Survey Report for *Cambarus veteranus* (Guyandotte River Crayfish) and *Cambarus callainus* (Big Sandy Crayfish)

West Virginia Department of Transportations
Coalfields Expressway
WV16 to Welch

Prepared for:

West Virginia Division of Highways
1334 Smith Street
Charleston, WV 25301

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Submitted by:

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MOUNTAIN STATE
BIOSURVEYS, LLC

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Introduction

General Location and Description

West Virginia Division of Highways (WVDOH) contracted Mountain State Biosurveys, LLC (MSB) to perform surveys for the federally endangered *Cambarus veteranus* (Guyandotte River Crayfish) and for federally threatened *Cambarus callainus* (Big Sandy Crayfish) on the proposed Coalfields Expressway-WV16 to Welch (Project). The proposed Project contains approximately eight (8) miles of linear corridor beginning in Wyoming County at WV 16 northwest of the Federal Correctional Facility, and extending southwest past Welch, WV and ending at Premier, WV (McDowell County) (Figure 1).

Study Area and Available Habitat

The proposed Project is located within the Appalachian Plateau physiographic province at an approximate elevation between 1200 to 2000 feet above mean sea level within the Big Sandy River Watershed. It contains steep slopes with dense vegetation. Much of the area contains disturbances from past mining activity, timber removal, and natural gas extraction. The area has also been impacted by the town of Welch.

Figure 1. General location of Project area in McDowell and Wyoming Counties, West Virginia.

Methods

During the Fall of 2017, MSB teamed with Dr. Zachary Loughman of West Liberty University and his lab students to conduct surveys for federally protected crayfish associated with the Project. Before surveys began, a meeting took place on September 26, 2017 with USFWS, WVDOH, and MSB to define the upstream and downstream survey limits. Once these parameters were set, survey methodology followed the "Big Sandy and Guyandotte River Crayfish Survey Protocol" issued by the USFWS (Appendix E). Streams associated with the Project area were first assessed for suitable crayfish habitat (Figure 2). Surveys were only conducted in areas with potential habitat. The following is taken directly from the USFWS protocol:

> "Each sampling reach should be approximately 125 meters (m) in length and include at least one riffle, run, or both riffle and run habitats. Crayfish sampling shall be performed using an 8'x4' seine, with double leads and double floats, and 1/8" netting. Sampling shall be performed by hauling a seine at a minimum of 10 locations within the 125m stream reach. Seine hauls will be completed by overturning every slab boulder (rocks approximately 1m wide x lm long; 5cm high) present per 2m linear upstream/downstream distance in riffles and runs. One to two slab boulders can be sampled per seine haul.
>
> When sampling is completed, collectors are required to identify all captured crayfish to species, sex all captured crayfish (Form **I,** Form II, Female, Female Glair, Female-Ovig, Female- Attached Juveniles), and record total carapace length (TCL) in millimeters for each C. *callainus/C. veteranus* encountered using calipers. Data shall be recorded on the standardized WVDNR Crayfish Morphometric Datasheet. A photographic voucher is required for all *C. callainus, C. veteranus* captured prior to release; representatives of other crayfish species should also be photographed. Every effort should be undertaken to ensure animals are outside of water for the briefest period of time possible (5 minute maximum, but a shorter period is preferred). Following data collection, animals are to be returned to the stream bottom upstream of their home rocks and guided back to their rock or other substrate debris.
>
> Collection of water quality and physical habitat metrics are required at each collection locale. At each sampling site, pH, temperature, percent dissolved oxygen, turbidity, and conductivity are to be measured. In addition to water quality, physical habitat will be evaluated through completion of a Qualitative Habitat Evaluation Index (QHEI; OEPA 2006)."

Results

There were two (2) streams sampled for a total of 21 sampling sites. Tug Fork, a tributary of Big Sandy River, known to have *C. callainus*, contained 11 sampling sites and Indian Creek, a tributary of Guyandotte River, which historically had a population of *C. veteranus*, contained 10 sites (Figure 3 and Figure 4). See Appendix A for data sheets and Appendix B for sample site pictures, Appendix C for *C. callainus* pictures, and Appendix D for scientific collecting permit.

All riffles within each tracts footprint were sampled. Riffles were chosen because they are the preferred habitats of both *C. veteranus* and *C. callainus*. Specifically, all cover objects within each riffle proper, and 25 meters upstream and downstream of the origin and terminance of each riffle were sampled. Slack waters, pools, and slow to moderate flowing runs were not sampled due to the lack of preference by each species for those habitats.

Tug Fork is a 3rd-4th order stream with riffle/run and pool sections. Width ranged from 10-18.9 meters and depths 0.25-1.0 meters at sampling sites. Cobble/boulder/slab substrate is present with sand, silt, and coalfines. Many areas contain concreted substrate. Anthropological impacts are present in most of the sampling reach. Large sections contain no canopy cover and are receiving nutrient loading resulting in algal blooms. Entire stream reach contains garbage. See Appendix A for additional information.

Indian Creek is a second order headwater stream with moderate gradient. Substrate is comprised of cobble, small boulder, and bedrock with sand and sediment in slack water. Widths range from 2 meters at upstream sampling site to 13 meters toward the lower sampling reach. Depths ranged from 0.2-0.75 meters. See Appendix A for more specifics.

Tug Fork had 11 sampling sites which produced three (3) crayfish species. Captures included *Cambarus hatfieldi* (n=150), *C. callainus* (n=8), and *Fraxonius cristivarius* (n=65) (Table 1). Water temperature ranged from 13-17.4 ℃, specific conductance 339-679 (µS/cm), salinity 0.2-0.47 (ppt), and pH 8.28-8.4 (Table 2). The QHEI scores ranged from 49.5-72. No sampling was conducted between sites 10-11 due to lack of habitat.

Indian Creek had 10 sampling sites which produced two (2) crayfish species. Captures included *C. thepiensis* (n=169) and *F. cristivarius* (n=147) (Table 1). Water temperature ranged from 10.6-15.7 ℃, specific conductance 303-603 (µS/cm), salinity 0.2-0.7 (ppt), and pH 7.22-8.61 (Table 2). The QHEI scores ranged from 41.5-82.

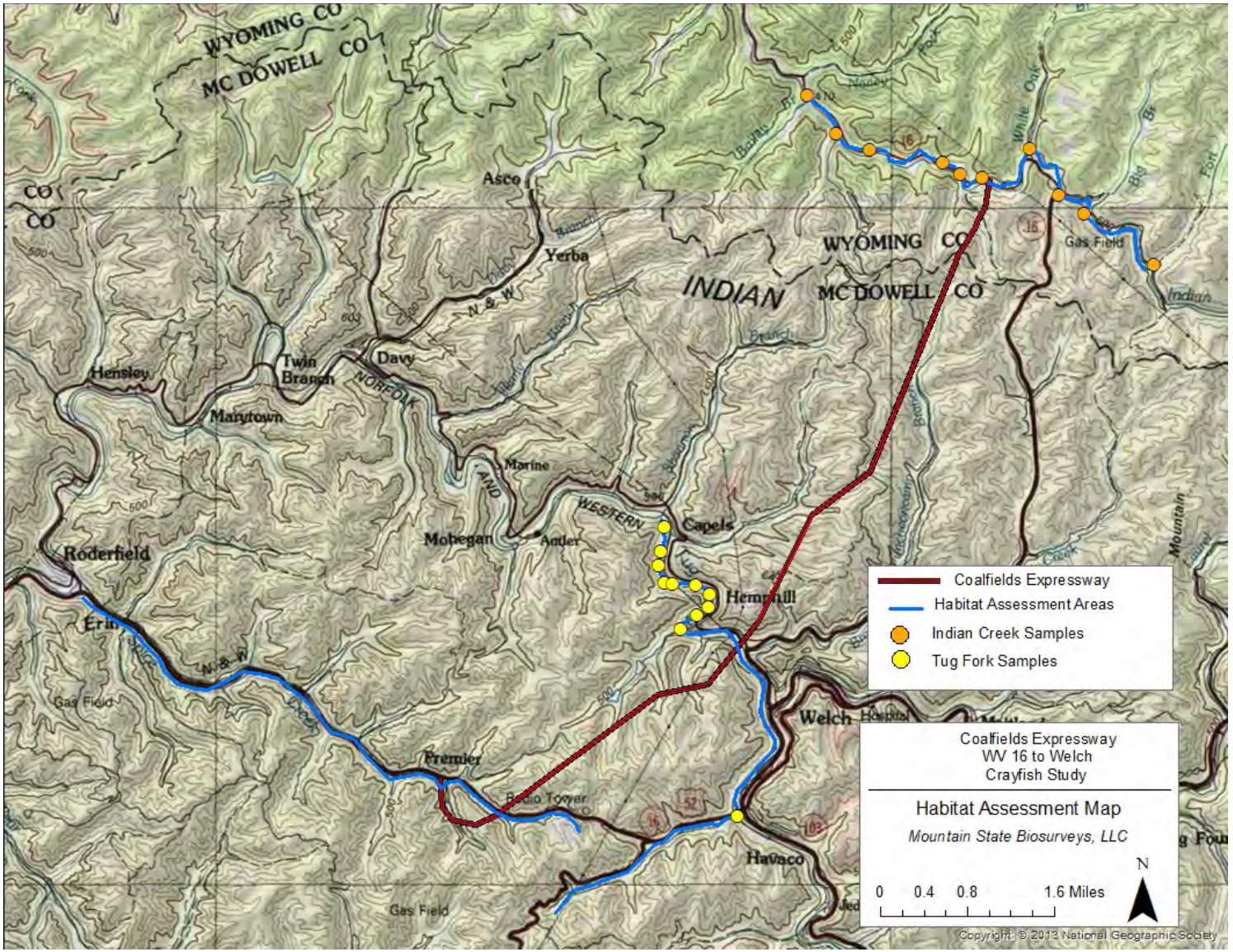

Figure 2. Habitat assessment areas.

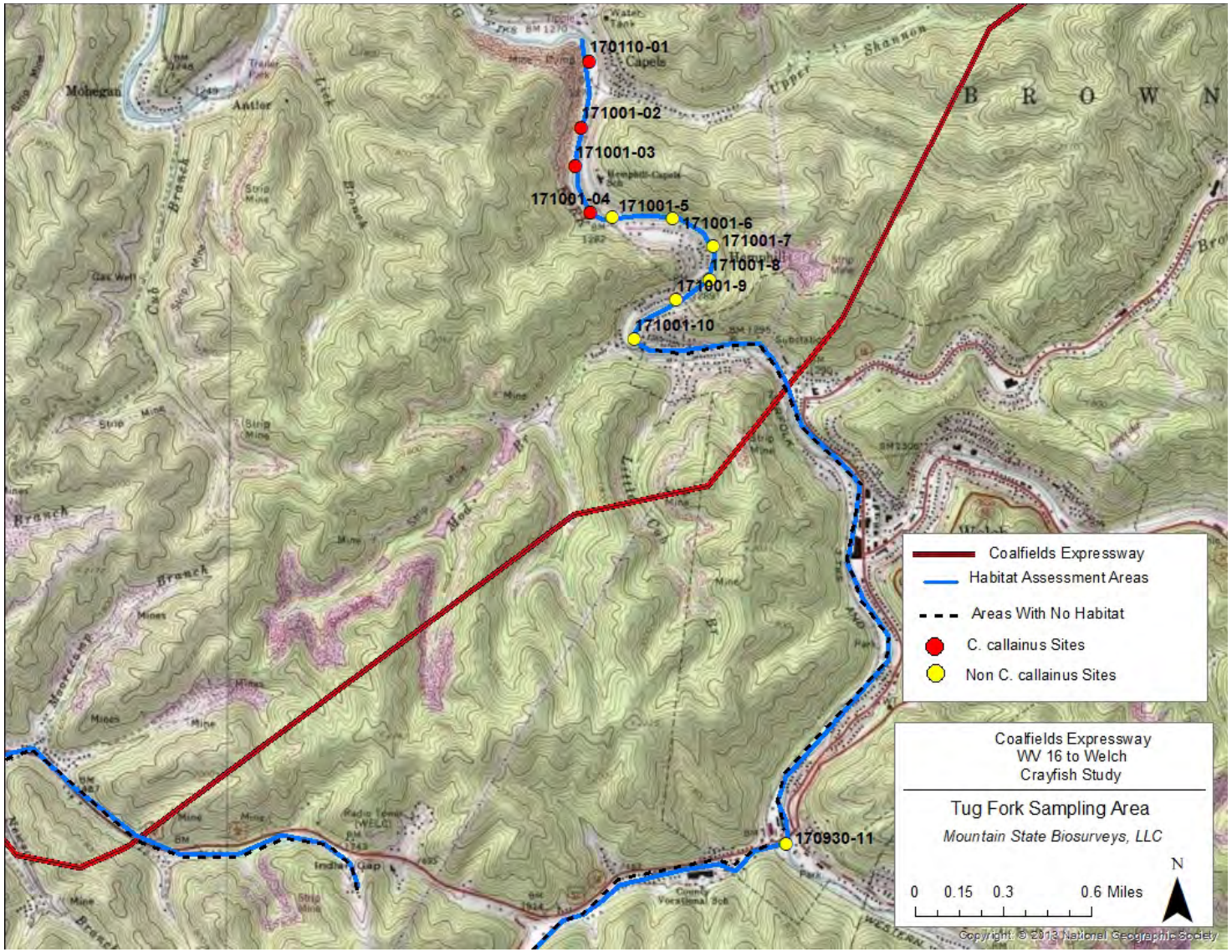

Figure 3. Tug Fork sampling locations.

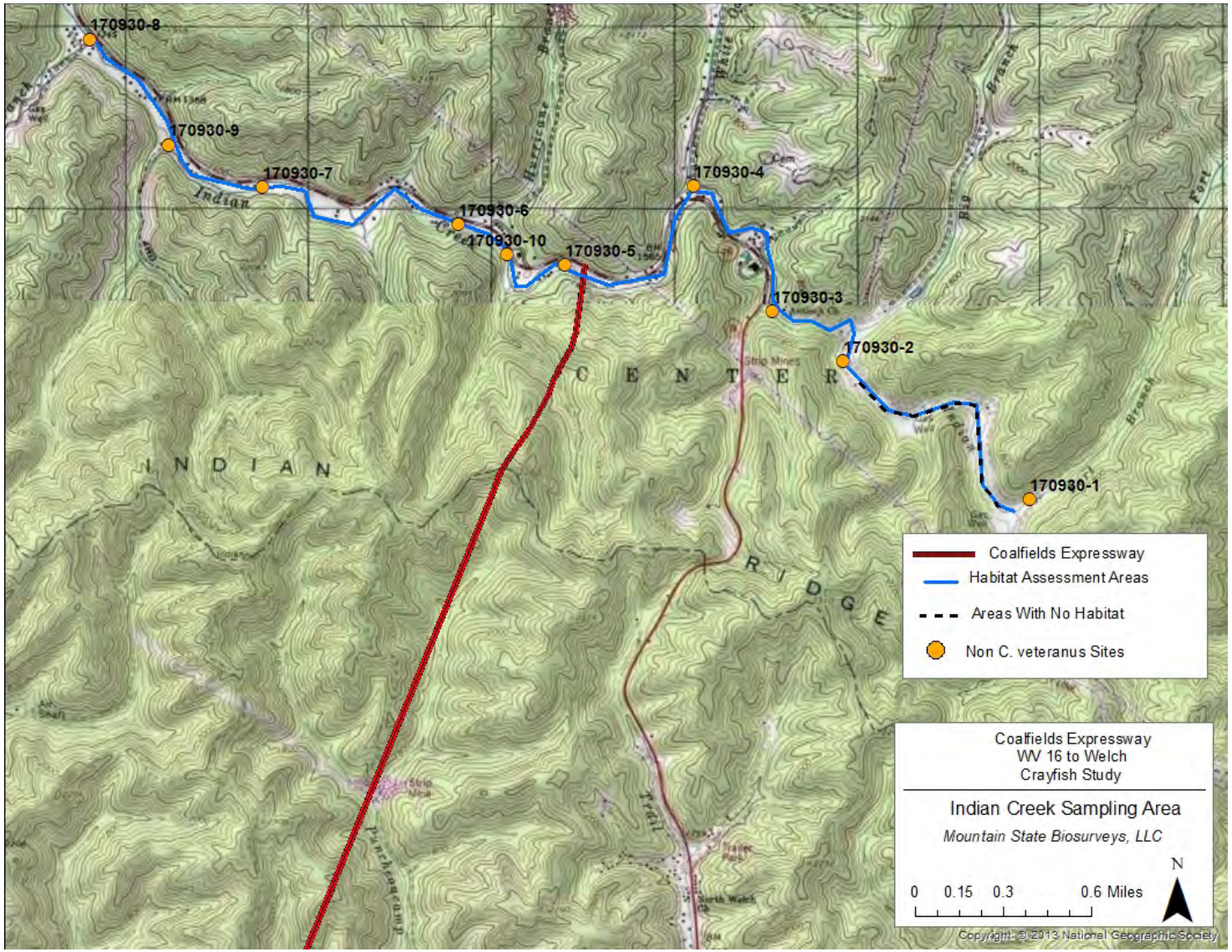

Figure 4. Indian Creek sampling locations.

Table 1. Crayfish capture data.

Coalfields Expressway-WV 16 to Welch- 2017 Crayfish Capture Data

Date	Stream	Collection #	Latitude	Longitude	*C. hatfieldi*	*C. callainus*	*C. thepiensis*	*C. veteranus*	*Faxonius cristivarious*
10/1/2017	Tug Fork	170110-01	37.45504	-81.60264	29	1	0	NA	11
10/1/2017	Tug Fork	171001-02	37.45177	-81.6031	13	3	0	NA	3
10/1/2017	Tug Fork	171001-03	37.44987	-81.60351	11	2	0	NA	1
10/1/2017	Tug Fork	171001-4	37.44759	-81.6025	10	2	0	NA	0
10/1/2017	Tug Fork	171001-5	37.44736	-81.60116	9	0	0	NA	1
10/1/2017	Tug Fork	171001-6	37.4473	-81.5974	27	0	0	NA	1
10/1/2017	Tug Fork	171001-7	37.44596	-81.59491	15	0	0	NA	2
10/1/2017	Tug Fork	171001-8	37.44433	-81.5951	10	0	0	NA	3
10/1/2017	Tug Fork	171001-9	37.4433	-81.59717	13	0	0	NA	4
10/1/2017	Tug Fork	17001-10	37.44135	-81.59977	12	0	0	NA	3
9/30/2017	Tug Fork	170930-11	37.41652	-81.59016	1	0	0	NA	1
9/30/2017	Indian Cr.	170930-1	37.49042	-81.52083	0	NA	91	0	0
9/30/2017	Indian Cr.	170930-2	37.49717	-81.53249	0	NA	0	0	7
9/30/2017	Indian Cr.	170930-3	37.4996	-81.53688	0	NA	13	0	18
9/30/2017	Indian Cr.	170930-4	37.50577	-81.54182	0	NA	14	0	19
9/30/2017	Indian Cr.	170930-5	37.50181	-81.54971	0	NA	7	0	14
9/30/2017	Indian Cr.	170930-6	37.50381	-81.55634	0	NA	5	0	39
9/30/2017	Indian Cr.	170930-7	37.50557	-81.56852	0	NA	20	0	20
9/30/2017	Indian Cr.	170930-8	37.51281	-81.57926	0	NA	6	0	4
9/30/2017	Indian Cr.	170930-9	37.50764	-81.57432	0	NA	4	0	9
9/30/2017	Indian Cr.	170930-10	37.50233	-81.55334	0	NA	9	0	17

Cambarus callainus Captures

Table 2. Water data.

Coalfields Expressway-WV 16 to Welch 2017 Water Data

Date	Stream	Collection#	Latitude	Longitude	Water Temp C	Sp. Con (mS/cm)	TDS (g/L)	Sal (ppt)	pH	QHEI
10/1/2017	Tug Fork	170110-01	37.45504	-81.60264	13	531	-	0.3	8.28	66.5
10/1/2017	Tug Fork	171001-02	37.45177	-81.6031	12.9	556	-	0.4	8.39	67
10/1/2017	Tug Fork	171001-03	37.44987	-81.60351	13.1	456	-	0.3	8.33	72
10/1/2017	Tug Fork	171001-4	37.44759	-81.6025	13.7	565	-	0.4	8.33	71.5
10/1/2017	Tug Fork	171001-5	37.44736	-81.60116	14.1	572	-	0.4	8.36	72
10/1/2017	Tug Fork	171001-6	37.4473	-81.5974	15.1	563	-	0.3	8.36	-
10/1/2017	Tug Fork	171001-7	37.44596	-81.59491	-	-	-	-	-	60.5
10/1/2017	Tug Fork	171001-8	37.44433	-81.5951	17	339	-	0.2	8.3	57.5
10/1/2017	Tug Fork	171001-9	37.4433	-81.59717	16.6	565	-	0.3	8.4	60
10/1/2017	Tug Fork	17001-10	37.44135	-81.59977	16.4	606	-	0.4	8.34	71
9/30/2017	Tug Fork	170930-11	37.41652	-81.59016	17.4	679	-	0.47	8.37	49.5
9/30/2017	Indian Cr.	170930-1	37.49042	-81.52083	10.6	548	-	0.4	8.43	72
9/30/2017	Indian Cr.	170930-2	37.49717	-81.53249	12.6	573	-	0.4	8.32	41.5
9/30/2017	Indian Cr.	170930-3	37.4996	-81.53688	12.9	588	-	0.4	8.47	64.5
9/30/2017	Indian Cr.	170930-4	37.50577	-81.54182	13.5	529	-	0.3	8.51	64.5
9/30/2017	Indian Cr.	170930-5	37.50181	-81.54971	13.8	618	-	0.4	8.55	60
9/30/2017	Indian Cr.	170930-6	37.50381	-81.55634	15.1	517	-	0.3	8.56	82
9/30/2017	Indian Cr.	170930-7	37.50557	-81.56852	14.8	303	-	0.2	8.28	68.5
9/30/2017	Indian Cr.	170930-8	37.51281	-81.57926	14.8	350	-	0.7	8.54	58
9/30/2017	Indian Cr.	170930-9	37.50764	-81.57432	14	308	-	0.2	7.22	52.5
9/30/2017	Indian Cr.	170930-10	37.50233	-81.55334	15.7	603	-	0.4	8.61	69
Cambarus callainus captures										

Summary

West Virginia Division of Highways (WVDOH) contracted Mountain State Biosurveys, LLC (MSB) to perform surveys for federally protected *C. veteranus* (Guyandotte River Crayfish) and federally threatened *C. callainus* (Big Sandy Crayfish) in areas associated with Coalfields Expressway WV16 to Welch Project. MSB teamed with Dr. Zachary Loughman of West Liberty University in the Fall of 2017 and sampled two (2) streams, Tug Fork and Indian Creek, for a total of 21 sampling sites. A total of four (4) species were captured during the survey. Most importantly federally threatened *Cambarus callainus*, which was captured at four (4) of the 11 sampling sites in Tug Fork. No federally listed species were captured in Indian Creek.

Please contact MSB with any questions.
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Appendix A

Data Sheets

Tug Fork Data

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / 9 / 2017 Project Name: DoTH-Tug

Stream name: Tug River - 16/52/103 int Collection #: 170930-11

Trib. of: Big Sandy Basin: Tug Co: McDowell

Town: Welch Geographic marker: 16/52/103 int

0 miles (~~N S E W~~) of 16/52/103 int Elevation: 1310 Stream Order: 3/4

Road/bridge: 16/52 crossing Specific Location: Tug River at 52/16 crossing at 16/52/103 intersection in Welch

Northing: 37.41652 Easting: -81.59016 (NAD83, Zone 17)

Stream Width: 10-12 Stream Depth: .25-1.0 Total # Seine Hauls: 10

Investigators/Firm: WLU / Marshall State

Collectors: Loughman et al.

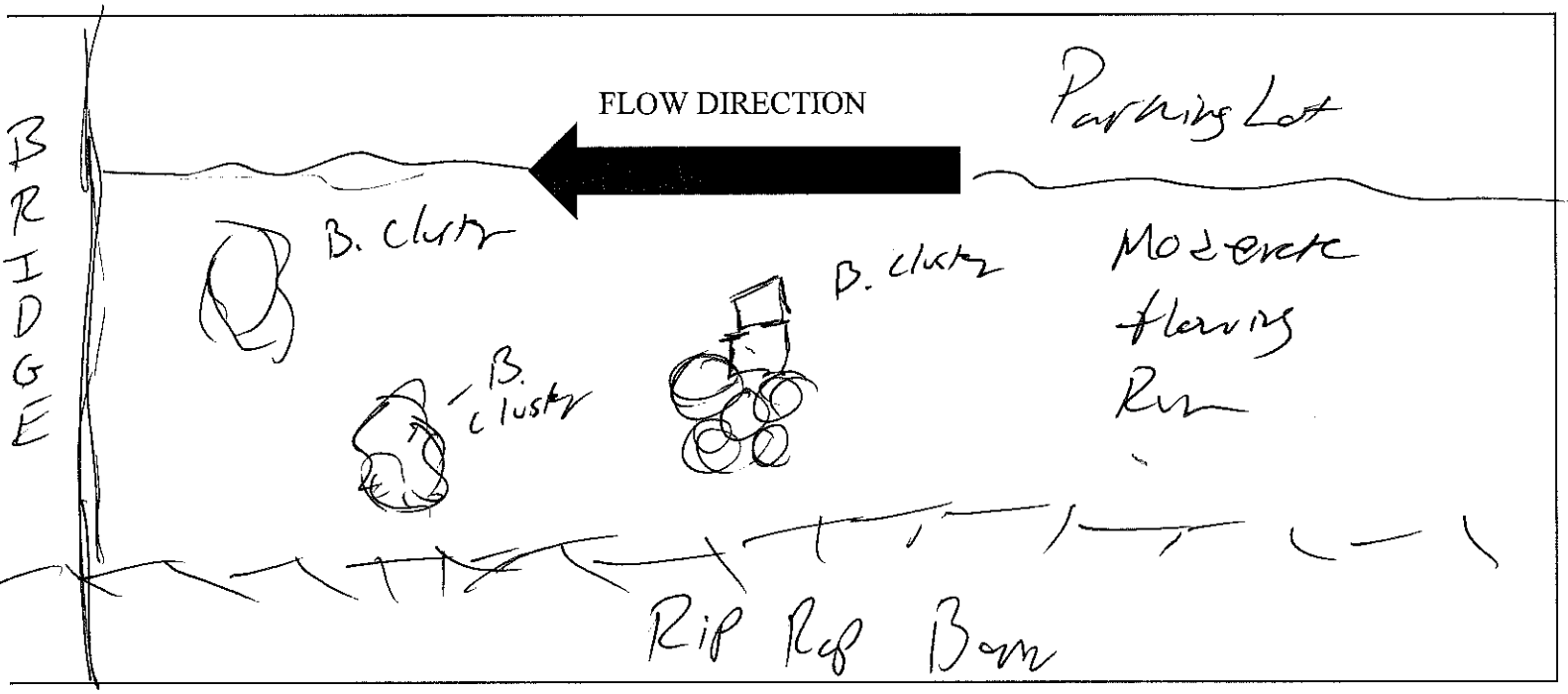
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
17.4	679	–	.47	8.37	–	–

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Cambarus hatfieldi	–	–	1	–	–	1
2.) Faxonius cristavarius	–	–	1	–	–	1
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1									
C. theepiensis										
C. hatfieldi	1									
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 49.5

Stream & Location: 170930-11-Tug at 16/52/103 **RM:** ___ **Date:** 30 Sept 2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** _____ **Lat./Long.:** 37.4165 / 81.5901 (NAD 83 - decimal °) **Office verified location** ☐

1] SUBSTRATE

Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]		
■ ☐ BOULDER [9]		1	☐ ☐ DETRITUS [3]		1
☐ ☒ COBBLE [8]		1	☐ ☐ MUCK [2]		
☑ ☐ GRAVEL [7]			☐ ■ SILT [2]		4
☐ ☐ SAND [6]		1	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ■ 3 or less [0]

Comments

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ■ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ■ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ■ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 8 *Maximum 20*

2] INSTREAM COVER

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

0 UNDERCUT BANKS [1]	6 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
0 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
1 ROOTMATS [1]			

AMOUNT Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ■ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20 11

3] CHANNEL MORPHOLOGY

Check ONE in each category (*Or 2 & average*)

SINUOSITY
- ☐ HIGH [4]
- ■ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ■ GOOD [5]
- ☐ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ■ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ■ MODERATE [2]
- ☐ LOW [1]

Comments

Channel Maximum 20 13

4] BANK EROSION AND RIPARIAN ZONE

Check **ONE** in each category for *EACH BANK* (*Or 2 per bank & average*)

River right looking downstream

EROSION

L	R	
■	☐	NONE / LITTLE [3]
☐	■	MODERATE [2] → 2.5
☐	☐	HEAVY / SEVERE [1]

RIPARIAN WIDTH

L	R	
☐	☐	WIDE > 50m [4]
☐	☐	MODERATE 10-50m [3]
☐	☐	NARROW 5-10m [2]
☐	☐	VERY NARROW < 5m [1]
■	■	NONE [0]

FLOOD PLAIN QUALITY

L	R	
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
■	■	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]

R	
☐	CONSERVATION TILLAGE [1]
☐	URBAN OR INDUSTRIAL [0]
☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10 3.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check **ONE** (*ONLY!*)
- ☐ > 1m [6]
- ■ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (*Or 2 & average*)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ■ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ■ MODERATE [1]
- ☐ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ■ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ■ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ■ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ■ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8 5

6] GRADIENT

DRAINAGE AREA (ft/mi) (mi²)

- ■ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

4

%POOL: — %GLIDE: —

%RUN: 100 %RIFFLE: —

Gradient Maximum 10 4

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

pass 1st _____ cm

pass 2nd _____ cm

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

Stream section consists of heavy anthropogenic impacts; including channel, R.p Rof, sediment, High banks, & garbage. Sampled three distinct boulder clusters.

