

## **APPENDIX 7**

### Stream Assessments

### Macroinvertebrate Collection

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## **Introduction**

Macroinvertebrate monitoring is a valuable tool to measure the ecological health of a stream. Because they are considered to be more sensitive to local conditions and respond relatively rapidly to change, benthic (bottom-dwelling) organisms are considered to be the primary tool to document the biological condition of the streams. The numbers and kinds of animals present at a study site can be compared to an unimpacted reference site. For example, the presence of mayflies, stoneflies, and caddisflies (also called “EPT taxa”) are indicators of good biological integrity, while many midge species are considered to be tolerant of degraded conditions. A stream with good biological integrity will have a good diversity of organisms present and not be dominated by one or two kinds of animals. This bioassessment technique results in a biological integrity value; the higher the value, the more ecologically healthy the stream.

## **Methods**

### Study Sites

1. Sand Creek at Brooks School Road
2. Sand Creek at 116<sup>th</sup> Street
3. Mud Creek at Madison/Hamilton County Line
4. Mud Creek at 116<sup>th</sup> Street
5. Mud Creek at 75<sup>th</sup> Street
6. Indian Creek at Marion/Hancock County Line
7. Indian Creek at 52<sup>nd</sup> Street
8. Indian Creek at Sunnyside Drive
9. Indian Creek below Indian Lake
10. Fall Creek below Geist Dam
11. Fall Creek at Emerson Avenue
12. Fall Creek at Meridian Street

### Habitat Evaluation

The aquatic habitat at each study site was evaluated according to the method described by Ohio EPA [2]. This method results in values being assigned to various habitat parameters (e.g. substrate quality, riparian vegetation, channel morphology, etc.) and results in a numerical score for each site. Higher scores indicate higher aquatic habitat value. The maximum value for habitat using this assessment technique is 100. For quality control purposed, a duplicate assessment was conducted by a second person at site 3.

### Sample Collection

Macroinvertebrate samples in this study were collected by dipnet in riffle areas where current speed approached 30 cm/sec. All samples were preserved in the field with 70% isopropanol and returned to the lab for sorting and analysis. Spring samples were collected on April 24 and 25, 2008. Fall samples were collected on October 15 and 20, 2008. A duplicate sample for quality control was collected at site 3 during the spring collections.

### Laboratory Analysis

In the laboratory, a 100 organism subsample was prepared from each site by evenly distributing the animals collected in a white, gridded pan. Grids were randomly selected and all organisms within grids were removed until 100 organisms had been selected from the entire sample.

Each animal was identified to the lowest practical taxon (usually genus or species) using standard taxonomic references [4,5,6]. As each new taxon was identified, a representative specimen was preserved as a "voucher." All voucher specimens will ultimately be deposited in the Purdue University Department of Entomology collection. The list of animals found at each site number for both spring and fall collections may be found in the appendix.

### Data Analysis (Macroinvertebrates)

Following identification of the animals in the sample, "metrics" were calculated for each site. These metrics are based on knowledge about the sensitivity of each species to changes in environmental conditions. The macroinvertebrate data from this study were analyzed by two different sets of metrics. Data were analyzed with the mIBI protocol developed by the Indiana Department of Environmental Management [3], which is based on taxonomic identification to the family level, and an adaptation of the Ohio EPA protocol [2], which is based on taxonomic identifications to the genus and species level. The maximum possible score with the Ohio EPA method is 60, while the mIBI has a maximum possible score of 8. To facilitate comparisons to habitat values, both biotic indices are also expressed as a percentage of the maximum possible score

## **Results**

During spring collections, 41 macroinvertebrate genera belonging to 24 families were identified. Predominant families were Chironomidae (midges) and Elmidae (riffle beetles). The sediment-tolerant midge species *Orthocladius obumbratus* was the dominant organism at all but two sites (sites 10 and 11).

During fall collections, 63 macroinvertebrate genera belonging to 27 families were collected. Predominant families were Chironomidae (midges), Hydropsychidae (net-spinning caddisflies), especially *Cheumatopsyche* spp., and Heptageniidae (flatheaded mayflies). Macroinvertebrate raw data are listed in the appendix.

Table 1. Results for habitat (QHEI) and macroinvertebrate (Ohio EPA and IDEM mIBI) assessments. Macroinvertebrate scores are expressed as a percentage of the total possible score. Derivation of scores is listed in the appendix.

Site Number	QHEI	Ohio EPA (spring)	Ohio EPA (fall)	IDEM mIBI (spring)	IDEM mIBI (fall)
1	28	23	47	18	30
2	50	20	57	23	55
3	53	28	47	32	68
3 duplicate	56	20	*	20	*
4	50	37	53	38	68
5	67	37	30	28	38
6	31	23	50	28	50
7	58	20	43	18	30
8	59	47	60	18	65
9	70	33	37	28	40
10	73	17	37	23	53
11	76	33	67	33	70
12	54	33	47	23	50

\* not applicable

### **Diagnosis**

#### Comparison of habitat quality and biotic integrity

One of the most useful aspects of biological monitoring is the ability to use information about the way aquatic animals respond to different types of stress to diagnose a problem. For example, when aquatic habitat and biotic integrity are graphed in relation to each other, they form a straight line unless water quality is degraded [1]. Plus or minus 10% can be added to the graph to allow for a certain degree of measurement error. When values fall outside this range, water quality problems are suspected. A comparison of biotic integrity to habitat for this study is shown in Figures 1 and 2.

Figure 1. Comparison of Ohio EPA biotic index values to habitat values. Biotic index values are an average of spring and fall data and are expressed as a percentage of the total possible value.

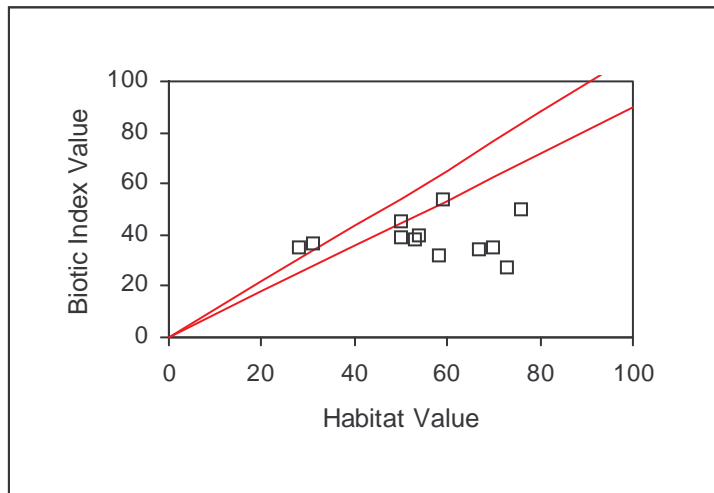
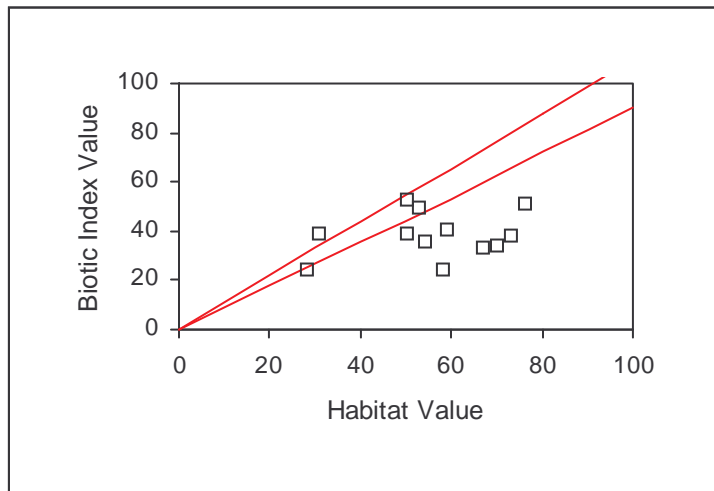


Figure 2. Comparison of IDEM macroinvertebrate biotic index values and habitat values. Biotic index values are an average of spring and fall data and are expressed as a percentage of the total possible value.



Examination of both graphs show similar patterns. Sites 5, 7, 9, 10, and 11 fall the farthest from the expected range in both graphs, which is likely the result of degraded water quality. When looking at the graph of Ohio EPA scores, sites 2, 3 and 12 group together moderately below the expected range, while on the graph of IDEM mIBI scores, sites 2, 8 and 12 are grouped together. These sites also have impaired water quality. The biotic integrity values at sites 1, 4 and 6 are within the range predicted by their habitat scores.

#### Primary water quality problem

The primary water quality problem in the study area appears to be silt. Extensive silt deposits were noted at several sites. Table 2 lists the silt tolerances of selected organisms

collected during the study. Although some silt intolerant organisms were present, the dominant forms were more frequently silt tolerant.

