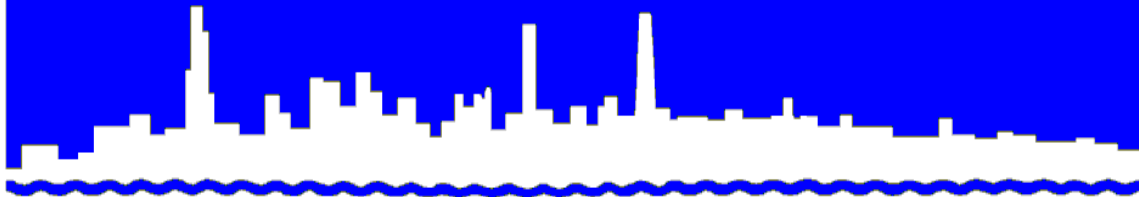


Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 14-17

***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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CALUMET, AND DES PLAINES RIVER SYSTEMS:
A SUMMARY OF BIOLOGICAL SAMPLING AND
HABITAT ASSESSMENTS DURING 2011**

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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. [Table 1](#) displays the 2011 field monitoring schedule for fish sampling and physical habitat assessments.

FIGURE 1: AMBIENT WATER QUALITY MONITORING PROGRAM SAMPLING STATIONS

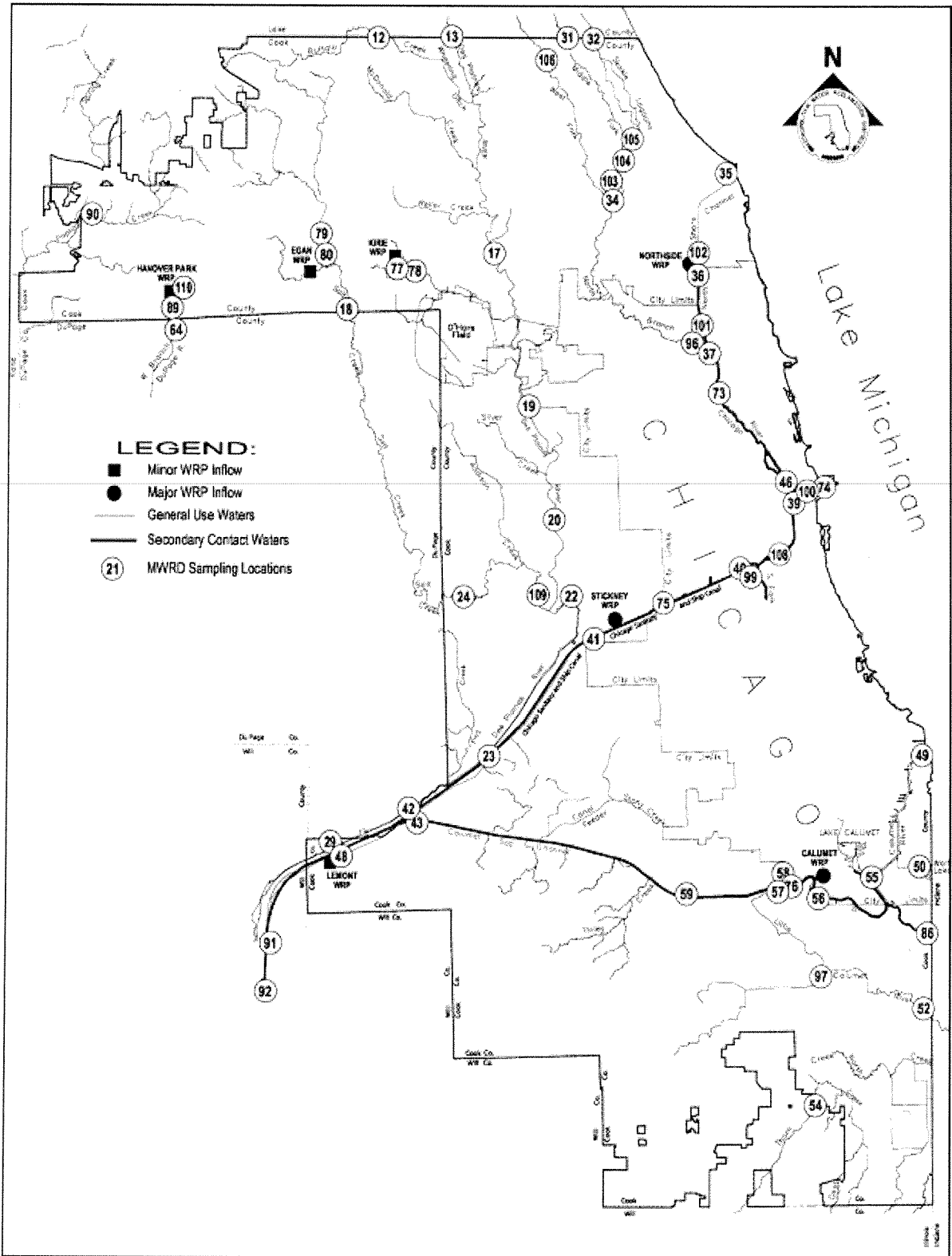


TABLE 1: SAMPLING DATES AT THE AMBIENT WATER QUALITY MONITORING PROGRAM STATIONS DURING 2011

Station No.	Sampling Station	Waterway	Date Sampled
<u>CHICAGO RIVER SYSTEM</u>			
96	Albany Avenue ¹	North Branch Chicago River	9/07/11
36	Touhy Avenue ¹	North Shore Channel	8/30/11
46	Grand Avenue ¹	North Branch Chicago River	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
<u>CALUMET RIVER SYSTEM</u>			
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
<u>DES PLAINES RIVER SYSTEM</u>			
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

¹Annual 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. [Appendix A](#) 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 boat-mounted 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 ($^{\circ}\text{C}$) 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 field-measured 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

Table 2 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 Table 3. Burnham Avenue on the GCR was sampled but did not yield any fish. Only 500 meters of the 130th 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. Tables 4 – 6 display the number and total weight of fish collected from each station, during 2011.

TABLE 2: SUMMARY OF QUALITATIVE HABITAT EVALUATION INDEX SCORES FOR WADEABLE SAMPLING STATIONS 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

¹QHEI=Qualitative Habitat Evaluation Index.

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
96	Albany Avenue	North Branch Chicago River	BP	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 (Continued): 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	BP	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

¹IBI = Index of Biotic Integrity.

ND = No fish were caught in the seine or conditions were unfavorable for seining.

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

Fish Species or Hybrid (x)	North Shore Channel	North Branch Chicago River		Chicago Sanitary and Ship Canal		
	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