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing: Can not find Little Indian Creek!

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 1 / 04 / 2017 Project Name: DOT - Tug #7

Stream name: Tug Fork River Collection #: 170110-01

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Capels Geographic marker: ~~UNT~~ Upper Shannon Branch tributary to Tug Fork, coming in from Capels

0.07 miles (N S E W) of Capels Elevation: 1367 Stream Order: 3/4

Road/bridge: Davy Roderfield Road Specific Location: Tug Fork River adjacent to Railroad tracks along Davy Roderfield Rd./Rt. 7, 0.07 mi NW of Capels, WV

Northing: 37.45504 Easting: -81.60264 (NAD83, Zone 17)

Stream Width: 34 Stream Depth: .2 - .3 Total # Seine Hauls: 39

Investigators/Firm: WLU / Mountain State

Collectors: Loughner et al.

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
13.0	1531	-	.3	8.28	-	-

Species Collected

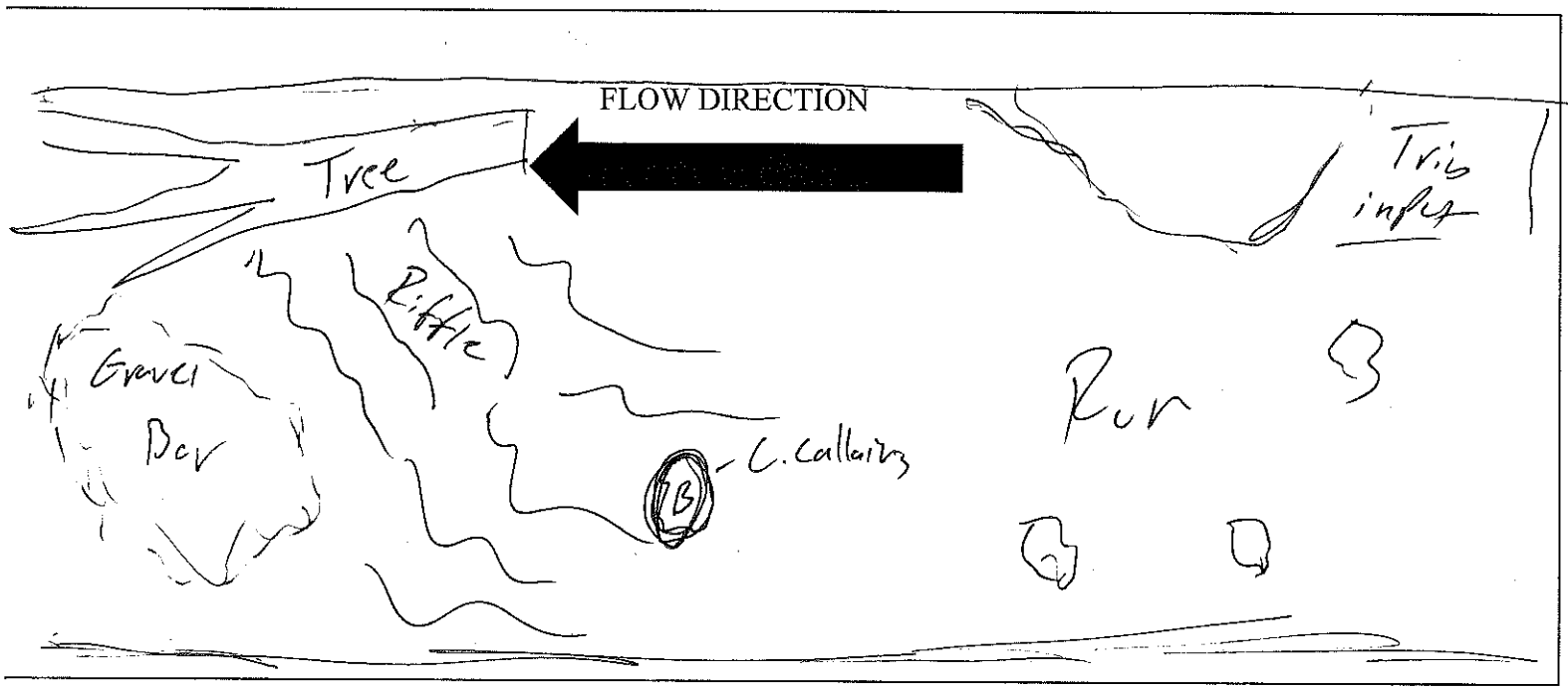
Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Cambarus hatfieldi	4	4	19	-	1	29
2.) Cambarus callainus	-	-	1	-	-	1
3.) Faxonius cristavarius	4	-	5	-	2	11
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1	1	1	1	1	2	1		
C. theepiensis										
C. hatfieldi	2	2	1	1	1	2	1	1	1	1
C. callainus	2	1	2	1	1	1	1	1	1	1
C. veteranus	1									

C. callainus

hat

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL
C. cal	♀	24.4						



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 66.5

Stream & Location: Tug River - 171001-01 **RM:** ___.__ **Date:** 10/11/2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** ____ **Lat./Long.:** (NAD 83 - decimal °) 37.45501 / 81.6026 Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	1	☐ ☐ HARDPAN [4]	___	___
■ ☐ BOULDER [9]	___	1	☐ ☐ DETRITUS [3]	___	___
☐ ■ COBBLE [8]	___	1	☐ ☐ MUCK [2]	___	___
☐ ☐ GRAVEL [7]	___	1	☐ ☐ SILT [2]	___	1
☐ ☐ SAND [6]	___	___	☐ ☐ ARTIFICIAL [0]	___	1
☐ ☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ■ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ■ HEAVY [-2] -1.5
- ■ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ■ EXTENSIVE [-2]
- ■ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Comments

Substrate 16 (Maximum 20)

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

- 0 UNDERCUT BANKS [1]
- 1 OVERHANGING VEGETATION [1]
- 1 SHALLOWS (IN SLOW WATER) [1]
- 1 ROOTMATS [1]
- 0 POOLS > 70cm [2]
- 0 ROOTWADS [1]
- 1 BOULDERS [1]
- 1 OXBOWS, BACKWATERS [1]
- 0 AQUATIC MACROPHYTES [1]
- 2 LOGS OR WOODY DEBRIS [1]

AMOUNT Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ■ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover 13 (Maximum 20)

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

SINUOSITY
- ☐ HIGH [4]
- ■ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ■ GOOD [5] 7.4
- ■ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ■ RECOVERED [4] 7.5
- ■ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ■ MODERATE [2]
- ☐ LOW [1]

Comments

Channel 12.5 (Maximum 20)

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

River right looking downstream

EROSION

L	R	
☐	☐	NONE / LITTLE [3]
■	■	MODERATE [2]
☐	☐	HEAVY / SEVERE [1]

RIPARIAN WIDTH

L	R	
☐	☐	WIDE > 50m [4]
■	☐	MODERATE 10-50m [3]
☑	■	NARROW 5-10m [2] 2.5
☐	☐	VERY NARROW < 5m [1]
☐	☐	NONE [0]

FLOOD PLAIN QUALITY

L	R	
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2] 2
■	■	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian 5.5 (Maximum 10)

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ■ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)
- ■ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ■ SLOW [1]
- ☐ VERY FAST [1]
- ☐ INTERSTITIAL [-1]
- ■ FAST [1]
- ☐ INTERMITTENT [-2]
- ■ MODERATE [1]
- ■ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 7 (Maximum 12)

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ■ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ■ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ■ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1] -0.5
- ■ MODERATE [0]
- ■ EXTENSIVE [-1]

Comments

Riffle / Run 5.5 (Maximum 8)

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)
- ☐ VERY LOW - LOW [2-4]
- ■ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 10 %GLIDE: — %RUN: 20 %RIFFLE: 70

Gradient 7 (Maximum 10)

70

A] SAMPLED REACH

Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE (1st -sample pass- 2nd)
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

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

_____ meters

CLARITY (1st --sample pass-- 2nd)
- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

1st pass _____ cm

2nd _____ cm

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

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

Nutrient enriched with odor. Sediment present on most substrate items in moderate to low flow situations. Female L. cat - Pt. Boulders in riffle either concreted into substrate or slightly movable. Most interstitial spaces obliterated unless in riffle. Cambarus callainus taken from under rock at head of riffle (Pic1). Above riffle several boulder clusters

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

√ Cambarus hatfieldi taken in this habitat & dominant. Cambarus hatfieldi all recent molts. Several large Form I ♂ taken at confl

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 1 / Oct / 2017 Project Name: DOT - Tug - Riffle #2

Stream name: Tug Fork Collection #: 171001-2

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Capels Geographic marker: Rail Road Crossing

0.21 miles (N (S) E (W)) of Capels Elevation: 1291 Stream Order: 3/4

(Road)/bridge: Davy Rodefield Rd./Highway Specific Location: Tug Fork River, 0.3 miles from train tracks and 0.21 miles south west of Capels on Davy Rodefield Road/Hwy 7 Northing: 37.45177 Easting: -81.6031 (NAD83, Zone 17)

Stream Width: 18.2 Stream Depth: .2 - .75 Total # Seine Hauls: 21

Investigators/Firm: WLU / Marshall State

Collectors: Laughman et. all

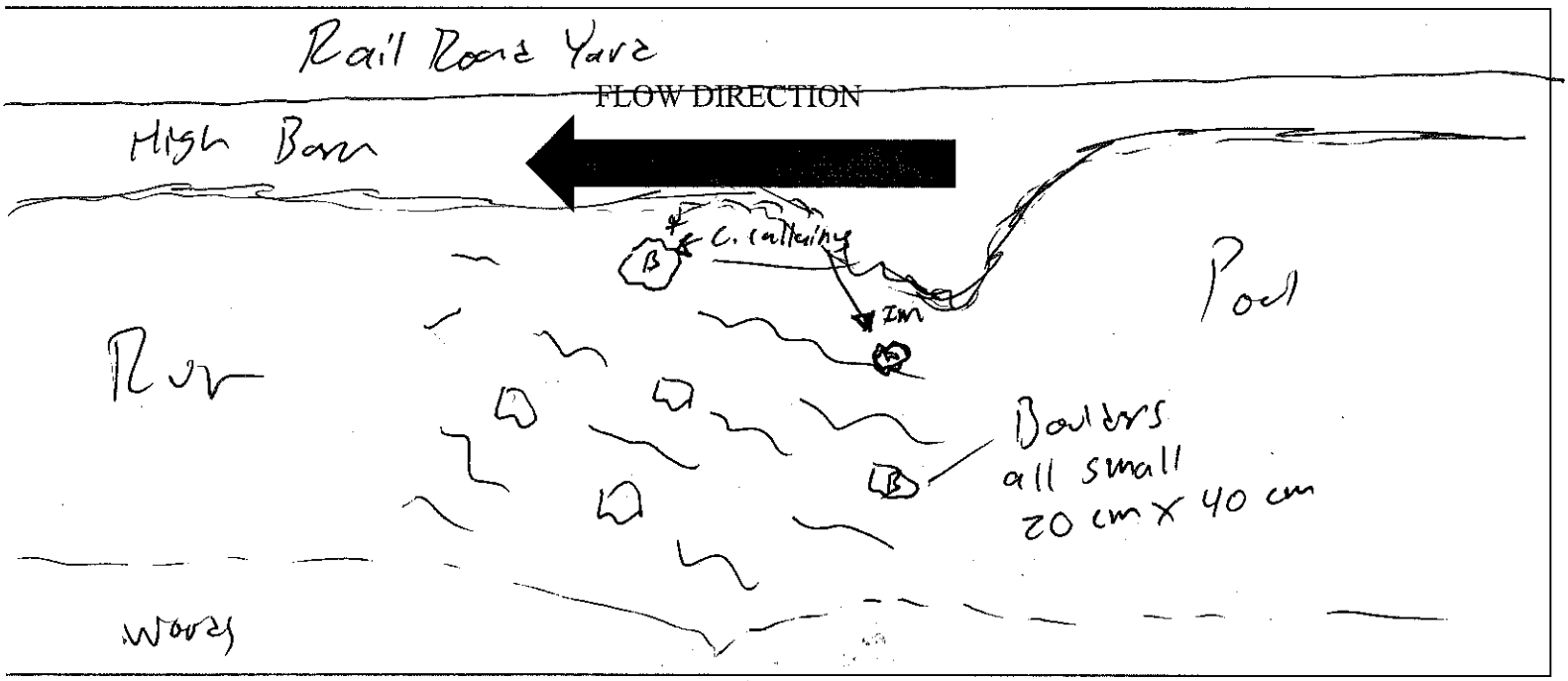
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
12.9	556	–	.4	8.39	–	–

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Cambarus hatfieldi	1	1	11	–	–	13
2.) Cambarus callainus	1	1	1	–	–	3
3.) Faxonius cristivarius	1	1	1			3
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1								
C. theepiensis										
C. hatfieldi	1	2	1	2	1	1	1	2	1	1
C. callainus	1	1	1							
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL
C.cal	IM	39.7 ↖ FM						
C.cal	♀ G(pre)	37.6						
C.cal	II ♂	45.1						



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 67

Stream & Location: 171001-2 - Tug #2 *RM:* ___ *Date:* 1 / Oct / 2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ *STORET #:* ______ *Lat./Long.:* (NAD 83 - decimal °) 37.45173 / 81.6031 *Office verified location* ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]		
☒☐ BOULDER [9]		1	☐☐ DETRITUS [3]		
☐☒ COBBLE [8]		1	☐☐ MUCK [2]		
☐☐ GRAVEL [7]		1	☐☐ SILT [2]		1
☐☐ SAND [6]		1	☐☐ ARTIFICIAL [0]		1
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☒ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☒ HEAVY [-2]
- ☒ MODERATE [-1] -1.5
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☒ EXTENSIVE [-2]
- ☒ MODERATE [-1] -1.5
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 16 *Maximum* 20

Comments

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

0 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
2 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
1 ROOTMATS [1]			

AMOUNT
Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☒ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 14

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

SINUOSITY
- ☐ HIGH [4]
- ☒ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☒ GOOD [5] 7.4
- ☒ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☒ NONE [6] 7.5
- ☒ RECOVERED [4]
- ☐ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☒ MODERATE [2]
- ☐ LOW [1]

Comments

Channel Maximum 20: 14

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

EROSION

L	R	
☐	☐	NONE / LITTLE [3]
☒	☒	MODERATE [2]
☐	☐	HEAVY / SEVERE [1]

RIPARIAN WIDTH

L	R	
☐	☐	WIDE > 50m [4]
☒	☐	MODERATE 10-50m [3]
☒	☒	NARROW 5-10m [2] 2.5
☐	☐	VERY NARROW < 5m [1]
☐	☐	NONE [0]

FLOOD PLAIN QUALITY

L	R		L	R	
☒	☐	FOREST, SWAMP [3] 1.5	☐	☐	CONSERVATION TILLAGE [1]
☐	☐	SHRUB OR OLD FIELD [2]	☐	☒	URBAN OR INDUSTRIAL [0]
☐	☐	RESIDENTIAL, PARK, NEW FIELD [1]	☐	☐	MINING / CONSTRUCTION [0]
☐	☐	FENCED PASTURE [1]			
☐	☐	OPEN PASTURE, ROWCROP [0]			

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 6

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check ONE (*ONLY!*)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☒ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (*Or 2 & average*)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☒ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☒ FAST [1]
- ☒ MODERATE [1]
- ☒ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☒ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ☒ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☒ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☒ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)
- ☐ VERY LOW - LOW [2-4]
- ☒ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: — %GLIDE: —
%RUN: 20 %RIFFLE: 80

Gradient Maximum 10: 7

A] SAMPLED REACH
Check ALL that apply

METHOD
☐ BOAT
☐ WADE
☐ L. LINE
☐ OTHER

STAGE
1st -sample pass- 2nd
☐ HIGH ☐
☐ UP ☐
☐ NORMAL ☐
☐ LOW ☐
☐ DRY ☐

DISTANCE
☐ 0.5 Km
☐ 0.2 Km
☐ 0.15 Km
☐ 0.12 Km
☐ OTHER
_____ meters

CLARITY
1st --sample pass-- 2nd
☐ < 20 cm ☐
☐ 20-<40 cm ☐
☐ 40-70 cm ☐
☐ > 70 cm/ CTB ☐
☐ SECCHI DEPTH ☐
1st pass _____ cm
2nd _____ cm

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

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

Shallow short riffle, Roughly 25-30 m long. Small slabrock present on a bed of sand, silt + coarse fines. Fine sediment covers most rocks. Roughly 1/2 of boulders embedded. Slabs along Rt bank but L cultains. Cambarus bartfieldi still dominant species. Several Cambarus sp. have multiformed dactyls + propodus. All Cambarus collected fresh molts. Riparian buffer forested, though Railroad

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

C] RECREATION AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

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

Circle some & COMMENT

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_2O / TILE / H_2O TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

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

Stream Drawing:

yard + trash present.

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 1 / Oct / 2017 Project Name: 171001-3 - DOT - Tug Fork

Stream name: Tug Fork #3 Collection #: 171001-03

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Capels Geographic marker: Copper Ridge Landfill

0.34 miles (N (S) E (W)) of Capels Elevation: 1304' Stream Order: 3/4

Road/bridge: Highway 7/Davy Roderfield Rd Specific Location: Tug Fork River, 0.08 mi SW of int. of Hwy. 7/Old Indian Ridge Rd, 0.34 mi SW of Capels, WV

Northing: 37.44987 Easting: -81.60351 (NAD83, Zone 17)

Stream Width: 16.0 m Stream Depth: _____ Total # Seine Hauls: 21

Investigators/Firm: WLU / Mountain State

Collectors: Laughman et. all

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
31.1	456	–	0.3	8.33	–	–

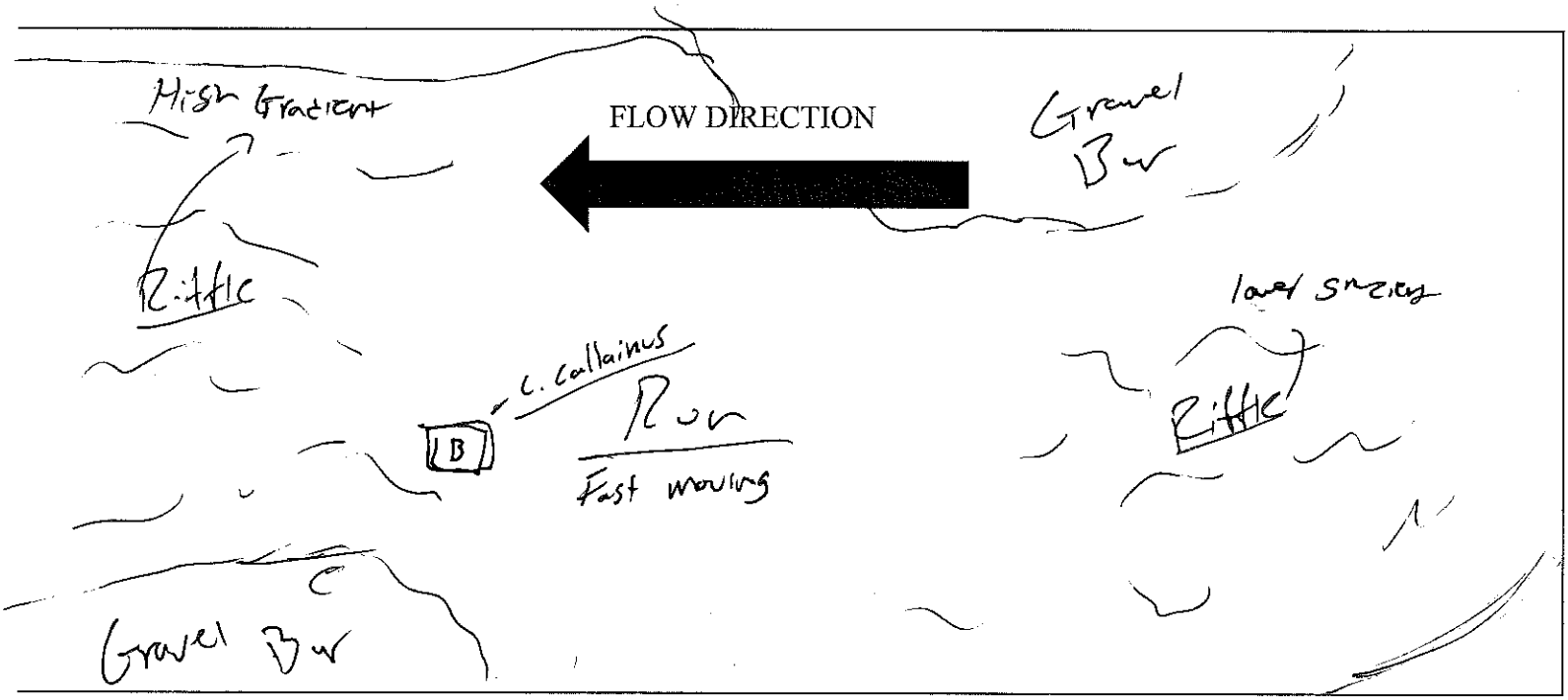
Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Cambarus callainus*	1	–	1	–	–	2
2.) *Faxonius cristavarius*	–	–	1	–	–	1
3.) *Cambarus hatfieldi*	2	1	8	–	–	11
4.)						
5.)						

21 total hauls

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1									
C. theepiensis										
C. hatfieldi	1	2	1	1	1	1	1	1	2	
C. callainus	1	1								
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL
C. cal	♂	37.0 mm						
C. cal	♀	40.0 m						



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

HS

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 72

Stream & Location: 171001-3 - Tus River RM: ___ Date: 1 / Oct / 17

Scorers Full Name & Affiliation:

River Code: ___-___-___ STORET #: ___ Lat./ Long.: (NAD 83 - decimal °) 37.4498 / 81.6035 Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	1	☐ ☐ HARDPAN [4]	___	___
■ ☐ BOULDER [9]	___	1	☐ ☐ DETRITUS [3]	___	___
☐ ■ COBBLE [8]	___	7	☐ ☐ MUCK [2]	___	___
☐ ☐ GRAVEL [7]	___	1	☐ ☐ SILT [2]	___	1
☐ ☐ SAND [6]	___	___	☐ ☐ ARTIFICIAL [0]	___	1
☐ ☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN		QUALITY
☐ LIMESTONE [1]	SILT	■ HEAVY [-2] −1.5
☐ TILLS [1]		■ MODERATE [-1]
☐ WETLANDS [0]		☐ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
■ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		■ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Comments

Substrate 16.5 Maximum 20

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

0 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	■ MODERATE 25-75% [7]
0 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 12

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
■ HIGH [4] −3.5	☐ EXCELLENT [7]	☐ NONE [6]	■ HIGH [3]
■ MODERATE [3]	■ GOOD [5]	■ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 15.5

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

River right looking downstream

EROSION (L / R)	RIPARIAN WIDTH (L / R)	FLOOD PLAIN QUALITY (L / R)
■ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]
☐ ■ MODERATE [2] −2.5	■ ■ MODERATE 10-50m [3]	■ ☐ SHRUB OR OLD FIELD [2] −1.5
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ■ RESIDENTIAL, PARK, NEW FIELD [1]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 7

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))	CHANNEL WIDTH (Check ONE (Or 2 & average))	CURRENT VELOCITY (Check ALL that apply)	
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	■ SLOW [1]
☐ 0.7-<1m [4]	■ POOL WIDTH = RIFFLE WIDTH [1]	■ VERY FAST [1]	☐ INTERSTITIAL [-1]
■ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	■ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		■ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 7

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
■ BEST AREAS > 10cm [2]	■ MAXIMUM > 50cm [2]	■ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 6

6] GRADIENT (ft/mi) DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4] ■ MODERATE [6-10] − 8 ☐ HIGH - VERY HIGH [10-6]

%POOL: 5 %GLIDE: — %RUN: 30 %RIFFLE: 65

Gradient Maximum 10: 8

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE
1st -sample pass- 2nd
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

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

_____ meters

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

1st pass _____ cm
2nd pass _____ cm

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

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

Very large riffle complex. Several nice slabs in riffle, head of riffle & runs. Sedimentation high, though embed moderate. Sediment flushed by riffle. Two freshly molted C. tallainus collected. IO? with deformed chelae. Stopped sampling; did not hit top riffle much. Found snuffling turtle in run above. Cambarus bartoni taken en masse. All fresh molts

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

C] RECREATION AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 1 / Oct / 2017 Project Name: Tug - DOT

Stream name: Tug Fork #4 Collection #: 171001-4

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Hemphill Geographic marker: Rail Road Crossing

0.4 miles (N S E W) of Hemphill Elevation: 1279 Stream Order: 3/4

Road/bridge: Davy Roderfield Road Specific Location: Tug Fork 0.1 miles from the train tracks and 0.4 miles North west of Hemphill, WV

Northing: 37.44759 Easting: -81.60250 (NAD83, Zone 17)

Stream Width: 16.0 Stream Depth: 2-5 Total # Seine Hauls: 10

Investigators/Firm: WLU / Mountain State

Collectors: Loughman et al.

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
13.7	565	–	0.4	8.33	–	–

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Cambarus callainus*	1	–	1	–	–	2
2.) *Cambarus hatfieldi*	1	–	9	–	–	10
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius										
C. theepiensis										
C. hatfieldi	1	3	2	3	1					
C. callainus	1	1								
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL
C. cal	I ♂	39.5						
C. cal	II ♂	44.3						

FLOW DIRECTION

Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 71.5

Stream & Location: 171001-4 - Tus Fork RM: ___.__ Date: 20 Oct 2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** ______ **Lat./Long.** (NAD 83 - decimal °) 37.44715 / 81.6025 Office verified location ☐

1] SUBSTRATE
Check *ONLY* **Two** substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]		1	☐☐ HARDPAN [4]		
☐☒ BOULDER [9]		1	☐☐ DETRITUS [3]		
☒☐ COBBLE [8]		1	☐☐ MUCK [2]		1
☐☐ GRAVEL [7]		1	☐☐ SILT [2]		1
☐☐ SAND [6]		1	☐☐ ARTIFICIAL [0]		1
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☒ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY
- ☒ HEAVY [-2] 5
- ☒ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

SILT / EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☒ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Comments

Substrate 16.5 / *Maximum 20*

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

0 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
2 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
0 ROOTMATS [1]			

AMOUNT Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☒ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20 14

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

SINUOSITY
- ☒ HIGH [4] → 3.5
- ☒ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☒ GOOD [5]
- ☐ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☒ RECOVERED [4]
- ☐ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☒ HIGH [3] → 2.5
- ☒ MODERATE [2]
- ☐ LOW [1]

Comments

Channel Maximum 20 15

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

River right looking downstream

L	R	EROSION
☐	☐	NONE / LITTLE [3]
☒	☒	MODERATE [2]
☐	☐	HEAVY / SEVERE [1]

L	R	RIPARIAN WIDTH
☐	☐	WIDE > 50m [4]
☒	☒	MODERATE 10-50m [3]
☐	☐	NARROW 5-10m [2]
☐	☐	VERY NARROW < 5m [1]
☐	☐	NONE [0]

L	R	FLOOD PLAIN QUALITY
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
☒	☒	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10 6

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check **ONE** (*ONLY!*)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☒ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (*Or 2 & average*)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☒ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☒ SLOW [1]
- ☐ VERY FAST [1]
- ☐ INTERSTITIAL [-1]
- ☒ FAST [1]
- ☐ INTERMITTENT [-2]
- ☒ MODERATE [1]
- ☒ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12 7

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☒ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☒ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☒ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☒ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8 6

6] GRADIENT
(ft/mi) ☐ VERY LOW - LOW [2-4] ☒ MODERATE [6-10] 7 ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: 1 %GLIDE: 1 %RUN: 60 %RIFFLE: 40

Gradient Maximum 10 7

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE (1st -sample pass- 2nd)
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

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

_______ meters

CLARITY (1st --sample pass-- 2nd)
- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

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

pass 1st_________ cm
2nd_________ cm

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

Another shallow riffle very similar to one site previous to this. [illegible] depth 20 cm. Changed protocol to 10 SH once animal forms. Very large C. calliginous taken from under large piece of plastic - used to be a [illegible]. Riparian corridor all wooded. Sediment & nutrient loading present. Both C. hatfieldi & C. calliginous undergone population wide molt recently

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

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft2 ☐ >3ft

D] MAINTENANCE
Circle some & COMMENT

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

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

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

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 1 / Oct / 2017 Project Name: Tug-DOT

Stream name: Tug Fork #5 Collection #: 171001-5

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Hemphill Geographic marker: Railroad Crossing

0.6 miles (N S E W) of Hemphill Elevation: 1335 Stream Order: 3/4

Road/bridge: Davy Roderfield Road Specific Location: Tug Fork River at Railroad bridge crossing, adjacent to Davy Roderfild Rd, 0.6 mi NW of Hemphill, WV Northing: 37.44736 Easting: 81.60116 (NAD83, Zone 17)

Stream Width: 18.6 Stream Depth: 0.2-0.5 Total # Seine Hauls: 20

Investigators/Firm: WLU / Mountain State

Collectors: Loughman et al.

