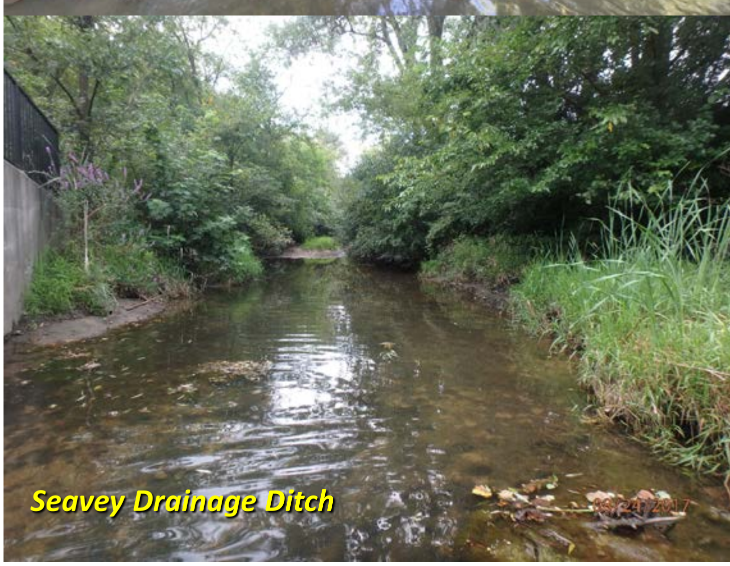
Biological and Water Quality Assessment of Upper Des Plaines River Subwatersheds: Year 1 Rotation 2017



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Biological and Water Quality Assessment of Upper Des Plaines River Subwatersheds: Year 1 Rotation 2017

Indian, Buffalo, and Aptakisic Creek Subwatersheds.

Lake County, IL

Technical Report MBI/2017-10-10

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FOREWORD

What is a Biological and Water Quality Survey?

A biological and water quality survey, or "bioassessment", is an interdisciplinary monitoring effort coordinated on a waterbody specific or watershed scale. This may involve a relatively simple setting focusing on one or two small streams, one or two principal stressors, and a handful of sampling sites or a much more complex effort including entire watersheds, multiple and overlapping stressors, and tens of sites. The 2017 study included the Year 1 subwatersheds in the Upper Des Plaines River subbasin consisting of the Indian, Buffalo, and Aptakisic Creek subwatersheds that encompass a reassessment of the baseline monitoring of 23 sites sampled in 2016. The principal focus of the 2017 bioassessment is on the status of the Illinois General Use for aquatic life and recreation.

Scope of the 2017 Biological and Water Quality Assessment

The Midwest Biodiversity Institute (MBI) was contracted by the Des Plaines Watershed Workgroup (DRWW) to develop a biological and water quality monitoring and assessment plan for Upper Des Plaines River and tributaries within Lake County, IL. The plan was incorporated into a Quality Assurance Project Plan (QAPP; DRWW 2016) that was submitted to and approved by Illinois EPA. The spatial sampling design consisted of an intensive pollution survey and geometric allocation of sites. This design was employed to fulfill multiple purposes and goals in addition to the determination of the existing status of the biological assemblages and their relationship to chemical, physical, and biological stressors. Targeted sites were positioned upstream and downstream from major discharges, other sources of potential pollution releases and contamination, and major tributaries to provide a "pollution profile" of the major mainstem streams and rivers. Sampling locations in the smaller tributaries were allocated by a geometric progression of drainage area to a "resolution" of 0.5-1.0 square miles. The major objectives include:

1. Determine the aquatic life status of each sampling location in quantitative terms, i.e., not only if a waterbody is impaired, but the spatial extent and severity of the impairment and the respective departures from established criteria;

2. Determine the proximate stressors that correspond to observed impairments for the purpose of targeting appropriate management actions to those stressors; and,

3. Screen for any potential issues with use attainability.

To meet these objectives data was collected with methods that provide high quality results and in conformance with the practices of Illinois EPA (IEPA 2010a,b; 2011a-g; 2014a,b) and Illinois DNR (2010a,b) and under a project QAPP approved by IEPA (DRWW 2016).

Previous biological assessments of the Upper Des Plaines River basin streams and rivers include major surveys by Illinois EPA (IEPA 1988,), Illinois DNR (IDNR; Pescitelli 2016; Pescitelli and Rung 2010a,b; Day 1991; Heidinger 1989; Bertrand 1984; Langbein and Wright 1976; Muench 1968), Illinois Natural History Survey (Bilger et al. 2016; Sherwood et al. 2016), U.S. Geological Survey (Steffeck and Streigl 1989), Shedd Aquarium (Bland and Willink 2015), and others (Slawski et al. 2008). Some of these surveys included the entirety of the Des Plaines River and others focused on the Upper Des Plaines defined as the mainstem and tributaries upstream from the confluence with Salt Creek. Smaller surveys of specific tributaries in Lake Co. have also been conducted, but none were of sufficient scope or coverage to meaningfully compare to the Year 1 watershed bioassessments of the Indian, Buffalo, or Aptakisic Creek subwatersheds. The recent basin-wide fish surveys by IDNR included only a single site located on Indian Creek. Other fish surveys include two sites on Seavey Drainage Ditch (pre- and post-dam removal 2008, 2010), a qualitative fish survey in Seavey Ditch and Indian Creek in June 2016 (Bland et al. 2016) and a more recent and comprehensive survey of fish, macroinvertebrates, and mussels in streams potentially impacted by the State Route 53 extension northward through Lake Co. in 2014 and 2015 (Sherwood et al. 2016; Bilger et al. 2016; Douglas et al. 2016). This included 3 sites in the Buffalo Creek subwatershed and 7 sites in Indian Creek subwatershed sampled for fish and 4 of these 10 sites sampled for macroinvertebrates.

EXECUTIVE SUMMARY

Summary of Findings

Aquatic Life Condition Assessment

The primary indicators of the status of the Illinois General Use for aquatic life are the Illinois fish and macroinvertebrate Indices of Biotic Integrity and generally following the guidance in the 2018 Integrated Report (IEPA 2018) with certain exceptions. The status of aquatic life is reported here in an attainment table (Table 1) and expressed as full, partial, or non-support and based on the most limiting of either the fish or macroinvertebrate results. Non-support is further subdivided into non-support fair and non-support poor; a partial support category is added to clarify instances where only one of the two assemblages attains the General Use support fish or macroinvertebrate threshold. Of the 23 sites assessed for the General Use for aquatic life none were in full support, two (2) in partial support, 11 non-support-fair, and 10 non-support poor. The fish assemblage was the limiting factor in all of the non-support and partial support determinations failing to meet the IEPA General Use threshold for the fIBI at any sampling site in the 2017 Year 1 subwatersheds. This finding is consistent with the watershed wide results observed in 2016 by MBI (2017) and 2013 by IDNR (Pescitelli 2016). The macro-invertebrate assemblage attained the General Use threshold for the mIBI at four (4) of the 23 biological sampling sites.

Causes and Sources of Non-attainment[1]

Causes and sources were determined for each impaired site and included categorical or parameter level associations and their sources (if known). These were compared to the IEPA derived causes listed in the 2018 Integrated Report (IEPA 2018) for coinciding sites. Assigning causes involves using a lines of evidence approach where chemical and physical threshold exceedances within a causal category (or of a parameter) is logically related to a biological impairment, not just simply based on the coincidental exceedance of a criterion or other threshold. Knowing about relationships that are supported by prior empirical observations in other studies and our own experiences helps boost the confidence in causal assignments. This process varies somewhat from that of IEPA in that additional effect thresholds were used to assign causes beyond those used by IEPA.

Eleven (11) causal categories and three (3) source categories were identified for the 2017 study area (Table 1; Figure 1). Of these causes, three (3) were habitat related (siltation, channel modification, and shallow depth) and eight (8) were chemical (low dissolved oxygen, organic enrichment, nutrient enrichment, chlorides, total dissolved solids [TDS], metals, and polycyclic aromatic hydrocarbons [PAHs]). Causes such chlorides (16 of 23 sites), habitat related (15 of 23 sites), and nutrient enrichment (13 of 23 sites) were distributed throughout the study area

[1] A ***Cause*** is an agent (or agents) associated with an aquatic life or recreational use impairment; a ***Source*** is the origin of the causal agent. Nomenclature generally follows U.S. EPA and state 303[d] listing guidelines.

***Table 1**. Aquatic life use attainment status in the 2017 Year 1 Upper Des Plaines River subwatersheds study area with associated causes and sources of impairment listed for partial and non-supporting sites determined by this study and by IEPA (2018) for matching sites (see footnote for fIBI and mIBI use support thresholds). fIBI and mIBI values that do not meet the General Use threshold are asterisked (*) and poor values are underlined. Causes of impairment that exceed thresholds in the Illinois 2018 Integrated Report guidance are underlined. (NA – Not Assessed; WWTP – Wastewater Treatment Plant)*

DRWW Site ID	River Mile	Drainage Area ($mi.^2$)	fIBI	mIBI	QHEI	Attainment Status[1]	MBI Causes	MBI Sources	IEPA Causes
Aptakisic Creek									
18-4	4.70	1.09	28*	21.5*	47.0	Non-Fair	Siltation, Channel modification, Organic enrich., TDS	Habitat alteration, Urban runoff	NA
18-3	4.30	2.30	16*	28.2*	55.5	Non-Poor	Channel mod., Nutrient enrich., Chloride, PAH	Habitat alteration, Urban runoff	
18-2	0.80	4.94	24*	24.0*	45.0	Non-Fair	Siltation, Channel mod., Low D.O., Chloride	Habitat alteration, Urban runoff	
18-1	0.50	5.50	22*	25.6*	48.0	Non-Fair	Channel mod., Nut. enrich., Chloride, Unk. Tox., PAHs	Habitat alteration, Urban runoff, WWTP	
Unnamed Tributary to Aptakisic Creek @RM 4.6									
18-5	0.05	0.99	24*	26.1*	43.5	Non-Fair	Siltation, Channel mod., Chloride	Urban runoff	NA
Buffalo Creek									
17-5	14.0	1.37	25*	23.7*	63.0	Non-Fair	Organic enrich., Chloride	Urban runoff	TSS
17-3	7.70	9.61	15*	49.6	73.0	Non-Poor	Organic enrichment	Urban runoff	
17-2	6.10	22.1	18*	50.8	64.3	Non-Poor	Channel mod., Low D.O., Organic & Nut. enrich., Chloride	Urban runoff	TSS
17-1	0.75	29.2	25*	30.8*	46.5	Non-Fair	Siltation, Channel mod., Low D.O., Nut. enrich., Chloride, PAHs	Urban runoff	
Unnamed Tributary to Buffalo Creek @RM 7.56									
17-4	0.68	8.55	8*	31.2*	52.5	Non-Poor	Low D.O., Nut. enrich., Chloride	Urban runoff	NA

***Table 1**. Aquatic life use attainment status in the 2017 Year 1 Upper Des Plaines River subwatersheds study area with associated causes and sources of impairment listed for partial and non-supporting sites determined by this study and by IEPA (2018) for matching sites (see footnote for fIBI and mIBI use support thresholds). fIBI and mIBI values that do not meet the General Use threshold are asterisked (*) and poor values are underlined. Causes of impairment that exceed thresholds in the Illinois 2018 Integrated Report guidance are underlined. (NA – Not Assessed; WWTP – Wastewater Treatment Plant)*

DRWW Site ID	River Mile	Drainage Area (mi.[2])	fIBI	mIBI	QHEI	Attainment Status[1]	MBI Causes	MBI Sources	IEPA Causes
Indian Creek									
15-9	10.83	2.68	19*	22.6*	55.5	Non-Poor	Shallow depth, Low D.O., Organic & Nut. enrich., Chloride	Urban runoff	Low D.O.
15-6	9.83	3.70	22*	23.2*	59.5	Non-Fair	Shallow depth	Habitat alteration	
15-5	5.40	17.3	25*	39.4*	66.5	Non-Fair	Nutrient enrichment	Urban runoff	
15-2	2.41	35.0	38*	46.8	73.0	Partial	Nutrient enrich., Chloride, PAHs	Urban runoff	
15-1	0.17	36.4	34*	53.5	65.0	Partial	Channel mod., Nutrient enrich.	Habitat alteration, Urban runoff	
West Branch Indian Creek									
15-10	0.80	2.22	12*	18.1*	58.5	Non-Poor	Shallow depth	Habitat alteration	NA
Kildeer Creek									
15-12	5.20	2.08	17*	40.0*	41.5	Non-Poor	Siltation, Organic & Nutrient enrichment	Habitat alteration, Urban runoff	NA
15-7	4.60	2.86	16*	32.2*	48.5	Non-Poor	Shallow depth, Low D.O., Organic & Nut. enrich., Chloride	Habitat alteration, Urban runoff	
15-13	2.21	5.01	16*	39.8*	61.0	Non-Poor	Chloride, Metals (As, Fe)	Urban runoff	
15-4	0.17	6.80	22*	33.0*	53.5	Non-Fair	Siltation, Low D.O., Nutrient enrich., Chloride	Urban runoff	

***Table 1**. Aquatic life use attainment status in the 2017 Year 1 Upper Des Plaines River subwatersheds study area with associated causes and sources of impairment listed for partial and non-supporting sites determined by this study and by IEPA (2018) for matching sites (see footnote for fIBI and mIBI use support thresholds). fIBI and mIBI values that do not meet the General Use threshold are asterisked (*) and poor values are underlined. Causes of impairment that exceed thresholds in the Illinois 2018 Integrated Report guidance are underlined. (NA – Not Assessed; WWTP – Wastewater Treatment Plant)*

DRWW Site ID	River Mile	Drainage Area (mi.²)	fIBI	mIBI	QHEI	Attainment Status[1]	MBI Causes	MBI Sources	IEPA Causes
Seavey Drainage Ditch									
15-3	3.66	5.05	12*	17.4*	62.0	Non-Poor	Nutrient enrich., Chloride	Urban runoff	NA
15-8	0.45	9.77	25*	30.6*	55.0	Non-Fair	Channel mod., Low D.O., Organic & Nutrient enrich., Chloride	Habitat alteration, Urban runoff	
Forest Lake Drain									
15-11	0.83	1.70	20*	22.0*	48.3	Non-Fair	Siltation, Shallow depth, Channel modification	Habitat alteration	NA

[1] - **IEPA General Aquatic Life Use Support Thresholds**

AQLU Status	fIBI	mIBI
Full Support	≥41	≥41.8
Non-Support Fair	>20,<41	≥20.9,<41.8
Non-Support Poor	≤20	<20.9

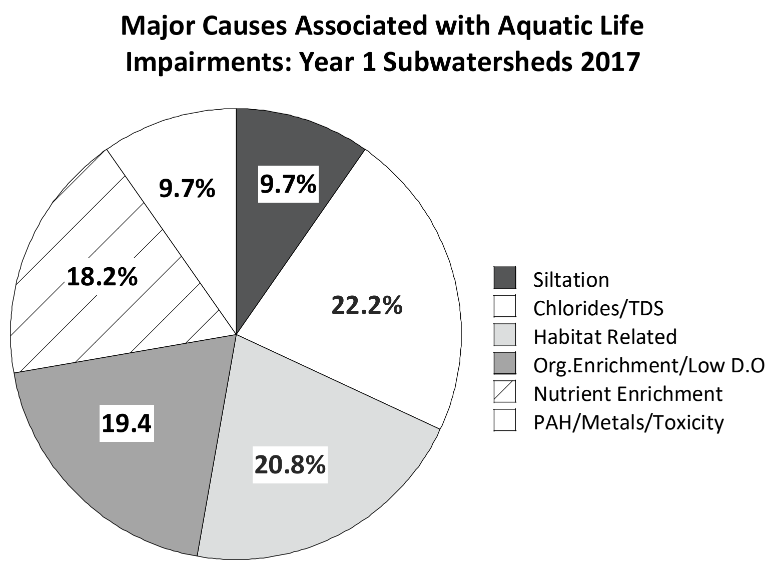

Figure 1. *Major causes associated with aquatic life impairments in the Year 1 subwatersheds, 2017*

while others were confined to specific subwatersheds (organic enrichment), localized (unknown toxicity, metals), or sporadic in the study area (PAHs). Urban runoff was the most pervasive source in the 2017 study area being assigned to 20 of 23 sites. Habitat alteration was assigned to 10 of 23 sites and a single site was affected by the sole wastewater treatment plant (WWTP) discharge in the 2017 study area. The causes and sources were derived from the analyses described in the **SYNTHESIS** section (p. 49) where the rationale for assigning causes and sources is detailed. These constitute the principal causes and sources that would need to be addressed to resolve the aquatic life impairments listed in Table 1. Illinois EPA (2018) listed a different set of causes at only three (3) sites which corresponded to nine (9) of the 23 MBI biological sites for total suspended solids and low D.O. The listing of more causes by MBI is due to use of a wider array of effect thresholds, differences in the interpretation of impairments, and most of all differences in the spatial survey design. IEPA sampled 20 fewer sites than MBI in the 2017 study area (Table 1) which left seven (7) streams unassessed for 303(d) purposes.

Synthesis of Results

Biological signatures of siltation and habitat related impacts, toxicity, nutrient enrichment, dissolved solids, and organic enrichment from multiple sources were evident throughout the 2017 study area. Organic enrichment related biological responses were in the form of an increased proportion of organic enrichment tolerant species and by total Kjeldahl nitrogen (TKN) values that exceeded biological thresholds. Nutrient enrichment was based on a modification of the Ohio Stream Nutrient Assessment Procedure (SNAP; Ohio EPA 2015b) and the more recent large rivers nutrient methodology (Miltner 2018) which includes the width of the diel D.O. swing, benthic chlorophyll a, and selected nutrient measures. A toxic response signature in the macroinvertebrates occurred downstream from the Lake Co. Des Plaines River WWTP in Aptakisic Creek which was repeated from 2016. Sediment contamination was revealed with PAH compounds exceeding consensus based threshold and probable effect levels at five (5) sites. D.O. criteria exceedances were measured by both daytime grab and continuous monitoring. Heavy siltation associated with habitat alterations and urban runoff occurred at seven (7) sites, but moderate siltation was evident at all except the upstream most site in Aptakisic Creek. Dissolved solids in the form of elevated chlorides and conductivity were prevalent in the most urbanized parts of the subwatersheds, but were comparatively low in the upper Indian Creek subwatershed. There were some slight differences between the 2016 and

2017 results, but not enough to alter the pervasive non-attainment of the General Use aquatic life biocriteria observed in both years. Flows measured at the gaging station on Buffalo Creek showed 2017 to have more frequent and higher flow events than in 2016 which showed in some of the overall lower quality habitat assessment results in 2017 compared to 2016.

Recreational Use Assessment

Levels of fecal bacteria in the form of *Escherichia coli* (*E. coli*) cfu[2]/100 mL were used to assess the status of recreation in and on the water. The IEPA General Use criteria are expressed as counts of fecal coliform bacteria, which were not measured here, hence the U.S. EPA national criteria for *E. coli* were used instead. The U.S. EPA *E. coli* criteria are expressed in terms of a 90-day geometric mean and a statistical threshold value (STV) which is the 90^{th} percentile of the data distribution that is not be exceeded by more than 10 percent of the samples. Given the sample size limitations, the mean values were used as an approximation of the 90-day geometric mean and maximum values as the STV. The U.S. EPA recommended 90-day geometric mean criteria value is 126 cfu/100 ml and the STV criteria value is 410 cfu/100 ml (U.S. EPA 2012).

There were numerous exceedances of the U.S. EPA recommended geometric mean and STV criteria (Table 2). Among the 22 sites sampled for *E. coli*, 19 had maximum values that exceeded the STV. However, only 11 sites had exceedances of the geometric mean. Both the mean and STV values were elevated in the Aptakisic Creek subwatershed and these occurred both upstream and downstream from the Lake Co. Des Plaines WWTP. Indian Creek had the next highest exceedances of both the geometric mean and STV. Only one site in the Buffalo Creek subwatershed exceed the geometric mean, but all sites had values exceeding the STV. The upstream most sites in Buffalo Creek and Kildeer Creek were the only instances of meeting both criteria, but exceedances occurred at the remaining downstream sites in Kildeer Creek. The two sites in Seavey Drainage Ditch met the geometric mean, but exceeded the maximum.

The results indicate substantial sources of fecal bacteria, possibly including failing septic system discharges in addition to general urban and suburban nonpoint sources. The 2018 Watershed Plan (LCSMC 2018) showed numerous sources of failing or potentially failing septic systems in Buffalo and Indian Creeks, but few if any in Aptakisic Creek. These were largely based on GIS and modeling estimates hence we suggest this be revisited for Aptakisic Creek. The comparatively lesser number of exceedances of the geometric mean compared to 91% of the sites exceeding the STV suggests wet weather sources.

[2] cfu = colony forming units

***Table 2**. E. coli values (cfu/100 ml) for samples collected in the Year 1 subwatersheds study area during May-October 2017. Blue shaded bars are the actual values and red shaded values exceed the recommended U.S. EPA (2012) 90-day geometric mean (126 cfu/100 mL) and maximum STV (410 cfu/100 mL) recreation use criteria.*

Site ID	Basin	Strean	River	River Mile	Year	Samples	Minimum	Geometric Mean	Max. STV
18-3	95	701	Aptakisic Creek	4.3	2017	4	1	104.4	1300
18-2	95	701	Aptakisic Creek	0.8	2017	10	79.4	296.6	1550
18-1	95	701	Aptakisic Creek	0.5	2017	10	93.3	228.1	1120
18-5	95	712	Unnamed Trib. to Aptakisic Cr.	0.05	2017	2	156	379	921
17-5	95	703	Buffalo Creek	14	2017	2	42	49.4	58
17-3	95	703	Buffalo Creek	7.7	2017	10	1	74.8	1300
17-2	95	703	Buffalo Creek	6.1	2017	10	1	70.3	2420
17-1	95	703	Buffalo Creek	0.75	2017	10	1	124.7	1990
17-4	95	713	Unnamed Trib. to Buffalo Cr.	0.68	2017	10	1	194.8	2420
15-11	95	705	Forest Lake Drain	0.83	2017	2	365	432.3	512
15-9	95	706	Indian Creek	10.83	2017	4	31.6	162.3	613
15-6	95	706	Indian Creek	9.83	2017	10	1	76.6	1050
15-5	95	706	Indian Creek	5.4	2017	10	1	139.5	1050
15-2	95	706	Indian Creek	2.41	2017	10	1	131.7	579
15-1	95	706	Indian Creek	0.17	2017	10	1	107.1	980
15-10	95	717	W. Branch Indian Creek	0.8	2017	1	219	219	219
15-12	95	707	Kildeer Creek	5.2	2017	2	18	20.8	24
15-7	95	707	Kildeer Creek	4.6	2017	10	52	192	2420
15-13	95	707	Kildeer Creek	2.21	2017	2	172	273.5	435
15-4	95	707	Kildeer Creek	0.17	2017	10	1	107.6	886
15-3	95	390	Seavey Drainage Ditch	3.66	2017	10	1	105.3	727
15-8	95	390	Seavey Drainage Ditch	0.45	2017	4	1	48.6	435

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STUDY AREA DESCRIPTION

Lake County is comprised of 53 individual communities and 18 townships with a total area of 1368 square miles of which a significant fraction are waterbodies comprised of lakes, wetlands, rivers, and streams in the Upper Des Plaines River basin. According to the 2010 U.S. Census the population of Lake Co. is 703,462 (272,957 in the Upper Des Plaines watershed) with a density of 1,572 people per square mile and 260,310 housing units making it the third most populated county in Illinois ranking behind adjacent Cook and nearby DuPage Counties. The Des Plaines River originates in Wisconsin near Racine in Kenosha Co. north of where it enters Illinois in Lake County. The Des Plaines flows due south for 110 miles joining the Kankakee River to form the Illinois River. The total watershed area is approximately 2110 square miles of which 1231 are in Illinois (Healy 1979). The watershed in Lake Co. is "trellised" meaning it is narrow in width relative to the length of the mainstem thus the tributaries are of comparatively shorter lengths with comparatively small drainage areas.

The Year 1 2017 study area included the Buffalo, Indian, and Aptakisic Creek subwatersheds and attendant tributaries within Lake Co., IL. The Buffalo Creek subwatershed includes two tributaries that feed Buffalo Creek, which flows southeast from the Buffalo Creek Reservoir, into the

Wheeling Drainage Ditch, and to the Upper Des Plaines River in Wheeling. The Indian Creek subwatershed includes Seavey Ditch, Kildeer Creek (South Branch Indian Creek), and several smaller tributaries which enter the Des Plaines River just south of Route 22 in Lincolnshire. The Aptakisic Creek subwatershed includes two channelized streams that join to form the main branch of Aptakisic Creek, which flows east through Buffalo Grove and Vernon Township to the Upper Des Plaines River. Together these subwatersheds comprise 34% of the Upper Des Plaines basin (Lake Co. SMC 2018). Indian Creek is the largest subwatershed (37.7 mi.^{2}) in the 2017 study area, followed by Buffalo Creek (27.2 mi.^{2}), and Aptakisic Creek (6.8 mi.^{2}). Land use is mostly medium-large scale urban in the Aptakisic (60.5%) and Buffalo (50.2%) Creek subwatersheds and less so in Indian Creek (35.7%). By contrast forest preserve and parks comprise very low fractions of land use in the Aptakisic (0.04%), Buffalo (6.2%), and Indian (3.4%) Creek subwatersheds (Lake Co. SMC 2018).

General Landscape Setting

The 2017 Year 1 subwatersheds lie mostly within the Kettle Moraine subregion of the Southeastern Wisconsin Till Plains Level III ecoregion with lesser portions in the Valparaiso-Wheaton Morainal Complex subregion of the Central Corn Belt Plains Level III ecoregion (Table 3; Woods et al. 1995). The Kettle Moraine subregion occupies the majority of the study area to the west and northwest of the mainstem. It is characterized by poorly drained, hilly to hummocky morainal areas that include conspicuous glacial landforms, numerous lakes, and wetlands including bogs, fens, and marshes. Drainage networks are less integrated and more

Table 3. *Level IV subregions of the 2016 Upper Des Plaines River watershed study area and their key attributes (from Woods et al. 1995).*

Level IV Subregion	Physiography	Geology	Soils	Potential Natural Vegetation	Land Use/Land Cover
Kettle Moraine (53b)	Glaciated, hummocky to hilly area with steeply sloping moraines, outwash plains, closed depressions, mounds, level areas, and many wetlands and natural lakes.	Wisconsinan-age glacial till, outwash gravels, and thin loess (<20"). Silurian & Ordovician dolomite, lime-stone, and shale bedrock.	Mostly Alfisols (Hapludalfs, Epiaqualfs); also, Mollisols (Argiudolls, Endoaquolls), Histosols.	Oak–hickory forest, oak savanna, & blue-stem prairie occur on moraines. Wet-lands (bogs, fens, seeps, sedge meadows, marshes) were common.	Forest, pasture-land, & wetland. Home sites common on moraines and lakes.
Valparaiso-Wheaton Morainal Complex (54f)	Glaciated, hilly, hummocky, rolling area containing moraines, kames, eskers, rolling till plains, outwash plains, kettle holes, and ravines. Small lakes and marshes are common.	Wisconsinan-age glacial till, Quarter-nary lake deposits, thin loess (<20") & alluvium. Ordovician & Silurian dolomite, limestone, & shale bedrock buried by glacial drift with outcrops along some streams.	Alfisols (Epiaqualfs, Hapludalfs), Mollisols (Endoaquolls, Argiudolls), Inceptisols (Eutrudepts).	A mosaic of oak–hickory forest & bluestem prairie. Dry prairies and dry upland forests on dry soils; mesic forests on poorly drained uplands. Floodplain forests in river bottoms.	Mostly growing urban/suburban development, but wooded areas, wetlands, and pastureland are common in preserves.

poorly developed than on the older till and outwash plains of adjacent Rock River Drift Plain subregion. Lakes are typically larger and more concentrated than to the south in the Valparaiso Morainal Complex subregion and much more common than in other neighboring subecoregions. Soils are largely derived from thick late-Wisconsinan glacial drift and thin loess deposits where they occur. Alfisols are common, but Mollisols and Histosols also occur. Overall, organic soils are more extensive than elsewhere in Illinois, and Mollisols are less common than in subregions to the west. In the early 1800s moraines were covered by savanna, prairie, and forest (oak-hickory) with depressions containing wetlands. Landscape alterations in the 1900s reduced the tracts of forest and nonforested wetlands replacing them with urban and suburban development. However, wooded areas, lakes, and wetlands are still common especially in the extensive forest preserves.