Table 2. Silt tolerances of selected organisms collected during 2008 study. [7]

<u>Organism</u>	<u>Silt Tolerance</u>
<i>Stenacron interpunctatum</i>	Tolerant
<i>Baetis intercalaris</i>	Tolerant
<i>Caenis</i> spp.	Tolerant
<i>Cheumatopsyche</i> spp.	Tolerant
<i>Hydropsyche betteni</i>	Tolerant
<i>Ceratopsyche bifida</i>	Intolerant
<i>Ceratopsyche sparna</i>	Intolerant
<i>Chimarra obscura</i>	Intolerant
<i>Orthocladius obumbratus</i>	Tolerant

#### Prioritization of sub-watersheds

1. Indian Creek (sites 6, 7, 8, and 9). Heavy silt deposits were observed at all sites in the Indian Creek subwatershed. Habitat at the most upstream site (6) was poor and was limited by lack of instream cover and riparian vegetation. Site 7 had the highest percentage (90%) of the sediment-tolerant midge *Orthocladius obumbratus* of any site during spring sampling. Site 8 had unstable riffle substrates that were embedded from silt deposits. Site 9 had few mayflies, was dominated by the planarian flatworm *Dugesia* in the fall collection, and had the most extensive silt deposits of any site in the study.

2. Fall Creek (sites 10, 11, and 12): Despite having a habitat score of 73, Site 10 had few mayflies, and was dominated by midges in the spring and the caddisfly *Cheumatopsyche* and blackfly larva (*Simulium* spp.) in the fall. This site is immediately below Geist Dam and may be affected by water quality problems within the reservoir, such as periodic dissolved oxygen deficits. Site 11 had the best habitat score (76) of all the study sites, but only had only fair biotic integrity, with one mayfly in the spring sample. The fall sample had good biotic integrity, with four mayfly species and three caddisfly species represented. Site 12 had few mayflies present, primarily *Stenacron interpunctatum*. Dominant organisms were the midge species *Orthocladius obumbratus* in the spring and the caddisfly genus *Cheumatopsyche* in the fall. Habitat quality was limited by a lack of in-stream cover and riparian vegetation.

3. Mud Creek (sites 3, 4, and 5): Habitat at the Mud Creek sites was good (QHEI scores of 50 to 67). The most downstream site (5) was observed to have moderate silt deposits and had impaired biotic integrity. The spring sample was dominated (50%) by *Orthocladius obumbratus* but had few mayflies, while the fall sample had no mayflies. Sites 3 and 4 had biotic integrity values closer to what would be expected based on the available habitat. Habitat quality at these sites was reduced by past channelization.

4. Sand Creek (sites 1 and 2). Site 1 had the poorest habitat (QHEI score of 28) of any of the study sites. There were heavy silt deposits, unstable substrates and evidence of recent channelization. Biotic integrity scores were close to what would be expected based on

available habitat. Site 2 had much better habitat (QHEI score of 50) with moderate levels of silt observed, but had very few mayflies in either the spring or fall collections. Both sites 1 and 2 were dominated by the midge *Orthocladius obumbratus* in the spring.

### **Recommendations**

1. Control inflow of sediment and silt into streams throughout the Fall Creek watershed. Special emphasis should be placed on sediment control within the Indian Creek subwatershed.
2. Investigate the status of water quality in Geist Reservoir. Water quality problems within Geist Reservoir may be affecting biotic integrity downstream in Fall Creek.
3. Enhance habitat by planting riparian vegetation at sites where it is sparse or absent, for example, at the upstream site (6) of Indian Creek and the downstream site (12) of Fall Creek.
4. Avoid future channelization of streams. Sites 3 and 4 on Mud Creek are in the process of natural recovery from past channelization. Site 1 on Sand Creek showed evidence of recent channelization but also of a two-stage ditch construction project which holds the potential to improve habitat and water quality in the future.

### **References**

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APPENDIX  
Macroinvertebrate Site Data  
Macroinvertebrate Metrics Data and Scoring  
Qualitative Habitat Evaluation Index (QHEI) Data

Spring macroinvertebrate data

			1	2	3	3 dpl.	4	5	6
Ephemeroptera	Baetidae	Baetis amplus			1		2	2	
	Heptagenidae	Stenacrom interpunctatum					3	2	
		Stenonema femoratum							
		S. terminatum							
	Caenidae	Caenis spp.	1						
Trichoptera	Hydropsychidae	Hydropsyche betteni	1	1			19	1	
		Ceratopsyche bifida	1					1	
		Cheumatopsyche spp.		3	3		7	1	
	Hydroptilidae	Ochotrichia spp.			1	1			
	Philopotamidae	Chimarra obscura						2	
	Polycentropidae	Neureclipsis spp.							3
	Lepidostomatidae								
Plecoptera	Perlodidae	Isoperla spp.							6
Coleoptera	Elmidae	Stenelmis spp.	1	3	20	10	1	9	17
		Optioservus fastiditus		14			2	7	
		Macronychus glabratus			2				
	Psephenidae	Psephenus herricki			11	7			
Odonata	Calopterygidae	Argia spp.				1			
	Coenagrionidae	Hetaerina spp.							
Diptera	Simuliidae	Simulium spp.		8			10	3	8
	Tipulidae	Hexatoma spp.			1				
	Ceratopogonidae		1						
	Chironomidae	Thienemannimyia spp.			6			3	
		Orthocladus obumbratus	73	69	51	73	47	50	21
		Parametriocnemus lundbecki	20						
		Cricotopus bicinctus							3
		C. tremulus				4	2	11	
		Eukiefferiella claripennis						4	2
		Polypedilum convictum			3	3	7		
		P. fallax							
		Dicrotendipes spp.						4	
		Paratendipes albimanus							
		Glyptotendipes lobiferus							
		Cryptochironomus fulvus							
		Parachironomus frequens							
		Rheotanytarus spp.							
Crustacea		Decapoda							
Isopoda		Caecodotea spp.	1						
		Lirceus spp.							40
Amphipoda									
Annelida		Oligochaeta	1	2	1	1			
		Hirudinea							
Bivalvia		Corbicula fluminea							
Platyhelminthes		Dugesia spp.							
total			100	100	100	100	100	100	100

Spring macroinvertebrate data, con't.

			7	8	9	10	11	12
Ephemeroptera	Baetidae	Baetis amplus						
	Heptagenidae	Stenacrom interpunctatum	2	1	2		1	9
		Stenonema femoratum		15				
		S. terminatum						4
	Caenidae	Caenis spp.	4	3	4			
Trichoptera	Hydropsychidae	Hydropsyche betteni						
		Ceratopsyche bifida					8	2
		Cheumatopsyche spp.			1	7	4	10
	Hydroptilidae	Ochotrichia spp.				1		
	Philopotamidae	Chimarra obscura						
	Polycentropidae	Neureclipsis spp.						
	Lepidostomatidae						1	
Plecoptera	Perlodidae	Isoperla spp.						
Coleoptera	Elmidae	Stenelmis spp.		2	2	1	24	
		Optioservus fastiditus		2	1			
		Macronychus glabratus						
	Psenpenidae	Psephenus herricki		8				
Odonata	Calopterygidae	Argia spp.	1					
	Coenagrionidae	Hetaerina spp.						1
Diptera	Simuliidae	Simulium spp.		10	32	14	46	
	Tipulidae	Hexatoma spp.					1	
	Ceratopogonidae							
	Chironomidae	Thienemannimyia spp.			14			6
		Orthocladius obumbratus	90	19	12	5	9	53
		Parametriocnemus lundbecki						
		Cricotopus bicinctus			2	5	4	12
		C. tremulus						
		Eukiefferiella claripennis		7	19			
		Polypedilum convictum		2	4	33	2	
		P. fallax		5				
		Dicrotendipes spp.		2		5		
		Paratendipes albimanus		17				
		Glyptotendipes lobiferus			7	24		
		Cryptochironomus fulvus		2				
		Parachironomus frequens						3
		Rheotanytarus spp.		2				
Crustacea		Decapoda	1					
Isopoda		Caecodotea spp.						
		Lirceus spp.		1				
Amphipoda			1			1		
Annelida		Oligochaeta		2		1		
		Hirudinea				1		
Bivalvia		Corbicula fluminea	1					
Platyhelminthes		Dugesia spp.				2		
total			100	100	100	100	100	100

# Fall Macroinvertebrate Data

						1	2	3	4	5	6
Ephemeroptera	Baetidae	Baetis flavistrigia					1				
		B. hageni							3		
	Heptageniidae	Stenacrom interpunctatum				3	1		1		1
		Stenonema femoratum				4					
	Caenidae	Caenis spp.				46					
Trichoptera	Hydropsychidae	Hydropsyche betteni					12	4	43	2	8
		Ceratopsyche bifida					2	1	8	2	
		C. sparna					4	8	11		
		Cheumatopsyche spp.				3	37	43	9	12	12
	Philopotamidae	Chimarra obscura						6			
Plecoptera	Perlidae	Perlinella spp.									
	Perlodidae									2	
Coleoptera	Elmidae	Stenelmis spp.						13	8		26
		Optioservus fastiditus					11		4	4	15
		Dubiraphia spp.				1					
	Psephenidae	Psephenus herricki						12			
	Hydrophilidae	Berosus spp.									3
	Heliodidae										1
	Coenagrionidae	Argia spp.				3		1			1
	Aeshnidae	Boyeria spp.						1			
	Simuliidae	Simulium spp.					5		6	60	
		Tipula spp.					1	5	1	2	6
Diptera	Tipulidae	Antocha spp.					3	1	1	1	
		Chironomidae	Ablabesmyia mallochi			4					
		Thienemannimyia spp.					4	2	1		6
		Orthocladius obumbratus					4		2	9	
		Parametriocnemus lundbecki					1			1	1
		Cricotopus bicinctus					2				1
		Eukiefferiella bavarica						2		3	
		Thienemanniella xena					2				
		Polypedilum convictum					2		1	1	7
		Dicrotendipes spp.				4					
		Glyptotendipes lobiferus				3					
		Cryptochironomus fulvus				2					
		Endochironomus nigricans				4					
		Microtendipes caelum					5				
		Rheotanytarus spp.				4					
	Isopoda	Caecodotea spp.									2
		Lirceus spp.				11					
	Amphipoda						2		1		
Annelida	Oligochaeta					3				1	
	Hirudinea					3	1				
Bivalvia	Sphaeriidae					1					
Gastropoda	Ancylidae	Ferrissia spp.									
	Physidae	Physella spp.				1					
Platyhelminthes		Dugesia spp.						1			10
total						100	100	100	100	100	100

Fall Macroinvertebrate Data, con't.

