



MPCA STREAM HABITAT ASSESSMENT (MSHA) PROTOCOL FOR STREAM MONITORING SITES

I. PURPOSE

To describe the methods used by the Minnesota Pollution Control Agency's (MPCA) Biological Monitoring Program to collect qualitative physical habitat information at stream monitoring sites for the purpose of assessing water quality and developing biological criteria.

II. SCOPE/LIMITATIONS

This procedure applies to all river and stream monitoring sites for which an integrated assessment of water quality is to be conducted. An integrated assessment involves the collection of biological (fish and macroinvertebrate communities), physical habitat, and chemical information to assess stream condition.

III. GENERAL INFORMATION

Sites may be selected for assessment for a number of reasons including: 1) sites randomly selected for condition monitoring as part of the Environmental Monitoring and Assessment Program (EMAP), 2) sites selected for the development and calibration of biological criteria, and 3) sites selected to evaluate a suspected source of pollution. Although the reasons for monitoring a site vary, the MSHA protocol described in this document applies to all monitoring sites unless otherwise noted.

IV. REQUIREMENTS

- A. Qualifications of crew leaders: The crew leader must be a professional aquatic biologist with a minimum of a Bachelor of Science degree in aquatic biology or closely related specialization. He or she must have a minimum of six months field experience in physical habitat sampling methodology. Field crew leaders should also possess excellent map reading skills and a demonstrated proficiency in the use of a GPS (Global Positioning System) receiver and orienteering compass.
- B. Qualifications of field technicians/interns: A field technician/intern must have at least one year of college education and coursework in environmental and/or biological science.
- C. General qualifications: All personnel conducting this procedure must have the ability to perform rigorous physical activity. It is often necessary to wade through streams and/or wetlands, canoe, or hike for long distances to reach a sampling site.

V. RESPONSIBILITIES

- A. Field crew leader: Implement the procedures outlined in the action steps and ensure that the data generated meets the standards and objectives of the Biological Monitoring Program.
- B. Technicians/interns: Implement the procedures outlined in the action steps, including maintenance and stocking of equipment, data collection and recording.

VI. QUALITY ASSURANCE AND QUALITY CONTROL

Compliance with this procedure will be maintained through annual internal reviews. Technical personnel will conduct periodic self-checks by comparing their results with other trained personnel.

In addition to adhering to the specific requirements of this sampling protocol and any supplementary site specific procedures, the minimum QA/QC requirements for this activity are as follows:

- A. Control of deviations: Deviation shall be sufficiently documented to allow repetition of the activity as performed.
- B. QC samples: Ten percent of sites sampled in any given year are resampled as a means of determining sampling error and temporal variability.
- C. Verification: The field crew leader will conduct periodic reviews of field personnel to ensure that technical personnel are following procedures in accordance with this SOP.

VII. TRAINING

- A. All inexperienced personnel will receive instruction from a trainer designated by the program manager. Major revisions in this protocol require that all personnel be re-trained in the revised protocol by experienced personnel.
- B. The field crew leader will provide instruction in the field and administer a field test to ensure personnel can execute this procedure.

VIII. ACTION STEPS

- A. Equipment list: Verify that either a form and pencil, or a field computer is present before commencement of this procedure.
- B. Data collection method: The location and length of the sampling reach is determined during site reconnaissance (see SOP--“*Reconnaissance Procedures for Initial Visit to Stream Monitoring Sites*”). Unless otherwise instructed, observations of physical habitat characteristics should be limited to the sampling reach. Sampling is conducted during daylight hours within the summer index period of mid-June through mid-September. Sampling should occur when streams are at or near base-flow. The habitat evaluation is conducted immediately after fish sampling in order to provide the evaluator a perspective of the fish habitat within the reach.

Habitat characteristics are recorded using a qualitative, observation based method (modified from: Rankin 1989. The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application. Ohio EPA, Division of Water Quality Planning and Assessment, Ecological Analysis Section, Columbus, Ohio.). The Ohio QHEI is a physical habitat index designed to provide an empirical evaluation of the lotic macrohabitat characteristics that are important to fish communities and which are generally important to other aquatic life. Although similar to the Ohio QHEI, the MSHA has been modified to more adequately assess important characteristics influencing Minnesota streams. The MSHA incorporates measures of watershed land use, riparian quality, bank erosion, substrate type and quality, instream cover, and several characteristics of channel morphology.

Observations are recorded on the **MPCA Stream Habitat Assessment Worksheet**. A copy is attached and guidelines for filling out this data sheet are described in the following pages.

C. MPCA Stream Habitat Assessment Data Sheet

This data sheet describes the presence and abundance of instream and riparian characteristics within the sampling reach. The variables recorded are as follows:

C.1. Stream Documentation

- A) *Stream* – The name of the stream as shown on the most recent USGS 7.5” topographic map. Include all parts of the name (i.e. South Branch Wild Rice River).
- B) *County* – The county in which the station is located.

- C) *Date* – The date habitat sampling is conducted in month/day/year format (MM/DD/YY).
- D) *Field Number* – A seven-digit code that uniquely identifies the station. The first two digits identify the year of sampling, the second two identify the major river basin, and the last three are numerically assigned in sequential order (example: 02UM001).
- E) *Person Scoring* – The personnel completing the MSHA. This person(s) should have walked or boated the entire stream reach paying particular attention to habitat features.
- F) *Site Location* – A general description of where the sampling station is located. Usually includes the nearest road crossing and town. For example, “0.5 mi. downstream of C.R. 30, 4 mi. SW of Northome”.

C.2. Surrounding Land Use: Record the predominant land use on each bank within approximately 2 to 3 square miles, not just the surrounding area of the site. The emphasis should be on upstream land use. Check either the most predominant land use, or choose two and average the scores. A land use or aerial map can be used for this assessment if available. Land use categories are as follows:

Forest, Wetland, Prairie, Shrub: Land that is dominated by trees, low-lying areas saturated with water, grasses and forbs, or woody vegetation less than 3 m. in height.

Old Field/Hay Field: Land that is used for agricultural purposes other than row crops or pasture.

Fenced Pasture: Land that is regularly grazed by livestock, but is fenced to prevent livestock from entering streams.

Conservation Tillage, No Till: Land that is currently in agricultural production, but retains the vegetative material from the previous year’s crop to protect the soil.

Residential/Park: Land that has been modified for residential use (i.e. backyards, city parks).

Urban/Industrial: Land that has been modified for commercial or industrial use (i.e. parking lots, malls).

Open Pasture: Land that is regularly grazed by livestock, but is not fenced to prevent livestock from entering streams.

Row Crop: Land that is currently in intensive agricultural production, and doesn’t use any conservation tactics (i.e. corn, soybeans, beets, potatoes).

C.3. Riparian Zone (Check the most appropriate category for each bank)

- A) *Riparian Width* – Estimate the width of the undisturbed vegetative zone adjacent to the stream. Beneficial vegetation types include stable grasses, trees, and shrubs with low runoff potential. Disturbed vegetation is not included in the riparian width (i.e. mowed grass).
- B) *Bank Erosion* – Estimate the percentage of the stream bank that is actively eroding. To be considered as erosion, the banks must be actively eroding through break down, soil sloughing, or false banks. False banks are natural banks that have been cut back, usually by livestock trampling.
- C) *Shade* – Estimate the percentage of overhead canopy cover that is shading the stream channel. Professional judgment may be required to rate stream shading characteristics in larger streams and rivers as 100% shade cover would not be expected in these systems even in the absence of disturbance. The general intent of the rating is to evaluate the condition of stream canopy characteristics.

C.4. Instream Zone

- A) *Substrate* – Document the two predominant substrate types for each channel type present within the reach. One substrate type may be recorded where > 80% of the channel is dominated by a single substrate type. For

each channel type present within the reach, estimate the percent of the stream channel represented by that channel type. The percentages should add up to 100. For example, if the majority of your reach was a run, with a few pools and one riffle, the percentage could be 75% run, 20% pool, and 5% riffle. The definitions for each channel and substrate type are as follows:

Channel Types

Pool: Water is slow and generally deeper than a riffle or run. Water surface is smooth, no turbulence. A general rule that can be used to distinguish a pool from a run or riffle is if two or more of the following conditions apply; the stream channel is wider, deeper, or slower than average.

Riffle: Higher gradient areas where the water is fast and turbulent, water depths are relatively shallow, and substrates are typically coarse. Water surface is visibly broken.

Run: The water may be moderately fast to slow but the water surface typically appears smooth with little or no surface turbulence. Generally, runs are deeper than a riffle and shallower than a pool.

Glide: Similar to a run, but where there is no visible flow and the channel is too shallow for a pool. Examples include a channelized stream with a uniform depth and flow. This term should not be used in conjunction with pools, riffles, and runs in a natural stream setting.

Substrate Types

Boulder: Large rocks ranging from 250 mm to 4000 mm in diameter (basketball to car size).

Cobble: Rocks ranging in diameter from 64 mm to 250 mm (tennisball to basketball).

Gravel: Rocks varying in diameter from 2 mm to 64 mm (BB to tennisball).

Sand: Inorganic material that is visible as particles and feels gritty between the fingers, 0.06 to 2.0 mm in size.

Clay: Very fine inorganic material. Individual particles are not visible or are barely visible to the naked eye. Will support a person's weight and retains its shape when compacted.

Bedrock: A solid slab of rock, > 4000 mm in length (larger than a car).

Silt: Fine inorganic material that is typically dark brown in color. Feels greasy between fingers and does not retain its shape when compacted into a ball. A person's weight will not be supported if the stream bottom consists of silt.

Muck: A fine layer of black completely decomposed vegetative organic matter.

Detritus: Decaying organic material such as macrophytes, leaves, finer woody debris, etc. that may appear similar to silt when very fine.

Sludge: A thick layer of organic matter of animal or human origin, often originating from wastewater.

- B) *Embeddedness* – Indicate the percentage to which coarse substrates are surrounded by or covered with fine sediments throughout the reach. Coarse substrates consist of gravel, cobble, and boulders. An embeddedness rating of 0% corresponds to very little or no fine sediments surrounding coarse substrates. Coarse substrate material completely surrounded and covered with sediment is considered 100% embedded. If coarse substrates are not present in the reach, check “no coarse substrate”.
- C) *Substrate Types* – Record the number of substrate types present within the reach, either less than or equal to 4, or greater than 4.

- D) *Water Color* – Record the predominant color of the water by checking the appropriate category. Definitions are as follows:

Clear: Water is transparent, and objects are clearly visible underwater.

Stained: Water is colored due to minerals in the water, but objects are still visible.

Turbid: Water is colored and not transparent; brown due to silt, green due to algae, or other.

- E) *Cover Type* – Indicate the types of cover available to fish within the reach (check all that apply). Cover for fish consists of objects or features dense enough to provide complete or partial shelter from the stream current or concealment from predators or prey. In order to be considered cover, the water depth must be at least 10 cm where the cover type occurs. Definitions are as follows:

Undercut Banks: Stream banks where the stream channel has cut underneath the bank. The bank could overhang the water surface when water levels are low. The undercut bank must overhang (horizontally) the wetted stream channel a minimum of 15 cm and the bottom of the undercut bank must be no more than 15 cm above the water level in order to be considered cover for fish.

Overhanging Vegetation: Terrestrial vegetation overhanging the wetted stream channel. Vegetation must be no more than 15 cm above the water level to be considered cover for fish.

Deep Pools: Area where the channel is particularly deep, often near a bend.

Logs or Woody Debris: Logs, branches, or aggregations of smaller pieces of wood in contact with or submerged in water.

Boulders: Large rocks as described under *Substrate Types*.

Rootwads: Aggregation of tree roots that extend into the stream.

Emergent Macrophytes: Vascular plants that typically have a significant portion of their biomass above the water surface. Examples include *Typha*, *Scirpus*, and *Zizania*.

Floating Leaf Macrophytes: Vascular plants with a significant amount of their biomass floating on the water in the form of leaves and flowers. Examples include duckweed and water lily.

Submergent Macrophytes: Vascular plants that have all of their biomass (except flowers) at or below the surface of the water. Examples include *Vallisneria*, *Elodea*, *Potamogeton*, *Nymphaea* and *Ceratophyllum*.

- F) *Cover Amount* – Estimate the total percentage of fish cover within the reach. If the channel is completely filled with aquatic vegetation, check the “choking vegetation only” option.

C.5. Channel Morphology (Check the most appropriate category for each)

- A) *Depth Variability* – The difference in thalweg depth between the shallowest stream cross section and the deepest stream cross section. The thalweg depth is the deepest point along a stream cross section. Indicate the degree to which the thalweg depths vary within the stream reach.
- B) *Channel Stability* – The ability of a stream channel to maintain its bed and banks, without eroding or moving particles downstream. A riffle that forms diagonally across the channel and has a high amount of fine substrates that change location is indicative of an unstable stream bed. Channelized streams often have high bank stability but low bed stability as the substrate is typically comprised of fine materials that are susceptible to moving downstream. Ratings are as follows:

High: Channel with stable banks and substrates, little or no erosion of the banks, and little or no bedload within the stream. Artificial channels (i.e. concrete) exhibit a high degree of stability even though they typically have a negative effect on biological communities.

Moderate/High: Channel has the ability to maintain stable riffle, run, and pool characteristics. A minor amount of bank erosion and/or bedload is present.

Moderate: Channel that exhibits some instability, characterized by erosion, bedload, or shows the effects of wide fluctuations in water level.

Low: Channels that have a high degree of bedload and severely eroding banks. A homogenous stream bed characterized by shifting sand substrates has low stability.

- C) *Velocity Types* – Indicate which flow types are present within the reach (check all that apply). The definitions are as follows:

Torrential: Extremely turbulent and fast flow; water surface is broken, usually limited to gorges and dam spillways.

Fast: Mostly non-turbulent flow with small standing waves in riffle-run areas, water surface may be partially broken.

Moderate: Non-turbulent flow that is detectable (i.e. floating objects are visibly moved downstream).

Slow: Water flow is detectable, but barely perceptible.

Eddies: Areas of circular motion within the current, usually formed in pools immediately downstream of riffles/runs.

Interstitial: Water flow that infiltrates a streambed, and moves through gravel substrates in riffle-run areas.

Intermittent: No flow is present, with standing pools separated by dry reaches.

- D) *Sinuosity* – Indicate the degree to which the stream meanders. Sinuosity is defined as the ratio of stream channel distance to straight line distance between two points on a stream. For wide streams or rivers it may be necessary to consider a longer stream reach, as the true meander cycle is often not adequately represented in these systems within the sampling reach. Ratings are as follows:

Excellent: Streams exhibiting a high degree of meandering. Presence of 2 or more well defined bends (deep areas outside and shallow areas on the inside of the bend).

Good: Stream with more than 2 bends, with at least one well defined bend.

Fair: Channel with 1 or 2 poorly defined outside bends, or slight meandering within a modified reach.

Poor: Straight channel with no bends in the reach. Channelized streams or ditches are often rated as poor.

- E) *Pool Width/Riffle Width* – Indicate the ratio of pool width to riffle width within the reach. If there is no riffle at the site select “no riffle”.

- F) *Channel Development* – Indicate the complexity of the stream channel or the degree to which the stream has developed different channel types, creating sequences of riffles, runs, and pools. In small streams, riffles, runs, and pools must occur more than once within the sampling reach. The ratings of channel development are as follows:

Excellent: Well defined riffles present with gravel, cobble, or boulder substrates; pools vary in depth, and there is a clear transition between pools, riffles, and runs. Multiple sequences of riffles, runs, and pools are present within the reach.

Good: Riffles, runs, and pools are all present, but with less frequency, and are less distinct. Riffles have large substrates (gravel, rubble, or boulder), and pools have variation in depth.

Fair: Riffles are absent or poorly developed (shallow with sand and fine gravel substrates). Some deeper pools may exist, but transitions are generally not abrupt.

Poor: Riffles are absent; pools if present are shallow or lack variation in depth. Channelized streams generally have poor channel development.

- G) *Present Water Level* – An estimation of water level as it relates to summer base flow expectations. In most streams, the “normal” water level can be determined with relative ease by observing channel characteristics.

D. Scoring the MSHA

Following are instructions on how to score the completed MSHA form. The maximum score is 100.

- D.1. Surrounding Land Use: Average the scores of the two banks. For example, if residential/park was the land use selected on the left bank, and forest, wetland, prairie, shrub was selected on the right bank, then the land use score would be $(2+5)/2=3.5$. In the case of two land uses selected for one bank, the two scores are averaged together, and then averaged with the score of the other bank. The maximum land use score is 5.

- D.2. Riparian Zone: Average the scores of the two banks for Riparian Width, Bank Erosion, and Shade; then add the three scores. For example, if moderate riparian width (3) was chosen for the left bank and very narrow (1) on the right bank; little bank erosion (4) on the left bank, and moderate (3) on the right bank; heavy shade (5) on the left bank, and substantial (4) on the right bank; the riparian zone score would be: $[(3+1)/2] + [(4+3)/2] + [(5+4)/2] = 10$. The maximum riparian score is 15.

D.3. Instream Zone

- A) *Substrate, Embeddedness, and Substrate Types* – Add the scores of substrate, embeddedness, and substrate type. The substrate score is calculated by adding the two substrate scores for each channel type, multiplying by the percentage of the channel type, and adding the scores for each channel type present. If only one substrate type is chosen because it makes up more than 80% of the channel type, multiply the one substrate score by 2 before multiplying it by the percentage of the channel type. The maximum substrate score is 27.

- B) *Cover Type and Cover Amount* – Add the scores of cover type and cover amount. The cover score can range from 1 to 8. The highest macrophyte score is 1, even if all three macrophyte types are present. The maximum cover score is 17.

- D.4. Channel Morphology: Add the scores of Depth Variability, Channel Stability, Velocity Types, Sinuosity, Pool Width/Riffle Width, and Channel Development. The maximum channel morphology score is 36.

- D.5. Total Score: Add the Surrounding Land Use, Riparian Zone, Instream Zone, and Channel Morphology scores together to get the total MSHA score for the site.

MPCA STREAM HABITAT ASSESSMENT

(revised 3-07)

1. Stream Documentation

Stream _____
 County _____ Date _____
 Field Number _____ Person Scoring _____
 Site Location _____

MSHA SCORE

Max = 100

2. Surrounding Land Use (check the most predominant or check two and average scores) [L=left bank/R =right bank, facing downstream]

<input type="checkbox"/> L <input type="checkbox"/> R	<input type="checkbox"/> Forest, Wetland, Prairie, Shrub [5]	<input type="checkbox"/> L <input type="checkbox"/> R	<input type="checkbox"/> Residential/Park [2]	Land Use <input type="text"/>
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Old Field/Hay Field [3]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Urban/Industrial [0]	
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Fenced Pasture [2]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Open Pasture [0]	
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Conservation Tillage, No Till [2]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Row Crop [0]	
Max=5				

3. Riparian Zone (check the most predominant)

A. Riparian Width				B. Bank Erosion				C. Shade			
<input type="checkbox"/> L <input type="checkbox"/> R	<input type="checkbox"/> Extensive > 300'	[5]	<input type="checkbox"/> L <input type="checkbox"/> R	<input type="checkbox"/> None	[5]	<input type="checkbox"/> L <input type="checkbox"/> R	<input type="checkbox"/> Heavy	>75%	[5]		
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Wide 150'-300'	[4]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Little	5-25% [4]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Substantial	50-75%	[4]		
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Moderate 30'-150'	[3]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Moderate	25-50% [3]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Moderate	25-50%	[2]		
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Narrow 15'-30'	[2]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Heavy	50-75% [1]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Light	5-25%	[1]		
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Very Narrow 3'-15'	[1]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Severe	75-100% [0]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> None		[0]		
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> None	[0]	Riparian <input type="text"/>								
Max=15											

4. Instream Zone

A. Substrate (check two for each channel type)

	[10]	[9]	[8]	[7]	[5]	[5]	[2]	[1]	[1]	[0]
	Boulder	Cobble	Gravel	Sand	Clay	Bedrock	Silt	Muck	Detritus	Sludge
Pool	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Riffle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Run	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Channel Type %	<input type="text"/>									

B. Embeddedness

<input type="checkbox"/> None	[5]
<input type="checkbox"/> Light 25-50%	[3]
<input type="checkbox"/> Moderate 50-75%	[1]
<input type="checkbox"/> Severe 75-100%	[-1]
<input type="checkbox"/> No coarse substrate	[0]

D. Water Color

<input type="checkbox"/> Clear	<input type="checkbox"/> Turbid
<input type="checkbox"/> Stained	<input type="checkbox"/> Brown
	<input type="checkbox"/> Green
	<input type="checkbox"/> Other

Substrate

Max=27

C. Substrate Types

<input type="checkbox"/> >4	[2]
<input type="checkbox"/> <=4	[0]

E. Cover Type (check all that apply)

<input type="checkbox"/> Undercut Banks	[1]	<input type="checkbox"/> Macrophytes:	[1]
<input type="checkbox"/> Overhanging Vegetation	[1]	<input type="checkbox"/> Emergent	
<input type="checkbox"/> Deep Pools	[1]	<input type="checkbox"/> Floating Leaf	
<input type="checkbox"/> Logs or Woody Debris	[1]	<input type="checkbox"/> Submergent	
<input type="checkbox"/> Boulders	[1]		
<input type="checkbox"/> Rootwads	[1]		

F. Cover Amount (check one)

<input type="checkbox"/> Extensive >50%	[10]
<input type="checkbox"/> Moderate 25-50%	[7]
<input type="checkbox"/> Sparse 5-25%	[3]
<input type="checkbox"/> Nearly Absent	[0]
<input type="checkbox"/> Choking Vegetation only	[-1]

Cover

Max=17

5. Channel Morphology

A. Depth Variability

<input type="checkbox"/> Greatest Depth >4X Shallow Depth	[6]
<input type="checkbox"/> Greatest Depth 2-4X Shallow Depth	[3]
<input type="checkbox"/> Greatest Depth <2X Shallow Depth	[0]

B. Channel Stability

<input type="checkbox"/> High	[9]
<input type="checkbox"/> Moderate/High	[6]
<input type="checkbox"/> Moderate	[3]
<input type="checkbox"/> Low	[0]

C. Velocity Types (check all that apply)

<input type="checkbox"/> Torrential	[-1]
<input type="checkbox"/> Fast	[1]
<input type="checkbox"/> Moderate	[1]
<input type="checkbox"/> Slow	[1]
<input type="checkbox"/> Eddies	[1]
<input type="checkbox"/> Intermittent	[-2]
<input type="checkbox"/> Interstitial	[-1]

D. Sinuosity

<input type="checkbox"/> Excellent	[6]
<input type="checkbox"/> Good	[4]
<input type="checkbox"/> Fair	[2]
<input type="checkbox"/> Poor	[0]

E. Pool Width/Riffle Width

<input type="checkbox"/> Pool Width > Riffle Width	[2]
<input type="checkbox"/> Pool Width = Riffle Width	[1]
<input type="checkbox"/> Pool Width < Riffle Width	[0]
<input type="checkbox"/> No Riffle	[0]

F. Channel Development

<input type="checkbox"/> Excellent	[9]
<input type="checkbox"/> Good	[6]
<input type="checkbox"/> Fair	[3]
<input type="checkbox"/> Poor	[0]

G. Present Water Level

<input type="checkbox"/> Flood
<input type="checkbox"/> High
<input type="checkbox"/> Normal
<input type="checkbox"/> Low
<input type="checkbox"/> Interstitial

Channel Morphology

Max=36