The Valparaiso-Wheaton Morainal Complex subregion is a hilly, hummocky to rolling area containing moraines, kames, eskers, and outwash plains with numerous small lakes and marshes. Soils are largely derived from thick, late-Wisconsinan glacial drift and thin loess deposits where they occur. Alfisols are common and Mollisols also occur, but are less common than in neighboring subregions. In the early 1800s prairie and forest (oak-hickory) dominated the moraines with swamp white oak forests and marshes occurring in poorly drained areas. Prairie covered slightly more than half of this subregion. Subsequent fire suppression has reduced the number of prairie openings, thereby increasing forest density. Today, urban and suburban development is increasingly replacing rural land uses. However, wooded areas, lakes, and wetlands are still common especially in the County owned forest preserves. Land uses are varied and include residential (26.3%), public/private open space (19.4%), agricultural (12.2%), transportation (10.6%), forest/grassland (9.3%), water (7.0%), wetlands (5.4%), and the remainder comprised of six other land use types (Lake Co. Local Planning Committee 2012).

Major Point Sources

Significant point sources of pollution were inventoried as part of the 2016 Upper Des Plaines Bioassessment (MBI 2017) to understand the extent of their potential impact and for the intensive pollution survey monitoring design. The 2017 Year 1 study area includes one major discharge, the Lake Co. Dept. of Public Works (LCDPW) Des Plaines River WWTP (16.0 MGD) that discharges to the lower 0.5 miles of Aptakisic Creek. There are a total of 18 wastewater treatment plants (WWTP) in the Upper Des Plaines watershed within Lake Co. of which eight (8) are major discharges (Table 3) comprising a total of more than 80 million gallons per day (MGD; average annual flows) of treated wastewater. Of this total the majority is discharged by the North Shore Water Reclamation District Gurnee (NSWRD; 23.6 MGD), NSWRD Waukegan (22.0 MGD), and Lake Co. Dept. of Public Works (LCDPW) Des Plaines River WWTPs (16.0 MGD). All except one of these facilities have advanced treatment for oxygen demanding wastes (BOD), ammonia-N (NH_3-N), and suspended solids (TSS). The Mundelein WWTP is the only secondary treatment facility remaining. Two facilities have phosphorus removal and all except Mundelein monitor for N and P (MBI 2017).

Nonpoint Sources

Nonpoint sources in the 2017 study area include mostly urban sources, the latter of varying intensities ranging from light suburban to heavy urban and industrial land uses. These have been extensively classified and delineated by the Lake Co. SMC. Hydromodification of stream and river flows and habitat also occurs with the former being influenced by varying land uses and the latter mostly in the form of legacy channelization and riparian encroachment by urban and suburban development. An edge of pavement coverage illustrates the extent of urbanization in the 2017 study area and between the three subwatersheds (Figure 2).

Sampling Sites Selection and Locations

A Monitoring Strategy for the Des Plaines River Watershed was developed by the Monitoring Committee of the Des Plaines River Watershed Workgroup (DRWW 2018). The spatial allocation of sites was established by the DRWW for water sampling in 2015 and this was used as the core for the initial allocation of biological and habitat sites. While the initial baseline

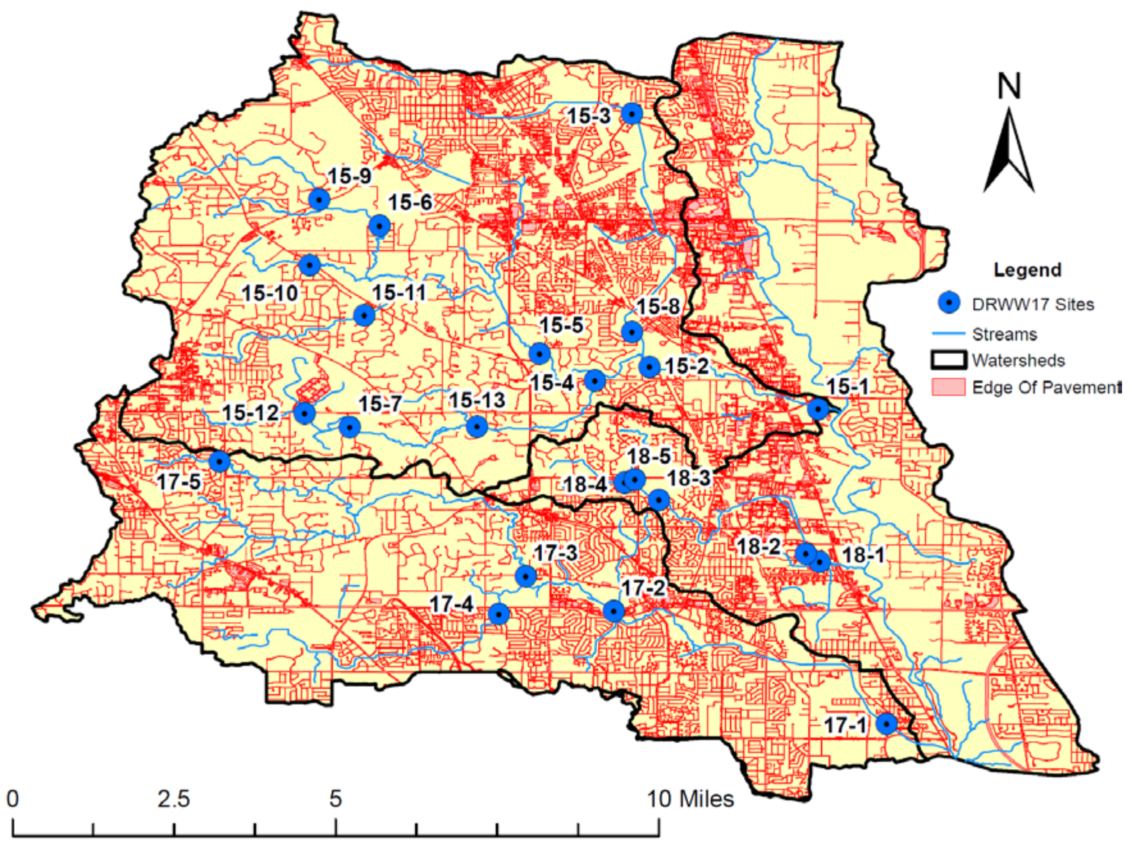

Figure 2*. The degree of urbanization in the 2017 Year 1 study area as reflected by the edge of pavement coverage for Lake Co. The 2017 sampling locations are included.*

survey in 2016 included all 70 sites, a rotation through three subsets of the Upper Des Plaines River basin in Lake Co. was established in 2017.

Spatial Survey Design

A tiered design was adopted by DRWW that more frequently monitors water chemistry at sites with higher flow and land area while allowing for comprehensive coverage of the watershed (DRWW 2016). The initial design consisted of 44 sites located throughout the Upper Des Plaines watershed. MBI later developed a combined intensive pollution survey and geometric allocation of sites for the bioassessment plan. This consisted of geometric panels of drainage area and assigning sampling sites where these occurred throughout the Upper Des Plaines watershed. This resulted in the addition of 26 sites with most located in the upper reaches of small tributaries, with a few sites added to the Des Plaines mainstem to fill gaps left in the longitudinal continuum and to address two dam removal projects. The result was a total of 69 sites sampled in 2016 for biological assemblages and habitat with the 44 DRWW sites also sampled for water chemistry via grab samples and 49 for sediment chemistry. Each sampling site was assigned a unique DRWW numeric site code, a river mile, and UTM coordinates. A total of 23 sites in the Indian, Buffalo, and Aptakisic Creek subwatersheds were sampled in 2017 for biological, chemical, and physical parameters (Figure 3). New in 2017 was the addition of

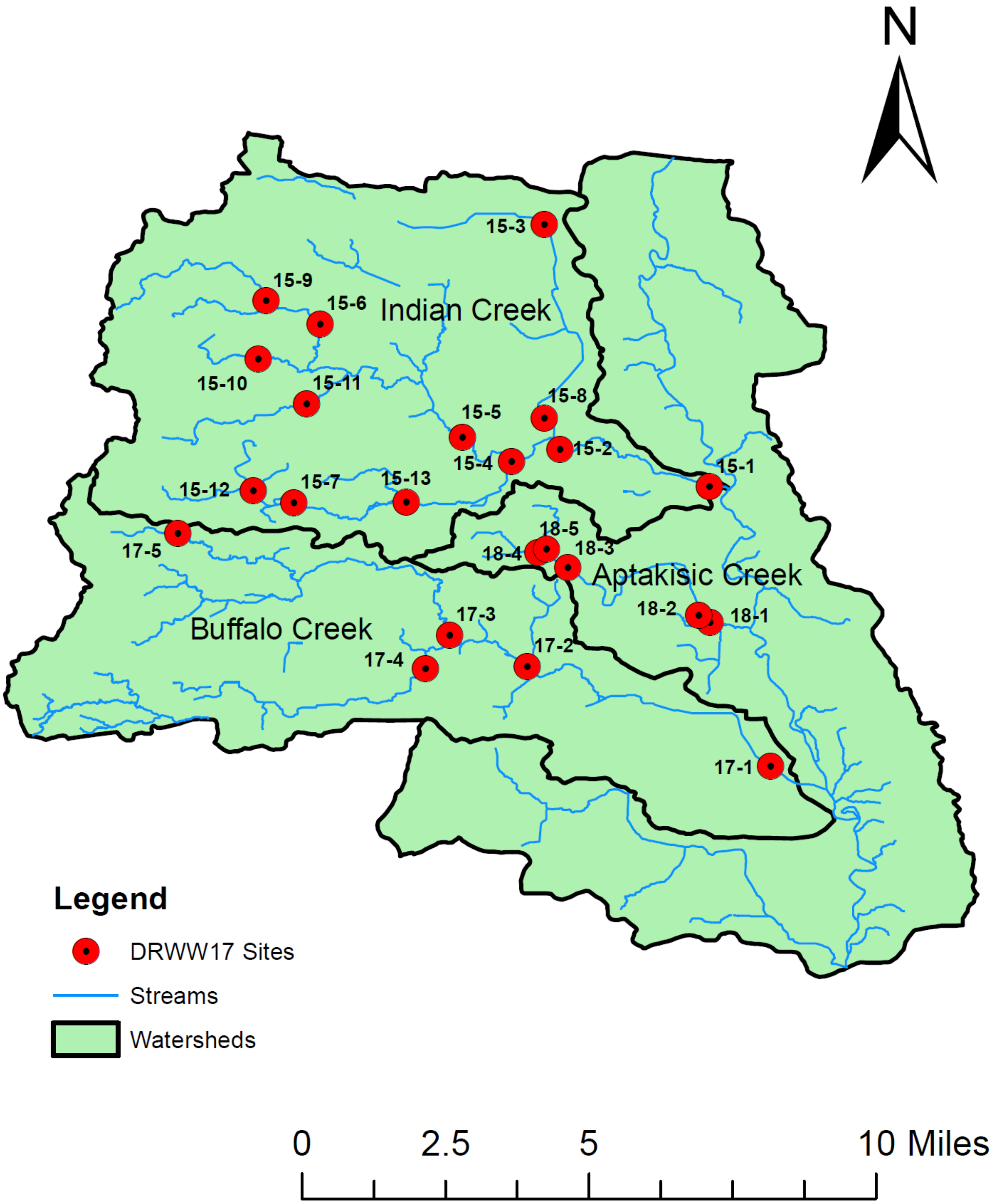

Figure 3*. Location of biological, chemical, and habitat sampling sites in the Year 1 Study area, 2017. Site codes correspond to sites listed in Appendix A-1.*

Datasondes (continuous data for D.O., temperature, conductance, and pH) and benthic chlorophyll a samples at 14 sites (Appendix Table A-1).

METHODS

All methods followed Illinois EPA and DNR procedures, except as modified to meet the needs of the DRWW, but with the goal of providing comparable data to evaluate aquatic life and recreational use attainment. This includes fish, macroinvertebrates, habitat, bacteria, chemical parameters (water and sediment), continuous data for select parameters, and benthic chlorophyll a. Recreational use attainment was evaluated with *Escherichia coli* and using the U.S. EPA national criteria since none were available from Illinois EPA.

Chemical/Physical Water Quality - Methods

Water Sampling

The specific methods of data collection followed IEPA (2012a) and chemical laboratory analyses were provided by Suburban Labs. The chemical/physical parameter categories (demand, nutrients, metals, organics) and the frequency of sample collection are summarized in DRWW (2016, 2018). DRWW assigned tiers to the original 44 sampling sites as follows:

- **Tier 1**: 10 sites located on the mainstem Des Plaines River and Mill Creek that are sampled monthly for water May through September and in November and March (seven times per year) for all demand[3], nutrient, and bacteria parameters; annually under low flow conditions for water column metals, water organics; and once every three years concurrent with the bioassessment for sediment metals and sediment organics.
- **Tier 2**: 10 sites located on the Des Plaines and tributary streams are monitored monthly from May through September and in November and March (seven times per year) for the majority of demand, nutrient, and bacteria parameters; annually under low flow conditions for water column metals, water organics; and once every three years concurrent with the bioassessment for sediment metals and sediment organics.
- **Tier 3**: 24 sites located on the Des Plaines and tributary streams within the watershed are monitored for water chemistry that will occur monthly from May through September and in November and March (seven times per year) for the majority of demand, nutrient, and bacteria parameters; and once every three years concurrent with the bioassessment for sediment metals and sediment organics.

The parameters analyzed and frequencies of collection varied by tier assignment. Twenty-five (25) sites were added for the 2016 biological and habitat assessment and consisted of small, headwater sites generally with catchments of less than 1-2 square miles. These were designated as Tier 4 sites in the revised monitoring strategy and they were not sampled for

[3] Demand parameters include: chlorides, conductivity, pH, TOC, sulfate, total suspended solids, volatile suspended solids, dissolved oxygen, temperature, and turbidity.

water chemistry in 2016 or 2017 with the exception of field parameters collected by the fish and Datasonde crews.

Sediment Sampling

Surficial sediments were sampled for bulk chemical analysis at 16 locations following IEPA methods (IEPA 2011b). Samples were collected in October 2017 and were analyzed by Suburban Labs.

Nutrient Effect Assessment Procedure

A new methodology to assess the effect of nutrients was introduced in 2017. Modeled after the Stream Nutrient Assessment Procedure (SNAP) developed by Ohio EPA (2015b), it includes consideration of the width of the diel variation in D.O. and the biomass of chlorophyll a in benthic algae in addition to the concentration of total phosphorus and dissolved inorganic nitrogen (nitrates + nitrites). Additional parameters such as total suspend solids (TSS) and total Kjeldahl nitrogen (TKN) would also have been included, but were not collected at a sufficient number of sites. Datasondes were deployed for consecutive-day periods during times of low stream flow and elevated summer ambient temperatures (YSI 2012, 2017). Together these results were used to determine five degrees of nutrient enrichment (none, low, moderate, high, and severe). Since this is the first attempt to use this methodology in the Upper Des Plaines basin the assessments of the degree of nutrient enrichment should be regarded as preliminary.

Biological Assemblage Sampling

Biological assemblages in the 2017 Year 1 study area included fish and macroinvertebrates at 23 instream locations. Biological and habitat sampling adhered to a summer-early fall index period of June 16-October 15 for fish and July 1-September 30 for macroinvertebrates. For fish all sites were sampled once and macroinvertebrates once, the latter with a 10% resample. A habitat evaluation was performed at all fish sites using the QHEI (Ohio EPA 2006) and a site description accompanied the Illinois EPA multihabitat macroinvertebrate sample. All sampling occurred during periods of summer-fall base flows – periods of higher flows and elevated runoff were avoided.

Fish Assemblage Methods

Fish were collected once at each site with pulsed D.C. electrofishing units including a Wisconsin AbP-3 battery-powered back pack or T&J 1736 DCV units. Deference was given to the most effective method given the prevailing site and water characteristics. The upper boundary for using the battery-powered back pack electrofishing unit was two times the depth and five times the width of the net ring (anode). Wider and deeper sites were sampled with the T&J 1736 DCV generator powered unit as either a bank set longline or floated on a roller barge. All sites were sampled in an upstream direction. The primary net ring served as the anode and a woven steel cable cathode trailed from the back pack unit, the longline, or the roller barge. A long handled dip net was used to assist in the capture of stunned fish. A two or three-person crew consisting of a fish crew leader and one or two field technicians conducted the sampling under summer-fall base flow conditions. Sampling effort was standardized by distance and included a 150-200 meter long reach for all wadeable sites.

Captured fish were placed in a live well, bucket, or live net for later processing. Water was regularly replaced and/or aerated to maintain adequate oxygen levels in the water and to minimize mortality. Samples from each site were processed by enumerating and recording weights by species and by life stage (young-of-the-year, juvenile, and adult) on a field sheet. The incidence of external anomalies was recorded following procedures outlined by Ohio EPA (1996, 2015a) and refinements made by Sanders et al. (1999). Fish were released back into the water after they were identified to species, examined for external anomalies, and weighed either individually or in batches. Larval fish were not included in a sample and fish measuring less than 15-20 mm in length were generally excluded as a matter of practice (excepting adults of small species). All sites were marked with GPS coordinates (beginning, middle, and end of a sampling reach) and site data was recorded on a standard field form.

While the majority of captured fish were identified to species in the field, any uncertainty about field identification required vouchering for laboratory identification. Voucher specimens were preserved in borax buffered 10% formalin solution and labeled by date, stream, and geographic identifier (e.g., river mile and site number). Regional ichthyology keys were used including the Fishes of Illinois (Smith 1979) and updates available through the Illinois Natural History Survey (INHS). Scientific nomenclature followed Page et al. (2012). Vouchers were deposited at The Ohio State University Museum of Biodiversity (OSUMB) in Columbus, OH. The data were used to calculate the Illinois Fish Index of Biotic Integrity (fIBI; Smogor 2000, 2005) as the primary assessment of fish assemblage quality.

Macroinvertebrate Methods

Macroinvertebrate methods followed the Illinois EPA multi-habitat method (IEPA 2011c,d) at all sites (Appendix Table A-1). The IEPA multi-habitat method involves the selection of a sampling reach that has instream and riparian habitat conditions typical of the assessment reach. Sampling reach requirements included flow conditions that approximate typical summer base flows, the absence of highly influential tributary streams, the presence of one riffle/pool sequence or analog (i.e., run/bend meander or alternate point-bar sequence), if present, and a length of at least 300 feet. The collection of macroinvertebrates was accomplished with a dip net in all bottom-zone and bank-zone habitat types that occurred within a sampling site. Water conditions must allow a sampler to apply the 11-transect habitat-sampling method or to estimate with reasonable accuracy via visual or tactile cues the amount of each of several bottom-zone and bank-zone habitat types. All sites were marked with GPS coordinates (beginning and end of a sampling reach) and site data was recorded on a standard field form.

Multi-habitat macroinvertebrate samples were field preserved in 10% formalin. Upon delivery to the MBI lab in Hilliard, OH the preserved samples were transferred to 70% ethyl alcohol. Laboratory procedures followed the IEPA (2011e) methodology which requires the production of a 300-organism subsample from a gridded tray following a scan and pre-pick of large and/or rare taxa. Taxonomic resolution was at the lowest practicable resolution for the common macroinvertebrate assemblage groups such as mayflies, stoneflies, caddisflies, midges, and crustaceans, which goes beyond the genus level requirement of IEPA (2011g). However, calculation of the Macroinvertebrate IBI (mIBI) adhered to the IEPA methods by using genera as the benchmark level of taxonomic resolution for mIBI scoring.

Habitat Assessment

The QHEI (Rankin 1989, 1995; Ohio EPA 2006) was employed as the principal aquatic habitat assessment methodology at each site. The protocol was accomplished as part of the fish assemblage method by the fish crew leader who is trained and experienced in using the QHEI. The QHEI measures six categories of habitat that are important to the aquatic biota with a scoring range of 0-100. QHEI scores of 60 are generally regarded as sufficient to support the General Use for aquatic life. Scores below 45 indicate substantial deficiencies in habitat that can preclude attainment of the General Use. A QHEI matrix (Rankin 1995) showing the occurrence of good and modified attributes was also examined to evaluate the overall capacity of the stream habitat to support the General Use at each site.

Data Management

All data was managed by MBI in internal databases that permit ready access and analysis. Biological and habitat data is stored in a routine based on the Ohio ECOS format that MBI uses for all biological data management tasks. Biological data analysis included the calculation of Illinois fish and macroinvertebrate IBIs for determining General Use aquatic life status and the accompanying data attributes to enhance the diagnosis of impairments. Habitat data was analyzed using the QHEI and also via a QHEI attributes matrix to aid in assessing habitat related impairments. Summaries of species/taxa relative abundance and QHEI metrics at each site and by sampling date are provided in Appendices B-D.

Determining Use Attainability

Illinois EPA offers a single aquatic life use designation that applies to all rivers and streams through the General Use provision of the Illinois WQS. This is the presumed use applicable to all rivers and streams in Illinois which includes the 2017 study area. An assessment of aquatic life use attainability is therefore not a routine outcome of a biological and water quality assessment and was not performed herein. However, the data collected is adequate to determine if habitat is a limiting factor for any instances of non-support.

Determining Use Attainment

The determination of the attainment status of the Illinois General Use for aquatic life generally followed the guidance in the 2018 IEPA Integrated Report (IEPA 2018) relying primarily on the biological results and attainment of the fIBI and mIBI thresholds expressed as fully supporting, partially supporting, non-supporting fair, and non-supporting poor, with the most limiting result of either the fish or macroinvertebrates determining the assignment of fair or poor. The addition of a partial support category goes beyond the current IEPA structure and was done to highlight where one assemblage attained their respective fIBI or mIBI biocriterion.

Determining Causal Associations

Using the results, conclusions, and recommendations of this assessment requires an understanding of the methodology used to determine biological status and assigning associated causes and sources of impairment utilizing the accompanying chemical/physical data and source information (e.g., point source loadings, land use).

Causal Diagnosis

Describing the causes and sources associated with observed biological impairments relies on an interpretation of multiple lines of evidence including water chemistry data, sediment chemistry data, habitat data, effluent data, land use data, and biological response signatures (Yoder and Rankin 1995; Yoder and DeShon 2003). Thus the assignment of associated causes and sources of biological impairment in this report represents the association of impairments (based on response indicators) with stressor and exposure indicators using linkages to the bioassessment data based on previous experiences with analogous situations and impact types. This was done by relating exceedances of chemical thresholds such as chronic and acute water quality criteria and relevant biological effects thresholds for water and sediment chemistry associated with biological impairments to determine categorical and/or parameter specific causes. The reliability of the identification of associated causes and sources is increased where other such prior associations have been observed. This process relies on multiple lines of evidence concerning the biological response which is the ultimate measure of success in water quality management. Exceedance thresholds for chemical parameters used in the causal analyses are provided in Table 4 and as used in the tabular and graphical presentation of the chemical water and sediment results.

Hierarchy of Water Indicators

A carefully conceived ambient monitoring approach, using cost-effective indicators comprised of ecological, chemical, and toxicological measures, can ensure that all relevant pollution sources are judged objectively on the basis of environmental results. A tiered approach that links the results of administrative actions with true environmental measures was employed in our analyses. This integrated approach is outlined in Figure 4 and includes a hierarchical continuum from administrative to true environmental indicators. The six “levels” of indicators include:

- Level 1 - actions taken by regulatory agencies (permitting, enforcement, grants);
- Level 2 - responses by the regulated entity (treatment works, pollution prevention);
- Level 3 - changes in discharged quantities (pollutant loadings);
- Level 4 - changes in ambient conditions (chemical/physical water quality, habitat);

- Level 5 - changes in uptake and/or assimilation (tissue contamination, biomarkers, assimilative capacity); and,
- Level 6 - changes in health, ecology, or other effects (ecological condition, human and wildlife health).

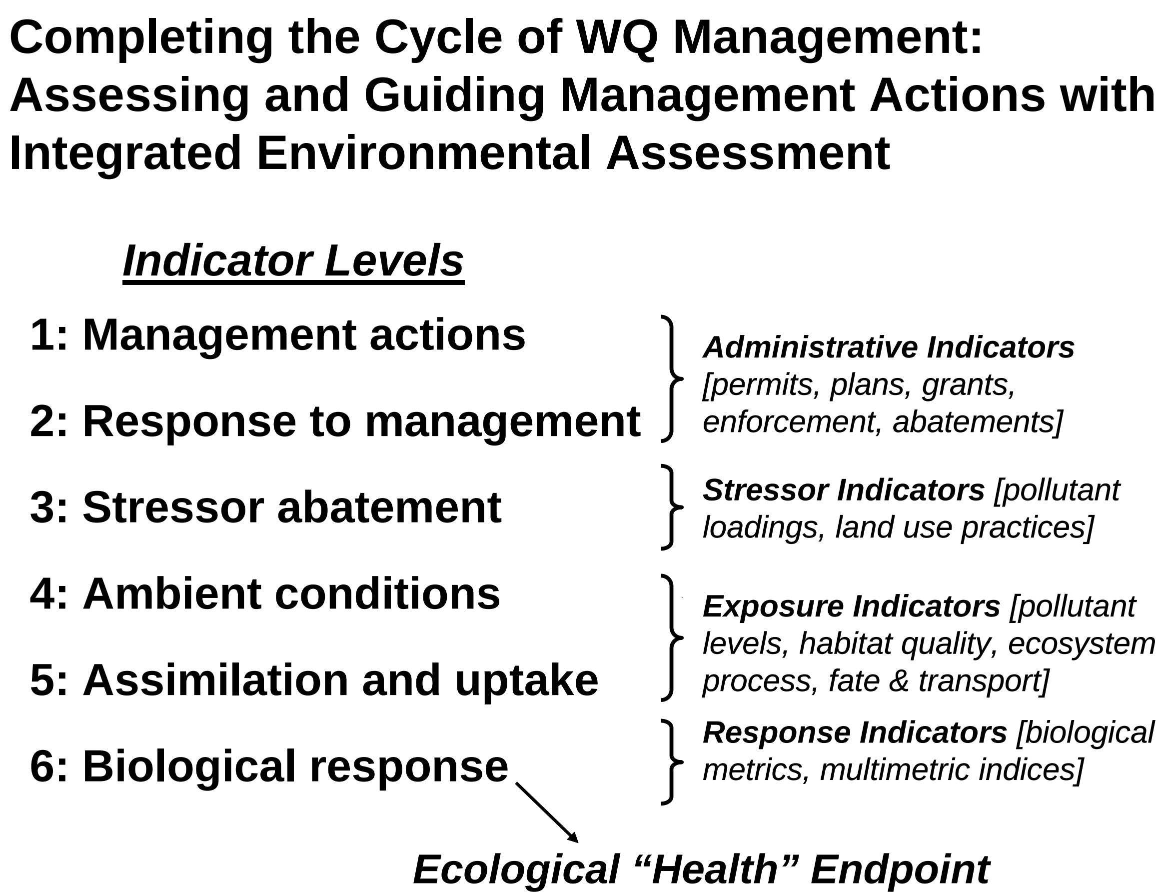

Figure 4*. The hierarchy of administrative and environmental indicators which can be used to support monitoring and assessment, reporting, and an evaluation of the effectiveness of pollution controls on a receiving stream. This is patterned after a model developed by U.S. EPA (1995a,b) and enhanced by Karr and Yoder (2004).*

In this process the results of administrative activities (levels 1 and 2) are linked to water quality (levels 3, 4, and 5) which translates to a response (level 6). An example is the aggregate effect of billions of dollars spent on water pollution control in the U.S. since the early 1970s that have been determined with quantifiable measures of environmental condition. In this case the hierarchy was applied to a specific stream reach that is impacted by multiple point and nonpoint sources. The administrative steps taken by Illinois EPA to issue NPDES permits (Level 1) and the steps taken by the permit holders (Level 2) are easily described and quantified. Quantifying changes in the loadings of pollutants (Level 3) can be affected by the quality and completeness of the effluent monitoring which includes the capture of stressors that actually affect the receiving streams. Likewise, documenting changes in ambient conditions (Level 4) can also be affected by the quality and completeness of the chemical/physical monitoring that not only includes the parameters but also the spatial design in relation to sources of pollution. This in turn informs about how pollution sources tax the assimilative capacity (Level 5) of a receiving stream. The end result of all the above is portrayed by the response in the biological indicators which is expressed as attainment or non-attainment of the Illinois General Use aquatic life thresholds for the fish and macroinvertebrate IBIs (IEPA 2016). Symptoms expressed by the biota beyond the index scores can be useful in aiding the causal diagnosis as a feedback loop in the hierarchy of indicators process.

Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators.

- *Stressor* indicators generally include activities which have the potential to degrade the aquatic environment such as pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications.
- *Exposure* indicators are those which measure the effects of stressors and can include whole effluent toxicity tests, tissue residues, and biomarkers, each of which provides evidence of biological exposure to a stressor or bioaccumulative agent.
- *Response* indicators are generally composite measures of the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices which comprise the Illinois EPA biological endpoints.

This classification of indicators represents the essential technical elements for the pollution survey design that was employed in the Upper Des Plaines bioassessments by using each indicator *within* its most appropriate role which are most appropriate for each (Yoder and Rankin 1998).

Causal Associations

Describing the causes and sources associated with biological impairments in the study area involved the interpretation of multiple lines of evidence that included water chemistry, sediment chemistry, habitat, and effluent data, a general knowledge about upstream land uses, and biological response signatures within the biological data itself. The assignment of causes and sources of biological impairment result from the association of the impairment with exceedances of water quality criteria or other response-based thresholds and the proximity to sources of pollution.

RESULTS – CHEMICAL/PHYSICAL WATER QUALITY

Chemical/physical water quality in the 2017 Year 1 study area was characterized by grab sample data collected from the water column six times at each Tier 1-3 site during summer-fall base flows and by hand held meter only at Tier 4 sites. Sediment chemistry was determined from samples collected at 17 Tier 1-3 sites in October 2017. Commonly detected chemical parameters were compared either to the criteria in the Illinois WQS, IEPA non-standard benchmarks, reference benchmarks, and/or biologically derived thresholds (Table 4). As such, the chemical/physical data herein serves as an indicator of the degree of exposure and stress in support of using the biological data to assess the attainment of designated aquatic life uses and to assist in assigning associated causes and sources. Parameter groupings included field, demand, ionic strength, nutrients, heavy metals, and organic compounds. Bacteria data were collected by grab samples and were used primarily to determine the status of recreational uses in accordance with U.S. EPA National Water Quality Criteria (U.S. EPA 2012).

Flow Regime

The flow regime in the 2017 study area during the period January 1 – December 31, 2016 and 2017 is depicted in Figure 5 based on the gauge operated by the U.S. Geological Survey on Buffalo Creek near Wheeling, IL. The flow regime was highly variable in both years, but summer-fall flows were generally at or below the 50^{th} percentile flow of 8.2 cubic feet/second (cfs) and approached the $Q_{7,10}$ flow of 0.21 cfs on most days. The historical record shows numerous days of zero flow. Peak flows occurred in the winter, spring, early summer, and fall months of 2016 and 2017 following significant precipitation events, but peak flows were higher in 2017 resulting in runoff events of increased quantity and duration. Overall Buffalo Creek exhibited flashy flows similar to other urbanized northeastern Illinois streams.

Water Column Chemistry

The water column chemistry results were analyzed for spatial patterns in each of the three subwatersheds by drainage area and as a frequency plot for the entirety of each subwatershed. Exceedances of Illinois WQS, Illinois non-standard benchmarks, regional reference benchmarks, and biological effect thresholds were assessed. Exceedances of these benchmarks and thresholds are indicated on the plots and tables of the 2017 chemical results.

Exceedances of Biological Effect and Reference Thresholds

The principal purpose of chemical data in a bioassessment is to provide data that supports the interpretation and the assignment of associated causes of biological impairments. Chemical exceedance and biological effect thresholds are essential to that process and included the Illinois water quality criteria, biological effect thresholds derived from regional analyses of stress/response relationships, regional reference benchmarks, and national and regional biological effects compendia. Some of these consist of correlations between concentrations of

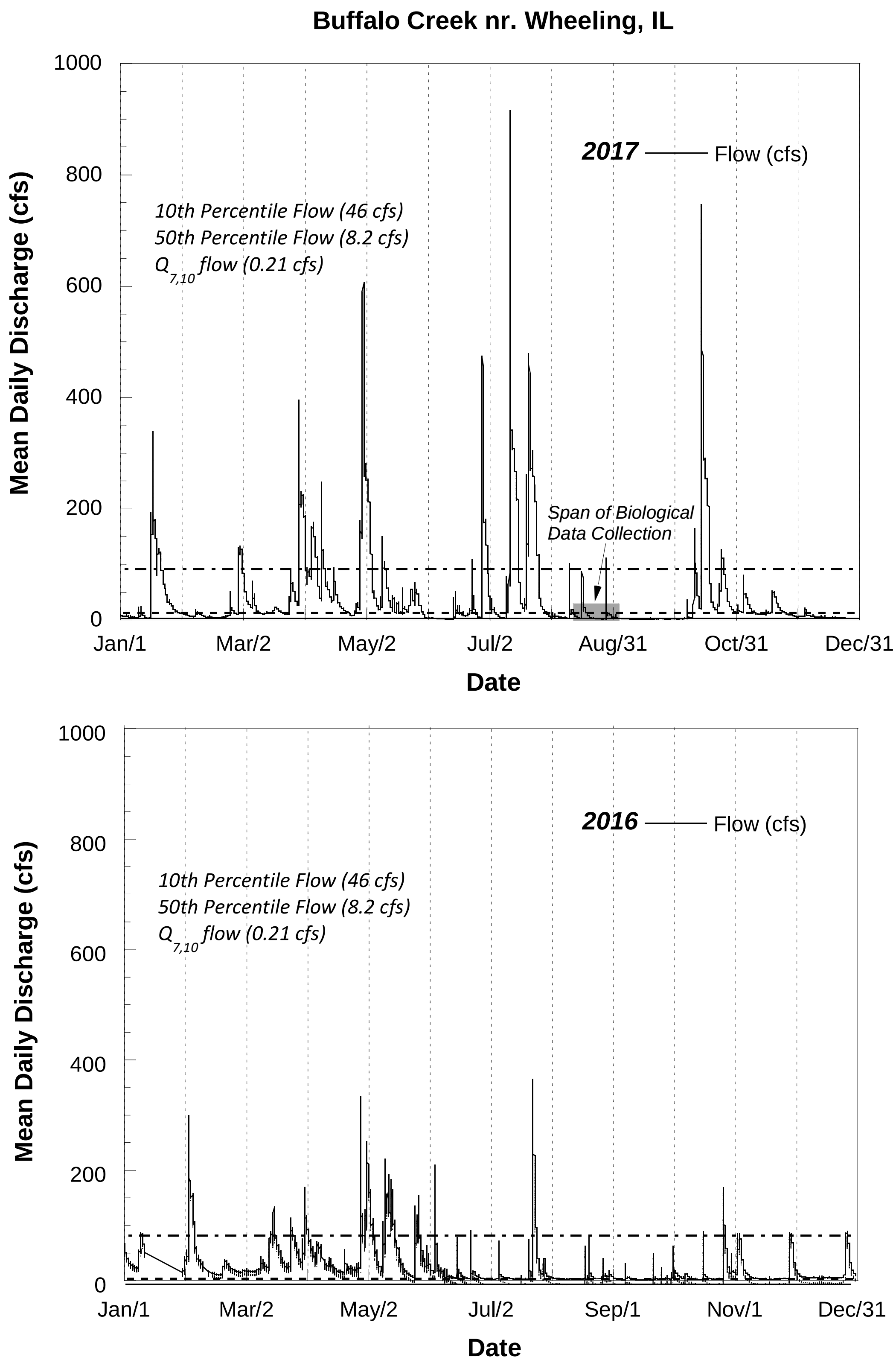

Figure 5. *Daily flow measured at the USGS gage on Buffalo Creek (USGS 05528500) near Gurnee, IL during calendar years 2017 (upper) and 2016 (lower). The dashed lines are the 10th and 50th percentile flows; the seven-day, ten year critical low flow is indicated by the solid line and the span of biological data collection is indicated by a shaded bar along the x-axis.*

substances that correspond to biological quality gradients across significant geographical areas while others are toxicological endpoints derived from laboratory studies. Two recent regional studies that were used include correlative effects levels of different chemicals by the DuPage River Salt Creek Working Group (DRSCWG; Miltner et al. 2010) in northeastern Illinois and the Metropolitan Sewer District of Greater Cincinnati (MSDGC; MBI 2015) in southwest Ohio. NOAA Screening Quick Reference Tables (SQRT; Buchman 2008) were also used especially for chemicals that are not included in the Illinois WQS. A compendium of biological and toxicological effect thresholds are listed in Table 4 and are cited as they are used. Sediment chemical results were evaluated against threshold and probable effect levels (TEL and PEL) established by MacDonald et al. (2000). Exceedances of these values were used to support the assignment of causes of biological impairment provided that there was a logical linkage of the chemical exceedance with the biological impairment. The chemical results are also displayed graphically for selected parameters and in tables of exceedances of IEPA water quality criteria and biological effect thresholds for select parameter groups for both water column and sediment chemistry results. With the exception of D.O. there were no other exceedances of parameters that have IEPA water quality criteria.

Demand and Nutrient Related Parameters

Demand and nutrient related parameters consist of those related to the discharges of treated and untreated sewage, organic enrichment from point and nonpoint sources, nutrient parameters and their effects, and physical parameters such as total suspended solids and temperature.

Dissolved Oxygen (D.O.)

Exceedances of dissolved oxygen (D.O.) were assessed with grab sample data and short-term Datasonde deployments. Grab D.O. samples collected during daylight revealed several exceedances of the IEPA August-February minimum of 3.5 mg/L and March-July minimum of 5.0 mg/L (Table 5). These were the most pronounced at 3 sites in Buffalo Creek and single sites in Indian and Kildeer Creeks where minimum values of <2 mg/L were measured in four samples. Lesser exceedances of the minimum criteria occurred in Buffalo, Indian, and Aptakisic Creeks. Extremely high daytime values occurred at several sites in Buffalo and Indian Creeks and using the width between minimum and maximum values as an indication of the possible magnitude of a diel swing, several had wide swings indicative of excessive algal activity.

Short-term deployments of Datasonde continuous recorders likewise recorded exceedances of parts of the IEPA D.O. criteria and also revealed excessive diel swings (Figure 6). All of the deployments were made after August 1 hence the minimum was evaluated against the 3.5 mg/L criterion. There was insufficient data to evaluate the weekly and rolling average aspects of the IEPA D.O. criteria, but the median was compared to the weekly average of 6.0 mg/L for screening purposes. Exceedances of the 3.5 mg/L minimum criterion occurred at three sites and were the most pronounced in Kildeer Creek (15-7) with minimum values close to that obtained by grab sampling. This was also one of four sites with median values that exceeded

***Table 4**. Chemical thresholds consisting of Illinois water quality criteria, biological effects thresholds, and non-effect reference benchmarks used to support the assignment of causes to observed biological impairments in the 2017 study area. Only chemical parameters that were detected in water samples are included.*

Parameter[1]	Water Quality Criteria[2]		Effect Thresholds[3]				Non-effect Benchmarks[4]	
	IL Chronic	IL Acute	Ohio EPA[5]	SW Ohio[6]	NOAA SQRT[7]	Other	Regional Reference[8]	IL Non-Standard[9]
Demand Group								
BOD_5	NA[10]	NA	--	2.48 mg/L [HW Streams] 2.96 mg/L [WD Streams] 2.60 mg/L [BT Rivers]	--	--	2.00 mg/L [HW Streams]	--
Dissolved Oxygen (D.O.)	5.5./6.0 mg/L [7-day rolling avg.]	3.5/5.0 mg/L [minimum]	7.2 mg/L [HW Streams]	5.32 mg/L [All Streams]	--	--	6.6 mg/L [HW Streams]	--
Suspended Solids (TSS)	NA	NA	16.0 mg/L [HW Streams]	65.7 mg/L [HW Streams] 70.8 mg/L [WD Streams] 74.3 mg/L [BT Rivers]	--	--	28.0 mg/L [HW Streams]	--
Nutrients Group								
Ammonia-N (NH_3-N)	1.24 mg/L [pH 8.0/25°C]	8.40 mg/L [pH 8.0/25°C]	0.05 mg/L [HW Streams]	0.31 mg/L [HW Streams]	--	0.15 mg/L [DRSCW IPS[11]]	0.025 mg/L [HW Streams]	--
Total Kjeldahl Nitrogen (TKN)	NA	NA	0.50 mg/L [HW Streams]	0.51 mg/L [HW Streams]	--	1.00 mg/L [DRSCW IPS[11]]	0.70 mg/L	--

Parameter[1]	Water Quality Criteria[2]		Effect Thresholds[3]				Non-effect Benchmarks[4]	
	IL Chronic	IL Acute	Ohio EPA[5]	SW Ohio[6]	NOAA SQRT[7]	Other	Regional Reference[8]	IL Non-Standard[9]
				0.58 mg/L [WD Streams] 1.05 mg/L [BT Rivers]				
Phosphorus	NA	NA	0.216 mg/L [HW Streams]	0.080 mg/L [HW Streams] 0.010 mg/L [WD Streams] 0.17 mg/L [BT Rivers]	--		0.072 mg/L	0.610 mg/L
Nitrate-N (NO_3-N)	NA	NA	0.90 mg/L [HW Streams]	0.96 mg/L [HW Streams] 1.38 mg/L [WD Streams] 1.68 mg/L [BT Rivers]	--		1.87 mg/L [HW Streams] 1.80 mg/L [EPA Ecoregion 54]	7.80 mg/L
Ionic Strength Group								
Chlorides	NA	500 mg/L;	46.0 mg/L [HW Streams]	52.6 mg/L [HW Streams] 59.1 mg/L [WD Streams] 68.4 mg/L [BT Rivers]	--	112 (fish); 141 (macro.) mg/L [DRSCW IPS[12]]	35.0 mg/L [HW Streams] 31 mg/L (WD Streams) 55 mg/L [BT Rivers]	--
Conductance, Specific	NA	NA	966 µS/cm [HW Streams] 861 µS/cm [WD Streams] 770 µS/cm [BT Rivers]	703 µS/cm [HW Streams] 660 µS/cm [WD Streams] 730 µS/cm [BT Rivers]	--	300 µS/cm [EPA draft[13]]	751 µS/cm [HW Streams]	--

Parameter[1]	Water Quality Criteria[2]		Effect Thresholds[3]				Non-effect Benchmarks[4]	
	IL Chronic	IL Acute	Ohio EPA[5]	SW Ohio[6]	NOAA SQRT[7]	Other	Regional Reference[8]	IL Non-Standard[9]
Dissolved Solids (TDS)	NA	1500 mg/L [Dec. 1-Apr. 30; expires 2018]	--	364 mg/L [HW Streams] 384 mg/L [WD Streams] 395 mg/L [BT Rivers]	--	--	296 mg/L [SW Ohio HW]	--
Sulfate	1809 mg/L	--	334 mg/L [HW Streams]	119 mg/L [HW Streams]	--	--	118.8 mg/L [HW Streams] 120 mg/L [WD Streams] 115 mg/L [BT Rivers]	--
Metals Group[14]								
Arsenic (As)	0.190 mg/L	0.360 mg/L	0.002 mg/L [HW Streams]	--	0.190 mg/L [Chronic]	See SQRT	0.001 mg/L [HW Streams]	--
Copper (Cu)	0.022 mg/L	0.036 mg/L	0.010 mg/L [HW Streams]	5.9 µg/L [HW Streams] 8.9 µg/L [WD Streams] 10.4 µg/L [BT Rivers]	0.009 mg/L[C] 0.130 mg/L[A]	See SQRT	5.0 µg/L [HW Streams] 5.0 µg/L [WD Streams] 5.0 µg/L [BT Rivers]	--
Lead (Pb)	0.051 mg/L	0.245 mg/L	0.002 mg/L [HW Streams]	2.7 µg/L [HW Streams] 17.4 µg/L [WD Streams] 26.8 µg/L [BT Rivers]	0.0025 mg/L[C] 0.065 mg/L[A]	See SQRT	2.5 µg/L [HW Streams] 2.5 µg/L [WD Streams] 3.0 µg/L [BT Rivers]	--

Parameter[1]	Water Quality Criteria[2]		Effect Thresholds[3]				Non-effect Benchmarks[4]	
	IL Chronic	IL Acute	Ohio EPA[5]	SW Ohio[6]	NOAA SQRT[7]	Other	Regional Reference[8]	IL Non-Standard[9]
Manganese (Mn)	3.52 mg/L	8.15 mg/L	0.942 mg/L [HW Streams]	98 µg/L [HW Streams] 347 µg/L [WD Streams] 472 µg/L [BT Rivers]	0.080 mg/L[C] 2.300 mg/L[A]	See SQRT	0.185 mg/L [HW Streams]	--
Zinc (Zn)	0.073 mg/L	0.273 mg/L	0.010 mg/L [HW Streams]	16.4 µg/L [HW Streams] 39.3 µg/L [WD Streams] 60.8 µg/L [BT Rivers]	0.120 mg/L [Chronic]	See SQRT	15 µg/L [HW Streams] 15 µg/L [WD Streams] 20 µg/L [BT Rivers]	--

1 All parameter values as total unless specific otherwise.
2 Illinois water quality criteria (Illinois Administrative Code Part 302) - http://www.epa.illinois.gov/topics/water-quality/standards/derived-criteria/index.
3 Field-based thresholds using fish and macroinvertebrate assemblage endpoints;
4 Values represent analyses of large scale ambient chemical databases with statistical approaches.
5 Biocriteria derived threshold values (2 Interquartile Ranges [2IQR] above median) in *Appendices to Association Between Nutrients and the Aquatic Biota of Ohio River and Streams* (Ohio EPA 1999).
6 Biological assemblage effect thresholds derived for SW Ohio in *Integrated Prioritization System (IPS) Documentation and Atlas of Biological Stressor Relationships for Southwest Ohio* (MBI 2015).
7 NOAA Screening Quick Reference Tables (SQRT; NOAA 2008) – hardness dependent parameters at 100 mg/L hardness; with EPA EcoUpdate Ecotox Thresholds EPA/F-95-038.
8 Ohio regional reference values (2 Interquartile Ranges [2IQR] above median) in *Appendices to Association Between Nutrients and the Aquatic Biota of Ohio River and Streams* (Ohio EPA 1999) unless otherwise specified.
9 Values are 1 and 2 standard deviations (SD) above the mean of all values measured statewide.
10 NA – not applicable, not included in IL WQS.
11 DRSCW IPS – DuPage River Salt Creek Workgroup integrated Prioritization System derived threshold.
12 DRSCW IPS – DuPage River Salt Creek Workgroup integrated Prioritization System derived threshold.
13 U.S. EPA field-based threshold for Central Appalachian streams in A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams (U.S. EPA 2011)
14 Hardness dependent metals shown at 300 mg/L total hardness – see IAC Part 302 for formulae.

***Table 5**. Dissolved oxygen (D.O.) concentrations (mg/L) based on grab samples collected at 22 locations in the Year 1 2017 study area showing the mean, minimum, maximum, and width between the minimum and maximum values.*

Site ID	Name	River Mile	Drain. Area (mi.^{2})	Mean D.O. (mg/L)	Min. D.O. (mg/L)	Max. D.O. (mg/L)	Samples	D.O. "Swing"
18-3	Aptakisic Creek	4.3	2.3	8.6	4.2	12.9	6	8.7
18-2	Aptakisic Creek	0.8	4.9	6.7	3.4	12.4	6	9.0
18-1	Aptakisic Creek	0.5	5.5	8.6	6.0	11.8	6	5.8
18-5	Unnamed Trib. to Aptakisic Cr.	0.05	1.0	4.0	3.5	4.4	2	0.9
17-5	Buffalo Creek	14.0	1.4	5.2	4.0	6.4	2	2.4
17-3	Buffalo Creek	7.7	9.6	8.4	6.6	11.7	6	5.0
17-2	Buffalo Creek	6.1	22.1	7.6	1.1	11.8	6	10.6
17-1	Buffalo Creek	0.75	29.1	8.7	1.8	13.0	6	11.2
17-4	Unnamed Trib. to Buffalo Cr.	0.68	8.6	6.6	3.2	11.9	6	8.7
15-9	Indian Creek	10.8	2.7	7.1	1.8	13.2	6	11.5
15-6	Indian Creek	9.8	3.7	6.3	4.2	11.6	6	7.4
15-5	Indian Creek	5.4	17.3	6.9	4.8	11.3	6	6.5
15-2	Indian Creek	2.4	35.0	7.6	4.8	12.0	6	7.3
15-1	Indian Creek	0.17	36.4	9.1	6.1	12.9	6	6.8
15-12	Kildeer Creek	5.2	2.1	8.9	7.9	9.8	2	1.9
15-7	Kildeer Creek	4.6	2.9	7.4	1.9	12.2	6	10.3
15-13	Kildeer Creek	2.2	5.0	6.7	5.4	8.0	2	2.6
15-4	Kildeer Creek	0.17	6.8	6.9	4.7	12.1	6	7.4
15-11	Forest Lake Drain	0.8	1.7	6.9	6.5	7.3	2	0.8
15-10	W. Branch Indian Creek	0.8	2.2	6.2	5.4	7.0	2	1.6
15-3	Seavey Drainage Ditch	3.7	5.1	8.9	5.8	13.2	6	7.4
15-8	Seavey Drainage Ditch	0.45	9.8	9.0	5.5	13.1	6	7.7
	Exceedance of 3.5 mg/L minimum (Aug.-Feb.).							
	Exceedance of the 5 mg/L minimum (Mar.-Jul.).							
	Min. to max. "swing" >6.5 mg/L).							

the Illinois minimums in the continuous results. The lowest minimum and median D.O. values that exceeded the IEPA D.O. criteria were likely due to nonpoint source impacts and the combination of organic sediments and low flows that exacerbated the biochemical oxygen demand. Some of the sites are also affected by organic wastes from failing septic systems and some corresponded to elevated levels of *E. coli* used here as an indication of organic wastes in addition to the customary recreational risk. However, it is the excessive diel swings that were the most prevalent in the D.O. results which coupled with the very low minimums that represents a significant stressor for aquatic life in all three subwatersheds. Determining the diverse sources of this impairment should be a priority for future restoration.

Ammonia-Nitrogen (N)

Levels of ammonia-N were either below or just above the mean detection level (MDL) with no values that would suggest either chronic or acutely toxic effects to aquatic life (Figure 7). Detectable values in 2017 were less frequent than in 2016 presumably due to the higher flows in 2017. In terms of effect thresholds all values were below the SW Ohio threshold of 0.56 mg/L and only a few results exceeded the DRSCW IPS threshold of 0.15 mg/L. There were no outlier values measured downstream of the Lake Co. Des Plaines River WWTP in Aptakisic Creek based on grab samples collected at RM 0.5 (18-1).

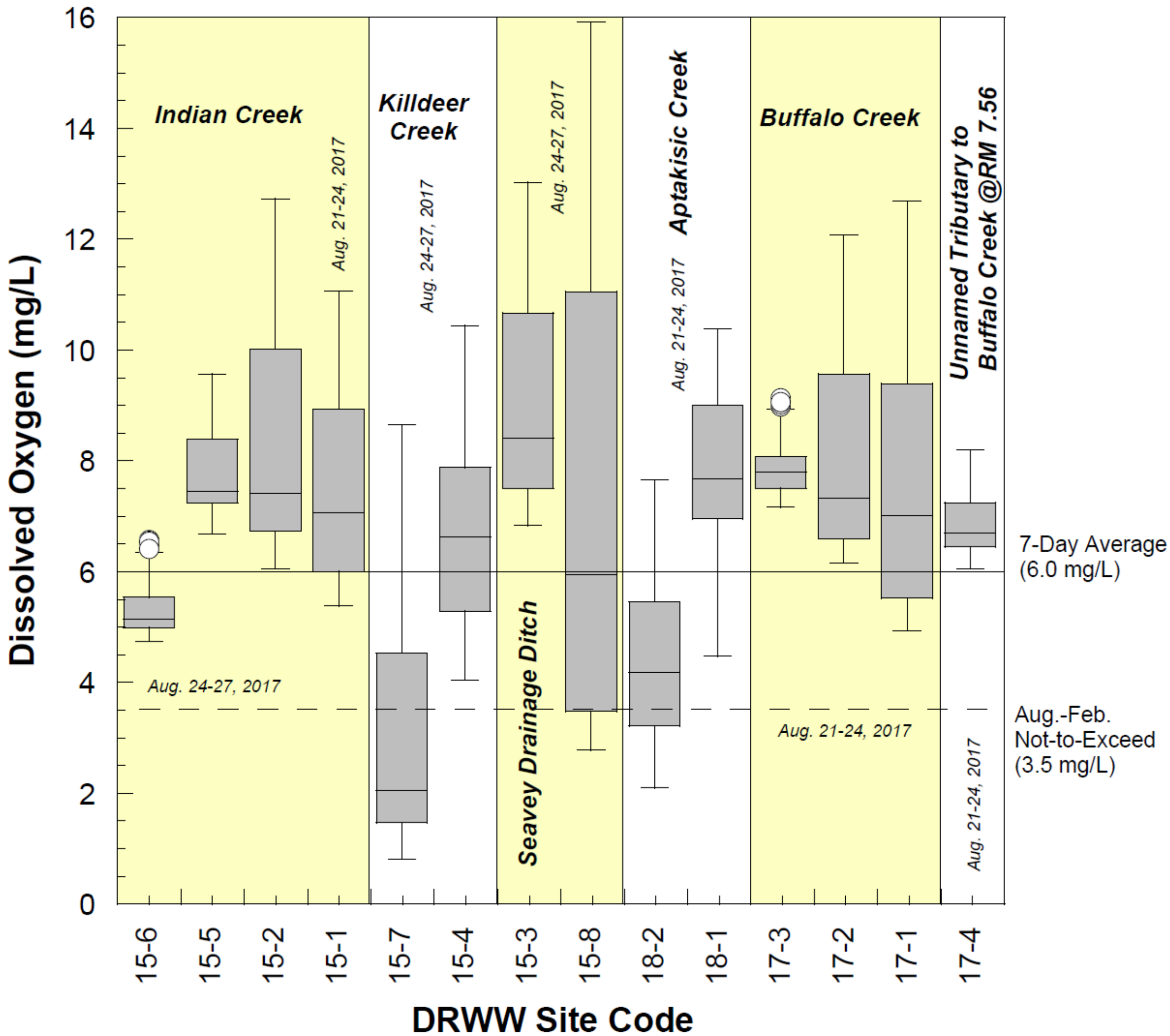

***Figure 6**. Dissolved oxygen (D.O.) concentrations (mg/L) measured continuously by Datasondes deployed for 3-4 day periods during August 21-24 and 24-27, 2017 at 14 locations in the 2017 study area. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The IEPA August-February minimum (3.5 mg/L) and the 7-day average D.O. criteria are shown by solid and dashed lines.*

Total Phosphorus

Total phosphorus levels varied widely in the 2017 study area with median values in 2016 and 2017 close to or below the U.S. EPA Ecoregion 54 reference value of 0.07 mg/L to peak values of 0.15-0.40 mg/L at all sites except Aptakisic Creek with a slight increase with stream size (Figure 8). Total P values of 2-3 mg/L were measured downstream from the Lake Co. Des Plaines River WWTP an obvious indication of enrichment by that point source (Figure 8, lower panel). The role of total P and other indicators as a contributor to overall nutrient enrichment effects was considered as part of the modified SNAP procedure (Ohio EPA 2015b).