				7	8	9	10	11	12
Ephemeroptera	Baetidae	B. intercalaris			1	2		18	6
	Heptageniidae	Stenacrom interpunctatum		53					
		Stenonema femoratum		5	5				
		S. terminatum						22	
		S. pulchellum						2	2
	Caenidae	Caenis spp.		1					
	Tricorythidae	Tricorythodes spp.					4	5	
Trichoptera	Hydropsychidae	Hydropsyche betteni			14				
		H. orris						4	
		Ceratopsyche bifida			5			17	9
		C. sparna			9				
		Cheumatopsyche spp.			35	11	47	9	39
	Philopotamidae	Chimarra obscura			1	1			
Plecoptera	Perlidae	Perlinella spp.						1	
Coleoptera	Elmidae	Stenelmis spp.		2	6	17			9
		Macronychus glabratus						1	
	Psephenidae	Psephenus herricki			9				
Odonata	Coenagrionidae	Argia spp.		4					
Megaloptera	Corydalidae	Corydalus cornutus						2	
Lepidoptera	Pyrilidae							4	
Diptera	Simuliidae	Simulium spp.			2	6	26		11
	Tipulidae	Tipula spp.			4				
	Chironomidae	Thienemannimyia spp.		2		4			4
		Orthocladus obumbratus		3	1			2	4
		Parametriochnemus lundbecki		1					
		Cricotopus bicinctus			1		7	5	13
		C. trifascia							1
		Rheocricotopus robacki							1
		Thienemanniella xena			1	3			
		Polypedilum convictum			4	10	8		
		Phaenopsectra spp.		2					
		Dicrotendipes spp.		3		2		1	
		Chironomus spp.		5					
		Glyptotendipes lobiferus		3		12	1	1	
		Microtendipes caelum		3	1	1		6	
		Rheotanytarus spp.		2					1
Crustacea	Isopoda	Caecodotea spp.			1				
		Lirceus spp.		2					
Annelida	Oligochaeta			1			1		
	Hirudinea			1		1	1		
Bivalvia	Sphaeriidae					3			
Gastropoda	Ancylidae	Ferrissia spp.		7					
Platyhelminthes		Dugesia spp.				27	5		
total				100	100	100	100	100	100

Qualitative Habitat Evaluation Index (QHEI) site data

Site	1	2	3	3 dpl	4	5	6
Substrate	6	12	16	16	14	15	5
Cover	3	7	7	10	7	11	4
Channel	3	11	9	10	9	14	7
Riparian	4	6	6	3	6	7	3
Pool/Current	4	5	5	4	5	8	4
Riffle/Rum	2	3	6	5	3	6	2
Gradient	6	6	6	8	6	6	6
Total QHEI	28	50	53	56	50	67	31

Qualitative Habitat Evaluation Index (QHEI) site data

Site	7	8	9	10	11	12
Substrate	10	10	14	14	18	12
Cover	12	12	12	14	14	5
Channel	12	14	16	14	14	12
Riparian	8	8	9	10	8	3
Pool/Current	7	8	8	10	11	11
Riffle/Rum	3	1	3	5	5	5
Gradient	6	6	8	6	6	6
Total QHEI	58	59	70	73	76	54

Ohio EPA metrics data (spring)

Site	1	2	3	3 dpl.	4	5	6	7	8	9	10	11	12
# genera	9	7	11	8	10	14	8	7	16	12	13	10	9
# mayfly taxa	1	0	1	0	2	2	0	2	3	2	0	1	2
# caddisfly taxa	2	2	2	1	2	4	1	0	0	1	2	3	2
#diptera taxa	3	2	4	3	4	6	4	1	8	7	6	5	4
% tanitarsini	0	0	0	0	0	0	0	0	2	0	0	0	0
% mayflies	1	0	1	0	5	4	0	6	19	6	0	1	13
% caddisflies	2	4	4	1	26	5	3	0	0	1	8	13	12
% tolerant	1	2	1	1	0	4	3	0	9	9	35	4	12
%nontanytarsids & non-insects	96	79	62	81	66	75	74	93	67	90	91	62	74
% dominant	73	69	51	73	47	50	40	90	19	32	33	46	53

### Ohio EPA metrics scoring (spring)

Site	1	2	3	3 dupl	4	5	6	7	8	9	10	11	12
# genera	2	2	2	2	2	4	2	2	4	2	2	2	2
# mayfly taxa	0	0	0	0	2	2	0	2	2	2	0	0	2
# caddisfly taxa	2	2	2	2	2	4	2	0	0	2	2	2	2
#diptera taxa	0	0	2	0	2	2	2	0	4	2	2	2	2
% tanitarsini	0	0	0	0	0	0	0	0	2	0	0	0	0
% mayflies	2	0	1	0	2	2	0	2	4	2	0	2	4
% caddisflies	2	2	2	2	6	2	2	0	0	2	2	4	4
% tolerant	6	6	6	6	6	6	6	6	6	6	0	6	4
%nontanytarsids & non-insects	0	0	2	0	0	0	0	0	0	0	0	2	0
% dominant	0	0	0	0	0	0	0	0	6	2	2	0	0
Ohio EPA score	14	12	17	12	22	22	14	12	28	20	10	20	20
standardized score	23	20	28.3	20	37	37	23	20	47	33	17	33	33

### Ohio EPA metrics data (fall)

Site	1	2	3	4	5	6	7	8	9	10	11	12
# genera	17	18	13	14	13	15	18	16	14	9	15	11
# mayfly taxa	3	2	0	2	0	1	3	2	1	1	4	2
# caddisfly taxa	1	4	5	4	3	2	0	5	2	1	3	2
#diptera taxa	6	10	4	6	7	5	9	7	7	4	5	7
% tanitarsini	4	0	0	0	0	0	2	0	0	0	0	1
% mayflies	53	2	0	4	0	1	59	6	2	4	47	8
% caddisflies	3	55	62	71	16	20	0	64	12	47	30	48
% tolerant	11	2	0	0	1	1	19	1	14	9	7	13
%nontanytarsids & non-insects	36	32	11	13	78	33	33	15	69	49	15	34
% dominant	46	37	43	43	60	26	53	35	27	47	22	39



# Ohio EPA metrics scoring (fall)

Site	1	2	3	4	5	6	7	8	9	10	11	12
# genera	4	4	2	4	2	4	4	4	4	2	4	2
# mayfly taxa	2	2	0	2	0	0	2	2	0	0	2	2
# caddisfly taxa	2	4	6	4	4	2	0	6	2	2	4	2
#diptera taxa	2	4	2	2	2	2	4	2	2	2	2	2
% tanitarsini	2	0	0	0	0	0	2	0	0	0	0	2
% mayflies	6	2	0	2	0	2	6	2	2	2	6	2
% caddisflies	2	6	6	6	4	6	0	6	4	6	6	6
% tolerant	4	6	6	6	6	6	4	6	4	6	6	4
%nontanytarsids & non-insects	4	4	6	6	0	4	4	6	0	2	6	4
% dominant	0	2	0	0	0	4	0	2	4	0	4	2
Ohio EPA score	28	34	28	32	18	30	26	36	22	22	40	28
Standardized score	47	57	47	53	30	50	43	60	37	37	67	47

## IDEM mIBI metrics data (spring)

Site	1	2	3	3 dpl	4	5	6	7	8	9	10	11	12
Family HBI	6.01	5.66	5.29	5.7	5.48	5.52	6.22	5.97	5.57	5.9	5.86	5.19	5.69
No. of taxa	7	5	8	6	6	7	6	7	8	6	9	7	4
no. of individuals	200	>350	>350	>350	>350	200	>350	150	110	>350	200	160	150
% dominant	93	69	60	80	56	72	40	90	56	58	72	46	74
EPT index	2	1	3	1	3	4	2	2	2	3	2	3	2
ept count	6	20	25	5	155	18	31.5	9	22	25	16	22.4	37.5
ept count/total count	0.03	0.04	0.05	0.01	0.31	0.09	0.09	0.06	0.2	0.1	0.08	0.14	0.25
ept/chironomids	0.03	0.06	0.08	0.01	0.06	0.12	0.346	0.07	0.36	0.1	0.11	0.93	0.34
chironomid count	>146	>146	>146	>146	>146	144	>146	135	62	>149	144	24	111
ind/squares	>410	>410	>410	>410	>410	>410	>410	>410	<30	>410	>410	>410	>410