¹Game species

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

Fish Species or Hybrid (x)	Calumet River		Little Calumet River				Wolf Lake Outlet
	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

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

Fish Species or Hybrid (x)	Calumet River		Little Calumet River				Wolf Lake Outlet
	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 SYSTEM DURING 2011

Fish Species or Hybrid (x)	Thorn Creek		Cal-Sag Channel		
	Station 54 Joe Orr Road	Station 97 170 th Street	Station 58 Ashland Avenue	Station 59 Cicero Avenue	Station 43 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

¹Game species

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

Fish Species or Hybrid (x)	Des Plaines River			Higgins Creek	Salt Creek	West Branch DuPage River
	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
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 (Continued): NUMBER OF FISH COLLECTED FROM EACH STATION ON THE DES PLAINES RIVER SYSTEM DURING 2011

Fish Species or Hybrid (x)	Des Plaines River			Higgins Creek	Salt Creek	West Branch DuPage River
	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	2	0	0	25	2
Longear sunfish ¹	0	0	0	0	0	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

16

¹Game Species.

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APPENDIX A

OHIO QUALITATIVE HABITAT EVALUATION INDEX

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

Scorers Full Name & Affiliation: _____

River Code: _____ STORET #: _____ Lat./ Long.: _____ / 18 _____ 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	ORIGIN	QUALITY
<input type="checkbox"/> BLDR /SLABS [10]	_____	<input type="checkbox"/> HARDPAN [4]	_____	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> HEAVY [-2]
<input type="checkbox"/> BOULDER [9]	_____	<input type="checkbox"/> DETRITUS [3]	_____	<input type="checkbox"/> TILLS [1]	<input type="checkbox"/> MODERATE [-1]
<input type="checkbox"/> COBBLE [8]	_____	<input type="checkbox"/> MUCK [2]	_____	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> NORMAL [0]
<input type="checkbox"/> GRAVEL [7]	_____	<input type="checkbox"/> SILT [2]	_____	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> FREE [1]
<input type="checkbox"/> SAND [6]	_____	<input type="checkbox"/> ARTIFICIAL [0]	_____	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> EXTENSIVE [-2]
<input type="checkbox"/> BEDROCK [5]	_____			<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> MODERATE [-1]

Check ONE (Or 2 & average)

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

Comments _____

Substrate 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.