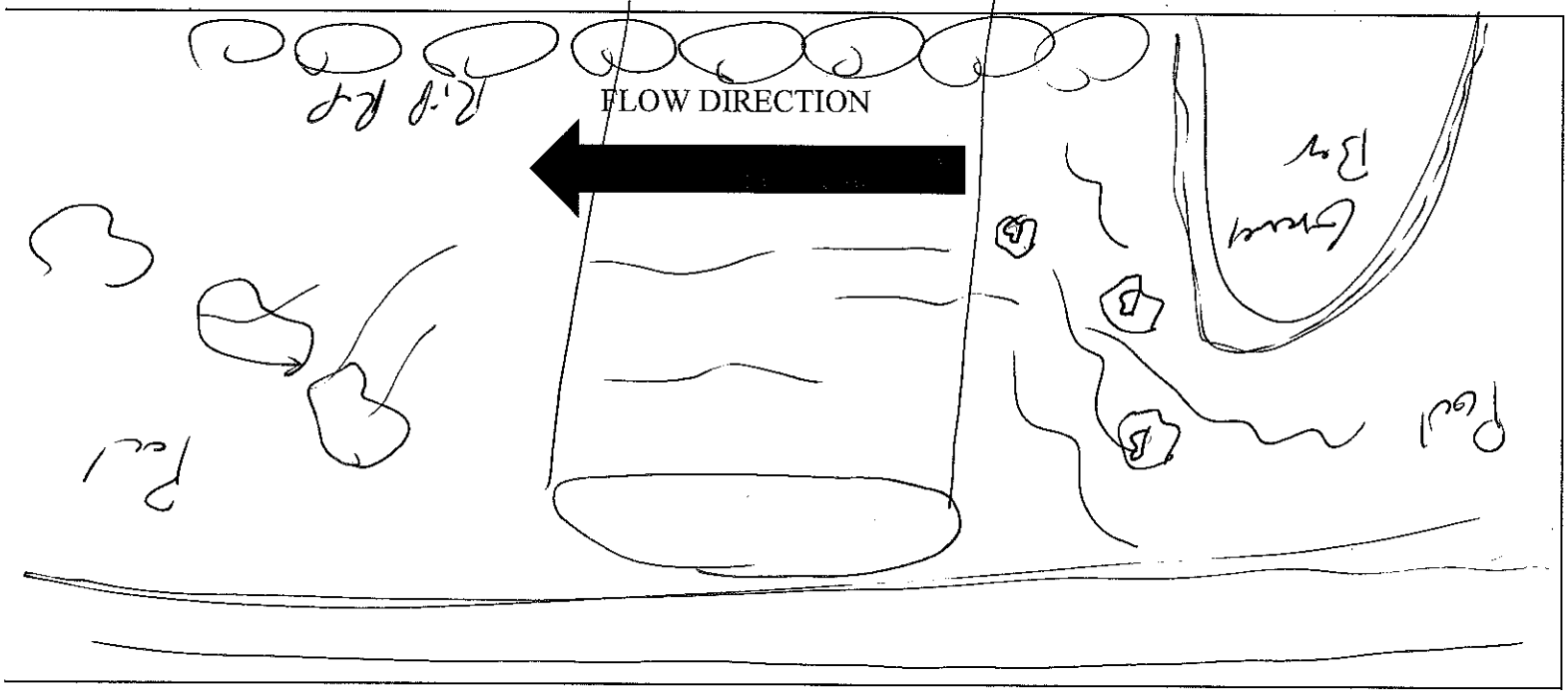
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
14.1	0.572	–	0.40	8.36	–	–

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	–	–	1	–	–	1
2.) *Cambarus hatfieldi*	2	1	6	–	–	9
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1									
C. theepiensis										
C. hatfieldi	1	2	2	3	1					
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

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

QHEI Score: 72

Stream & Location: 17001-5 **RM:** ___.__ **Date:** 01 Oct 17

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** _____ **Lat./Long.** (NAD 83 - decimal °) 37.4473 / 81.6011 ☐ Office verified location

1] SUBSTRATE
Check *ONLY* **Two** substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	/	☐ ☐ HARDPAN [4]	___	___
■ ☐ BOULDER [9]	___	/	☐ ☐ DETRITUS [3]	___	___
☐ ■ COBBLE [8]	___	/	☐ ☐ MUCK [2]	___	/
☐ ☐ GRAVEL [7]	___	/	☐ ☐ SILT [2]	___	/
☐ ☐ SAND [6]	___	/	☐ ☐ ARTIFICIAL [0]	___	/
☐ ☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ■ 3 or less [0]

ORIGIN (Check ONE (*Or 2 & average*))
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☑ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT:
- ■ HEAVY [-2] → -1.5
- ■ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS:
- ■ EXTENSIVE [-2]
- ■ MODERATE [-1]
- ☐ NORMAL [0] → -1.5
- ☐ NONE [1]

Substrate **14** *Maximum 20*

Comments

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

0 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	1 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
0 ROOTMATS [1]		

AMOUNT (Check ONE (*Or 2 & average*))
- ■ EXTENSIVE >75% [11] → 7.9
- ■ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20 **17**

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

SINUOSITY
- ☐ HIGH [4]
- ■ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ■ EXCELLENT [7]
- ■ GOOD [5] → 6
- ☐ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ■ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ■ HIGH [3] → 2.5
- ■ MODERATE [2]
- ☐ LOW [1]

Comments

Channel Maximum 20 **14.5**

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

River right looking downstream

EROSION (L / R)
- ☐ ☐ NONE / LITTLE [3]
- ■ ■ MODERATE [2]
- ☐ ☐ HEAVY / SEVERE [1]

RIPARIAN WIDTH (L / R)
- ☐ ☐ WIDE > 50m [4]
- ☐ ☐ MODERATE 10-50m [3]
- ■ ☐ NARROW 5-10m [2] → 1.5
- ☐ ■ VERY NARROW < 5m [1]
- ☐ ☐ NONE [0]

FLOOD PLAIN QUALITY (L / R)
- ☐ ☐ FOREST, SWAMP [3]
- ■ ☐ SHRUB OR OLD FIELD [2] → 1.5
- ☐ ■ RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ FENCED PASTURE [1]
- ☐ ☐ OPEN PASTURE, ROWCROP [0]

(L / R)
- ☐ ☐ CONSERVATION TILLAGE [1]
- ☐ ☐ URBAN OR INDUSTRIAL [0]
- ☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10 **5**

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check **ONE** (*ONLY!*))
- ☐ > 1m [6]
- ■ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (*Or 2 & average*))
- ■ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ■ FAST [1]
- ■ MODERATE [1]
- ■ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ■ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12 **10**

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ■ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ■ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ■ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1] → -0.5
- ■ MODERATE [0]
- ■ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8 **4.5**

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)
- ☐ VERY LOW - LOW [2-4]
- ■ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 10 %GLIDE: — %RUN: 60 %RIFFLE: 30

Gradient Maximum 10 **7**

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

1st _____ cm

2nd _____ cm

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

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

Samples riffle associated with Railway bridge. Rif Rep, boulders & anthropogenic objects serve as cover. High Velocity riffle at downside of bridge embedded. Substrate much more Cobbles here compared to previous site. Sediment issues also more severe

B] AESTHETICS

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

D] MAINTENANCE

Circle some & COMMENT

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 1 / Oct / 2017 Project Name: DOT - Tug

Stream name: Tug Fork #6 Collection #: 17101-6

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Hemphill Geographic marker: ~330 m upstream from railroad crossing

0.21 miles (N ~~S E~~ W) of Hemphill Elevation: 1291 Stream Order: 3

Road/bridge: Davy Roderfield Road Specific Location: Tug Fork River ~330m upstream from railroad crossing, adjacent to Davy Roderfield Rd, 0.21 mi NW of Hemphill Northing: 37.44730 Easting: -81.59740 (NAD83, Zone 17)

Stream Width: 12.3 Stream Depth: _____ Total # Seine Hauls: 29

Investigators/Firm: WLU/ Mountain State

Collectors: Loughman et. all

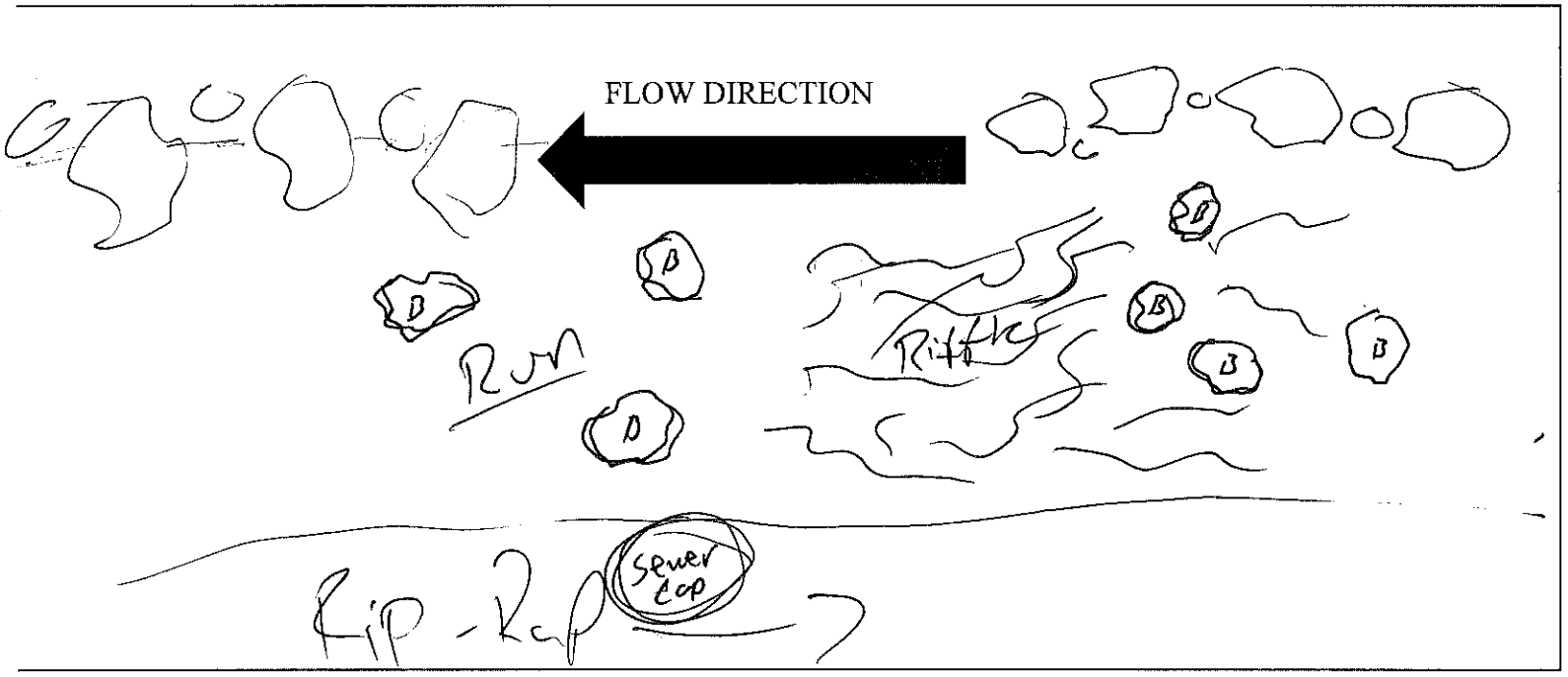
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
15.1	563	-	0.3	8.36	-	-

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Cambarus hatfieldi*	5	2	20			27
2.) *Faxonius cristavarius*	1					1
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1									
C. theepiensis										
C. hatfieldi	3	2	1	1	1	1	1	1	2	1
C. callainus	1	1	1	1	2	1	2	1	1	
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

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

QHEI Score: ____

Stream & Location: 171001-06 **RM:** ___.__ **Date:** 1/Oct/17

Scorers Full Name & Affiliation: ____

River Code: ___-___-___ **STORET #:** ____ **Lat./Long.:** (NAD 83 - decimal °) 37.4473 / 81.5974 Office verified location ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	____	____	☐☐ HARDPAN [4]	____	____
☐☐ BOULDER [9]	____	____	☐☐ DETRITUS [3]	____	____
☐☐ COBBLE [8]	____	____	☐☐ MUCK [2]	____	____
☐☐ GRAVEL [7]	____	____	☐☐ SILT [2]	____	____
☐☐ SAND [6]	____	____	☐☐ ARTIFICIAL [0]	____	____
☐☐ BEDROCK [5]	____	____	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

SILT

EMBEDDEDNESS

QUALITY
- ☐ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]
- ☐ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate ____ *Maximum 20*

Comments

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

____ UNDERCUT BANKS [1]	____ POOLS > 70cm [2]	____ OXBOWS, BACKWATERS [1]
____ OVERHANGING VEGETATION [1]	____ ROOTWADS [1]	____ AQUATIC MACROPHYTES [1]
____ SHALLOWS (IN SLOW WATER) [1]	____ BOULDERS [1]	____ LOGS OR WOODY DEBRIS [1]
____ ROOTMATS [1]		

AMOUNT
Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Cover Maximum 20 ____

Comments

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

SINUOSITY
- ☐ HIGH [4]
- ☐ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☐ GOOD [5]
- ☐ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ☐ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☐ MODERATE [2]
- ☐ LOW [1]

Comments

Channel Maximum 20 ____

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

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R	FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ NONE / LITTLE [3]	☐ NONE / LITTLE [3]	☐ WIDE > 50m [4]	☐ WIDE > 50m [4]	☐ FOREST, SWAMP [3]	☐ FOREST, SWAMP [3]
☐ MODERATE [2]	☐ MODERATE [2]	☐ MODERATE 10-50m [3]	☐ MODERATE 10-50m [3]	☐ SHRUB OR OLD FIELD [2]	☐ SHRUB OR OLD FIELD [2]
☐ HEAVY / SEVERE [1]	☐ HEAVY / SEVERE [1]	☐ NARROW 5-10m [2]	☐ NARROW 5-10m [2]	☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ RESIDENTIAL, PARK, NEW FIELD [1]
		☐ VERY NARROW < 5m [1]	☐ VERY NARROW < 5m [1]	☐ FENCED PASTURE [1]	☐ FENCED PASTURE [1]
		☐ NONE [0]	☐ NONE [0]	☐ OPEN PASTURE, ROWCROP [0]	☐ OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Riparian Maximum 10 ____

Comments

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check **ONE** (*ONLY!*)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (*Or 2 & average*)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ SLOW [1]
- ☐ VERY FAST [1]
- ☐ INTERSTITIAL [-1]
- ☐ FAST [1]
- ☐ INTERMITTENT [-2]
- ☐ MODERATE [1]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Pool / Current Maximum 12 ____

Comments

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☐ EXTENSIVE [-1]

Riffle / Run Maximum 8 ____

Comments

6] GRADIENT
(____ ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (____ mi²)

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

Gradient Maximum 10 ____

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

C] RECREATION AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

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

Run - Riffle - Run complex. Riffle gradient high! Maybe a bit high for typical C. callainy habitat. Run at downstream end of riffle gutted out & deep. Embed higher here than previous sites. Noticeable odor & film on H2O now. Conversion now occuring much more frequently

B] AESTHETICS

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

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: ~~30~~ 1 / Oct / 2017 Project Name: Tug

Stream name: Tug - Possibly at crossing Collection #: 171001-7

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Hemphill Geographic marker: ~110m SE of int. of River Rd + Candy Ln.

0.12 miles (N S E W) of Hemphill Elevation: 1241 Stream Order: 3

(Road) bridge: River Road Specific Location: Tug Fork by neighborhood ~110m SE of intersection of River Rd. and Candy Lane, 0.21 mi NE of Hemphill

Northing: 37.44596 Easting: -81.59491 (NAD83, Zone 17)

Stream Width: 18.9 Stream Depth: .2-1.0 Total # Seine Hauls: ~~30~~ 25

Investigators/Firm: WLU/Mountain State

Collectors: Laughman et. all

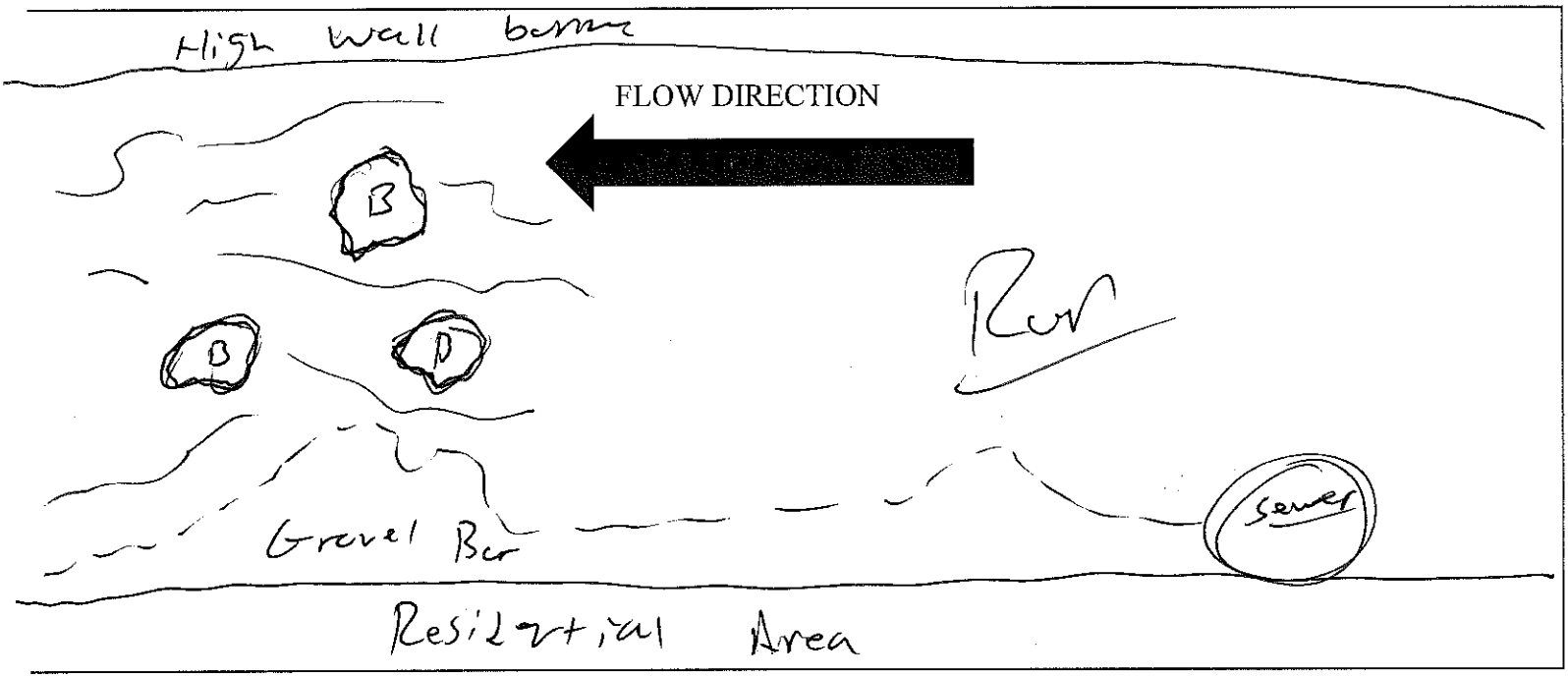
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	1	—	1	—	—	2
2.) *Cambarus hatfieldi*	3	—	12	—	—	15
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1 +18								
C. theepiensis	1	2	3	1	1	1	1	2	1	1
C. hatfieldi	Shat									
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

A5

OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 60.5

Stream & Location: 171001-7 – Tug Fork **RM:** ___.__ **Date:** 1 Oct 2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** _____ **Lat./ Long.** (NAD 83 - decimal °) 37.4459 / 81.5949 ☐ Office verified location

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___
☐ ☑ BOULDER [9]	___	1	☐ ☐ DETRITUS [3]	___	___
☐ ☑ COBBLE [8]	___	1	☐ ☐ MUCK [2]	___	1
☐ ☐ GRAVEL [7]	___	1	☐ ☐ SILT [2]	___	1
☐ ☐ SAND [6]	___	1	☐ ☐ ARTIFICIAL [0]	___	1
☐ ☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☑ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY
- ☑ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

SILT / EMBEDDEDNESS

- ☑ EXTENSIVE [-2]
- ☑ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

-1.5

Comments

Substrate 15.5 Maximum 20

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

0 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	1 OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
2 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
0 ROOTMATS [1]			

AMOUNT Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ☑ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 13

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

SINUOSITY
- ☐ HIGH [4]
- ☑ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☑ GOOD [5]
- ☑ FAIR [3] 2.4
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ☑ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☑ MODERATE [2]
- ☐ LOW [1]

Comments

Channel Maximum 20: 12

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

River right looking downstream

EROSION

L	R	
☐	☐	NONE / LITTLE [3]
☐	☑	MODERATE [2] -1.5
☑	☐	HEAVY / SEVERE [1]

RIPARIAN WIDTH

L	R	
☐	☐	WIDE > 50m [4]
☑	☐	MODERATE 10-50m [3]
☐	☐	NARROW 5-10m [2]
☐	☐	VERY NARROW < 5m [1]
☐	☑	NONE [0] -1.5

FLOOD PLAIN QUALITY

L	R	
☐	☐	FOREST, SWAMP [3]
☑	☐	SHRUB OR OLD FIELD [2] -1.5
☐	☑	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 4.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☑ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☑ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☑ FAST [1]
- ☑ MODERATE [1]
- ☑ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☑ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 4

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☑ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☑ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☑ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1] -0.5
- ☑ MODERATE [0]
- ☑ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4.5

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

- ☐ VERY LOW - LOW [2-4]
- ☑ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: — %GLIDE: —

%RUN: 40 %RIFFLE: 60

Gradient Maximum 10: 7

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE
1st -sample pass- 2nd
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

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

_______ meters

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

1st ________ cm
pass
2nd ________ cm

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

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

Urbanization impacts now present. Noticable odor now present. Tree canopy now gone. Sedimentation amount very high now. Algae & silt making carpet across substrate. Interstitial spaces absent except for riffles. Sampled 250 m. Coords are at upper margin of sampling reach. Cambarus hubrichti sexed → several ♂/♀ pairs @ previous site.

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

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE
Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 1 /Oct /2017 Project Name: DOT - Tug

Stream name: Tug Fork - Near crossing Collection #: 17 1001 - 8

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Hemphill Geographic marker: ~140m downstream from railroad crossing

0.04 miles (N (S) E W) of Hemphill Elevation: 1225 Stream Order: 3

(Road)/bridge: River Road Specific Location: Tug Fork ~140m downstream from railroad bridge crossing, 0.04 mi SE of Hemphill

Northing: 37.44433 Easting: -81.59510 (NAD83, Zone 17)

Stream Width: 14 m Stream Depth: _____ Total # Seine Hauls: 10

Investigators/Firm: WLU / Mountain State

Collectors: Laughman et. all

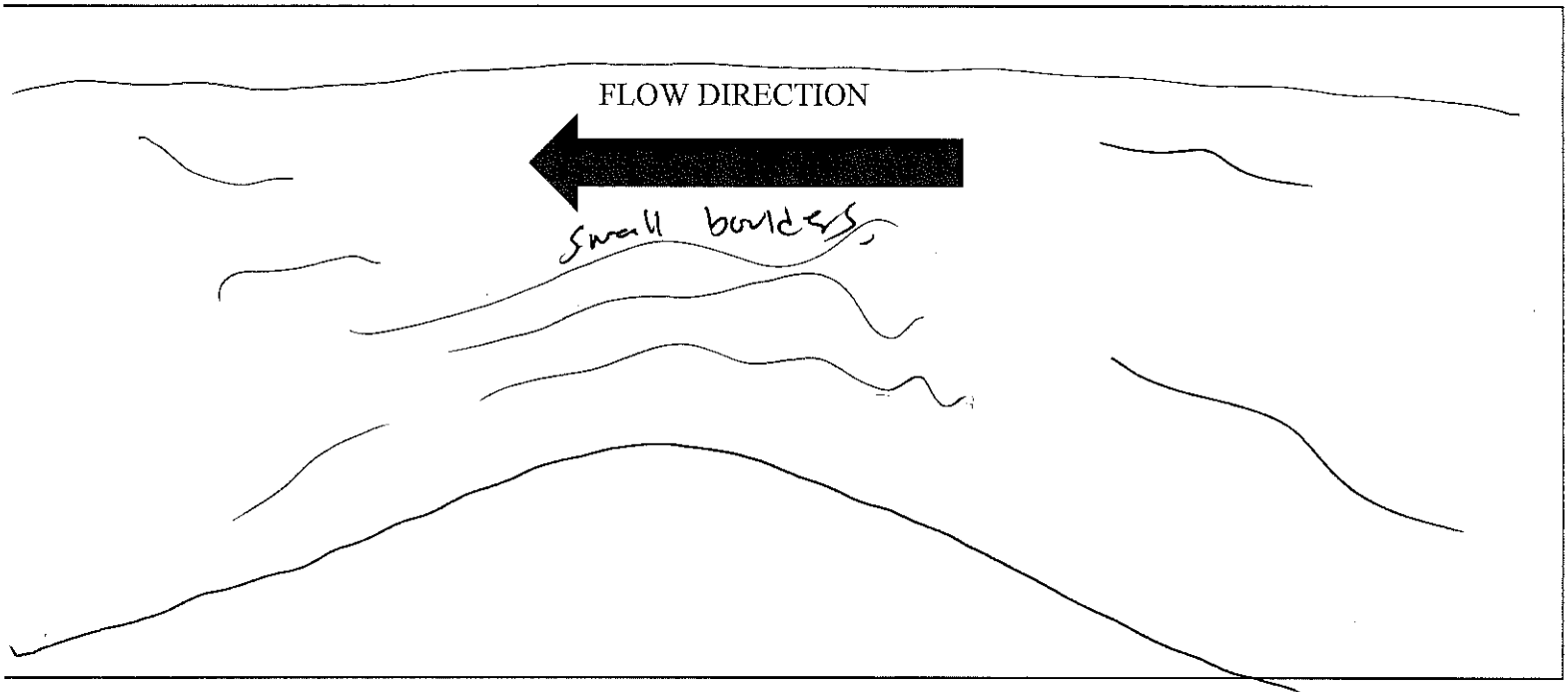
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
17.0	339		.2	8.3		

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Faxonius cristavarius	2	1	~~0~~	–	–	3
2.) Cambarus hatfieldi	–	–	10	–	–	10
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	2								
C. theepiensis										
C. hatfieldi	1	2	1	2	1	1	1	1		
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

A.S

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

QHEI Score: 57.5

Stream & Location: 171001-8 · Tug *RM:* ___.___ *Date:* 1 / Oct / 2017

Scorers Full Name & Affiliation: ____________

River Code: __-___-___ *STORET #:* ______ *Lat./ Long.* (NAD 83 - decimal °) 37.4443 / 81.5951 *Office verified location* ☐

1] SUBSTRATE Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]			☐☐ HARDPAN [4]		
■☐ BOULDER [9]		/	☐☐ DETRITUS [3]		/
☐■ COBBLE [8]		/	☐☐ MUCK [2]		/
☐☐ GRAVEL [7]		/	☐☐ SILT [2]		/
☐☐ SAND [6]		/	☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (*Or 2 & average*)

ORIGIN		QUALITY
☐ LIMESTONE [1]	SILT	■ HEAVY [-2]
☐ TILLS [1]		☐ MODERATE [-1]
☐ WETLANDS [0]		☐ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
■ SANDSTONE [0]	EMBEDDEDNESS	■ EXTENSIVE [-2]
☐ RIP/RAP [0]		■ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0] -1.5
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Substrate 5.5 *Maximum 20*

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

0 UNDERCUT BANKS [1]
1 OVERHANGING VEGETATION [1]
2 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]
0 POOLS > 70cm [2]
0 ROOTWADS [1]
1 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
0 AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT Check ONE (*Or 2 & average*)
☐ EXTENSIVE >75% [11]
■ MODERATE 25-75% [7]
■ SPARSE 5-<25% [3] > 5
☐ NEARLY ABSENT <5% [1]

Comments

Cover 10 *Maximum 20*

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	■ MODERATE [2]
☐ LOW [2]	■ FAIR [3]	■ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel 11 *Maximum 20*

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

River right looking downstream

L R EROSION	L R RIPARIAN WIDTH	L R FLOOD PLAIN QUALITY	L R
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
■■ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☐■ NARROW 5-10m [2]	■■ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	■☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian 4.5 *Maximum 10*

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check **ONE** (*ONLY!*)
☐ > 1m [6]
☐ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
■ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (*Or 2 & average*)
☐ POOL WIDTH > RIFFLE WIDTH [2]
■ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
☐ TORRENTIAL [-1] ☐ SLOW [1]
■ VERY FAST [1] ☐ INTERSTITIAL [-1]
■ FAST [1] ☐ INTERMITTENT [-2]
■ MODERATE [1] ☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 5 *Maximum 12*

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
■ BEST AREAS > 10cm [2]	■ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	■ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1] -0.5
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
			■ EXTENSIVE [-1]

Comments

Riffle / Run 4.5 *Maximum 8*

6] GRADIENT (ft/mi) ☐ VERY LOW - LOW [2-4]
DRAINAGE AREA (mi²) ■ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: ✓ %GLIDE: – %RUN: 20 %RIFFLE: 80

Gradient 7 *Maximum 10*

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

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

No Canopy. 150 m upstream from previous site. #s almost equal between species. Sediments + nutrients high. Same conditions as previous site.

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 1 / Oct / 2017 Project Name: Tug Fork - DOT

Stream name: Tug Fork #9 Collection #: 171001-9

Trib. of: Big Sandy Basin: Tug Fork River Co: McDowell

Town: Welch Geographic marker: Just inside Welch city limits.

0.13 miles (N (S) E (W)) of Hemphill Elevation: 1320 Stream Order: 3

Road/bridge: Rail Road Crossing Specific Location: Tug Fork 0.04 miles south west of the rail road crossing and 0.13 miles south west of Hemphill, WV.

Northing: 37.44330 Easting: -81.59717 (NAD83, Zone 17)

Stream Width: _____ Stream Depth: _____ Total # Seine Hauls: 24

Investigators/Firm: WLU/Mountain State

Collectors: Laughman et. all

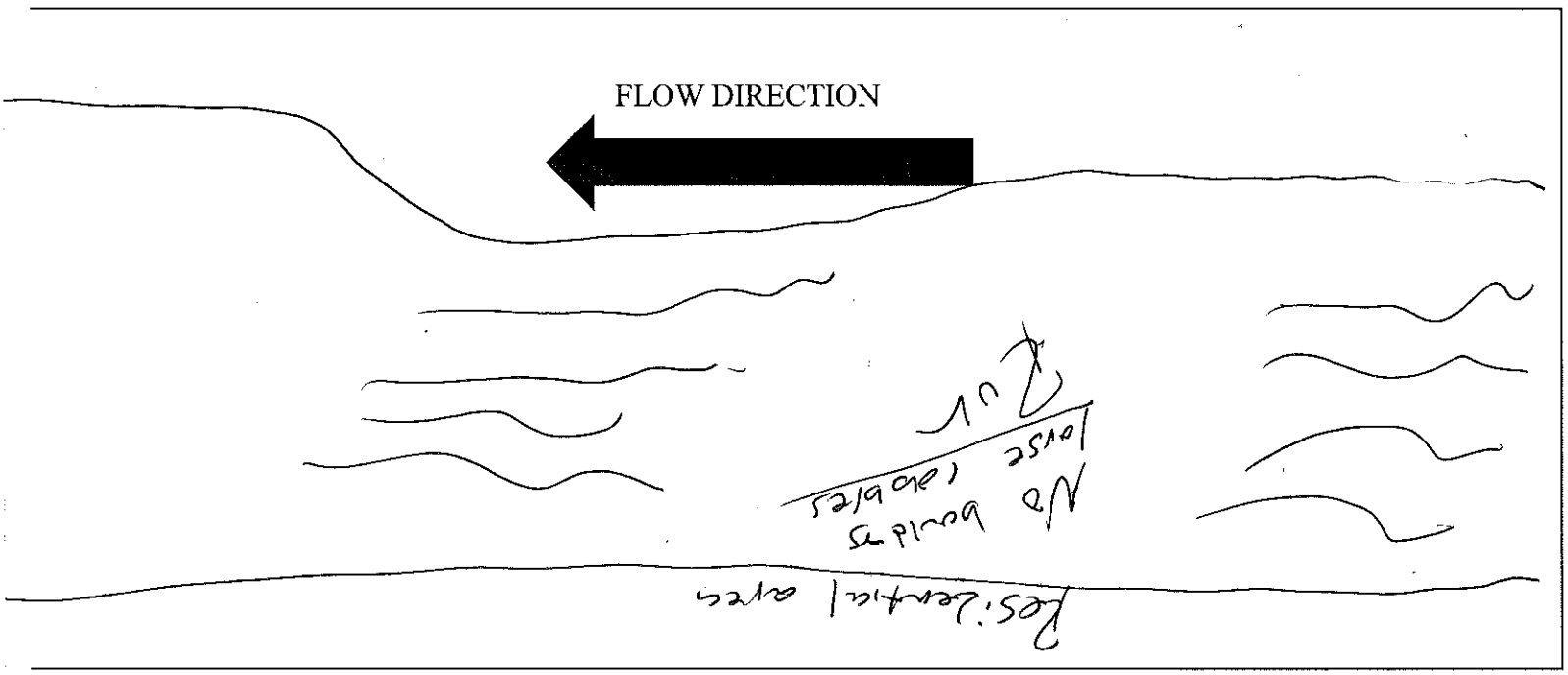
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
16.0	565	0.3	0.3	8.4	–	—

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	1		3			4
2.) *Cambarus hatfieldi*	1	2	10			13
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristavarius	1	1	1	1						
C. theepiensis										
C. hatfieldi	2	1	1	1	2	2	2	1	1	
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 60

Stream & Location: Ivy Fork – 171001-9 **RM:** ___ **Date:** 1 / Oct / 2007

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** _____ **Lat./Long.:** (NAD 83 - decimal °) 37.9433 / 81.5971 Office verified location ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___
☐ ■ BOULDER [9]	___	1	☐ ☐ DETRITUS [3]	___	1
■ ☐ COBBLE [8]	___	1	☐ ☐ MUCK [2]	___	1
☐ ☐ GRAVEL [7]	___	1	☐ ☐ SILT [2]	___	1
☐ ☐ SAND [6]	___	___	☐ ☐ ARTIFICIAL [0]	___	___
☐ ☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ■ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN		QUALITY
☐ LIMESTONE [1]	SILT	■ HEAVY [-2]
☐ TILLS [1]		■ MODERATE [-1]
☐ WETLANDS [0]		☐ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
■ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		■ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

-1.5

Comments

Substrate 14.5 *Maximum 20*

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

0 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	1 OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
0 ROOTMATS [1]			

AMOUNT (Check ONE (*Or 2 & average*))
☐ EXTENSIVE >75% [11]
■ MODERATE 25-75% [7]
■ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

7.5

Comments

Cover *Maximum 20* 12

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	■ MODERATE [2]
☐ LOW [2]	■ FAIR [3]	■ RECOVERING [3]	■ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

-1.5

Comments

Channel *Maximum 20* 10.5

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

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	(L R)
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
■ ■ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	■ ■ NARROW 5-10m [2]	■ ■ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian *Maximum 10* 5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check **ONE** (*ONLY!*))
☐ > 1m [6]
☐ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
■ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (*Or 2 & average*))
■ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)
☐ TORRENTIAL [-1] ■ SLOW [1]
☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
■ FAST [1] ☐ INTERMITTENT [-2]
■ MODERATE [1] ☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current *Maximum 12* 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
■ BEST AREAS > 10cm [2]	■ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	■ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run *Maximum 8* 5

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4]
■ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 10 %GLIDE: —
%RUN: 30 %RIFFLE: 60

Gradient *Maximum 10* 7

A] SAMPLED REACH
Check ALL that apply

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

Large riffle complex; Boulders & Slabs of any size rare. Lots of garbage along Bank. Stream impacted by coal fires, sediment, nutrient, Channel, & residence. Grey H_2O prevalent. Not conducive for C. cavatus. Cambarus hatfieldi gradient. Cambarus hatfieldi slopes

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

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

_____ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

pass 1st _______ cm
2nd _______ cm

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

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

C] RECREATION AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

Riffle under Railroad Bridge not sampled. Boulders embed; waste in H_2O, possibly human. Dangerous. Kicked a few boulders. NO crayfish.

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 01 / Oct / 2019 Project Name: Tug - DOT

Stream name: Tug Fork River Collection #: 17001-10

Trib. of: Big Sandy River Basin: ~~Tug Fork River~~ ~~Charles H. "Charlie"~~ Co: McDowell Co

Town: Hemphill Geographic marker: Charles H. "Charlie" Spencer Memorial Bridge

0.33 miles (N (S) E (W)) of Hemphill Elevation: 1289 Stream Order: 3/4

Road/bridge: ~~Hemphill~~ City Park Rd. Specific Location: Tug Fork River at City Park Road crossing, 0.33 mi SW of Hemphill, WV

Northing: 37.44135 Easting: -81.59977 (NAD83, Zone 17)

Stream Width: 15m Stream Depth: 0.2-4.0m Total # Seine Hauls: 20

Investigators/Firm: WLU/Mountain State

Collectors: Loughman et. al

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
16.4	0.606	—	0.4	8.34	—	—

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *C. hatfieldi*	1	2	8	—	1	12
2.) *F. cristavarius*	1	—	2	—	—	3
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	✓	✓	✓							
C. theepiensis										
C. hatfieldi	✓	✓	✓	✓	2	1	1	1	1	1
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL

FLOW DIRECTION

Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

A5

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

QHEI Score: 71

Stream & Location: 170110-10 Jug River **RM:** ___ **Date:** 01 / Oct / 2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** _____ **Lat./Long.** (NAD 83 - decimal °): 37.4413 / 81.5997 **Office verified location** ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☑ BLDR /SLABS [10]		1	☐ HARDPAN [4]		
☑ BOULDER [9]		1	☐ DETRITUS [3]		
☐ COBBLE [8]		1	☐ MUCK [2]		1
☐ GRAVEL [7]		1	☐ SILT [2]		
☐ SAND [6]			☐ ARTIFICIAL [0]		1
☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☑ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

EMBEDDEDNESS

SILT

QUALITY
- ☑ HEAVY [-2]
- ☑ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]
- ☑ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 17.5 *Maximum 20*

Comments

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

0 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	3 LOGS OR WOODY DEBRIS [1]	
2 ROOTMATS [1]			

AMOUNT Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☑ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Cover Maximum 20: 12

Comments

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

SINUOSITY
- ☑ HIGH [4]
- ☐ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☑ EXCELLENT [7]
- ☑ GOOD [5]
- ☐ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☑ RECOVERED [4]
- ☐ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☑ HIGH [3]
- ☐ MODERATE [2]
- ☐ LOW [1]

Channel Maximum 20: 17

Comments

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

River right looking downstream

EROSION

L	R	
☐	☐	NONE / LITTLE [3]
☑	☑	MODERATE [2]
☐	☐	HEAVY / SEVERE [1]

RIPARIAN WIDTH

L	R	
☐	☐	WIDE > 50m [4]
☐	☐	MODERATE 10-50m [3]
☑	☐	NARROW 5-10m [2]
☐	☐	VERY NARROW < 5m [1]
☐	☑	NONE [0]

FLOOD PLAIN QUALITY

L	R	
☐	☐	FOREST, SWAMP [3]
☑	☐	SHRUB OR OLD FIELD [2] 1.5
☐	☑	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Riparian Maximum 10: 4.5

Comments

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check **ONE** (*ONLY!*)
- ☑ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (*Or 2 & average*)
- ☑ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☑ SLOW [1]
- ☑ VERY FAST [1]
- ☐ INTERSTITIAL [-1]
- ☑ FAST [1]
- ☐ INTERMITTENT [-2]
- ☑ MODERATE [1]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Pool / Current Maximum 12: 12

Comments

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☑ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☑ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☑ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☑ MODERATE [0]
- ☑ EXTENSIVE [-1]

Riffle / Run Maximum 8: 5

Comments

6] GRADIENT
(ft/mi) ☑ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: 15 %GLIDE: 0 %RUN: 70 %RIFFLE: 15

Gradient Maximum 10: 3

A] SAMPLED REACH
Check ALL that apply

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

large well established riffle with slab rock, Boulders, & large cobbles. Run at base of steep test. Class 2 Cambarus (callainus) hubbsi. Several large slabs & Boulders in riffle. Cambarus ~~Calliz~~ (bartonii) dominant species. Several boulders embed. Siltation & Sedimentation Systems Anthro impacts prevalent

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

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

_______ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

pass 1st _______ cm
2nd _______ cm

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

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

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

$\bar{x}$ width
$\bar{x}$ depth
max. depth
$\bar{x}$ bankfull width
bankfull $\bar{x}$ depth
W/D ratio
bankfull max. depth
floodprone x^2 width
entrench. ratio

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 2 / Oct / 2017 Project Name: DOT - Gilbert

Stream name: Gilbert Creek Collection #: 171002-1

Trib. of: Guyandotte River Basin: Guyandotte Co: Mingo

Town: Gilbert Geographic marker: Truck pull off adjacent to Rte 2

2.14 miles (N S E W) of Gilbert Elevation: 1054 Stream Order: 2/3

Road/bridge: Highway 52 Specific Location: Gilbert Creek 0.2 miles west of Highway 52 and 2.14 miles Northwest of Gilbert, WV.

Northing: 37.62635 Easting: -81.90221 (NAD83, Zone 17)

Stream Width: 8-10 Stream Depth: .2 - .5 Total # Seine Hauls: 16

Investigators/Firm: WLU/Mountain State

Collectors: Laughman et. all

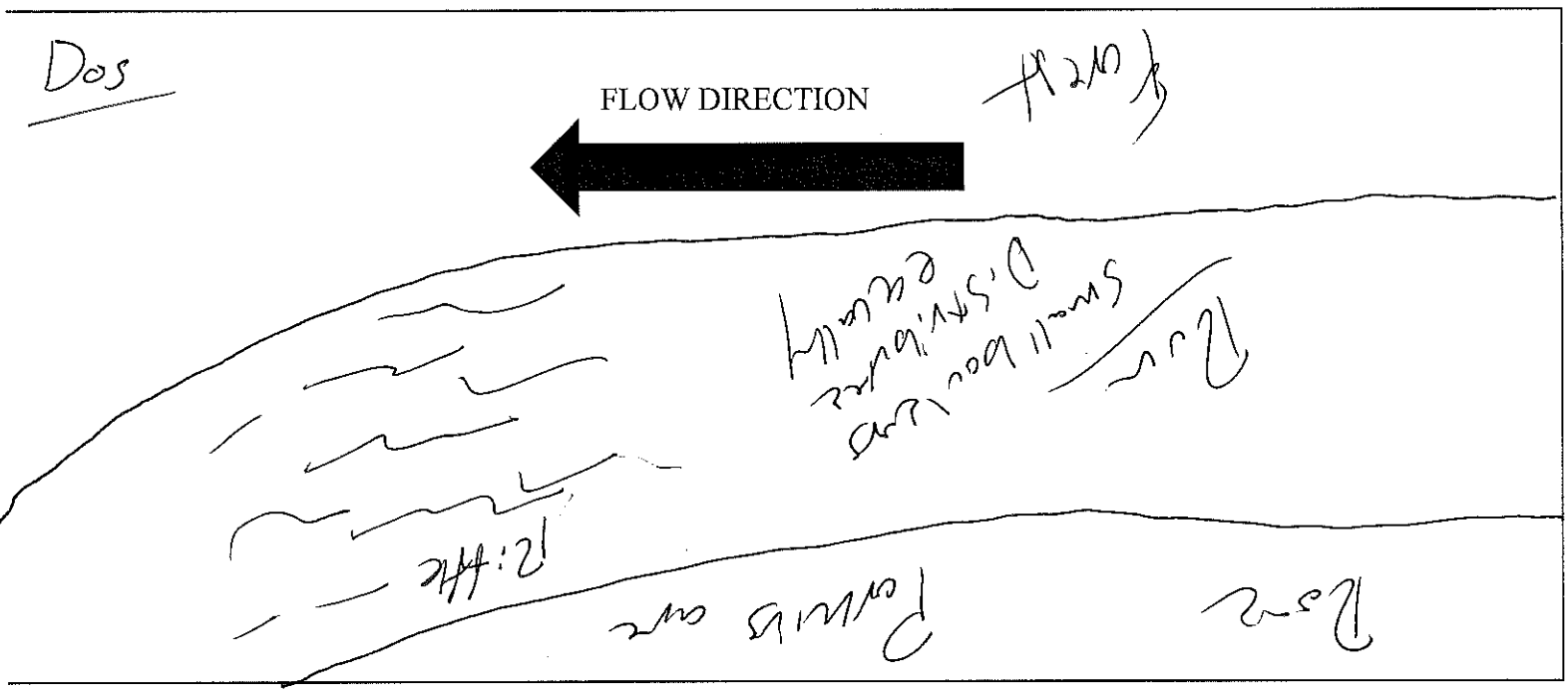
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
11.9	903	-	0.6	8.28	-	-

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	2	-	2	-	-	4
2.)						
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1	1	1	+12					
C. theepiensis										
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

AS

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 69

Stream & Location: 171002 - 1 - Gilbert Creek **RM:** ___.__ **Date:** 21 04 2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** ______ **Lat./ Long.:** (NAD 83 - decimal °) 37.6263 81.9022 Office verified location ☐

1] SUBSTRATE

Check *ONLY* **Two** substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]	___	___	☐☐ HARDPAN [4]	___	___
■☐ BOULDER [9]	___	1	☐☐ DETRITUS [3]	___	___
☐■ COBBLE [8]	___	1	☐☐ MUCK [2]	___	___
☐☐ GRAVEL [7]	___	1	☐■ SILT [2]	___	1
☐☐ SAND [6]	___	1	☐■ ARTIFICIAL [0]	___	1
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN
☐ LIMESTONE [1]
☐ TILLS [1]
☐ WETLANDS [0]
☐ HARDPAN [0]
■ SANDSTONE [0]
☐ RIP/RAP [0]
☐ LACUSTURINE [0]
☐ SHALE [-1]
☐ COAL FINES [-2]

QUALITY
SILT
☐ HEAVY [-2]
■ MODERATE [-1]
■ NORMAL [0]
☐ FREE [1]
EMBEDDEDNESS
☐ EXTENSIVE [-2]
■ MODERATE [-1]
☐ NORMAL [0]
☐ NONE [1]

Comments

Substrate 17.5 *Maximum 20*

2] INSTREAM COVER

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

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	1 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
0 ROOTMATS [1]		

AMOUNT
Check ONE (*Or 2 & average*)
☐ EXTENSIVE >75% [11]
■ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover *Maximum 20* 15

3] CHANNEL MORPHOLOGY

Check ONE in each category (*Or 2 & average*)

SINUOSITY
☐ HIGH [4]
■ MODERATE [3]
☐ LOW [2]
☐ NONE [1]

DEVELOPMENT
☐ EXCELLENT [7]
■ GOOD [5]
☐ FAIR [3]
☐ POOR [1]

CHANNELIZATION
☐ NONE [6]
■ RECOVERED [4]
☐ RECOVERING [3]
☐ RECENT OR NO RECOVERY [1]

STABILITY
☐ HIGH [3]
■ MODERATE [2]
☐ LOW [1]

Comments

Channel *Maximum 20* 14

4] BANK EROSION AND RIPARIAN ZONE

Check **ONE** in each category for *EACH BANK* (*Or 2 per bank & average*)

River right looking downstream

EROSION

L	R	
☐	☐	NONE / LITTLE [3]
■	■	MODERATE [2]
☐	☐	HEAVY / SEVERE [1]

RIPARIAN WIDTH

L	R	
☐	☐	WIDE > 50m [4]
☐	☐	MODERATE 10-50m [3]
☐	■	NARROW 5-10m [2]
■	☐	VERY NARROW < 5m [1]
☐	☐	NONE [0]

FLOOD PLAIN QUALITY

L	R	
☐	■	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
■	☐	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]

L	R	
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian *Maximum 10* 5.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check **ONE** (*ONLY!*)
☐ > 1m [6]
☐ 0.7-<1m [4]
■ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (*Or 2 & average*)
☐ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
■ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
☐ TORRENTIAL [-1]
☐ VERY FAST [1]
■ FAST [1]
■ MODERATE [1]
■ SLOW [1]
☐ INTERSTITIAL [-1]
☐ INTERMITTENT [-2]
☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current *Maximum 12* 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
☐ BEST AREAS > 10cm [2]
■ BEST AREAS 5-10cm [1]
☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
■ MAXIMUM > 50cm [2]
☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
■ STABLE (e.g., Cobble, Boulder) [2]
☐ MOD. STABLE (e.g., Large Gravel) [1]
☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ NONE [2]
☐ LOW [1]
■ MODERATE [0]
☐ EXTENSIVE [-1]

Comments

Riffle / Run *Maximum 8* 5

6] GRADIENT

(ft/mi) ☐ VERY LOW - LOW [2-4] ■ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: — %GLIDE: —
%RUN: 60 %RIFFLE: 40

Gradient *Maximum 10* 7

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE (1st -sample pass- 2nd)
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

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

_____ meters

CLARITY (1st --sample pass-- 2nd)
- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

1st _________ cm
pass
2nd _________ cm

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

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

Upstream of mire at first major riffle complex. Boulders proper, not slabs. Sedimentation & algae present en masse in slack H2O. Embed present, not systemic. Cambarus rare. Faxonius not very common either. Sampled 200 m with core as center point.

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

C] RECREATION AREA DEPTH
POOL: ☐ >100ft^2 ☐ >3ft

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

Circle some & *COMMENT*

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 2 / Oct / 2017 Project Name: DOT - Gilbert

Stream name: Gilbert Creek Collection #: 171002-2

Trib. of: Guyandotte River Basin: Guyandotte Co: Mingo

Town: Gilbert Geographic marker: Promise Christian Fellowship Church

1.55 miles (N S E W) of Gilbert Elevation: 957 Stream Order: 2/3

Road/bridge: Highway 52 Specific Location: Gilbert Creek at Promise Christian Fellowship Church, 1.55 mi NW of Gilbert

Northing: 37.62336 Easting: -81.89225 (NAD83, Zone 17)

Stream Width: 3-5 Stream Depth: .2-.5 Total # Seine Hauls: 16

Investigators/Firm: WLN/Mountain State

Collectors: Laughman et. all

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
12.0	976	~	0.1	8.34	—	—

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Faxonius cristavarius	2		3-6			5
2.)						
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1	1	1	1	no	+ 10			
C. theepiensis										
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL

FLOW DIRECTION

Please attach a topographic map identifying snrvey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 64

Stream & Location: 171002-2 - Gilbert Creek **RM:** ___._ **Date:** __/__/__

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** ______ **Lat./Long.** (NAD 83 - decimal °) 37.6233 / 81.8922 Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR/SLABS [10]			☐ ☐ HARDPAN [4]		
■ ☐ BOULDER [9]		1	☐ ☐ DETRITUS [3]		1
☐ ■ COBBLE [8]			☐ ☐ MUCK [2]		
☐ ☐ GRAVEL [7]			☐ ☐ SILT [2]		1
☐ ☐ SAND [6]		1	☐ ☐ ARTIFICIAL [0]		1
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ■ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN		QUALITY	
☐ LIMESTONE [1]	SILT	☐ HEAVY [-2]	Substrate
☐ TILLS [1]		■ MODERATE [-1]	15
☐ WETLANDS [0]		☐ NORMAL [0]	
☐ HARDPAN [0]		☐ FREE [1]	Maximum 20
■ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]		■ MODERATE [-1]	
☐ LACUSTURINE [0]		☐ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Comments

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

1 UNDERCUT BANKS [1]	2 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	■ MODERATE 25-75% [7]
0 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 17

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	■ GOOD [5]	☐ RECOVERED [4]	■ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	■ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 13

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

River right looking downstream

EROSION (L / R)	RIPARIAN WIDTH (L / R)	FLOOD PLAIN QUALITY (L / R)	(L / R)
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
■ ■ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	■ ■ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	■ ■ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 3

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ■ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ■ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)

☐ TORRENTIAL [-1]	■ SLOW [1]
☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
■ FAST [1]	☐ INTERMITTENT [-2]
■ MODERATE [1]	☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: (Check ONE (Or 2 & average)). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	■ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
■ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	■ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 3

6] GRADIENT
(ft/mi) ☐ VERY LOW - LOW [2-4] ■ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: 15 %GLIDE: 1

%RUN: 55 %RIFFLE: 30

Gradient Maximum 10: 7

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

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

Rip Rapple Bank. High Gradient. Silt + Algae

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 2 / Oct / 2017 Project Name: DOT- Gilbert

Stream name: Gilbert Creek Collection #: 171002-3

Trib. of: Guyandotte River Basin: Guyandotte Co: Mingo

Town: Gilbert Geographic marker: Sign for the town of Gilbert on US-52

1.2 miles (N S E W) of Gilbert Elevation: 914 Stream Order: 2/3

Road/bridge: US 52 Specific Location: Gilbert Creek at Gilbert Sign on US52., 1.2 mi NW of Gilbert

Northing: 37.62016 Easting: -81.88715 (NAD83, Zone 17)

Stream Width: _____ Stream Depth: _____ Total # Seine Hauls: 16

Investigators/Firm: WLU/Marshall State

Collectors: Laughman et. all

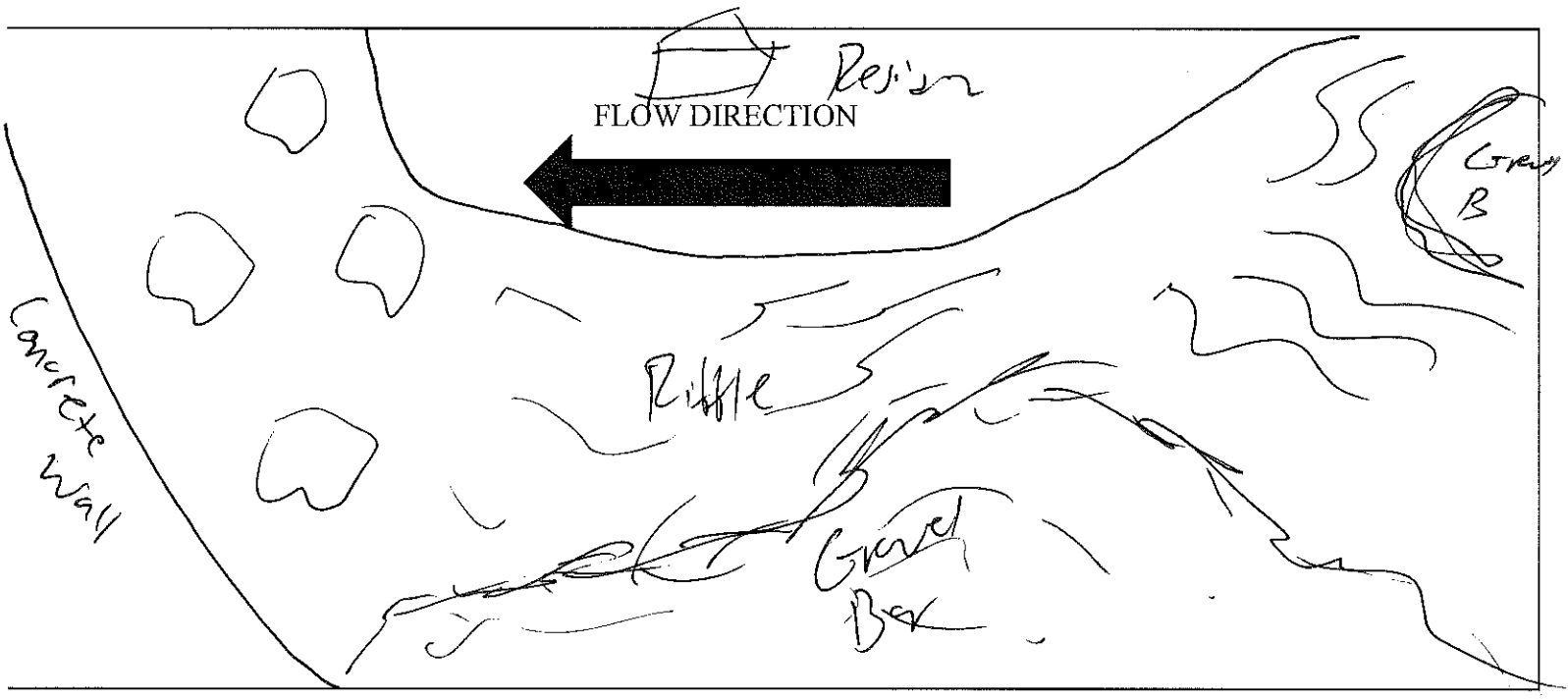
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
11.8	968	–	0.7	8.7	–	–

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Faxonius cristavarius	–	–	1	–	–	1
2.)						
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristavarius	1	15								
C. theepiensis										
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 57

Stream & Location: Gilbert Creek - #3 **RM:** ____ **Date:** 2 Oct 2017

17 10 02-3 **Scorers Full Name & Affiliation:**

River Code: ___-___-___ **STORET #:** _____ **Lat./Long.** (NAD 83 - decimal °) 37.6201 / 81.8871 Office verified location ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

Check ONE (*Or 2 & average*)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]		
☐ ☐ BOULDER [9]		1	☐ ☐ DETRITUS [3]		1
☐ ☒ COBBLE [8]		1	☐ ☐ MUCK [2]		
☒ ☐ GRAVEL [7]		1	☐ ☐ SILT [2]		1
☐ ☐ SAND [6]		1	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☒ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY -1.5

SILT:
- ☒ HEAVY [-2]
- ☒ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS:
- ☒ EXTENSIVE [-2]
- ☒ MODERATE [-1]
- ☐ NORMAL [0] -1.5
- ☐ NONE [1]

Substrate 14 *Maximum 20*

Comments

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

0 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
0 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
2 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
0 ROOTMATS [1]			

AMOUNT
Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☒ MODERATE 25-75% [7] 7.5
- ☒ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover *Maximum 20* 9

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☒ MODERATE [3]	☐ GOOD [5]	☒ RECOVERED [4]	☒ MODERATE [2]
☐ LOW [2]	☒ FAIR [3]	☐ RECOVERING [3]	☒ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel *Maximum 20* 11.5

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

River right looking downstream

EROSION (L / R)	RIPARIAN WIDTH (L / R)	FLOOD PLAIN QUALITY (L / R)
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]
☒ ☒ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☒ ☒ RESIDENTIAL, PARK, NEW FIELD [1]
	☐ ☒ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]
	☒ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]
		☐ ☐ CONSERVATION TILLAGE [1]
		☐ ☐ URBAN OR INDUSTRIAL [0]
		☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian *Maximum 10* 3.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check **ONE** (*ONLY!*))
- ☐ > 1m [6]
- ☒ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (*Or 2 & average*))
- ☒ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☒ FAST [1]
- ☒ MODERATE [1]
- ☒ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current *Maximum 12* 9

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☒ BEST AREAS 5-10cm [1]	☒ MAXIMUM < 50cm [1]	☒ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☒ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run *Maximum 8* 3

6] GRADIENT
(ft/mi) ☐ VERY LOW - LOW [2-4] ☒ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: 10 %GLIDE: — %RUN: 40 %RIFFLE: 50

Gradient *Maximum 10* 7

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

pass: 1st _____ cm; 2nd _____ cm

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

Very little Cowbera habitat. Slab boulders pretty much non-existent. Riffles present. All composing of large cobbles & random boulders. ~~Lots~~ Pools also present. Favorite only crayfish collected. Repeat site.

Sampled 200 m / Coords center point / 1st site downstream of mine

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 2 / Oct / 2017 Project Name: Gilbert Creek - Oct

Stream name: Gilbert Creek Collection #: 171002-4

Trib. of: Guyandotte River Basin: Guyandotte River Co: Mingo

Town: Gilbert Geographic marker: Gilbert Lodge

0.87 miles (N S E W) of Gilbert Elevation: 880 Stream Order: 2/3

Road/bridge: Highway 52 Specific Location: Gilbert Creek at Gilbert Lodge 0.5 miles from the train tracks and 0.87 miles NW of Gilbert, WV

Northing: 37.61429 Easting: -81.8828 (NAD83, Zone 17)

Stream Width: 8-10 w Stream Depth: .2-.4 Total # Seine Hauls: 16

Investigators/Firm: WLU/Mountain State

Collectors: Laughman et. all

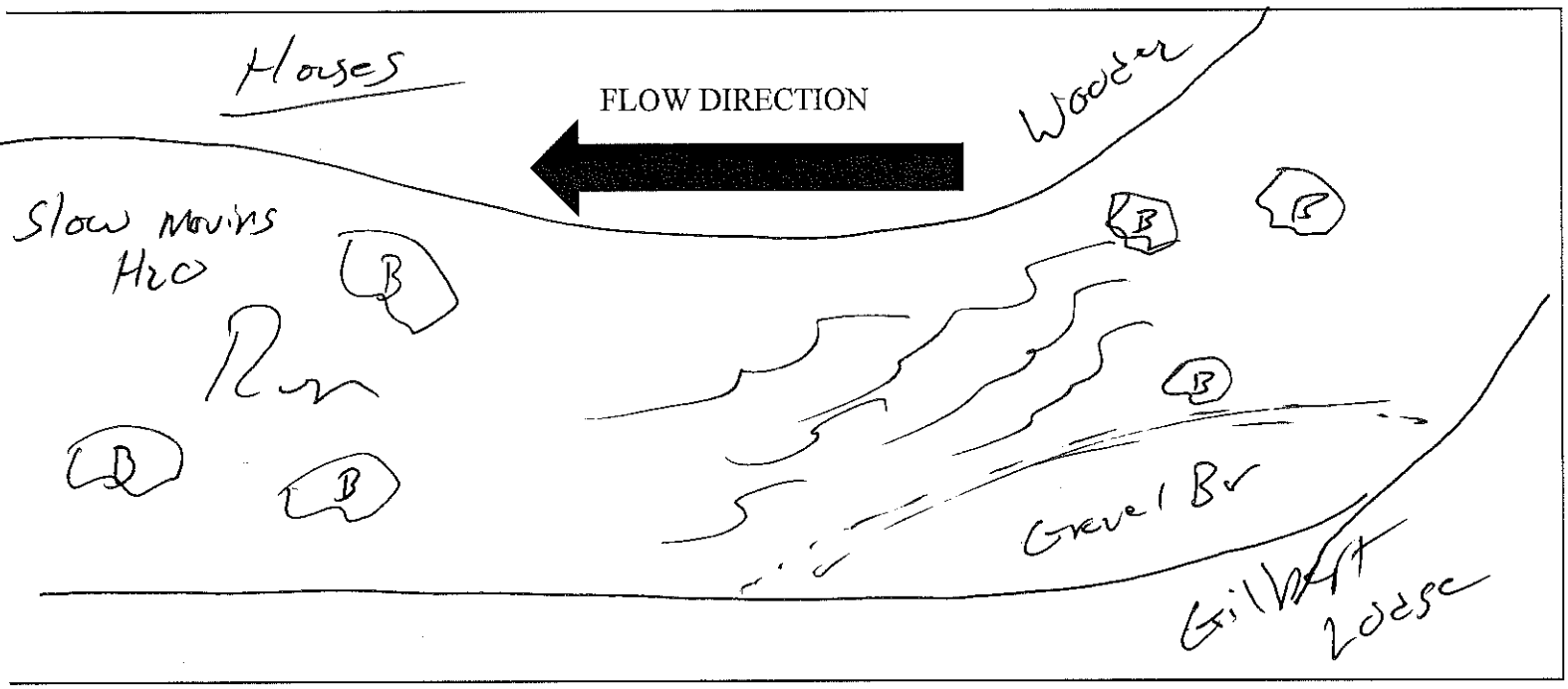
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
12.1	967	–	.6	8.36	–	–

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	–	–	2	–	–	2
2.)						
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1	+14							
C. theepiensis										
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

AS

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 65

Stream & Location: 17002-4 - Gilbert Creek *RM:* ___._ *Date:* 21 Oct 2024

Scorers Full Name & Affiliation:

River Code: __-___-__ *STORET #:* ______ *Lat./Long.:* (NAD 83 - decimal °) 37.6142 / 81.8828 Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present. Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]			☐☐ HARDPAN [4]		
■☐ BOULDER [9]		1	☐☐ DETRITUS [3]		
☐■ COBBLE [8]		1	☐☐ MUCK [2]		
☐☐ GRAVEL [7]		1	☐☐ SILT [2]		1
☐☐ SAND [6]			☐☐ ARTIFICIAL [0]		1
☐☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

ORIGIN	QUALITY: SILT	QUALITY: EMBEDDEDNESS
☐ LIMESTONE [1]	☐ HEAVY [-2]	■ EXTENSIVE [-2]
☐ TILLS [1]	☐ MODERATE [-1]	■ MODERATE [-1]
☐ WETLANDS [0]	■ NORMAL [0]	☐ NORMAL [0]
☐ HARDPAN [0]	☐ FREE [1]	☐ NONE [1]
■ SANDSTONE [0]		
☐ RIP/RAP [0]		
☐ LACUSTURINE [0]		
☐ SHALE [-1]		
☐ COAL FINES [-2]		

Comments

Substrate: 17.5 (Maximum 20)

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

Score	Cover type	Score	Cover type	Score	Cover type
0	UNDERCUT BANKS [1]	1	POOLS > 70cm [2]	0	OXBOWS, BACKWATERS [1]
0	OVERHANGING VEGETATION [1]	0	ROOTWADS [1]	0	AQUATIC MACROPHYTES [1]
1	SHALLOWS (IN SLOW WATER) [1]	1	BOULDERS [1]	1	LOGS OR WOODY DEBRIS [1]
0	ROOTMATS [1]				

AMOUNT — Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ■ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover: 12 (Maximum 20)

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	■ GOOD [5]	■ RECOVERED [4]	■ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel: 14 (Maximum 20)

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

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
■■ MODERATE [2]	■☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	■■ NARROW 5-10m [2]	■■ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian: 5 (Maximum 10)

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH — Check ONE (ONLY!)	CHANNEL WIDTH — Check ONE (Or 2 & average)	CURRENT VELOCITY — Check ALL that apply	
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	■ SLOW [1]
☐ 0.7-<1m [4]	■ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	■ FAST [1]	☐ INTERMITTENT [-2]
■ 0.2-<0.4m [1]		■ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]			

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current: 5 (Maximum 12)

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	■ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
■ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	■ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run: 4 (Maximum 8)

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

- ☐ VERY LOW - LOW [2-4]
- ■ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: — %GLIDE: —
%RUN: 30 %RIFFLE: 70

Gradient: 7 (Maximum 10)

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

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

Boulders back now. Reach composed of several large boulder chutes in riffles, as well as boulders in pools. Riparian corridor gone of any vegetation or canopy. Residential impacts now present. Gradient somewhat high now. Conductivity still high. Cambarus habitat present; No Cambarus found -- Sampled 200m of stream.

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 2 / Oct / 2017 Project Name: DOT - Gilbert cr.

Stream name: Gilbert Creek Collection #: 171002-5

Trib. of: Guyandotte River Basin: Guyandotte Co: Mingo

Town: Gilbert Geographic marker: Devil Anse Trail house

0 miles (~~N S E W~~) of Gilbert Elevation: 814 Stream Order: 2/3

Road/bridge: US 52 Specific Location: Gilbert Creek at Devil Anse Trailhouse office in Gilbert

Northing: 37.61064 Easting: -81.87806 (NAD83, Zone 17)

Stream Width: 12 m Stream Depth: 12 Total # Seine Hauls: 16

Investigators/Firm: WLU / Mountain State

Collectors: Loughman et al.

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
12.4	962	—	.6	8.38	—	—

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	1	—	1	—	—	2
2.) *Cambarus theepiensis*	—	—	1	—	—	1
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1								
C. theepiensis	1 Juv	+15								
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL

FLOW DIRECTION

Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

AS

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 63.5

Stream & Location: Gilbert Creek - 171002-5 **RM:** ___.__ **Date:** 2/09/2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** _____ **Lat./Long.:** (NAD 83 - decimal °) 39.6100 / 81.8780 ☐ Office verified location

1] SUBSTRATE
Check *ONLY* **Two** substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___
☑ ☐ BOULDER [9]	___	1	☐ ☐ DETRITUS [3]	___	___
☐ ☑ COBBLE [8]	___	1	☐ ☐ MUCK [2]	___	___
☐ ☐ GRAVEL [7]	___	1	☐ ☐ SILT [2]	___	1
☐ ☐ SAND [6]	___	1	☐ ☐ ARTIFICIAL [0]	___	1
☐ ☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☑ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☑ MODERATE [-1]
- ☐ NORMAL [0] -0.5
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☑ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Comments

Substrate 17.5 *Maximum 20*

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

- 0 UNDERCUT BANKS [1]
- 1 OVERHANGING VEGETATION [1]
- 1 SHALLOWS (IN SLOW WATER) [1]
- 0 ROOTMATS [1]
- 0 POOLS > 70cm [2]
- 1 ROOTWADS [1]
- 1 BOULDERS [1]
- 0 OXBOWS, BACKWATERS [1]
- 0 AQUATIC MACROPHYTES [1]
- 1 LOGS OR WOODY DEBRIS [1]

AMOUNT
Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☑ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20 12

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

SINUOSITY
- ☐ HIGH [4]
- ☑ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☑ GOOD [5]
- ☐ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☑ RECOVERED [4]
- ☐ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☑ MODERATE [2]
- ☐ LOW [1]

Comments

Channel Maximum 20 14

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

River right looking downstream

EROSION (L / R)
- ☐ ☑ NONE / LITTLE [3]
- ☑ ☐ MODERATE [2] >2.5
- ☐ ☐ HEAVY / SEVERE [1]

RIPARIAN WIDTH (L / R)
- ☐ ☐ WIDE > 50m [4]
- ☐ ☑ MODERATE 10-50m [3]
- ☐ ☐ NARROW 5-10m [2]
- ☐ ☐ VERY NARROW < 5m [1]
- ☑ ☐ NONE [0] 1.5

FLOOD PLAIN QUALITY (L / R)
- ☐ ☐ FOREST, SWAMP [3]
- ☐ ☐ SHRUB OR OLD FIELD [2]
- ☑ ☑ RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ FENCED PASTURE [1]
- ☐ ☐ OPEN PASTURE, ROWCROP [0]
- ☐ ☐ CONSERVATION TILLAGE [1]
- ☐ ☐ URBAN OR INDUSTRIAL [0]
- ☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10 5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check **ONE** (*ONLY!*)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☑ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (*Or 2 & average*)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☑ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ SLOW [1]
- ☐ VERY FAST [1]
- ☐ INTERSTITIAL [-1]
- ☑ FAST [1]
- ☐ INTERMITTENT [-2]
- ☑ MODERATE [1]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12 4

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☑ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☑ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☑ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☑ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8 4

6] GRADIENT
(ft/mi) ☐ VERY LOW - LOW [2-4] ☑ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: 20 %GLIDE: — %RUN: 40 %RIFFLE: 40

Gradient Maximum 10 7

A] SAMPLED REACH

Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

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

_____ meters

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

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

1st pass _____ cm

2nd _____ cm

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

Though in town, excellent size for boulders & riffles. Classic Cambria habitat. Sediment and algae systemic - Interstitial spaces obliterated. Gradient lower than previous sites. Sampled in 2015

Cobbles are mixed part - Sampled 200m reach.

B] AESTHETICS

Circle some & *COMMENT*

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Indian Creek Data

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept. / 2017 Project Name: DOT - Indian Creek

Stream name: Indian Creek - Head H2O Collection #: 170930-1

Trib. of: Guyandotte River Basin: Guyandotte Co: Wyoming

~~Trib~~ Town: Fort Branch Geographic marker: Fort Branch Rd crossing

0 miles (~~N S E W~~) of ~~Fort Br. Rd. Cross.~~ Elevation: 1654 Stream Order: 2

Road/bridge: Fort Branch Rd. Specific Location: Indian Creek of Fort Branch at Fort Branch Rd crossing, 3.67 mi N of Carswell, WV

Northing: 37.49042 Easting: -81.52083 (NAD83, Zone 17)

Stream Width: 2-5m Stream Depth: .2-.3 m Total # Seine Hauls: 16

Investigators/Firm: WLU/Mountain State

Collectors: Z. Laughman, T. Khan, E. Delekta, C. Vopal, A. Symes

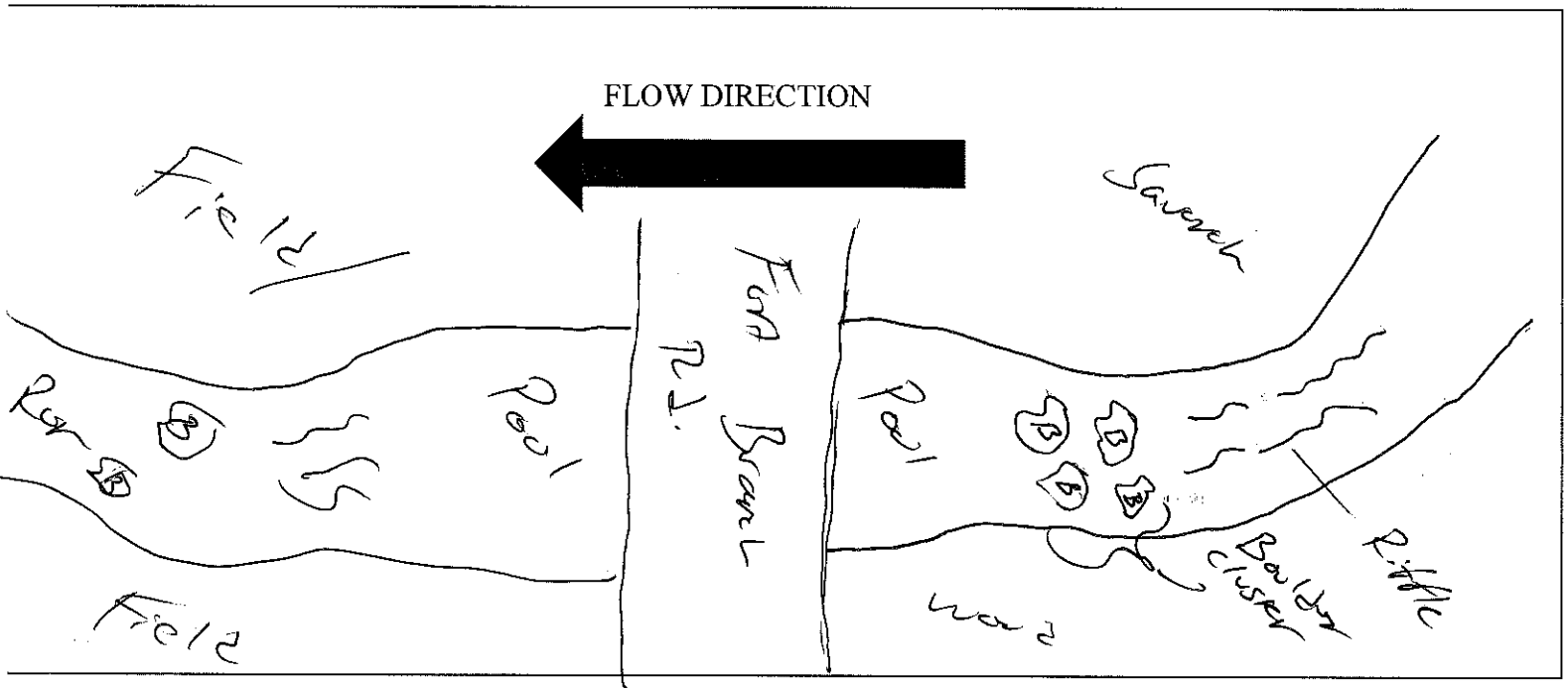
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
10.6	548	-	0.4	8.43	-	-

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Cambarus theepiensis*	1	29	43	-	18	91
2.)						
3.)						
4.)						
5.) *Cambarus dubius burrows*						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
[illegible]	4	6	6	14	13	8	7	1	4	4
C. theepiensis	5	4	8	5	3	3				
C. hatfieldi	all C. theep									
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

OhioEPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: [72]

Stream & Location: 170930-1 = Indian Creek Head Hdo **RM:** ___ **Date:** 30 9 2017

Scorers Full Name & Affiliation: ______

River Code: __-___-__ **STORET #:** ______ **Lat./Long.:** (NAD 83 - decimal °) 37.49042 / 81.52083 Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]			☐☐ HARDPAN [4]		
■☐ BOULDER [9]		/	☐☐ DETRITUS [3]		/
☐■ COBBLE [8]		/	☐☐ MUCK [2]		/
☐☐ GRAVEL [7]		/	☐☐ SILT [2]		/
☐☐ SAND [6]		/	☐☐ ARTIFICIAL [0]		/
☐☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ■ MODERATE [-1]
- ■ NORMAL [0] -0.5
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ■ MODERATE [-1]
- ■ NORMAL [0] -0.5
- ☐ NONE [1]

Substrate [18] Maximum 20

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

0 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
2 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
0 ROOTMATS [1]		

AMOUNT
Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ■ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover [15] Maximum 20

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	■ GOOD [5]	■ RECOVERED [4] → 3.5	■ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	■ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel [13.5] Maximum 20

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

River right looking downstream

L R EROSION	L R RIPARIAN WIDTH	L R FLOOD PLAIN QUALITY	L R
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
■■ MODERATE [2]	■■ MODERATE 10-50m [3]	■■ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☐☐ NARROW 5-10m [2]	☐☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian [7] Maximum 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)	CHANNEL WIDTH Check ONE (Or 2 & average)	CURRENT VELOCITY Check ALL that apply	
☐ > 1m [6]	■ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	■ SLOW [1]
☐ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	■ FAST [1]	☐ INTERMITTENT [-2]
■ 0.2-<0.4m [1]		■ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]			

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current [6] Maximum 12

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	■ MAXIMUM > 50cm [2]	■ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2] 0.5
■ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	■ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run [5.5] Maximum 8

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

- ☐ VERY LOW - LOW [2-4]
- ■ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 5 %GLIDE: — %RUN: 60 %RIFFLE: 35

Gradient [7] Maximum 10

EPA 4520 06/16/06

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass- 2nd
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE
- ☒ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

______ meters

CLARITY

1st --sample pass-- 2nd
- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

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

pass 1st ________ cm

2nd ________ cm

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

Headwater stream morphology. Possibly Fort Branch. Stream composed of cobble/small boulder substrates over sand bottomed bed. Gradient moderate. Sedimentation present in slack H2O environments. Classic head H2O stream for region. Not Cambarus veteranus habitat. Sampled 100 m up + downstream of coordinate

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

C] RECREATION
AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

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

Circle some & *COMMENT*

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

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

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept / 2017 Project Name: DOT - Indian Creek

Stream name: Indian Creek Collection #: 170930-2

Trib. of: Guyandotte River Basin: Guyandotte Co: Wyoming

Town: Kimball Geographic marker: Electrical Station

5.1 miles (N (S) E W) of Kimball Elevation: 1572' Stream Order: 2

(Road) bridge: Fox Branch Rd. Specific Location: Indian Creek 0.4 miles from Fort Branch Rd / Rt 16 Int's., 5.1 mi S of Kimball

Northing: 37.49717 Easting: -81.53249 (NAD83, Zone 17)

Stream Width: 5-9m Stream Depth: .2-.3 Total # Seine Hauls: 16

Investigators/Firm: WLU/Mountain State

Collectors: See previous

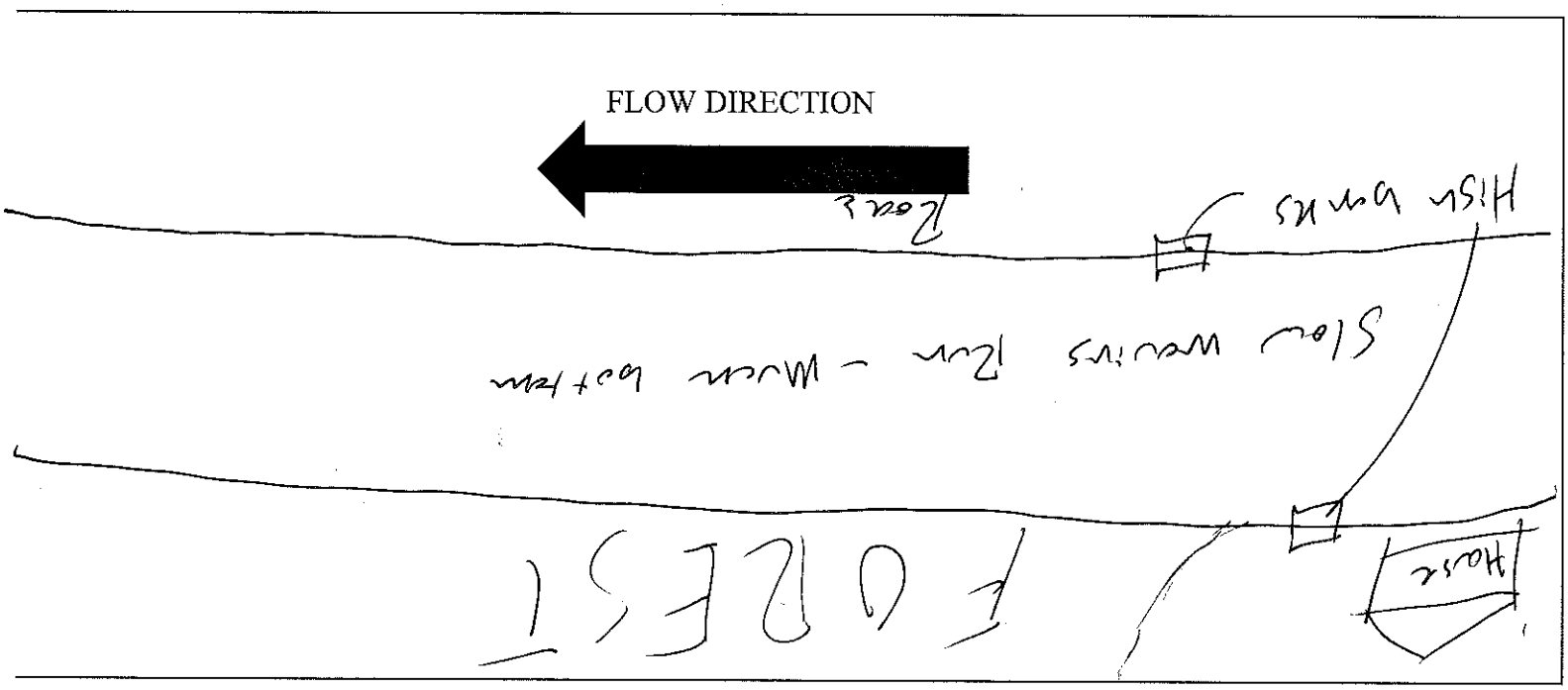
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
12.6	573	-	0.4	8.32	-	-

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Faxonius cristavarius	2	1	4	-	-	7
2.)						
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1	1	3	1	+12				
C. theepiensis										
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

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

QHEI Score: 41.5

Stream & Location: Indian Creek = 170930 - 2 **RM:** ___.___ **Date:** 9/19/2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** ____ **Lat./Long.:** 37.49717 / 81.53249 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]	___	___	☐☐ HARDPAN [4]	___	1
☐☐ BOULDER [9]	___	___	☐☐ DETRITUS [3]	___	1
☒☐ COBBLE [8]	___	1	☐☐ MUCK [2]	___	1
☐☒ GRAVEL [7]	___	1	☐☐ SILT [2]	___	1
☐☐ SAND [6]	___	1	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☒ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☒ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY -1.5

SILT
- ☒ HEAVY [-2]
- ☒ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☒ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Comments

Substrate 12.5 *Maximum 20*

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

0 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	1 OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
1 SHALLOWS (IN SLOW WATER) [1]	0 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
1 ROOTMATS [1]			

AMOUNT
Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ☒ MODERATE 25-75% [7] → 5
- ☒ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover 10 *Maximum 20*

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

SINUOSITY
- ☐ HIGH [4]
- ☐ MODERATE [3]
- ☐ LOW [2]
- ☒ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☐ GOOD [5]
- ☒ FAIR [3] → 2
- ☒ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ☐ RECOVERING [3]
- ☒ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☐ MODERATE [2]
- ☒ LOW [1]

Comments

Channel 5 *Maximum 20*

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

EROSION (L / R)
- ☐ ☐ NONE / LITTLE [3]
- ☒ ☒ MODERATE [2]
- ☐ ☐ HEAVY / SEVERE [1]

RIPARIAN WIDTH (L / R)
- ☐ ☐ WIDE > 50m [4]
- ☐ ☐ MODERATE 10-50m [3]
- ☐ ☐ NARROW 5-10m [2]
- ☒ ☒ VERY NARROW < 5m [1]
- ☐ ☐ NONE [0]

FLOOD PLAIN QUALITY (L / R) → 2
- ☒ ☐ FOREST, SWAMP [3]
- ☐ ☐ SHRUB OR OLD FIELD [2]
- ☐ ☒ RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ FENCED PASTURE [1]
- ☐ ☐ OPEN PASTURE, ROWCROP [0]

(L / R)
- ☐ ☐ CONSERVATION TILLAGE [1]
- ☐ ☐ URBAN OR INDUSTRIAL [0]
- ☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian 5 *Maximum 10*

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check **ONE** (*ONLY!*)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☒ < 0.2m [0]

CHANNEL WIDTH
Check ONE (*Or 2 & average*)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☒ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☒ MODERATE [1]
- ☒ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 3 *Maximum 12*

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☒ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ☒ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☒ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☒ LOW [1]
- ☒ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run 1 *Maximum 8*

6] GRADIENT
DRAINAGE AREA (ft/mi) (mi²)
- ☒ VERY LOW - LOW [2-4] → 3
- ☒ MODERATE [6-10] → 7
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 20 %GLIDE: - %RUN: 80 %RIFFLE: -

Gradient 5 *Maximum 10*

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

pass: 1st _____ cm; 2nd _____ cm

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

Stream doubled in width. No real riffles or slabs present. Nutrient loading appears high. Previous mile of stream has some slab rock; still head H2O morphology. First site where stream gradient is lower, stream wider, & more indicative of C. veteranus habitat. Faxonius cristavarius dominant crayfish here.

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

Samples 200 m upstream of center pt.

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept. / 2017 Project Name: DOT - Indian Creek

Stream name: Indian creek - Fort Br/16 Int's Collection #: 170930-3

Trib. of: Guyandotte River Basin: Guyandotte Co: Wyoming

Town: Kimball Geographic marker: Fort Branch Rd/Rt 16 Int's

0 miles (~~N S E W~~) of Antioch Regular Baptist Church Elevation: 1586 Stream Order: 2/3

Road/bridge: Fort Branch Rd. Specific Location: Indian creek at Fort Branch Rd crossing .01 mi from Fort Branch Rd/Rt 16 Cross-5.34mi NW of Kimball, WV Northing: 37.49966 Easting: -81.53688 (NAD83, Zone 17)

Stream Width: 5-8 Stream Depth: .2 - .6m Total # Seine Hauls: 20

Investigators/Firm: WLU/Mountain State

Collectors: See previous - Loughman et al

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
12.9	588	-	0.4	8.47	-	-

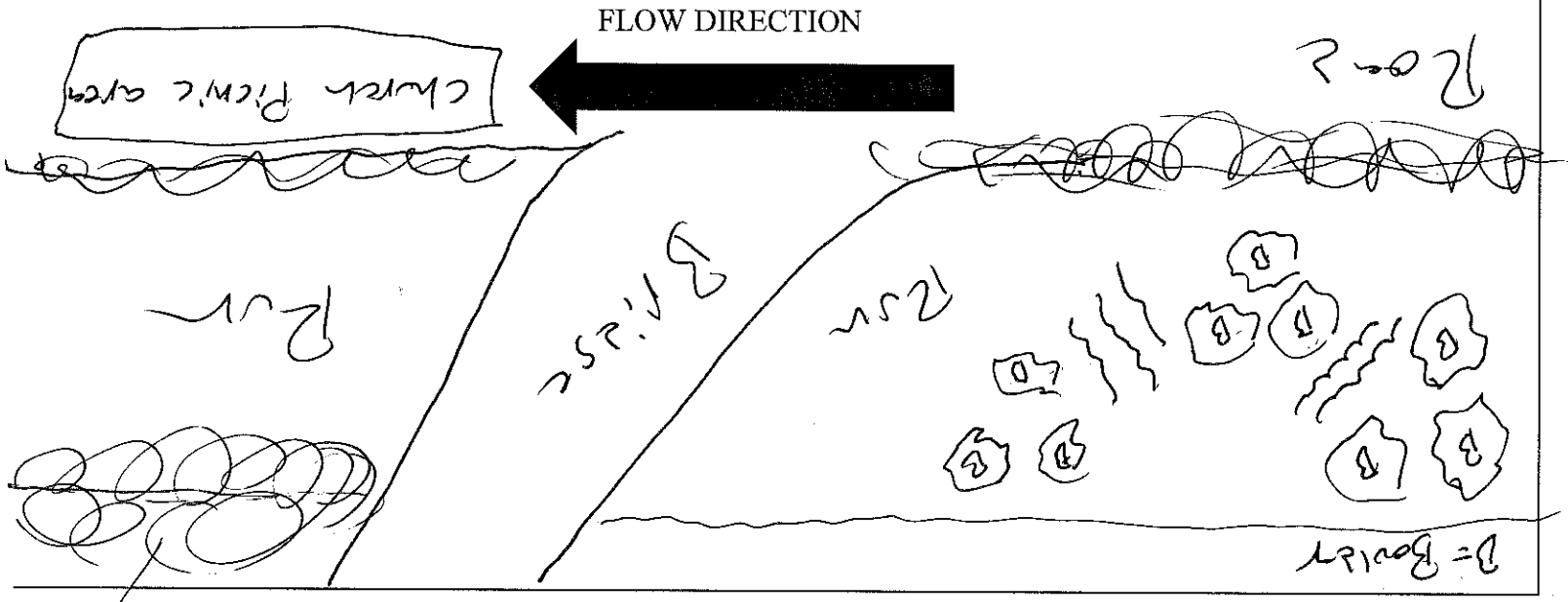
Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	4	4	9	-	1	18
2.) *Cambarus theepiensis*	1	6	5	-	1	13
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1	2	1	1	4	1	4	1	1
C. theepiensis	1	1	1	1	3	1	3	1	2	+11
C. hatfieldi										
C. callainus										
C. veteranus										

1+10

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 64.5

Stream & Location: 170930-3 – Indian Creek *RM:* ___.__ *Date:* 30/9/2017

Scorers Full Name & Affiliation: ____________

River Code: __-___-___ *STORET #:* ______ *Lat./Long.: (NAD 83 - decimal °)* 37.49960 / 81.53688 Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
■☐ BLDR /SLABS [10]		/	☐☐ HARDPAN [4]		
☐■ BOULDER [9]		/	☐☐ DETRITUS [3]		/
☐☐ COBBLE [8]		/	☐☐ MUCK [2]		
☐☐ GRAVEL [7]		/	☐☐ SILT [2]		/
☐☐ SAND [6]		/	☐☐ ARTIFICIAL [0]		/
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ■ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN: ☐ LIMESTONE [1] ☐ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ■ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY (-1.5):
SILT: ■ HEAVY [-2] ■ MODERATE [-1] ☒ NORMAL [0] ☐ FREE [1]
EMBEDDEDNESS: ☐ EXTENSIVE [-2] ■ MODERATE [-1] ☐ NORMAL [0] ☐ NONE [1]

Substrate: 16.5 (Maximum 20)

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

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
2 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
0 ROOTMATS [1]		

AMOUNT Check ONE (Or 2 & average): ☐ EXTENSIVE >75% [11] ■ MODERATE 25-75% [7] ☐ SPARSE 5-<25% [3] ☐ NEARLY ABSENT <5% [1]

Comments

Cover: 15 (Maximum 20)

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	■ GOOD [5] → 4	☒ RECOVERED [4]	■ MODERATE [2]
☐ LOW [2]	■ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	■ RECENT OR NO RECOVERY [1]	

Comments

Channel: 10 (Maximum 20)

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

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	(L R)
☐☐ NONE / LITTLE [3]	☒☐ WIDE > 50m [4]	■☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
■■ MODERATE [2]	■☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☐☐ NARROW 5-10m [2]	☐■ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐■ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian: 6 (Maximum 10)

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!): ☐ > 1m [6] ■ 0.7-<1m [4] ☐ 0.4-<0.7m [2] ☐ 0.2-<0.4m [1] ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average): ☐ POOL WIDTH > RIFFLE WIDTH [2] ■ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply: ☐ TORRENTIAL [-1] ☐ SLOW [1] ☐ VERY FAST [1] ☐ INTERSTITIAL [-1] ☐ FAST [1] ☐ INTERMITTENT [-2] ■ MODERATE [1] ☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current: 6 (Maximum 12)

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH: ☐ BEST AREAS > 10cm [2] ■ BEST AREAS 5-10cm [1] ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH: ■ MAXIMUM > 50cm [2] ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE: ☐ STABLE (e.g., Cobble, Boulder) [2] ■ MOD. STABLE (e.g., Large Gravel) [1] ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS: ☐ NONE [2] ☐ LOW [1] ■ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run: 4 (Maximum 8)

6] GRADIENT (ft/mi) DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4] ■ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: — %GLIDE: 5 %RUN: 80 %RIFFLE: 15

Gradient: 7 (Maximum 10)

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

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

Moderate moving Run with Sand Bottomed Benthos. Some Sand possibly Natural. Excessive sediment covered on Sand - possibly due to low flow conditions. Several boulder clusters present along & in Run. No high Velocity Riffles present in Reach. Samples 200 m upstream of bridge.

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

$\bar{x}$ width
$\bar{x}$ depth
max. depth
$\bar{x}$ bankfull width
bankfull $\bar{x}$ depth
W/D ratio
bankfull max. depth
floodprone x^2 width
entrench. ratio

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept / 2017 Project Name: DOT - Indian Creek

Stream name: Indian Creek - CR 16-14 Collection #: 170930-4

Trib. of: Guyandotte River Basin: Guyandotte Co: Wyoming

Town: Hemphill Geographic marker: CR 16-14 crossing

5.5 miles (N S E W) of Hemphill Elevation: 1581' Stream Order: 3

Road/bridge: CR 16-14 Specific Location: Indian Creek at CR 16-14 crossing, 5.5 mi S of Hemphill, WV

Northing: 37.50577 Easting: -81.54182 (NAD83, Zone 17)

Stream Width: 8-10m Stream Depth: .2 - .75m Total # Seine Hauls: 20

Investigators/Firm: WLU / Mountain State

Collectors: Loughman et al.

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
13.5°	.529	–	.3	8.51	–	–

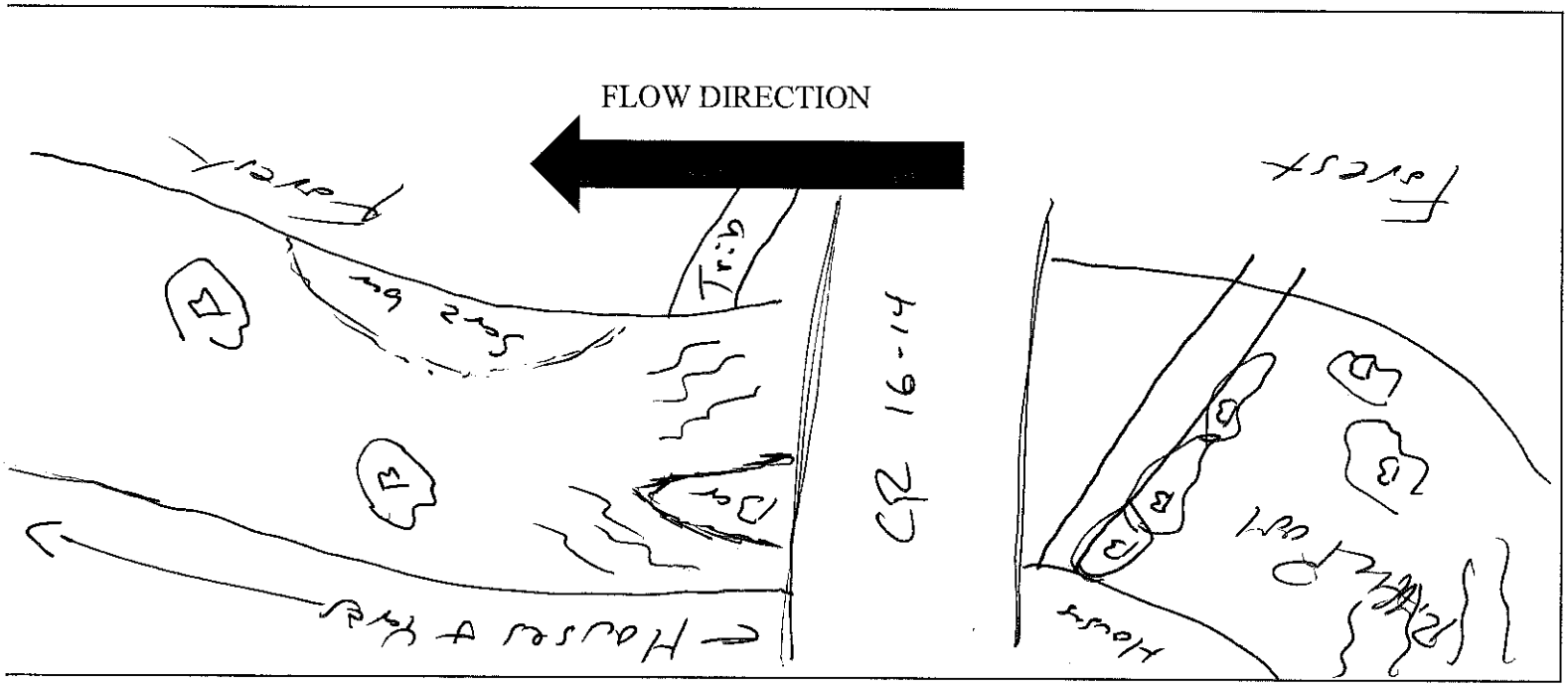
Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Faxonius cristavarius	5	6	8	–	0	19
2.) Cambarus theepiensis	0	9	5	–	0	14
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristavarius	1	2	1	1	1	1	1	1	1	1
C. theepiensis	1	2	1							
C. hatfieldi										
C. callainus	1	1	1	3	4	1	1	1	3	1
C. veteranus	2									

F. cristavarius

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

64.5

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 64.5

Stream & Location: Indian Creek - CR 16-14-170930-4 **RM:** ___ **Date:** 10/5/2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ **STORET #:** ___ **Lat./Long.:** 37.50577 / 81.54182 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
■ BLDR/SLABS [10]	1	1	☐ HARDPAN [4]		1
■ BOULDER [9]	1	1	☐ DETRITUS [3]	1	
☐ COBBLE [8]	1	1	☐ MUCK [2]	1	
☐ GRAVEL [7]		1	☐ SILT [2]		
☐ SAND [6]			☐ ARTIFICIAL [0]		1
☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ■ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ■ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ■ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 19 *Maximum 20*

Comments

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

0 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]	
1 SHALLOWS (IN SLOW WATER) [1]	2 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
1 ROOTMATS [1]			

AMOUNT
Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ■ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Cover Maximum 20 15

Comments

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

SINUOSITY
- ☐ HIGH [4]
- ■ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☐ GOOD [5]
- ■ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ■ RECOVERING [3]
- ■ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ■ MODERATE [2]
- ☐ LOW [1]

Channel Maximum 20 9

Comments

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

River right looking downstream

EROSION

L	R	
☐	☐	NONE / LITTLE [3]
■	■	MODERATE [2]
☐	☐	HEAVY / SEVERE [1]

RIPARIAN WIDTH

L	R	
☐	☐	WIDE > 50m [4]
☐	☐	MODERATE 10-50m [3]
☐	☐	NARROW 5-10m [2]
☐	■	VERY NARROW < 5m [1]
■	☐	NONE [0] ——0.5

FLOOD PLAIN QUALITY

L	R	
☐	☐	FOREST, SWAMP [3]
☐	☐	SHRUB OR OLD FIELD [2]
■	■	RESIDENTIAL, PARK, NEW FIELD [1]
☐	☐	FENCED PASTURE [1]
☐	☐	OPEN PASTURE, ROWCROP [0]
☐	☐	CONSERVATION TILLAGE [1]
☐	☐	URBAN OR INDUSTRIAL [0]
☐	☐	MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Riparian Maximum 10 3.5

Comments

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check ONE (*ONLY!*)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ■ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (*Or 2 & average*)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ■ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ■ FAST [1]
- ■ MODERATE [1]
- ■ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ■ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Pool / Current Maximum 12 6

Comments

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ■ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ■ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
Check ONE (*Or 2 & average*).
- ■ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ■ MODERATE [0]
- ☐ EXTENSIVE [-1]

Riffle / Run Maximum 8 5

Comments

6] GRADIENT
DRAINAGE AREA (ft/mi) (mi²)

- ☐ VERY LOW - LOW [2-4]
- ■ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 5 %GLIDE: 5 %RUN: 70 %RIFFLE: 20

Gradient Maximum 10 7

06/16/06

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

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

_____ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

pass 1st _________ cm
2nd _________ cm

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

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

Stream consists of several moderate gradient runs followed by step pools. Riffles with slabs & cobble substrates present as well. Stream courses through residential "neighborhood" & terminates in succession habitats. Siltation & embed issues present. Sampled upstream & downstream of Corzinek zoom. All boulder clusters in riffles sampled.

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

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft2 ☐ >3ft

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

Circle some & *COMMENT*

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept / 2017 Project Name: DOT - Indian Creek

Stream name: Indian Creek - Rt 16 Collection #: 170930-5

Trib. of: Guyandotte River Basin: Guyandotte Co: Wyoming

Town: Hemphill Geographic marker: Pull off adjacent to Rt 16

4.9 miles (N (S) E (W)) of Hemphill Rd Elevation: 1531 Stream Order: 3

Road/bridge: Rt 16 Specific Location: Indian Creek adjacent to Rt 16, 4.9 mi SW of Hemphill

Northing: 37.50181 Easting: -81.54971 (NAD83, Zone 17)

Stream Width: 9-11m Stream Depth: .2-.4 Total # Seine Hauls: 20

Investigators/Firm: WLU / Martin State

Collectors: Laughman et al.

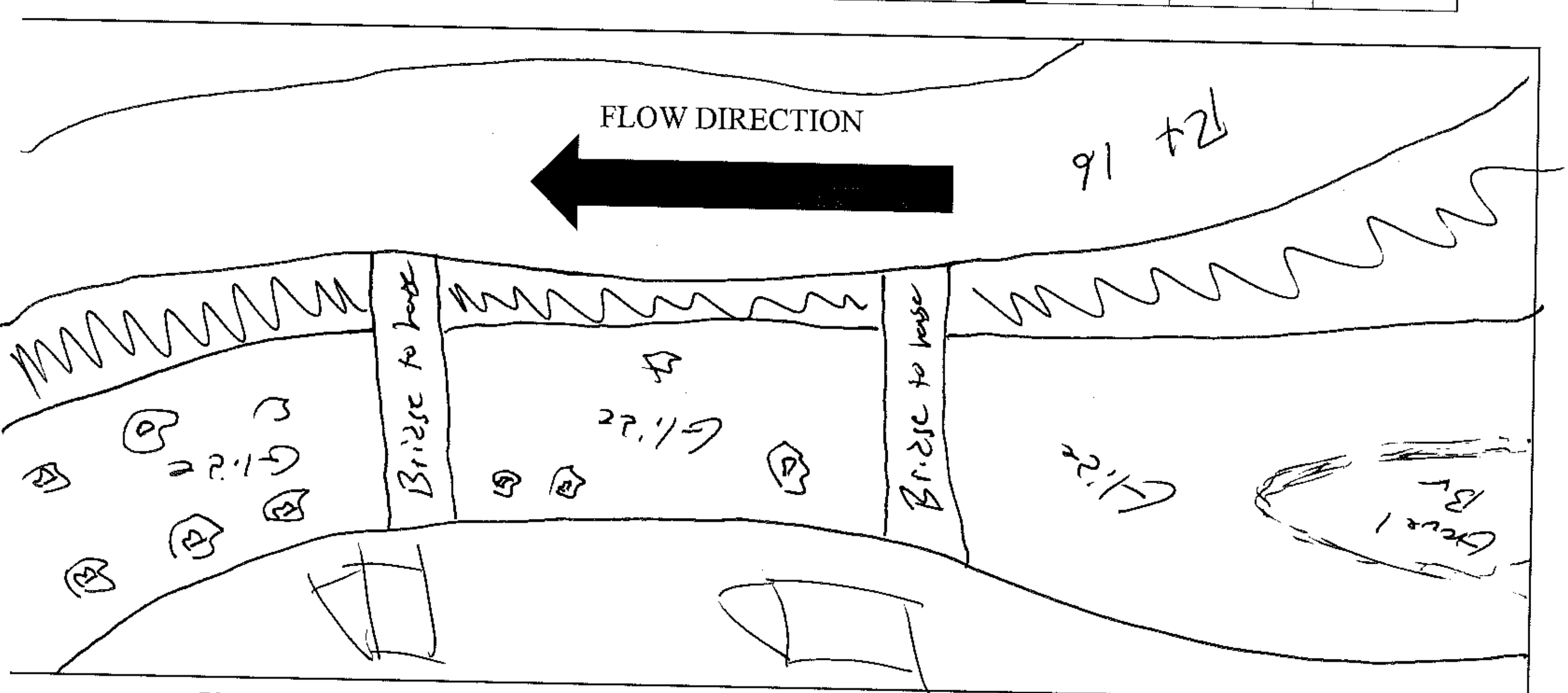
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
13.8	.618	–	.4	8.55	–	–

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) Faxonius cristivarius	–	4	9	–	1	14
2.) Cambarus theepiensis	–	3	4	–	–	7
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	2	1	1	1	3	2	4	+13		
C. theepiensis	1	1	1	1	1	1	1	+13		
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

60

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 69

Stream & Location: 170930-5 Indian Creek RM: ___.__ Date: 30 Sep 2017

Scorers Full Name & Affiliation: _____

River Code: ___-___-___ STORET #: _____ Lat./Long.: 37.50181 81.54971 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE

Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	1	☐ ☐ HARDPAN [4]	___	1
■ ☐ BOULDER [9]	___	1	☐ ☐ DETRITUS [3]	___	1
☐ ☐ COBBLE [8]	___	1	☐ ☐ MUCK [2]	___	1
☐ ☐ GRAVEL [7]	___	___	☐ ☐ SILT [2]	___	1
☐ ☐ SAND [6]	___	___	☐ ☐ ARTIFICIAL [0]	___	1
☐ ■ BEDROCK [5]	___	1	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN		QUALITY	
☐ LIMESTONE [1]	SILT	☐ HEAVY [-2]	Substrate
☐ TILLS [1]		■ MODERATE [-1]	14
☐ WETLANDS [0]		☐ NORMAL [0]	
☐ HARDPAN [0]		☐ FREE [1]	Maximum 20
■ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]		■ MODERATE [-1]	
☐ LACUSTURINE [0]		☐ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Comments

2] INSTREAM COVER

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

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (*Or 2 & average*))
2 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	1 AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	■ MODERATE 25-75% [7]
0 ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 14

3] CHANNEL MORPHOLOGY

Check ONE in each category (*Or 2 & average*)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	■ MODERATE [2]
☐ LOW [2]	■ FAIR [3]	■ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11

4] BANK EROSION AND RIPARIAN ZONE

Check ONE in each category for *EACH BANK* (*Or 2 per bank & average*)

River right looking downstream

EROSION (L / R)	RIPARIAN WIDTH (L / R)	FLOOD PLAIN QUALITY (L / R)	
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	■ ☐ FOREST, SWAMP [3] — 7	☐ ☐ CONSERVATION TILLAGE [1]
☐ ☐ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
■ ■ HEAVY / SEVERE [1]	■ ☐ NARROW 5-10m [2]	☐ ■ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	☐ ■ NONE [0] — 1	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 8 4

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (*ONLY!*))

- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ■ < 0.2m [0]

CHANNEL WIDTH (Check ONE (*Or 2 & average*))

- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ■ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)

☐ TORRENTIAL [-1]	■ SLOW [1]
☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
■ FAST [1]	☐ INTERMITTENT [-2]
■ MODERATE [1]	■ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	■ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
■ BEST AREAS 5-10cm [1]	■ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	■ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5

6] GRADIENT

DRAINAGE AREA (ft/mi) (mi²)

- ☐ VERY LOW - LOW [2-4]
- ■ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: – %GLIDE: 75

%RUN: 15 %RIFFLE: 10

Gradient Maximum 10: 7

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st-sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

pass: 1st _____ cm; 2nd _____ cm

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

Reach consists of large bedrock slide with intermittent boulder clusters. Stream Some wetland between residences & road. Very high gradient during higher flows. Impacts include sediment, bank erosion & Channelization Sampled upstream of coordinate 150 m downstream 250 m.

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept / 2017 Project Name: DOT - Indian Creek

Stream name: Indian Creek - Seneca minacle Collection #: 170930-6

Trib. of: Guyandotte River Basin: Guyandotte Co: 170930-6

Town: Wolf Pen Geographic marker: Seneca Coal Sign along Rt 16

3.08 miles (N (S) (E) W) of Wolf Pen Elevation: 1456' Stream Order: 3

(Road)/bridge: SR 16 Specific Location: Indian Creek adjacent to SR 16 at Seneca Mining Pinacle LLC Sign, 3.08 mi SE Wolf Pen, WV Northing: 37.50381 Easting: -81.55634 (NAD83, Zone 17)

Stream Width: 10-13m Stream Depth: .2-.6 Total # Seine Hauls: 20

Investigators/Firm: WLU / Maintain State

Collectors: Loughman et al.

Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
15.1	517	-	0.3	8.56	-	-

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	12	10	16	-	1	39
2.) *Cambarus theepiensis*	-	2	3	-	-	5
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	4	2	1	1	8	1	1	1	2	2
C. theepiensis	1	3	3	6	1	2	+ 4			
C. hatfieldi	↘ 1 THAP	# 2	1	1 +	16					
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL

FLOW DIRECTION

Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

82

Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: [82]

Stream & Location: Indian Creek - 170930-6 **RM:** ___.__ **Date:** 30 Sept 2017

Scorers Full Name & Affiliation: ______________________

River Code: __-___-__ **STORET #:** ______ **Lat./Long.:** (NAD 83 - decimal °) 37.50381 / 81.55634 Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
■☐ BLDR/SLABS [10]	/	/	☐☐ HARDPAN [4]		
☐■ BOULDER [9]	/	/	☐☐ DETRITUS [3]		/
☐☐ COBBLE [8]	/	/	☐☐ MUCK [2]		/
☐☐ GRAVEL [7]		/	☐☐ SILT [2]		
☐☐ SAND [6]	/	/	☐☐ ARTIFICIAL [0]		/
☐☐ BEDROCK [5]		/	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN: ☐ LIMESTONE [1] ☐ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ■ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY:
SILT: ☐ HEAVY [-2] ■ MODERATE [-1] ■ NORMAL [0] ☐ FREE [1] → -0.5
EMBEDDEDNESS: ☐ EXTENSIVE [-2] ■ MODERATE [-1] ■ NORMAL [0] ☐ NONE [1] → -0.5

Substrate Maximum 20: **20**

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

1	UNDERCUT BANKS [1]	1	POOLS > 70cm [2]	0	OXBOWS, BACKWATERS [1]
2	OVERHANGING VEGETATION [1]	1	ROOTWADS [1]	0	AQUATIC MACROPHYTES [1]
2	SHALLOWS (IN SLOW WATER) [1]	2	BOULDERS [1]	1	LOGS OR WOODY DEBRIS [1]
1	ROOTMATS [1]				

AMOUNT Check ONE (Or 2 & average): ■ EXTENSIVE >75% [11] ■ MODERATE 25-75% [7] → 9 ☐ SPARSE 5-<25% [3] ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: **20**

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	■ EXCELLENT [7]	☐ NONE [6]	■ HIGH [3]
■ MODERATE [3]	■ GOOD [5] → 6	■ RECOVERED [4] → 3.5	■ MODERATE [2] → 2.5
☐ LOW [2]	☐ FAIR [3]	■ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: **15**

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

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐■ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	■☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
■☐ MODERATE [2] → 2.5	■☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2] → 2	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☐■ NARROW 5-10m [2] → 2.5	☐■ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: **7**

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!): ☐ > 1m [6] ■ 0.7-<1m [4] ☐ 0.4-<0.7m [2] ☐ 0.2-<0.4m [1] ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average): ☐ POOL WIDTH > RIFFLE WIDTH [2] ■ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply: ☐ TORRENTIAL [-1] ☐ VERY FAST [1] ■ FAST [1] ■ MODERATE [1] ■ SLOW [1] ☐ INTERSTITIAL [-1] ☐ INTERMITTENT [-2] ■ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential: Primary Contact / Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: **9**

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	■ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
■ BEST AREAS 5-10cm [1]	■ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: **4**

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4] ■ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: 10 %GLIDE: — %RUN: 40 %RIFFLE: 50

Gradient Maximum 10: **7**

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

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

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept / 2017 Project Name: DOH - Indian Creek

Stream name: Indian Creek - Pull off DS of Vehicle Maintenance Garage Collection #: 170930-7

Trib. of: Guyandotte River Basin: Guyandotte Co: Wyoming

Town: Hemphill Geographic marker: Pull off / Quad crossing

4.7 miles (N (S) E W) of Hemphill Elevation: 1455 Stream Order: 3

(Road)/bridge: SR. 16 Specific Location: Indian Creek adjacent to SR 16, 4.7 mi South of Hemphill, WV

Northing: 37.50557 Easting: -81.56852 (NAD83, Zone 17)

Stream Width: 9-12 Stream Depth: .2 - .5 Total # Seine Hauls: 20

Investigators/Firm: WLU / Mountain State

Collectors: Lerchmen et al.

