Required

HBRW Tiers 2 & 3

Physical Survey / Habitat Assessment

* Note: As you collect your sample, check for crayfish. Crayfish should be released but numbers recorded here:
rep 1_____crayfish released
rep 2_____crayfish released

Assess a 200 foot segment up & downstream from your sample site

School/Group_____ River/Stream_____
Survey Site_____ Survey Date & Time_____
Name of person(s) completing survey_____

Weather: Today_____ ***Temperature:*** Air_____°C
Past 2 days_____ Water_____°C

Sampling Site Type (Select one from each row)									
Stream Size	Headwater Tributaries			Creeks and Streams			Larger Rivers		
Gradient	FAST (primarily riffle)			VARIED (pools and riffles)			SLOW (low gradient)		
Surrounding Land Use	Forested		Agricultural		Residential			Urban	
	dense	sparse	pasture-land	crop-land	rural	village	suburban	Resi-dential	commercial/ industrial

Stream Width: The stream is on average _____ meters wide and _____meters deep.

Water Level: Compared to the height of the stream channel, the water level seems relatively: ☐ high ☐ medium ☐ low

Water Appearance/Odor:

Turbidity substantially greater than natural conditions: ☐ Yes ☐ No

Describe_____

Oily film, grease globules, or unusual odor or color present ☐ Yes ☐ No

Describe:_____

Algae or Weed Growth: Substantially greater than natural conditions: ☐ Yes ☐ No

Describe_____

Upstream Dam: ☐ Yes ☐ No How far upstream: _____

Average Velocity of Sampling Site:

0.45 – 0.75 m/sec is optimal for BMI collection

Average time it takes to flow 3 meters:
a) 3 m / _____sec = v1 _____
b) 3 m / _____sec = v2 _____
AVERAGE: _____ m/sec

Average Depth of Sampling Site: _____meters

Assessment Factors: Circle the box that best applies for each assessment factor.

Assessment Factor	Excellent	Good	Fair	Poor
Riffle size	Well-developed riffle, as wide as stream & as long as 2x stream width	Riffle as wide as stream but riffle length less than 2x stream width	Riffle not as wide as stream and length less than 2x stream width	Riffles or run virtually nonexistent
Substrate size (at BMI collection site)	Cobble predominates; boulders, gravel common	Cobble less abundant; boulders and gravel common	Gravel, boulders or bedrock prevalent; some cobble	Large boulders and bedrock or sand & silt prevalent; cobble lacking
Shelter for fish	Snags, submerged logs, undercut banks, or other stable habitat are found in over 50% of the site	Snags, submerged logs, undercut banks, or other stable habitat are found in 30-50% of the site	Snags, submerged logs, undercut banks, or other stable habitat are found in 10-30% of the site	Snags, submerged logs, undercut banks, or other stable habitat are found in less than 10% of the site
Embeddedness (at BMI collection site)	Rocks in stream <25% embedded; very little sand, silt, or mud	Rocks 25-50% embedded; can easily turn over rocks	Rocks 50-75% embedded and firmly stuck in sediments	Rocks >75% embedded; bottom mostly sand, silt, or mud
Flow pattern (deep is > 2 ft)	All 4 patterns present: slow/deep, fast/shallow,fast/deep, slow/shallow	Only 3 of 4 flow patterns present	Only 2 of 4 flow patterns present	Dominated by 1 flow pattern
Channel alteration	Stream straightening, dredging, artificial embankments, dams or bridge abutments absent or minimal; stream with meandering pattern	Some stream straightening, dredging, artificial embankments, or dams present, usually near bridge abutments; no recent channel alteration	Artificial embankments present to some extent on both banks; and 40-80% of stream site straightened, dredged, or otherwise altered	Banks shored with gabion or cement; over 80% of the stream site straightened and disrupted
Stream bank cover and stability *	Banks stable; no evidence of erosion; bank covered by vegetation or rock	Moderately stable; small areas of erosion; most of bank covered by vegetation or rock	Largely unstable; almost half of bank has areas of erosion or is not covered by vegetation or rock	Unstable, eroded; less than half of bank covered by vegetation or rock, or rock slumping into creek
Disruption of riparian bank coverage* (land bordering stream bank)	Mature trees and vegetation; most growing naturally; no disturbance by forestry, grazing, or mowing	Trees, woody plants, soft green plants dominate; some disruption but not affecting full plant growth potential	Obvious disruption; patches of bare soil, cultivated fields or closely cropped vegetation are the norm	Not much natural vegetation left or it has been removed to 3" or less in height
Width of riparian vegetation zone*	More than 35 yards wide; human activities have not impacted zone	Zone 12-35 yards wide; marginal impact from human activities	Zone 6-12 yards wide; impact from human activities evident	Zone less than 6 yards wide; lots of nearby human activities
Litter	No litter (metal or plastic) in area	Very little litter; accidentally dropped	Litter fairly common; purposely dropped	Lots of litter present; obviously dumped

*if the two banks are very different, assess the worst side

Given the assessment above, how would you rate your habitat overall? _____

Describe how land uses / human activities may be impacting the stream.

