge = CSA x Velocity

= 6.9 x 2.6

= 17.9 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

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 57th Street, SE
Charleston, WV 25304

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