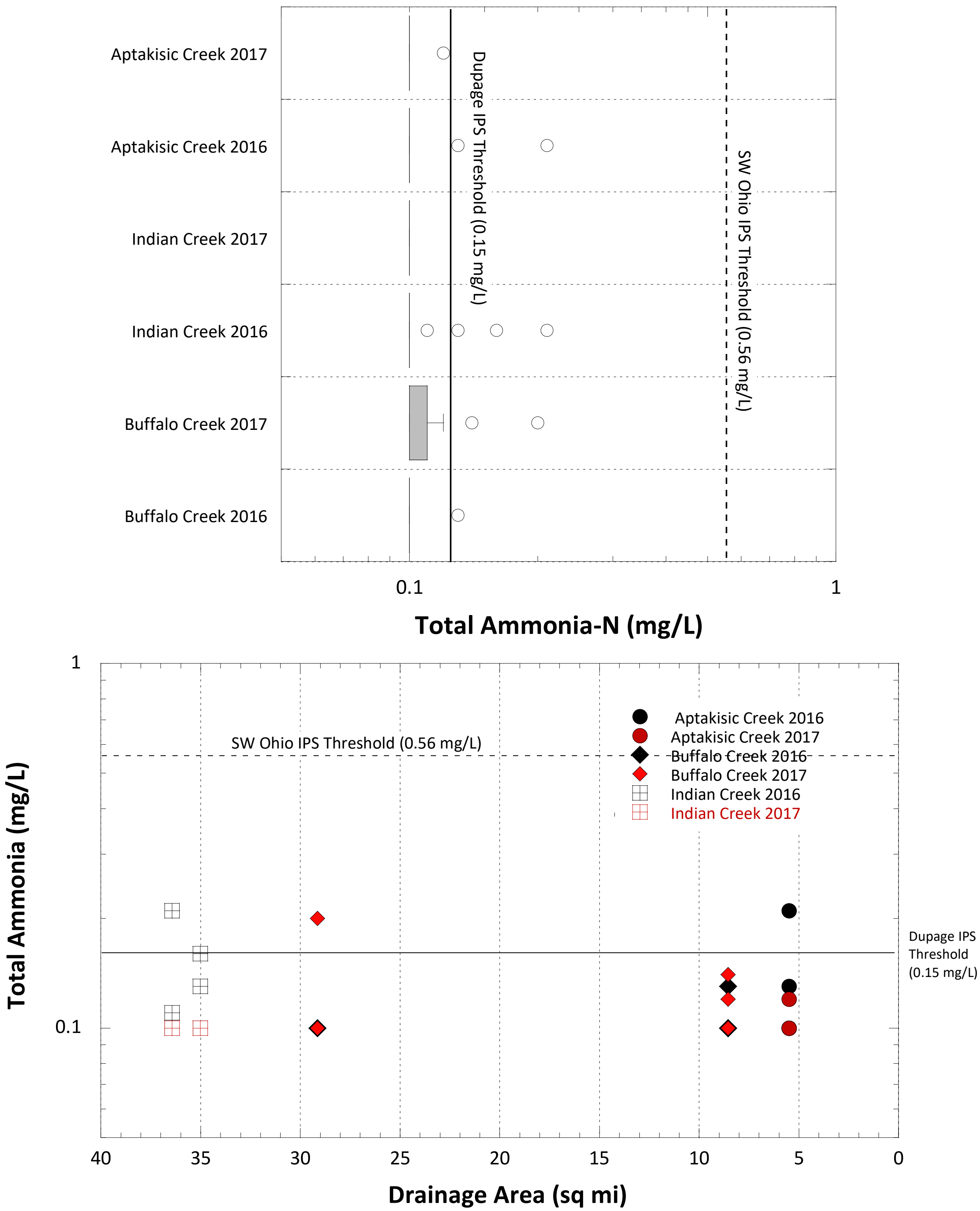

***Figure 7**. Concentrations of ammonia-N by subwatershed and stream in the Year 1 2017 study area. Raw values in tributary subwatersheds are shown as box-and-whisker plots (upper panel, shaded boxes) and by individual site by drainage area (lower panel) in 2016 and 2017. Dashed and solid lines represent effect thresholds correlated with impaired biota in the DuPage River-Salt Creek IPS study (0.15 mg/L) and the SW Ohio IPS study (0.56 mg/L).*

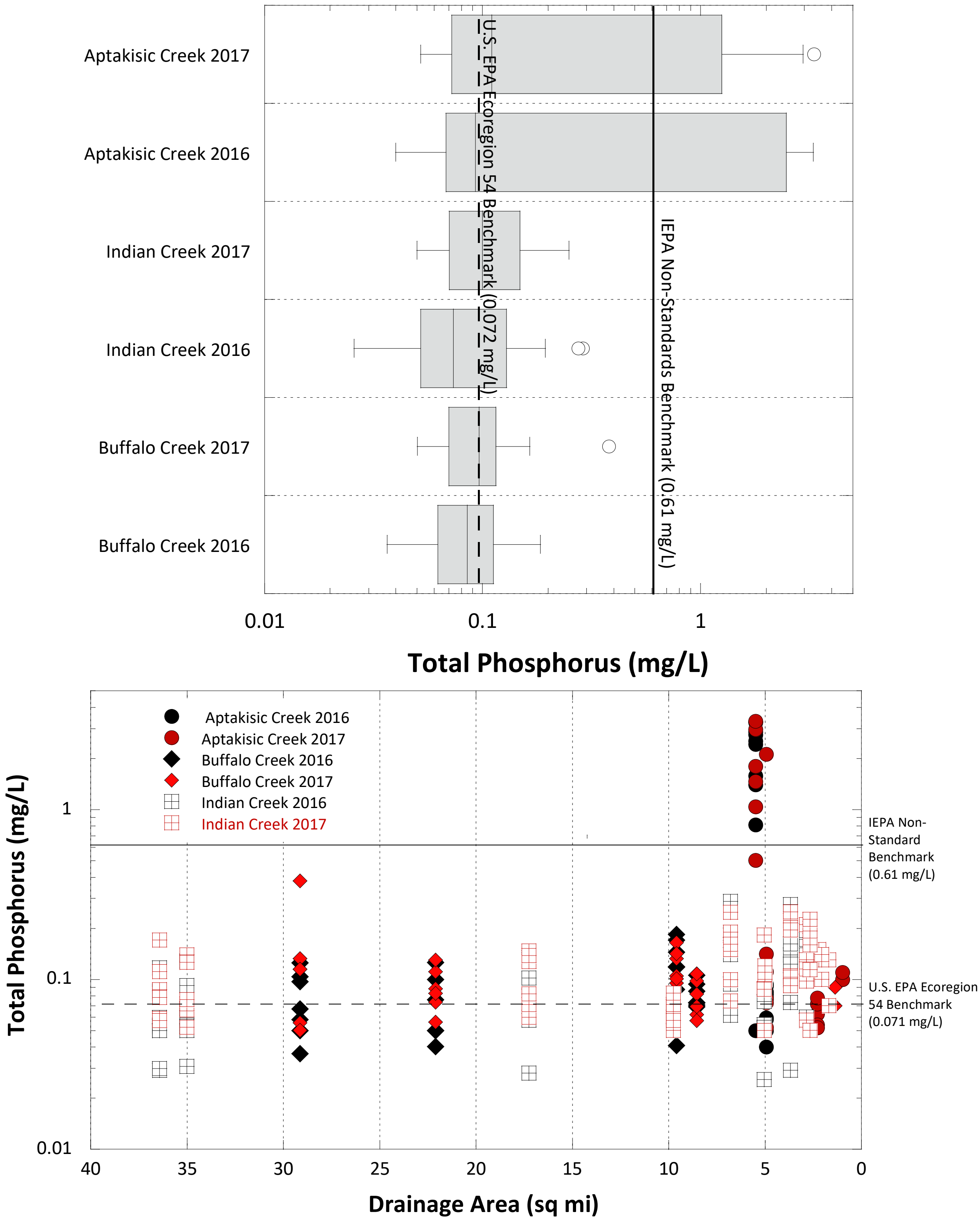

Figure 8. *Concentrations of total phosphorus by subwatershed and stream in the Year 1 2017 study area. Raw values in tributary subwatersheds are shown as box-and-whisker plots (upper panel, shaded boxes) and by individual site by drainage area (lower panel) in 2016 and 2017. Dashed and solid lines represent regional reference and IEPA non-standard (not effect based) thresholds.*

Total Nitrates (NO_3-N)

Total nitrates showed a similar pattern to total P being lowest at all sites except the Aptakisic Creek site immediately downstream from the Lake Co. Des Plaines River WWTP and with a gradual increase with stream size. Concentrations mostly ranged from 0.2-0.4 mg/L, but were well in excess of the U.S. EPA Regional Reference benchmark of 1.8 mg/L and the much higher IEPA non-standard benchmark of 7.8 mg/L at the downstream most Aptakisic Creek site, a reflection of the nitrification treatment process at the Lake Co. Des Plaines River WWTP and an obvious indication of enrichment by that point source (Figure 9, lower panel). The role of total nitrate-N and other indicators as a contributor to overall nutrient enrichment effects was considered as part of the modified SNAP procedure (Ohio EPA 2015b).

Total Kjeldahl Nitrogen (TKN)

Total organic nitrogen as measured by Total Kjeldahl Nitrogen (TKN), an indicator of the living or recently dead fraction of sestonic algae, can be an indicator of nutrient enrichment. While TKN is not a direct effect parameter, it is indicative of the effects of organic enrichment by nitrogenous biomass. All TKN values in 2016 and 2017 exceeded the SW Ohio Headwater Streams effect based threshold of 0.51 mg/L (Figure 10). All of the 2017 TKN values exceeded the DuPage-Salt IPS threshold of 1.0 mg/L, but many values were below that threshold in 2016 including all values in Aptakisic Creek. The flow regime analysis shows that peak flow events were fewer and lesser in magnitude in 2016 than in 2017 when TKN values were nearly doubled an indication of a relationship between TKN and runoff events.

Nutrient Effects Assessment

The impact of nutrients on aquatic life has been well documented (e.g., Allan 2004), but the derivation of criteria and their form and application are only just now emerging. Unlike toxicants, the influence of nutrients on aquatic life is indirect through their influence on algal photosynthesis and respiration and the resulting increased magnitude of diel D.O. swings and by the biochemical oxygen demand exerted by algal decomposition. Nutrients can also affect food sources for macroinvertebrates and fish and the response of aquatic life to elevated nutrients is co-influenced by habitat (e.g., substrate composition), stream flow (e.g., scouring and dilution), temperature, and shading. Illinois is the leading state in terms of nitrogen (16.8%) and phosphorus (12.9%) loadings exported towards the Gulf of Mexico where an anoxic zone has developed (U.S. EPA 2008). In Illinois, as in neighboring Midwestern states that drain to the Mississippi River, efforts are underway to modernize nutrient water quality criteria.

The combined effects of nutrient enrichment were assessed to supplement the preceding descriptions of concentrations of each of the key nutrient related parameters. A multi-parameter approach modified from the Ohio SNAP method and the newer large rivers method (Miltner 2018), and as described in the Methods section, was employed. The results are detailed in a matrix that shows the fish and macroinvertebrate IBIs, the QHEI score, total P, nitrate-N, TKN, the maximum and minimum D.O. (based on Datasondes), the width of the diel D.O. swing, benthic chlorophyll a (as biomass), and an overall rating of the degree of nutrient enrichment based on exceedances of thresholds for the aforementioned indicators and

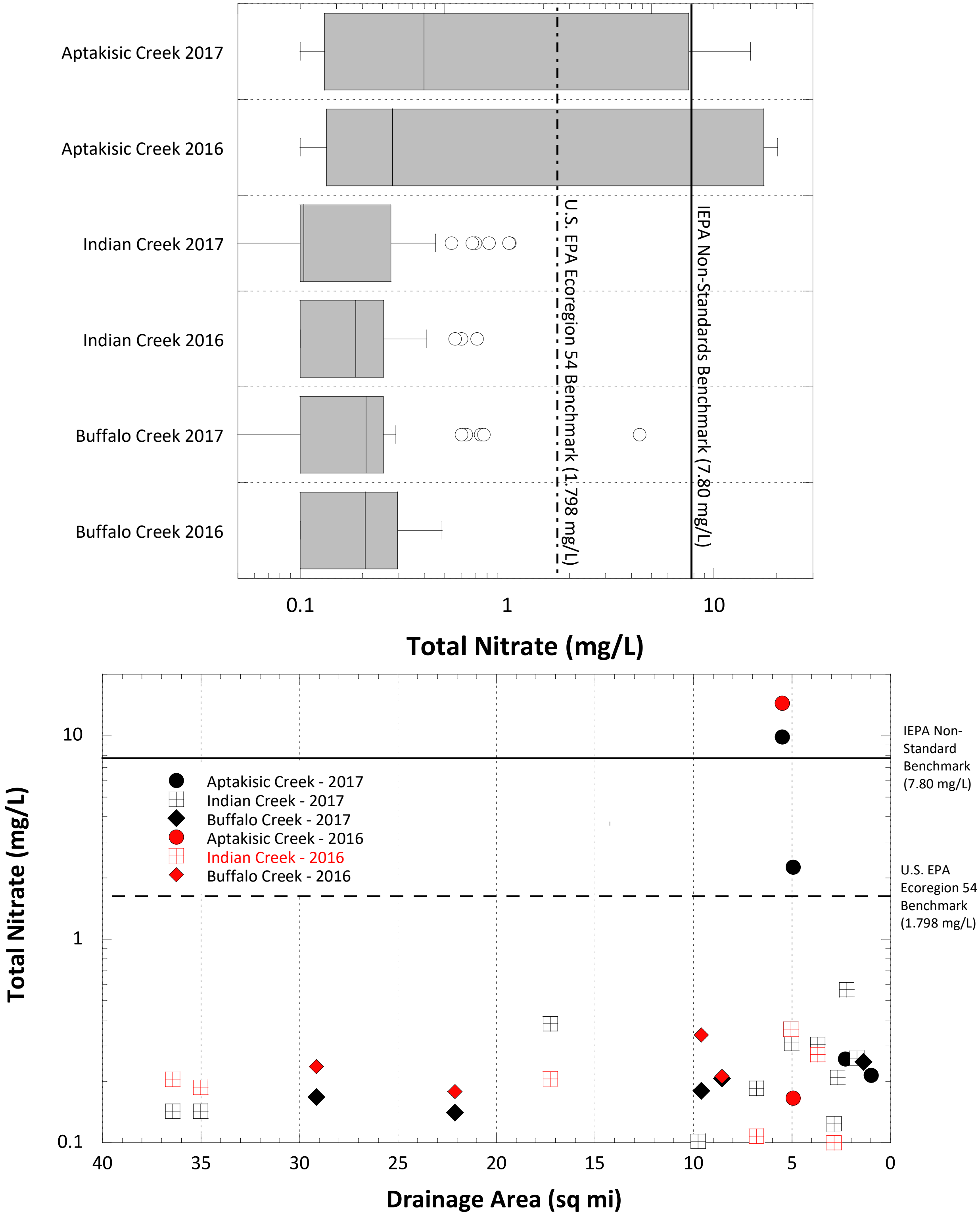

Figure 9*. Concentrations of total nitrate-N by subwatershed and stream in the Year 1 2017 study area. Raw values in tributary subwatersheds are shown as box-and-whisker plots (upper panel, shaded boxes) and by individual site by drainage area (lower panel) in 2016 and 2017. Dashed and solid lines represent regional reference and IEPA non-standard (not effect based) thresholds.*

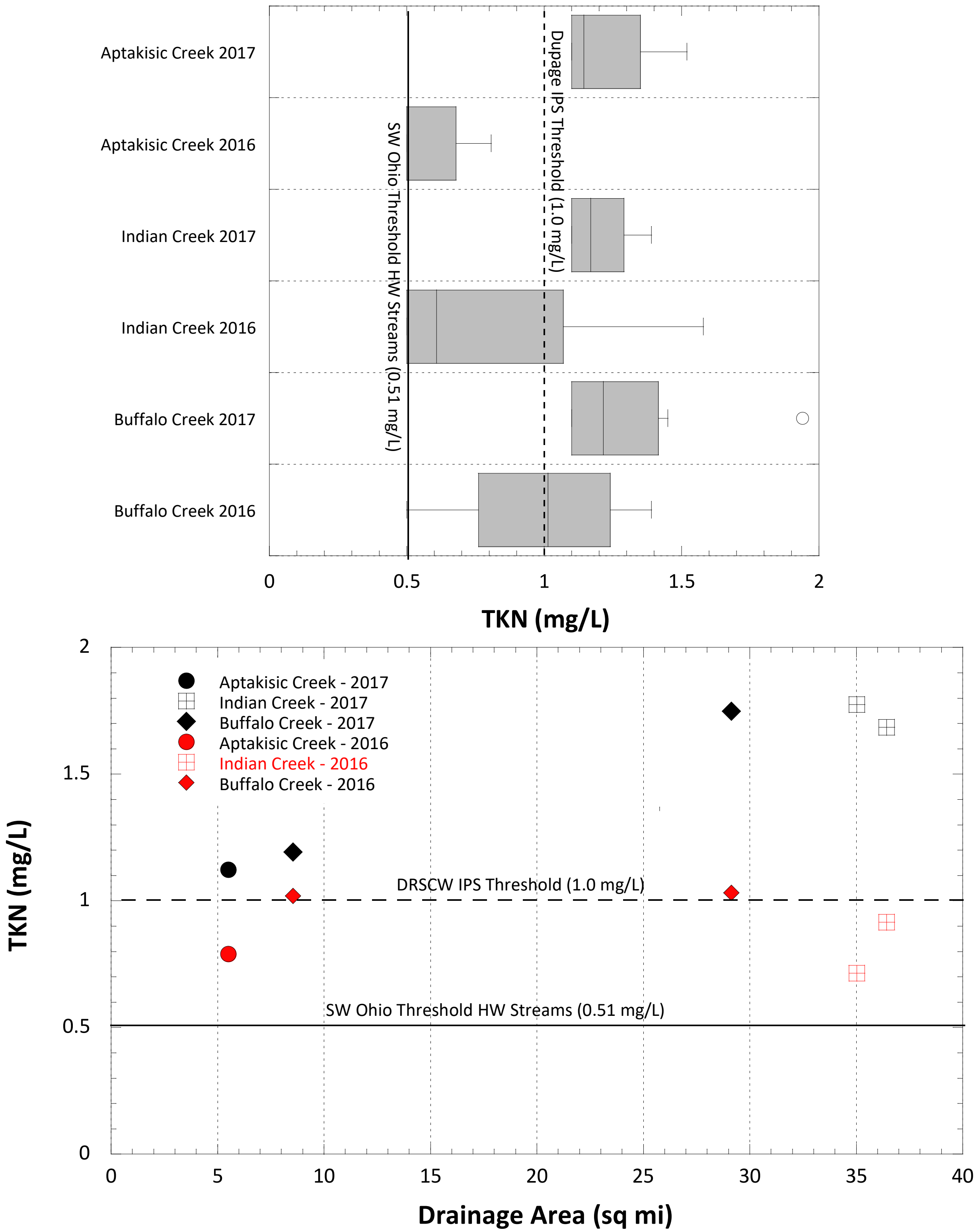

Figure 10*. Concentrations of total Kjeldahl nitrogen (TKN) by subwatershed and stream in the Year 1 2017 study area. Raw values in tributary subwatersheds are shown as box-and-whisker plots (upper panel, shaded boxes) and by individual site by drainage area (lower panel) in 2016 and 2017. Dashed and solid lines represent two different effect based thresholds.*

parameters at 14 sites in the 2017 study area (Table 6). The overall degree of nutrient enrichment effects are represented by the Enrichment Status that results from the degree to which each of the nutrient parameters and SNAP indicators exceed their respective thresholds, the minimum and maximum D.O., the width of the diel D.O. swing, and benthic chlorophyll a biomass. Only one site had a severe nutrient enrichment effect assigned – site 15-2 at RM 2.4 in Indian Creek. This site had the highest benthic chlorophyll a biomass in the study area, a high diel D.O swing, and a very low minimum D.O. The aquatic life attainment status was partial support with the fish IBI missing full support by only 3 IBI units and good habitat as indicated by a QHEI score of 73 that was the highest in the 2017 study area. Three sites were assigned a high enrichment effect status based mostly on high total P and elevated TKN values and a high to wide diel D.O swing. All three sites had very low or low benthic chlorophyll a biomass values. Three sites were assigned none for the enrichment effect status and all were the upstream most sites in their respective streams. One was site 18-2 at RM 0.8 in Aptakisic Creek upstream from the Lake Co. Des Plaines River WWTP. The effect of the WWTP discharge was evident in a high enrichment effect status at the downstream site (18-1) at RM 0.5 which resulted from very high total P and nitrate-N levels, a moderately high daytime D.O., and a moderate diel swing. The remaining six sites were all assigned a moderate nutrient effect status with all except one site having high or even wide diel D.O. swings. The site with a normal diel swing had elevated TKN and the second highest benthic chlorophyll a biomass in the study area. While none of the symptoms of nutrient enrichment observed in the tributary watersheds in 2016 (MBI 2017) were associated with WWTP discharges, they were thought to be the result of a combination of nutrients and organic matter in runoff and summer low flows resulting in localized reaches of low D.O. This assertion was based mostly on the frequency of very high daytime D.O. values (>10-12 mg/L) that suggest the existence of high or wide diel swings resulting from increased algal activity fostered by elevated nutrients and low flows.

As stated in the Methods section this is a preliminary assessment pending the development of a larger database of nutrient effect indicators for Northeast Illinois. The assignment of the nutrient enrichment effect ratings for the 2017 results does not appear to track well with the two primary nutrient parameters, total P and nitrate-N. Only two sites had extremely elevated total P values, both of which occurred in Aptakisic Creek. Nitrate-N values were likewise extremely elevated at these two sites, but were reflective of reference levels at most other sites. TKN is a sometimes overlooked indicator of nutrient enrichment effects and it is recommended along with TSS as part of the Ohio EPA large river nutrient method (Miltner 2018). Neither TKN nor TSS was consistently available at the 14 sites assessed in 2017 so it is recommended to include them as part of the suite of nutrient parameters in future surveys. In addition the Illinois Nutrient science Advisory Committee (NSAC 2018) recently released preliminary recommendations for nutrients including similarly structured combined criteria including sestonic and benthic chlorophyll a thresholds.

Total Suspended Solids (TSS)

Total suspended solids are a measure of filterable material in water and have long been an indicator of sewage and industrial wastes that are often associated with particulates, but also can be related to decaying plant and animal matter and suspended silts. Compared to the

***Table 6**. Results of applying an interim modified Stream Nutrient Assessment Procedure to 14 sites in the 2017 Year 1 study area. Descriptions of how each result reflects the degree of nutrient enrichment effects and results in an assignment of enrichment status are at the bottom of the matrix.*

Site ID	RM	Drainage Area (sq. mi.)	fIBI	mIBI	Attain-ment Status	QHEI	Total Phos. (mg/l)[a]	Nitrate (mg/L)[a]	TKN[b] (mg/L)	Max. D.O.	Min. D.O.	Max. Diel Swing[c,d]	Diel Swing Narrative	Benthic Chl. a[e,f,g] (mg/m^2)	Benthic Chl. a Narrative	Enrichment Effect Status	Rationale for Enrichment Status
Aptakisic Creek																	
18-2	0.8	4.94	24	24	NON - Fair	45.0	0.43	1.61	na	7.7	2.1	4.16	Normal	42.41	Low	None	Only one indicator (Total P) elevated; very low D.O. due to other causes.
18-1	0.5	5.5	22	25.6	NON - Fair	48.0	1.85	9.64	1.19	10.4	4.47	5.91	Moderate	97.04	Low	High	Elevated P, N, TKN; moderate diel swing; low Bchla.
Buffalo Creek																	
17-3	7.7	9.61	15	49.6	NON - Poor	73.0	0.12	0.27	na	9.13	7.16	1.37	Normal	116.2	Low	Low	Only total P moderate.
17-2	6.1	22.1	18	50.8	NON - Poor	64.3	0.09	0.21	na	12.08	6.16	5.76	High	31.62	Very Low	Moderate	High D.O. and diel swing; very low Bchla.
17-1	0.75	29.14	25	30.8	NON - Fair	46.5	0.14	0.95	1.75	12.68	4.93	7.75	Wide	44.01	Very Low	High	High D.O. and diel swing, elevated TKN, moderate total P.
Unnamed Tributary to Buffalo Creek @RM 7.56																	
17-4	0.68	8.55	8	31.2	NON - Poor	57.5	0.08	0.28	1.19	8.19	6.05	1.8	Normal	314.49	High	Moderate	Elevated TKN, high Bchla.
Indian Creek																	
15-6	9.83	3.7	22	23.2	NON - Fair	59.5	0.16	0.27	na	6.57	4.74	1.73	Normal	5.13	Very Low	None	Elevated total P only, all others normal.
15-5	5.4	17.26	25	39.4	NON - Fair	66.5	0.10	0.34	na	11.3	4.8	6.5	Wide	25.23	Very Low	Moderate	Elevated total P, high D.O. and wide diel swing.
15-2	2.41	35.02	38	46.8	NON - Part	73.0	0.09	0.17	1.78	12.73	6.06	6.07	High	354.55	Very High	Severe	Elevated total P, High D.O. and diel wing, elevated TKN, very high Bchla.
15-1	0.17	36.43	34	53.5	NON - Part	65.0	0.09	0.18	1.69	11.06	5.38	5.51	High	61.76	Low	Moderate	Elevated total P, High D.O. and diel swing, low Bchla.
Seavey Drainage Ditch																	
15-3	3.66	5.05	12	17.5	NON - Poor	62.0	0.09	0.41	na	13.03	6.83	5.77	High	62.83	Low	Moderate	Elevated total P, High D.O. and diel swing, low Bchla.
15-8	0.45	9.77	25	30.6	NON - Fair	55.0	0.07	0.15	na	15.92	2.78	12.9	Wide	3.16	Very Low	High	Normal total P, very high D.O. and diel swing, low Bchla.
Kildeer Creek																	
15-7	4.6	2.86	16	32.2	NON - Poor	48.5	0.12	0.12	na	8.65	0.82	4.53	Moderate	7.42	Very Low	None	Elevated total P, very low D.O. and moderate diel swing, very low Bchla, other causes.
15-4	0.17	6.8	22	-	NON - Fair	53.5	0.15	0.16	na	10.44	4.05	5.7	High	17.36	Low	Moderate	High total P, high D.O. and moderate diel swing, low Bchla.
No Enrichment (None)						Excellent >75	<0.04	<0.44	<Ref. LIQR (0.20)	<8 mg/L	Meets D.O.	Normal swing (<2 mg/L)	Normal	Very Low (≤60 mg/m^2)		None	All indicators within normal ranges
Low Enrichment						Good >60	>0.04;<0.08	>0.44; <1.10	<Ref. Med. (0.30)	<10 mg/L	Meets D.O.	<4 mg/L	Low	Low (60-150 mg/m^2)		Low	Only one indicator outside of normal ranges
Moderate Enrichment						Fair >45	>0.08; <0.13	>1.10; <3.60	<Effect Threshold (0.50)	>10 mg/L	1 Exceed-ance	<5 mg/L	Moderate	Moderate (150 - 320 mg/m^2)		Moderate	2-3 indicators outside of normal ranges
High Enrichment						Poor >30	>0.13; <0.40	>3.60; <6.70	>1.0 mg/L	>12 mg/L	Multiple Exceed-ances	Moderate Swing; >5 mg/L	High	High (150-320 mg/m^2) with Wide Diel Swing		High	Multiple indicators outside of normal ranges
Severe Enrichment						V.Poor <30	>0.40	≥6.70	>2.0 mg/L	>15 mg/L	MultipleeExceed-ances	Wide Swing >6.5 mg/L	Wide	Very High (≥320mg/m^2)		Severe	All indicators well outside of normal ranges

[a]Ohio EPA SNAP Procedure Thresholds (Ohio EPA 2015); bMBI(2015) IPS TKN threshold; cMinnesota eutrophication DO flux (5 mg/L) threshold (MPCA 2018) for the Southern River Nutrient Region; dOhio EPA DO flux or swing (6.5 mg/L) for their SNAP procedure (Ohio EPA 2015).

[e]Very low benthic chlorophyll benchmark based on oligotrophic/mesotriophic thresold (60 mg/m^2) of Dodds et al. (1998); fLow-moderate benthc chlrophyll threshold (150 mg/m2) based on the "enriched conditions" threshold of Welch et al. (1988).

[g]High-very high benthic chlorophyll threshold (320 mg/m^2) based on Ohio EPA SNAP procedures (Ohio EPA 2015).

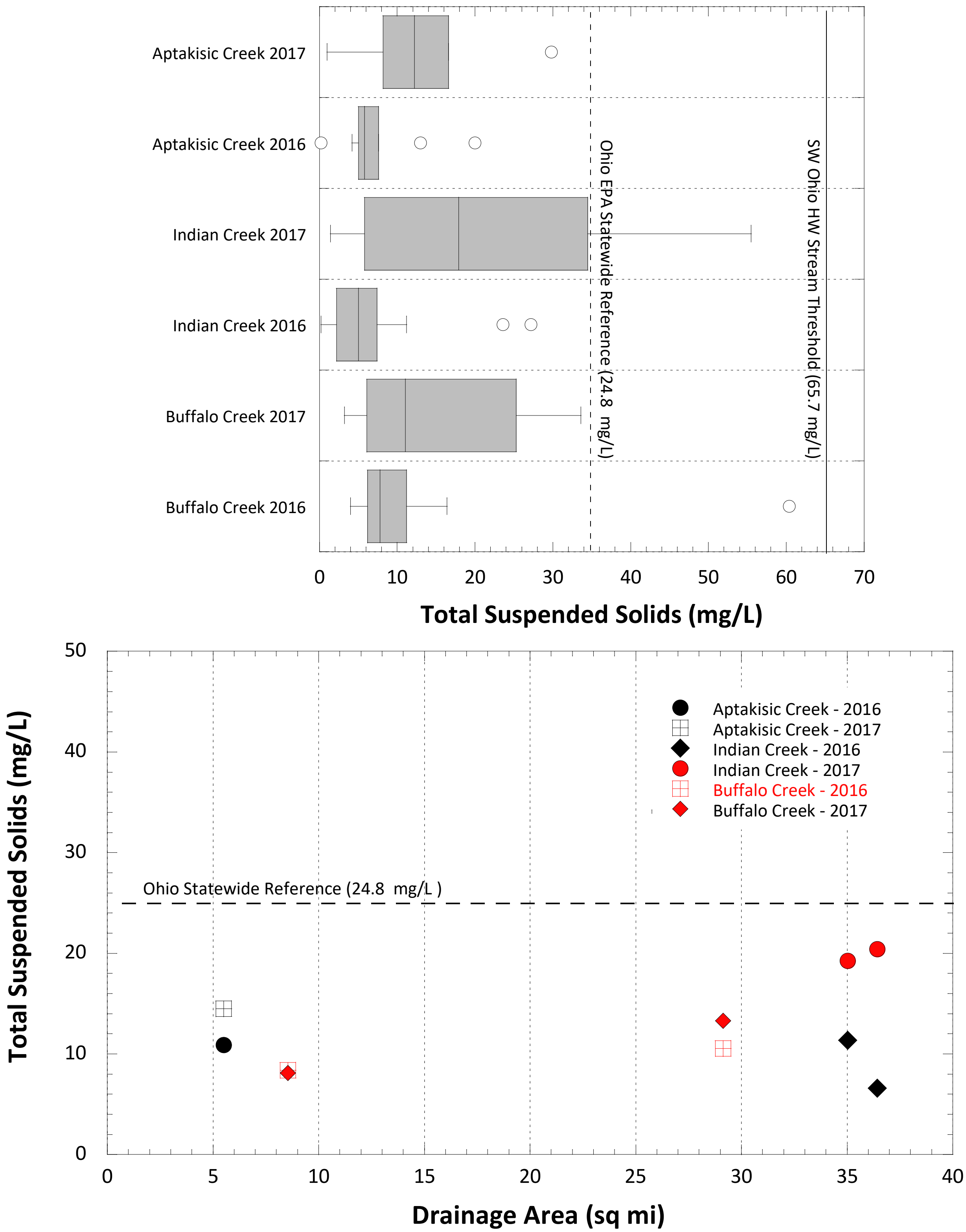

Figure 11*. Concentrations of total suspended solids (TSS) by subwatershed and stream in the Year 1 2017 study area. Raw values in tributary subwatersheds are shown as box-and-whisker plots (upper panel, shaded boxes) and by individual site by drainage area (lower panel) in 2016 and 2017. Dashed and solid lines represent a regional reference and effect based thresholds.*

available regional reference and biological effect thresholds (Table 4) TSS concentrations in 2016 and 2017 were low and not suggestive of direct negative effects on the biota (Figure 11). The results did reflect the differences in the flow regimes between 2016 and 2017 with higher TSS values measured in 2017, which tracks with the TKN results.

Temperature

Temperature is a controlling factor for aquatic life, hence it is important to document the thermal regime and any apparent alterations. This was done via grab measurements made at the time of chemical and biological sample collection and continuously via short-term deployment of Datasondes. Based on continuous data collected during Datasonde deployments (August 21-24 and August 24-27, 2017) and grab sample data collected July 1-September 15, there were no temperature values that were of concern in terms of potential harm to aquatic life. Typically the potential for adverse thermal effects are evaluated based on the warmest period of the year and against temperature criteria that are intended to protect aquatic life. The IEPA summer maximum criterion of 32.2°C (90°F) is at the extreme maximum for the most sensitive stream fish and which is shown to be met at all times by the continuous data (Figure 12) and the grab sample data (Figure 13). The Ohio temperature criteria are stream size specific with a maximum and average criteria of 29.4°C (84.9°F) and 27.8°C (82.0F) and these are met as well, thus there is no reason to believe that temperatures are a limiting factor to the biota. There were differences between the two Datasonde deployment periods, but these are also well within the intra-seasonal variations that can occur in small streams. The risk in an urban watershed is with artificial heating by runoff from paved surfaces, small ponds, and industrial process discharges.

Urban Parameters

Urban parameters are those that indicate runoff from urban land surfaces and can typically be in the form of elevated concentrations of dissolved materials, suspended solids delivered by runoff events and increased bank erosion due to altered flows, heavy metals, nutrients, and polycyclic aromatic hydrocarbon (PAH) compounds from automobiles and road and parking surfaces. Six parameters measured in the water column (Table 7) plus metals and organics measured in sediments (Tables 8 and 9) were used to assess for urban related water quality impacts.

Dissolved Materials in Urban Runoff

In temperate climates such as exist in northern Illinois, dissolved materials in the form of chlorides are an emerging problem because they accumulate in soils and shallow groundwater and have been documented to reach concentrations that can threaten and impair aquatic life. Of particular concern in urban areas with higher road density is the concentration of chlorides from winter road salt applications and point source loadings from water softening blowdown. Kelly et al. (2012) identified a steadily increasing trend in chloride levels in the Illinois River at Peoria where the median increased from 20 mg/L in 1947 to nearly 100 mg/L in 2004 with high values in the 1940s of <40 mg/L and spikes in 2003 of >300 mg/L. In addition to chlorides

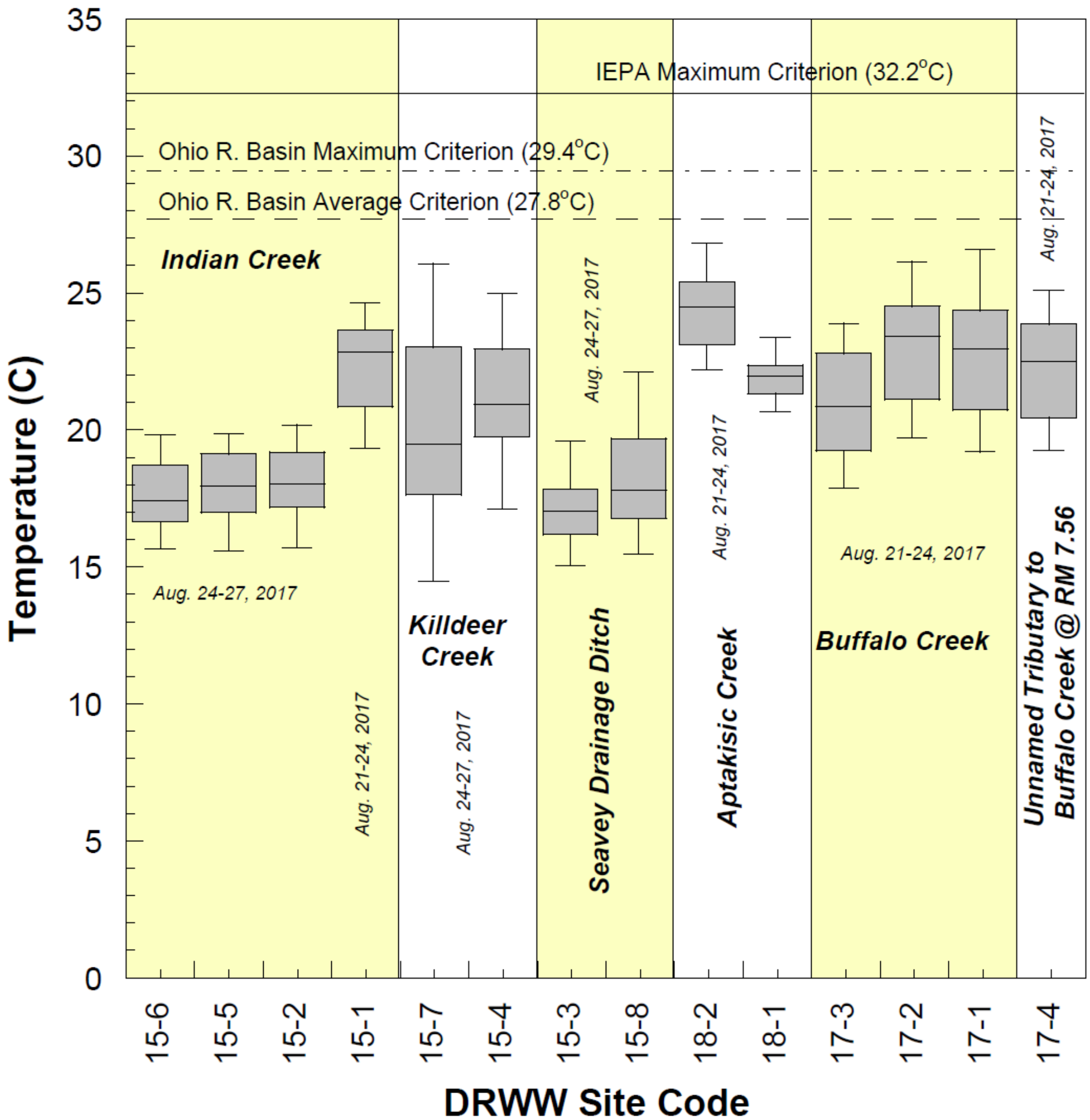

Figure 12. *Temperature (°C) measured continuously by Datasondes deployed for 3-4 day periods during August 21-24 and 24-27, 2017 at 14 locations in the 2017 study area. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The IEPA maximum (32.2°C) and the Ohio EPA General Ohio River Basin maximum (29.4°C) and average (27.8°C) criteria are shown by solid and dashed lines.*

dissolved materials were measured by specific conductance (Table 7). Chlorides do not exhibit a simple runoff and export mode of effect, but rather accumulate in near surface groundwater (Kelly 2008), soils, and land surfaces adjacent to streams. Seasonal studies have shown that elevated summer concentrations are correlated with acute concentrations during late winter and spring periods (Kaushal et al. 2005). Research in New England (Kaushal et al. 2005) and Minnesota (Novotny et al. 2008) show that chlorides can accumulate in watersheds and that there is a strong association between high winter and elevated summer concentrations.

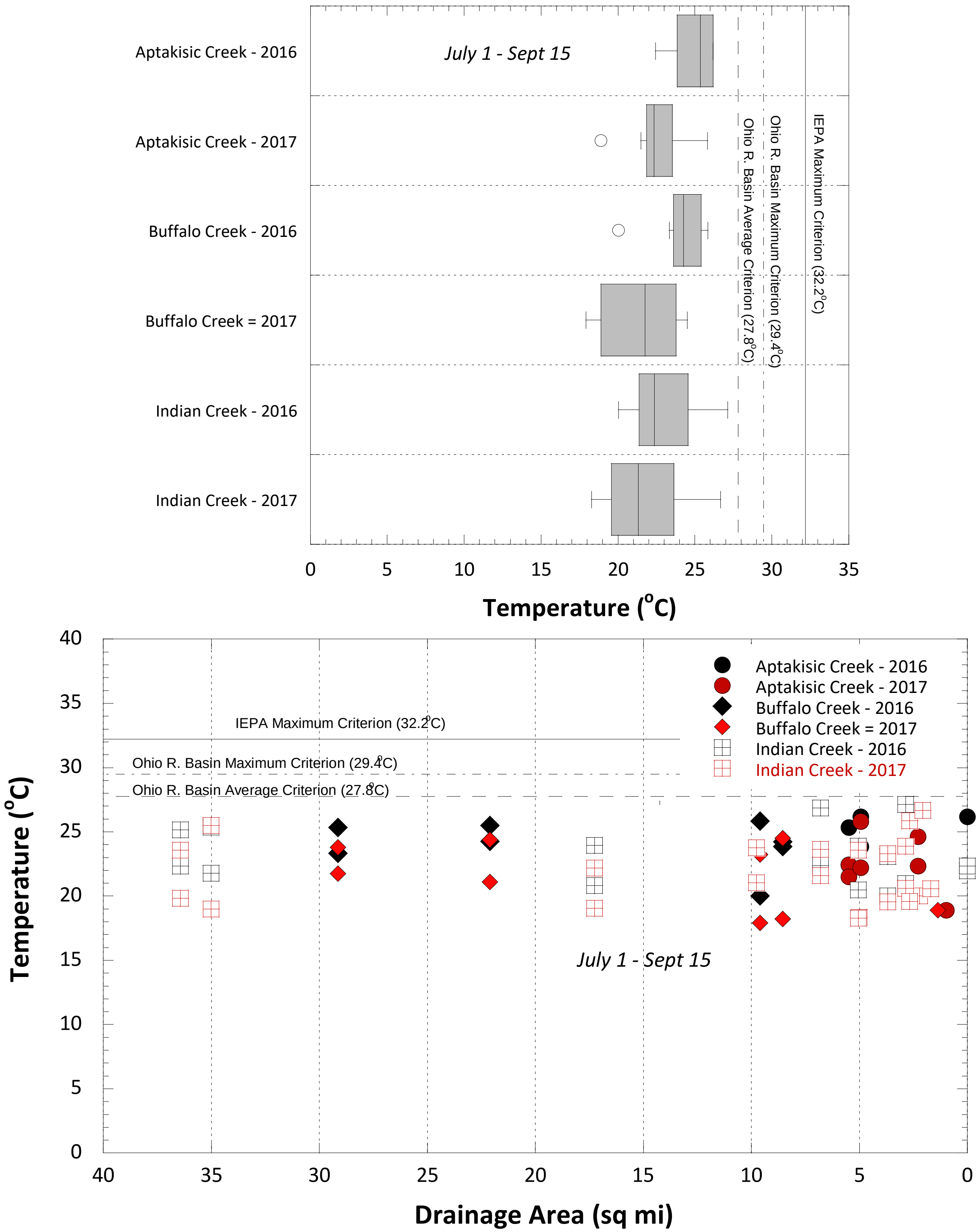

Figure 13*. Temperature (°C) based on grab samples collected in 2016 and 2017 by subwatershed and stream in the Year 1 2017 study area. Raw values in tributary subwatersheds are shown as box-and-whisker plots (upper panel, shaded boxes) and by individual site by drainage area (lower panel) in 2016 and 2017. Dashed and solid lines represent the IEPA maximum temperature criterion and the Ohio EPA General Ohio River Basin maximum (29.4°C) and average (27.8°C) criteria.*

***Table 7**. Mean specific conductance and concentrations of total suspended solids (TSS), chloride, total Kjeldahl nitrogen (TKN), total copper, and total zinc measured at sampling sites in the Year 1 2017 study area during May-October 2017. Yellow highlighted values exceed thresholds listed at the bottom of the table.*

Site ID	River Mile	Drainage Area (sq. mi.)	Spec. Conductance µS/cm	TSS (mg/L)	Chloride (mg/L)	TKN (mg/L)	Total Cu (µg/L)	Total Zn (µg/L)
Aptakisic Creek								
18-3	4.3	2.3	1020	-	134	-	4.2	11.2
18-2	0.8	4.9	884	-	173	-	4.2	11.2
18-1	0.5	5.5	1434	12.2	236	1.15	4.2	11.2
Unnamed Tributary to Aptakisic Creek @RM 4.6								
18-5	0.05	1.0	828	-	116	-	4.2	11.2
Buffalo Creek								
17-5	14	1.4	1015	8.9	147	1.15	4.2	11.2
17-3	7.7	9.6	836	15.3	111	1.25	4.2	11.2
17-2	6.1	22.1	814	15.3	141	1.25	4.2	11.2
17-1	0.75	29.1	1037	15.3	161	1.25	4.2	11.2
Unnamed Tributary to Buffalo Creek @RM 7.56								
17-4	0.68	8.6	888	8.9	170	1.15	4.2	11.2
Forest Lake Drain								
15-11	0.83	1.7	754	-	106	-	4.1	6.5
Indian Creek								
15-9	10.83	2.7	559	-	87	-	4.1	6.5
15-6	9.83	3.7	632	-	69	-	4.1	6.5
15-5	5.4	17.3	821	-	107	-	4.1	6.5
15-2	2.41	35.0	945	15.8	126	1.17	4.1	6.5
15-1	0.17	36.4	948	12.4	133	1.17	4.1	6.5
Killdeer Creek								
15-12	5.2	2.1	789	-	132	-	4.1	6.5
15-7	4.6	2.9	966	-	125	-	4.1	6.5
15-13	2.21	5.0	854	-	122	-	4.1	6.5
15-4	0.17	6.8	933	-	108	-	4.1	6.5
Seavey Drainage Ditch								
15-3	3.66	5.1	984	-	141	-	4.1	6.5
15-8	0.45	9.8	993	-	161	-	4.1	6.5
W. Branch Indian Creek								
15-10	0.8	2.2	679	0	87	-	4.1	6.5
Headwater Thresholds:			>600[a]	16[a]	112[b]	1.0[b]	5.0[a] µg/L	15.0[a] µg/L
Wadeable Thresholds:			>610[a]	24.75[a]				

[a] Ohio EPA statewide reference (75th percentile); [b] DRSCW IPS threshold.

Novotny et al. (2008) identified that 78% of the road salt applied in a Minnesota watershed accumulated in a given year and contributed to an increase in summer chloride concentrations. Specific conductance values were routinely elevated above the Ohio reference levels for headwater and wadeable streams exceeding 1000 µS/cm in Aptakisic Creek and

Table 8. *Heavy metal concentrations (mg/kg) in sediment at 16 sites in the 2017 Year 1 study area. Highlighted cells indicate an exceedance of one or more thresholds listed at the bottom.*

Site ID	River Mile	As	Ba	Cd	Cu	Pb	Fe	Mn	Ni	Zn	Al	V	Sr	Ag	Co
Aptakisic Creek															
18-3	4.3	3.35	27.1	0.37	16.3	10.3	10700	370	10.8	45.3	3920	10.4	65.7	0.06	5.19
18-2	0.8	6.56	89.9	0.62	24.1	20.2	21100	548	22.1	78.2	10400	23.9	47.9	0.06	10.8
18-1	0.5	3.03	123	0.38	21.9	15.3	14800	397	13.8	78.8	6910	14.9	107	0.06	6.56
Buffalo Creek															
17-3	7.7	4.79	37.2	0.38	14.2	13.6	12800	603	11.9	36.8	4210	11.6	33.2	0.06	6.18
17-2	6.1	4.02	34.4	0.35	11.8	10.8	11800	497	9.71	34.8	3930	11.3	42	0.06	4.88
17-1	0.75	3.81	32.3	0.49	17.6	16.8	12300	448	11	57.8	4310	12.1	52.9	0.06	5.21
Unnamed Tributary to Buffalo Creek @ RM 7.56															
17-4	0.68	5.78	32.7	0.54	14.9	13.9	16200	245	10.9	50.4	4810	15	30.9	0.06	5.44
Indian Creek															
15-9	10.83	4.2	34.3	0.32	12.9	11.3	11600	597	10	29.5	4230	12.3	22.1	0.06	4.83
15-6	9.83	6.64	56.1	0.48	21.4	15.4	17300	611	16.4	53	7370	18.4	30.4	0.06	7.84
15-5	5.4	5.25	56.4	0.59	24.1	17.8	17900	450	16.3	70.8	8500	18.5	43	0.06	7.4
15-2	2.41	3.86	54.9	0.63	29.8	18	17700	460	14.6	75.8	7080	17.3	61.6	0.23	6.72
15-1	0.17	2.54	17.9	0.28	10.2	8.43	8490	313	6.76	34.7	2560	8.43	37.5	0.06	3.33
Seavey Drainage Ditch															
15-3	3.66	6.38	32.4	0.75	20.9	30.7	19600	293	16	61.6	7460	16.4	30.7	0.06	5.39
15-8	0.45	2.3	23.8	0.56	25.6	13.4	9120	230	9.64	58.8	3280	9.1	41.9	0.58	4.09
Kildeer Creek															
15-7	4.6	5.43	45.2	0.41	19.6	16.7	15700	330	16.5	40.9	7470	15.1	38	0.06	7.33
15-4	0.17	9.86	45.8	0.58	13.7	16.5	33800	489	14.3	59.5	5430	16.2	30.8	0.06	7.92
MacDonald et al. 2000	TEC	9.79	None	0.99	31.6	35.8	20000	460	22.7	121.0	None	None	None	1.60	None
	PEC	33.00	None	4.98	149.0	128.0	40000	1100	48.6	459.0	None	None	None	2.20	None
OEPA 2008	OH SRVs		190.0	0.79	32.0	47.0	41000	1500	33.0		29000	40.0		0.43	12.00
Short 1998 (IEPA)	Elevated	7.20	145.0	2.00	37.0	60.0	26100	1100	26.0	170.0	None	None	None	None	None
	Highly El.	18.00	230.0	9.30	170.0	245.0	53000	2300	45.0	760.0	None	None	None	5.00	None

***Table 9**. Sediment PAH levels (mg/kg) in sediments at 16 sites in the 2017 Tear 1 study area. Highlighted cells indicate an exceedance of one or more thresholds listed at the bottom (TEL – threshold effect level; PEL – probable effect level; TEC – threshold effect concentration; PEC – probable effect concentration).*

Site ID	RM	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)-anthracene	Benzo(a)-pyrene	Benzo(b)fluor-anthene	Benzo(g,h,i)-perylene	Benzo(k)fluor-anthene	Chrysene	Dibenzo(a,h)-anthracene	Fluoranthene	Fluorene	Indeno(1,2,3cd)-pyrene	Naphthalene	Phenanthrene	Pyrene
Aptakisic Creek																	
18-3	4.3	286.0	66.0	603	907	919	1240	585	525	1110	112	3410	328	581	66	2950	2370
18-2	0.8	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9
18-1	0.5	73.3	68.4	369	965	913	1240	489	565	1100	112	3220	119	531	68.4	2110	2240
Buffalo Creek																	
17-3	7.7	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4
17-2	6.1	61.8	61.8	61.8	91	104	151	61.8	61.8	137	61.8	279	61.8	61.8	61.8	97.8	226
17-1	0.75	60.9	60.9	156	679	806	1160	666	471	966	112	2220	60.9	625	60.9	864	1570
Unnamed Tributary to Buffalo Creek @RM 7.56																	
17-4	0.68	60.4	60.4	60.4	88.3	106	176	76	78.3	154	60.4	328	60.4	69.5	60.4	128	251
Indian Creek																	
15-9	10.83	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6
15-6	9.83	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8
15-5	5.4	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
15-2	2.41	101	101	101	351	457	703	325	276	553	101	1350	101	300	101	595	933
15-1	0.17	56.5	56.5	56.5	63.5	67.9	102	56.5	56.5	87.9	56.5	204	56.5	56.5	56.5	95.2	157
Kildeer Creek																	
15-7	4.6	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7	75.7
15-4	0.17	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7	64.7
Seavey Drainage Ditch																	
15-3	3.66	59.5	59.5	59.5	118	115	166	88	68.3	152	59.5	278	59.5	82	59.5	108	247
15-8	0.45	68.8	68.8	68.8	303	455	817	404	280	588	68.8	1240	68.8	389	68.8	288	879
MacDonald et al. 2000	TEL	6.7	5.87	46.9	31.7	31.9	None	None	None	57.1	6.22	111	77.4	None	34.6	41.9	53
	PEL	88.9	128	245	385	782	None	None	None	862	135	2,355	144	None	391	875	875
	TEC	None	None	57.2	108	150	240	170	240	166	33	423	77.4	200	176	204	195
	PEC	None	None	845	1050	1450	13,400	320	13,400	1,290	135	2,230	536	3,200	561	1,170	1,520

Buffalo Creek. The highest value of 1434 µS/cm occurred in Aptakisic Creek downstream from the Lake Co. Des Plaines River WWTP. Conductance values were the lowest in Indian Creek, but all except one site exceeded the reference thresholds. TKN values exceeded the DRSCW IPS threshold of 1.0 mg/L at all of the eight (8) sites where it was measured. Such exceedances are common in urban watersheds and are the product of urban runoff. The other three parameters (TSS, copper, and zinc) were below effect thresholds at all sites where each was measured. Chloride levels (mg/L) tracked conductance levels which were well correlated with each other. Most sites exceeded the DRSCW IPS threshold of 112 mg/L which is a biological effect derived threshold. The lowest values occurred in the upper parts of the Indian Creek subwatershed. In studies of neighboring Salt Creek and the West, East, and Lower DuPage River watersheds, multi-year sampling has identified increasing trends of elevated concentrations of dissolved materials, particularly chlorides (MBI 2013, 2014, 2016a, 2016b). High levels of chlorides during the summer in the Year 1 subwatersheds suggest that late winter and early spring chloride levels are much higher during runoff events and likely contribute to the disproportionate impairment in headwater streams. Actual concentrations that result in adverse effects on fish and invertebrates likely occur during peak runoff events in late winter and early spring when values approach or exceed the 230 mg/L U.S. EPA recommended chronic criterion.

Sediment Chemistry

Sediment samples were evaluated against guidelines compiled by McDonald et al. (2000) and the Ontario Ministry of Environment (1993) that list ranges of contaminant concentrations by threshold (TEL) or probable (PEL) effects on aquatic life supplemented with some other parameters summarized in the NOAA SQUIRT documents (Buchman et al. 2008) and for sediment metals by Short (1998) for Illinois that identified elevated and extremely elevated sediment metal concentrations. Specifically, threshold effect levels (TEL) are where toxic effects are initially apparent and likely to affect the most sensitive organisms. Probable effect levels (PEL) are where toxic effects are more likely to be observed over a wider range of organism sensitivities. Sediment metal sampling results from 2016 are summarized by concentration rating and parameter class in Table 8 and polycyclic aromatic hydrocarbon (PAHs) compounds in Table 9. PAHs result from the incomplete combustion of hydrocarbons and are a common component of stormwater runoff in urban areas.

Elevated levels of heavy metals in urban landscapes are commonly associated with runoff from roads and highways and industrial and municipal sources. Given the development in the Year 1 subwatersheds some elevated metals were expected, particularly where road and building densities are high. Manganese was elevated above TEL benchmarks in 7 of 16 samples collected (Table 8) with no sites above the higher PEL benchmarks. Iron was exceeded at two sites, one TEL and one PEL and is likely an indication of inorganic sediment in runoff.

Sediment Organics

Table 9 shows concentrations of PAH compounds in the sediment in relation to the PEL/PEC benchmarks and TEL values where these are higher than the minimum detection limits. Values greater than the PELs are color coded red and greater than the TELs and TECs and less than the PEL/PEC are color coded orange and yellow (Table 9). Five values for benzo(g,h,i)perylene exceeded the MacDonald et al. (2000) PEL at two Aptakisic Creek locations and at downstream locations in Buffalo Creek, Indian Creek, and Seavey Drainage Ditch. Three other PEL exceedances occurred in Aptakisic Creek downstream from the Lake Co. Des Plaines River WWTP for fluoranthene, phenanthrene, and pyrene. The other PEL exceedance was for pyrene at the downstream site in Buffalo Creek. PAH compounds above the TEL/TEC thresholds were widespread among selected PAH compounds throughout the Year 1 subwatersheds especially for anthracene and dibenzo(a,h)anthracene at nearly every site. Position in the watershed (e.g., headwaters vs. downstream) seemed to be more of a factor in the presence of elevated PAH compounds in 2017 with the higher levels occurring downstream. PAHs are carried in runoff from roads, parking lots, and other transportation related land uses as well as industrial sources. While many of the 2017 sites are in proximity to roads, parking lots, and other impervious surfaces, other sites without such values are also near these features. It will take a more detailed examination of potential sources to identify the origins of the hot spots in the 2017 results.

Physical Habitat Quality for Aquatic Life - QHEI

The physical habitat of a stream or river is a primary determinant of biological quality and potential. Streams in the glaciated Midwest, left in their natural state, typically offer pool-run-riffle sequences, moderate to high sinuosity, and well-developed channels with deep pools, heterogeneous substrates, and cover in the form of woody debris, hard substrates, and aquatic macrophytes. Lower gradient streams may not offer distinct riffle habitats and are oftentimes run and glide dominated, but can still offer a diversity of substrates, well developed pool habitats, and well developed instream cover features associated with woody debris and aquatic macrophytes. The Qualitative Habitat Evaluation Index (QHEI) categorically scores basic components of stream habitat into ranks according to the degree to which those components are found compared to a natural state, or conversely, in an altered or modified state. In the Upper Des Plaines River study area, QHEI scores and physical habitat attributes were recorded in conjunction with the fish sampling conducted at each site.

Year 1 2017 Study Area

Based on QHEI scores and the number of good and modified attributes (after Rankin 1989, 1995; Table 11 and Figure 14) overall habitat quality ranged from poor to very good in 2017. Fair and poor QHEI scores were the result of the predominance by high and moderate influence modified attributes with as many as 6-9 at the poorest quality sites (Table 11). The number of modified QHEI habitat attributes are illustrated in Figure 15 for each major subwatershed and each site. The most frequently occurring high influence modified attributes were a predominance of silt/muck substrates, a lack of sinuosity, sparse or no cover, and maximum pool depths <40 cm. Fast current types were absent at all sites and reflect the generally low gradient character of the subwatersheds. Moderate to high silt cover and moderate to extensive substrate embeddedness were observed at all except one site which is consistent with our findings throughout the Upper Des Plaines watershed (MBI 2017). Fair-poor development and moderate to extensive riffle embeddedness are moderate influence modified attributes that were observed at all except three and four sites, respectively. The ratio of modified to good attributes was ≥2.0 at 11 of 23 sites and extremely high (9.0 and 10.0) at two sites. Ratios ≥2.0 generally indicate a greater number of habitat modifications that would require direct mitigation to reverse. It also means that meeting the General Use biocriteria would likely be precluded by habitat regardless of water quality conditions raising concerns about use attainability (Rankin 1995). The sites with ratios <2.0 is the result of having fewer modified attributes coupled with enough good attributes to offset the negative influence of the modified attributes.

With the exception of the site at the mouth of Buffalo Creek (17-1) all of the fair and poor QHEI scores were in the upper reaches of the 2017 study area subwatersheds at drainage areas <10 square miles (Figure 14), which is consistent with our experience of observing smaller headwater streams being disproportionately modified in urbanized watersheds (Yoder et al. 2000; Miltner et al. 2004). There was an overall pattern of QHEI scores in 2017 being slightly

***Table 10**. Qualitative Habitat Evaluation Index (QHEI) matrix showing good and modified habitat attributes at each site in the Year 1 study area in 2017. (■- good habitat attribute; ● - high influence modified attribute; ●- moderate influence modified attribute). Modified to good attribute ratios ≥2.0 are yellow, orange, or red highlighted in accordance with the predominance of modified attributes.*

			Good Habitat Attributes											High Influence Modified Attributes						Moderate Influence Modified Attributes													Ratios	
Site ID	**River Mile**	**QHEI**	**No Channelization**	**Boulder, Cobble, Gravel**	**Silt Free**	**Good-Excellent Development**	**Moderate-High Sinuosity**	**Moderate-Extensive Cover**	**Fast Flow w Eddies**	**Little to No Embeddedness**	**Max Depth > 40 cm**	**No Riffle Embeddedness**	**"Good" Habitat Attributes**	**Channelized or No Recovery**	**Silt/Muck Substrates**	**No Sinuosity**	**Sparse No Cover**	**Max Depths <40 cm**	**High Influence Modified Attributes**	**Recovering from Channelization**	**Mod-High Silt Cover**	**Sand Substrates (Boatable sites)**	**Hardpan Origin**	**Fair- Poor Development**	**Low Sinuosity**	**≤ 2 Cover Types**	**Intermittent Flow/Pools <20 cm**	**No Fast Current Types**	**Mod-Extensive Embeddedness**	**Mod-Extensive Riffle**	**No Riffle**	**Modified Habitat Attributes**	**Ratio of Modified (High):Good**	**Ratio of Modified (All):Good**
Aptakisic Creek																																		
18-4	4.70	**47.0**						■		■	■		3		●	●			2	●				●	●			●		●		5	0.67	2.33
18-3	4.30	**55.5**		■							■		2			●	●		2	●	●			●	●			●	●	●		7	1.00	4.50
18-2	0.80	**45.0**						■			■		2		●	●			2	●	●			●				●	●		●	6	1.00	4.00
18-1	0.50	**48.0**						■			■		2	●		●			2		●			●				●	●		●	5	1.00	3.50
Unnamed Tributary to Aptakisic Creek @RM 4.6																																		
18-5	0.05	**43.5**						■					1		●	●		●	3	●	●			●	●			●	●	●		7	3.00	10.0
Buffalo Creek																																		
17-5	14.0	**63.0**	■	■		■	■	■			■		6						0		●			●				●	●	●		5	0.00	0.86
17-3	7.70	**73.0**	■	■		■	■	■			■		6						0		●							●	●	●		4	0.00	0.67
17-2	6.10	**64.3**		■		■		■			■		4						0	●	●				●			●	●	●		6	0.00	1.50
17-1	0.75	**46.5**		■									1	●		●	●	●	4		●			●				●	●		●	5	4.00	9.00
Unnamed Tributary to Buffalo Creek @RM 7.56																																		
17-4	0.68	**57.5**	■	■				■			■		4				●		1		●		●	●	●			●	●	●		7	0.25	2.00
Indian Creek																																		
15-9	10.8	**55.5**	■	■		■	■	■					5					●	1		●			●				●	●	●		5	0.20	1.20
15-6	9.83	**59.5**	■	■				■					3					●	1		●			●	●			●	●	●		6	0.33	2.33
15-5	5.40	**66.5**	■	■			■	■			■		5						0		●			●				●	●	●		5	0.00	1.00
15-2	2.41	**73.0**	■	■		■	■	■			■		6						0		●							●	●	●		4	0.00	0.67
15-1	0.17	**65.0**		■				■			■		3						0	●	●			●	●			●	●	●		7	0.00	2.33

***Table 10**. Qualitative Habitat Evaluation Index (QHEI) matrix showing good and modified habitat attributes at each site in the Year 1 study area in 2017. (■- good habitat attribute; ● - high influence modified attribute; ●- moderate influence modified attribute). Modified to good attribute ratios >2.0 are yellow, orange, or red highlighted in accordance with the predominance of modified attributes.*

			Good Habitat Attributes											High Influence Modified Attributes						Moderate Influence Modified Attributes													Ratios	
Site ID	River Mile	QHEI	No Channelization	Boulder, Cobble, Gravel	Silt Free	Good-Excellent Development	Moderate-High Sinuosity	Moderate-Extensive Cover	Fast Flow w Eddies	Little to No Embeddedness	Max Depth > 40 cm	No Riffle Embeddedness	"Good" Habitat Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse No Cover	Max Depths <40 cm	High Influence Modified Attributes	Recovering from Channelization	Mod-High Silt Cover	Sand Substrates (Boatable sites)	Hardpan Origin	Fair- Poor Development	Low Sinuosity	≤ 2 Cover Types	Intermittent Flow/Pools <20 cm	No Fast Current Types	Mod-Extensive Embeddedness	Mod-Extensive Riffle	No Riffle	Modified Habitat Attributes	Ratio of Modified (High):Good	Ratio of Modified (All):Good
Killdeer Creek																																
15-12	5.20	**41.5**	■					■			■		3		●				1		●			●	●			●	●	●		6	0.33	2.33
15-7	4.60	**48.5**	■	■			■	■					4					●	1		●			●				●	●	●		5	0.25	1.50
15-13	2.21	**61.0**	■	■		■	■	■			■		6						0		●			●				●	●	●		5	0.00	0.83
15-4	0.01	**53.5**	■				■	■			■		4		●				1		●			●				●	●	●		5	0.25	1.50
W. Branch Indian Creek																																
15-10	0.80	**58.5**	■	■			■	■					4					●	1		●			●				●	●	●		5	0.25	1.50
Seavey Drainage Ditch																																
15-3	3.66	**62.0**	■	■		■		■			■		5				●		1		●			●	●			●	●	●		6	0.20	1.40
15-8	0.45	**55.0**		■				■			■		3			●			1	●	●			●				●	●	●		6	0.33	2.33
Forest Lake Drain																																
15-11	0.83	**48.3**					■					■	2		●		●	●	3	●	●			●				●	●			5	1.50	4.00

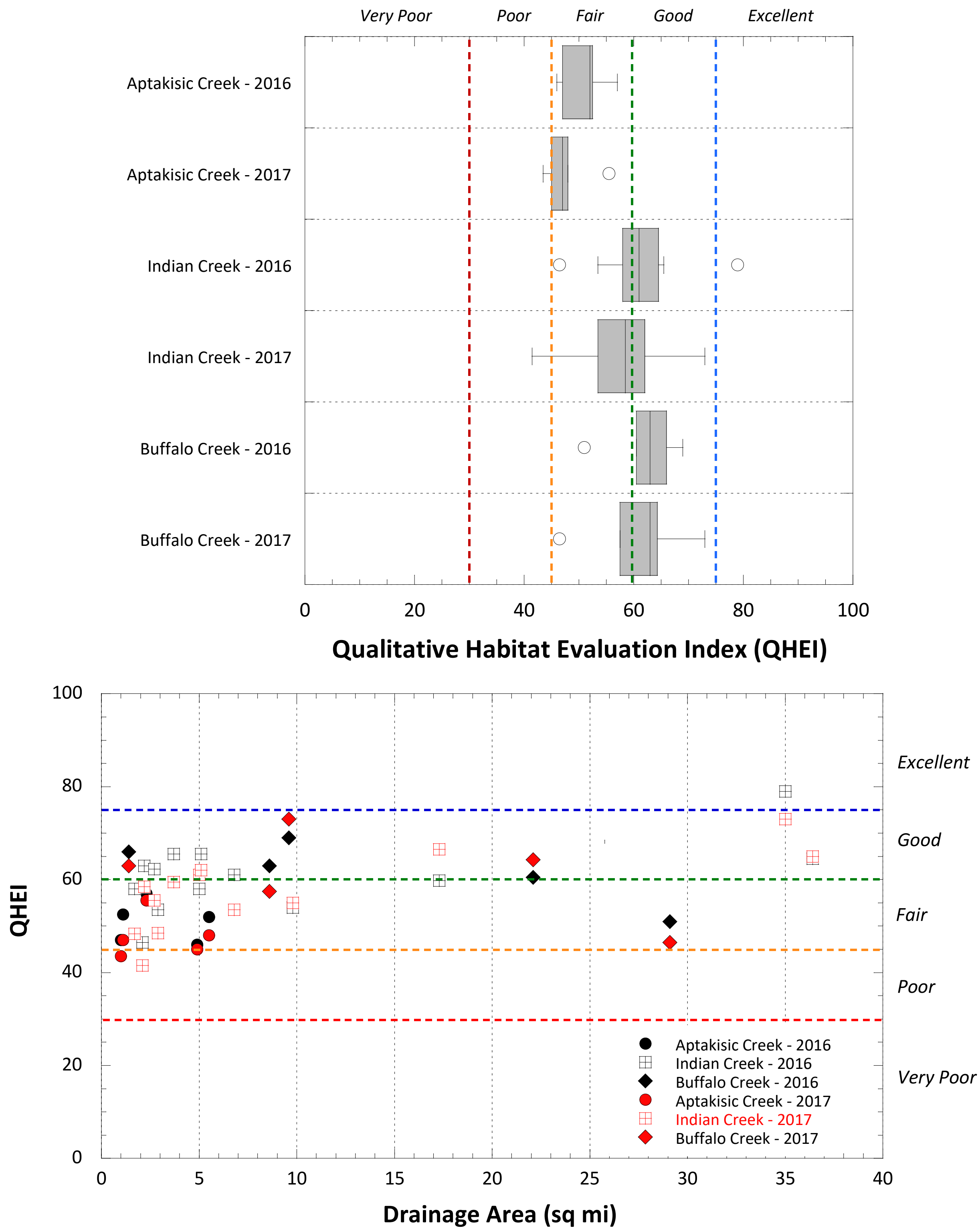

Figure 14. *Qualitative Habitat Evaluation Index (QHEI) scores in the Year 1 study area in 2016 and 2017. Values in the principal subwatersheds are shown as box-and-whisker plots (upper panel) and as a scatter plot of individual sites by drainage area (lower panel). The narrative ranges of QHEI scores from excellent to very poor are indicated.*

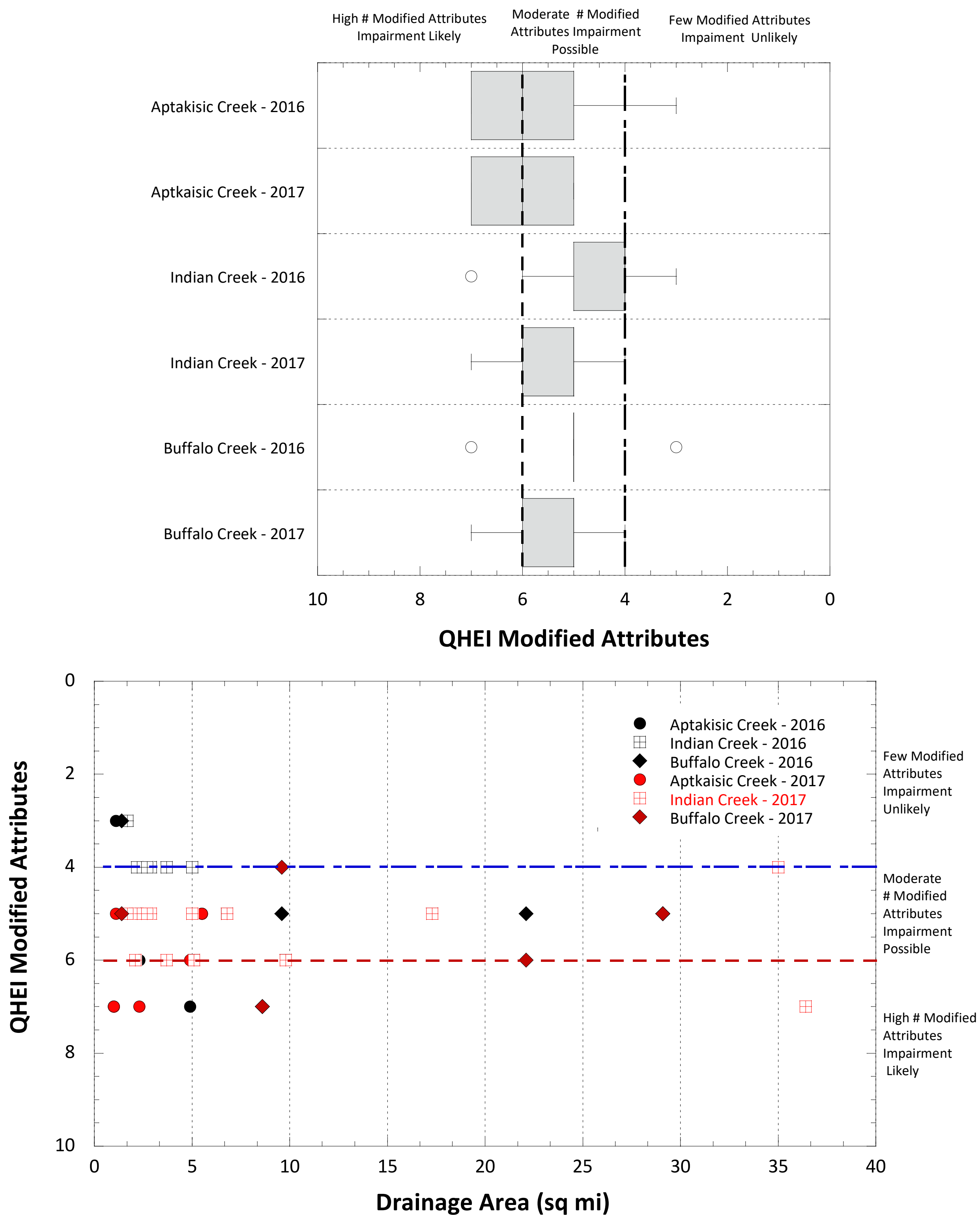

***Figure 15**. The number of modified QHEI attributes at sites in the Year 1 study area in 2016 and 2017. Modified attributes in the principal subwatersheds are shown as box-and-whisker plots (upper panel) and as a scatter plot of the number of modified attributes at individual sites on a reverse scale by drainage area (lower panel) along a reverse scale on the y-axis. Thresholds for the likelihood of the number of modified attributes causing a biological impairment are indicated.*

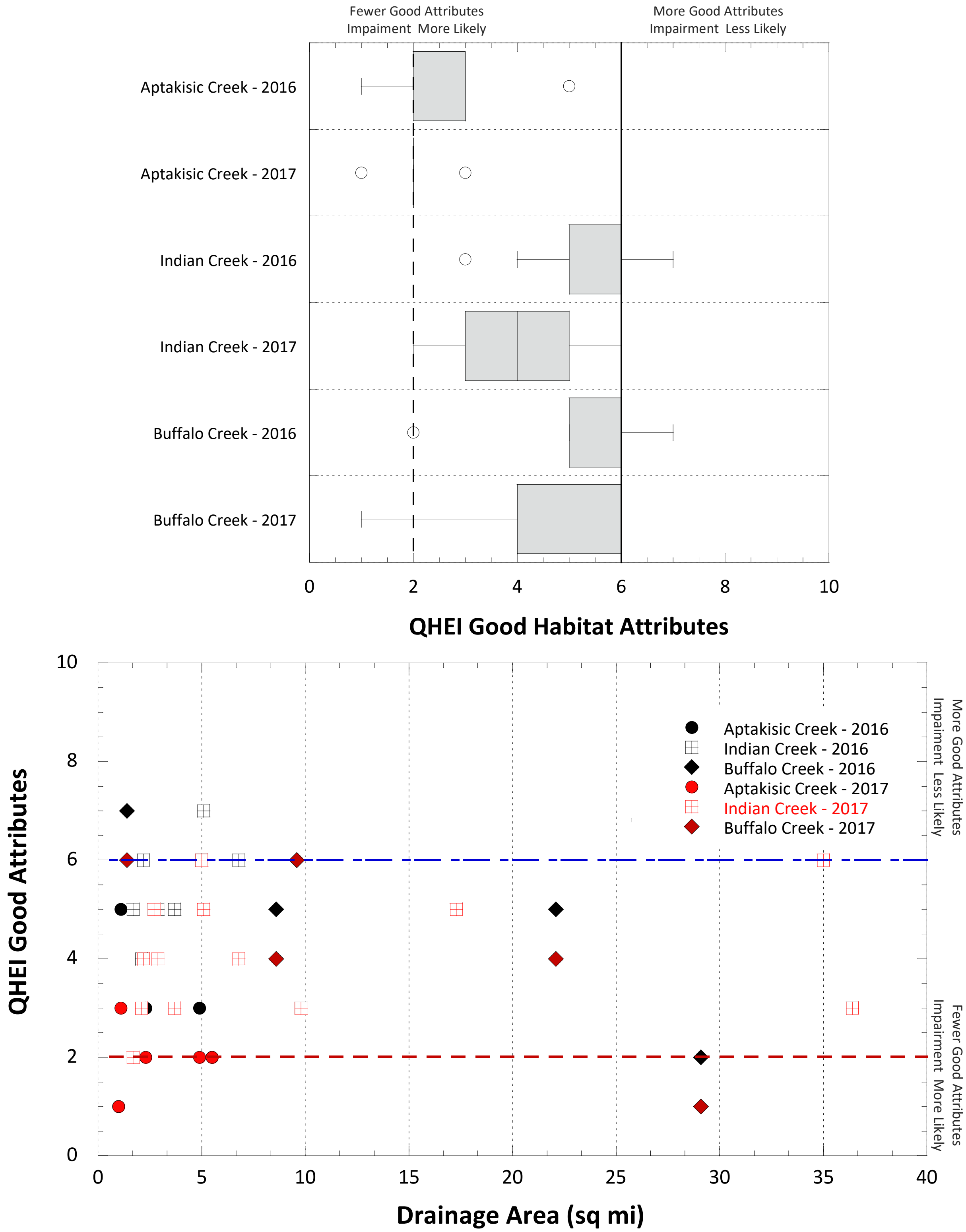

***Figure 16**. The number of good QHEI attributes at sites in the Year 1 study area in 2016 and 2017. Good QHEI attributes in the principal subwatersheds are shown as box-and-whisker plots (upper panel) and as a scatter plot of the number of good attributes at individual sites by drainage area (lower panel). Thresholds for the likelihood of the number of good attributes fostering biological attainment are indicated.*

lower than in 2016 (Figure 15, upper panel) which could be related to the spates of peak flows that occurred through July 2017 about two weeks before the QHEI assessments were made. There was a trend towards an increased accumulation of modified attributes (Figure 15) and a decline in the number of good attributes (Figure 16) in 2017 compared to 2016.

Aptakisic Creek

Habitat was uniformly fair in the Aptakisic Creek subwatershed with the site in the Unnamed Tributary (18-5) in the poor quality range (Table 11; Figure 14). All five sites were predominated by modified QHEI attributes with the modified:good ratios >4.0 at all except one site and the highest ratio in the study area of 10.0 in the Unnamed Tributary (18-5). Each site had at least two high influence modified attributes, 5-7 moderate influence modified attributes, but only 1-3 good attributes.

Indian Creek

As the largest subwatershed in the 2017 study area Indian Creek had 13 of the 23 sites sampled with six sites in the mainstem and remainder scattered among four tributaries. It had the widest range of habitat quality from good to poor in 2017 and is the least urbanized of the three subwatersheds. The mainstem had marginally good to good quality habitat as reflected by the QHEI scores with consistently good quality habitat at the downstream most three sites (15-1, 15-2, and 15-5; Table 11 and Figure 14). These were also three of only six sites in the study area that had no high influence modified attributes. However, moderate influence attributes were among the highest in the study area and included moderate-high silt, fair-poor development, no fast current types, moderate to extensive embeddedness of the site and riffle habitats. The modified:good ratios varied with two sites >2.0 (15-6 and 15-1) and due to having fewer good attributes. With the exception of two sites in the tributaries (15-13 Kildeer Creek and 15-3 Seavey Drainage Ditch) QHEI scores were poor or fair. These sites had up to three high influence modified attributes, 5-6 moderate influence modified attributes, and fewer good attributes (Table 11; Figures 15 and 16). However, modified:good ratios were <2.0 at only three sites and 4.0 at the Forest Lake Drain site (15-11).

Buffalo Creek

Sites in the Buffalo Creek subwatershed varied from fair to very good quality habitat. The three upstream sites on the mainstem were good (17-2 and 17-5) and very good (17-3) and the unnamed tributary was just shy of good (Table 11). The site at the mouth of the mainstem (17-4) was fair with one of the lowest scores in the 2017 study area. It had four high influence modified attributes, five moderate influence modified attributes, and only one good attribute resulting in a modified:good ratio of 9.0 which was the highest in the 2017 study area (Table 11) and limiting to the aquatic biota. Conversely, ratios were well less than <2.0 at the other mainstem sites and exactly 2.0 in the unnamed tributary.

Biological Assemblages – Macroinvertebrates

There were 127 unique macroinvertebrate taxa collected in the Year 1 study area in 2017 (Appendix B). The predominant taxa collected were primary facultative or tolerant and most are characteristic of lentic type habitats and are tolerant of the moderate to heavy siltation that is prevalent throughout the study area. The most numerous was *Hyalella azteca,* a facultative taxon, followed by Oligochaeta which are highly tolerant (Table 11). The chironomid *Polypedilum (P.) illinoense* is a highly tolerant taxon to toxics and also increases in its probability of collection as the overall substrate quality declines. The prevalence of silt tolerant taxa was a key line of evidence in assigning siltation as a cause contributing to aquatic life impairment in the Upper Des Plaines River watershed in 2016 (MBI 2017).

Table 11. *The fifteen most abundant macroinvertebrate taxa collected in the Year 1 study area in 2017 including number collected, taxa group, functional group, and taxa tolerance assignments.*

Taxa Code	Taxa Name	Number Collected	Taxa Group	IL Functional Group	IL Tolerance Score
06201	*Hyalella azteca*	1127	N	CG	5
03600	*Oligochaeta*	890	N	CG	10
84470	*Polypedilum (P.) illinoense*	407	D	SH	6
93200	*Hydrobiidae*	351	N	SC	6
01801	*Turbellaria*	351	N	PR	6
22001	*Coenagrionidae*	266	O	PR	5.5
52200	*Cheumatopsyche sp*	262	CA	CF	6
84450	*Polypedilum (Uresipedilum) flavum*	236	D	SH	6
05800	*Caecidotea sp*	231	N	CG	6
98001	*Pisidiidae*	223	N	CF	5
98200	*Pisidium sp*	192	N	CF	5
83300	*Glyptotendipes (G.) sp*	171	D	CF	10
83040	*Dicrotendipes neomodestus*	145	D	CG	6
69400	*Stenelmis sp*	140	CO	SC	6
68700	*Dubiraphia sp*	134	CO	CG	5

Taxa Group: N - Non-Insect; MA - Mayfly; O - Odonata; CA - Caddisfly; D - Dipteran; T - Tribe Tanytarsini; CO - Coleoptera
IL Functional Group: CG - Collecter/Gatherer; PR - Predator; CF - Collectors/Filterers; SH - Shredder; SC - Scraper
IL Tolerance Score Ranges from 0 (Least Tolerant) to 10 (Most Tolerant)

Year 1 2017 Study Area

Macroinvertebrate assemblage quality in the 2017 Year 1 subwatersheds ranged from poor to good condition (Table 12; Figure 16). Only four sites of the 23 sites met the mIBI biocriterion of 41.8. Two sites were rated as poor and 17 sites were rated fair. Table 12 lists selected mIBI metrics and macroinvertebrate assemblage attributes two of which are key biological response signatures associated with toxic impacts (% toxic tolerant taxa) or organic enrichment (% organic enrichment tolerant taxa; Yoder and DeShon 2003). Four sites exceed the organic enrichment threshold with an additional six sites just below. Only one site exceeded the toxic tolerant threshold. The number of EPT taxa was either zero or low (1-3) at 17 pf the 23 sites while only two sites had EPT taxa counts considered to be good. Overall mIBI scores were lowest in the Aptakisic Creek subwatershed and highest in Buffalo Creek with little apparent

***Table 12**. Selected fish and macroinvertebrate assemblage attributes for sites sampled in the Year 1 study area in 2017. Biological index scores are shaded by level of use support: green – fully supporting; yellow – non-support fair; red – non-support poor; key metrics as signatures of toxic or organic enrichment impacts are shaded in green, yellow, and red based on Yoder and DeShon(2003) and IBI or mIBI metric ratings.*

Site ID	River Mile	Drain-age Area (mi.^{2})	fIBI	Native Sp.	DELT Anomalies%	Intol. Sp.	%Mineral Spawners	% Tolerant	mIBI	Total Taxa	Intolerant Taxa	% Tolerants	EPT Taxa	% EPTs	MBI	% Toxic Tol. Taxa	% Org. Enrich. Taxa
Seavey Drainage Ditch																	
15-3	3.66	5.05	12	5	0	0	0	40.0	17.5	18	1	19.0	0	0	6.6	10.3	33.1
15-8	0.45	9.77	25	14	0	1	11.8	42.9	30.6	29	3	19.1	4	2.9	7.0	3.5	46.5
Aptakisic Creek																	
18-4	4.70	1.09	28	4	0	0	0	50.0	21.5	19	0	11.6	0	0	6.5	2.1	52.3
18-3	4.30	2.3	16	5	0	0	0	60.0	28.2	22	2	9.9	2	0.7	6.3	3.9	34.4
18-2	0.80	4.94	24	12	0.38	0	0.8	41.7	24.0	20	1	19.4	2	4.8	6.4	6.0	31.6
18-1	0.50	5.5	22	10	0	1	0.9	30.0	25.6	25	2	8.5	2	2.2	6.4	55.4	21.5
Unnamed Tributary to Aptakisic Creek @RM 4.6																	
18-5	0.05	0.99	24	5	0	0	0	60.0	26.1	23	2	8.5	1	0.4	6.0	6.0	27
Buffalo Creek																	
17-5	14.0	1.37	25	7	0	0	0	71.4	23.7	20	2	17.1	1	0.4	6.8	2.0	59.7
17-3	7.70	9.61	15	9	0	0	0	66.7	49.6	31	2	9.4	3	34.7	5.7	3.5	11.2
17-2	6.10	22.1	18	10	0	0	2.7	40.0	50.8	32	4	13.6	6	7.5	6.0	2.1	15.8
17-1	0.75	29.14	25	12	1.55	0	0.6	41.7	30.8	25	1	19.8	2	1.0	6.5	3.0	33.6
Unnamed Tributary to Buffalo Creek @RM 7.56																	
17-4	0.68	8.55	8	4	0	0	0	75.0	31.2	24	2	6.0	3	1.7	5.7	4.6	14.5
Indian Creek																	
15-9	10.8	2.68	19	9	0	0	0	44.4	22.7	18	1	15.0	2	2.8	6.8	3.2	30.4
15-6	9.83	3.7	22	10	0	0	0	40.0	23.2	26	2	14.0	1	0.3	6.8	3.2	32.1
15-5	5.40	17.26	25	11	0	0	1.2	45.5	39.4	31	2	4.7	2	3.1	5.3	0.3	6.6
15-2	2.41	35.02	38	17	0	1	27.3	35.3	46.8	38	4	12.5	2	7.2	6.3	7.2	21.6
15-1	0.17	36.43	34	14	0	2	20.4	35.7	53.5	39	5	8.7	6	23.3	6.0	12.5	14
Forest Lake Drain																	
15-11	0.83	1.7	20	8	0	0	0	62.5	22.0	21	1	5.7	1	1.8	5.4	1.8	1.8
Kildeer Creek																	
15-12	5.20	2.08	17	9	0.25	0	0	77.8	40.0	25	2	5.7	1	0.3	5.9	0.9	4.2
15-7	4.60	2.86	16	11	0	0	0	72.7	32.2	31	1	20.3	4	16.1	7.1	0.6	35
15-13	2.21	5.01	16	11	0	0	0	54.6	39.8	18	2	4.6	4	51.0	5.7	3.4	20.7
15-4	0.01	6.8	22	13	0	0	0	38.5	33.0	26	1	9.8	4	2.5	5.9	3.7	14.7
W. Branch Indian Creek																	
15-10	0.80	2.22	12	2	0	0	0	0	18.1	14	1	3.7	0	0	5.8	1.0	11.2
Biological Signature Thresholds (Yoder and DeShon 2003)																	
Good:			**≥ 41**	5-6	0	5-6	5-6	5-6	**≥ 41.8**	>70	>70	< 5	≥4	>70	>70	<10	<30
Fair:			**>20<41**	2-4	>0 - < 10	2-4	2-4	2-4	**>20.9<41.8**	40-69	40-69	5-10	3-4	40-69	40-69	<10<35	>30;<35
Poor:			**≤ 20**	0-1	≥10	0-1	0-1	≥70	**≤ 20.9**	< 40	< 40	>10	≤2	< 40	< 40	≥ 35	≥ 35

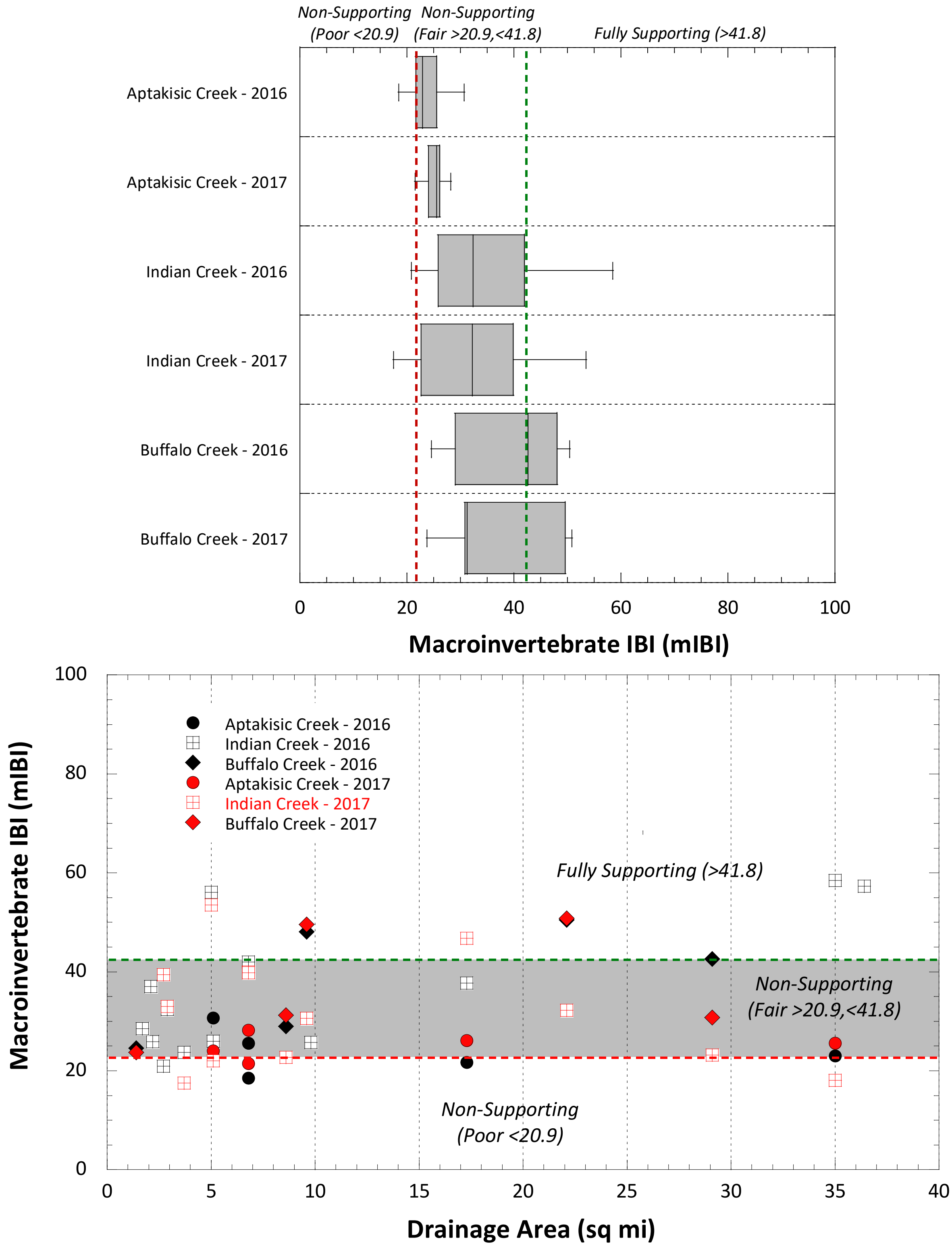

Figure 17*. Illinois macroinvertebrate IBI scores for samples in the Year 1 tributary subwatersheds in 2016 and 2017 as shown as shaded box plots (upper panel) and as a scatter plot for individual sites by drainage area in 2016 and 2017(lower panel). IEPA thresholds for determining full support, non-support-fair, and non-support-poor of the General Use for aquatic life are indicated by dashed lines.*

differences between 2016 and 2017 (Figure 16). Indian Creek was intermediate , but it had the highest scoring mIBI and highest total taxa of all sites in 2017 at downstream most site (15-1).

Aptakisic Creek is the most developed of the three 2017 year 1 subwatersheds. All four sites on Aptakisic Creek had fair mIBI scores with the three upstream most sites exhibiting a strong response to organic enrichment and the lower most site downstream of the LCPWD Des Plaines River WWTP exhibited the only toxic tolerant response in 2017 as it did in 2016 (MBI 2017). An unnamed tributary to Aptakisic Creek (Site 18-5) had a fair mIBI and an organic enrichment biological response signature with 38.1% organic tolerant taxa.

Biological Assemblages – Fish

Forty-four (44) fish species were collected along with three hybrids in the Year 1 subwatersheds in 2017. The assemblage was predominated by tolerant and moderately tolerant fish species (Table 13). Green sunfish, bluntnose minnow, bluegill, blackstripe topminnow, and creek chub were the most numerous species collected in 2017. Of the top 15 species seven are highly

Table 13. *The fifteen most abundant species collected in the Year 1 subwatersheds in 2017 with IL and OH tolerance assignments, numbers collected, and percent collected by number (species with blank tolerance are intermediate).*

Species	Tolerance		No. Collected	% By Number
	IL	OH		
Green Sunfish	T	T	2209	13.62
Buntnose Minnow	T	T	1880	11.59
Bluegill		P	1869	11.52
Blackstripe Topminnow			1765	10.88
Creek Chub	T	T	1232	7.59
Largemouth Bass			935	5.76
Spotfin Shiner			884	5.45
White Sucker	T	T	826	5.09
Yellow Bullhead	T	T	626	3.86
Central Mudminnow		T	507	3.13
Central Stoneroller			430	2.65
Hornyhead Chub	I	I	356	2.19
Johnny Darter			313	1.93
Black Bullhead		P	297	1.83
Pumpkinseed		P	261	1.61

I – intolerant; P – moderately tolerant; T – highly tolerant.

tolerant, three moderately tolerant, and only one (Hornyhead Chub) intolerant.

None of the 2017 fIBI scores met the General Use criterion of 41 although the lowermost two sites in Indian Creek came close with scores of 34 (15-1) and 38 (15-2), respectively which were the highest in the Year 1 survey (Table 13). Ten Of the 23 sites were in the poor range. For selected FIBI metrics, native species ranged from a low of 2 in the w. Branch of Indian Creek

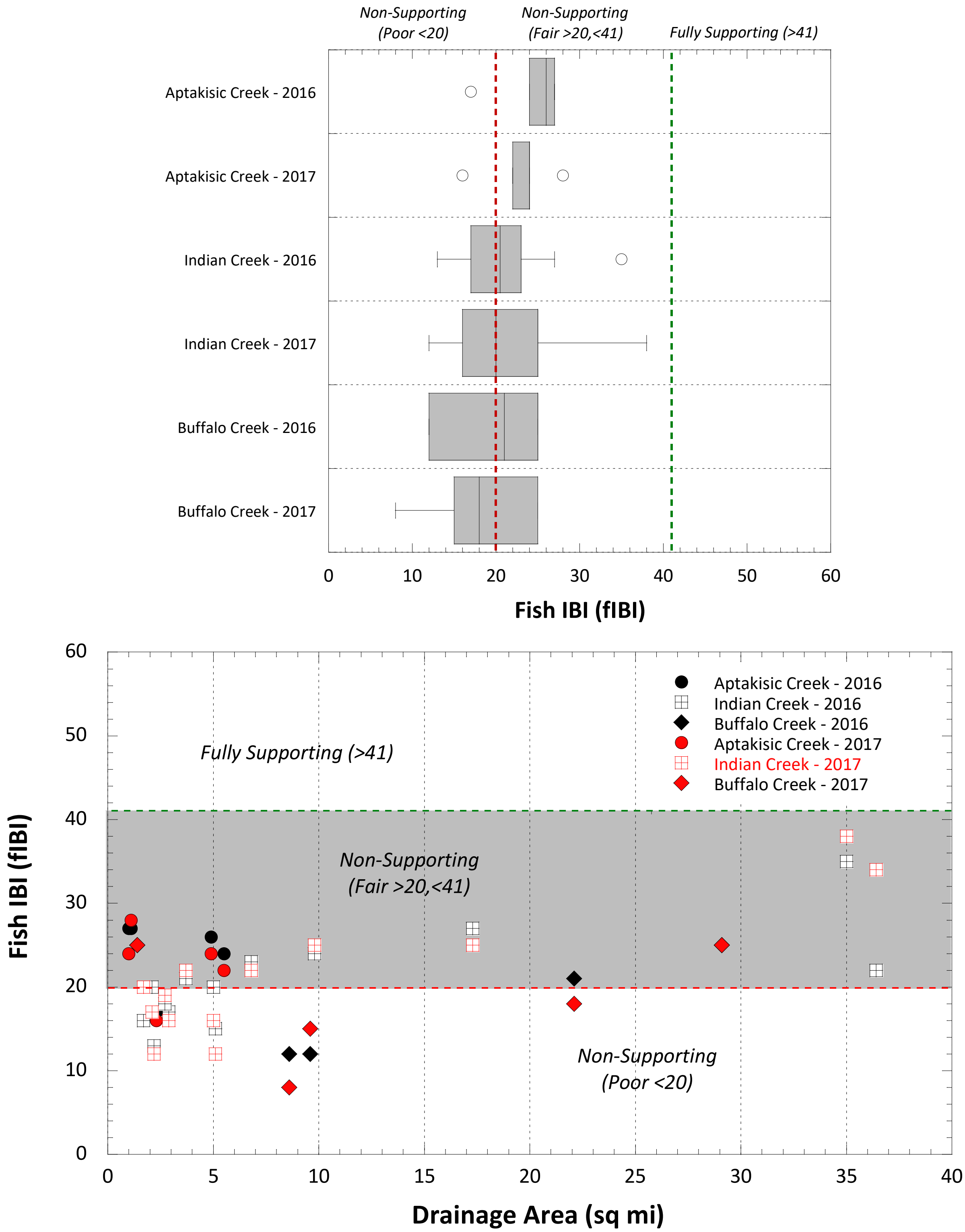

__Figure 18__. Illinois fish IBI scores for samples in the Year 1 tributary subwatersheds in 2016 and 2017 as shown as shaded box plots (upper panel) and as a scatter plot for individual sites by drainage area in 2016 and 2017(lower panel). IEPA thresholds for determining full support, non-support-fair, and non-support-poor of the General Use for aquatic life are indicated by dashed lines.

(15-10) to 17 in lower Indian Creek (15-2). Mineral substrate spawners were absent at 15 of 23 sites and only in appreciable abundance at the lowermost two sites in Indian Creek. The proportion of tolerant species ranged from a low of 30% in the lowermost site in Aptakisic Creek (18-1) to a high of 77.8% at the upstream site in Kildeer Creek (15-12). DELT anomalies were detected at only 3 sites and in relatively low frequencies (0.25-1.55%). All except one fIBI value was in the fair range in Aptakisic Creek and one-half and more were in the poor range in Indian and Buffalo Creeks (Figure 17).

Indian Creek is the largest of the three Year 1 subwatersheds (38 sq. mi.) and fIBIs ranged from fair to poor (poor mostly at smaller sites). Streams sampled included Indian Creek, Kildeer Creek, West Fork of Indian Creek, Seavey Drainage Ditch and Forest Lake Drain. The fish assemblages were comprised mostly of tolerant species with the more sensitive hornyhead chub at several of the larger sites. Habitat ranged from fair to excellent; however, all sites had moderate to heavy siltation and heavily embedded substrates which is consistent with the dominance by tolerant fish species such as creek chub, white sucker, green sunfish and yellow bullhead. The urban land uses have undoubtedly have altered the natural flow regimes and that combined with the highly erodible soils contribute to the degraded substrate conditions throughout the subwatershed. Similar results were observed in the Buffalo Creek subwatershed.

The Aptakisic Creek fish assemblage supported fair fIBIs also dominated by tolerant fish species such as white sucker, creek chub, green sunfish, and yellow bullhead and a lack of sensitive species and mineral substrate spawners (i.e., simple lithophils). The lower most site is downstream from the LCPWD Des Plaines River WWTP. In 2016 native species richness declined upstream to downstream from 18 to 12 with a slight increase in DELT anomalies (0.5 to 1.1%) even though the fIBI only declined by 2 points (26 to 24). In 2017 the decline in native species richness was less (12 to 10) with no detection of DELT anomalies downstream.

SYNTHESIS

The baseline biological condition of the Year 1 subwatersheds has been shaped by the natural, low gradient and wetland-origins of the region. The current condition of the biological assemblages reflects changes that have altered these natural features mostly via hydrological and physical conversion resulting from urban development. The influence of altered hydrology, increased soil erosion, and habitat alterations were evident in the bioassessment results. The excessive siltation and embeddedness of substrates and channel modification were the most pervasive of the causes in 2016 these were likewise present in 2017.

New tools were applied in the 2017 Year 1 subwatershed assessment and included a more thorough analysis of the *effect* of nutrient enrichment and continuous monitoring to yield a more comprehensive characterization of the D.O. regime. Coupled with the chemical/physical assessment and the habitat and biological measures that were used in 2016, all were used in an integrated manner to assign associated causes to the biological impairments observed in 2017.

The biological criteria for fish and macroinvertebrates used by Illinois EPA (2018) establish the thresholds by which impaired sites and reaches are determined. The assignment of causes in this analysis generally followed the intent of the Illinois Integrated Report assessment guidelines, but was supplemented by more extensive biological effect thresholds derived by the DuPage River Salt Creek Integrated Prioritization System (IPS; Miltner et al. 2010), for southwestern Ohio (MBI 2015), and from the scientific literature (e.g., consensus-based sediment quality guidelines of MacDonald et al. 2000). Table 4 summarized the principal thresholds used in the assignment of causes for the 2017 bioassessment. It should be noted here that these are being used on an interim basis pending the development of region-specific thresholds for northeastern Illinois that is currently supported by both the DRWW and DRSCW.

The delineation of causes and sources was based on integrating and synthesizing the preceding analyses of categorical and parameter-specific stressor threshold exceedances. The most influential of these in 2017 are included in Table 14 along with the fish and macroinvertebrate IBI scores. Habitat alteration is represented by the QHEI and the QHEI modified:good attributes ratio, D.O. includes the minimum measured by grab sampling and Datasondes, the effect of nutrient enrichment by the diel D.O. swing narrative and the nutrient enrichment effect status, chemical threshold exceedances for water and sediment, and two biological response signatures, organic enrichment and toxic tolerant indicators. The rationale for listing a particular cause follows:

- Siltation (7 of 23 sites) – any high influence *Silt/Muck Substrate* in the QHEI attributes matrix (Table 10).
- Channel modification (10 of 23 sites) – any high influence *Channelized/No Recovery* or moderate influence *Recovering from Channelization* in the QHEI attributes matrix (Table 10).
- Shallow depth (5 of 23 sites) – any *Maximum Depth <40 cm* in the QHEI attributes matrix (Table 10).
- Low D.O. (8 of 23 sites) – any value *<3.5 mg/L* (Aug.- Feb.) or *<5 mg/L* (Mar.- Jul.) in Table 5 or 6; values <2 mg/L are considered nuisance levels.
- Nutrient Enrichment (14 of 23 sites) - diel D.O. Swing narrative ratings of *High* or *Wide* and/or nutrient enrichment status of *Moderate, High, or Severe* as described in Table 6.
- Organic enrichment (7 of 23 sites) – any organic enrichment *Biological Response* in Table 12 or a TKN value *>1 mg/L* (Table 7).
- Chloride/TDS (16 of 23 sites) – any chloride value >biological effect threshold in Table 7 or conductivity >biological effect threshold in Table 7 in the absence of a chloride value.
- Metals (2 of 23 sites) – any sediment *PEC or PEL* exceedance in Table 8.
- PAH (5 of 23 sites) – any sediment *PEC or PEL* exceedance in Table 9.
- Toxicity (1 of 23 sites) – any toxic *Biological Response* in Table 12.

Exceedances of the chloride threshold was the most pervasive cause occurring at 16 sites followed by nutrient enrichment (14 sites), channel modification (10 sites), low D.O. (8 sites), siltation and organic enrichment (7 sites), shallow depth and PAHs (5 sites), metals (2 sites), and toxicity (1 site). Only three sources were assigned including urban runoff as the most pervasive source (20 of 23 sites) followed by habitat alteration (10 sites) and these co-occurred at seven (7) sites. The third source was the Lake Co. Des Plaines River WWTP at only one site, the downstream most location in Aptakisic Creek.

***Table 14**. Key chemical, physical, and biological response indicators of impairment observed at each site in the Year 1 subwatersheds study area in 2017. Proximate causes associated with biological impairments are drawn from exceedance and other analyses of habitat, nutrient effects, chemical threshold exceedances, sediment chemical exceedances, and biological response signatures. See footnotes for table references and biological, physical, and chemical threshold intervals.*

Site ID	River Mile	Drainage Area (sq. mi.)	fIBI[1]	mIBI[2]	QHEI[3]	QHEI Modified: Good Ratio[3]	Min. D.O. (Grab) <WQC[4]	Min. D.O. (Sonde) <WQC[5]	D.O. Swing Narrative[6]	Nutrient Enrichment Effect Status[7]	Chemical Threshold Exceedances[8]	Sediment Threshold Exceedances[9]	%Organic Enrichment Indicators[10]	%Toxic Tolerant Indicators[11]	Proximate Causes	Sources
Aptakisic Creek																
18-4	4.7	1.09	28*	21.5*	47.0	2.33	6.9	na	na	na	Cond.	Mn,Fe	M (52.3%)		Siltation, Chanel mod., Organic enrich., TDS, Metals (Mn,Fe)	Habitat alteration, Urban runoff
18-3	4.3	2.3	16*	28.2*	55.5	4.50	4.2	na	Wide	na	Cl	PAH(3)			Channel mod., Nutrient enrich., Chloride, PAH(3)	Habitat alteration, Urban runoff
18-2	0.8	4.94	24*	24.0*	45.0	4.00	3.4	2.1	Normal	None	Cl				Siltation, Channel mod., Low D.O., Chloride	Habitat alteration, Urban runoff
18-1	0.5	5.5	22*	25.6*	48.0	3.50	6.0	4.5	Moderate	High	Cl,TKN	PAH(4)		M (55.4%)	Channel mod., Nutrient enrich., Chloride, Unk. Toxicity, PAH(4)	Habitat alteration, Urban runoff, WWTP
Unnamed Trib to Aptakisic Creek @RM 4.64																
18-5	0.05	0.99	24*	26.1*	43.5	10.00	3.5	na	Normal	na	Cl				Siltation, Channel mod., Chloride	Urban runoff
Buffalo Creek																
17-5	14	1.37	25*	23.7*	63.0	0.86	4.0	na	Normal	na	Cl,TKN		M (59.7%); F (71.4%)		Organic enrichment, Chloride	Urban runoff
17-3	7.7	9.61	15*	49.6	73.0	0.67	6.6	7.2	Normal	Low	TKN				Organic enrichment	Urban runoff
17-2	6.1	22.1	18*	50.8	64.3	1.50	1.1	6.2	High	Moderate	Cl,TKN				Channel mod., Low D.O., Organic & Nutrient enrich., Chloride	Urban runoff
17-1	0.75	29.14	25*	30.8*	46.5	9.00	1.8	4.9	Wide	High	Cl,TKN	PAH(2)			Siltation, Channel mod., Low D.O., Nutrient enrich., Chloride, PAH(2)	Urban runoff
Unnamed Tributary to Buffalo Creek @RM 7.56																
17-4	0.68	8.55	8*	31.2*	57.5	2.00	3.2	6.1	Normal	Moderate	Cl,TKN				Low D.O., Nutrient enrich., Chloride	Urban runoff
Indian Creek																
15-9	10.83	2.68	19*	22.7*	55.5	1.20	1.8	na	Wide	na					Shallow depth, Low D.O., Organic & Nutrient enrich., Chloride	Urban runoff
15-6	9.83	3.7	22*	23.2*	59.5	2.33	4.2	4.7	Normal	Low					Shallow depth	Habitat alteration
15-5	5.4	17.26	25*	39.4	66.5	1.00	4.8	4.8	Wide	Moderate					Nutrient enrich.	Urban runoff
15-2	2.41	35.02	38*	46.8	73.0	0.67	4.8	6.1	High	Severe	Cl,TKN	PAH(1)			Nutrient enrich., Chloride, PAH(1)	Urban runoff
15-1	0.17	36.43	34*	53.5	65.0	2.33	6.1	5.4	High	Moderate	Cl,TKN				Channel mod., Nutrient enrich.	Habitat alteration, Urban runoff
Kildeer Creek																
15-12	5.2	2.08	17*	40.0*	41.5	2.33	7.9	na	Normal	na	Cl		F (77.8%)		Siltation, Organic & Nutrient enrich.	Habitat alteration, Urban runoff
15-7	4.6	2.86	16*	32.2*	48.5	1.50	1.9	0.8	Moderate	None	Cl		M (35.0%); F 72.7%)		Shallow depth, Low D.O., Organic & Nutrient enrich., Chloride	Urban runoff
15-13	2.21	5.01	16*	39.8*	61.0	0.83	5.4	na	Normal	na	Cl				Chloride, Metals (As, Fe)	Urban runoff
15-4	0.01	6.8	22*	33.0*	53.5	1.50	4.7	4.1	High	Moderate	Cl				Siltation, Low D.O., Nutrient enrich., Chloride	Urban runoff
West Branch Indian Creek																
15-10	0.8	2.22	12*	18.1*	58.5	1.50	5.4	na	Normal	na					Shallow depth	Habitat alteration
Seavey Drainage Ditch																
15-3	3.66	5.05	12*	17.5*	62.0	1.40	5.8	6.8	High	Moderate	Cl				Nutrient enrich., Chloride	Urban runoff
15-8	0.45	9.77	25*	30.6*	55.0	2.33	5.5	2.8	Wide	High	Cl	PAH(1)	M (46.5%)		Channel mod., Low D.O., Organic & Nut. enrich., Chloride, PAH(1)	Habitat alteration, Urban runoff
Forest Lake Drain																
15-11	0.83	1.7	20*	22.0*	48.3	4.00	6.5	na	Normal	na					Siltation, Shallow depth, Channel mod.	Habitat alteration

[1] fIBI: full support ≥41; nonsupport-fair ≥20<41; nonsupport-poor <20. [2] mIBI: full support >41.8; nonsupport-fair >20.9<41.8; nonsupport-poor <20.9. [3] From Table 10: QHEI >60 Good, >45<60 Fair, <45 Poor; Elevated ratio >2.0; Highly elevated ratio >4.0. <5.99; Extremely elevated ratio >6.0

[4] From Table 5: exceedance of 3.5 mg/L minimum (Aug.- Feb.); exceedance of 5.0 mg/l minimum (Mar.- Jul.); <2 mg/L nuisance level. [5] From Table 6: exceedance of 3.5 mg/l minimum Aug.-Feb.) only. [6] From Table 6: Normal (<2 mg/L); Low (<4 mg/L); Moderate (<5 mg/L); High (>5 mg/L); Wide (>6.5 mg/L).