## IDEM mIBI metrics scoring (spring)

Site	1	2	3	3 dpl	4	5	6	7	8	9	10	11	12
Family HBI	0	0	2	0	2	2	0	0	2	0	0	2	0
No. of taxa	0	0	2	0	0	0	0	0	2	0	2	0	0
no. of individuals	6	8	8	8	8	6	8	4	2	8	6	4	4
% dominant	0	0	2	0	2	0	4	0	2	2	0	2	0
EPT index	0	0	2	0	2	4	0	0	0	2	0	2	0
ept count	0	2	2	0	6	0	2	0	2	2	0	2	2
ept count/total count	0	0	0	0	2	0	0	0	2	0	0	2	2
ept/chironomids	0	0	0	0	0	0	0	0	0	0	0	0	0
chironomid count	0	0	0	0	0	2	0	2	2	0	2	4	2
ind/squares	8	8	8	8	8	8	8	8	0	8	8	8	8
mIBI	1.4	1.8	2.6	1.6	3	2.2	2.2	1.4	1.4	2.2	1.8	2.6	1.8
% of total possible	17.5	22.5	32.5	20	37.5	27.5	27.5	17.5	17.5	28	22.5	32.5	22.5

IDEM mIBI metrics data (fall)

	Site	1	2	3	4	5	6	7	8	9	10	11	12
Family HBI		7.01	4.5	4.01	4.18	5.41	4.6	5.32	4.21	5.99	5.06	4.45	4.7
No. of taxa		11	9	9	8	7	10	9	11	9	7	9	6
no. of individuals		100	>350	>350	>350	>350	>350	120	>350	>350	>350	>350	>350
% dominant		46	55	56	71	60	41	58	63	32	47	30	48
EPT index		3	3	2	3	2	2	2	4	3	2	5	3
ept count		56	57	62	75	18	21	59	70	14	51	78	56
ept count/total count		0.56	0.57	0.62	0.75	0.18	0.21	0.59	0.7	0.14	0.51	0.78	0.56
ept/chironomids		2.667	2.85	15.5	18.75	1.286	1.4	2.46	10	0.438	3.188	5.2	2.33
chironomid count		21	20	4	4	14	15	24	7	32	16	15	24
ind/squares		<30	>410	>410	>410	>410	>410	<30	>410	>410	>410	>410	>410

IDEM mIBI metrics scoring (fall)

	Site	1	2	3	4	5	6	7	8	9	10	11	12
Family HBI		0	6	8	6	2	6	2	6	0	4	6	4
No. of taxa		4	2	2	2	0	2	2	4	2	0	2	0
no. of individuals		2	8	8	8	8	8	2	8	8	8	8	8
% dominant		2	2	2	0	2	4	2	0	4	2	6	2
EPT index		2	2	0	2	0	0	0	4	2	0	4	2
ept count		4	4	4	4	0	2	4	4	0	4	4	4
ept count/total count		4	6	6	8	2	2	6	6	4	6	8	6
ept/chironomids		2	2	8	8	2	2	2	6	0	4	4	2
chironomid count		4	4	8	8	6	6	4	6	4	6	6	4
ind/squares		0	8	8	8	8	8	0	8	8	8	8	8
mIBI		2.4	4.4	5.4	5.4	3	4	2.4	5.2	3.2	4.2	5.6	4
% of total possible		30	55	68	67.5	38	50	30	65	40	52.5	70	50

River Code: 101 RMI: 1 Stream: Fish Creek  
 Date: 4/25/08 Location: Philmont Brooks School Rd.  
 Scorers Full Name: GRB Affiliation:

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		POOL RIFFLE		SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR / SLBS [10]	<input type="checkbox"/> GRAVEL [7]	<input type="checkbox"/> SAND [6]	<input type="checkbox"/> BEDROCK [5]	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT	<input checked="" type="checkbox"/> SILT HEAVY [-2]	<input type="checkbox"/> SILT MODERATE [-1]	<input type="checkbox"/> SILT NORMAL [0]	<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> EMBEDDED	<input type="checkbox"/> NESS	<input type="checkbox"/> EXTENSIVE [-2]	<input type="checkbox"/> MODERATE [-1]	<input type="checkbox"/> NORMAL [0]	<input type="checkbox"/> NONE [1]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> COAL FINES [-2]					
<input type="checkbox"/> HARDPAN [4]									
<input type="checkbox"/> MUCK [2]									
<input checked="" type="checkbox"/> SILT [2]									

NOTE: Ignore Sludge Originating From Point Sources

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]

COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)	
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]
<input type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]	<input type="checkbox"/> MODERATE 25-75% [7]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> SPARSE 5-25% [3]
<input type="checkbox"/> ROOTMATS [1]			<input checked="" type="checkbox"/> NEARLY ABSENT < 5% [1]

COMMENTS:

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL
<input checked="" type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input checked="" type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING
				<input checked="" type="checkbox"/> BANK SHAPING
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION	
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R	L R (Per Bank)	
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input checked="" type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]	<input checked="" type="checkbox"/> MODERATE [2]	
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> HEAVY/SEVERE [1]	
<input type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROW CROP [0]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> HEAVY/SEVERE [1]	
<input checked="" type="checkbox"/> VERY NARROW < 5 m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> HEAVY/SEVERE [1]	
<input type="checkbox"/> NONE [0]					

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY (POOLS & RIFFLES)
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]
<input type="checkbox"/> 0.7-1m [4]	<input checked="" type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]
<input type="checkbox"/> 0.4-0.7m [3]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]
<input checked="" type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]
<input type="checkbox"/> < 0.2m [POOL=0]		<input type="checkbox"/> TORRENTIAL [1]
		<input type="checkbox"/> INTERMITTENT [2]
		<input type="checkbox"/> VERY FAST [1]

COMMENTS:

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]
<input type="checkbox"/> Best Areas < 5 cm		<input checked="" type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input checked="" type="checkbox"/> MODERATE [0]
[RIFFLE=0]			<input type="checkbox"/> EXTENSIVE [-1]
COMMENTS: <u></u>		<input type="checkbox"/> NO RIFFLE (Metric=0)	

6) GRADIENT (ft/mi):  DRAINAGE AREA (sq.mi.):

%POOL:  %GLIDE:   
 %RIFFLE:  %RUN:

\* Best areas must be large enough to support a population of riffle-dwelling species



River Code: 2 RMI: Stream: Sand Cr.

Date: 4/25/08 Location: 116 H St

Scorers Full Name: GRB Affiliation:

1) SUBSTRATE (Check ONLY Three Substrate TYPE BOXES; Estimate % present)

TYPE	POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> BLDR /SLBS [10]	<input checked="" type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> SAND [6]	<input checked="" type="checkbox"/> LIMESTONE [1]	<input checked="" type="checkbox"/> SILT HEAVY [-2]
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> BEDROCK [5]	<input type="checkbox"/> DETRITUS [3]	<input checked="" type="checkbox"/> TILLS [1]	<input checked="" type="checkbox"/> SILT MODERATE [-1]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> SILT NORMAL [0]
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> COAL FINES [-2]	<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> NONE [1]	<input type="checkbox"/> EXTENSIVE [-2]
<input type="checkbox"/> SLT [2]				<input checked="" type="checkbox"/> MODERATE [-1]

NOTE: Ignore Sludge Originating From Point Sources.

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]

COMMENTS:

Substrate  
12  
Max 20

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE	SCORE	AMOUNT
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]
<input checked="" type="checkbox"/> ROOTMATS [1]		

COMMENTS:

Cover  
7  
Max 20

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input checked="" type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION
<input checked="" type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT, OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING

COMMENTS:

Channel  
11  
Max 20

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)	BANK EROSION
<input type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> NONE/LITTLE [3]
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input checked="" type="checkbox"/> MODERATE [2]
<input type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input checked="" type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]
<input type="checkbox"/> NONE [0]		

COMMENTS:

Riparian  
6  
Max 10

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES]
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]
<input type="checkbox"/> 0.7-1m [4]	<input checked="" type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]
<input checked="" type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]
<input type="checkbox"/> < 0.2m [POOL=0]		<input type="checkbox"/> TORRENTIAL [-1]

COMMENTS:

Pool/  
Current  
5  
Max 12

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input checked="" type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]
<input type="checkbox"/> Best Areas < 5 cm [0]		<input checked="" type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input checked="" type="checkbox"/> MODERATE [0]
			<input type="checkbox"/> EXTENSIVE [-1]

COMMENTS:

Riffle/Run  
3  
Max 8  
Gradient  
6  
Max 10

6) GRADIENT (ft/mi): \_\_\_\_\_ DRAINAGE AREA (sq.mi.): \_\_\_\_\_

%POOL: \_\_\_\_\_ %GLIDE: \_\_\_\_\_

%RIFFLE: \_\_\_\_\_ %RUN: \_\_\_\_\_

\* Best areas must be large enough to support a population of riffle-obligate species

plankton growth thick on rocks



River Code: J RMI: Stream: Mud Creek  
Date: 4/25/08 Location: Madison/Hamilton Co. Line  
Scorers Full Name: GRB Affiliation:

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE	POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> BDR/SUBS [10]	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> SAND [8]	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT HEAVY [-2]
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> BEDROCK [5]	<input checked="" type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> FIELDS [1]	<input type="checkbox"/> SILT MODERATE [-1]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> HARDPAN [0]	<input checked="" type="checkbox"/> SILT NORMAL [0]
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> SILT [2]	<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> EXTENSIVE [-2]
		<input type="checkbox"/> COAL FINES [-2]		<input checked="" type="checkbox"/> MODERATE [-1]
				<input checked="" type="checkbox"/> NORMAL [0]
				<input type="checkbox"/> NONE [1]

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]  
(High Quality Only, Score 55 or >)

COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE	SCORE	TYPE	SCORE	AMOUNT
UNDERCUT BANKS [1]		POOLS > 70 cm [2]		<input type="checkbox"/> EXTENSIVE > 75% [11]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]		ROOTWADS [1]		<input type="checkbox"/> MODERATE 25-75% [7]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]		<input checked="" type="checkbox"/> BOULDERS [1]		<input checked="" type="checkbox"/> SPARSE 5-25% [3]
<input checked="" type="checkbox"/> ROOTMATS [1]				<input type="checkbox"/> NEARLY ABSENT < 5% [1]

COMMENTS:

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [4]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input checked="" type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION
<input checked="" type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING
				<input type="checkbox"/> BANK SHAPING
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)	BANK EROSION
L R (Per Bank)	L R (Most Predominant Per Bank)	L R (Per Bank)
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input checked="" type="checkbox"/> NONE/LITTLE [3]
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> MODERATE [2]
<input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input checked="" type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	
<input type="checkbox"/> NONE [0]		

COMMENTS:

5) POOL/GLIDE AND RIFFLES/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY (POOLS & RIFFLES)
(Check 1 ONLY)	(Check 1 OF 2 & AVERAGE)	(Check 1 or 2 apply)
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]
<input type="checkbox"/> 0.7-1m [4]	<input checked="" type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]
<input checked="" type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE WIDTH [0]	<input checked="" type="checkbox"/> MODERATE [1]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]
<input type="checkbox"/> < 0.2m [POOL=0]		<input type="checkbox"/> TORRENTIAL [-1]
		<input type="checkbox"/> INTERSTITIAL [-1]
		<input type="checkbox"/> INTERMITTENT [-2]
		<input type="checkbox"/> VERY FAST [1]

COMMENTS:

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input checked="" type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input checked="" type="checkbox"/> LOW [1]
<input type="checkbox"/> Best Areas < 5 cm [0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]
			<input type="checkbox"/> EXTENSIVE [-1]

COMMENTS:

6) GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.):

%POOL:	%GLIDE:
%RIFFLE:	%RUN:





## Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

56

River Code: 3 R.M.: Stream: Mud Creek  
 Date: 4/25/08 Location: Madison/Hamilton Co. Line  
 Scorers Full Name: MMK Affiliation: \_\_\_\_\_

1) SUBSTRATE (Check ONLY ~~Two~~ Substrate TYPE BOXES; Estimate % present)

TYPE	POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> BLDR / SLBS [10]	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> Check ONE (OR 2 & AVERAGE)	<input type="checkbox"/> SILT	<input type="checkbox"/> SILT HEAVY [-2]
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> SAND [6]	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT MODERATE [-1]	<input type="checkbox"/> SILT MODERATE [-1]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> BEDROCK [5]	<input checked="" type="checkbox"/> TILLS [1]	<input type="checkbox"/> SILT NORMAL [0]	<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> SILT FREE [1]	<input type="checkbox"/> EXTENSIVE [-2]
<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> MODERATE [-1]	<input checked="" type="checkbox"/> NORMAL [0]
<input type="checkbox"/> SILT [2]	<small>NOTE: Ignore Sludge Originating From Point Sources</small>	<input type="checkbox"/> SANDSTONE [0] EMBEDDED	<input type="checkbox"/> NONE [1]	
		<input type="checkbox"/> RIP/RAP [0] NESS:		
		<input type="checkbox"/> LACUSTRINE [0]		
		<input type="checkbox"/> SHALE [-1]		
		<input type="checkbox"/> COAL FINES [-2]		

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]

(High Quality Only, Score 5 or >)

COMMENTS: \_\_\_\_\_

Substrate  
16  
Max 20

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> SPARSE 5-25% [3]
<input type="checkbox"/> ROOTMATS [1]	<input type="checkbox"/> NEARLY ABSENT < 5% [1]
<input type="checkbox"/> POOLS > 70 cm [2]	
<input checked="" type="checkbox"/> ROOTWADS [1]	
<input type="checkbox"/> BOULDERS [1]	
<input type="checkbox"/> OXBOWS, BACKWATERS [1]	
<input type="checkbox"/> AQUATIC MACROPHYTES [1]	
<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	

COMMENTS: \_\_\_\_\_

Cover  
10  
Max 20

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION
<input checked="" type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input checked="" type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING
				<input type="checkbox"/> BANK SHAPING
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS

COMMENTS: \_\_\_\_\_

Channel  
10  
Max 20

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)	BANK EROSION
L R (Per Bank)	L R (Most Predominant Per Bank)	L R (Per Bank)
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> NONE/LITTLE [3]
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input checked="" type="checkbox"/> MODERATE [2]
<input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input checked="" type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]
<input type="checkbox"/> NONE [0]		

COMMENTS: \_\_\_\_\_

Riparian  
3  
Max 10

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES) (Check All That Apply)
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]
<input type="checkbox"/> 0.7-1m [4]	<input checked="" type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input checked="" type="checkbox"/> FAST [1]
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]
<input checked="" type="checkbox"/> 0.2-0.4m [1]		<input type="checkbox"/> SLOW [1]
<input type="checkbox"/> < 0.2m (POOL=0)		<input type="checkbox"/> TORRENTIAL [1]
		<input type="checkbox"/> INTERSTITIAL [1]
		<input type="checkbox"/> INTERMITTENT [2]
		<input type="checkbox"/> VERY FAST [1]

COMMENTS: \_\_\_\_\_

Pool/Current  
4  
Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RIFFLE DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input checked="" type="checkbox"/> LOW [1]
<input type="checkbox"/> Best Areas < 5 cm [0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]
(RIFFLE=0)			<input type="checkbox"/> EXTENSIVE [-1]
COMMENTS: _____		<input type="checkbox"/> NO RIFFLE (Metric=0)	

Riffle/Run  
5  
Max 8  
Gradient  
8  
Max 10

6) GRADIENT (ft/mi): \_\_\_\_\_ DRAINAGE AREA (sq.mi.): \_\_\_\_\_

%POOL:  %GLIDE:   
 %RIFFLE:  %RUN:

\* Best areas must be large enough to support a population of riffs-obligate species





## Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

50

River Code: 7 RM: Stream: Mud Creek

Date: 4/25/09 Location: 116th St.

Scorer's Full Name: GRB Affiliation:

1) SUBSTRATE (Check ONLY Three Substrate TYPE BOXES; Estimate % present)

TYPE	POOL RIFFLE:	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> BLDR /SLBS [10]	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> Check ONE (OR 2 & AVERAGE)	<input type="checkbox"/> SILT	<input type="checkbox"/> SILT HEAVY [-2]
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> SAND [6]	<input checked="" type="checkbox"/>	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT MODERATE [-1]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> BEDROCK [5]	<input checked="" type="checkbox"/>	<input type="checkbox"/> TILLS [1]	<input checked="" type="checkbox"/> SILT NORMAL [0]
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> DETRITUS [3]	<input checked="" type="checkbox"/>	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> ARTIFICIAL [0]	<input checked="" type="checkbox"/>	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> EXTENSIVE [-2]
<input type="checkbox"/> SILT [2]	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0] EMBEDDED	<input type="checkbox"/> MODERATE [-1]
			<input type="checkbox"/> RIP/RAP [0] NESS:	<input checked="" type="checkbox"/> NORMAL [0]
			<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> NONE [1]
			<input type="checkbox"/> SHALE [-1]	
			<input type="checkbox"/> COAL FINES [-2]	

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☒ 3 or Less [0]

COMMENTS:

Substrate  
14  
Max 20

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)	Cover
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]
<input checked="" type="checkbox"/> ROOTMATS [1]	COMMENTS:	

AMOUNT: ☐ EXTENSIVE > 75% [11] ☐ MODERATE 25-75% [7] ☒ SPARSE 5-25% [3] ☐ NEARLY ABSENT < 5% [1]

Cover  
7  
Max 20

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	<input type="checkbox"/> IMPOUND.
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input checked="" type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	<input type="checkbox"/> ISLANDS
<input checked="" type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL	<input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	<input type="checkbox"/> BANK SHAPING
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

Channel  
9  
Max 20

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)	BANK EROSION	Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R (Per Bank)	
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]
<input type="checkbox"/> MODERATE 10-50m [3]	<input checked="" type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input checked="" type="checkbox"/> MODERATE [2]
<input checked="" type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROW CROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]	
<input type="checkbox"/> NONE [0]			

Riparian  
6  
Max 10

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES) (Check All That Apply)	Pool/Current
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]	<input type="checkbox"/> TORRENTIAL [-1]
<input type="checkbox"/> 0.7-1m [4]	<input checked="" type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]	<input type="checkbox"/> INTERSTITIAL [-1]
<input checked="" type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> INTERMITTENT [-2]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	<input type="checkbox"/> VERY FAST [1]
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS:		

Pool/Current  
5  
Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	<input type="checkbox"/> NONE [2]
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input checked="" type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> MODERATE [0]
<input type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input checked="" type="checkbox"/> EXTENSIVE [-1]	

COMMENTS:

Riffle/Run  
3  
Max 8  
Gradient  
6  
Max 10

6) GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.):

%POOL: %GLIDE: %RIFFLE: %RUN:

\* Best areas must be large enough to support a population of riffle-obligate species



River Code: 5 RM: Stream: Mud Creek  
 Date: 4/24/08 Location: Fall Cr. Parkway  
 Scorers Full Names: GRB Affiliation: \_\_\_\_\_

## 1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR / SLBS [10]	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> Check ONE (OR 2 & AVERAGE)	<input type="checkbox"/> SILT: <input type="checkbox"/> SILT HEAVY [-2]	Substrate <div style="border: 1px solid black; padding: 2px; display: inline-block;">15</div> Max 20		
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> SAND [6]	<input checked="" type="checkbox"/> LIMESTONE [1]	<input checked="" type="checkbox"/> SILT MODERATE [-1]			
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> BEDROCK [5]	<input checked="" type="checkbox"/> TILLS [1]	<input type="checkbox"/> SILT NORMAL [0]			
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> SILT FREE [1]			
<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> EXTENSIVE [-2]			
<input type="checkbox"/> SILT [2]	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0] EMBEDDED	<input type="checkbox"/> MODERATE [-1]		
		<input type="checkbox"/> RIP/RAP [0] NESS:	<input checked="" type="checkbox"/> NORMAL [0]			
		<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> NONE [1]			
		<input type="checkbox"/> SHALE [-1]				
		<input type="checkbox"/> COAL FINES [-2]				

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]  
 (High Quality Only, Score 5 or >) ☐ 3 or Less [0]

## COMMENTS:

## 2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)	Cover
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> EXTENSIVE > 75% [11]	Cover <div style="border: 1px solid black; padding: 2px; display: inline-block;">11</div> Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]	
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input type="checkbox"/> SPARSE 5-25% [3]	
<input checked="" type="checkbox"/> ROOTMATS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

## 3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input checked="" type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	Channel <div style="border: 1px solid black; padding: 2px; display: inline-block;">14</div> Max 20
<input checked="" type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	
<input type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL	
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

## COMMENTS:

## 4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION	Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)		Riparian <div style="border: 1px solid black; padding: 2px; display: inline-block;">7</div> Max 10
<input type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]		
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input checked="" type="checkbox"/> MODERATE [2]		
<input checked="" type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROW CROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]		
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]			
<input type="checkbox"/> NONE [0]					

## COMMENTS:

## 5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (Check All That Apply)	Pool/Current
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]	Pool/Current <div style="border: 1px solid black; padding: 2px; display: inline-block;">8</div> Max 12
<input checked="" type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]	
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]	
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	
<input type="checkbox"/> < 0.2m [POOL=0]		<input type="checkbox"/> TORRENTIAL [-1]	
COMMENTS:		<input type="checkbox"/> INTERSTITIAL [-1]	
		<input type="checkbox"/> INTERMITTENT [-2]	
		<input type="checkbox"/> VERY FAST [1]	

## CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input checked="" type="checkbox"/> Best Areas > 10 cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	Riffle/Run <div style="border: 1px solid black; padding: 2px; display: inline-block;">6</div> Max 8
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input type="checkbox"/> Best Areas < 5 cm. (RIFFLE=0)		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input checked="" type="checkbox"/> MODERATE [0]	
COMMENTS:		<input type="checkbox"/> NO RIFFLE [Metric=0]	<input type="checkbox"/> EXTENSIVE [-1]	Gradient <div style="border: 1px solid black; padding: 2px; display: inline-block;">6</div> Max 10

6) GRADIENT (ft/mi): \_\_\_\_\_ DRAINAGE AREA (sq.mi.): \_\_\_\_\_ %POOL:  %GLIDE:   
 %RIFFLE:  %RUN:

\* Best areas must be large enough to support a population of native coldwater species

fat mucket (w.d.) (clam)  
typical





## Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

31

River Code: 6 RM: Stream: Indian Creek

Date: 4/25/08 Location: County Line

Scorer's Full Name: G.R.B. Affiliation:

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR /SLBS [10]	<input type="checkbox"/> H-GRAVEL [7]	<input type="checkbox"/> SAND [6]	<input checked="" type="checkbox"/> L- LESTONE [1]	<input checked="" type="checkbox"/> SILT	<input checked="" type="checkbox"/> SILT HEAVY [-2]	<input type="checkbox"/> SILT MODERATE [-1]	<input type="checkbox"/> SILT NORMAL [0]
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> BEDROCK [5]	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> SANDSTONE [0]	<input checked="" type="checkbox"/> EXTENSIVE [-2]	<input type="checkbox"/> MODERATE [-1]	<input type="checkbox"/> NORMAL [0]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> COAL FINES [-2]	<input type="checkbox"/> NONE [1]	
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> SILT [2]					

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]

COMMENTS:

Substrate  
5  
Max 20

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)	
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]	<input type="checkbox"/> MODERATE 25-75% [7]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> SPARSE 5-25% [3]
<input type="checkbox"/> ROOTMATS [1]			<input checked="" type="checkbox"/> NEARLY ABSENT < 5% [1]

COMMENTS:

Cover  
4  
Max 20

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input checked="" type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL
<input type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING

COMMENTS:

Channel  
7  
Max 20

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION	
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]	<input type="checkbox"/> NONE/LITTLE [3]	<input checked="" type="checkbox"/> MODERATE [2]
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input checked="" type="checkbox"/> NONE [0]					

COMMENTS:

Riparian  
3  
Max 10

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY)		MORPHOLOGY (Check 1 or 2 & AVERAGE)		CURRENT VELOCITY (POOLS & RIFFLES) (Check All That Apply)	
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]	<input type="checkbox"/> TORRENTIAL [-1]	<input type="checkbox"/> EDDIES [1]	<input type="checkbox"/> TORRENTIAL [-1]
<input type="checkbox"/> 0.7-1m [4]	<input checked="" type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [3]	<input type="checkbox"/> INTERSTITIAL [-1]	<input type="checkbox"/> FAST [3]	<input type="checkbox"/> INTERSTITIAL [-1]
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> INTERMITTENT [-2]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> INTERMITTENT [-2]
<input checked="" type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	<input type="checkbox"/> VERY FAST [1]	<input checked="" type="checkbox"/> SLOW [1]	<input type="checkbox"/> VERY FAST [1]
<input type="checkbox"/> < 0.2m [POOL=0]					

COMMENTS:

Pool/Current  
4  
Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]
<input type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input checked="" type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]
			<input checked="" type="checkbox"/> EXTENSIVE [-1]

COMMENTS:

Riffle/Run  
2  
Max 8  
Gradient  
6  
Max 10

6) GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.):

%POOL: %GLIDE: %RIFFLE: %RUN:

\* Best areas must be large enough to support a population of native obligate species



River Code: 7 RMI: Stream: Indian Creek

Date: 4/24/08 Location: 52nd St.

Scorer's Full Name: GAB Affiliation:

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		POOL RIFFLE		SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR/SLBS [10]		<input checked="" type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/>	Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)			
<input type="checkbox"/> BOULDER [9]		<input checked="" type="checkbox"/> SAND [6]	<input checked="" type="checkbox"/>	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/>	<input checked="" type="checkbox"/> SILT: <input checked="" type="checkbox"/> SILT HEAVY [-2]			
<input type="checkbox"/> COBBLE [8]		<input type="checkbox"/> BEDROCK [5]		<input checked="" type="checkbox"/> TILLS [1]		<input type="checkbox"/> SILT MODERATE [-1]			
<input type="checkbox"/> HARDPAN [4]		<input type="checkbox"/> DETRITUS [3]		<input type="checkbox"/> WETLANDS [0]		<input type="checkbox"/> SILT NORMAL [0]			
<input type="checkbox"/> MUCK [2]		<input type="checkbox"/> ARTIFICIAL [0]		<input type="checkbox"/> HARDPAN [0]		<input type="checkbox"/> SILT FREE [1]			
<input checked="" type="checkbox"/> SALT [2]		NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/>	<input checked="" type="checkbox"/> EXTENSIVE [-2]			
				<input type="checkbox"/> RIP/RAP [0]	NESS:	<input type="checkbox"/> MODERATE [-1]			
				<input type="checkbox"/> LACUSTRINE [0]		<input type="checkbox"/> NORMAL [0]			
				<input type="checkbox"/> SHALE [-1]		<input type="checkbox"/> NONE [1]			
				<input type="checkbox"/> COAL FINES [-2]					

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]

(High Quality Only, Score 5 or >)

COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)		Cover
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input checked="" type="checkbox"/> EXTENSIVE > 75% [11]	12 Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> ROOTWADS [1]	<input checked="" type="checkbox"/> AQUATIC MACROPHYTES [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]	
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> SPARSE 5-25% [3]	
<input checked="" type="checkbox"/> ROOTMATS [1]	COMMENTS:		<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input checked="" type="checkbox"/> EXCELLENT [7]	<input checked="" type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING <input type="checkbox"/> IMPOUND.	12 Max 20
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION <input type="checkbox"/> ISLANDS	
<input checked="" type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL <input type="checkbox"/> LEVEED	
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING <input type="checkbox"/> BANK SHAPING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)			8 Max 10
<input type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input checked="" type="checkbox"/> NONE/LITTLE [3]			
<input checked="" type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input checked="" type="checkbox"/> MODERATE [2]			
<input type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]			
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]				
<input type="checkbox"/> NONE [0]						

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES) (Check All That Apply)	Pool/Current
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL: WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]	7 Max 12
<input checked="" type="checkbox"/> 0.7-1m [4]	<input checked="" type="checkbox"/> POOL: WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]	
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL: WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]	
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS:	<input type="checkbox"/> TORRENTIAL [-1]	
		<input type="checkbox"/> INTERSTITIAL [-1]	
		<input type="checkbox"/> INTERMITTENT [-2]	
		<input type="checkbox"/> VERY FAST [1]	

CHECK ONE OR CHECK 2 AND AVERAGE				Riffle/Run
RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	3 Max 8
<input type="checkbox"/> Best Areas > 10 cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]	
			<input checked="" type="checkbox"/> EXTENSIVE [-1]	
COMMENTS:				
<input type="checkbox"/> NO RIFFLE (Metric=0)				6 Max 10

6) GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.): %POOL: %GLIDE: %RIFFLE: %RUN:

\* Best areas must be large enough to support a population of riffle-obligate species





## Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

59

River Code: 8 RM: Stream: Indian Creek  
Date: 4/24/08 Location: Sunnyside  
Scorers Full Name: GRB Affiliation:

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> BLDR /SLBS [10]	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> SAND [6]	<input checked="" type="checkbox"/> LESTONE [1]	<input checked="" type="checkbox"/> SILT	<input checked="" type="checkbox"/> SILT HEAVY [-2]
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> BEDROCK [5]	<input checked="" type="checkbox"/> DETRITUS [3]	<input checked="" type="checkbox"/> WETLANDS [0]	<input checked="" type="checkbox"/> TILLS [1]	<input type="checkbox"/> SILT MODERATE [-1]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> SANDSTONE [0]	<input checked="" type="checkbox"/> EMBEDDED	<input type="checkbox"/> SILT NORMAL [0]
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> SILT [2]	<input type="checkbox"/> COAL FINES [-2]	<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> MODERATE [-1]	<input type="checkbox"/> NORMAL [0]	<input type="checkbox"/> EXTENSIVE [-2]

NOTE: Ignore Sludge Originating From Point Sources

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]

COMMENTS:

Substrate  
10  
Max 20

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]
<input checked="" type="checkbox"/> ROOTMATS [1]	<input type="checkbox"/> NEARLY ABSENT < 5% [1]

COMMENTS:

Cover  
12  
Max 20

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input checked="" type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING
<input checked="" type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION
<input type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING

COMMENTS:

Channel  
14  
Max 20

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)	BANK EROSION
<input type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> NONE/LITTLE [3]
<input checked="" type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input checked="" type="checkbox"/> MODERATE [2]
<input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	
<input type="checkbox"/> NONE [0]		

COMMENTS:

Riparian  
8  
Max 10

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES) (Check All That Apply)
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]
<input checked="" type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]
<input type="checkbox"/> < 0.2m [POOL=0]		<input type="checkbox"/> TORRENTIAL [1]

COMMENTS:

Pool/Current  
8  
Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]
<input type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input checked="" type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]

COMMENTS:

Riffle/Run  
1  
Max 8  
Gradient  
6  
Max 10

6) GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.):

%POOL: %GLIDE:  
%RIFFLE: %RUN:

\* Best areas must be large enough to support a population of native obligate species

fat mucket (w. d.)



Qualitative Habitat Evaluation Index Field Sheet QHEI Score: **70**River Code: **9** RMI: **Stream:** **Indian Creek**Date: **4/24/08** Location: **D/S Indian Lake**Scorers Full Name: **GRB** Affiliation:

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR / SLBS [10]	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> SAND [6]	<input checked="" type="checkbox"/> LESTONE [1]	SILT:	<input checked="" type="checkbox"/> SILT HEAVY [-2]	Substrate <b>14</b> Max 20
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> BEDROCK [5]	<input checked="" type="checkbox"/> TILLS [1]	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> SILT MODERATE [-1]	<input type="checkbox"/> SILT MODERATE [-1]	
<input checked="" type="checkbox"/> COBBLE [8]	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> SILT NORMAL [0]	<input type="checkbox"/> SILT NORMAL [0]	
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> SILT FREE [1]	<input type="checkbox"/> SILT FREE [1]	
<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> NOTE: Ignore Sludge Originating From Point Sources	<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> COAL FINES [-2]	<input checked="" type="checkbox"/> EXTENSIVE [-2]	<input checked="" type="checkbox"/> EXTENSIVE [-2]	
<input type="checkbox"/> SILT [2]					<input type="checkbox"/> MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)		<input checked="" type="checkbox"/> 4 or More [2]	<input type="checkbox"/> 3 or Less [0]		<input type="checkbox"/> NORMAL [0]	
COMMENTS:					<input type="checkbox"/> NONE [1]	

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)	TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)	Cover
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> EXTENSIVE > 75% [11]	<b>12</b> Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> ROOTWADS [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]	
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input type="checkbox"/> SPARSE 5-25% [3]	
<input checked="" type="checkbox"/> ROOTMATS [1]		<input type="checkbox"/> NEARLY ABSENT < 5% [1]	
COMMENTS:			

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input checked="" type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	<b>16</b> Max 20
<input checked="" type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL	
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION	Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)		<b>9</b> Max 10
<input type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input checked="" type="checkbox"/> NONE/LITTLE [3]		
<input checked="" type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]		
<input type="checkbox"/> NARROW 5-10m [2]	<input checked="" type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROW CROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]		
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]			
<input type="checkbox"/> NONE [0]					

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY (POOLS & RIFFLES)	Pool/Current	
(Check 1 ONLY)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	<b>8</b> Max 12	
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]		<input type="checkbox"/> TORRENTIAL [-1]
<input checked="" type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]		<input type="checkbox"/> INTERSTITIAL [-1]
<input type="checkbox"/> 0.4-0.7m [3]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]		<input type="checkbox"/> INTERMITTENT [-2]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]		<input type="checkbox"/> VERY FAST [1]
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS:			

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	<b>3</b> Max 8
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]	<b>8</b> Max 10
COMMENTS:		<input type="checkbox"/> NO RIFFLE (Metric=0)	<input checked="" type="checkbox"/> EXTENSIVE [-1]	

6) GRADIENT (ft/mi): **DRAINAGE AREA (sq.mi.):**%POOL: **%GLIDE:**  
%RIFFLE: **%RUN:**

\* Best areas must be large enough to support a population of riffle-adapted species

EPA 4520

fat mucket (w.d.)  
paper shell (f.d.)  
extensive silt deposits

06/24/01



River Code: 10 RMA:            Stream: Fall Creek

Date: 4/25/08 Location: Geist Dam

Scorer's Full Name: GRB Affiliation:           

1) SUBSTRATE (Check ONLY ~~Two~~ Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR / SLBS [10]	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> Check ONE (OR 2 & AVERAGE)	<input type="checkbox"/> SILT	<input type="checkbox"/> SILT HEAVY [-2]	Substrate <div style="border: 1px solid black; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 5px;">14</div> Max 20	
<input type="checkbox"/> BOULDER [9]	<input checked="" type="checkbox"/> SAND [6]	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT MODERATE [-1]	<input type="checkbox"/> SILT MODERATE [-1]		
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> BEDROCK [5]	<input checked="" type="checkbox"/> TILLS [1]	<input checked="" type="checkbox"/> SILT NORMAL [0]	<input type="checkbox"/> SILT FREE [1]		
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> EXTENSIVE [-2]	<input type="checkbox"/> MODERATE [-1]		
<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> HARDPAN [0]	<input checked="" type="checkbox"/> NORMAL [0]	<input type="checkbox"/> NONE [1]		
<input checked="" type="checkbox"/> SILT [2]	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0] EMBEDDED	<input type="checkbox"/> RIP/RAP [0] NESS:		
			<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> SHALE [-1]		
			<input type="checkbox"/> COAL FINES [-2]			

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2]  
(High Quality Only, Score 5 or >) ☐ 3 or Less [0]

COMMENTS:           

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)	Cover
<input type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> POOLS > 70 cm [2]	<input checked="" type="checkbox"/> EXTENSIVE > 75% [11]	Cover <div style="border: 1px solid black; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 5px;">14</div> Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> ROOTWADS [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]	
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input type="checkbox"/> SPARSE 5-25% [3]	
<input checked="" type="checkbox"/> ROOTMATS [1]		<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input checked="" type="checkbox"/> EXCELLENT [7]	<input checked="" type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	Channel <div style="border: 1px solid black; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 5px;">14</div> Max 20
<input checked="" type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	
<input type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL	
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	

COMMENTS:           

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)			Riparian <div style="border: 1px solid black; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 5px;">10</div> Max 10
<input checked="" type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input checked="" type="checkbox"/> NONE/LITTLE [3]			
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]			
<input type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROW CROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]			

COMMENTS:           

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]	Pool/Current	
(Check 1 ONLY)	(Check 1 of 2 & AVERAGE)	(Check All That Apply)	Pool/Current <div style="border: 1px solid black; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 5px;">10</div> Max 12	
<input checked="" type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]		<input type="checkbox"/> TORRENTIAL [-1]
<input type="checkbox"/> 0.7-1m [4]	<input checked="" type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input checked="" type="checkbox"/> FAST [1]		<input type="checkbox"/> INTERSTITIAL [-1]
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input type="checkbox"/> MODERATE [1]		<input type="checkbox"/> INTERMITTENT [-2]

COMMENTS:           

CHECK ONE OR CHECK 2 AND AVERAGE				Riffle/Run
RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run <div style="border: 1px solid black; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 5px;">5</div> Max 8
<input checked="" type="checkbox"/> Best Areas > 10 cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input checked="" type="checkbox"/> LOW [1]	

COMMENTS:            ☒ UNSTABLE (Fine Gravel, Sand) [0] ☐ MODERATE [0] ☐ EXTENSIVE [-1] ☐ NO RIFFLE [Metric=0]

6) GRADIENT (ft/mi):            DRAINAGE AREA (sq.mi.):            %POOL:            %GLIDE:             
%RIFFLE:            %RUN:           

\* Best areas must be large enough to support a population of riffle-obligate species



Qualitative Habitat Evaluation Index Field Sheet QHEI Score: **78**

River Code: 11 RMI: Stream: Fall Creek  
Date: 4/24/08 Location: Emerson St.  
Scorers Full Name: GLB Affiliation: \_\_\_\_\_

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		POOL RIFFLE		SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR / SLBS [10]	_____	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/>	Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)	<input type="checkbox"/> SILT	<input type="checkbox"/> SILT HEAVY [-2]	<div>Substrate</div> <div>8</div> <div>Max 20</div>	
<input type="checkbox"/> BOULDER [9]	_____	<input type="checkbox"/> SAND [8]	_____	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT	<input type="checkbox"/> MODERATE [-1]	<input type="checkbox"/> MODERATE [-1]		
<input checked="" type="checkbox"/> COBBLE [8]	<input checked="" type="checkbox"/>	<input type="checkbox"/> BEDROCK [5]	_____	<input checked="" type="checkbox"/> TILLS [1]	<input type="checkbox"/> WETLANDS [0]	<input checked="" type="checkbox"/> SILT FREE [1]	<input type="checkbox"/> SILT FREE [1]		
<input type="checkbox"/> HARDPAN [4]	_____	<input type="checkbox"/> DETRITUS [3]	_____	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> EXTENSIVE [-2]	<input type="checkbox"/> EXTENSIVE [-2]		
<input type="checkbox"/> MUCK [2]	_____	<input type="checkbox"/> ARTIFICIAL [0]	_____	<input type="checkbox"/> RIP/RAP [0]	NESS:	<input type="checkbox"/> MODERATE [-1]	<input type="checkbox"/> MODERATE [-1]		
<input type="checkbox"/> SILT [2]	_____	NOTE: Ignore Sludge Originating From Point Sources			<input type="checkbox"/> LACUSTRINE [0]	<input checked="" type="checkbox"/> NORMAL [0]	<input type="checkbox"/> NONE [1]		
NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)		<input checked="" type="checkbox"/> 4 or More [2]		<input type="checkbox"/> 3 or Less [0]		<input type="checkbox"/> COAL FINES [-2]			

## COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)		Cover
<input type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]	<div>14</div> <div>Max 20</div>
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]	
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> SPARSE 5-25% [3]	
<input checked="" type="checkbox"/> ROOTMATS [1]	COMMENTS:		<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY		DEVELOPMENT		CHANNELIZATION		STABILITY		MODIFICATIONS/OTHER		Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input checked="" type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	<input type="checkbox"/> IMPOUND.	<div>14</div> <div>Max 20</div>				
<input checked="" type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	<input type="checkbox"/> ISLANDS					
<input type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL	<input type="checkbox"/> LEVEED					
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	<input type="checkbox"/> BANK SHAPING					
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS						

## COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) P River Right Looking Downstream P

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)			<div>8</div> <div>Max 10</div>
<input type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input checked="" type="checkbox"/> NONE/LITTLE [3]			
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]			
<input checked="" type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]			
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]				
<input type="checkbox"/> NONE [0]						

## COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH		MORPHOLOGY		CURRENT VELOCITY (POOLS & RIFFLES)		Pool/Current
(Check 1 ONLY)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	(Check All That Apply)			<div>11</div> <div>Max 12</div>
<input checked="" type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]	<input type="checkbox"/> TORRENTIAL [1]			
<input type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input checked="" type="checkbox"/> FAST [3]	<input type="checkbox"/> INTERSTITIAL [1]			
<input type="checkbox"/> 0.4-0.7m [3]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> INTERMITTENT [2]			
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	<input type="checkbox"/> VERY FAST [1]			
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS:					

## RIFFLE DEPTH

RIFFLE DEPTH		RUN DEPTH		CHECK ONE OR CHECK 2 AND AVERAGE		RIFFLE/RUN
<input checked="" type="checkbox"/> Best Areas > 10 cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MAX < 50 [1]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	<div>5</div> <div>Max 8</div>
<input type="checkbox"/> Best Areas 5-10 cm [1]				<input checked="" type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]				<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input checked="" type="checkbox"/> MODERATE [0]	
COMMENTS:				<input type="checkbox"/> NO RIFFLE (Metric=0)		<div>6</div> <div>Max 10</div>

6) GRADIENT (ft/mi): \_\_\_\_\_ DRAINAGE AREA (sq.mi.): \_\_\_\_\_

%POOL: \_\_\_\_\_ %GLIDE: \_\_\_\_\_  
%RIFFLE: \_\_\_\_\_ %RUN: \_\_\_\_\_

\* Best areas must be large enough to support a population of riffle-adapted species

mucket (live)  
white heelsplitter (f.d.)  
wabash pigtoe } (w.d.)  
fat mucket  
creeper



River Code: 12 RM: Stream: Fall Creek  
 Date: 4/24/08 Location: Meridian St., Indpls  
 Scorers Full Name: GRB Affiliation: \_\_\_\_\_

1) SUBSTRATE (Check ☒ ONLY Two Substrate TYPE BOXES; Estimate % present

TYPE		PGC POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> BLDG/SLS [10]	<input type="checkbox"/> GRAVEL [7]	<input checked="" type="checkbox"/> Check ONE (OR 2 & AVERAGE)	<input checked="" type="checkbox"/> Check ONE (OR 2 & AVERAGE)		
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> SAND [6]	<input checked="" type="checkbox"/> LIMESTONE [1]	<input checked="" type="checkbox"/> SILT:	<input type="checkbox"/> SILT HEAVY [-2]	Substrat <div style="border: 1px solid black; padding: 2px; display: inline-block;">12</div> Max 20
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> BEDROCK [5]	<input checked="" type="checkbox"/> TILLS [1]	<input checked="" type="checkbox"/> WETLANDS [0]	<input checked="" type="checkbox"/> SILT MODERATE [-1]	
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> HABITAT [0]	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> SILT NORMAL [0]	
<input checked="" type="checkbox"/> MUCK [2]	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> EMBEDDED	<input type="checkbox"/> SILT FREE [1]	
<input type="checkbox"/> SILT [2]	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> MODERATE [-1]	
NUMBER OF SUBSTRATE TYPE TYPES: <input checked="" type="checkbox"/> 4 or More [2]		<input type="checkbox"/> 3 or Less [0]	<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> NORMAL [0]	
COMMENTS:		<input type="checkbox"/> COAL FINES [-2]	<input type="checkbox"/> NONE [1]		

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)	Cover
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]	Cover <div style="border: 1px solid black; padding: 2px; display: inline-block;">5</div> Max 20
<input type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> MODERATE 25-75% [7]	
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]	
<input type="checkbox"/> ROOTMATS [1]	<input type="checkbox"/> NEARLY ABSENT < 5% [1]	
COMMENTS:		

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	Channel <div style="border: 1px solid black; padding: 2px; display: inline-block;">12</div> Max 20
<input checked="" type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input checked="" type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	
<input type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL	
<input type="checkbox"/> NONE [0]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]	<input type="checkbox"/> DREDGING	<input type="checkbox"/> BANK SHAPING	
<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS					

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) ☒ River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION	Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)		Riparian <div style="border: 1px solid black; padding: 2px; display: inline-block;">3</div> Max 10
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input checked="" type="checkbox"/> NONE/LITTLE [3]		
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input checked="" type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]		
<input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]		
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]			
<input checked="" type="checkbox"/> NONE [0]					
COMMENTS:					

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY (POOLS & RIFFLES)	Pool/Current	
(Check 1 ONLY)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	Pool/Current <div style="border: 1px solid black; padding: 2px; display: inline-block;">11</div> Max 12	
<input checked="" type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]		<input type="checkbox"/> TORRENTIAL [-1]
<input type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> FAST [1]		<input type="checkbox"/> INTERMITTENT [-2]
<input type="checkbox"/> 0.4-0.7m [2]		<input checked="" type="checkbox"/> MODERATE [1]		<input type="checkbox"/> VERY FAST [1]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]		
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS:			

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input checked="" type="checkbox"/> Best Areas > 10cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	Riffle/Run <div style="border: 1px solid black; padding: 2px; display: inline-block;">5</div> Max 8
<input type="checkbox"/> Best Areas 5-10cm [1]	<input type="checkbox"/> MAX < 50 [1]	<input checked="" type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input type="checkbox"/> Best Areas < 5cm [0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]	
COMMENTS:		<input type="checkbox"/> NO RIFFLE [Metric=0]	<input type="checkbox"/> EXTENSIVE [-1]	

6] GRADIENT (ft/mi): \_\_\_\_\_ DRAINAGE AREA (sq.mi.): \_\_\_\_\_ %POOL: \_\_\_\_\_ %GLIDE: \_\_\_\_\_  
 %RIFFLE: \_\_\_\_\_ %RUN: \_\_\_\_\_

\*\* Best areas must be large enough to support a population of riffle-obligate species