HBRW Tier 3

Stream Bottom Survey

Evaluate your specific BMI collection site (riffle area)

School/Group_____ River/Stream_____
Survey Site_____ Survey Date & Time_____
Name of person(s) completing survey_____

1. Set up 2-4 transects across the stream, in riffle habitats.
2. Starting at the water' s edge, take one step at a time toward the opposite bank. With each step, reach over the toe of your wader with your forefinger without looking down and feel the substrate material closest to your large toe (could be mud or sand; does not have to be a rock). Pick it up (if possible), measure its size, and mark a tally in the appropriate column in the "Substrate Size Table" below.
3. If the substrate is a cobble, be careful as you pick it up out of the stream bottom so you can estimate how much it is covered up by silt or sand. Feel with your fingers for the edge of the cobble where it emerges from the silt or sand, and keep your fingers on that edge as you pick it up. Often there will be a "bathtub ring" line on the cobble where the level of the silt or sand was. There is also often algae growing on the top surface of the cobble down to that line. Estimate the percentage that the cobble is embedded and check the appropriate box in the "Cobble Embeddedness Table" below.
4. Continue until you have sampled approximately 50 substrate sizes and 20 cobbles.
5. In the "Substrate Size Table," total the tallies for each substrate type and record these numbers in the second row. Calculate the percentage of each substrate size by dividing the number of tallies by the total number (this should be approximately 50) and multiplying by 100.

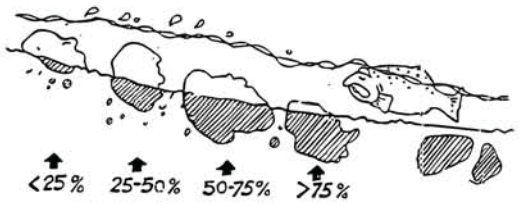
Substrate Size Table

Substrate Type	**Silt/Clay/Mud** (makes the water cloudy if disturbed)	**Sand (up to 0.1″)**	**Gravel (0.1-2″)**	**Cobbles (2-10″)**	**Boulders (>10″)**	**Bedrock** (solid rock covers stream bottom)
Tallies						
# of Tallies						
Percentage						

Cobble Embeddedness Table

Cobble #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
0-25%																				
25-50%																				
50-75%																				
75-100%																				

50% embeddedness indicates doubtful habitat for many macroinvertebrates, trout, and egg survival



Based on your results, estimate the average embeddedness of the whole site:

Average Embeddedness: _____ %
(record on physical survey/habitat assessment form)

HBRW Tiers 2 & 3

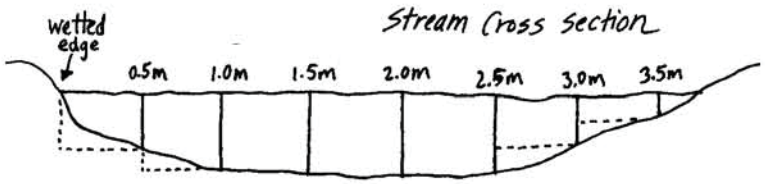
Flow Worksheet

School/Group_____ River/Stream_____ Site_____

Name of person(s) measuring flow_____ Date & Time_____

Area of the Stream's Cross-Section:

1. Stretch a tape measure from wetted edge to wetted edge.
2. At 0.5 meter intervals, across the entire width of the stream, measure the depth (in meters) and record in the table at right. (If stream is more than 10.5m wide, measure in 1m intervals).
3. Each segment you measured is like a small rectangle (see diagram below). The area of each rectangle equals its depth times its width. Since the width of each rectangle is 0.5 meter, the area of each rectangle is 0.5 times its depth, in square meters.



interval (m)	depth (m)	interval (m)	depth (m)
wetted edge	0	5.5	
0.5		6.0	
1.0		6.5	
1.5		7.0	
2.0		7.5	
2.5		8.0	
3.0		8.5	
3.5		9.0	
4.0		9.5	
4.5		10.0	
5.0		10.5	

4. The total cross section area of the stream is estimated by adding up the areas of all the rectangles. This is the same as adding up all the depths you measured and multiplying by 0.5. Record your total cross section area estimate in the box at right. (If measured at 1m intervals, simply add the depths).

Sum of depths _____

x .5 =

Total Cross Section Area _____

Velocity of the Stream's Water:

1. Record the distance of the marked course in the space below.
2. Record the number of seconds it takes the float to travel the marked course. Do this 9 times (3 times on the left side of the stream, 3 times in the center, and 3 times on the right side) and record the average time.
3. Calculate the average velocity by dividing the distance of the course by the average time. Convert to underwater velocity by multiplying by 0.85.

	Left side	
	Center	
	Right side	
	SUM:	
	Avg. Time: (sum/9)	sec.

Distance (_____ m) / **Average Time** _____ sec) X 0.85 = **Average Underwater Velocity** _____ m/sec

Flow:

The flow, or discharge of the stream, is the volume of water that moves past a site in a certain amount of time. Calculate the flow by multiplying the total cross section area by the average underwater velocity.

Average Velocity _____ m/sec **x** **Cross Section Area** _____ m^2 = **FLOW** _____ m^3/sec **x 35.32 =** **Compare to USGS Data** _____ ft^3/sec

HBRW All Tiers

Site Drawing:

Draw a "bird's-eye" sketch of your 200' long river segment up and downstream from your sampling site, recording:

1. Your sampling sites—include where you collected chemical and BMI samples, and measured velocity and cross section area.
2. Direction of water flow—indicate with arrows.
3. Location and orientation of any photos taken.
4. In-stream habitat—riffles, pools, runs, large woody debris, boulders, organic material, aquatic plants, overhanging vegetation, etc.
5. Streambanks—steep & gently sloping areas, naturally vegetated, bare, eroding, clear-cut, or mowed areas, artificially protected areas, etc.
6. Channel—wide & narrow areas, meanders, shaded & exposed areas, unnatural alterations, dams, culverts, etc.
7. Human land uses—roads, houses, driveways, parking lots, storm drain pipes, sewage pipes, factories, farms, livestock crossings, recreational use, logging, etc.

Required

Sampling Site Description: Describe exactly where you collected chemical and BMI samples and measured velocity and cross section area: