

Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

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AMBIENT WATER QUALITY MONITORING IN THE CHICAGO,

CALUMET, AND DES PLAINES RIVER SYSTEMS:

A SUMMARY OF BIOLOGICAL SAMPLING AND

HABITAT ASSESSMENTS DURING 2011

May 2014

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DISCLAIMER

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

INTRODUCTION

The Metropolitan Water Reclamation District of Greater Chicago (District) began monitoring the biological component of the Ambient Water Quality Monitoring (AWQM) Program at 59 sampling stations on 21 waterways in 2001. The biological monitoring portion of the AWQM Program operates on a four-year cycle, with a primary focus on a different river system in the entire service area each year. The four river systems of interest are the northern portion of the Chicago River System (NPCRS), the southern portion of the Chicago River System (SPCRS), the Calumet River System (CRS), and the Des Plaines River System (DPRS). Fifteen of the 59 stations located across all of the waterways are monitored annually based on their proximity to District water reclamation plants (WRPs) or municipal boundaries. Of the remaining 44 sampling stations, 12 are on the NPCRS, 8 are on the SPCRS, 10 are on the CRS, 13 are on the DPRS, and 1 station is on the Fox River System. During 2011, biological monitoring focused on the CRS, including the Calumet River, Little Calumet River (LCR), Calumet-Sag Channel (CSC), Grand Calumet River (GCR), Thorn Creek, and the Wolf Lake Drain. This report documents the biological, habitat, and sediment quality monitored during 2011.

In addition to the AWQM Program data being used to assess the impact of the District's WRPs, our data are often shared with other governmental agencies, non-governmental organizations, and academic institutions.

DESCRIPTION OF THE STUDY AREA

Chicago, Calumet, and Des Plaines River Systems

The District service area waterways consist of man-made canals as well as natural streams which have been altered to varying degrees. Some natural waterways have been modified by being deepened, straightened, and/or widened to such an extent that reversion to their natural state would be impossible. The waterways serve the Chicago area by draining urban stormwater runoff and treated municipal wastewater effluent and allowing commercial navigation in the deep-draft portions.

The primary man-made waterways include the North Shore Channel (NSC), connecting Lake Michigan at Wilmette to the North Branch Chicago River (NBCR); the Chicago Sanitary and Ship Canal (CSSC), extending from Damen Avenue to the Lockport Powerhouse; and the CSC, connecting the LCR with the CSSC. The primary natural waterways include the wadeable branches of the NBCR, flowing south from Lake County to the confluence with the NSC and continuing as the deep-draft portion of the NBCR, which joins the Chicago River and becomes the South Branch Chicago River; the DPR, flowing south from Lake County and joining with the discharge from the CSSC downstream of the Lockport Powerhouse; and the Calumet River, which flows south into the LCR.

Sampling Stations

The sampling stations for the AWQM Program are located on natural and man-made waterways throughout the District's service area. A map of the Chicago area waterways, including the 59 sampling stations and the District's WRPs, is shown in Figure 1. Stations were primarily selected so that there was at least one monitoring station on the lower end of an Illinois Environmental Protection Agency 303(d)-impaired waterway segment in 1998. Secondary criteria for selecting sampling locations included: (1) above and below District WRPs, (2) below Lake Michigan diversion points, (3) above the junction of two major waterways, (4) below county municipal boundaries, and (5) in areas of environmental concern. Fifteen of the 59 stations were chosen for annual biological monitoring.

In addition to the annual stations, biological sampling was performed at ten stations in the CRS during 2011, including the Calumet River, LCR, CSC, GCR, Thorn Creek, and Wolf Lake Drain. <u>Table 1</u> displays the 2011 field monitoring schedule for fish sampling and physical habitat assessments.

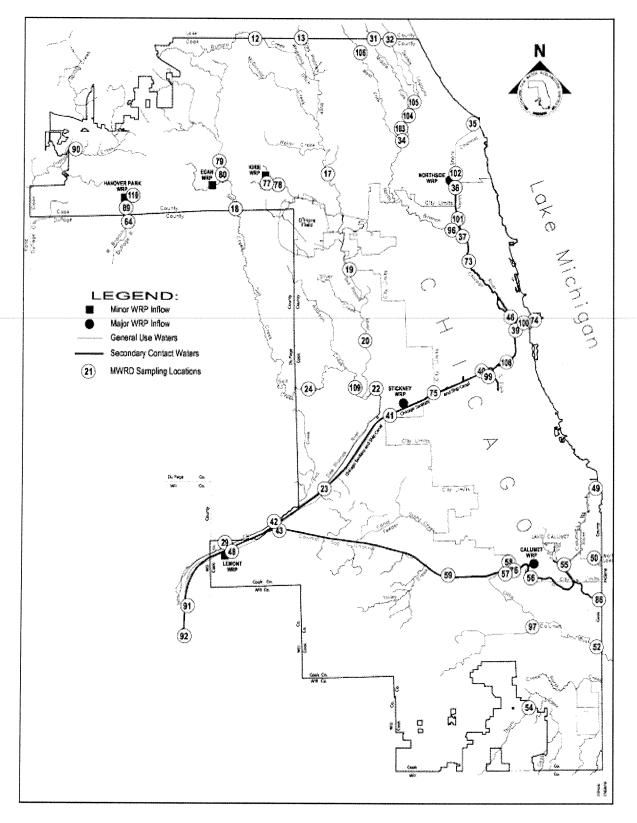


FIGURE 1: AMBIENT WATER QUALITY MONITORING PROGRAM SAMPLING STATIONS

TABLE 1: SAMPLING DATES AT THE AMBIENT WATER QUALITY MONITORING
PROGRAM STATIONS DURING 2011

Station No.	Sampling Station Waterway		Date Sampled
		CHICAGO RIVER SYSTEM	
96	Albany Avenue ¹	North Branch Chicago River	9/07/11
36	Touhy Avenue ¹	North Shore Channel	8/30/11
46			8/29/11
75	Cicero Avenue ¹	Chicago Sanitary & Ship Canal	8/26/11
41	Harlem Avenue ¹	Chicago Sanitary & Ship Canal	7/08/11
92	Lockport ¹	Chicago Sanitary & Ship Canal	8/04/11
		CALUMET RIVER SYSTEM	
49	Ewing Avenue	Calumet River	9/12/11
55	130 th Street ¹	Calumet River	9/08/11
56	Indiana Avenue	Little Calumet River	9/15/11
76	Halsted Street ¹	Little Calumet River	9/21/11
57	Ashland Avenue	Little Calumet River	9/06/11
52	Wentworth Avenue	Little Calumet River	8/22/11
58	Ashland Avenue	Calumet-Sag Channel	8/18/11
59	Cicero Avenue ¹	Calumet-Sag Channel	8/03/11
43	Route 83	Calumet-Sag Channel	9/19/11
86	Burnham Avenue	Grand Calumet River	8/10/11
50	Burnham Avenue	Wolf Lake Outlet	7/15/11
97	170 th Street	Thorn Creek	7/13/11
54	Joe Orr Road	Thorn Creek	7/14/11
	D	ES PLAINES RIVER SYSTEM	
78	Wille Road ¹	Higgins Creek	6/30/11
18	Devon Avenue ¹	Salt Creek	9/02/11
64	Lake Street ¹	West Branch DuPage River	7/06/11
13	Lake-Cook Road ¹	Des Plaines River	7/07/11
22	Ogden Avenue ¹	Des Plaines River	7/01/11
91	Material Service Rd. ¹	Des Plaines River	7/12/11
¹ Annual sa	impling station.		

Annual sampling station.

MATERIALS AND METHODS

Habitat

Calculating Qualitative Habitat Evaluation Index Scores. The Qualitative Habitat Evaluation Index (QHEI) was created by the Ohio Environmental Protection Agency to determine the suitability of a stretch of waterway to fish and macroinvertebrates based on physical habitat characteristics (Rankin, 1989). The index was developed to assess wadeable streams, not deep-draft channels such as those prevalent in the Chicago area. Therefore, only wadeable stations were assessed using the QHEI. <u>Appendix A</u> shows the QHEI Field Assessment Form. Habitat scores were calculated using the Ohio QHEI procedures for assessing the quality of substrates, instream cover, channel morphology, riparian zone/erosion, pool and riffle/run development, and stream gradient. Sites were then classified as excellent, good, fair, poor, or very poor based on their ability to support aquatic life in reference to habitat (Rankin, 2004). The classification ranges were as follows:

>=75	Excellent
60-74	Good
46-59	Fair
30-45	Poor
<30	Very Poor

Fish

Boatable Stream Sampling. Fish were collected at each sampling station using a boatmounted electrofisher powered by a direct current (DC) generator. Stunned fish were picked out of the water with long-handled dip nets. For deep-draft sites, the section of canal sampled extended for 400 meters. For most shallow sites that were too deep to wade, a 100-meter section of waterway was sampled. Whenever possible, both sides of the waterways were electrofished.

Wadeable Stream Sampling. Fish were collected at each sampling station using a DC backpack electrofisher and a bag seine. Conductivity and temperature in degree of Celsius (°C) were recorded before each sample collection. In most instances, two 40-meter long backpack electrofisher collections were conducted at each station. A 40-meter reach of the creek was electrified by moving upstream parallel to the bank. Additional personnel followed the electrofisher, collecting the stunned fish with dip nets. Following the first collection, a second 40-meter

electrofishing survey was conducted on the opposite bank. If the creek was less than five meters wide, electrofishing was done only once along a 40-meter reach. The total electrofishing time during each 40-meter collection was noted.

A 15-foot bag seine with 3/16-inch mesh was also used to collect fish. Staff pulled the seine for 40 meters traveling upstream parallel to the bank. In most instances, a separate 40-meter seine collection was done along each bank.

Fish Processing. In the field, most fish were identified to species, weighed to the nearest gram or nearest 0.1 gram (depending on size), measured for standard and total length to the nearest millimeter, and examined for the incidence of disease, parasites, or other anomalies. Following processing, these fish were returned live to the river. Minnows and other small fish that were difficult to identify were preserved in a 10 percent formalin solution and returned to the laboratory for further analysis. These fish were processed in a similar manner to the fieldmeasured fish except that they were weighed to the nearest 0.01 gram.

Index of Biotic Integrity. Biological integrity of aquatic ecosystems has been defined as the ability to support and maintain a balanced, integrated, and adaptive community having a species composition, diversity, and functional organization comparable to that of a natural habitat (Karr et al., 1986). Karr's 1986 Index of Biotic Integrity (IBI) was used to analyze fish data from 2011.

The limitations of using this tool, which was meant to apply to wadeable streams, for some of the man-made, channelized waterways in the Chicago area should be recognized.

Karr's IBI integrates information from 12 fish community metrics that fall into three major categories: (1) species richness and composition, (2) trophic composition, and (3) fish abundance and condition. Each metric is scored 1, 3, or 5 based on whether its evaluation deviates strongly, deviates somewhat, or approximates expectations, respectively, as compared to an undisturbed site located in a similar geographical region and on a stream of comparable size. Individual metrics are added to calculate a total IBI score. A high IBI indicates high biological integrity or health and low disturbance or lack of perturbations. A low IBI indicates low biological integrity and high disturbance or degradation. Separate IBI metric scores were determined based on the relative abundance of fish collected with each fishing gear. The scores were used to determine IBI categories of good (41-60), fair (21-40) or poor (<21), as derived by the IEPA (IEPA, 1996).

RESULTS

Habitat

<u>Table 2</u> shows the QHEI scores and ratings for the six wadeable stations in the CRS that were assessed in 2011. The completed QHEI Field Assessment Forms for each station are provided in Appendix B.

Fish

IBI scores calculated for each AWQM station and collection method are shown in <u>Table</u> <u>3</u>. Burnham Avenue on the GCR was sampled but did not yield any fish. Only 500 meters of the 130^{th} Street station on the Calumet River were sampled due to a mechanical issue with the electrofishing generator. A 200-meter section of the LCR was electrofished along each bank at the Ashland Avenue station. Thirty species of fish, including 14 game fish species, were collected from deep-draft stations, and 33 species of fish, including 15 game fish species, were collected from wadeable stations during 2011. <u>Tables 4 – 6</u> display the number and total weight of fish collected from each station, during 2011.

Station No. Station Name		Waterway	QHEI ¹ Score	Habitat Rating
58	Ashland Avenue	Little Calumet River	58	Fair
50	Burnham Avenue	Wolf Lake Outlet	50	Fair
86	Burnham Avenue	Grand Calumet River	35	Poor
52	Wentworth Avenue	Little Calumet River	33	Poor
97	170 th Street	Thorn Creek	45	Fair
54	Joe Orr Road	Thorn Creek	64	Good

TABLE 2: SUMMARY OF QUALITATIVE HABITAT EVALUATION INDEX SCORESFOR WADEABLE SAMPLING STATIONS DURING 2011

¹QHEI=Qualitative Habitat Evaluation Index.

Station No.			Sample Gear	IBI ¹ Score	IBI ¹ Category
96	Albany Avenue	North Branch Chicago River	ВР	26	Fair
96	Albany Avenue	North Branch Chicago River	Seine	34	Fair
36	Touhy Avenue	North Shore Channel	Large EF Boat	32	Fair
46	Grand Avenue	North Branch Chicago River	Large EF Boat	32	Fair
75	Cicero Avenue	Chicago Sanitary and Ship Canal	Large EF Boat	34	Fair
41	Harlem Avenue	Chicago Sanitary and Ship Canal	Large EF Boat	28	Fair
92	Lockport	Chicago Sanitary and Ship Canal	Large EF Boat	28	Fair
49	Ewing Avenue	Calumet River	Large EF Boat	38	Fair
55	130 th Street	Calumet River	Large EF Boat	36	Fair
50	Burnham Avenue	Wolf Lake Outlet	BP	36	Fair
50	Burnham Avenue	Wolf Lake Outlet	Seine	34	Fair
86	Burnham Avenue	Grand Calumet River	Small EF Boat	ND	ND
52	Wentworth Avenue	Little Calumet River	Small EF Boat	30	Fair
56	Indiana Avenue	Little Calumet River	Large EF Boat	38	Fair
76	Halsted Street	Little Calumet River	Large EF Boat	34	Fair
57	Ashland Avenue	Little Calumet River	Small EF Boat	34	Fair
58	Ashland Avenue	Calumet-Sag Channel	Large EF Boat	26	Fair
59	Cicero Avenue	Calumet-Sag Channel	Large EF Boat	26	Fair
43	Route 83	Calumet-Sag Channel	Large EF Boat	22	Fair
54	Joe Orr Road	Thorn Creek	BP	30	Fair
54	Joe Orr Road	Thorn Creek	Seine	ND	ND
97	170 th Street	Thorn Creek	Small EF Boat	30	Fair
78	Wille Road	Higgins Creek	BP	24	Fair
78	Wille Road	Higgins Creek	Seine	ND	ND
18	Devon Avenue	Salt Creek	BP	26	Fair
18	Devon Avenue	Salt Creek	Seine	34	Fair
64	Lake Street	West Branch DuPage River	BP	30	Fair
64	Lake Street	West Branch DuPage River	Seine	26	Fair

TABLE 3: INDEX OF BIOTIC INTEGRITY SCORE AND CATEGORY BY STATION DURING 2011

Station No.	Location	Waterway	Sample Gear	IBI ¹ Score	IBI ¹ Category
13	Lake-Cook Road	Des Plaines River	ВР	26	Fair
13	Lake-Cook Road	Des Plaines River	Seine	26	Fair
22	Ogden Avenue	Des Plaines River	BP	26	Fair
22	Ogden Avenue	Des Plaines River	Seine	32	Fair
91	Material Services Road	Des Plaines River	BP	24	Fair
91	Material Services Road	Des Plaines River	Seine	30	Fair

TABLE 3 (Continued): INDEX OF BIOTIC INTEGRITY SCORE AND CATEGORY BY STATION DURING 2011

^TIBI = Index of Biotic Integrity. ND = No fish were caught in the seine or conditions were unfavorable for seining.

	North Shore Channel	North Branch (Chicago River	Chicago	Sanitary and Shi	p Canal
Fish Species or Hybrid (x)	Station 36 Touhy Avenue	Station 46 Grand Avenue	Station 96 Albany Avenue	Station 75 Cicero Avenue	Station 41 Harlem Avenue	Station 92 Lockport (16 th Street)
Gizzard shad	88	63	0	136	3	1
Northern pike ¹	1	0	0	0	0	0
Central mudminnow	0	0	3	0	0	0
Goldfish	0	0	0	5	0	0
Common carp	15	2	1	10	18	0
Golden shiner	13	10	0	1	0	0
Emerald shiner	0	1	0	0	0	0
Spottail shiner	2	0	0	0	0	0
Spotfin shiner	20	8	0	1	0	0
Bluntnose minnow	13	0	0	1	49	0
White sucker	2	0	0	0	0	0
Yellow bullhead ¹	0	0	0	1	8	1
Channel catfish ¹	2	0	2	2	3	0
Blackstripe topminnow	0	0	20	0	0	0
Mosquitofish	0	0	0	202	4	14
Green sunfish ¹	1	2	38	15	5	27
Pumpkinseed ¹	3	3	0	13	29	1
Bluegill ¹	11	4	4	12	18	1
Largemouth bass ¹	3	1	0	2	0	2
Black crappie ¹	0	1	0	0	0	0
Number of Game Fish Species	6	5	3	6	5	5
Total Number of Fish Species	13	10	6	13	9	7
Total Number of Fish	174	95	68	401	137	47
Total Weight of Fish (kg)	75.8	11.1	0.2	32.8	89.5	0.6

TABLE 4: NUMBER OF FISH COLLECTED FROM EACH SAMPLING STATION IN THE CHICAGO RIVER SYSTEM DURING 2011

¹Game species

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TABLE 5: NUMBER OF FISH COLLECTED FROM EACH SAMPLING STATION IN THE CALUMET RIVER SYSTEM DURING 2011

	Calum	net River		Little Calun	net River		Wolf Lake Outle
Fish Species or Hybrid (x)	Station 49 Ewing Avenue	Station 55 130 th Street	Station 52 Wentworth Avenue	Station 57 Ashland Avenue	Station 56 Indiana Avenue	Station 76 Halsted Street	Station 97 Burnham Avenue
Gizzard shad	1	96	4	83	143	246	0
Central mudminnow	0	0	0	0	0	2	0
Grass pickerel ¹	0	0	0	2	0	0	2
Goldfish	0	0	7	1	0	8	0
Common carp	0	2	5	14	26	60	1
Common carp x goldfish	0	0	0	0	0	1	0
Golden shiner	0	1	0	1	0	1	1
Emerald shiner	1	0	0	0	8	0	1
Spottail shiner	0	0	0	0	0	0	3
Spotfin shiner	0	1	0	0	0	0	0
Sand shiner	0	0	0	0	1	0	0
Bluntnose minnow	0	46	0	0	110	0	706
White sucker	0	3	2	0	0	27	1
Black buffalo	0	0	0	0	2	0	0
Yellow bullhead ¹	1	0	2	1	3	18	0
Channel catfish ¹	0	0	0	0	2	0	0
Brook silverside	0	13	0	0	11	0	19
White perch ¹	0	0	0	0	1	0	0
Yellow bass ¹	0	0	0	0	1	0	0
Rock bass ¹	45	16	0	0	0	0	0
Green sunfish ¹	0	7	3	5	37	3	0

	Calu	met River		Little C	alumet River		Wolf Lake Outlet
Fish Species or Hybrid (x)	Station 49 Ewing Avenue	Station 55 130 th Street	Station 52 Wentworth Avenue	Station 57 Ashland Avenue	Station 56 Indiana Avenue	Station 76 Halsted Street	Station 50 Burnham Avenue
Pumpkinseed ¹	0	3	0	1	66	90	0
Bluegill ¹	1	2	1	0	48	89	59
Longear sunfish ¹	0	0	0	0	0	0	20
Smallmouth bass ¹	71	9	0	0	4	0	2
Largemouth bass ¹	0	18	0	2	37	44	1
White crappie ¹	0	0	0	1	1	0	0
Black crappie ¹	0	0	1	0	0	0	0
Yellow perch ¹	0	1	0	0	0	0	1
Freshwater drum	0	2	0	0	0	0	0
Round goby	26	3	0	2	4	0	0
Number of Game Fish Species	4	7	4	6	9	5	6
Total Number of Fish Species	7	16	8	11	18	11	13
Total Number of Fish	146	223	25	124	507	589	817
Total Weight of Fish (kg)	4.9	23.3	7.4	44.8	145.0	61.9	0.7

TABLE 5 (Continued): NUMBER OF FISH COLLECTED FROM EACH SAMPLING STATION IN THE CALUMET RIVER SYS-TEM DURING 2011

	Tho	m Creek	Ca	I-Sag Channel	
Fish Species or Hybrid (x)	Station 54 Joe Orr Road	Station 97 170 th Street	Station 58 Ashland Avenue	Station 59 Cicero Avenue	Station 42 Route 83
Gizzard shad	0	0	11	60	15
Grass pickerel ¹	0	1	0	0	0
Goldfish	0	0	0	1	0
Common carp	0	3	40	11	15
Emerald shiner	0	0	0	2	0
Bluntnose minnow	0	0	2	13	40
White sucker	0	1	0	0	0
Yellow bullhead ¹	1	1	4	1	0
Channel catfish ¹	0	1	0	0	0
Green sunfish ¹	0	0	8	9	1
Pumpkinseed ¹	0	0	0	1	0
Bluegill ¹	1	1	16	6	0
Largemouth bass ¹	0	1	18	19	1
Johnny darter	1	0	0	0	0
Freshwater drum	0	0	2	1	0
Round goby	0	2	0	0	1
Number of Game Fish Species	2	5	4	5	2
Total Number of Fish Species	3	8	8	11	6
Total Number of Fish	3	11	101	124	73
Total Weight of Fish (kg)	0.06	1.3	135.1	40.2	43.7

TABLE 5 (Continued): NUMBER OF FISH COLLECTED FROM EACH SAMPLING STATION IN THE CALUMET RIVER SYSTEM DURING 2011

¹Game species

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		Des Plaines Rive	r	Higgins Creek	Salt Creek	West Branch DuPage River
	Station 13	Station 22	Station 91	Station 78	Station 18	Station 64
Fish Species or	Lake-Cook	Ogden	Material Service	Wille	Devon	Lake
Hybrid (x)	Road	Avenue	Road	Road	Avenue	Street
Central mudminnow	0	0	2	0	0	0
Grass pickerel ¹	0	0	0	0	0	0
Goldfish	0	0	0	0	1	0
Common carp	0	0	0	0	0	1
Golden shiner	0	0	0	0	0	0
Emerald shiner	0	0	0	0	0	0
Spottail shiner	0	0	0	0	0	0
Spotfin shiner	6	4	3	0	1	0
Bluntnose minnow	27	0	0	0	0	1
Fathead minnow	0	0	0	3	0	0
White sucker	1	5	0	0	0	3
Spotted sucker	1	0	0	0	0	0
Oriental weatherfish	0	0	4	0	0	0
Black bullhead ¹	1	0	0	0	0	1
Yellow bullhead ¹	2	0	3	0	4	4
Channel catfish ¹	0	0	0	0	0	0
Blackstripe topminnow	19	0	4	0	2	0
Mosquitofish	0	0	1	0	0	0
Brook silverside	0	0	0	0	0	0
Rock bass ¹	1	0	0	0	0	0
Green sunfish ¹	10	17	0	0	18	13
Pumpkinseed ¹	1	0	0	0	0	0

TABLE 6: NUMBER OF FISH COLLECTED FROM EACH SAMPLING STATION IN THE DES PLAINES RIVER SYSTEM DURING 2011

TABLE 6 (Continued): NUMBER OF FISH COLLECTED FROM EACH STATION ON THE DES PLAINES RIVER SYSTEM DURING 2011

		Des Plaines R	iver	Higgins Creek	Salt Creek	West Branch DuPage River
Fish Species or Hybrid (x)	Station 13 Lake-Cook Road	Station 22 Ogden Avenue	Station 91 Material Service Road	Station 78 Wille Road	Station 18 Devon Avenue	Station 64 Lake Street
Orangespotted sunfish ¹	0	0	0	0	5	0
Bluegill ¹	4	$\overset{\circ}{2}$	0	0 0	25	2
Longear sunfish ¹	0	$\overline{0}$	Ő	Ő	0	$\frac{2}{0}$
Smallmouth bass ¹	0	0	0	0	0	0
Largemouth bass ¹	2	0	0	0	4	0
Johnny darter	0	0	0	0	0	0
Yellow perch	0	0	0	0	0	0
Round goby	0	4	0	0	0	0
Number of Game Fish Species	7	2	1	0	5	4
Total Number of Fish Species	12	5	6	1	8	7
Total Number of Fish	75	32	17	3	60	25
Total Weight of Fish (g)	1,182	178	124	8	409	940

¹Game Species.

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APPENDIX A

OHIO QUALITATIVE HABITAT EVALUATION INDEX



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet QHEI Score:

Stream & Location:			_ <i>RM:</i>	<i>Date:</i> _//
River Code:	Score STORET #:	ers Full Name & Affiliation: Lat./ Long.:	/8 .	Office verified
1] SUBSTRATE Check ONLY TV		(NAD 83 - decimal °) •	/0	<u> </u>
estimate % or r	tote every type present		DNE (<i>Or 2 & a</i>	
BEST TYPES POOL RI	FFLE OTHER TYPES PO			QUALITY
BLDR /SLABS [10]	HARDPAN [4]			HEAVY [-2]
BOULDER [9]		WETLANDS [0]	SILT	NORMAL [0]
GRAVEL [7]		HARDPAN [0]		EREF 111
SAND [6]	ARTIFICIAL [0]	SANDSTONE [0]	SDDED,	EXTENSIVE [-2] Moderate [-1] Normal [0] NONE [1]
	(Score natural subst	trates; ignore RIP/RAP [0] pint-sources) LACUSTURINE [0	N NES	MODERATE [-1] Maximul
NUMBER OF BEST TYPES:	3 or less [0]		100 -	
Comments		COAL FINES [-2]		
2] INSTREAM COVER Indicat quality; 3-Highest quality in modera diameter log that is stable, well deve UNDERCUT BANKS [1] OVERHANGING VEGETATIO SHALLOWS (IN SLOW WAT ROOTMATS [1] Comments	; 2-Moderate amounts, but not of te or greater amounts (e.g., very l eloped rootwad in deep / fast wat POOLS > 70cm [DN [1]ROOTWADS [1]	highest quality or in small amounts large boulders in deep or fast wate er, or deep, well-defined, functiona	r, large C I pools. IRS [1]	AMOUNT heck ONE (Or 2 & average) EXTENSIVE >75% [11] MODERATE 25-75% [7] SPARSE 5-<25% [3] NEARLY ABSENT <5% [1] Cover Maximum 20
3] CHANNEL MORPHOLOG	Check ONE in each category (Or 2 & average)	(//////////////////////////////	
SINUOSITY DEVELOPI				
HIGH [4] EXCELLE		🗖 HIGH [3]		
MODERATE [3] GOOD [5]		MODERATE [2]		
LOW [2] FAIR [3] NONE [1] POOR [1]	RECOVERING [3]	LOW [1]		Channel
Comments				Maximum
				20
4] BANK EROSION AND RII	PARIAN ZONE Check ONE ir	n each category for EACH BANK)r 2 per bank &	average)
		FLOOD PLAIN QUAL	ITY _{L R}	
L ROSION		FOREST, SWAMP [3]	· · ·	ONSERVATION TILLAGE [1]
		SHRUB OR OLD FIELD [2] RESIDENTIAL, PARK, NEW FIELD		RBAN OR INDUSTRIAL [0] NING / CONSTRUCTION [0]
		FENCED PASTURE [1]	-1-1	predominant land use(s)
		OPEN PASTURE, ROWCROP [0]		m riparian. Riparian
Comments				Maximum
				10
5] POOL / GLIDE AND RIFFI			, []	Recreation Potential
	CHANNEL WIDTH heck ONE (Or 2 & average)	CURRENT VELOCITY Check ALL that apply		Primary Contact
		TORRENTIAL [-1] SLOW [1]	S	Secondary Contact
	WIDTH = RIFFLE WIDTH [1]	VERY FAST [1] INTERST	TIAL [-1]	(circle one and comment on back)
				Baali
0.2-<0.4m [1]	L	MODERATE [1] DEDDIES [Indicate for reach - pools and r		Pool / Current
Comments		,		Maximum
Indicate for functional r	iffles: Best areas must be	e large enough to support	a populați	12
of riffle-obligate species		E (Or 2 & average).	a populati	NO RIFFLE [metric=0
RIFFLE DEPTH	RUN DEPTH RIFFLE	/ RUN SUBSTRATE RIF	FLE / RUN	EMBEDDEDNESS
	XIMUM > 50cm [2] STABLE		NO	
	XIMUM < 50cm [1] MOD. ST		LO	DERATE [0] Riffle /
BEST AREAS < 5cm [metric=0]	LI UNS TAB	LE (e.g., Fine Gravel, Sand) [0]	EX	TENSIVE [-1] Run Maximum
Comments				Maximum 8
6] GRADIENT (ft/mi)	VERY LOW - LOW [2-4]	%POOL:)%GLIDE:	Gradient
	MODERATE [6-10]		%RIFFLE:	Maximum
(mi²)	HIGH - VERY HIGH [10-6]	%RUN: (10
EPA 4520				06/16/06

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

AJ SAMPLED REACH Check ALL that apply	Comment RE: Reach consistency/ I	s reach typical of steam?, Recreation	n/ Observed - Inferred, Other	/ Sampling observations, Concerns, Acc	ess directions, etc.
METHOD STAGE BOAT 1st -sample pass- 2nd WADE HIGH L. LINE UP					
0.5 Km 0.2 Km 1stsample pass 2r	INVASIVE MACROPHYTES EXCESS TURBIDITY DISCOLORATION FOAM / SCUM OIL SHEEN TRASH / LITTER NUISANCE ODOR SLUDGE DEPOSITS CSOs/SSOs/OUTFALLS	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	EJ ISSUES WWTP / CSO / NPDES / INDUSTRY HARDENED / URBAN / DIRT&GRIME CONTAMINATED / LANDFILL BMPs-CONSTRUCTION-SEDIMENT LOGGING / IRRIGATION / COOLING BANK / EROSION / SURFACE FALSE BANK / MANURE / LAGOON WASH H20 / TILE / H20 TABLE ACID / MINE / QUARRY / FLOW NATURAL / WETLAND / STAGNANT PARK / GOLF / LAWN / HOME ATMOSPHERE / DATA PAUCITY	F] MEASUREMENTS x̄ width x̄ depth max. depth x̄ bankfull width bankfull x̄ depth W/D ratio bankfull max. depth floodprone x ² width entrench. ratio Legacy Tree:

Stream Drawing:

APPENDIX B

COMPLETED OHIO QUALITATIVE HABITAT EVALUATION INDEX FIELD ASSESSMENT FORMS FOR EACH 2011 WADEABLE STATION

WW < 3
OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet QHEI Score: 58 fair
Stream & Location: Ashlasic LLR RM: Date: 3 19 11
Scorers Full Name & Affiliation:
AL CLUDETDATE Check ONLY Two substrate TYPE ROXES:
estimate % or note every type present BEST TYPES BLDR /SLABS [10] CHER TYPES BLDR /SLABS [10] HARDPAN [4] BOULDER [9] DETRITUS [3] BOULDER [9] DETRITUS [3] BLDR /SLABS [10] BEST TYPES BOULDER [9] DETRITUS [3] BOULDER [9] BEST TYPES BOULDER [9] BEST TYPES BOULDER [9] BEST TYPES BEST TYPES SILT [2] BEST TYPES: Silt [2] States [0] SHALE [-1] BEST TYPES: 4 or more [2] sludge from point-sources SHALE [-1] NONE [1] BEST TYPES: 4 or more [2] sludge from point-sources SHALE [-1] NONE [1] BEST TYPES: 4 or more [2] sludge from point-sources BESHALE [-1] SHALE [-1] <
2] INSTREAM COVER indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 3-Highest 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 / last water, or deep, well-defined, functional pools. AMOUNT OVERHANGING VEGETATION [1] OVERHANGING VEGETATION [1] ROOTWADS [1] OVERWADS [1] EXTENSIVE >75% [1] OVERHANGING VEGETATION [1] BOULDERS [1] BOULDERS [1] OVERWOODY DEBRIS [1] NEARLY ABSENT <5% [1]
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] Comments Channel Channe
4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average) River right looking downstream RIPARIAN WIDTH FLOOD PLAIN QUALITY Conservation tillage [1] Mone / Little [3] Moderate 10-50m [3] Moderate [2] NARROW 5-10m [2] Heavy / Severe [1] Very NARROW < 5m [1]
5] POOL / GLIDE AND RIFFLE / RUN QUALITY MAXIMUM DEPTH CHANNEL WIDTH CURRENT VELOCITY Check ONE (ONLY) Check ONE (Or 2 & average) Check ALL that apply 10
Indicate for functional riffles; Best areas must be large enough to support a population of riffle/obligate species: Check ONE (Or 2 & average). RIFFLE DEPTH RUN DEPTH RIFFLE / RUN SUBSTRATE RIFFLE / RUN EMBEDDEDNESS BEST AREAS > 10cm [2] MAXIMUM > 50cm [2] STABLE (e.g., Cobbie, Boulder) [2] NONE [2] BEST AREAS 5-10cm [1] MAXIMUM < 50cm [1] MOD. STABLE (e.g., Large Gravel) [1] LOW [1] BEST AREAS < 510cm [1] MAXIMUM < 50cm [1] UNSTABLE (e.g., Fine Gravel, Sand) [0] Riffle (Imetric=0] Comments
6] GRADIENT (DRAINAGE AREA (mi ²) HIGH - VERY HIGH [10-6] HIGH -
EPA 4520 3 301- Wirel () / / / / / / / / / / / / / / / / / /

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A) SAMPLED REACH Check ALL that apply	Comment RE: Reach consistency/1 53 yd wide	s reach typical of steam?, Recreation	/ Observed - Inferred, Othen	Sampling observations, Concerns, Acce	ess directions, etc.
METHOD STAGE BOAT 1s - simple cases 2nd WADE HIGH L LINE UP OTHER NORMAL	0	Core			
meters SECCHI DEPTH CANOPY 1al W > 85% - OPEN 1al D 55% < 65%	Invasive macrophytes EXERCIST TURBIDITY DISCOLORATION FOAM / SCUM	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 BMP3-CONSTRUCTION-SEDIMENT LOGGING / IRRIGATION / COOLING BANK / EROSION / SURFACE FALSE BANK / MANURE / LAGOON WASH H20 / TILE / H20 TABLE ACID / MINE / QUARRY / FLOW NATURAL / WETLAND / STAGNANT PARK / GOLF / LAWN / HOME ATMOSPHERE / DATA PAUCITY	F] MEASUREMENTS x width x depth max, depth x bankfull width bankfull x depth W/D ratio bankfull max, depth floodprone x ² width entrench, ratio Legacy Tree:

Stream Drawing:

B-2

WN50				- Fair
	Qualitative Habitat Eva	aluation Index Field S	Sheet QHEI Score	
River Code:	Stream:	Stalf after and "	· /*	
Date: 2-15-18	_ Location:	inham Ave		
Scorers Full Name:	Affillation:		*****	
	NLY Two SubstrateTYPE BOXES;		CURCERATE OUALITY	
TYPE POOL F		LE <u>SUBSTRATE ORIGIN</u> Check ONE (OR 2 & AVERAGE)	SUBSTRATE QUALITY Check ONE (OR 2 & AVERAGI	5
	10	D'-LIMESTONE [1] SILT:	- SILT HEAVY [-2]	-,
			SILT MODERATE [-1]	Substrate
CI CHARDPAN [4]		U WETLANDS[0]	-SILT NORMAL [0]	(The second seco
	D DARTIFICIALIO	CI -HARDPAN [0]	·SILT FREE [1]	7
BD-SILT [2] 70	NOTE: Ignore Studge Originating From Point Sources	-SANDSTONE [0] EMBEDD	ED D-EXTENSIVE [-2]	Max 20
	· · · · · · · · · · · · · · · · · · ·	- CI-RIP/RAP [0] NESS:	-MODERATE [-1]	
NUMBER OF SUBSTRATE TY		D .LACUSTRINE [0]	D -NORMAL [0]	
(High Quality Only, Score 5 o	or >) [3]F3 or Less [0]	CI-SHALE [-1]	-NONE [1]	
COMMENTS		COAL FINES [-2]	AMOUNT: Check ONLY One	~~~~
•	live each cover type a score of 0 to TYPE: Score All That Occur	S; see back for meducuons)	AMOUNT: (Check ONLY One check 2 and AVERAGE)	Cover
(Structure)	POOLS> 70 cm [2]	OXBOWS, BACKWATERS [1]	CH- EXTENSIVE > 75% [11]	
OVERHANGING VEGETATI	<u> </u>	3 AQUATIC MACROPHYTES [1]	D - MODERATE 25-75% [7]	
SHALLOWS (IN SLOW WAT		LOGS OR WOODY DEBRIS [1]	CI - SPARSE 5-25% [3]	Max 20
	AENTS:		D - NEARLY ABSENT < 5%[1]	
3] CHANNEL MORPHOL		agory OR check 2 and AVERAG		Channel
SINUOSITY DEVE	LOPMENT CHANNELIZATION		10NS/OTHER	
	XCELLENT [7] D . NONE [6]	I + HIGH [3] I + SNAGO		6
	AIR [3] D - RECOVERED [4]		Y REMOVAL CI - LEVEED	Max 20
	AIR [3] ET- RECOVERING [3]			
DAY: NONE [1] DAY: P	RECOVERY [1]		DE CHANNEL MODIFICATIONS	
COMMENTS:			•	A
41. RIPARIAN ZONE AND	BANK EROSION(check ONE box pe	r bank or check 2 and AVERAGE pe	r bank) 🕈 River Right Looking	Downstream F
RIPARIAN WIDTH	FLOOD PLAIN OU	ALITY (PAST 100 Meter RIPARIA)	VI BANK ERUSIUN	Riparlan
L R. (Per Bank)	L R (Most Predominant Per Ban	k) L R	L R (Per Bank) E [1] B B-NONE/LITTLE [
E G - WIDE > 50m [4]	I CLIFOREST, SWAMP [3]		IDI DI -MODERATE [2]	
	D D RESIDENTIAL, PARK, NEW FIEL			[1] ^{Max 10}
TT VERY NARROW 5 mil] D D-FENCED PASTURE [1]	D D-MINING/CONSTRUCTIO		
10- NONE [0]				
COMMENTS:				and the second secon
	_			
5. JPOOL/GLIDE AND RIFI			Y [POOLS & RIFFLESI]	Pool/ Current
MAX, DEPTH	MORPHOLOGY (Check 1 or 2 & AVERAGE)		That Apply)	
(Check 1 ONLY!) □ - ⇒1m [6]	-POOL WIDTH > RIFFLE WIDTH [2]	•	-TORRENTIAL[-1]	5
PM - 2 00 141	-POOL WIDTH - RIFFLE WIDTH [1]	G-FAST[1]	-INTERSTITIAL[-1]	Max 12
	POOL WIDTH < RIFFLE W. [0]		-INTERMITTENT[-2]	
🖬 - 0.2-0.4m [1]		27-SLOW [1]	-VERY FAST[1]	
[] - < 0.2m [POOL=0]	COMMENTS:			
				Riffle/Run
		OR CHECK 2 AND AVERAGE FFLE/RUN SUBSTRATE	IFFLE/RUN EMBEDDEDNESS	A
RIFFLE DEPTH Best Areas >10 cm [2]	and a state of the	BLE (e.g., Cobble, Boulder) [2]	- NONE [2]	
 Best Areas 5-10 cm[1] Best Areas 5-10 cm[1] 		D. STABLE (e.g., Large Gravel) [1		Max B
□ · Best Areas < 5 cm		STABLE (Fine Gravel, Sand) [0]	D - MODERATE [0]	Gradient
[RIFFLE+0]			- EXTENSIVE [-1]	ത
COMMENTS:		O - NO RIFFLE	[Metric=0]	القا
		* POOL		Max 10
6) GRADIENT (fl/mi):	DRAINAGE AREA (sq.ml.) :			
** Boal areas ment be large unaugh to sup	nart a population of 1990-widepute spectas	%RIFFLE:	%RUN:	
				06/24/01
EFA 1020 7;	10. L'with - 0.6-1 8-Low-	. o higmile		
	0,	111		
	0 - Law -	Mousiale	,	
		В-3		

Is Sampling Reach Repres	sentative of th	e Stream (Y/N)	If Not, E	xplain:				Major Suspected Sources of Impacts (Check All That Apply):
								None D Industrial D WWTP D
			•					
		· · ·	······					Silviculture[] Construction [] Urban Runolf []
	First Sempling Pase	Gear:	Distance:	Water Clari	y: Water Stag	e: Cunopy	-% Open	CSOs Suburban impacts Mining Channelization
Subjective Aesthetic Rating (1-10) Gradient: (1-10)	Average Ave Width D		Stream Av. Bankfult B Width	n Measurements ankfull Mean W Depth Ri	D Bankfull Ma	K Floodprone Area Width		Other Flow Alteration []
Stream Drawing:	120		L	<u>,</u>				Other:

	100110
Instructions for scoring the alternate cover metric: Each cover type should receive a score	is Stream Ephemeral (no pools, totally dry or only damp spots)?
amounts or if more common of maminal quality 2 - Cover type present in very small	How Fer.
amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed	In There Water Close Downstream?
rootwads in deep/fast water, or deep, well-defined, functional pools.	Is Dry Channel Mostly Natural?

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Yes/No

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River Code:			2.801
Date: 8-10-11	Location: Durn		
Scorers Full Name:	Affiliat		
•	ONLY Two SubstrateTYPE BC		CHROTRATE OUALITY
- hundard and the		. RIFFLE SUBSTRATE ORIGIN Check ONE (OR 2 & AVERAGE)	SUBSTRATE QUALITY Check ONE (OR 2 & AVERAGE)
-BLDR /SLBS(10)			D- SILT HEAVY [-2]
			D-SILT MODERATE [-1] Sub
			-SILT NORMAL [0]
			D-SILT FREE [1]
	NOTE: Ignore Skudge Originet	-SANDSTONE [0] EMBEDI	
	From Point Sources	D-RIP/RAP [0] NESS:	MODERATE [-1]
NUMBER OF SUBSTRATE	TYPES: D-4 or More [2]	-LACUSTRINE [0]	II -NORMAL [0]
(High Quality Only, Score		D-SHALE [-1]	D-NONE [1]
COMMENTS		D-COAL FINES [-2]	
2] INSTREAM COVER	(Give each cover type a score	of 0 to 3; see back for instructions)	AMOUNT: (Check ONLY One or Co
(Structure)	TYPE: Score All That		check 2 and AVERAGE)
UNDERCUT BANKS [1]	~		CI - EXTENSIVE > 75% [11]
OVERHANGING VEGET			B - SPARSE 5-25% [3] Ma
D SHALLOWS (IN SLOW)			I - NEARLY ABSENT < 5%[1]
ROOTMATS [1] CO	OMMENTS:	R Category OR check 2 and AVERAG	
	EVELOPMENT CHANNELIZATI	ON STABILITY MODIFICA	TIONS/OTHER Cha
	· EXCELLENT [7] D - NONE [6]		
	GOOD [5] D - RECOVERI		CATION D. ISLANDS
	I- FAIR [3] IN- RECOVERI	the following the second se	PY REMOVAL CI - LEVEED ME
	I- POOR [1] D- RECENT (GING D - BANK SHAPING SIDE CHANNEL MODIFICATIONS
COMMENTS:	RECOVERY [1]	box per bank or check 2 and AVERAGE p	
1 0 (0 0 1)			M BANK EROSION Rip
- NARROW 5-10 m [2 - VERY NARROW <5 - NONE [0]	L R (Most Predominant Pe EFOREST, SWAMP [3] [] [] [] SHRUB OR OLD FIELD [[] [] [] RESIDENTIAL, PARK, NEV m[1] [] [] -FENCED PASTURE [1]		L R (Per Bank) 5E [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D D-HEAVY/SEVERE[1] ^{Mai}
2 2 • WIDE → 50m [4] □ - MODERATE 10-50m □ - NARROW 5-10 m [7 □ - VERY NARROW <5 □ - NONE [0] COMMENTS:	FOREST, SWAMP [3] FOREST, SWAM	2] D-CONSERVATION TILLAC 2] D B-URBAN OR INDUSTRIA W FIELD [1] D D-OPEN PASTURE,ROWC	L R (Per Bank) 5E [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D D-HEAVY/SEVERE[1] ^{Mai}
2 12 - WIDE > 50m [4] □ - MODERATE 10-50m □ - NARROW 5-10 m [7 □ - VERY NARROW <5 □ - NONE [0] COMMENTS:	FOREST, SWAMP [3] To ESHRUB OR OLD FIELD [C C C C C C C C C C C C C C C C C C	CURRENT YELOCI	L R (Per Bank) 5E [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D D-HEAVY/SEVERE[1] ^{Max} ON [0] Po <u>IY [</u> POOLS & RIFFLES1] Cur
2 12 - WIDE > 50m [4] □ - MODERATE 10-50m □ - NARROW 5-10 m [7 □ - VERY NARROW <5 □ - NONE [0] COMMENTS: 5.]POOL/GLIDE AND F	FOREST, SWAMP [3] To ESHRUB OR OLD FIELD [C ESIDENTIAL, PARK, NEV To E FENCED PASTURE [1] C E FENCED PASTURE [1] RIFFLE/RUN QUALITY <u>MORPHOLOGY</u> (Check 1 or 2 & AVERAC	CURRENT YELOCI	L R (Per Bank) 5E [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D -HEAVY/SEVERE[1] ^{Max} ON [0] Po TY [POOLS & RIFFLES!] Cur I That Apply)
■ ■- WIDE > 50m [4] □ - MODERATE 10-50m □ - NARROW 5-10 m [3 □ - VERY NARROW <5 □ - VERY NARROW <5 □ - NONE [0] COMMENTS: 5.]POOL/GLIDE AND F MAX, DEPTH (Check 1 ONLY!) □ - >1m [6]	FOREST, SWAMP [3] D FOREST, SWAMP [3] D ESHRUB OR OLD FIELD [D RESIDENTIAL, PARK, NEV m[1] D - FENCED PASTURE [1] RIFFLE/RUN QUALITY <u>MORPHOLOGY</u> (Check 1 or 2 & AVERACE D POOL WIDTH > RIFFLE WIDT	CURRENT YELOCI Check AI TH [2] CONSERVATION TILLAC CURRENT YELOCI CONSTRUCTION CON	L R (Per Bank) 5E [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D D-HEAVY/SEVERE[1] ^{Mai} ON [0] TY [POOLS & RIFFLES!] Cur 1 That Apply) D-TORRENTAL[-1] L TI 1
	FOREST, SWAMP [3] D FOREST, SWAMP [3] D FOREST, SWAMP [3] D FENCED OR OLD FIELD [D RESIDENTIAL, PARK, NEV m[1] D -FENCED PASTURE [1] RIFFLE/RUN QUALITY <u>MORPHOLOGY</u> (Check 1 or 2 & AVERACC -POOL WIDTH > RIFFLE WIDT -POOL WIDTH = RIFFLE WIDT	CURRENT YELOCI GE CURRENT YELOCI GE CORRENT YELOCI GE GE GE GE GE GE GE GE GE <td< td=""><td>L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D -HEAVY/SEVERE[1]^{Max} ON [0] Po I -HEAVY/SEVERE[1] Po Po Po Po Po Po I That Apply) D-TORRENTIAL[-1] D-INTERSTITIAL[-1] Max</td></td<>	L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D -HEAVY/SEVERE[1] ^{Max} ON [0] Po I -HEAVY/SEVERE[1] Po Po Po Po Po Po I That Apply) D-TORRENTIAL[-1] D-INTERSTITIAL[-1] Max
	FOREST, SWAMP [3] D FOREST, SWAMP [3] D ESHRUB OR OLD FIELD [D RESIDENTIAL, PARK, NEV m[1] D - FENCED PASTURE [1] RIFFLE/RUN QUALITY <u>MORPHOLOGY</u> (Check 1 or 2 & AVERACE D POOL WIDTH > RIFFLE WIDT	CURRENT YELOCI GE CURRENT YELOCI GE CORRENT YELOCI GE GE GE GE GE GE GE <t< td=""><td>L R (Per Bank) SE [1] B D-NONE/LITTLE [3] CROP [0] D -HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur 1 That Apply) 2-TORRENTIAL[-1] 5 D-INTERSTITIAL[-1] Mai D-INTERMITTENT[-2]</td></t<>	L R (Per Bank) SE [1] B D-NONE/LITTLE [3] CROP [0] D -HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur 1 That Apply) 2-TORRENTIAL[-1] 5 D-INTERSTITIAL[-1] Mai D-INTERMITTENT[-2]
2 10 - WIDE > 50m [4] □ - MODERATE 10-50m □ - NARROW 5-10 m [2 □ - VERY NARROW <5 □ - VERY NARROW <5 □ - NONE [0] COMMENTS: 5.]POOL/GLIDE AND F MAX, DEPTH (Check 1 ONLY!) □ - >1m [6] 11 - 0.4-0.7m [2] □ - 0.2-0.4m [1]	FOREST, SWAMP [3] D FOREST, SWAMP [3] D ESHRUB OR OLD FIELD [D RESIDENTIAL, PARK, NEV m[1] D - FENCED PASTURE [1] RIFFLE/RUN QUALITY <u>MORPHOLOGY</u> (Check 1 or 2 & AVERACC -POOL WIDTH > RIFFLE WIDT -POOL WIDTH + RIFFLE WIDT @ -POOL WIDTH < RIFFLE W. [0]	CURRENT YELOCI GE CURRENT YELOCI GE CORRENT YELOCI GE GE GE GE GE GE GE <t< td=""><td>L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D -HEAVY/SEVERE[1]^{Max} ON [0] Po I -HEAVY/SEVERE[1] Po Po Po Po Po Po I That Apply) D-TORRENTIAL[-1] D-INTERSTITIAL[-1] Max</td></t<>	L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] CROP [0] D -HEAVY/SEVERE[1] ^{Max} ON [0] Po I -HEAVY/SEVERE[1] Po Po Po Po Po Po I That Apply) D-TORRENTIAL[-1] D-INTERSTITIAL[-1] Max
■ ■- WIDE > 50m [4] ■ ■ - MODERATE 10-50m ■ ■ - NARROW 5-10 m [7 ■ ■ - VERY NARROW <5 ■ ■ - VERY NARROW <5 ■ ■ - NONE [0] COMMENTS: 5.]POOL/GLIDE AND F <u>MAX, DEPTH</u> (Check 1 ONLY!) ■ - >1m [6] ■ 0.7-1m [4] ■ - 0.4-0.7m [2]	FOREST, SWAMP [3] D FOREST, SWAMP [3] D FOREST, SWAMP [3] D FENCED OR OLD FIELD [D RESIDENTIAL, PARK, NEV m[1] D -FENCED PASTURE [1] RIFFLE/RUN QUALITY <u>MORPHOLOGY</u> (Check 1 or 2 & AVERACC -POOL WIDTH > RIFFLE WIDT -POOL WIDTH = RIFFLE WIDT	CURRENT YELOCI GE CURRENT YELOCI GE CORRENT YELOCI GE GE GE GE GE GE GE <t< td=""><td>L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D D-HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur 1 That Apply) D-TORRENTIAL[-1] Cur 1 That Apply] D-INTERSTITIAL[-1] D-INTERMITTENT[-2] D-VERY FAST[1]</td></t<>	L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D D-HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur 1 That Apply) D-TORRENTIAL[-1] Cur 1 That Apply] D-INTERSTITIAL[-1] D-INTERMITTENT[-2] D-VERY FAST[1]
2 10 - WIDE > 50m [4] □ - MODERATE 10-50m □ - NARROW 5-10 m [2 □ - VERY NARROW <5 □ - VERY NARROW <5 □ - NONE [0] COMMENTS: 5.]POOL/GLIDE AND F MAX, DEPTH (Check 1 ONLY!) □ - >1m [6] 11 - 0.4-0.7m [2] □ - 0.2-0.4m [1]	FOREST, SWAMP [3]	CURRENT YELOCI GE CURRENT YELOCI GE CORRENT YELOCI GE GE GE GE GE GE GE <t< td=""><td>L R (Per Bank) SE [1] B D-NONE/LITTLE [3] CROP [0] D -HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur 1 That Apply) 2-TORRENTIAL[-1] 5 D-INTERSTITIAL[-1] Mai D-INTERMITTENT[-2]</td></t<>	L R (Per Bank) SE [1] B D-NONE/LITTLE [3] CROP [0] D -HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur 1 That Apply) 2-TORRENTIAL[-1] 5 D-INTERSTITIAL[-1] Mai D-INTERMITTENT[-2]
2 ■ 20- WIDE > 50m [4] □ □ - MODERATE 10-50m □ □ - NARROW 5-10 m [2] □ □ - VERY NARROW <5	FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTI CO	L R (Per Bank) SE [1] B D-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D D-HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur I That Apply) D-TORRENTIAL[-1] D-INTERSTITIAL[-1] D-INTERSTITIAL[-1] Max Riffle RIFFLE/RUN EMBEDDEDNESS
	FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTI CONSTR	L R (Per Bank) SE [1] B D-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D -HEAVY/SEVERE[1] Na: ON [0] TY [POOLS & RIFFLES!] Cur I That Apply) D-TORRENTIAL[-1] D-INTERSTITIAL[-1] D-INTERSTITIAL[-1] D-INTERSTITIAL[-1] Cur Riffle RIFFLE/RUN EMBEDDEDNESS D-NONE [2]
■ ■- WIDE > 50m [4] ■ ■ - MODERATE 10-50m ■ ■ - NARROW 5-10 m [3] ■ □ - VERY NARROW <5	FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTI CONSTR	L R (Per Bank) SE [1] B D-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D -HEAVY/SEVERE[1] Na: ON [0] TY [POOLS & RIFFLES!] Cur I That Apply) D-TORRENTIAL[-1] D-INTERSTITIAL[-1] SINTERSTITIAL[-1] D-INTERMITTENT[-2] D-VERY FAST[1] Riffle RIFFLE/RUN EMBEDDEDNESS D - NONE [2] I D-LOW [1] Max
■ ■- WIDE > 50m [4] □ □ - MODERATE 10-50m □ □ - NARROW 5-10 m [3] □ □ - VERY NARROW <5	FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTI CONSTR	L R (Per Bank) SE [1] B D-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D -HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur I That Apply) D-TORRENTIAL[-1] S I That Apply) D-TORRENTIAL[-1] S I That Apply) D-TORRENTIAL[-1] S I That Apply D-TORRENTIAL[-1] S I That Apply I That Apply D-TORRENTIAL[-1] S I That Apply I That Appl
2 100-WIDE > 50m [4] □ - MODERATE 10-50m □ - NARROW 5-10 m [3] □ - VERY NARROW <5	FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTI CONSTR	L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D -HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur I That Apply) D-TORRENTAL[-1] 6 D-INTERSTITAL[-1] 6 D-INTERSTITAL[-1] 6 I That Apply) D-TORRENTAL[-1] 6 D-INTERSTITAL[-1] 7 Riffle RIFFLE/RUN EMBEDDEDNESS D - NONE [2] 7 I D- LOW [1] 7 Max D - MODERATE [0] 6 Gra D - EXTENSIVE [-1] 7 (1)
ID - WIDE > 50m [4] ID - MODERATE 10-50m ID - NARROW 5-10 m [3] ID - VERY NARROW <5	FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTI CONSTR	L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D -HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur I That Apply) D-TORRENTAL[-1] 6 D-INTERSTITAL[-1] 6 D-INTERSTITAL[-1] 6 I That Apply) D-TORRENTAL[-1] 6 D-INTERSTITAL[-1] 7 Riffle RIFFLE/RUN EMBEDDEDNESS D - NONE [2] 7 I D- LOW [1] 7 Max D - MODERATE [0] 6 Gra D - EXTENSIVE [-1] 7 (1)
Image: Control of the second seco	FOREST, SWAMP [3] FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTION CONSTRUCTI	L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D D-HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur I That Apply) D-TORRENTUL[-1] 6 D-INTERSTITIAL[-1] 6 D-INTERSTITIAL[-1] 6 I That Apply) D-TORRENTUL[-1] 6 I That Apply) D-TORRENTUL[-1] 6 Cur I That Apply) D-TORRENTUL[-1] 6 Cur I That Apply) D-TORRENTUL[-1] 6 Cur I That Apply (Cur I That Apply) D-TORRENTUL[-1] 6 Cur I That Apply (Cur I That Apply) D-TORRENTUL[-1] 7 Cur I That Apply (Cur I That Apply (Cur
2 ■ 20- WIDE > 50m [4] □ □ - MARROW 5-10 m [7] □ □ - VERY NARROW 5-10 m [7] □ □ - VERY NARROW 5-10 m [7] □ □ - VERY NARROW 5-10 m [7] □ - NONE [0] COMMENTS: 5.]POOL/GLIDE AND F MAX, DEPTH (Check 1 ONLY!) □ - 11m [6] ■ 0.7-11m [4] □ - 0.4-0.7m [2] □ - 0.2-0.4m [1] □ - 0.2m [POOL=0] RIFFLE DEPTH □ - Best Areas >10 cm	FOREST, SWAMP [3] FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTI CO	L R (Per Bank) SE [1] B B-NONE/LITTLE [3] CAL [0] C -MODERATE [2] ROP [0] C -HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES1] Cur 1 That Apply) - TORRENTIAL[-1] - INTERSTITIAL[-1] - INTERSTITIAL[-1] - INTERMITTENT[-2] - VERY FAST[1] Riffle RIFFLE/RUN EMBEDDEDNESS C - NONE [2] 1] C - LOW [1] Max C - MODERATE [0] Gra C - EXTENSIVE [-1] [Metric=0] Max
■ ■- WIDE > 50m [4] ■ ■ MODERATE 10-50m ■ NARROW 5-10 m [2] ■ - NONE [0] COMMENTS: 5.]POOL/GLIDE AND F MAX, DEPTH (Check 1 ONLY!) = - 11m [6] ■ - 0.4-0.7m [2] = 0.2-0.4m [1] = < 0.2-0.4m [1]	FOREST, SWAMP [3] FOREST, SWAMP [3]	CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CURRENT YELOCI CONSTRUCTION CONSTRUCTION CONS	L R (Per Bank) SE [1] B B-NONE/LITTLE [3] L [0] D D-MODERATE [2] ROP [0] D D-HEAVY/SEVERE[1] ON [0] TY [POOLS & RIFFLES!] Cur I That Apply) D-TORRENTUL[-1] 6 D-INTERSTITIAL[-1] 6 D-INTERSTITIAL[-1] 6 I That Apply) D-TORRENTUL[-1] 6 I That Apply) D-TORRENTUL[-1] 6 Cur I That Apply) D-TORRENTUL[-1] 6 Cur I That Apply) D-TORRENTUL[-1] 6 Cur I That Apply (Cur I That Apply) D-TORRENTUL[-1] 6 Cur I That Apply (Cur I That Apply) D-TORRENTUL[-1] 7 Cur I That Apply (Cur I That Apply (Cur

Is Sampling Reach Repres	entative of	f the Stre	am (Y/N)	If Not,	Exp <u>lain:</u>					Major Suspected Sources of Impacts (Check All That Apply): None D Industrial
	1									WWTP C Ag C Livestock C Silviculture C Construction C Urben Runoff
	First Sampling P	-	ear:	Distance	Water	Clarity:	Water Stage	a: Canopy	-% Open	CSOs Suburban Impacts Mining Channelization Ripartan Removal (2)
Subjective Aesthetic Rating Rating (1-10) (1-10) Gradient: - Low, [] - Moderate, [] -High	Width	Average Depth	Maximum Depth		em Measuren Bankfull Mear Depth		Bankfull Max Depth	Floodgrone Area Width		Lendifie (2) Netural (2) Dame (2) Other Flow Alteration (2) Other:

Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

WW52			Pre c P
OhioEPA	Qualitative Habitat Ev and Use Assessmen		CHEI Score: 33
Stream & Location: Little	Calumet River, We	Atworth RM:	Date:812211/
NC/DG	1	Name & Affiliation:/8	Office verified
River Code: 11 SUBSTRATE Check ONLY Two s	INAD I	13 - decima *)	location
BEST TYPES POOL RIFFL BLDR /SLABS [10] BLDR /SLABS [10] BOULDER [9] GRAVEL [7] BEDROCK [5] NUMBER OF BEST TYPES:		UTILLS (1) WETLANDS (0) SI	QUALITY MHEAVY [-2]
Comments U	3 or less [u]	COAL FINES [-2]	
2] INSTREAM COVER Indicate pr quality: 3-Highest quality in moderate o diameter log that is stable, well develop UNDERCUT BANKS [1] OVERHANGING VEGETATION [SHALLOWS (IN SLOW WATER) ROOTMATS [1]	rg creater amounts (e.g., very large bou red rootwad in deep / fast water, or dee POOLS > 70cm [2] 1]ROOTWADS [1]	iders in deep or last water, large	Check ONE (Or 2 & average) EXTENSIVE >75% [11] MODERATE 25-75% [7] SPARSE 5-<25% [3] NEARLY ABSENT <5% [1]
Comments			Cover Maximum 20
3] CHANNEL MORPHOLOGY C SINUOSITY DEVELOPMEN HIGH [4] EXCELLENT MODERATE [3] GOOD [5] LOW [2] FAIR [3] NONE [1] POOR [1] Comments	NT CHANNELIZATION	STABILITY HIGH [3] MODERATE [2] LOW (1]	Channel Meximum 20
EROSION D' Wid D NONE / LITTLE [3] D MOI D/D MODERATE [2] D NAF	PARIAN WIDTH R FL E > 50m [4] D D FOREST DERATE 10-50m [3] D D SHRUB RROW 5-10m [2] D D KESIDEJ YNARROW < 5m [1]	OOD PLAIN QUALITY ; SWAMP [3] or old field [2] OR OLD FIELD [2] VITAL, PARK, NEW FIELD [1] PASTURE [1]	ank & average) CONSERVATION TILLAGE [1] URBAN OR INDUSTRIAL [0] MINING / CONSTRUCTION [0] cale predominant land use(s) t 100m riparian. Riparian Maximum 10
Check ONE (ONLY!) Check ☐ > 1m [6] ☐ POOL W ☐ 9.7≪1m [4] ☐ POOL W	IANNEL WIDTH CL ONE (Or 2 & average) IDTH > RIFFLE WIDTH [2] C TORRE IDTH = RIFFLE WIDTH [1] VERY F IDTH < RIFFLE WIDTH [0] FAST [MODE]	URRENT VELOCITY Check ALL that apply INTIAL [-1] SLOW [1] FAST [1] INTERSTITIAL [-1] INTERMITTENT [-2] RATE [1] EDDIES [1] INF for reach - pools and riffles.	
of riffle-obligate species: RIFFLE DEPTH RUI BESTAREAS > 10cm [2] MAXIN	IUM > 50cm [2] [] STABLE (e.g., Col IUM < 50cm [1] [] MOD. STABLE (e.	average). SUBSTRATE RIFFLE / R bble, Boulder) [2] [] g., Large Gravel) [1] [] Eine Gravel, Sandi [0] []	
DRAINAGE AREA	VERY LOW - LOW [2-4] MODERATE [6-10] HIGH - VERY HIGH [10-6]	%POOL: %GLI %RUN: (100)%RIFF	
EPA 4520 52' Wide	1), 6 - 1, 0. f- In/ n	a to a	06/16/06

B-7

Comment RE. Reach consistency/ Is reach typical of steam?, Recreation/ Observed - Inferred, Other/ Sampling observations, Concerns, Access directions, etc. AI SAMPLED REACH Check ALL that apply METHOD STAGE 1st -sample pass- 2nd CY BOAT HIGH WADE O UP DLUNE | NORMAL OTHER TLOW DISTANCE DRY 0.5 Km E] ISSUES F] MEASUREMENTS **BJAESTHETICS** DI MAINTENANCE CLARITY Circle some & COMMENT 0.2 Km WWTP CSO / NPDES / INDUSTRY 1st -sample pass- 2nd PUBLIC / PRIVATE / BOTH / NA I NUISANCE ALGAE X width 0.15 Km □ < 20 cm ACTIVE / HISTORIC / BOTH / NA HARDENED / URBAN / DIRT&GRIME INVASIVE MACROPHYTES X depth 🗍 0.12 Km 20-<40 cm CONTAMINATED / LANDFILL EXCESS TURBIDITY YOUNG-SUCCESSION-OLD max. depth OTHER. 40-70 cm DISCOLORATION SPRAY / SNAG / REMOVED **BMPs-CONSTRUCTION-SEDIMENT x** bankfull width □>70 cm/ CTB □ LOGGING / IRRIGATION / COOLING 100 MODIFIED / DIPPED OUT / NA FOAM / SCUM bankfull x depth **WSECCHI DEPTH** meters LEVEED / ONE SIDED **BANK / EROSION / SURFACE** OIL SHEEN ~ 3 W/D ratio **RELOCATED / CUTOFFS** FALSE BANK / MANURE / LAGOON TRASH/LITTER -CANOPY 111 60 cm bankfull max. depth NUISANCE ODOR WASH H20 / TILE / H20 TABLE MOVING-BEDLOAD-STABLE > 85%- OPEN floodprone x² width LUDGE DEPOSITS **ARMOURED / SLUMPS** ACID / MINE / QUARRY / FLOW 55%-<85% NATURAL/WETLAND/STAGNANT entrench, ratio CSOS/SSOS/OUTFALLS ISLANDS / SCOURED 1 30%-<55% PARK / GOLF / LAWN / HOME IMPOUNDED / DESICCATED Legacy Tree: N10%-<30% C] RECREATION AREA DEPTH FLOOD CONTROL/ DRAINAGE ATMOSPHERE / DATA PAUCITY POOL: >100ft2 >3ft CLOSED

Stream Drawing:

River Code:	RM:	Stream:			Sheet QHEI Sco	
Date: 113/11	Loçation	: 170**				
Scorers Full Na	me:	Affiliatio				
1] SUBSTRATE (CI	heck ONLY Two Sub		(ES; Estimate % pres			
TYPE	POOL RIFFLE		RIFFLE <u>SUBSTRATE O</u> Check ONE (OR 2 B		SUBSTRATE QUALI Check ONE (OR 2 & AVE	
C C-BLDR /SLBS(10		AVEL [7]	ET -LIMESTONE		2- SILT HEAVY [-2]	
					-SILT MODERATE [Durk alamba
D D-HARDPAN [4]				0]	-SILT NORMAL [0]	· (77)
D D-MUCK [2]		TIFICIAL[0]	CI-HARDPAN [0]		O -SILT FREE [1]	<u> </u>
La GI-SILT [2]	NOTE: Ign From Point	ore Sludge Originating t Sources			DED D-EXTENSIVE [-2]	Max 20
			[]-RIP/RAP [0]	NESS:	D-MODERATE [-1]	
High Quality Only, S		r More [2]	-LACUSTRINE	[0]	D-NONE [1]	
COMMENTS		r Less [0]	COAL FINES	-21		
2] INSTREAM COV	VER (Give each cove	r type a score of	f 0 to 3; see back for in		AMOUNT: (Check ONLY	One or Cover
(Structure)	TYP	E: Score All That C)ccur		check 2 and AVERAGE)	
2 UNDERCUT BANK	- 1 · 1	_POOLS> 70 cm [7				- II I & II
2 OVERHANGING VI		BOULDERS [1]	<u></u> AQUATIC MAG <u>3 LOGS OR WO</u>	•••		[/] () Max 20
SHALLOWS (IN SL	LOW WATER) [1] COMMENTS:				- NEARLY ABSENT < 5	
31 CHANNEL MOR	RPHOLOGY: (Check	ONLY ON PER	Category OR check	and AVERA		
SINUOSITY	DEVELOPMENT	CHANNELIZATION	N STABILITY	MODIFIC	TIONS/OTHER	Channel
0 - HIGH [4]	O · EXCELLENT [7]					171
D - MODERATE [3]					OPY REMOVAL CI - LEVEED	Max 20
D - NONE [1]	[] - FAIR [3] [] - POOR [1]	D · RECENT OF	• •			
D- HORE [1]	a. Fook [1]	RECOVERY [1]			SIDE CHANNEL MODIFICATIO	NS
COMMENTS:		• -		-		
4]. RIPARIAN ZON	E AND BANK EROS	ON(check ONE bo	ox per bank or check 2 al	NO AVERAGE P	er bank) 🖗 River Right Loo AN) BANK EROSIO	
RIPARIAN WIDTH	1	FLOOD PLAIN	N QUALITY (PAST 100	Meter RIPAKI	ANI DANK CRUSIU	I Riparian
			Bank) I B		L R (Per Bank)	
L R (Per Bank)		Predominant Per		RVATION TILLA	L R (Per Bank)	(in the second
WIDE > 50m [[4] EFFOREST -50m [3] EFFOREST	r, swawp [3] OR OLD FIELD [2]		OR INDUSTRI	L R (Per Bank) GE [1] D -NONE/LITT AL [0] D -MODERATE	
WIDE > 50m [(4) 27 EXPROREST -50m [3] 21 EX-SHRUB m [2] 21 EX-RESIDE	I, SWAMP [3] OR OLD FIELD [2] NTIAL,PARK,NEW	D D-CONSE D D-URBA FIELD [1] D D-OPEN	OR INDUSTRI	L R (Per Bank) GE [1] D D-NONE/LITT AL [0] D D-MODERATE CROP [0] ET 12-HEAVY/SEV	LE [3]
	[4] ET ET FOREST -50m [3] ET ET SHRUB	I, SWAMP [3] OR OLD FIELD [2] NTIAL,PARK,NEW	D D-CONSE D D-URBA FIELD [1] D D-OPEN	OR INDUSTRI	L R (Per Bank) GE [1] D D-NONE/LITT AL [0] D D-MODERATE CROP [0] ET 12-HEAVY/SEV	
Image: Wide > 50m [Image: Moderate 10 Image: Moderate 10 Image: Narrow 5-10 Image: Very Narrow 10 Image: None [0]	(4) 27 EXPROREST -50m [3] 21 EX-SHRUB m [2] 21 EX-RESIDE	I, SWAMP [3] OR OLD FIELD [2] NTIAL,PARK,NEW	D D-CONSE D D-URBA FIELD [1] D D-OPEN	OR INDUSTRI	L R (Per Bank) GE [1] D D-NONE/LITT AL [0] D D-MODERATE CROP [0] ET 12-HEAVY/SEV	
	(4) 27 EXPROREST -50m [3] 21 EX-SHRUB m [2] 21 EX-RESIDE	I, SWAMP [3] OR OLD FIELD [2] NTIAL,PARK,NEW	D D-CONSE D D-URBA FIELD [1] D D-OPEN	OR INDUSTRI	L R (Per Bank) GE [1] D D-NONE/LITT AL [0] D D-MODERATE CROP [0] ET 12-HEAVY/SEV	
Image: Control of Con	(4) 27 EXFOREST -50m (3) 21 CR SHRUB 1m (2) 21 CR RESIDE V <5 m[1] 21 CR FENCE	r, swawp [3] OR OLD FIELD [2] NTIAL,PARK,NEW D PASTURE [1]	FIELD [1] II -OPEN G II -OPEN G II -MININ	N OR INDUSTRI PASTURE,ROW G/CONSTRUCT	L R (Per Bank) GE [1] II II-NONE/LITT AL [0] II II-MODERATE 'CROP [0] III-MODERATE 'CROP [0]	LE [3]
Image: Control of Contro	[4] Image: Control of Cont	r, swawp [3] OR OLD FIELD [2] INTIAL,PARK,NEW ID PASTURE [1] ILITY IOLOGY	CU	N OR INDUSTRI PASTURE,ROW G/CONSTRUCT RRENT YELOC		LE [3]
Image: Control of the second secon	[4] Image: Control of Cont	r, SWAMP [3] OR OLD FIELD [2] INTIAL, PARK, NEW ID PASTURE [1] ID PASTURE [1] ID LOGY OL OGY OF 2 & AVERAGE	CU	NOR INDUSTRI PASTURE,ROW G/CONSTRUCT RRENT VELOC (Check A	L R (Per Bank) GE [1] I I-NONE/LITT AL [0] I I-MODERATE CROP [0] ET 12-HEAVY/SEV HON [0] ITYPOOLS & RIFFLEST VI That Apply)	LE [3]
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Image: Control of the second secon	[4] EFFOREST -50m [3] ESHRUB - m [2] ESHRUB m [2] ERESIDE V <5 m[1]	r, SWAMP [3] OR OLD FIELD [2] NTIAL, PARK, NEW D PASTURE [1] UITY OLOGY OF 2 & AVERAGE I > RIFFLE WIDTH I < RIFFLE W. [0] CHECK O EPTH	CU E) C CU E) C CU E) C C C CU E) C C C C C C C C C C C C C	A OR INDUSTRI PASTURE, ROW G/CONSTRUCT (Check A S[1] Check A S[1] (1] D AVERAGE ATE	L R (Per Bank) GE [1] D -NONE/LITT AL [0] D -MODERATE CROP [0] ETE-HEAVY/SEV TON [0] ITYPOOLS & RIFFLESI JI That Apply) -TORRENTIAL[-1] -INTERMITTENT[-2] -VERY FAST[1] RIFFLE/RUN_EMBEDDEDNI	LE [3] [2] ERE[1] ^{Max 10} PooV Current Max 12 Riffle/Rur
Image: Control of the second secon	[4] EPFOREST -50m [3] ID-SHRUB Im [2] ID-RESIDE V <5 m[1]	r, SWAMP [3] OR OLD FIELD [2] NTIAL, PARK, NEW D PASTURE [1] ULITY IOLOGY or 2 & AVERAGE I > RIFFLE WIDTH I = RIFFLE WIDTH I < RIFFLE W. [0] CHECK O EPTH X > 50 [2]	CU E) C) E) C) E) C) E) C) C) E) C) E) C) E) C) E) C) C) E) C) C) C) C) C) C) C) C) C) C	A OR INDUSTRI PASTURE, ROW G/CONSTRUCT (Check A S[1] (1] Check A S[1] D AVERAGE ATE Boulder) [2]	L R (Per Bank) GE [1] GE [1] GE [1] GE -NONE/LITT AL [0] GE -NONE/LITT AL [0] GE -NONE [2] I - NONE [2] RIFFLE/RUN EMBEDDEDNI GE - NONE [2]	Pool/ Pool/ Pool/ Current Max 12 Riffle/Run
Image: Control of the second secon	[4] EFFOREST -50m [3] ESHRUB -50m [3] ESHRUB m [2] ERESIDE V <5 m[1]	r, SWAMP [3] OR OLD FIELD [2] NTIAL, PARK, NEW D PASTURE [1] UD OG Y OF 2 & AVERAGE I > RIFFLE WIDTH I < RIFFLE WIDTH I < RIFFLE W. [0] <u>CHECK O</u> EPTH X > 50 [2]	CU E) CU E) CU E) CU E) CU E) CU CU CU CU CU CU CU CU CU CU	A OR INDUSTRI PASTURE, ROW G/CONSTRUCT (Check A S[1] [1] Check A S[1] D AVERAGE ATE Boulder) [2] arge Gravel) [2]	L R (Per Bank) GE [1] GE [1] GE [1] GE -NONE/LITT AL [0] GE -NONE/LITT AL [0] GE -NONE [2] ITYPOOLS & RIFFLEST NI That Apply) GE - TORRENTIAL[-1] GE - NORE [2] [1] GE - NONE [2] [1] GE - NONE [2] [1] GE - MODERATE [0] GE - MODERATE [0]	LE [3] [2] ERE[1] ^{Max 10} PooV Current Max 12 Riffle/Rur ESS Max 8
Image: Construct of the second sec	[4] EFFOREST -50m [3] ESHRUB -50m [3] ESHRUB m [2] ERESIDE V <5 m[1]	r, SWAMP [3] OR OLD FIELD [2] NTIAL, PARK, NEW D PASTURE [1] UD OG Y OF 2 & AVERAGE I > RIFFLE WIDTH I < RIFFLE WIDTH I < RIFFLE W. [0] <u>CHECK O</u> EPTH X > 50 [2]	CU FIELD [1] C - URBAY FIELD [1] C - OPEN C U CU CU CU CU CU CU CU CU CU C	A OR INDUSTRI PASTURE, ROW G/CONSTRUCT (Check A S(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	L R (Per Bank) GE [1] GE [1] GE [1] GE -NONE/LITT AL [0] GE -NONE/LITT AL [0] GE -NONE/LITT AL [0] GE -NONE [2] RIFFLE/RUN EMBEDDEDNI CONTENTIAL[-1] GE - NONE [2] CH - NONE [2] GE - NONE [2] GE - NONE [2] CH - NONE	LE [3] [2] ERE[1] ^{Max 10} PooV Current Max 12 Riffle/Run ESS Max 8 Gradient
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Image: Construct of the second sec	[4] EFFOREST -50m [3] ESHRUB -50m [3] ESHRUB m [2] ERESIDE V <5 m[1]	r, SWAMP [3] OR OLD FIELD [2] NTIAL, PARK, NEW D PASTURE [1] ULITY ID PASTURE [1] ID PASTURE [1]	CU FIELD [1] C - OPEN FIELD [1] C - OPEN C U CU CU CU CU CU CU CU CU CU C	N OR INDUSTRI PASTURE, ROW G/CONSTRUCT (Check A S[1] [1] D AVERAGE ATE Boulder) [2] arge Gravel) [vel, Sand) [0] D - NO RIFFL	L R (Per Bank) GE [1] GE [1] GE [1] GE -NONE/LITT AL [0] GE -NONE/LITT AL [0] GE -NONE/LITT AL [0] GE -NONE [2] RIFFLE/RUN EMBEDDEDNI CONTENTIAL[-1] GE - NONE [2] CH - NONE [2] GE - NONE [2] GE - NONE [2] CH - NONE	LE [3] [2] ERE[1] ^{Max 10} PooV Current Max 12 Riffle/Run ESS Max 8 Gradient
Image: Construct of the second sec	[4] EFFOREST -50m [3] ESHRUB -m [2] ERESIDE V <5 m[1]	r, SWAMP [3] OR OLD FIELD [2] NTIAL, PARK, NEW D PASTURE [1] UD OG Y OF 2 & AVERAGE I > RIFFLE WIDTH I < RIFFLE WIDTH I < RIFFLE W. [0] <u>CHECK O</u> EPTH X > 50 [2]	CU FIELD [1] C - OPEN FIELD [1] C - OPEN C U CU CU CU CU CU CU CU CU CU C	A OR INDUSTRI PASTURE, ROW G/CONSTRUCT (Check A S(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	L R (Per Bank) GE [1] I I NONE/LITT AL [0] I I NONE/LITT AL [0] I I NODERATE (CROP [0] ETE-HEAVY/SEV TON [0] ITY [POOLS & RIFFLESI JI That Apply) I -TORRENTIAL[-1] I -INTERSTITIAL[-1] I - NONE [2] I I - NONE [2] I - NONE	LE [3] [2] ERE[1] ^{Max 10} Pool Current Max 12 Riffle/Rur ESS O Max 8 Gradlent S
Image: Construct of the second sec	[4] EFFOREST -50m [3] ESHRUB -m [2] ERESIDE V <5 m[1]	r, SWAMP [3] OR OLD FIELD [2] NTIAL, PARK, NEW D PASTURE [1] ULITY ID PASTURE [1] ID PASTURE [1]	CU FIELD [1] C - OPEN FIELD [1] C - OPEN C U CU CU CU CU CU CU CU CU CU C	A OR INDUSTRI PASTURE, ROW G/CONSTRUCT (Check A S(1) Check A	L R (Per Bank) GE [1] GE [1] GE [1] GE -NONE/LITT AL [0] GE -NONE/LITT AL [0] GE -NONE/LITT CROP [0] GE -NONE	LE [3] [2] ERE[1] ^{Max 10} Pool Current Max 12 Riffle/Rur ESS O Max 8 Gradlent S

Is Sampling Reach Repres	First Sampling Pass Average Average Width Depth	Gear:	Distance:	Water Clarity: Water Clarity: n Moasurements: anddull Mean W/D Depth Ratio		e: Cunopy	-% Open Entrench Ratio	Mejor Suspected Sources of Impacts (Check All That Apply): None D Industrial D WWTP D Ag D Livestock D SilvicultureD Construction D Urban Runolf G CSOs D Suburban Impacts D Mining D Channelization G Riperian Removal D Landfile D Naturel D Dems D Other Flow Alteration D
Stream Drawing:								
	of between 0 an amounts or if m amounts, but no of highest quality very large bould	id 3, Where: 0 ore common (of highest q by in moderate ers in deep or) - Cover typ of marginal o uality or in s or greater a fast water, ia	metric: Each cov e absent; 1 - Cov quality; 2 - Cover mail amounts of I amounts. Example rge diameter logs I-defined, function	er type present i lype present i lighest quality as of highest that are stabl	int in very an in moderate y; 3 - Cover quality inclu	nali type de	Yes/No ts Stream Ephemeral (no pools, tolaity dry or only damp spots)? ts there water upstream? How Fer: ts There Water Close Downstream? How Fer: ts Dry Channel Mosity Natural?

	Qualitative Habitat	Evaluation Index Field	Sheet QHEI Score	: <u>64</u> G
River Code:	RM:Stream:	Thorn Cr		
ato: >-14-1	Location: Joe_ Q	Pro Rd.		
corers Full Name:	<u> </u>			
SUBSTRATE (Check	ONLY Two SubstrateTYPE BO			•
a designed with the second		RIFFLE SUBSTRATE ORIGIN <u>50</u> Check ONE (OR 2 & AVERAGE)	SUBSTRATE QUALITY Check ONE (OR 2 & AVERAG	ก
D-BLDR /SLBS[10]	$\gamma/1$	42 B -LIMESTONE [1] SILT.	I- SILT HEAVY [-2]	
			M -SILT MODERATE [-1]	Substrate
			-SILT NORMAL [0]	
I D-MUCK [2]		CI -HARDPAN [0]		
D-SILT [2] 25	NOTE: Ignore Studge Originati From Point Sources	a monostoric (of cinoco	÷ •	Max 20
		D-RIP/RAP [0] NESS:	-MODERATE [-1]	
NUMBER OF SUBSTRATE High Quality Only, Score !		D -LACUSTRINE [0]	-NORMAL [0] -NONE [1]	
	5 or >) []-3 or Less [0]	D-COAL FINES [-2]		
OMMENTS	(Give each cover type a score (of 0 to 3; see back for instructions)	AMOUNT: (Check ONLY One	or cause
(Structure)	TYPE: Score All That	Occur	check 2 and AVERAGE)	Cover
JUNDERCUT BANKS [1]	-7 POOLS> 70 cm		- EXTENSIVE > 75% [11]	14
2 OVERHANGING VEGETA	A	~		Max 20
O SHALLOWS (IN SLOW W		LOGS OR WOODT DEBRIS [1	1 U - SPARSE 5-25% [3] D - NEARLY ABSENT < 5%[1]	
CHANNEL MORPHO	WENTS:	R Category OR check 2 and AVERA		
	ELOPMENT CHANNELIZATIO		ATIONS/OTHER	Channel
	EXCELLENT [7] D . NONE [6]	D+ HIGH [3] D+ SNA		
	GOOD [5] D - RECOVERE			
⊐ - LOW [2] 51 -	FAIR [3] US · RECOVERI	NG [3] 🕮 - LOW [1] 🛛 🕮 - CAN	OPY REMOVAL D - LEVEED	
				Max 20
- NONE [1]	POOR [1] D RECENT O RECOVERY [1] D BANK EROSION Check ONE I FLOOD PLA	DR NO D - DREI	DGING EI-BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) PRiver Right Looking (AM) BANK EROSION	•
□ - NONE [1] □ - COMMENTS: 4]. RIPARIAN ZONE ANI <u>RIPARIAN WIDTH</u> _ R (Per Bank) □ □ - WIDE > 50m [4] □ □ - WODERATE 10-50m □ □ - NARROW 5-10 m [2]	POOR [1] POOR [DR NO DREI DR NO DREI Dox per bank or check 2 and AVERAGE LIN QUALITY (PAST 100 Meter RIPARI er Bank) L R D CONSERVATION TILLA 2] D E-CONSERVATION TILLA 2] D E-URBAN OR INDUSTRI V FIELD [1] D D-OPEN PASTURE, ROW	DGING I - BANK SHAPING SIDE CHANNEL MODIFICATIONS Per bank; PRiver Right Looking (AN) BANK EROSION L R (Per Bank) AGE [1] D -NONE/LITTLE [3 IAL [0] ^{ME} I - MODERATE [2] (CROP [0] D D -HEAVY/SEVERE[Downstream Riparian
ONNE [1] ONMENTS: <u>IPARIAN ZONE AN</u> <u>RIPARIAN WIDTH</u> R (Per Bank) O □ - WIDE > 50m [4] O □ - WIDE > 50m [4] O □ - NARROW 5-10 m [2] O - VERY NARROW <5 m	POOR [1] POOR [DR NO DATE OF DECK 2 and AVERAGE box per bank or check 2 and AVERAGE IN QUALITY (PAST 100 Meter RIPARI or Bank) L R D CONSERVATION TILLA 2] D B - URBAN OR INDUSTRI V FIELD [1] D - OPEN PASTURE,ROW D D - MINING/CONSTRUCT	DGING I - BANK SHAPING SIDE CHANNEL MODIFICATIONS Per bank; PRiver Right Looking (AN) BANK EROSION L R (Per Bank) AGE [1] D -NONE/LITTLE [3 IAL [0] ^{ME} I - MODERATE [2] (CROP [0] D D -HEAVY/SEVERE[Downstream Riparian
□ - NONE [1] □ - COMMENTS: 4] RIPARIAN ZONE ANI <u>RIPARIAN WIDTH</u> L R (Per Bank) □ □ - WIDE > 50m [4] □ □ - WODERATE 10-50m □ □ - NARROW 5-10 m [2]	POOR [1] POOR [DR NO DREI DR NO DREI Dox per bank or check 2 and AVERAGE LIN QUALITY (PAST 100 Meter RIPARI er Bank) L R D CONSERVATION TILLA 2] D E-CONSERVATION TILLA 2] D E-URBAN OR INDUSTRI V FIELD [1] D D-OPEN PASTURE, ROW	DGING I - BANK SHAPING SIDE CHANNEL MODIFICATIONS Per bank; PRiver Right Looking (AN) BANK EROSION L R (Per Bank) AGE [1] D -NONE/LITTLE [3 IAL [0] ^{ME} I - MODERATE [2] (CROP [0] D D -HEAVY/SEVERE[Downstream Riparian
ONNE [1] ONNE [1] ONMENTS: <u>RIPARIAN ZONE ANI</u> <u>RIPARIAN WIDTH</u> R (Per Bank) OO ONE ANI ON WIDE > 50m [4] OO ONE ANI ONE IN ARROW <5 m ONNE [0] COMMENTS:	POOR [1] POOR [DR NO DATE OF DECK 2 and AVERAGE box per bank or check 2 and AVERAGE IN QUALITY (PAST 100 Meter RIPARI or Bank) L R D CONSERVATION TILLA 2] D B - URBAN OR INDUSTRI V FIELD [1] D - OPEN PASTURE,ROW D D - MINING/CONSTRUCT	DGING I - BANK SHAPING SIDE CHANNEL MODIFICATIONS Per bank; PRiver Right Looking (AN) BANK EROSION L R (Per Bank) AGE [1] D -NONE/LITTLE [3 IAL [0] ^{ME} I - MODERATE [2] (CROP [0] D D -HEAVY/SEVERE[Downstream Riparian JJ (77) 1) Max 10
- NONE [1] - OMMENTS:	POOR [1] RECOVERY [1] D BANK EROSION check ONE I FLOOD PLA L R (Most Predominant Pe G D-FOREST, SWAMP [3] [3] D-SHRUB OR OLD FIELD [7] D-RESIDENTIAL, PARK, NEW [1] D D-FENCED PASTURE [1] FFLE/RUN QUALITY	DR NO DREID - DREID - DREID - DREID - DREID - DNE Dox per bank or check 2 and AVERAGE UN QUALITY (PAST 100 Meter RIPARI er Bank) L R D-CONSERVATION TILLA 2] D - CONSERVATION TILLA 2] D - URBAN OR INDUSTRI V FIELD [1] D D-OPEN PASTURE, ROW D - MINING/CONSTRUCT X WWT	DGING I - BANK SHAPING SIDE CHANNEL MODIFICATIONS Per bank) PRIVER Right Looking <u>AMI BANK EROSION</u> L R (Per Bank) AGE [1] I -NONE/LITTLE [3 IAL [0] ^{MI} I -MODERATE [2] /CROP [0] E I -HEAVY/SEVERE[rion [0]	Downstream Riparian JJ JJ Max 10 PooV
- NONE [1] - R (Per Bank) - R (Per Bank) - NODERATE 10-50m - NODERATE 10-50	POOR [1] POOR [DR NO DREID - MINING/CONSTRUCT 	DGING I - BANK SHAPING SIDE CHANNEL MODIFICATIONS Per bank; PRiver Right Looking (AN) BANK EROSION L R (Per Bank) AGE [1] D -NONE/LITTLE [3 IAL [0] ^{ME} I - MODERATE [2] (CROP [0] D D -HEAVY/SEVERE[Downstream Riparian JJ (77) 1) Max 10
- NONE [1] - NONE [1] - NONE [1] - - - - - - - - - - - - -	POOR [1] POOR [DR NO DI - DREI DOR NO DI - DREI Dox per bank or check 2 and AVERAGE LIN QUALITY (PAST 100 Meter RIPARI er Bank) L R D-CONSERVATION TILLA 2] DI - URBAN OR INDUSTRI V FIELD [1] DI - OPEN PASTURE,ROW DIMINING/CONSTRUCT X DWT CURRENT VELOC GE) (Check A H [2] DI -EDDIES[1]	DGING - BANK SHAPING SIDE CHANNEL MODIFICATIONS Per bank) PRIVER Right Looking <u>AM</u> <u>BANK EROSION</u> L R (Per Bank) AGE [1] D-NONE/LITTLE [3 IAL [0] - MODERATE [2] /CROP [0] D-HEAVY/SEVERE[TION [0] - MODERATE [2] /CROP [0] D-HEAVY/SEVERE[TION [0] - MODES & RIFFLES1] All That Apply) - TORRENTIAL[-1]	Downstream Riparian JJ JJ Max 10 PooV
- NONE [1] - WIDE > 50m [4] - III - WODERATE 10-50m - III - NONE [0] -	POOR [1] POOR [1] POOR [1] D BANK EROSION(check ONE I FLOOD PLA L R (Most Predominant Pe D FOREST, SWAMP [3] C D-SHRUB OR OLD FIELD [3] D D-SHRUB OR OLD FIELD [3] D D-RESIDENTIAL, PARK, NEW [1] D D-FENCED PASTURE [1] FFLE/RUN QUALITY MORPHOLOGY (Check 1 or 2 & AVERAG D-POOL WIDTH > RIFFLE WIDTH B-POOL WIDTH = RIFFLE WIDTH	DR NO DI - DREI DR NO DI - DREI Dox per bank or check 2 and AVERAGE LIN QUALITY (PAST 100 Meter RIPARI er Bank) L R D-CONSERVATION TILLA 2] DI - URBAN OR INDUSTRI V FIELD [1] DI - OPEN PASTURE,ROW DIMINING/CONSTRUCT X FIELD [1] DI -OPEN PASTURE,ROW DIMINING/CONSTRUCT X WWT CURRENT VELOC GE) (Check A H [2] DI -EDDIES[1] H [1] DI-FAST[1]	DGING □ - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) PRIVER Right Looking <u>AM</u> <u>BANK EROSION</u> L R (Per Bank) AGE [1] □ □ -NONE/LITTLE [3 IAL [0] ^M □ ■ -MODERATE [2] /CROP [0] Đ □ -HEAVY/SEVERE[TION [0]	Downstream Riparian JJ JJ Max 10 PooV
ONNE [1] ONNE [1] II- NONE [1] II- RIPARIAN ZONE ANI RIPARIAN WIDTH R (Per Bank) III- WIDE > 50m [4] III- WIDE > 50m [4] III- WODERATE 10-50m III- NARROW <5 m III- NARROW <5 m III- NONE [0] COMMENTS: S.]POOL/GLIDE AND RI MAX. DEPTH (Check 1 ONLY!) III - >1m [6] I - 0.7-1m [4] III - 0.4-0.7m [2]	POOR [1] POOR [DR NO DREID -	DGING □ - BANK SHAPING C SIDE CHANNEL MODIFICATIONS per bank) P River Right Looking L R (Per Bank) L	Downstream Riparian JJ JJ Max 10 PooV
AONE [1] COMMENTS: <u>IPARIAN ZONE ANI RIPARIAN WIDTH</u> R (Per Bank) D - WIDE > 50m [4] D - WIDE > 50m [4] D - WODERATE 10-50m D - NARROW <5 m D - NARROW <5 m D - NONE [0] OMMENTS:	POOR [1] POOR [1] POOL WIDTH - RIFFLE W. [0]	DR NO DREID -	DGING □ - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) PRIVER Right Looking <u>AM</u> <u>BANK EROSION</u> L R (Per Bank) AGE [1] □ □ -NONE/LITTLE [3 IAL [0] ^M □ ■ -MODERATE [2] /CROP [0] Đ □ -HEAVY/SEVERE[TION [0]	Downstream Riparian JJ JJ Max 10 PooV
ONNE [1] ONMENTS: <u>IPARIAN ZONE ANI RIPARIAN WIDTH</u> R (Per Bank) ONE (PE Bank) ONE	POOR [1] POOR [1] POOR [1] D BANK EROSION(check ONE I FLOOD PLA L R (Most Predominant Pe D FOREST, SWAMP [3] C D-SHRUB OR OLD FIELD [3] D D-SHRUB OR OLD FIELD [3] D D-RESIDENTIAL, PARK, NEW [1] D D-FENCED PASTURE [1] FFLE/RUN QUALITY MORPHOLOGY (Check 1 or 2 & AVERAG D-POOL WIDTH > RIFFLE WIDTH B-POOL WIDTH = RIFFLE WIDTH	DR NO DREID -	DGING □ - BANK SHAPING C SIDE CHANNEL MODIFICATIONS per bank) P River Right Looking L R (Per Bank) L	Downstream Riparian 1]]]]]]]]]]]]]]]]]]]
ONNE [1] ONNE [1] ONMENTS: <u>IPARIAN ZONE ANI RIPARIAN WIDTH R (Per Bank) ONE - WIDE > 50m [4] ONE - WIDE > 50m [4] ONE - WODERATE 10-50m ONE - NONE [0] ONNE [0] ON</u>	POOR [1] POOR POOR [1] POOR POOR POOR POOR POOR POOR POOR POO	DR NO DI - DRE DR NO DI - DRE Dox per bank or check 2 and AVERAGE NOUALITY (PAST 100 Meter RIPARI er Bank) L R Di D-CONSERVATION TILLA 2] DI - URBAN OR INDUSTR V FIELD [1] DI - OPEN PASTURE, ROW DI - MINING/CONSTRUCT 	DGING □ - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) P River Right Looking L R (Per Bank) L R (Per Bank) AGE [1] □ □ -NONE/LITTLE [2] AGE [1] □ □ -NONE/LITTLE [2] AGE [1] □ □ -NONE/LITTLE [2] -NOREATE [2] /CROP [0] □ □ -HEAVY/SEVERE[TION [0] P [ITY [POOLS & RIFFLES1] AII That Apply) □ -TORRENTIAL[-1] □ -INTERSTITIAL[-1] □ -INTERMITTENT[-2] □ -VERY FAST[1]	Downstream Riparian JJ JJ Max 10 PooV
ONNE [1] ONNE [1] ONMENTS: <u>RIPARIAN ZONE ANI RIPARIAN WIDTH R (Per Bank) ONE - WIDE > 50m [4] ONE - WIDE > 50m [4] ONE - WIDE > 50m [4] ONE - WIDE - NARROW 5-10 m [2] ONMENTS: ONMENTS: </u>	POOR [1] POOR [DR NO DI - DREI DR NO DI - DREI Dox per bank or check 2 and AVERAGE ; NOUALITY (PAST 100 Meter RIPARI er Bank) L R Di D-CONSERVATION TILLA 2] DI D-CONSERVATION TILLA 2] D-CONSERVATION TILLA 2] D-CONSERVATION TILLA 2]	DGING □ - BANK SHAPING SIDE CHANNEL MODIFICATIONS par bank) P River Right Looking L R (Per Bank) AGE [1] □ -NONE/LITTLE [2] L R (Per Bank) AGE [1] □ -NONE/LITTLE [2] L R (Per Bank) AGE [1] □ -NONE/LITTLE [2] L R (Per Bank) AGE [1] □ -NONE/LITTLE [2] L RIFFLESI] MI That Apply) □ -INTERSTITIAL[-1] □ -INTERMITTENT[-2] □ -VERY FAST[1]	Downstream Riparian 1]]]]]]]]]]]]]]]]]]]
ONNE [1] ONNE [1] ONMENTS: <u>IPARIAN ZONE ANI RIPARIAN XONE ANI RIPARIAN WIDTH R (Per Bank) O ONDERATE 10-50m ONDERATE 10-50m </u>	POOR [1] POOL WIDTH = RIFFLE WIDTH COMMENTS: POOL WIDTH < RIFFLE W. [0] COMMENTS: POOL [2] POO	DR NO DI - DREI DR NO DI - DREI Dox per bank or check 2 and AVERAGE ; NOUALITY (PAST 100 Meter RIPARI er Bank) L R Di D-CONSERVATION TILLA 2] DI U-CONSERVATION TILL	DGING - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) PRIVER Right Looking AM BANK EROSION L R (Per Bank) AGE [1] - NONE/LITTLE [3] AGE [1] - NONE/LITTLE [3] AGE [1] - MODERATE [2] /CROP [0] - MODERATE [2] /CROP [0] - MODERATE [2] /CROP [0] - MODERATE [2] - TORRENTIAL[-1] - INTERSTITIAL[-1] - INTERSTITIAL[-1] - INTERMITTENT[-2] - VERY FAST[1] RIFFLE/RUN EMBEDDEDNESS] - NONE [2]	Downstream Riparian Jaja Jaja Max 10 Pool/ Current Max 12 Riffle/Run
- NONE [1] - - NONE [1] - 4] RIPARIAN ZONE ANI RIPARIAN WIDTH - R (Per Bank) - WIDE > 50m [4] - WIDE > 50m [4] - WIDE > 50m [4] - WORE TE 10-50m - WODERATE 10-50m - WODERATE 10-50m - WODERATE 10-50m - WODERATE 10-50m - NORE [0] - NARROW 5-10 m [2] - NONE [0] COMMENTS: 5.]POOL/GLIDE AND RI MAX_DEPTH (Check 1 ONLY!) - 0.4-0.7m [2] - 0.4-0.7m [2] - 0.2-0.4m [1] - < 0.2m [POOL-0]	POOR [1] POOR POOR POOR POOR POOR POOR POOR POO	DR NO DI - DREI DR NO DI - DREI Dox per bank or check 2 and AVERAGE ; NOUALITY (PAST 100 Meter RIPARI or Bank) L R D-CONSERVATION TILLA TO CONSERVATION TILLA 2] DI - URBAN OR INDUSTRI W FIELD [1] DI - OPEN PASTURE, ROW DI - MINING/CONSTRUCT 	DGING - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) PRIVER Right Looking AM BANK EROSION L R (Per Bank) AGE [1] - NONE/LITTLE [3 AGE [1] - NONE/LITTLE [3 AGE [1] - MODERATE [2] /CROP [0] - MODERATE [2] - INTERSTITIAL[-1] - INT	Downstream Riparian J J J Max 10 Pool/ Current Max 12 Riffle/Run Max 8
→ NONE [1] □ - COMMENTS:	POOR [1] POOR [1]	DR NO DI - DREI DR NO DI - DREI Dr per bank or check 2 and AVERAGE NOUALITY (PAST 100 Meter RIPARI er Bank) L R D - CONSERVATION TILLA 2] DI - URBAN OR INDUSTR V FIELD [1] DI - OPEN PASTURE, ROW DI - MINING/CONSTRUCT 	DGING - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) P River Right Looking <u>AM</u> <u>BANK EROSION</u> L R (Per Bank) AGE [1] D -NONE/LITTLE [2] AGE [1] M -NONE/LITTLE [2] AGE [1] M - MODERATE [2] /CROP [0] B D -HEAVY/SEVERE[TION [0] P (ITY [POOLS & RIFFLES1] AII That Apply) -TORRENTIAL[-1] -INTERSTITIAL[-1] -INTERSTITIAL[-1] -INTERMITTENT[-2] -VERY FAST[1] RIFFLE/RUN EMBEDDEDNESS] D - NONE [2] [1] D - LOW [1] G - MODERATE [0]	Downstream Riparian Jaja Jaja Max 10 Pool/ Current Max 12 Riffle/Run
ONNE [1] ONNE [1] ONMENTS: <u>IPARIAN ZONE ANI RIPARIAN WIDTH R (Per Bank) ONNE (Per Bank) ONNE (Per Bank) ONNE ID- WIDE > 50m [4] ONNE ID- WODERATE 10-50m ONNE ID- NARROW <5 m ONNE [0] O</u>	POOR [1] POOR POOR POOR POOR POOR POOR POOR POO	DR NO D - DREI DR NO D - DREI Dox per bank or check 2 and AVERAGE LIN QUALITY (PAST 100 Meter RIPARI er Bank) L R D CONSERVATION TILLA 2] D - URBAN OR INDUSTRI V FIELD [1] D - OPEN PASTURE, ROW D - MINING/CONSTRUCT $\times WWT$ GEN (Check A H [2] D - EDDIES[1] H [1] - FAST[1] D - MODERATE [1] D - MODERATE [1] D - SLOW [1] ONE OR CHECK 2 AND AVERAGE RIFFLE/RUN SUBSTRATE D STABLE (e.g., Cobble, Boulder) [2] D-MOD, STABLE (e.g., Large Gravel) G- UNSTABLE (Fine Gravel, Sand) [0]	DGING - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) P River Right Looking <u>AM</u> <u>BANK EROSION</u> L R (Per Bank) AGE [1] D -NONE/LITTLE [2] AGE [1] M -NONE/LITTLE [2] AGE [1] M - MODERATE [2] /CROP [0] B D -HEAVY/SEVERE[TION [0] P (ITY [POOLS & RIFFLES1] AII That Apply) -TORRENTIAL[-1] -INTERSTITIAL[-1] -INTERSTITIAL[-1] -INTERMITTENT[-2] -VERY FAST[1] RIFFLE/RUN EMBEDDEDNESS] D - NONE [2] [1] D - LOW [1] G - MODERATE [0]	Downstream Riparian J J J Max 10 Pool/ Current Max 12 Riffle/Run Max 8
ONNE [1] ONNE [1] ONMENTS: <u>RIPARIAN ZONE ANI RIPARIAN XONE ANI RIPARIAN WIDTH R (Per Bank) ONNE (PE Bank) O</u>	POOR [1] \Box - RECENT C RECOVERY [1] D BANK EROSION(check ONE I FLOOD PLA L R (Most Predominant Pe \Box C) FOREST, SWAMP [3] [3] \Box D-SHRUB OR OLD FIELD [7] \Box C) RESIDENTIAL, PARK, NEW [1] \Box D-FENCED PASTURE [1] FFLE/RUN QUALITY <u>MORPHOLOGY</u> (Check 1 or 2 & AVERAG \Box -POOL WIDTH > RIFFLE WIDTH \Box -POOL WIDTH > RIFFLE W. [0] COMMENTS: <u>CHECK (RUN DEPTH</u> 2] \Box - MAX > 50 [2] 1] \Box - MAX < 50[1] C(e) $f_{AU}(t) \le f \le each$	DR NO DI - DREI DR NO DI - DREI Dox per bank or check 2 and AVERAGE ; NOUALITY (PAST 100 Meter RIPARI er Bank) L R Di D-CONSERVATION TILL 2] DI - URBAN OR INDUSTR V FIELD [1] DI - OPEN PASTURE, ROW DI - MINING/CONSTRUCT - WWT CURRENT VELOC SE) (Check A WWT CURRENT VELOC SE) (Check A H [2] DI - EDDIES[1] H [1] DI - FAST[1] DI - MODERATE [1] DI - MODERATE [1] DI - SLOW [1] ONE OR CHECK 2 AND AVERAGE <u>RIFFLE/RUN SUBSTRATE</u> D-STABLE (e.g., Cobble, Boulder) [2 D-MOD, STABLE (Fine Gravet, Sand) [0] - Tar	DGING - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) PRIVER Right Looking AM BANK EROSION L R (Per Bank) AGE [1] - NONE/LITTLE [3] IAL [0] - MODERATE [2] /CROP [0] - MODERATE [2] /CROP [0] - MODERATE [2] /CROP [0] - HEAVY/SEVERE[TION [0] - HEAVY/SEVERE[TION [0] - TORRENTIAL[-1] - INTERSTITIAL[-1] - INTERSTITIAL[-1] - INTERMITTENT[-2] - VERY FAST[1] RIFFLE/RUN EMBEDDEDNESS] - NONE [2] [1] - LOW [1] - EXTENSIVE [-1] E [Metric=0] /O %GLIDE:	Downstream Riparian J J J Max 10 Pool/ Current Max 12 Riffle/Run Max 8
ONNE [1] ONNE [1] ONMENTS: <u>RIPARIAN ZONE ANI RIPARIAN XONE ANI RIPARIAN WIDTH R (Per Bank) ONNE (PE Bank) O</u>	POOR [1] \Box - RECENT C RECOVERY [1] D BANK EROSION(check ONE I FLOOD PLA L R (Most Predominant Pa \Box D FOREST, SWAMP [3] [3] \Box D SHRUB OR OLD FIELD [2] \Box D RESIDENTIAL, PARK, NEW [1] \Box D -FENCED PASTURE [1] FFLE/RUN QUALITY <u>MORPHOLOGY</u> (Check 1 or 2 & AVERAG \Box -POOL WIDTH > RIFFLE WIDTH \Box -POOL WIDTH > RIFFLE WIDTH \Box -POOL WIDTH > RIFFLE WIDTH \Box -POOL WIDTH = RIFFLE WIDTH \Box -	DR NO DI - DREI DR NO DI - DREI Dr DR DE bank or check 2 and AVERAGE ; NOUALITY (PAST 100 Meter RIPARI er Bank) L R D - CONSERVATION TILL 2] DI - URBAN OR INDUSTR W FIELD [1] DI - OPEN PASTURE, ROW DI - MINING/CONSTRUCT - WWT CURRENT VELOC SED (Check A WWT CURRENT VELOC SED (Check A WWT CURRENT VELOC SED (Check A WWT CURRENT VELOC SED (Check A MWT SED (Check A MWT SED (Check A MWT SED (Check A MWT SED (Check A MWT SED (Check A SED (Check A SE	DGING - BANK SHAPING SIDE CHANNEL MODIFICATIONS per bank) PRIVER Right Looking AM BANK EROSION L R (Per Bank) AGE [1] - NONE/LITTLE [3] AL [0] - MODERATE [2] /CROP [0] - MODERATE [2] /CROP [0] - MODERATE [2] /CROP [0] - HEAVY/SEVERE[TION [0] - TORRENTIAL[-1] - INTERSTITIAL[-1] - INTERSTITIAL[-1] - INTERMITTENT[-2] - VERY FAST[1] RIFFLE/RUN EMBEDDEDNESS] - NONE [2] [1] - LOW [1] - EXTENSIVE [-1] E [Metric=0]	Downstream Riparian Jaj Ala Max 10 Pool/ Current Max 12 Riffle/Run Max 8 Gradient

B-11

Is Sampling Reach Repres	entative of	the Stre	am (Y/N)	If Not,	Exp <u>lain:</u>				· · · ·	Major Suspected Sources of Impacts (Check All That Apply): None D Industrial D WWTP D
										Ag D Livestock D SilvicultureD Construction D Urben Runoff D CSOs D
	First Sampling P		6ar.	Distance:	Water (Clarity:	Water Sta	ige: Canopy	/ -% Open	Suburben Impacts Mining Channelization Riperian Removal
Subjective Aesthetic Rating Rating (1-10) Gradient: (1-10) I - Low, I - Moderate, I -Higt	Average Width 17m	Average Depth	Maximum Depth		sam Measurem Bankfull Mean Depth		Bankfull M Depth	ax Floodprone Area Wight		Landilis () Netural () Dame () Other Flow Alteration () Other
Stream Drawing:								·		

r •

Yes/No