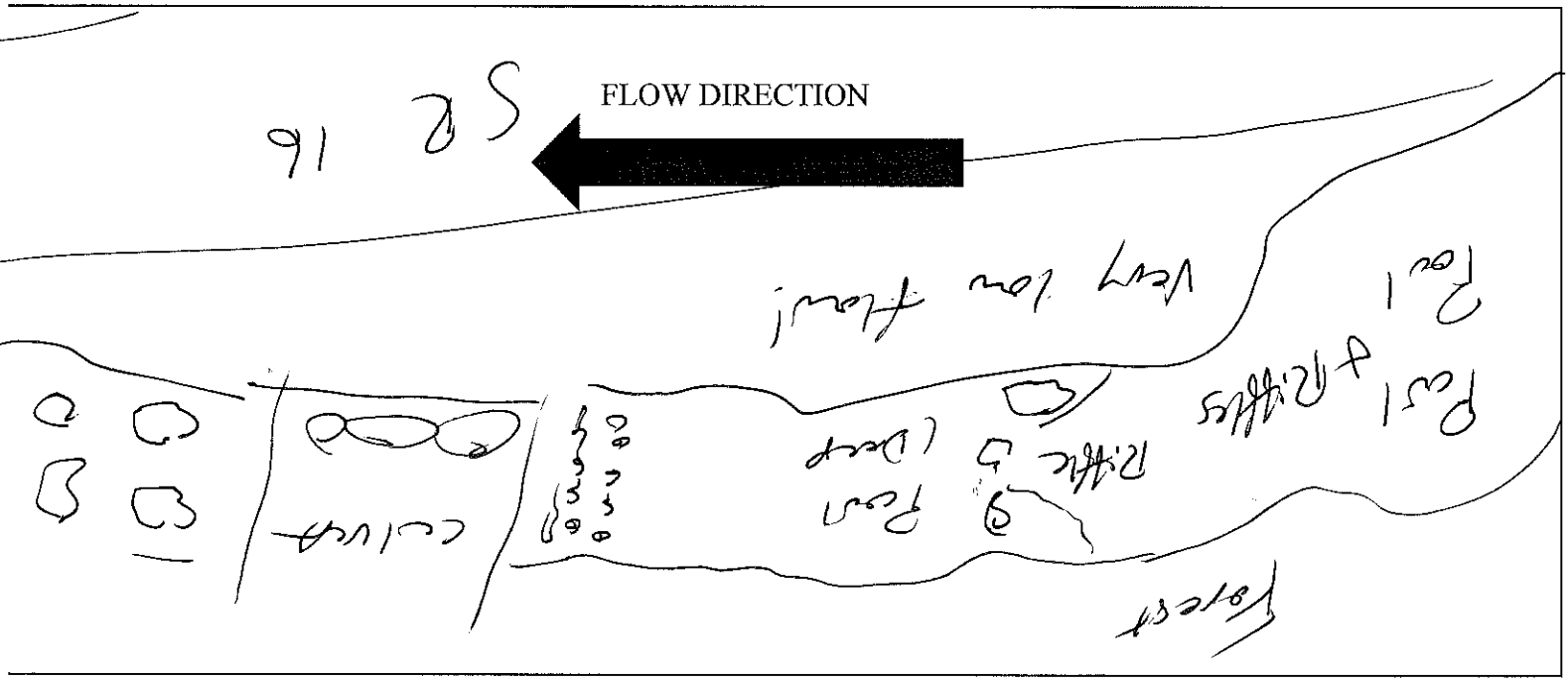
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
14.8	.3039	—	0.2	8.20	—	—

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	6	5	8	—	1	20
2.) *Cambarus theepiensis*	—	2	—	—	—	20
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristavarius	5	2	1	2	2	1	2	2	2	(+10
C. theepiensis										
C. hatfieldi	1	1	1	+17						
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

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

QHEI Score: 68.5

Stream & Location: Indian Creek - SR16 - 170930-7 *RM:* ___ *Date:* 3/5/21 2017

Scorers Full Name & Affiliation: ______

River Code: __-___-___ *STORET #:* ______ *Lat./Long.:* (NAD 83 - decimal °) 37.50557 / 81.56852 *Office verified location* ☐

1] SUBSTRATE
Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]		/	☐ ☐ HARDPAN [4]		
■ ☐ BOULDER [9]	/	/	☐ ☐ DETRITUS [3]		
☐ ■ COBBLE [8]	/	/	☐ ☐ MUCK [2]		
☐ ☐ GRAVEL [7]	/	/	☐ ☐ SILT [2]		/
☐ ☐ SAND [6]	/	/	☐ ☐ ARTIFICIAL [0]		/
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ■ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (*Or 2 & average*)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ■ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ■ HEAVY [-2]
- ☐ MODERATE [-1]
- ☒ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ■ EXTENSIVE [-2]
- ■ MODERATE [-1] (-1.5)
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 15.5 *Maximum 20*

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

- 0 UNDERCUT BANKS [1]
- 1 OVERHANGING VEGETATION [1]
- 1 SHALLOWS (IN SLOW WATER) [1]
- 0 ROOTMATS [1]
- 2 POOLS > 70cm [2]
- 1 ROOTWADS [1]
- 1 BOULDERS [1]
- 0 OXBOWS, BACKWATERS [1]
- 0 AQUATIC MACROPHYTES [1]
- 1 LOGS OR WOODY DEBRIS [1]

AMOUNT Check ONE (*Or 2 & average*)
- ☐ EXTENSIVE >75% [11]
- ■ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover 16 *Maximum 20*

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	■ GOOD [5]	■ RECOVERED [4]	■ MODERATE [2]
■ LOW [2] → 2.5	■ FAIR [3] → 4	■ RECOVERING [3] → 3.5	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel 12 *Maximum 20*

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

River right looking downstream

EROSION (L R)
- ☐ ☐ NONE / LITTLE [3]
- ■ ■ MODERATE [2]
- ☐ ☐ HEAVY / SEVERE [1]

RIPARIAN WIDTH (L R)
- ☐ ☐ WIDE > 50m [4]
- ☐ ■ MODERATE 10-50m [3]
- ■ ☐ NARROW 5-10m [2] → 2.5
- ☐ ☐ VERY NARROW < 5m [1]
- ☐ ☐ NONE [0]

FLOOD PLAIN QUALITY (L R)
- ■ ☐ FOREST, SWAMP [3] → 2.5
- ☐ ■ SHRUB OR OLD FIELD [2]
- ☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ FENCED PASTURE [1]
- ☐ ☐ OPEN PASTURE, ROWCROP [0]
- ☐ ☐ CONSERVATION TILLAGE [1]
- ☐ ☐ URBAN OR INDUSTRIAL [0]
- ☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian 7 *Maximum 10*

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (*ONLY!*)
- ☐ > 1m [6]
- ■ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (*Or 2 & average*)
- ■ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ■ MODERATE [1]
- ■ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 6 *Maximum 12*

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ■ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ■ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ■ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ■ LOW [1]
- ☐ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run 5 *Maximum 8*

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

- ☐ VERY LOW - LOW [2-4]
- ■ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 10 %GLIDE: —
%RUN: 70 %RIFFLE: 20

Gradient 7 *Maximum 10*

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE (1st -sample pass- 2nd)
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

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

_______ meters

CLARITY (1st --sample pass-- 2nd)
- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

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

pass 1st_________ cm
2nd_________ cm

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

Aquifer may be fractured. Stream very low, in a few locations limited to a series of isolated step pools. Flow much reduced compared to previous sites. Stream between 170930-6 & this site H_2O levels markedly reduced. Man made culvert present - H_2O could be mostly past H_2O / Ground H_2O exchange. Habitat ~~very~~ high gradient.

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

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE
Circle some & *COMMENT*

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

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

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

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept / 2012 Project Name: Indian Creek - DOT

Stream name: Indian Creek - Bailey Br. Collection #: 170930-8

Trib. of: Guyandotte River Basin: Guyandotte Co: Wyoming

Town: Hemphill Geographic marker: Mine Vent / Abandoned Bridge

0 miles (~~N S E W~~) of Bailey Br. Con Elevation: 1342 Stream Order: 3

Road/bridge: SR 16 Specific Location: Indian Creek adjacent to SR-16 at Confluence of Bailey Branch + Indian Cr.

Northing: 37.51291 Easting: -81.57926 (NAD83, Zone 17)

Stream Width: 10-12 Stream Depth: .2 - 4 Total # Seine Hauls: 20

Investigators/Firm: WLU / Mountain State

Collectors: Loughman et al.

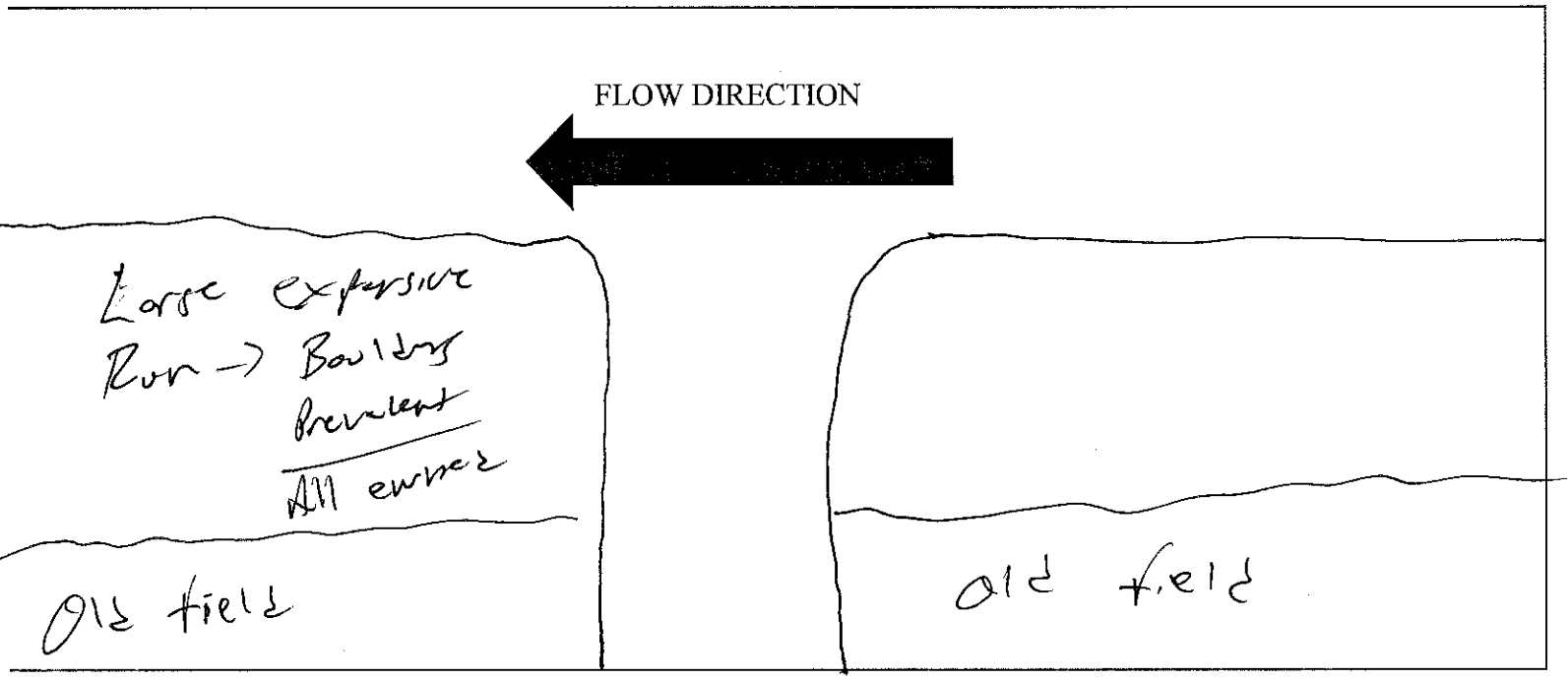
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
14.9	1350	-	0.7	8.54	-	-

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	1	0	3	-	-	4
2.) *Cambarus theepiensis*	3	1	2	-	-	6
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1	2							
C. theepiensis	1	1	1	1	1	1 Juv				
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

58

OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 58

Stream & Location: 170930 - 8 - Indian Creek / Bailey RM: ___.__ Date: 30 Sept 2017

Scorers Full Name & Affiliation:

River Code: ___-___-___ STORET #: _____ Lat./Long.: 37.51281 181.57926 (NAD 83 - decimal °) Office verified location ☐

1] SUBSTRATE

Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]		
☐■ BOULDER [9]		1	☐☐ DETRITUS [3]		
☐■ COBBLE [8]		1	☐☐ MUCK [2]		1
☐☐ GRAVEL [7]		1	☐☐ SILT [2]		1
☐☐ SAND [6]		1	☐☐ ARTIFICIAL [0]		1
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ■ 3 or less [0]

Check ONE (*Or 2 & average*)

ORIGIN	SILT / EMBEDDEDNESS	QUALITY
☐ LIMESTONE [1]		■ HEAVY [-2]
☐ TILLS [1]		☐ MODERATE [-1]
☐ WETLANDS [0]		☐ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
■ SANDSTONE [0]		■ EXTENSIVE [-2]
☐ RIP/RAP [0]		■ MODERATE [-1] -1.5
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
■ COAL FINES [-2]		

Comments

Substrate 11.5 *Maximum 20*

2] INSTREAM COVER

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

1 UNDERCUT BANKS [1]	0 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
0 ROOTMATS [1]		

AMOUNT Check ONE (*Or 2 & average*)

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

Comments

Cover *Maximum 20* 13

3] CHANNEL MORPHOLOGY

Check ONE in each category (*Or 2 & average*)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	■ GOOD [5]	■ RECOVERED [4] 3.5	■ MODERATE [2]
■ LOW [2] 2.5	☐ FAIR [3]	■ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel *Maximum 20* 13

4] BANK EROSION AND RIPARIAN ZONE

Check ONE in each category for *EACH BANK* (*Or 2 per bank & average*)

River right looking downstream

EROSION (L / R)	RIPARIAN WIDTH (L / R)	FLOOD PLAIN QUALITY (L / R)
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]
■■ MODERATE [2]	☐■ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]
☐☐ HEAVY / SEVERE [1]	■☐ NARROW 5-10m [2] 2.5	☐■ RESIDENTIAL, PARK, NEW FIELD [1]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0] 0.5

(L / R)
☐☐ CONSERVATION TILLAGE [1]
☐☐ URBAN OR INDUSTRIAL [0]
☐■ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian *Maximum 10* 5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (*ONLY!*)

☐ > 1m [6]
☐ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
■ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (*Or 2 & average*)

☐ POOL WIDTH > RIFFLE WIDTH [2]
■ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply

☐ TORRENTIAL [-1]	■ SLOW [1]
☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
■ FAST [1]	☐ INTERMITTENT [-2]
■ MODERATE [1]	☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current *Maximum 12* 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	■ MAXIMUM > 50cm [2]	■ STABLE (e.g., Cobble, Boulder) [2] 1.5	☐ NONE [2]
■ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	■ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			■ EXTENSIVE [-1]

Comments

Riffle / Run *Maximum 8* 3.5

6] GRADIENT (ft/mi)

DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4]
■ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: — %GLIDE: —
%RUN: 90 %RIFFLE: 10

Gradient *Maximum 10* 7

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass _____ cm

2nd _____ cm

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

Substrate black with coal fines. Mine exhaust for 300 m upstream from site. Substrate entirely encrusted in sediment & fines. Burrs present; majority of interstitial spaces eliminated. Riparian corridor at site consists of young secondary forest. Embed high & problematic for crayfish. Not suitable for C. veteranus

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

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

Legacy Tree:

Stream Drawing:

MS

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sep / 2017 Project Name: DOT- Indian Creek

Stream name: Indian Creek Collection #: 130930-9

Trib. of: Guyandotte River Basin: Guyandotte River Co: Wyoming

Town: Haynill Geographic marker: Low H2O bridge / Cabin

6.15 miles (N) S (E) W) of Welch Elevation: 1367 Stream Order: 3

Road/bridge: SR 16 Specific Location: Indian Creek adjacent to SR 16 at 1st low H2O bridge upstream of mine exhaust.

Northing: 37.50764 Easting: -81.57432 (NAD83, Zone 17)

Stream Width: 8-10m Stream Depth: .2-.5 Total # Seine Hauls: 20

Investigators/Firm: WLU / Mountain State

Collectors: Loughman et al.

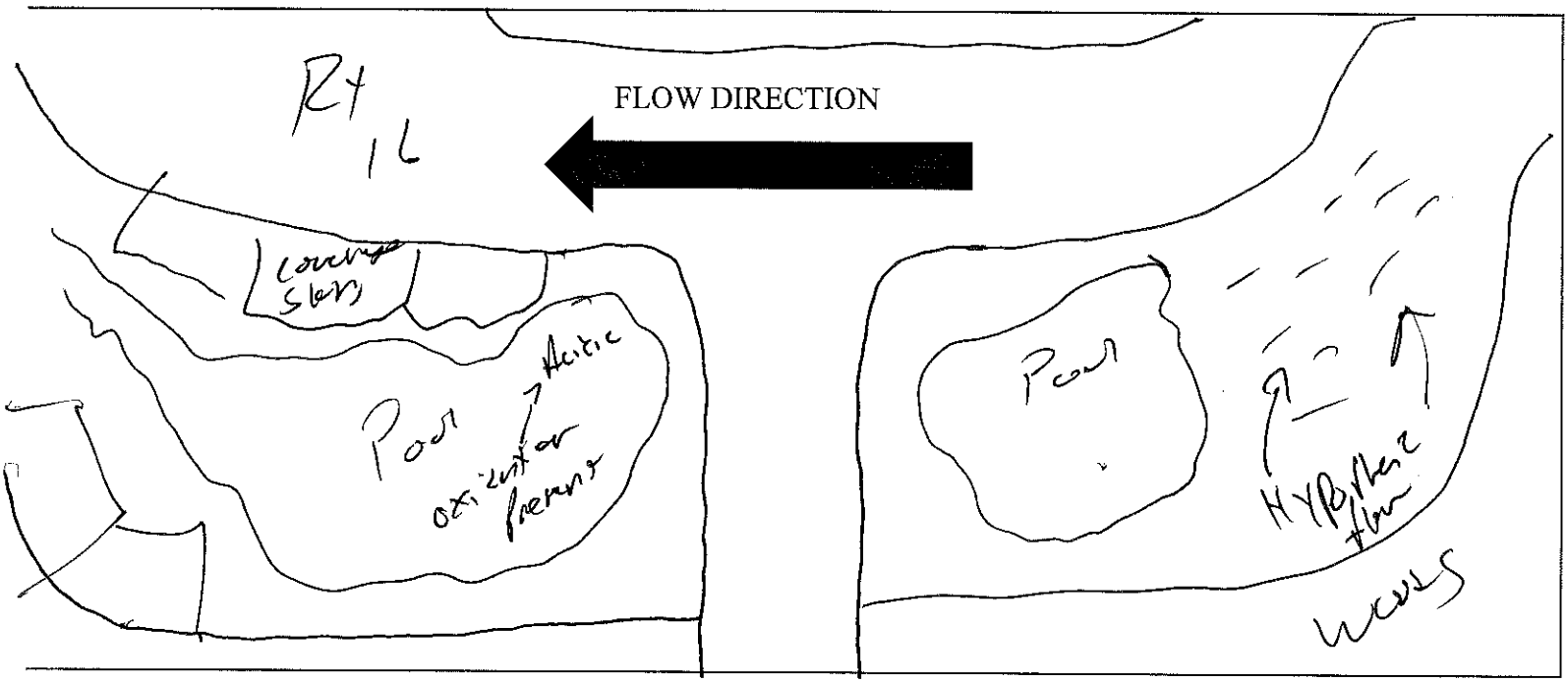
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
14	308	—	0.2	7.22	—	—

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	1	4	4	-	-	9
2.) *Cambarus theepiensis* ?	-	1	3	-	1	4
3.)						
4.) molting!						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristavarius	1	4	4	+17						
C. theepiensis	2	1	1	+16						
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach any additional comments.

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 52.5

Stream & Location: 170930 - 9 - Indian Creek - 10w 420 **RM:** ____ **Date:** 30 Sept 2017

Scorers Full Name & Affiliation:

River Code: ___ - ___ - ___ **STORET #:** ____ **Lat./ Long.:** (NAD 83 - decimal °) 37.507648 / 81.57432 Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	____	X	☐ ☐ HARDPAN [4]	____	____
☐ ☐ BOULDER [9]	____	1	☐ ☐ DETRITUS [3]	____	____
■ ☐ COBBLE [8]	____	1	☐ ☐ MUCK [2]	____	1
☐ ■ GRAVEL [7]	____	1	☐ ☐ SILT [2]	____	1
☐ ☐ SAND [6]	____	1	☐ ☐ ARTIFICIAL [0]	____	1
☐ ☐ BEDROCK [5]	____	____	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ■ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN
☐ LIMESTONE [1]
☐ TILLS [1]
☐ WETLANDS [0]
☐ HARDPAN [0]
■ SANDSTONE [0]
☐ RIP/RAP [0]
☐ LACUSTURINE [0]
☐ SHALE [-1]
☐ COAL FINES [-2]

QUALITY

SILT
■ HEAVY [-2]
☐ MODERATE [-1]
☐ NORMAL [0]
☐ FREE [1]

EMBEDDEDNESS
■ EXTENSIVE [-2]
■ MODERATE [-1]
☐ NORMAL [0]
☐ NONE [1]

Comments

Substrate: 11.5 (Maximum 20)

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

0 UNDERCUT BANKS [1]	1 POOLS > 70cm [2]	0 OXBOWS, BACKWATERS [1]
1 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	0 AQUATIC MACROPHYTES [1]
1 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]
~~X~~ 0 ROOTMATS [1]		

AMOUNT (Check ONE (Or 2 & average))
☐ EXTENSIVE >75% [11]
■ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 12

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
■ MODERATE [3]	☐ GOOD [5]	■ RECOVERED [4] 7 3.5	☐ MODERATE [2]
☐ LOW [2]	■ FAIR [3] 7 2	■ RECOVERING [3]	■ LOW [1]
☐ NONE [1]	■ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 9.5

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

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	(L R)
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
■ ■ MODERATE [2]	■ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☐ ■ NARROW 5-10m [2] 2.5	■ ■ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 4 5.5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))
☐ > 1m [6]
☐ 0.7-<1m [4]
■ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))
☐ POOL WIDTH > RIFFLE WIDTH [2]
■ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)
☐ TORRENTIAL [-1] ■ SLOW [1]
☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
☐ FAST [1] ☐ INTERMITTENT [-2]
■ MODERATE [1] ☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 5

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: (Check ONE (Or 2 & average)). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	■ MAXIMUM < 50cm [1]	■ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
■ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	■ MODERATE [0]
		Pools / DRY	☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 2

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4]
■ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 90 %GLIDE: — %RUN: — %RIFFLE: 10

Gradient Maximum 10: 7

A] SAMPLED REACH

Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

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

_____ meters

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

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

pass 1st _____ cm
pass 2nd _____ cm

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

1st Site upstream of mine exhaust. Stream is a series consisting of several isolated pools. Hyporheic flow still flowing - most are anoxic with oxidation occuring; "Rust" deposition common throughout. Sampled 200 m upstream of bridge. Very bad habitat for C. veterinus

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

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

E] ISSUES

WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

Cambarus callainus/Cambarus veteranus Survey Data Sheet

Date: 30 / Sept / 2017 Project Name: DOT - Indian Creek

Stream name: Indian Creek - Cement Collection #: 170930-10

Trib. of: Guyandotte Basin: Guyandotte Co: Wyoming

Town: Woosley Geographic marker: Cemented Rt Barn

0 miles (~~N S E W~~) of Cement Barn Elevation: 1478 Stream Order: 3

Road/bridge: SR 16 Specific Location: ~~SR~~ Indian Creek adjacent to SR 16 at Shentell Industries

Northing: 37.50233 Easting: -81.553314 (NAD83, Zone 17)

Stream Width: 9-10 Stream Depth: .2-.5 Total # Seine Hauls: ~~25~~ 21

Investigators/Firm: WLU / Mountain State

Collectors: Laishmen et al.

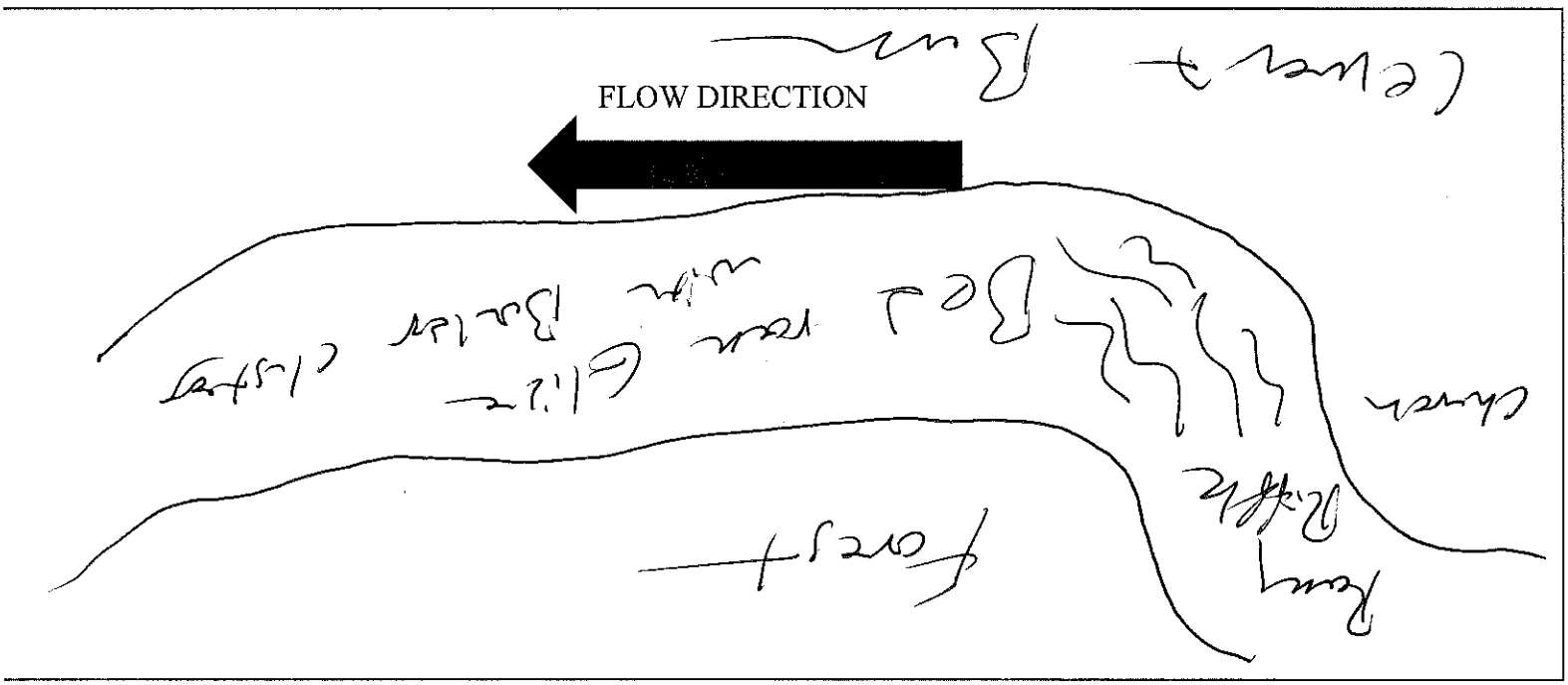
Temp(C)	SpCon(mS/cm)	TDS(g/L)	Sal(ppt)	pH	Turb(NTU)	%DO
15.7	.1603	–	0.4	8.61	–	–

Species Collected

Species	I♂	II♂	♀	B♀	Juv.	Total
1.) *Faxonius cristavarius*	5	3	7	–	2	17
2.) *Cambarus theepiensis*	~~5~~ 0	4	5	–	–	9
3.)						
4.)						
5.)						

Species	Number of Species Per Seine Haul									
	1	2	3	4	5	6	7	8	9	10
O. cristivarius	1	1	1	5	5	1	1	3	+12	
C. theepiensis	2	2	1	1	1	2	+13			
C. hatfieldi										
C. callainus										
C. veteranus										

Species	Sex	TCL	Species	Sex	TCL	Species	Sex	TCL



Please attach a topographic map identifying survey sites (include photos of sites), photos of specimens.