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

Comments _____

Cover Maximum 20 []

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

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

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

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

Comments _____

Riparian Maximum 10 []

5] **POOL / GLIDE AND RIFFLE / RUN QUALITY**

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	Recreation Potential
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	Primary Contact
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> TORRENTIAL [-1]	Secondary Contact
<input type="checkbox"/> 0.7-<1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> SLOW [1]	(circle one and comment on back)
<input type="checkbox"/> 0.4-<0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE WIDTH [0]	<input type="checkbox"/> INTERSTITIAL [-1]	
<input type="checkbox"/> 0.2-<0.4m [1]		<input type="checkbox"/> FAST [1]	
<input type="checkbox"/> < 0.2m [0]		<input type="checkbox"/> MODERATE [1]	
		<input type="checkbox"/> INTERMITTENT [-2]	
		<input type="checkbox"/> EDDIES [1]	

Indicate for reach - pools and riffles.

Comments _____

Pool / Current Maximum 12 []

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: NO RIFFLE [metric=0]

Check ONE (Or 2 & average).

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

Comments _____

Riffle / Run Maximum 8 []

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

DRAINAGE AREA (mi²)

%POOL: [] %GLIDE: []

%RUN: [] %RIFFLE: []

Gradient Maximum 10 []

AJ 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

- 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
- _____ meters

- CANOPY**
- 1st _____ cm
- pass
- 2nd _____ cm
- > 85%- OPEN
 - 55%-<85%
 - 30%-<55%
 - 10%-<30%
 - <10%- CLOSED

- CJ 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.

BJ AESTHETICS

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

DJ MAINTENANCE

- PUBLIC / PRIVATE / BOTH / NA
- ACTIVE / HISTORIC / BOTH / NA
- YOUNG-SUCCESSION-OLD
- SPRAY / SNAG / REMOVED
- MODIFIED / DIPPED OUT / NA
- LEVEED / ONE SIDED
- RELOCATED / CUTOFFS
- MOVING-BEDLOAD-STABLE
- 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 H₂O / TILE / H₂O TABLE
- ACID / MINE / QUARRY / FLOW
- NATURAL / WETLAND / STAGNANT
- PARK / GOLF / LAWN / HOME
- ATMOSPHERE / DATA PAUCITY

FJ MEASUREMENTS

- \bar{x} width
- \bar{x} depth
- max. depth
- \bar{x} bankfull width
- bankfull \bar{x} depth
- W/D ratio
- bankfull max. depth
- floodprone x² width
- entrench. ratio

Legacy Tree:

Stream Drawing:

APPENDIX B

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



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: **58** /air

Stream & Location: Ashland LCR

RM: _____ Date: 8/19/11

Scorers Full Name & Affiliation: _____

River Code: _____

STORET #: _____

Lat/ Long.: _____

18

Office verified location

1) SUBSTRATE

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

BEST TYPES		OTHER TYPES	
<input type="checkbox"/> BLDG /SLABS [10]	<input type="checkbox"/> POOL RIFFLE	<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> POOL RIFFLE
<input type="checkbox"/> BOULDER [9]	_____	<input type="checkbox"/> DETRITUS [3]	_____
<input type="checkbox"/> COBBLE [8]	_____	<input type="checkbox"/> MUCK [2]	_____
<input checked="" type="checkbox"/> GRAVEL [7]	<u>35</u>	<input type="checkbox"/> SILT [2]	_____
<input type="checkbox"/> SAND [6]	_____	<input type="checkbox"/> ARTIFICIAL [0]	_____
<input checked="" type="checkbox"/> BEDROCK [5]	<u>35</u>	(Score natural substrates; ignore sludge from point-sources)	

Check ONE (Or 2 & average) QUALITY

<input checked="" type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> HEAVY [-2]
<input type="checkbox"/> TILLS [1]	<input type="checkbox"/> MODERATE [-1]
<input type="checkbox"/> WETLANDS [0]	<input checked="" type="checkbox"/> NORMAL [0]
<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> FREE [1]
<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> EXTENSIVE [-2]
<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> MODERATE [-1]
<input type="checkbox"/> LACUSTURINE [0]	<input type="checkbox"/> NORMAL [0]
<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> NONE [1]
<input type="checkbox"/> COAL FINES [-2]	

Substrate **13** Maximum 20

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

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.

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

Check ONE (Or 2 & average) AMOUNT

<input type="checkbox"/> EXTENSIVE >75% [11]
<input checked="" type="checkbox"/> MODERATE 25-75% [7]
<input type="checkbox"/> SPARSE 5-25% [3]
<input type="checkbox"/> NEARLY ABSENT <5% [1]

Comments _____

Cover Maximum 20 **12**

3) CHANNEL MORPHOLOGY

Check ONE in each category (Or 2 & average)

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

Comments _____

Channel Maximum 20 **8**

4) BANK EROSION AND RIPARIAN ZONE

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

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

Comments _____

Indicate predominant land use(s) past 100m riparian. Riparian Maximum 10 **10**

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	
<input checked="" type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> TORRENTIAL [-1]	<input type="checkbox"/> SLOW [1]	<input type="checkbox"/> VERY FAST [1]	<input type="checkbox"/> INTERSTITIAL [-1]
<input type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]	<input type="checkbox"/> INTERMITTENT [-2]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> EDDIES [1]
<input type="checkbox"/> 0.4-0.7m [2]	<input checked="" type="checkbox"/> POOL WIDTH < RIFFLE WIDTH [0]	Indicate for reach - pools and riffles.			
<input type="checkbox"/> 0.2-0.4m [1]					
<input type="checkbox"/> < 0.2m [0]					

Comments _____

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

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).

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

Comments _____

Riffle / Run Maximum 8 **0**

6) GRADIENT

DRAINAGE AREA (ft²/mi) VERY LOW - LOW [2-4] MODERATE [6-10] HIGH - VERY HIGH [10-6]

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

Gradient Maximum 10 **8**

A) SAMPLED REACH

Check ALL that apply

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

METHOD STAGE

- BOAT 1st -sample pass- 2nd
 WADE HIGH
 L LINE UP
 OTHER NORMAL
 DISTANCE LOW
 DRY

53 yd wide
 ran right before

- 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

- CJ RECREATION** AREA DEPTH
 POOL: > 100ft² > 3ft

BJ AESTHETICS

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

DJ MAINTENANCE

- PUBLIC / PRIVATE / BOTH / NA
 ACTIVE / HISTORIC / BOTH / NA
 YOUNG-SUCCESSION-OLD
 SPRAY / SNAG / REMOVED
 MODIFIED / DIPPED OUT / NA
 LEVEED / ONE SIDED
 RELOCATED / CUTOFFS
 MOVING-BEDLOAD-STABLE
 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 H₂O / TILE / H₂O TABLE
 ACID / MINE / QUARRY / FLOW
 NATURAL / WETLAND / STAGNANT
 PARK / GOLF / LAWN / HOME
 ATMOSPHERE / DATA PAUCITY

FJ MEASUREMENTS

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

Stream Drawing:

WN50



Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 50

River Code: _____ RM: _____ Stream: Val + Lake Outlet
Date: 7-15-18 Location: Burnham Ave

Scorers Full Name: _____ Affiliation: _____

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

TYPE	POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> BLDR /SLBS [10] _____	<input type="checkbox"/> GRAVEL [7] _____	Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)
<input type="checkbox"/> BOULDER [9] _____	<input checked="" type="checkbox"/> SAND [6] <u>30</u>	<input type="checkbox"/> LIMESTONE [1] _____	SILT:	<input type="checkbox"/> SILT HEAVY [-2]
<input type="checkbox"/> COBBLE [8] _____	<input type="checkbox"/> BEDROCK [5] _____	<input type="checkbox"/> TILLS [1] _____	<input checked="" type="checkbox"/> SILT MODERATE [-1]	<input type="checkbox"/> SILT MODERATE [-1]
<input type="checkbox"/> HARDPAN [4] _____	<input type="checkbox"/> DETRITUS [3] _____	<input type="checkbox"/> WETLANDS [0] _____	<input type="checkbox"/> SILT NORMAL [0]	<input type="checkbox"/> SILT NORMAL [0]
<input type="checkbox"/> MUCK [2] _____	<input type="checkbox"/> ARTIFICIAL [0] _____	<input type="checkbox"/> HARDPAN [0] _____	<input type="checkbox"/> SILT FREE [1] _____	<input type="checkbox"/> SILT FREE [1] _____
<input checked="" type="checkbox"/> SILT [2] <u>70</u>	NOTE: Ignore Sludge Originating From Point Sources	<input type="checkbox"/> SANDSTONE [0] EMBEDDED	<input type="checkbox"/> EXTENSIVE [-2]	<input type="checkbox"/> EXTENSIVE [-2]
		<input type="checkbox"/> RIP/RAP [0] NESS:	<input checked="" type="checkbox"/> MODERATE [-1]	<input checked="" type="checkbox"/> MODERATE [-1]
		<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> NORMAL [0]	<input type="checkbox"/> NORMAL [0]
		<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> NONE [1]	<input type="checkbox"/> NONE [1]
		<input type="checkbox"/> COAL FINES [-2]		

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

COMMENTS: _____

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)
(Structure) TYPE: Score All That Occur

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

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

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

COMMENTS: _____

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

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

COMMENTS: _____

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

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

COMMENTS: _____

CHECK ONE OR CHECK 2 AND AVERAGE

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

COMMENTS: _____

6) GRADIENT (ft/mi): 1 DRAINAGE AREA (sq.mi.): _____ %POOL: 10 %GLIDE: 70
%RIFFLE: _____ %RUN: _____

** Best areas must be large enough to support a population of 1000+ aquatic species

740.0' wide - 26-1.0 h. miles

8 - Low - Moderate

Is Sampling Reach Representative of the Stream (Y/N) _____ If Not, Explain:

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient:

- Low, - Moderate, - High

Gear: _____ Distance: _____ Water Clarity: _____ Water Stage: _____ Canopy -% Open _____

First Sampling Pass _____

Stream Measurements:

Average Width	Average Depth	Maximum Depth	Av. Bankfull Width	Bankfull Depth	Bankfull Mean W/D Ratio	Bankfull Max Depth	Floodprone Area	Entrench. Width Ratio
120								

Major Suspected Sources of Impacts (Check All That Apply):

- None
- Industrial
- WWTP
- Ag
- Livestock
- Silviculture
- Construction
- Urban Runoff
- CSOs
- Suburban Impacts
- Mining
- Channelization
- Riparian Removal
- Landfills
- Natural
- Dams
- Other Flow Alteration
- 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.

Yes/No

Is Stream Ephemeral (no pools, totally dry or only damp spots)?

Is there water upstream? How Far: _____

Is There Water Close Downstream? How Far: _____

Is Dry Channel Mostly Natural?

WNB'0



Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 35

Point

River Code: _____ RM: _____ Stream: Grand Calumet River

Date: 8-10-11 Location: Burnham Ave.

Scorers Full Name: _____ Affiliation: _____

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

TYPE	POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR /SLBS [10] _____	<input type="checkbox"/> GRAVEL [7] _____	Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)	
<input type="checkbox"/> BOULDER [9] _____	<input type="checkbox"/> SAND [6] _____	<input checked="" type="checkbox"/> LIMESTONE [1] _____	SILT:	<input checked="" type="checkbox"/> SILT HEAVY [-2]	Substrate <input type="text" value="1"/> Max 20
<input type="checkbox"/> COBBLE [8] _____	<input type="checkbox"/> BEDROCK [5] _____	<input type="checkbox"/> TILLS [1] _____	<input type="checkbox"/> SILT MODERATE [-1]	<input type="checkbox"/> SILT NORMAL [0]	
<input type="checkbox"/> HARDPAN [4] _____	<input type="checkbox"/> DETRITUS [3] _____	<input checked="" type="checkbox"/> WETLANDS [0] _____	<input type="checkbox"/> SILT FREE [1] _____	<input type="checkbox"/> EXTENSIVE [-2]	
<input type="checkbox"/> MUCK [2] _____	<input type="checkbox"/> ARTIFICIAL [0] _____	<input type="checkbox"/> HARDPAN [0] _____	<input type="checkbox"/> SANDSTONE [0] EMBEDDED	<input type="checkbox"/> MODERATE [-1]	
<input checked="" type="checkbox"/> SILT [2] <u>95</u>	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> RIP/RAP [0] NESS:	<input type="checkbox"/> NORMAL [0]	

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

SHALE [-1] NONE [1]

COMMENTS: _____

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

TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)	Cover
<u>0</u> UNDERCUT BANKS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]	<input type="text" value="6"/> Max 20
<u>1</u> OVERHANGING VEGETATION [1]	<input type="checkbox"/> MODERATE 25-75% [7]	
<u>0</u> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]	
<u>0</u> ROOTMATS [1]	<input type="checkbox"/> NEARLY ABSENT < 5% [1]	
COMMENTS: _____		

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SHAGGING	<input type="text" value="8"/> Max 20
<input checked="" type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input checked="" type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input checked="" type="checkbox"/> CANOPY REMOVAL	
<input type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	
				<input type="checkbox"/> IMPOUND.	

COMMENTS: _____

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

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

COMMENTS: _____

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)	Pool/Current
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]	<input type="text" value="5"/> Max 12
<input checked="" type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]	
<input type="checkbox"/> 0.4-0.7m [2]	<input checked="" type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input type="checkbox"/> MODERATE [1]	
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS: _____	<input type="checkbox"/> TORRENTIAL [-1]	
		<input type="checkbox"/> INTERSTITIAL [-1]	

COMMENTS: _____

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	<input type="text" value="0"/> Max 8
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]	

COMMENTS: _____

6) GRADIENT (ft/mi): 0 DRAINAGE AREA (sq.mi.): _____

% POOL: _____ % GLIDE: _____

% RIFFLE: _____ % RUN: 100

COMMENTS: _____

43' wide... B-5

Is Sampling Reach Representative of the Stream (Y/N) ___ If Not, Explain:

- Major Suspected Sources of Impacts (Check All That Apply):
- None
 - Industrial
 - WWTP
 - Ag
 - Livestock
 - Silviculture
 - Construction
 - Urban Runoff
 - CSOs
 - Suburban Impacts
 - Mining
 - Channelization
 - Riparian Removal
 - Landfill
 - Natural
 - Dams
 - Other Flow Alteration
 - Other: _____

		Gear: _____	Distance: _____	Water Clarity: _____	Water Stage: _____	Canopy -% Open _____																		
<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Subjective Rating (1-10)</p>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Aesthetic Rating (1-10)</p>	<p>Stream Measurements:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Average Width</th> <th>Average Depth</th> <th>Maximum Depth</th> <th>Av. Bankfull Width</th> <th>Bankfull Mean Depth</th> <th>W/D Ratio</th> <th>Bankfull Max Depth</th> <th>Floodprone Area</th> <th>Entrench. Width Ratio</th> </tr> </thead> <tbody> <tr> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </tbody> </table>					Average Width	Average Depth	Maximum Depth	Av. Bankfull Width	Bankfull Mean Depth	W/D Ratio	Bankfull Max Depth	Floodprone Area	Entrench. Width Ratio									
Average Width	Average Depth	Maximum Depth	Av. Bankfull Width	Bankfull Mean Depth	W/D Ratio	Bankfull Max Depth	Floodprone Area	Entrench. Width Ratio																
<p>Gradient: <input type="checkbox"/> - Low, <input type="checkbox"/> - Moderate, <input type="checkbox"/> - High</p>																								

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.

- Yes/No
- Is Stream Ephemeral (no pools, totally dry or only damp spots)?
 - Is there water upstream? How Far: _____
 - Is There Water Close Downstream? How Far: _____
 - Is Dry Channel Mostly Natural?



Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: **33**

Stream & Location: Little Calumet River, Westworth RM: Date: 8/22/11

River Code: STORET #: Scorers Full Name & Affiliation: 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	ORIGIN	QUALITY
<input type="checkbox"/> BLDG / SLABS [10]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> LIMESTONE [1]	<input checked="" type="checkbox"/> HEAVY [-2]
<input type="checkbox"/> BOULDER [9]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> DETRITUS [3]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> SILT [1]	<input type="checkbox"/> MODERATE [-1]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> NORMAL [0]
<input type="checkbox"/> GRAVEL [7]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> SILT [2]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> FREE [1]
<input type="checkbox"/> SAND [6]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> ARTIFICIAL [0]	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> EXTENSIVE [-2]
<input type="checkbox"/> BEDROCK [5]	<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> RIP/RAP [0]	<input checked="" type="checkbox"/> MODERATE [-1]

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

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.

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

Comments:

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

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

Comments:

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

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

Comments:

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

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	Recreation Potential
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	Primary Contact
<input type="checkbox"/> > 1m [6]	<input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> TORRENTIAL [-1]	Secondary Contact
<input type="checkbox"/> 0.7-<1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input checked="" type="checkbox"/> SLOW [1]	(circle one and comment on back)
<input checked="" type="checkbox"/> 0.4-<0.7m [2]	<input checked="" type="checkbox"/> POOL WIDTH < RIFFLE WIDTH [0]	<input type="checkbox"/> VERY FAST [1]	
<input type="checkbox"/> 0.2-<0.4m [1]		<input type="checkbox"/> FAST [1]	
<input type="checkbox"/> < 0.2m [0]		<input type="checkbox"/> MODERATE [1]	
		<input type="checkbox"/> INTERSTITIAL [-1]	
		<input type="checkbox"/> INTERMITTENT [-2]	
		<input type="checkbox"/> EDDIES [1]	

Comments:

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
<input type="checkbox"/> BEST AREAS > 10cm [2]	<input type="checkbox"/> MAXIMUM > 50cm [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input type="checkbox"/> BEST AREAS 5-10cm [1]	<input type="checkbox"/> MAXIMUM < 50cm [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]
<input type="checkbox"/> BEST AREAS < 5cm [metric=0]		<input type="checkbox"/> UNSTABLE (e.g., Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]
			<input checked="" type="checkbox"/> EXTENSIVE [-1]

Comments:

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

DRAINAGE AREA (m²)

%POOL: %GLIDE:

%RUN: %RIFFLE:

Comments:

52' wide 0.6 - 1.0 ft/min

A) SAMPLED REACH

Check ALL that apply

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

- 0.5 Km
- 0.2 Km
- 0.15 Km
- 0.12 Km
- OTHER
- 100 meters

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

- CANOPY**
- 1st 60 cm
- 2nd _____ cm
- > 85% - OPEN
- 55% - 85%
- 30% - 55%
- 10% - 30%
- < 10% - CLOSED

C) RECREATION

AREA DEPTH

POOL: > 100m² > 3ft

- B) AESTHETICS**
- NUISANCE ALGAE
- 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

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 H₂O / TILE / H₂O 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 x² width
- entrench. ratio
- Legacy Tree:

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

Stream Drawing:

WWT7



Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 45

Fac. #

River Code: _____ RM: _____ Stream: Thorn Creek
 Date: 7/13/11 Location: 170th
 Scorers Full Name: JK Affiliation: _____

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

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

NOTE: Ignore Sludge Originating From Point Sources

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

COMMENTS: _____

Substrate
8
Max 20

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

TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)
<u>2</u> UNDERCUT BANKS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]
<u>2</u> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]
<u>0</u> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> SPARSE 5-25% [3]
<u>0</u> ROOTWADS [1]	<input type="checkbox"/> NEARLY ABSENT < 5% [1]
<u>1</u> POOLS > 70 cm [2]	
<u>2</u> ROOTWADS [1]	
<u>0</u> BOULDERS [1]	
<u>0</u> OXBOWS, BACKWATERS [1]	
<u>0</u> AQUATIC MACROPHYTES [1]	
<u>3</u> LOGS OR WOODY DEBRIS [1]	

COMMENTS: _____

Cover
13
Max 20

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

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

COMMENTS: _____

Channel
7
Max 20

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

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

COMMENTS: _____

Riparian
4
Max 10

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

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

COMMENTS: _____

Pool/Current
1
Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

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

COMMENTS: _____

Riffle/Run
0
Max 8
Gradient
8
Max 10

6) GRADIENT (ft/mi): 1 DRAINAGE AREA (sq.mi.): 32.2 %POOL: %GLIDE:
 %RIFFLE: %RUN: 100

* Best areas must be large enough to support a population of self-sufficient species

Instream (near) substrate
 from Thorn Creek
 Area the stream is fair
 170th ...
 B-9

Is Sampling Reach Representative of the Stream (Y/N) _____ If Not, Explain:

- Major Suspected Sources of Impacts (Check All That Apply):
- None
 - Industrial
 - WWTP
 - Ag
 - Livestock
 - Silviculture
 - Construction
 - Urban Runoff
 - CSOs
 - Suburban Impacts
 - Mining
 - Channelization
 - Riparian Removal
 - Landfills
 - Natural
 - Dams
 - Other Flow Alteration
 - Other: _____

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: - Low, - Moderate, - High

Gear: _____ Distance: _____ Water Clarity: _____ Water Stage: _____ Canopy -% Open _____

First Sampling Pass _____

Stream Measurements:									
Average Width	Average Depth	Maximum Depth	Av. Bankfull Width	Bankfull Depth	Bankfull Mean W/D Ratio	Bankfull Max Depth	Floodprone Area	Entrench. Width	Entrench. Ratio
20m									

Stream Drawing:

B-10

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.

- Yes/No
- Is Stream Ephemeral (no pools, totally dry or only damp spots)?
 - Is there water upstream? How Far: _____
 - Is There Water Close Downstream? How Far: _____
 - Is Dry Channel Mostly Natural?

WV 54

Good



Qualitative Habitat Evaluation Index Field Sheet QHEI Score: **64**

River Code: RM: Stream: Thorn Cr
Date: 7-14- Location: Joe Ann Rd
Scorers Full Name: DS Affiliation: _____

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

TYPE	POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> -BLDR /SLBS [10] _____	<input type="checkbox"/> -GRAVEL [7] _____	<u>50</u> Check ONE (OR 2 & AVERAGE)	<input type="checkbox"/> -LIMESTONE [1] _____	<input type="checkbox"/> -SILT HEAVY [-2]
<input type="checkbox"/> -BOULDER [9] _____	<input checked="" type="checkbox"/> -SAND [6] <u>70</u> <u>40</u>	<input type="checkbox"/> -BEDROCK [5] _____	<input type="checkbox"/> -TILLS [1] _____	<input checked="" type="checkbox"/> -SILT MODERATE [-1]
<input type="checkbox"/> -COBBLE [8] _____	<input type="checkbox"/> -ARTIFICIAL [0] _____	<input type="checkbox"/> -DETRITUS [3] _____	<input type="checkbox"/> -WETLANDS [0] _____	<input type="checkbox"/> -SILT NORMAL [0]
<input type="checkbox"/> -HARDPAN [4] _____	NOTE: Ignore Sludge Originating From Point Sources	<input type="checkbox"/> -HARDPAN [0] _____	<input type="checkbox"/> -SANDSTONE [0] EMBEDDED	<input checked="" type="checkbox"/> -SILT FREE [1]
<input type="checkbox"/> -MUCK [2] _____		<input type="checkbox"/> -RIP/RAP [0] _____	NESS:	<input checked="" type="checkbox"/> -EXTENSIVE [-2]
<input checked="" type="checkbox"/> -SILT [2] <u>25</u>		<input type="checkbox"/> -LACUSTRINE [0] _____	<input type="checkbox"/> -SHALE [-1]	<input type="checkbox"/> -MODERATE [-1]
		<input type="checkbox"/> -SHALE [-1]	<input type="checkbox"/> -COAL FINES [-2]	<input type="checkbox"/> -NORMAL [0]
				<input type="checkbox"/> -NONE [1]

Substrate
13
Max 20

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

COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)
(Structure) TYPE: Score All That Occur

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

AMOUNT: (Check ONLY One or check 2 and AVERAGE)
 - EXTENSIVE > 75% [11]
 - MODERATE 25-75% [7]
 - SPARSE 5-25% [3]
 - NEARLY ABSENT < 5% [1]

Cover
14
Max 20

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

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

Channel
0
Max 20

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

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

Riparian
7
Max 10

* WWTP

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

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

Pool/Current
9
Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

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

Riffle/Run
3
Max 8
Gradient
8
Max 10

6) GRADIENT (ft/mi): _____ DRAINAGE AREA (sq.mi.): 32.2
% POOL: 10 % GLIDE: _____
% RIFFLE: 5 % RUN: 85

> pool winds
not too fast

