

Appendix I QHEI/HHEI

Ohio EPA, Primary Headwater Habitat Evaluation Form

http://www.epa.ohio.gov/portals/35/wqs/headwaters/HHEI_Form_Clickable_10-02.pdf

Ohio EPA, Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

<http://www.epa.state.oh.us/portals/35/documents/QHEIFieldSheet061606.pdf>

Quick Guide to Completing the Ohio EPA QHEI Field Sheet

IDEM, OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

This form has not been distributed for public use. There is also a 2006 Biological Studies Section, Qualitative Habitat Evaluation Index (QHEI) SOP available on-line.

<http://monitoringprotocols.pbworks.com/f/IDEM+QHEI+SOP.pdf>

References

Ohio EPA, Division of Surface Water, Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams, Version 3.0.

http://www.epa.ohio.gov/portals/35/wqs/headwaters/PHWHManual_2012.pdf

Ohio EPA, Division of Surface Water, Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)

<http://epa.ohio.gov/portals/35/documents/QHEIManualJune2006.pdf>



Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3):

1

SITE NAME/LOCATION _____
 _____ SITE NUMBER _____ RIVER BASIN _____ DRAINAGE AREA (mi²) _____
 LENGTH OF STREAM REACH (ft) _____ LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____
 DATE _____ SCORER _____ COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: NONE / NATURAL CHANNEL RECOVERED RECOVERING RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check ONLY two predominant substrate TYPE boxes (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B.)

TYPE	PERCENT	TYPE	PERCENT
<input type="checkbox"/> BLDR SLABS [16 pts]	0%	<input type="checkbox"/> SILT [3 pt]	0%
<input type="checkbox"/> BOULDER (>256 mm) [16 pts]	0%	<input type="checkbox"/> LEAF PACK/WOODY DEBRIS [3 pts]	0%
<input type="checkbox"/> BEDROCK [16 pt]	0%	<input type="checkbox"/> FINE DETRITUS [3 pts]	0%
<input type="checkbox"/> COBBLE (65-256 mm) [12 pts]	0%	<input type="checkbox"/> CLAY or HARDPAN [0 pt]	0%
<input type="checkbox"/> GRAVEL (2-64 mm) [9 pts]	0%	<input type="checkbox"/> MUCK [0 pts]	0%
<input type="checkbox"/> SAND (<2 mm) [6 pts]	0%	<input type="checkbox"/> ARTIFICIAL [3 pts]	0%

Total of Percentages of Blldr Slabs, Boulder, Cobble, Bedrock **0.00%** (A) Substrate Percentage Check **0%** (B)

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 0 **TOTAL NUMBER OF SUBSTRATE TYPES: 1**

2. Maximum Pool Depth (Measure the maximum pool depth within the 61 meter (200 ft) evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check ONLY one box):

<input type="checkbox"/> > 30 centimeters [20 pts]	<input type="checkbox"/> > 5 cm - 10 cm [15 pts]
<input type="checkbox"/> > 22.5 - 30 cm [30 pts]	<input type="checkbox"/> < 5 cm [5 pts]
<input type="checkbox"/> > 10 - 22.5 cm [25 pts]	<input type="checkbox"/> NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS _____ **MAXIMUM POOL DEPTH (centimeters):** _____

3. BANK FULL WIDTH (Measured as the average of 3-4 measurements) (Check ONLY one box):

<input type="checkbox"/> > 4.0 meters (> 13') [30 pts]	<input type="checkbox"/> > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
<input type="checkbox"/> > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]	<input type="checkbox"/> < 1.0 m (<= 3' 3") [5 pts]
<input type="checkbox"/> > 1.5 m - 3.0 m (> 4' 7" - 9' 8") [20 pts]	

COMMENTS _____ **AVERAGE BANKFULL WIDTH (meters):** _____

HHEI Metric Points

Substrate Max = 40

1

A + B

Pool Depth Max = 30

0

Bankfull Width Max = 30

0

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY

NOTE: River Left (L) and Right (R) as looking downstream

RIPARIAN WIDTH		FLOODPLAIN QUALITY			
L	R	L	R	L	R
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Per Bank) Wide >10m		Mature Forest, Wetland		Conservation Tillage	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Moderate 5-10m		Immature Forest, Shrub or Old Field		Urban or Industrial	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Narrow <5m		Residential, Park, New Field		Open Pasture, Row Crop	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
None		Fenced Pasture		Mining or Construction	

COMMENTS _____

FLOW REGIME (At Time of Evaluation) (Check ONLY one box):

<input type="checkbox"/>	Stream Flowing	<input type="checkbox"/>	Moist Channel, isolated pools, no flow (Intermittent)
<input type="checkbox"/>	Subsurface flow with isolated pools (Interstitial)	<input type="checkbox"/>	Dry channel, no water (Ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check ONLY one box):

<input type="checkbox"/>	None	<input type="checkbox"/>	1.0	<input type="checkbox"/>	2.0	<input type="checkbox"/>	3.0
<input type="checkbox"/>	0.5	<input type="checkbox"/>	1.5	<input type="checkbox"/>	2.5	<input type="checkbox"/>	>3

STREAM GRADIENT ESTIMATE

Flat (0.5 m/m) Flat to Moderate Moderate (2 m/m) Moderate to Severe Severe (10 m/m)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? - Yes No QHEI Score (If Yes, Attach Completed QHEI Form)

DOWNSTREAM DESIGNATED USE(S)

<input type="checkbox"/> WWH Name:	<input type="text"/>	Distance from Evaluated Stream	<input type="text"/>
<input type="checkbox"/> CWH Name:	<input type="text"/>	Distance from Evaluated Stream	<input type="text"/>
<input type="checkbox"/> EWH Name:	<input type="text"/>	Distance from Evaluated Stream	<input type="text"/>

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION

USGS Quadrangle Name: NRCS Soil Map Page: NRCS Soil Map Stream Order
County: **Wyandot** Township / City:

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: Quantity: **0.00**
Photograph Information:
Elevated Turbidity? (Y/N): Y Canopy (% open): **0%**
Were samples collected for water chemistry? (Y/N): Y (Note lab sample no. or id. and attach results) Lab Number:
Field Measures: Temp (°C) Dissolved Oxygen (mg/l) pH (S.U.) Conductivity (µmhos/cm)
Is the sampling reach representative of the stream (Y/N) Y If not, please explain:
Additional comments/description of pollution impacts:

BIOTIC EVALUATION

Performed? (Y/N): Y (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)
Fish Observed? (Y/N) Y Voucher? (Y/N) Y Salamanders Observed? (Y/N) Y Voucher? (Y/N) Y
Frogs or Tadpoles Observed? (Y/N) Y Voucher? (Y/N) Y Aquatic Macroinvertebrates Observed? (Y/N) Y Voucher? (Y/N) Y
Comments Regarding Biology:

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed):

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location

FLOW 

Stream & Location: _____ RM: _____ Date: / /

Scorers Full Name & Affiliation: _____ Office verified location []
River Code: - - STORET #: _____ Lat./ Long.: _____ /8

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present. Check ONE (Or 2 & average). BEST TYPES: BLDR/SLABS [10], BOULDER [9], COBBLE [8], GRAVEL [7], SAND [6], BEDROCK [5]. OTHER TYPES: HARDPAN [4], DETRITUS [3], MUCK [2], SILT [2], ARTIFICIAL [0]. ORIGIN: LIMESTONE [1], TILLS [1], WETLANDS [0], HARDPAN [0], SANDSTONE [0], RIP/RAP [0], LACUSTURINE [0], SHALE [-1], COAL FINES [-2]. QUALITY: HEAVY [-2], MODERATE [-1], NORMAL [0], FREE [1], EXTENSIVE [-2], MODERATE 25-75% [7], NORMAL [0], NONE [1].

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools. AMOUNT: EXTENSIVE >75% [11], MODERATE 25-75% [7], SPARSE 5-<25% [3], NEARLY ABSENT <5% [1].

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average). SINUOSITY: HIGH [4], MODERATE [3], LOW [2], NONE [1]. DEVELOPMENT: EXCELLENT [7], GOOD [5], FAIR [3], POOR [1]. CHANNELIZATION: NONE [6], RECOVERED [4], RECOVERING [3], RECENT OR NO RECOVERY [1]. STABILITY: HIGH [3], MODERATE [2], LOW [1].

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average). River right looking downstream. EROSION: NONE / LITTLE [3], MODERATE [2], HEAVY / SEVERE [1]. RIPARIAN WIDTH: WIDE > 50m [4], MODERATE 10-50m [3], NARROW 5-10m [2], VERY NARROW < 5m [1], NONE [0]. FLOOD PLAIN QUALITY: FOREST, SWAMP [3], SHRUB OR OLD FIELD [2], RESIDENTIAL, PARK, NEW FIELD [1], FENCED PASTURE [1], OPEN PASTURE, ROWCROP [0]. CONSERVATION TILLAGE [1], URBAN OR INDUSTRIAL [0], MINING / CONSTRUCTION [0].

5] POOL / GLIDE AND RIFFLE / RUN QUALITY MAXIMUM DEPTH: > 1m [6], 0.7-<1m [4], 0.4-<0.7m [2], 0.2-<0.4m [1], < 0.2m [0]. CHANNEL WIDTH: POOL WIDTH > RIFFLE WIDTH [2], POOL WIDTH = RIFFLE WIDTH [1], POOL WIDTH < RIFFLE WIDTH [0]. CURRENT VELOCITY: TORRENTIAL [-1], VERY FAST [1], FAST [1], MODERATE [1], SLOW [1], INTERSTITIAL [-1], INTERMITTENT [-2], EDDIES [1]. Recreation Potential: Primary Contact, Secondary Contact. Pool / Current Maximum 12.

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: [] NO RIFFLE [metric=0]. RIFFLE DEPTH: BEST AREAS > 10cm [2], BEST AREAS 5-10cm [1], BEST AREAS < 5cm [metric=0]. RUN DEPTH: MAXIMUM > 50cm [2], MAXIMUM < 50cm [1]. RIFFLE / RUN SUBSTRATE: STABLE (e.g., Cobble, Boulder) [2], MOD. STABLE (e.g., Large Gravel) [1], UNSTABLE (e.g., Fine Gravel, Sand) [0]. RIFFLE / RUN EMBEDDEDNESS: NONE [2], LOW [1], MODERATE [0], EXTENSIVE [-1]. Riffle / Run Maximum 8.

6] GRADIENT (ft/mi) [] VERY LOW - LOW [2-4], MODERATE [6-10], HIGH - VERY HIGH [10-6]. DRAINAGE AREA (mi²). %POOL: [] %GLIDE: [] %RUN: [] %RIFFLE: [] Gradient Maximum 10.

Comment RE: Reach consistency/Is reach typical of stream?, Recreation/Observed - Inferred, Other/Sampling observations, Concerns, Access directions, etc.

AJ SAMPLED REACH

Check ALL that apply

- METHOD**
- BOAT
 - WADE
 - L. LINE
 - OTHER
- STAGE**
- 1st-sample pass-2nd
- HIGH
 - UP
 - NORMAL
 - LOW
 - DRY

- DISTANCE**
- 0.5 Km
 - 0.2 Km
 - 0.15 Km
 - 0.12 Km
 - OTHER

- CLARITY**
- 1st -sample pass- 2nd
- < 20 cm
 - 20-<40 cm
 - 40-70 cm
 - > 70 cm/ CTB

- SECCCHI DEPTH**
- 1st _____ cm
- 2nd _____ cm

- CANOPY**
- > 85% - OPEN
 - 55% -<85%
 - 30% -<55%
 - 10% -<30%
 - <10% - CLOSED

- CJ RECREATION**
- AREA DEPTH
- POOL: >100ft >3ft

BJ AESTHETICS

- NUISANCE ALGAE
- INVASIVE MACROPHYTES
- EXCESS TURBIDITY
- DISCOLORATION
- FOAM / SCUM
- OIL SHEEN
- TRASH / LITTER
- NUISANCE ODOR
- SLUDGE DEPOSITS
- CSOs/SSOs/OUTFALLS

DJ MAINTENANCE

- PUBLIC / PRIVATE / BOTH / NA
- ACTIVE / HISTORIC / BOTH / NA
- YOUNG-SUCCESSION-OLD
- SPRAY / SNAG / REMOVED
- MODIFIED / DIPPED OUT / NA
- LEVEED / ONE SIDED
- RELOCATED / CUTOFFS
- MOVING-BEDLOAD-STABLE
- ARMOURD / SLUMPS
- ISLANDS / SCoured
- IMPOUNDED / DESICCATED
- FLOOD CONTROL / DRAINAGE