Also attach auy additional comments.

AS

OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 69

Stream & Location: Indian Creek - DOT-170930-10 **RM:** ___._ **Date:** 30 Sept 2017

Scorers Full Name & Affiliation: ________

River Code: __-___-___ **STORET #:** ______ **Lat./Long.:** (NAD 83 - decimal °) 37.5023 / 81.5533 Office verified location [ ]

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
[x] [ ] BLDR /SLABS [10]		/	[ ] [ ] HARDPAN [4]		
[ ] [x] BOULDER [9]		/	[ ] [ ] DETRITUS [3]		
[ ] [ ] COBBLE [8]		/	[ ] [ ] MUCK [2]		
[ ] [ ] GRAVEL [7]			[ ] [ ] SILT [2]		/
[ ] [ ] SAND [6]		/	[ ] [ ] ARTIFICIAL [0]		
[ ] [ ] BEDROCK [5]		/	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: [x] 4 or more [2] [ ] 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
- [ ] LIMESTONE [1]
- [ ] TILLS [1]
- [ ] WETLANDS [0]
- [ ] HARDPAN [0]
- [x] SANDSTONE [0]
- [ ] RIP/RAP [0]
- [ ] LACUSTURINE [0]
- [ ] SHALE [-1]
- [ ] COAL FINES [-2]

QUALITY

SILT
- [ ] HEAVY [-2]
- [x] MODERATE [-1]
- [x] NORMAL [0] → -0.5
- [ ] FREE [1]

EMBEDDEDNESS
- [ ] EXTENSIVE [-2]
- [x] MODERATE [-1]
- [x] NORMAL [0] → -0.5
- [ ] NONE [1]

Substrate: 20 (Maximum 20)

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

- 0 UNDERCUT BANKS [1]
- 1 OVERHANGING VEGETATION [1]
- 1 SHALLOWS (IN SLOW WATER) [1]
- 1 ROOTMATS [1]
- 1 POOLS > 70cm [2]
- 0 ROOTWADS [1]
- 1 BOULDERS [1]
- 0 OXBOWS, BACKWATERS [1]
- 1 AQUATIC MACROPHYTES [1]
- 1 LOGS OR WOODY DEBRIS [1]

AMOUNT Check ONE (Or 2 & average)
- [ ] EXTENSIVE >75% [11]
- [x] MODERATE 25-75% [7] → 5
- [x] SPARSE 5-<25% [3]
- [ ] NEARLY ABSENT <5% [1]

Comments

Cover: 13 (Maximum 20)

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
[ ] HIGH [4]	[ ] EXCELLENT [7]	[ ] NONE [6]	[ ] HIGH [3]
[x] MODERATE [3]	[x] GOOD [5]	[ ] RECOVERED [4]	[x] MODERATE [2]
[ ] LOW [2]	[ ] FAIR [3]	[x] RECOVERING [3]	[ ] LOW [1]
[ ] NONE [1]	[ ] POOR [1]	[ ] RECENT OR NO RECOVERY [1]	

Comments

Channel: 13 (Maximum 20)

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

River right looking downstream

EROSION (L R)
- [ ] [ ] NONE / LITTLE [3]
- [x] [x] MODERATE [2]
- [ ] [ ] HEAVY / SEVERE [1]

RIPARIAN WIDTH (L R)
- [ ] [ ] WIDE > 50m [4]
- [x] [ ] MODERATE 10-50m [3]
- [ ] [ ] NARROW 5-10m [2]
- [ ] [ ] VERY NARROW < 5m [1]
- [ ] [x] NONE [0] → 1.5

FLOOD PLAIN QUALITY (L R)
- [ ] [ ] FOREST, SWAMP [3]
- [x] [ ] SHRUB OR OLD FIELD [2] → 1.5
- [ ] [x] RESIDENTIAL, PARK, NEW FIELD [1]
- [ ] [ ] FENCED PASTURE [1]
- [ ] [ ] OPEN PASTURE, ROWCROP [0]
- [ ] [ ] CONSERVATION TILLAGE [1]
- [ ] [ ] URBAN OR INDUSTRIAL [0]
- [ ] [ ] MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian: 5 (Maximum 10)

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)
- [ ] > 1m [6]
- [ ] 0.7-<1m [4]
- [x] 0.4-<0.7m [2]
- [ ] 0.2-<0.4m [1]
- [ ] < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)
- [ ] POOL WIDTH > RIFFLE WIDTH [2]
- [x] POOL WIDTH = RIFFLE WIDTH [1]
- [ ] POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- [ ] TORRENTIAL [-1]
- [ ] VERY FAST [1]
- [x] FAST [1]
- [x] MODERATE [1]
- [x] SLOW [1]
- [ ] INTERSTITIAL [-1]
- [ ] INTERMITTENT [-2]
- [x] EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current: 7 (Maximum 12)

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). [ ] NO RIFFLE [metric=0]

RIFFLE DEPTH
- [ ] BEST AREAS > 10cm [2]
- [x] BEST AREAS 5-10cm [1]
- [ ] BEST AREAS < 5cm [metric=0]

RUN DEPTH
- [ ] MAXIMUM > 50cm [2]
- [x] MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- [x] STABLE (e.g., Cobble, Boulder) [2]
- [x] MOD. STABLE (e.g., Large Gravel) [1]
- [ ] UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- [ ] NONE [2]
- [ ] LOW [1]
- [x] MODERATE [0]
- [ ] EXTENSIVE [-1]

Comments

Riffle / Run: 4 (Maximum 8)

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

- [ ] VERY LOW - LOW [2-4]
- [x] MODERATE [6-10]
- [ ] HIGH - VERY HIGH [10-6]

%POOL: 10 %GLIDE: 40
%RUN: 20 %RIFFLE: 30

Gradient: 7 (Maximum 10)

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE
1st -sample pass- 2nd
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

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

_______ meters

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

1st _______ cm
pass
2nd _______ cm

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

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

Right descending bank concrete Rip Rap for 60% of reach. Rest of reach composed of large cobble size with boulder clusters. Upstream reach several well established riffles with abundant slabs. Gradient high! Sampled 250 m.

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

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

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

Circle some & *COMMENT*

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

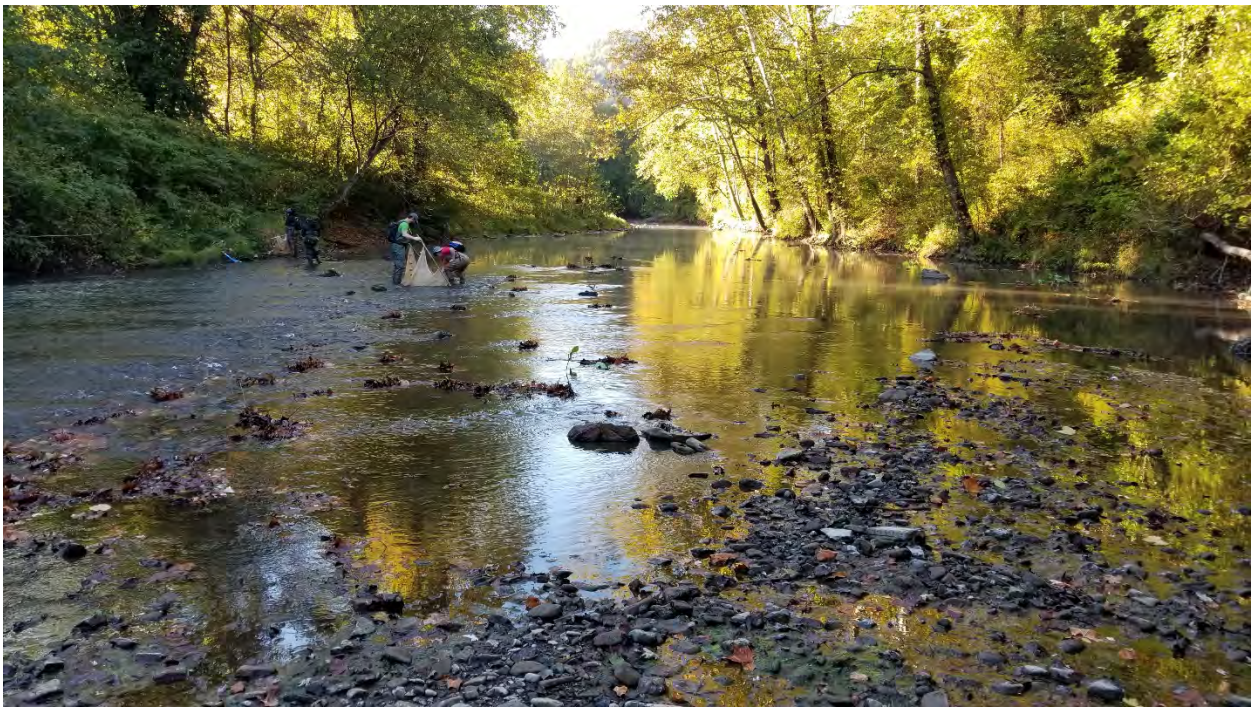
Legacy Tree:

Stream Drawing:

Appendix B

Sample Site Pictures

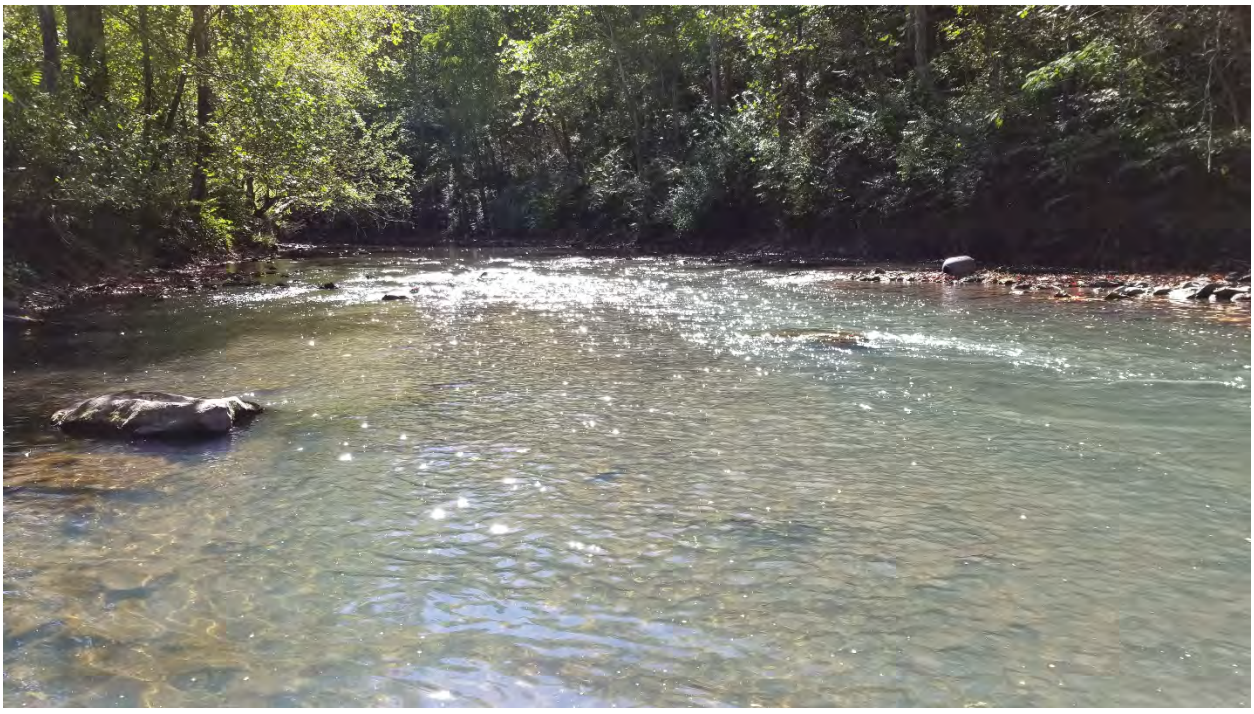
Tug Fork Pictures



Tug Fork Site 1

Tug Fork Site 2

Tug Fork Site 3



Tug Fork Site 4

Tug Fork Site 5

Tug Fork Site 6

Tug Fork Site 7

Tug Fork Site 8

Tug Fork Site 9

Tug Fork Site 10

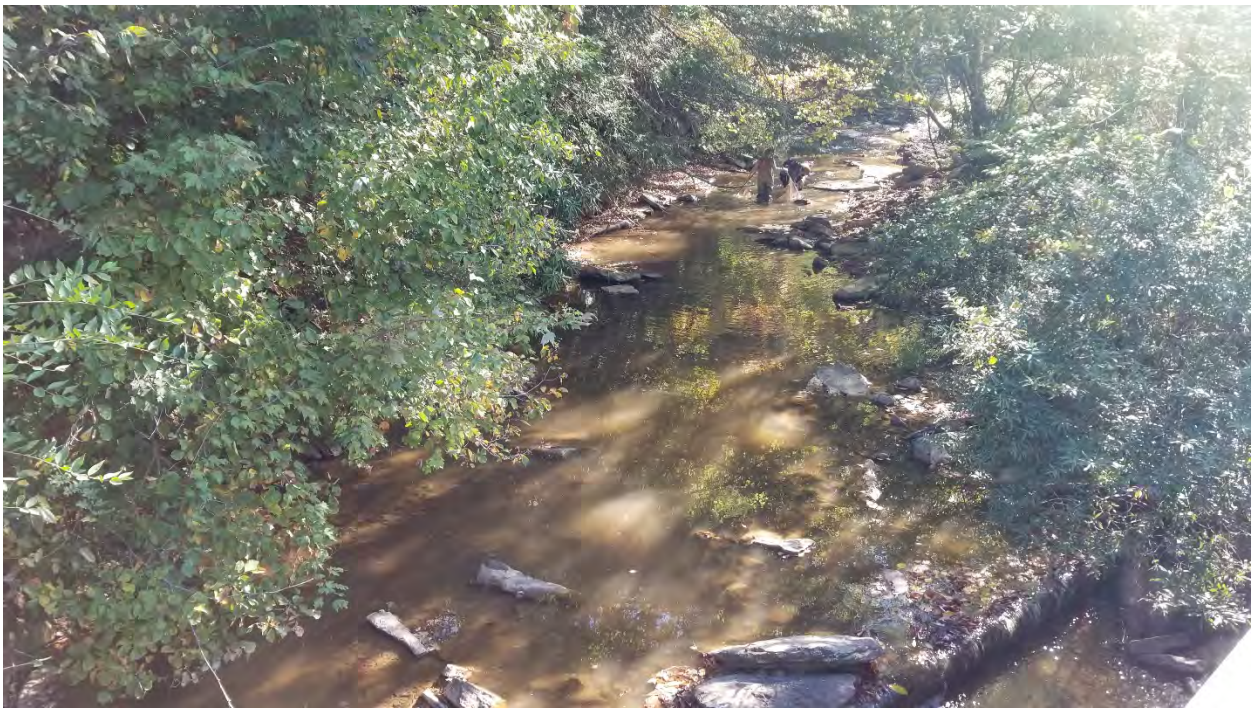
Tug Fork Site 11

Indian Creek Pictures

Indian Creek Site 1

Indian Creek Site 2

Indian Creek Site 3



Indian Creek Site 4

Indian Creek Site 5

Indian Creek Site 6

Indian Creek Site 7

Indian Creek Site 8

Indian Creek Site 9

Indian Creek Site 10

Appendix C

C. callainus Pictures

C. callainus at site 170110-01

C. callainus at site 171001-02

C. callainus at site 171001-03

C. callainus at site 171001-04

Appendix D

Scientific Collecting Permit

DIVISION OF NATURAL RESOURCES
Wildlife Resources Section
Operations Center
P.O. Box 67
Elkins, West Virginia 26241-3235
Telephone (304) 637-0245
Fax (304) 637-0250

Jim Justice
Governor

Stephen S. McDaniel
Director

NUMBER 2017.229

SCIENTIFIC COLLECTING PERMIT

Under Authority Conferred by Chapter 20, Article 2, Section 50, Code of West Virginia, As Amended

Zachary Loughman
West Liberty University
208 University Drive
College Union Box 139
West Liberty, WV 26074

is hereby permitted to collect specimens according to the attached application and the Special Provisions on the reverse side of this permit.

This permit is not transferable and expires on December 31, 2017.

A complete list of all specimens collected will be kept and reported to the Director of the Division of Natural Resources of West Virginia no later than 45 days after the expiration date of this permit.

PERMIT PROVISIONS

I understand that (1) The privileges granted under this permit are not transferable, and to allow anyone other than myself to use my permit is unlawful and will be considered cause for revocation of said permit; (2) A Federal Scientific Collection Permit issued by the U.S. Department of Interior must be obtained before any migratory birds, or their nests or eggs, are collected or held in captivity; (3) The Federal Permit does not extend the privileges of the permittee beyond those granted by the Division of Natural Resources; (4) Permission must be obtained from either the owner or the custodian of any fenced or posted land before entering same for the purpose of collecting scientific specimens; (5) It is unlawful to carry a revolver or pistol contrary to Article VII, Chapter 61, Code of West Virginia; (6) It is unlawful to collect specimens with a gun on a Sunday; (7) It is unlawful to sell, offer for sale, barter, or offer to barter any wild animals, wild birds, fish or frogs collected; (8) When traps or nets or other devices are used UNATTENDED while exercising the privileges of this permit, said traps, nets, or devices must have attached thereto a tag bearing the name, address and number of the Scientific Collecting Permit; (9) It is unlawful to take or attempt to take any wild animals, wild birds, fish or frogs under said permit except for scientific and propagation purposes; (10) A hunting or fishing license must be obtained before specimens may be taken for sport; (11) Only those species or classes of wild birds, wild animals, fish or frogs listed below, and in the numbers stated, may be lawfully taken under said permit; and (12) I am required by law to carry my Scientific Collecting Permit, on my person while exercising the privileges granted thereunder, and to exhibit the permit to anyone requesting to see the same.

Must be signed before valid.

Signature of permittee

Chief, Wildlife Resources, WVDNR

Date of issue 5/11/17

IMPORTANT

THE ATTACHED APPLICATION FORM INDICATING SPECIES TO BE COLLECTED, LOCATIONS OF COLLECTIONS, MANNER OF COLLECTION, AND PURPOSE OF COLLECTION IS TO BE CONSIDERED A PART OF THIS PERMIT AND SHOULD REMAIN ATTACHED.

YOU ARE SUBJECT TO THE FOLLOWING COLLECTING AND REPORTING PROVISIONS. FAILURE TO MEET THESE CRITERIA IS GROUNDS FOR REVOCATION OF THE PERMIT AND/OR DENIAL OF FUTURE PERMIT APPLICATIONS AND/OR PENALTIES OR OTHER STRICTURES.

SPECIAL PROVISIONS:

If any work is planned to occur in a State Park or State Forest, a permit must be obtained from WVDNR – Parks and Recreation.

If any work is planned to occur on National Forest or National Park Service lands, a permit must be obtained from the appropriate agency.

Please provide disposition of any voucher specimens, including the collection number if available.

The WVDNR requests a copy of any papers, reports or theses published as a result of this research.

Reporting: Please provide a report detailing your survey work within 45 days after the expiration date of your permit. The WVDNR prefers a report in electronic format using Microsoft Excel or Access. The following information must be included: date, species name, number of each species observed, number of each species kept, location (county, quadrangle name, and directions), and habitat information. Also include the site coordinates (latitude/longitude or UTMs), or attach a topographical map with the site marked if possible. This information can be emailed to barbara.d.sargent@wv.gov or provided on a CD.

APPLICATION FOR WEST VIRGINIA SCIENTIFIC COLLECTING PERMIT

Name: Zachary J. Loughman

Institution\Affiliation: West Liberty University

Street: 208 University Drive College Union Box 139

City: West Liberty **State:** West Virginia **Zip:** 26074

Telephone: (304) 336-8923 **Email:** zloughman@cecinc.com

Profession: Biologist **Major Professor:**

Specific Manner of Collection:

Crayfish – Seine netting and dip nets and snorkeling

Purpose for which specimens are to be collected (attach abstract):

Crayfish will be collected for continued monitoring activities on imperilled species, and continued data collection ofr the West Virginia Crayfish Atlas Project

How will specimens be disposed?

Crayfish will be preserved in the field in 80% ETOH, and transferred to 70% ETOH in the laboratory for long term storage.

Date on which collecting is to be: May 20, 2017 December 31, 2017

(Commence)* **(Terminate)***

Location(s) where collections are to be taken (be specific):

County(s) If aquatic, indicate: Statewide

Stream(s): All major West Virginia watersheds potentially may be surveyed.

Location (distance to nearest town, miles from the mouth):

N/A will be provided in the future for approval for projects before any work is performed.

Attach separate pages if additional space is required.

(Over)

Report that will result from studies and additional comments or information which may be pertinent to issuing this permit: Permit applications, Monitoring Reports; Reports generated for crayfish surveys/ relocation submitted to WVDNR and USFWS (if required)

Have you received a WV permit in previous years? Yes

Most recent year: 2016

SPECIES TO BE COLLECTED OR HANDLED

SCIENTIFIC NAME

GENUS	SPECIES	NUMBER
Fishes and Macroinvertebrates		
Crayfish	(*Cambarus callainus,Cambarus veteranus*) (T&E)	
Crayfish	(*common species*)	

Signature [signature] **Date** 5/5/2017

Send application to: Scientific Collecting Permit
Wildlife Resources
P.O. Box 67, Ward Road
Elkins, West Virginia 26241

11/18/03

Please include these individuals as Assistants on the Permit: Zachary Dillard, Katie Scott, Emmy Deleketa, Riley Aulick, Adam Bert, Christopher Vopal, Audrey Sikes.

DIVISION OF NATURAL RESOURCES
Wildlife Resources Section
Operations Center
P.O. Box 67
Elkins, West Virginia 26241-3235
Telephone (304) 637-0245
Fax (304) 637-0250

Jim Justice
Governor

Stephen S. McDaniel
Director

ADDENDUM TO SCIENTIFIC COLLECTING PERMIT NO. 2017.229

Permittee: Zachary Loughman
Address: West Liberty University
208 University Drive
College Union Box 139
West Liberty, WV 26074

THE FOLLOWING PROVISIONS ARE ADDED TO THIS PERMIT: Crayfish surveys may be conducted in Horsepen Creek and Gilbert Creek, near Gilbert, Mingo County; Spice Creek and Tug Fork, near Welch, McDowell County; and Indian Creek, Wyoming County.

Written concurrence from the US Fish and Wildlife Service is required prior to surveys.

THIS ADDENDUM MUST BE ATTACHED TO ORIGINAL PERMIT.

Must be signed before valid.

Signature of permittee

Scientific Collecting Permit Coordinator

Date of issue 8/23/2017

Appendix E

USFWS Protocol

Big Sandy and Guyandotte River Crayfish Survey Protocol

Project-specific survey plans shall be coordinated with and approved by the lead U.S. Fish and Wildlife Service (USFWS) Field Office at the address below prior to conducting any surveys within potential habitat for the Big Sandy crayfish (*Cambarus callainus*) or the Guyandotte River crayfish (*C. veteranus*). Survey plans should be submitted at least 30 days prior to the proposed start of surveys. When surveys are conducted to evaluate whether a proposed project may affect the species, surveys should be conducted early in project planning so that project modifications can be made to avoid and minimize project effects. Surveyors must hold all appropriate State and Federal collection permits prior to conducting the work.

Surveys are not permitted from July 20 through September 10 due to egg extrusion and rearing of juveniles by females. Surveys must be conducted when water conditions/temperatures are conducive to detecting *C. callainus/C. veteranus*. Water temperature must be above 50° F/ 10° C and surveys cannot be completed for 72 hours after a precipitation greater than 0.5in/1.3cm to ensure clear water and that suitable sampling conditions are present.

Surveys should be conducted throughout the entire reach of stream that may be affected by a potential project; total upstream and downstream distance to be sampled from the point of direct impact will be determined for each project by the USFWS. Once the survey area has been delineated, the area should be divided into sampling reaches and each reach sampled following the approved protocol.

Each sampling reach should be approximately 125 meters (m) in length and include at least one riffle, run, or both riffle and run habitats. Crayfish sampling shall be performed using an 8'x4' seine, with double leads and double floats, and 1/8" netting. Sampling shall be performed by hauling a seine at a minimum of 10 locations within the 125m stream reach. Seine hauls will be completed by overturning every slab boulder (rocks approximately 1m wide x 1m long; 5cm high) present per 2m linear upstream/downstream distance in riffles and runs. One to two slab boulders can be sampled per seine haul.

Seine hauls should be completed with at minimum a two-person team using the seine. One crew member will hold both handles/brails, with the seine spread approximately 2m in width. Handles should be held at a 40°-50° angle from the stream surface. The other crew members should ensure that the seines lead line is making contact with the stream substrate and that the lead line is not resting on substrate items that are planned to be sampled in the ensuing haul. Once these conditions are met, surveyors charged with flipping substrate items should do so quickly and assertively. When each substrate item is overturned, the surveyor should kick in the direction of the seine over the area of stream substrate uncovered by moving rocks being sampled.

Slab boulders should always be given sampling priority given *C. callainus*/*C. veteranus*' association with them. If a sampling reach does not contain sufficient slab boulders, the following substrate features should be given sampling priority in the following order of importance: boulders, large cobble, course woody debris, and artificial cover. All substrate items should be placed back in their original position immediately following the seine hauls in which they were dislodged from the substrate.

At the end of each haul, surveyors must ensure that the lead line is removed from the water prior to the float line so all captured organisms remain in the net bellows and are not dumped back into the stream following sampling. At this time, crayfishes should be removed from the net and placed into trolling buckets. All substrate items should be placed back in their original position immediately following the seine hauls in which they were dislodged from the substrate.

All crayfishes collected shall be housed temporarily in trolling bait buckets that do not leave the stream proper until processing begins. No more than five adult *C. callainus/C. veteranus* are to be housed in one bucket at one time; multiple buckets are suggested. Buckets are to be anchored in the stream or attached to collectors during active sampling.

Data must be recorded on the standardized datasheets provided with your collecting permit. A minimum of ten seine hauls per sampling reach is required; the total number of seine hauls employed at a reach shall be recorded as well as the total number of crayfish collected of each species per seine haul. Electric fishing gear ***should never*** be used at potential *C. callainus* and *C. veteranus* sites. Electric fishing gear is not considered efficient gear for the collection of stream crayfishes.

When sampling is completed, collectors are required to identify all captured crayfish to species, sex all captured crayfish (Form I, Form II, Female, Female Glair, Female-Ovig, Female-Attached Juveniles), and record total carapace length (TCL) in millimeters for each *C. callainus*/*C. veteranus* encountered using calipers. Data shall be recorded on the standardized WVDNR Crayfish Morphometric Datasheet. A photographic voucher is required for all *C. callainus*/*C. veteranus* captured prior to release; representatives of other crayfish species should also be photographed. Every effort should be undertaken to ensure animals are outside of water for the briefest period of time possible (5 minute maximum, but a shorter period is preferred). Following data collection, animals are to be returned to the stream bottom upstream of their home rocks and guided back to their rock or other substrate debris.

Collection of water quality and physical habitat metrics are required at each collection locale. At each sampling site, pH, temperature, percent dissolved oxygen, turbidity, and conductivity are to be measured. In addition to water quality, physical habitat will be evaluated through completion of a Qualitative Habitat Evaluation Index (QHEI; OEPA 2006).

If any C. *callainus* or *C. veteranus* are captured, the appropriate State wildlife agency in which the surveys were conducted and the appropriate USFWS Field Office(s) shall be notified within 48 hours of collection via a reporting spreadsheet developed by the WVDNR. Written reports of all survey efforts shall be provided to the appropriate State wildlife agency in which the surveys were conducted and the appropriate USFWS Field Office(s) and shall include, at a minimum, information on the survey dates and water conditions, who conducted the survey, the methods used, survey results including results per seine haul, photographs of *C. callainus or C. veteranus* specimens and of the survey area, and all water quality and QHEI data gathered.

Agency Contact Information:

States:

Kentucky Department of Fish and Wildlife Resources
#1 Sportsman's Lane, Frankfort, KY 40601
(502) 564-7109

Virginia Department of Game and Inland Fisheries
7870 Villa Park Drive, Suite 400, Henrico, VA 23228
(804) 367-1000

West Virginia Division of Natural Resources
PO Box 67, Elkins, WV 26241
(304) 637-0245

U.S. Fish and Wildlife Service:

Kentucky Ecological Services Field Office
330 West Broadway, Suite 265, Frankfort, KY 40601
(502) 695-0468

Virginia Ecological Services Field Office
6669 Short Lane, Gloucester, VA 23061
(804) 693-6694

West Virginia Ecological Services Field Office*
694 Beverly Pike, Elkins WV 26241
(304) 636-6586

*****denotes lead recovery office