EJ ISSUES

- WWTP / CSO / NPDES / INDUSTRY
- HARDENED / URBAN / DIRT&GRIME
- CONTAMINATED / LANDFILL
- BMPs-CONSTRUCTION-SEDIMENT
- LOGGING / IRRIGATION / COOLING
- BANK EROSION / SURFACE
- FALSE BANK / MANURE / LAGOON
- WASH H₂O / TILE / H₂O TABLE
- ACID / MINE / QUARRY / FLOW
- NATURAL / WETLAND / STAGNANT
- PARK / GOLF / LAWN / HOME
- ATMOSPHERE / DATA PAUCITY

FJ MEASUREMENTS

- \bar{x} width
 - \bar{x} depth
 - max. depth
 - \bar{x} bankfull width
 - bankfull \bar{x} depth
 - W/D ratio
 - bankfull max. depth
 - floodprone \bar{x}^2 width
 - entrench. ratio
- Legacy Tree:

Stream Drawing:



OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

Sample #	bioSample #	Stream Name	Location
Surveyor	Sample Date	County	Macro Sample Type
			<input type="checkbox"/> Habitat Complete
			QHEI Score: <input type="text"/>

1] SUBSTRATE Check ONLY Two predominant substrate TYPE BOXES; estimate % and check every type present

BEST TYPES		OTHER TYPES		ORIGIN	QUALITY
PREDOMINANT PRESENT	TOTAL %	PREDOMINANT PRESENT	TOTAL %		
P/G R/R	P/G R/R	P/G R/R	P/G R/R		
<input type="checkbox"/> BLD/SLABS [10]	<input type="checkbox"/>	<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/>	<input type="checkbox"/> LIMESTONE [1]	S I L T
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/>	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/>	<input type="checkbox"/> TILLS [1]	
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/>	<input type="checkbox"/> MUCK [2]	<input type="checkbox"/>	<input type="checkbox"/> WETLANDS [0]	M O D E R A T E
<input type="checkbox"/> GRAVEL [7]	<input type="checkbox"/>	<input type="checkbox"/> SILT [2]	<input type="checkbox"/>	<input type="checkbox"/> HARDPAN [0]	
<input type="checkbox"/> SAND [6]	<input type="checkbox"/>	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/>	<input type="checkbox"/> SANDSTONE [0]	M A X I M U M
<input type="checkbox"/> BEDROCK [5]	<input type="checkbox"/>	(Score natural substrates; ignore sludge from point-sources)		<input type="checkbox"/> RIP/RAP [0]	
NUMBER OF BEST TYPES:				<input type="checkbox"/> LACUSTRINE [0]	Substrate Maximum 20
<input type="checkbox"/> 4 or more [2]				<input type="checkbox"/> SHALE [-1]	
<input type="checkbox"/> 3 or less [0]				<input type="checkbox"/> COAL FINES [-2]	

Comments

2] INSTREAM COVER Indicate presence 0 to 3 and estimate percent: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed root wad in deep/fast water, or deep, well-defined, functional pools.)

% Amount	% Amount	% Amount	AMOUNT
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	Check ONE (Or 2 & average)
<input type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> MODERATE 25-75% [7]
<input type="checkbox"/> ROOTMATS [1]			<input type="checkbox"/> SPARSE 5- < 25% [3]
			<input type="checkbox"/> NEARLY ABSENT < 5% [1]
			Cover Maximum 20

Comments

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERING [4]	<input type="checkbox"/> MODERATE [2]
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]	
			Channel Maximum 20

Comments

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream	L R	EROSION	L R	RIPARIAN WIDTH	L R	FLOOD PLAIN QUALITY	L R	CONSERVATION TILLAGE
		<input type="checkbox"/> NONE/LITTLE [3]		<input type="checkbox"/> WIDE > 50m [4]		<input type="checkbox"/> FOREST, SWAMP [3]		<input type="checkbox"/> URBAN OR INDUSTRIAL [0]
		<input type="checkbox"/> MODERATE [2]		<input type="checkbox"/> MODERATE 10-50m [3]		<input type="checkbox"/> SHRUB OR OLD FIELD [2]		<input type="checkbox"/> MINING / CONSTRUCTION [0]
		<input type="checkbox"/> HEAVY/SEVERE [1]		<input type="checkbox"/> NARROW 5-10m [2]		<input type="checkbox"/> RESIDENTIAL, PARK, NEWFIELD [1]		
				<input type="checkbox"/> VERY NARROW [1]		<input type="checkbox"/> FENCED PASTURE [1]		Indicate predominant land use(s) past 100m riparian.
				<input type="checkbox"/> NONE [0]		<input type="checkbox"/> OPEN PASTURE, ROWCROP [0]		Riparian Maximum 10

Comments

5] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	Recreation Potential
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	(Circle one and comment on back)
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> TORRENTIAL [-1]	<input type="checkbox"/> Primary Contact
<input type="checkbox"/> 0.7 - < 1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> VERY FAST [1]	<input type="checkbox"/> Secondary Contact
<input type="checkbox"/> 0.4 - < 0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE WIDTH [0]	<input type="checkbox"/> FAST [1]	
<input type="checkbox"/> 0.2 - < 0.4m [1]		<input type="checkbox"/> MODERATE [1]	Pool/ Current Maximum 12
<input type="checkbox"/> < 0.2m [0] [metric = 0]		<input type="checkbox"/> INTERSTITIAL [-1]	
		<input type="checkbox"/> INTERMITTENT [-2]	
		<input type="checkbox"/> EDDIES [1]	
		Indicate for reach - pools and riffles.	

Comments

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input type="checkbox"/> BEST AREAS > 10cm [2]	<input type="checkbox"/> MAXIMUM > 50cm [2]	<input type="checkbox"/> STABLE (eg., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input type="checkbox"/> BEST AREAS 5 - 10cm [1]	<input type="checkbox"/> MAXIMUM < 50cm [1]	<input type="checkbox"/> MOD. STABLE (eg., Large Gravel) [1]	<input type="checkbox"/> LOW [1]
<input type="checkbox"/> BEST AREAS < 5cm [metric = 0]		<input type="checkbox"/> UNSTABLE (eg., Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]
			<input type="checkbox"/> EXTENSIVE [-1]
			Riffle/ Run Maximum 8

Comments

6] GRADIENT (ft/mi)	<input type="checkbox"/> VERY LOW - LOW [2-4]	% POOL: <input type="text"/>	% GLIDE: <input type="text"/>	Gradient Maximum 10
	<input type="checkbox"/> MODERATE [6-10]			
DRAINAGE AREA (mi ²)	<input type="checkbox"/> HIGH - VERY HIGH [10-6]	% RUN: <input type="text"/>	% RIFFLE: <input type="text"/>	



OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

COMMENT

A-CANOPY		B-AESTHETICS		C-RECREATION		D-MAINTENANCE		E-ISSUES	
<input type="checkbox"/> > 85% - Open	<input type="checkbox"/> Nuisance algae	<input type="checkbox"/> Oil sheen	<input type="checkbox"/> Pool: <input type="checkbox"/> > 100 ft ²	<input type="checkbox"/> Public <input type="checkbox"/> Private	<input type="checkbox"/> WWTP <input type="checkbox"/> CSO <input type="checkbox"/> NPDES	<input type="checkbox"/> Active <input type="checkbox"/> Historic	<input type="checkbox"/> Industry <input type="checkbox"/> Urban	<input type="checkbox"/> Hardened <input type="checkbox"/> Dirt & Grime	<input type="checkbox"/> Contaminated <input type="checkbox"/> Landfill
<input type="checkbox"/> 55% - < 85%	<input type="checkbox"/> Invasive macrophytes	<input type="checkbox"/> Trash/Litter	Depth <input type="checkbox"/> > 3 ft	Succession: <input type="checkbox"/> Young <input type="checkbox"/> Old	<input type="checkbox"/> BMPs: <input type="checkbox"/> Construction <input type="checkbox"/> Sediment	<input type="checkbox"/> Spray <input type="checkbox"/> Islands <input type="checkbox"/> Scoured	<input type="checkbox"/> Logging <input type="checkbox"/> Irrigation <input type="checkbox"/> Cooling	<input type="checkbox"/> Erosion: <input type="checkbox"/> Bank <input type="checkbox"/> Surface	<input type="checkbox"/> False bank <input type="checkbox"/> Manure <input type="checkbox"/> Lagoon
<input type="checkbox"/> 30% - < 55%	<input type="checkbox"/> Excess turbidity	<input type="checkbox"/> Nuisance odor		Snag: <input type="checkbox"/> Removed <input type="checkbox"/> Modified	<input type="checkbox"/> Leveed: <input type="checkbox"/> One sided <input type="checkbox"/> Both banks	<input type="checkbox"/> Leveed: <input type="checkbox"/> One sided <input type="checkbox"/> Both banks	<input type="checkbox"/> Relocated <input type="checkbox"/> Cutoffs	<input type="checkbox"/> Wash H ₂ O <input type="checkbox"/> Tile <input type="checkbox"/> H ₂ O Table	<input type="checkbox"/> Mine: <input type="checkbox"/> Acid <input type="checkbox"/> Quarry
<input type="checkbox"/> 10% - < 30%	<input type="checkbox"/> Discoloration	<input type="checkbox"/> Sludge deposits		Leveed: <input type="checkbox"/> One sided <input type="checkbox"/> Both banks	<input type="checkbox"/> Bedload: <input type="checkbox"/> Moving <input type="checkbox"/> Stable	<input type="checkbox"/> Bedload: <input type="checkbox"/> Moving <input type="checkbox"/> Stable	<input type="checkbox"/> Armoured <input type="checkbox"/> Slumps	<input type="checkbox"/> Flow: <input type="checkbox"/> Natural <input type="checkbox"/> Stagnant	<input type="checkbox"/> Wetland <input type="checkbox"/> Park <input type="checkbox"/> Golf
<input type="checkbox"/> < 10% - Closed	<input type="checkbox"/> Foam/Scum	<input type="checkbox"/> CSOs/SSOs/Outfalls		Leveed: <input type="checkbox"/> One sided <input type="checkbox"/> Both banks	<input type="checkbox"/> Impounded <input type="checkbox"/> Desiccated	<input type="checkbox"/> Impounded <input type="checkbox"/> Desiccated	<input type="checkbox"/> Flood control <input type="checkbox"/> Drainage	<input type="checkbox"/> Lawn <input type="checkbox"/> Home	<input type="checkbox"/> Atmospheric deposition
								<input type="checkbox"/> Agriculture <input type="checkbox"/> Livestock	

Looking upstream (> 10m, 3 readings: \leq 10m, 1 reading in middle); Round to the nearest whole percent

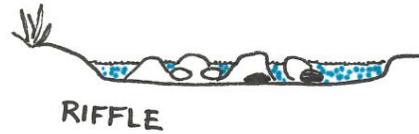
% open	Right	Middle	Left	Total Average
	%	%	%	%
	X	X	X	

Stream Drawing:

Quick Guide to Completing the Ohio EPA QHEI Field Sheet

There are two habitat types: riffle/run and pool/glide.

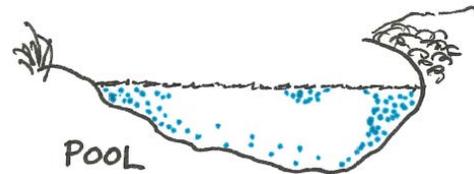
1. Riffle - Areas of the stream with fast current velocity and shallow depth; the water surface is visibly broken.



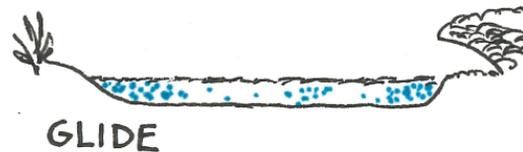
2. Run - Areas of the stream that have rapid non-turbulent flow; runs are deeper than riffles with a faster current velocity than pools and are generally located downstream from riffle where the stream narrows; the stream bed is often flat beneath a run and the water surface is not visibly broken.



3. Pool - An area of the stream with slow current velocity and a depth greater than riffle and run areas; the stream bed is often concave and stream width frequently is the greatest; the water surface slope is nearly zero.



4. Glide - An area common to most modified stream channels that do not have a distinguishable pool, run, and riffle habitats. The current and flow is similar to that of a canal and the water surface gradient is nearly zero.



Metric 1: Substrate

A. Substrate type. Identify the two most common or if one type is greater than 75 to 80% of the bottom area check it twice. The nine substrate types are:

1. Bedrock - solid rock forming a continuous surface.
2. Boulder - rounded stone over 10" in diameter or large "slabs" more than 10" in length.
3. Cobble - stones from 2.5 to 10" in diameter.
4. Gravel - mixture of rounded coarse material from 1/12 to 2.5" in diameter.
5. Sand - materials 0.06 to 2.0 mm in diameter, has a gritty texture when rubbed between fingers.
6. Silt - materials 0.004 to 0.06 mm in diameter, generally a fine material that feels "greasy" when rubbed between fingers.
7. Hardpan - particles less than 0.004 mm in diameter, usually clay, which forms a dense gummy surface that is difficult to penetrate.
8. Marl - calcium carbonate; usually grayish-white; often contains fragments of mollusk shells.
9. Detritus - dead, unconsolidated organic material covering the bottom of which could include sticks, wood and other partially or un-decayed coarse plant material.
10. Muck - black, fine, flocculent, completely decomposed organic matter (does not include sewage slug).
11. Artificial - substrates such as rock baskets, gabions, bricks, trash, concrete, etc., placed in the stream for reasons OTHER than habitat mitigation.

B. Substrate quality. There are three components of substrate quality: origin, embeddedness and silt cover.

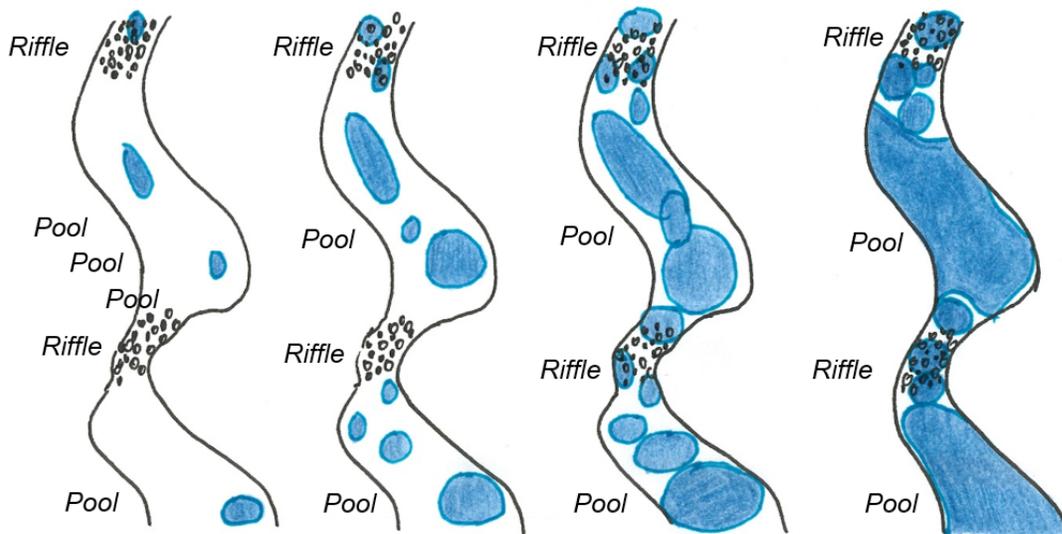
1. Origin refers to the parent material that the stream substrate is derived from. One box should be checked.

- a. Limestone - may contain fossils, easily scratched with a knife, usually bedrock or flat boulders and cobbles.
- b. Tills - sediments deposited by glaciers, rounded particles.
- c. Wetlands - organic muck and detritus.
- d. Hardpan - clay, smooth and slippery.
- e. Sandstone - rounded fragments of sand fused together.
- f. Rip/rap - artificial boulders.
- g. Lacustrine - old lake bed sediments.
- h. Shale - sedimentary rock made of silt/clay, soft and cleaves easily.
- i. Coal fines - black fragments of coal.

2. Embeddedness is the degree that cobble, gravel and boulder substrates are surrounded, impacted in, or covered by fine materials (sand and silt). Substrates are considered embedded if >50% of the substrate surface is embedded in fine material. Embedded substrates cannot be easily removed. The pervasiveness or extensiveness of the embedded substrates is measured in percentages.

- a. Extensive - > 75%
- b. Moderate - 50 to 75%
- c. Normal - 25 to 50%
- d. None - < 25%

Embeddedness



Little/No Embeddedness
 < 25% of station – only in natural depositional areas

Low Embeddedness
 25 to 50% of station – some outside of natural depositional areas

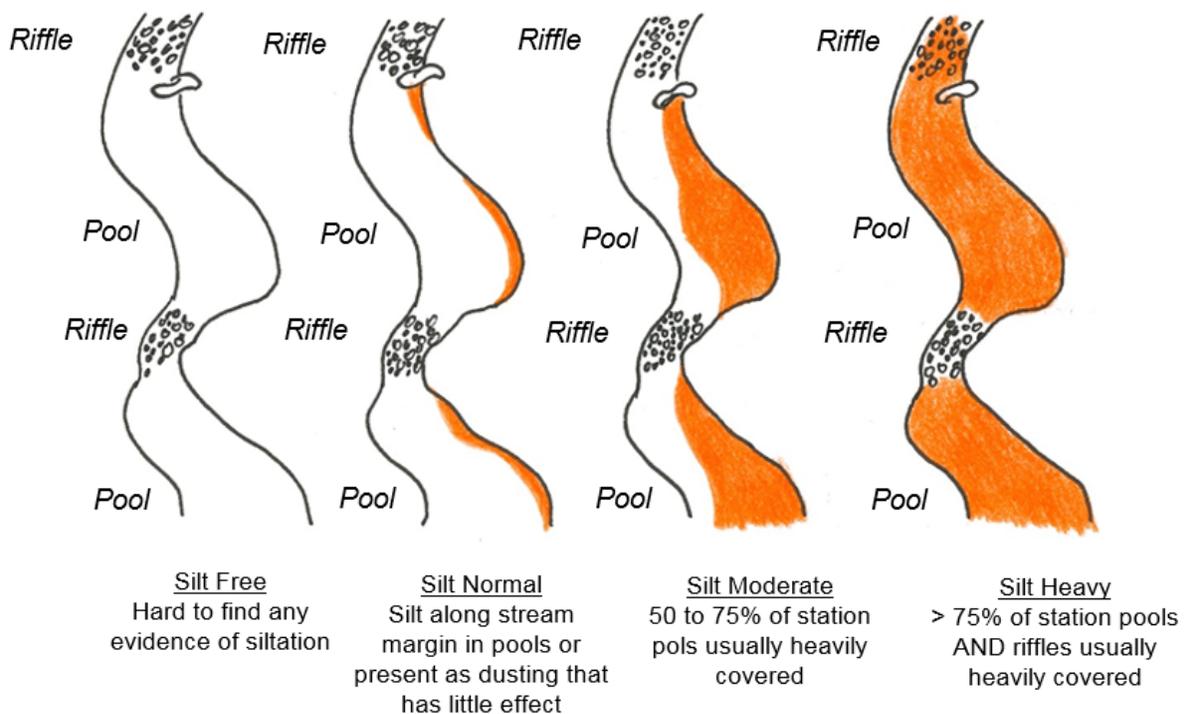
Moderate Embeddedness
 50 to 75% of station – pools usually heavily embedded

Extensive Embeddedness
 > 75% of station – pools and riffles usually heavily embedded

3. Silt cover is the extent that substrates are covered by fine silt size particles 1 inch thick or greater or obviously affecting aquatic habitats.

- a. Heavy - The entire stream bottom is layered with a deep covering of silt (pools/glides and all but the fastest areas of riffles/runs).
- b. Moderate - Extensive covering by silts but with some area of cleaner substrate such as in the riffles.
- c. Normal - Silt is deposited in small amount along the stream margin or is present as a “dusting” that appears to have little significance.
- d. Free - Exceptional clean substrates.

Silt Cover

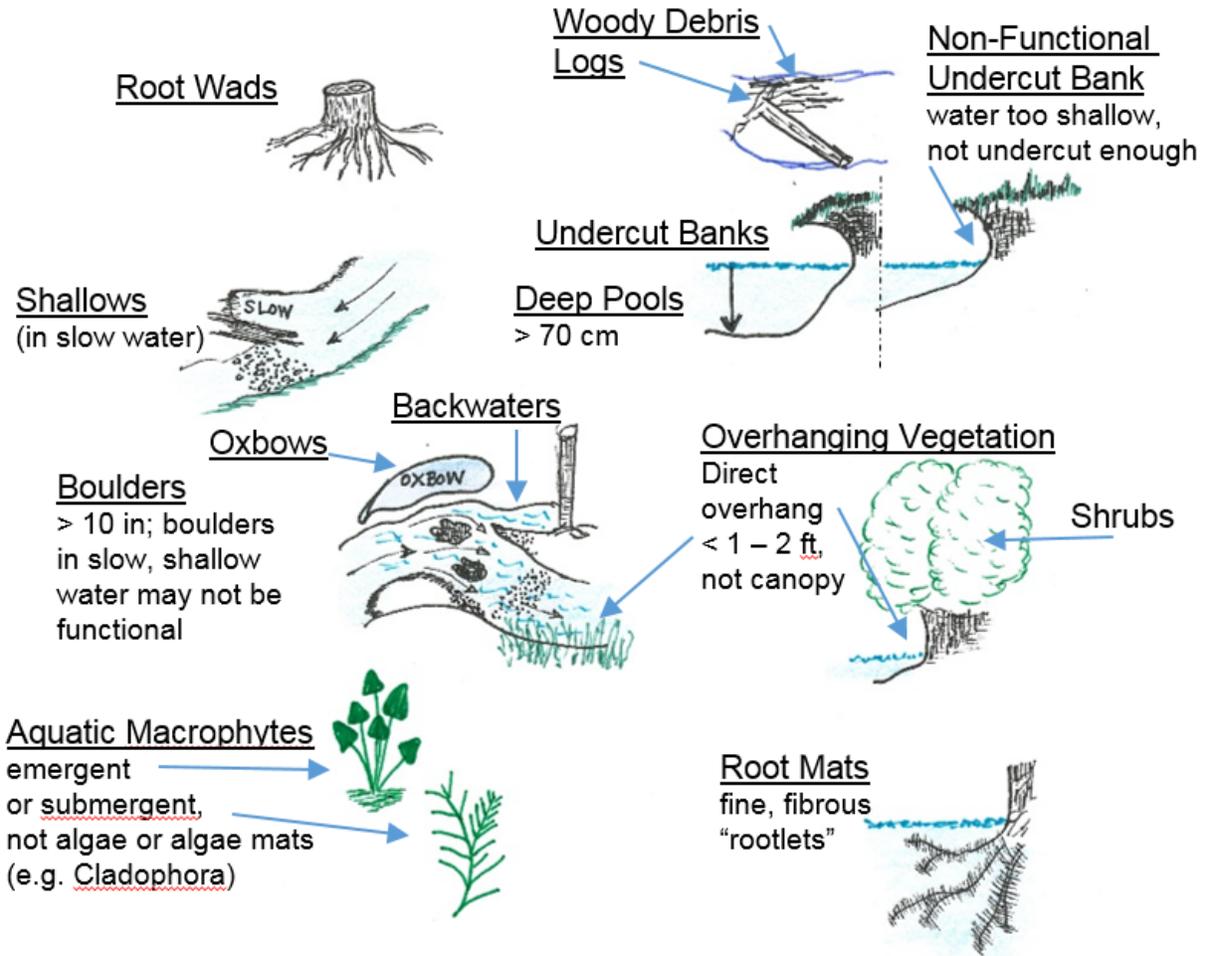


Metric 2: Instream cover

1. Score each cover type that is present in a sufficient quantity to support species that may commonly be associated with the habitat type. Do not score cover types that are in areas of insufficient depth to provide function.
2. Cover types. Score - 0 (absent), 1 (very small amounts or if common of marginal quality), 2 (moderate amounts - not high quality or high quality - small amount), 3 (highest quality in moderate or greater amount)
 - a. Undercut banks - must have sufficient water depth and size.
 - b. Overhanging vegetation - includes direct overhang < 1 to 2 feet, does not include canopy.
 - c. Shallows (in slow water)
 - d. Rootmats - fine, fibrous “rootlets”.
 - e. Pools - > 70 cm (___ in)
 - f. Rootwads

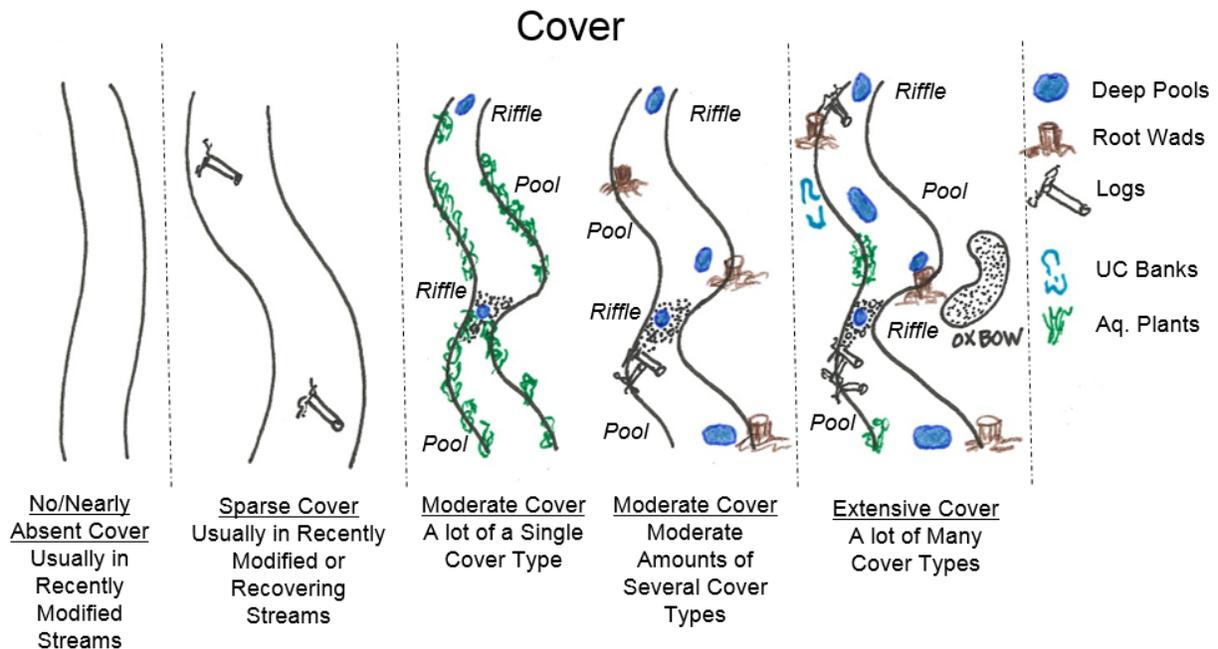
- g. Boulders - > 10", boulders in slow, shallow water may not be functional.
- h. Oxbows, backwaters
- i. Aquatic macrophytes - emergent or submergent, not algae or algae mats.
- j. Logs or woody debris

Cover Types



2. Amount.

- a. Extensive - > 75%
- b. Moderate - 25 > 75%
- c. Sparse - 5 to < 25%
- d. Nearly absent - < 5%



Metric 3. Channel morphology

A. Sinuosity.

1. No - A straight channel.
2. Low - A channel with only 1 or 2 poorly defined outside bends in the sample reach or slight meandering within modified banks.
3. Moderate - More than 2 outside bends, with at least one bend well defined.
4. High - Has 2 or 3 well defined outside bends with deep areas outside and shallow areas inside.

B. Development. This metric refers to the development of riffle/pool complexes.

1. Poor - Riffles are either absent or shallow with sand and fine gravel substrates. If pools are present they are shallow. Also includes channels with predominant glide habitats.
2. Fair - Riffles are poorly developed or absent. The pools are more developed with greater variation in depth.
3. Good - Riffles are better defined with larger substrates such as gravel, rubble or boulders. Pools have variation in depth and there is a distinct transition between pools and riffles.
4. Excellent - Similar level of development as good but pools must have a maximum depth of >1 m and deep riffles and runs (>0.5 m).

	Excellent	Good	Fair	Poor
Pool	> 1 m deep, well defined	0.7-1.0 m deep, well defined	Some depth variation	Shallow if present
Glide	Not common	Not common	Common	Predominant
Riffle	Deep, well defined riffles, large substrates	Defined riffles, large substrates	Poorly defined riffles or riffles absent	Absent of shallow with fine substrates
Run	> 0.5 m deep, well defined	Deep, well defined	Usually absent	Absent

C. Channelization.

1. Natural - No obvious direct moving or alteration of the channel and a natural appearance.
2. Recovered - Streams that have been channelized in the past, but that have recovered most of their natural channel characteristics.
3. Recovering - Channelized streams that are still in the process of regaining their former, natural channel, however the habitats are still degraded.
4. Recent or no recovery - Recently channelized or show no significant recovery of habitats, for example, drainage ditches, grass lined or rock rip-rap banks.

D. Stability.

1. Low - Characterized by fine substrates in riffles that often change location, have unstable and severely eroding banks, and a high bedload that slowly creeps downstream. Riffles may form diagonally across the channel.
2. Moderate - Appear to maintain stable riffle/pool and channel characteristics, but exhibit some instability such as high bedload, eroding or false banks, or effects of wide fluctuations in water level.
3. High - Have stable banks and substrates and little or no erosion or bedload. Includes artificially stable concrete channels.

Metric 4: Riparian zone and bank erosion

This metric evaluates the quality of the riparian buffer zone and quality of floodplain vegetation. The left and right banks (looking downstream) are evaluated with an average for the final score.

A. Riparian width. The width of the riparian (stream side) vegetation.

B. Floodplain quality. The purpose of this metric is to identify the land uses that might deliver harmful runoff from to the stream. Identify the two most predominant to include left and right banks outside of the riparian zone. The types of land use are:

1. Forest, swamp;
2. Shrub or old field;
3. Residential, park or new field;
4. Fenced pasture;
5. Open pasture, rowcrop;
6. Conservation tillage;
7. Urban or industrial, and;
8. Mining/construction.

C. Bank erosion. Bank erosion has five possible ratings:

1. None - Streambanks are stable and not being altered by water flows or animals;
2. Little - Streambanks are stable, but are being lightly altered;
3. Moderate - Streambanks are receiving moderate alterations;
4. Heavy - Streambanks have received major alterations, and;
5. Severe - Streambanks are severely altered.

Metric 5: Pool/glide and riffle-run quality

A. Pool/glide quality is evaluated by determining the maximum depth of a pool or glide, channel width and current velocity.

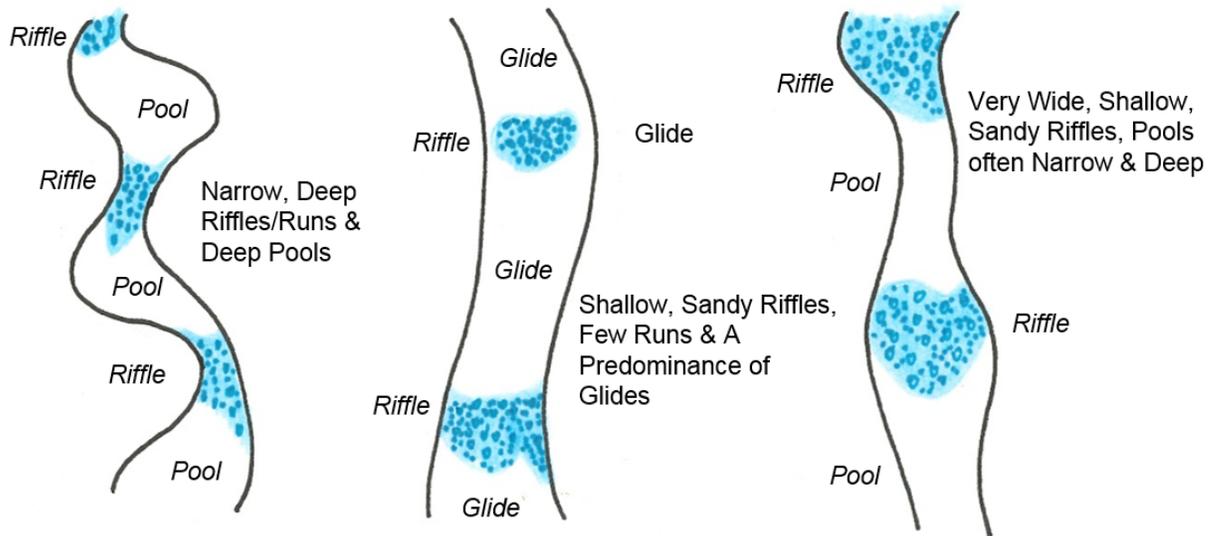
1. Maximum pool depth. Maximum pool depth is a key indicator of whether the stream can support a well-balanced fish community. Streams with pools of less than 40 cm in depth are less likely to have well balanced fish communities. Maximum pool depth is also related to the stream channel (i.e. continuous, intermittent, interstitial), and thus serves as a good discriminator of the various classes of primary headwater habitat (PHWH) streams. Pools or glides with maximum depths of less than 20 cm are considered to have lost their function.

2. Current velocity. There are eight current types indicating the velocity. Each one present should be included in the evaluation.

- a. Torrential. Extremely turbulent and fast flow with large standing waves. The water surface is broken with no definable, connected surface.
- b. Very fast. Turbulent flow that makes it difficult to stand and creates pulsating effect against leg.
- c. Fast. Mostly non-turbulent flow with small standing waves in riffle/run areas. The water surface may be partially broken, but there is a visibly connected surface. It flows forcefully over objects.
- d. Moderate. Non-turbulent flow that is detectable and visible. Flowing objects are readily transported downstream. Water flow around rather than over objects.
- e. Slow. Water flow is perceptible, but very sluggish.
- f. Eddies. Small areas of circular motion usually formed in pools immediately downstream from riffle-run areas.
- g. Interstitial. Water flow that is perceptible only in the interstitial spaces between substrate particles in riffle-run areas.
- h. Intermittent. There is no flow evident anywhere leaving standing pools that are separated by dry areas.

3. Morphology options are wide (pools wider than riffles), equal (pools and riffles are the same width), and narrow (if the riffles are wider than the pools).

Pool – Riffle Morphology



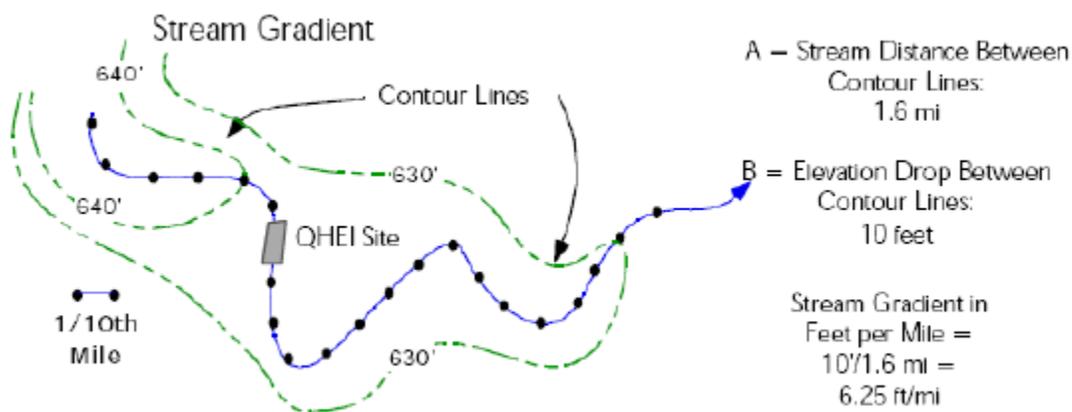
B. Riffle-run quality is determined by evaluating the depth of the best riffle in the zone, the depth of the run, the type and stability of the riffle habitats and the embeddedness of the substrates.

Metric 6: Map gradient.

Map gradient is the elevation drop (feet per mile) through the sampling area calculated using USGS 7.5 minute topographic maps.

#1 - Measure the stream length between the first contour line upstream and the first contour line downstream of the sampling site.

#2 - Divide the distance by the contour interval.



For more detail see Ohio EPA, *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)*.