[7] See Table 6 for assignments - only made for sites with diel D.O. and benthic chlorophyll a data. [8] Water column chemical threshold exceedances in Table 7 (Cond. - conductivity; Cl - chloride; TKN total Kjeldahl nitrogen).

[9] Sediment metal ad organic exceedences of PEC/PEL or IEPA Elevated levels in Tables 8 and 9 (PAH - polycyclic aromatic hydrocarbons with numer of compounds). [10] Biological response signatures for organic enrichment - see Table 12 (M - macoinvertebrates; F - fish).

[11] Biological response signatures for general toxicity - see Table 12 (M - macoinvertebrates; F - fish).

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APPENDIX A

A-1: Upper Des Plaines Year 1 2017 Sites and Indicators

Site ID	River Mile	Latitude	Longitude	Drainage Area (sq. mi.)	Chemical	Datasonde/ Benthic Chl.a	Habitat	Biological	Sampling Location
Aptakisic Creek (95-701)									
18-4	4.7	42.18122	-87.96678	1.09	F		QHEI	MH, FHW	N. Buffalo Grove Rd. (Twin Creeks)
18-3	4.3	42.17702	-87.95915	2.30	F, C, N, O, B, S		QHEI	MH, FHW	Copperwood Dr. bike crossing
18-2	0.8	42.16468	-87.92781	4.94	F, C, N, O, B, S	X	QHEI	MH, FHW	Pekara Rd, West of Hwy. 21
18-1	0.5	42.16349	-87.92245	5.50	F, C, N, O, B, S	X	QHEI	MH, FHW	Aspen Road
Unnamed Trib to Aptakisic Creek @ RM 4.64 (95-712)									
18-5	0.05	42.18153	-87.96576	0.99	F, C, N, B		QHEI	MH, FHW	Dst. Aptakisic Rd.; W of N. Buffalo Grove Rd., Twins Creek Park
Buffalo Creek (95-703)									
17-5	14	42.18589	-88.05815	1.37	F, C, N, B		QHEI	MH, FHW	Quentin Rd.
17-3	7.7	42.1596	-87.99056	9.61	F, C, N, O, B, S	X	QHEI	MH, FHW	Checker Road
17-2	6.1	42.15216	-87.96938	22.1	F, C, N, O, B, S	X	QHEI	MH, FWD	Lake Cook Rd @ Farington Ditch
17-1	0.75	42.12671	-87.90835	29.1	F, C, N, O, B, S	X	QHEI	MH, FWD	Plum Creek Drive (Wolf Dr.)
Unnamed Tributary to Buffalo Creek @ RM 7.56 (95-713)									
17-4	0.68	42.15345	-87.99661	8.55	F, C, N, O, B, S		QHEI	MH, FHW	Lake Cook Rd @ Buffalo Creek Tributary
Indian Creek (95-706)									
15-9	10.8	42.24454	-88.03565	2.68	F, C, N, O, B, S		QHEI	MH, FHW	N. Midlothian Rd.
15-6	9.83	42.23809	-88.02246	3.70	F, C, N, O, B, S	X	QHEI	MH, FHW	Washitay Ave
15-5	5.4	42.21088	-87.98597	17.3	F, C, N, O, B, S	X	QHEI	MH, FHW	Oakwood Rd.
15-2	2.41	42.20629	-87.96123	35.0	F, C, N, O, B, S	X	QHEI	MH, FWD	Sullivan Woods Preserve, North of Creekview Dr.
15-1	0.17	42.1981	-87.92312	36.4	F, C, N, O, B, S	X	QHEI	MH, FWD	Marriot Inn parking lot - adj. Cranes Landing GC
Kildeer Creek (95-707)									
15-12	5.2	42.19621	-88.03919	2.08	F, C, N, B,		QHEI	MH, FHW	IL Rt. 22
15-7	4.6	42.19297	-88.02905	2.86	F, C, N, O, B, S	X	QHEI	MH, FHW	Salem Lake Drive S. of Rt. 22
15-13	2.21	42.19357	-88.0023	5.01	F, C, N, B		QHEI	MH, FHW	Willowbrook Rd. S. of Half Day Rd.
15-4	0.01	42.20552	-87.97467	6.80	F, C, N, O, B, S	X	QHEI	MH, FHW	Port Clinton Rd at Killdeer Creek
West Branch Indian Creek (95-717)									
15-10	0.8	42.23022	-88.0377	2.22	F, C, N, B		QHEI	MH, FHW	Gilmer Rd.
Seavey Drainage Ditch (95-390)									
15-3	3.66	42.26345	-87.96553	5.05	F, C, N, O, B, S	X	QHEI	MH, FHW	Gregg's Parkway
15-8	0.45	42.21546	-87.96697	9.77	F, C, N, O, B, S	X	QHEI	MH, FHW	Vernon Hills GC - hole number 3
Forest Lake Drain (95-705)									
15-11	0.83	42.21958	-88.0257	1.70	F, C, N, B		QHEI	MH, FHW	Hawthorne Grove Rd.

Chemical Codes: F - Field; C – Conventional (DO, pH, etc.,); N – Nutrients; O – Organics; B – Bacteria; S – Sediment samples (metals, organics, pesticides, PCBs, PAHs).

Biological Codes: MH – IEPA multihabitat; FHW – Fish, Headwater; FWD – Fish, Wadeable.

APPENDIX B

Upper Des Plaines Year 1 2017 Fish Assemblage Data

B-1: Fish Index of Biotic Integrity (IBI) Metrics & Scores
B-2: Fish Species Grand (all sites combined)
B-3: Fish Species by Sampling Event

Appendix Table B-1. Fish IBI results for data collected in the Des Plaines River study area during 2017.

Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI Reg.	Number of: Native species	Sunfish species	Sucker species	Intolerant species	Benthic Invert. species	Minnow species	Percent: Mineral Substrate Spawners	Tolerant Fish (as Species)	Generalist Feeders	Specialized Benthic Invert-ivores	Rel.No. /(0.3km)	IBI	Modified Iwb
SEAVEY DRAINAGE DITCH - (95390)																			
Year: 2017																			
15-3	3.66	F	08/24/2017	5.0	25.7	3	5(1)	4(6)	0(0)	0(0)	0(0)	0(0)	0(0)	40(4)	95(1)	0(0)	260	12.0	4.8
15-8	0.45	E	08/23/2017	9.7	37.7	3	14(3)	3(4)	1(1)	1(1)	2(2)	5(3)	12(2)	43(4)	80(3)	4(2)	698	25.0	7.2
APTAKISIC CREEK - (95701)																			
Year: 2017																			
18-4	4.70	F	08/24/2017	1.0	1.1 X	3	4(6)	3(6)	0(0)	0(0)	0(0)	1(6)	0(0)	50(4)	55(6)	0(0)	130 *	28.0	4.4
18-3	4.30	F	08/24/2017	2.3	11.0	3	5(1)	3(6)	0(0)	0(0)	0(0)	2(1)	0(0)	60(3)	67(5)	0(0)	126 *	16.0	4.5
18-2	0.80	E	08/23/2017	4.9	24.9	3	12(3)	4(6)	1(2)	0(0)	2(2)	2(1)	1(1)	42(4)	69(4)	2(1)	522	24.0	6.9
18-1	0.50	D	08/25/2017	5.5	27.0	3	10(2)	3(5)	1(2)	1(1)	3(2)	0(0)	1(1)	30(5)	85(2)	3(2)	506	22.0	6.2
BUFFALO CREEK - (95703)																			
Year: 2017																			
17-5	14.00	F	08/22/2017	1.3	1.9 X	3	7(6)	3(6)	1(6)	0(0)	0(0)	2(4)	0(0)	71(2)	98(1)	0(0)	754	25.0	5.6
17-3	7.70	F	08/24/2017	9.6	37.3	3	9(2)	3(4)	1(1)	0(0)	0(0)	3(2)	0(0)	67(3)	76(3)	0(0)	326	15.0	5.6
17-2	6.10	E	08/23/2017	22.1	52.6	3	10(2)	4(5)	0(0)	0(0)	1(1)	3(2)	3(1)	40(4)	81(3)	0(0)	520	18.0	6.7
17-1	0.75	E	08/23/2017	29.1	57.6	3	12(2)	3(4)	1(1)	0(0)	3(2)	2(2)	1(1)	42(4)	72(4)	14(5)	646	25.0	5.9
FOREST LAKE DRAIN - (95705)																			
Year: 2017																			
15-11	0.83	F	08/22/2017	1.7	5.5 X	3	8(3)	3(6)	0(0)	0(0)	0(0)	3(2)	0(0)	63(3)	54(6)	0(0)	78 *	20.0	5.4
INDIAN CREEK - (95706)																			

na - Qualitative data, Modified Iwb not applicable.
X - IBI extrapolated
* - < 200 Total individuals in sample
** - < 50 Total individuals in sample
● - One or more species excluded from IBI calculation.

Appendix Table B-1. Fish IBI results for data collected in the Des Plaines River study area during 2017.

Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI Reg.	Number of: Native species	Number of: Sunfish species	Number of: Sucker species	Number of: Intolerant species	Number of: Benthic Invert. species	Number of: Minnow species	Percent: Mineral Substrate Spawners	Percent: Tolerant Fish (as Species)	Percent: Generalist Feeders	Percent: Specialized Benthic Invert-ivores	Rel.No. /(0.3km)	IBI	Modified Iwb
Year: 2017																			
15-9	10.83	F	08/22/2017	2.6	14.0	3	9(2)	4(6)	0(0)	0(0)	0(0)	2(1)	0(0)	44(4)	42(6)	0(0)	442	19.0	6.1
15-6	9.83	F	08/22/2017	3.7	19.8	3	10(2)	4(6)	0(0)	0(0)	1(1)	2(1)	0(0)	40(4)	70(4)	10(4)	504	22.0	6.2
15-5	5.40	E	08/25/2017	17.2	48.1	3	11(2)	4(5)	1(1)	0(0)	2(2)	2(2)	1(1)	45(4)	74(4)	11(4)	332	25.0	6.0
15-2	2.41	D	10/25/2017	35.0	61.0	3	17(4)	5(6)	1(1)	1(1)	3(2)	5(3)	27(4)	35(5)	40(6)	29(6)	840	38.0	7.8
15-1	0.17	D	08/25/2017	36.4	61.8	3	14(3)	4(5)	1(1)	2(2)	2(2)	5(3)	20(3)	36(4)	63(5)	18(6)	522	34.0	7.4
KILDEER CREEK - (95707)																			
Year: 2017																			
15-12	5.20	F	08/24/2017	2.0	9.4 X	3	9(2)	3(6)	1(3)	0(0)	0(0)	3(2)	0(0)	78(2)	92(2)	0(0)	820	17.0	6.3
15-7	4.60	F	08/22/2017	2.8	15.3	3	11(3)	3(6)	1(2)	0(0)	0(0)	4(2)	0(0)	73(2)	94(1)	0(0)	672	16.0	6.9
15-13	2.21	F	08/24/2017	5.0	25.3	3	11(2)	4(6)	1(2)	0(0)	0(0)	2(1)	0(0)	55(3)	90(2)	0(0)	626	16.0	6.8
15-4	0.01	F	08/23/2017	6.8	30.9	3	13(3)	4(6)	1(2)	0(0)	1(1)	2(2)	0(0)	38(4)	83(3)	0(1)	482	22.0	6.7
UNNAMED TRIB TO APTAKISIC CREEK - (95712)																			
Year: 2017																			
18-5	0.05	F	08/24/2017	0.9	1.1 X	3	5(6)	3(6)	0(0)	0(0)	0(0)	2(6)	0(0)	60(3)	83(3)	0(0)	48 * *	24.0	4.0
UT TO BUFFALO CREEK @ RM XX.X - (95713)																			
Year: 2017																			
17-4	0.68	E	08/23/2017	8.5	35.3	3	4(1)	2(3)	0(0)	0(0)	0(0)	1(1)	0(0)	75(2)	97(1)	0(0)	374	8.00	5.2
W. BRANCH INDIAN CREEK - (95717)																			
Year: 2017																			
15-10	0.80	F	08/22/2017	2.2	10.2	3	2(0)	2(5)	0(0)	0(0)	0(0)	0(0)	0(0)	0(6)	99(1)	0(0)	216	12.0	3.0

na - Qualitative data, Modified Iwb not applicable.
X - IBI extrapolated
* - < 200 Total individuals in sample
** - < 50 Total individuals in sample
● - One or more species excluded from IBI calculation.

Appendix B-2: Midwest Biodiversity Institute
Fish Species List - Grand Totals

Rivers: *Seavey Drainage Ditch; Aptakisic Creek; Buffalo Creek; Forest Lake Drain; Indian Creek; Kildeer Creek; Unnamed Trib to Aptakisic Creek; Buffalo Creek Tributary; W. Branch Indian Creek*

Years: 2017

Number of Samples: 23 Data Sources: 99 Data Types: D; E; F

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		8	0.7	0.14	22	0.48	33.7
34-001	CENTRAL MUDMINNOW	I	T	C		2	0.2	0.04	0	0.01	2.5
37-003	NORTHERN PIKE	P		M	F	2	0.2	0.04	146	3.13	880.0
40-016	WHITE SUCKER	O	T	S	W	121	10.0	2.19	285	6.10	28.3
43-001	COMMON CARP	O	T	M	G	37	3.1	0.67	116	2.49	37.8
43-003	GOLDEN SHINER	I	T	M	N	57	4.7	1.03	31	0.67	6.6
43-004	HORNYHEAD CHUB	I	I	N	N	131	10.9	2.37	111	2.38	10.2
43-013	CREEK CHUB	G	T	N	N	580	48.1	10.48	795	17.02	16.5
43-034	SAND SHINER	I	M	M	N	2	0.2	0.04	0	0.01	2.0
43-042	FATHEAD MINNOW	O	T	C	N	15	1.3	0.27	3	0.07	2.6
43-043	BLUNTNOSE MINNOW	O	T	C	N	418	34.7	7.55	89	1.91	2.5
43-044	CENTRAL STONEROLLER	H		N	N	91	7.6	1.64	48	1.03	6.3
43-117	CARMINE SHINER	I	I	S	N	2	0.2	0.04	0	0.01	2.0
47-002	CHANNEL CATFISH			C	F	3	0.3	0.05	1	0.02	4.0
47-004	YELLOW BULLHEAD	I	T	C		274	22.7	4.95	559	11.96	24.5
47-006	BLACK BULLHEAD	I	P	C		19	1.6	0.34	83	1.78	52.8
47-008	STONECAT MADTOM	I	I	C		7	0.6	0.13	4	0.11	8.5
47-013	TADPOLE MADTOM	I		C		1	0.1	0.02	0	0.02	10.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		178	14.8	3.22	18	0.40	1.2
77-003	ROCK BASS	C		C	S	8	0.7	0.14	21	0.46	32.5
77-006	LARGEMOUTH BASS	C		C	F	480	39.8	8.68	387	8.29	9.7
77-007	WARMOUTH SUNFISH	C		C	S	2	0.2	0.04	2	0.06	17.5
77-008	GREEN SUNFISH	I	T	C	S	1208	100.3	21.83	844	18.06	8.4
77-009	BLUEGILL SUNFISH	I	P	C	S	1486	123.3	26.86	971	20.79	7.8
77-010	ORANGESPOTTED SUNFISH	I		C	S	1	0.1	0.02	0	0.02	10.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	8	0.7	0.14	11	0.26	18.0
77-015	GREEN SF X BLUEGILL SF					33	2.7	0.60	53	1.15	19.5
77-016	GREEN SF X PUMPKINSEED					1	0.1	0.02	0	0.01	5.0
80-003	YELLOW PERCH			M		11	0.9	0.20	9	0.20	10.0
80-005	BLACKSIDE DARTER	I		S	D	48	4.0	0.87	23	0.50	5.9
80-011	LOGPERCH	I	M	S	D	1	0.1	0.02	0	0.02	10.0
80-014	JOHNNY DARTER	I		C	D	297	24.7	5.37	27	0.59	1.1
80-021	IOWA DARTER	I		M	D	1	0.1	0.02	0	0.00	2.0

No Species: 33 **Nat. Species:** 30 **Hybrids:** 2 **Total Counted:** 5533 **Total Rel. Wt. :** 4673

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-8 River: 95-390 Seavey Drainage Ditch RM: 0.45 Date: 08/23/2017

Time Fished: 1105 Distance: 0.150 Drainge (sq mi): 9.7 Depth: 0

Location: Vernon Hills GC - hole number 3 Lat: 42.21546 Long: -87.96697

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL MUDMINNOW	I	T	C		2	4.0	0.57	10	0.13	2.5
40-016	WHITE SUCKER	O	T	S	W	24	48.0	6.88	1160	14.80	24.1
43-004	HORNYHEAD CHUB	I	I	N	N	10	20.0	2.87	480	6.12	24.0
43-013	CREEK CHUB	G	T	N	N	99	198.0	28.37	2960	37.76	14.9
43-042	FATHEAD MINNOW	O	T	C	N	1	2.0	0.29	4	0.05	2.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	49	98.0	14.04	440	5.61	4.4
43-044	CENTRAL STONEROLLER	H		N	N	29	58.0	8.31	400	5.10	6.9
47-004	YELLOW BULLHEAD	I	T	C		27	54.0	7.74	600	7.66	11.1
54-002	BLACKSTRIPE TOPMINNOW	I		M		2	4.0	0.57	4	0.05	1.0
77-006	LARGEMOUTH BASS	C		C	F	13	26.0	3.72	140	1.79	5.3
77-008	GREEN SUNFISH	I	T	C	S	18	36.0	5.16	600	7.66	16.6
77-009	BLUEGILL SUNFISH	I	P	C	S	60	120.0	17.19	980	12.50	8.1
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	0.57	20	0.26	5.0
80-014	JOHNNY DARTER	I		C	D	13	26.0	3.72	40	0.51	1.5

No Species: 14 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 349 **Total Rel. Wt. :** 7838

IBI: 30.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-3 River: 95-390 Seavey Drainage Ditch RM: 3.66 Date: 08/24/2017

Time Fished: 900 Distance: 0.150 Drainge (sq mi): 5.0 Depth: 0

Location: Gregg's Parkway Lat: 42.26345 Long: -87.96553

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.77	8	0.28	4.0
77-006	LARGEMOUTH BASS	C		C	F	5	10.0	3.85	1760	60.73	176.0
77-007	WARMOUTH SUNFISH	C		C	S	1	2.0	0.77	30	1.04	15.0
77-008	GREEN SUNFISH	I	T	C	S	53	106.0	40.77	400	13.80	3.7
77-009	BLUEGILL SUNFISH	I	P	C	S	70	140.0	53.85	700	24.15	5.0

No Species: 5 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 130 **Total Rel. Wt. :** 2898

IBI: 30.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 18-1 River: 95-701 Aptakisic Creek RM: 0.50 Date: 08/25/2017

Time Fished: 1675 Distance: 0.200 Drainge (sq mi): 5.5 Depth: 0

Location: Aspen Road Lat: 42.16349 Long: -87.92248

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	9	13.5	2.67	2640	22.63	195.5
47-004	YELLOW BULLHEAD	I	T	C		28	42.0	8.31	2685	23.02	63.9
47-006	BLACK BULLHEAD	I	P	C		1	1.5	0.30	6	0.05	4.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		14	21.0	4.15	15	0.13	0.7
77-006	LARGEMOUTH BASS	C		C	F	19	28.5	5.64	105	0.90	3.6
77-008	GREEN SUNFISH	I	T	C	S	134	201.0	39.76	3165	27.13	15.7
77-009	BLUEGILL SUNFISH	I	P	C	S	113	169.5	33.53	2790	23.92	16.4
77-015	GREEN SF X BLUEGILL SF					8	12.0	2.37	210	1.80	17.5
80-005	BLACKSIDE DARTER	I		S	D	3	4.5	0.89	30	0.26	6.6
80-014	JOHNNY DARTER	I		C	D	7	10.5	2.08	15	0.13	1.4
80-021	IOWA DARTER	I		M	D	1	1.5	0.30	3	0.03	2.0

No Species: 10 **Nat. Species:** 10 **Hybrids:** 1 **Total Counted:** 337 **Total Rel. Wt. :** 11664

IBI: 34.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 18-2 River: 95-701 Aptakisic Creek RM: 0.80 Date: 08/23/2017

Time Fished: 1130 Distance: 0.150 Drainge (sq mi): 4.9 Depth: 0

Location: Pekara Rd, West of Hwy. 21 Lat: 42.16468 Long: -87.92781

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	12	24.0	4.60	2750	29.51	114.5
43-003	GOLDEN SHINER	I	T	M	N	24	48.0	9.20	500	5.37	10.4
43-043	BLUNTNOSE MINNOW	O	T	C	N	90	180.0	34.48	460	4.94	2.5
47-004	YELLOW BULLHEAD	I	T	C		22	44.0	8.43	1720	18.46	39.0
47-006	BLACK BULLHEAD	I	P	C		7	14.0	2.68	880	9.44	62.8
54-002	BLACKSTRIPE TOPMINNOW	I		M		6	12.0	2.30	20	0.21	1.6
77-006	LARGEMOUTH BASS	C		C	F	66	132.0	25.29	1000	10.73	7.5
77-008	GREEN SUNFISH	I	T	C	S	25	50.0	9.58	700	7.51	14.0
77-009	BLUEGILL SUNFISH	I	P	C	S	1	2.0	0.38	980	10.52	490.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.38	100	1.07	50.0
77-015	GREEN SF X BLUEGILL SF					2	4.0	0.77	170	1.82	42.5
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	0.77	30	0.32	7.5
80-014	JOHNNY DARTER	I		C	D	3	6.0	1.15	8	0.09	1.3

No Species: 12 **Nat. Species:** 12 **Hybrids:** 1 **Total Counted:** 261 **Total Rel. Wt. :** 9318

IBI: 28.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 18-3 River: 95-701 Aptakisic Creek RM: 4.30 Date: 08/24/2017

Time Fished: 772 Distance: 0.150 Drainge (sq mi): 2.3 Depth: 0

Location: Copperwood Dr. bike xing Lat: 42.17702 Long: -87.95915

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	CREEK CHUB	G	T	N	N	2	4.0	3.17	360	26.09	90.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	5	10.0	7.94	30	2.17	3.0
77-006	LARGEMOUTH BASS	C		C	F	21	42.0	33.33	330	23.91	7.8
77-008	GREEN SUNFISH	I	T	C	S	31	62.0	49.21	560	40.58	9.0
77-009	BLUEGILL SUNFISH	I	P	C	S	4	8.0	6.35	100	7.25	12.5

No Species: 5 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 63 **Total Rel. Wt. :** 1380

IBI: 26.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 18-4 River: 95-701 Aptakisic Creek RM: 4.70 Date: 08/24/2017

Time Fished: 711 Distance: 0.150 Drainge (sq mi): 1.0 Depth: 0

Location: N. Buffalo Grove Rd. (Twin Creeks Park) Lat: 42.18122 Long: -87.96678

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	CREEK CHUB	G	T	N	N	3	6.0	4.62	360	37.50	60.0
77-006	LARGEMOUTH BASS	C		C	F	28	56.0	43.08	180	18.75	3.2
77-008	GREEN SUNFISH	I	T	C	S	27	54.0	41.54	340	35.42	6.3
77-009	BLUEGILL SUNFISH	I	P	C	S	6	12.0	9.23	40	4.17	3.3
77-015	GREEN SF X BLUEGILL SF					1	2.0	1.54	40	4.17	20.0

No Species: 4 **Nat. Species:** 4 **Hybrids:** 1 **Total Counted:** 65 **Total Rel. Wt. :** 960

IBI: 32.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 17-1 River: 95-703 Buffalo Creek RM: 0.75 Date: 08/23/2017

Time Fished: 1297 Distance: 0.150 Drainge (sq mi): 29.1 Depth: 0

Location: Plum Creek Drive (Wolf Dr) Lat: 42.12671 Long: -87.90835

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	1	2.0	0.31	20	0.45	10.0
43-013	CREEK CHUB	G	T	N	N	5	10.0	1.55	220	4.90	22.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	3	6.0	0.93	20	0.45	3.3
47-002	CHANNEL CATFISH			C	F	1	2.0	0.31	4	0.09	2.0
47-004	YELLOW BULLHEAD	I	T	C		53	106.0	16.41	1600	35.60	15.0
47-013	TADPOLE MADTOM	I		C		1	2.0	0.31	20	0.45	10.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		24	48.0	7.43	100	2.23	2.0
77-006	LARGEMOUTH BASS	C		C	F	19	38.0	5.88	220	4.90	5.7
77-008	GREEN SUNFISH	I	T	C	S	141	282.0	43.65	1920	42.72	6.8
77-009	BLUEGILL SUNFISH	I	P	C	S	29	58.0	8.98	200	4.45	3.4
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.31	20	0.45	10.0
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	0.62	30	0.67	7.5
80-014	JOHNNY DARTER	I		C	D	43	86.0	13.31	120	2.67	1.4

No Species: 12 **Nat. Species:** 12 **Hybrids:** 1 **Total Counted:** 323 **Total Rel. Wt. :** 4494

IBI: 32.0 **MIwb:** 5.9

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 17-2 River: 95-703 Buffalo Creek RM: 6.10 Date: 08/23/2017

Time Fished: 1199 Distance: 0.150 Drainge (sq mi): 22.1 Depth: 0

Location: Lake Cook Rd @ Farington Ditch Lat: 42.15216 Long: -87.96938

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	CREEK CHUB	G	T	N	N	50	100.0	19.23	3680	35.93	36.8
43-043	BLUNTNOSE MINNOW	O	T	C	N	13	26.0	5.00	80	0.78	3.0
43-044	CENTRAL STONEROLLER	H		N	N	7	14.0	2.69	240	2.34	17.1
47-004	YELLOW BULLHEAD	I	T	C		34	68.0	13.08	2300	22.46	33.8
47-008	STONECAT MADTOM	I	I	C		7	14.0	2.69	400	3.91	28.5
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.38	2	0.02	1.0
77-006	LARGEMOUTH BASS	C		C	F	32	64.0	12.31	620	6.05	9.6
77-008	GREEN SUNFISH	I	T	C	S	56	112.0	21.54	1620	15.82	14.4
77-009	BLUEGILL SUNFISH	I	P	C	S	58	116.0	22.31	1230	12.01	10.6
77-010	ORANGESPOTTED SUNFISH	I		C	S	1	2.0	0.38	20	0.20	10.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.38	50	0.49	25.0

No Species: 10 **Nat. Species:** 10 **Hybrids:** 1 **Total Counted:** 260 **Total Rel. Wt. :** 10242

IBI: 34.0 **MIwb:** 6.7

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 17-3 River: 95-703 Buffalo Creek RM: 7.70 Date: 08/24/2017

Time Fished: 886 Distance: 0.150 Drainge (sq mi): 9.6 Depth: 0

Location: Checker Road Lat: 42.15960 Long: -87.99056

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	2	4.0	1.23	20	0.40	5.0
43-013	CREEK CHUB	G	T	N	N	68	136.0	41.72	2360	47.73	17.3
43-042	FATHEAD MINNOW	O	T	C	N	1	2.0	0.61	4	0.08	2.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	13	26.0	7.98	40	0.81	1.5
47-004	YELLOW BULLHEAD	I	T	C		9	18.0	5.52	820	16.59	45.5
54-002	BLACKSTRIPE TOPMINNOW	I		M		24	48.0	14.72	40	0.81	0.8
77-006	LARGEMOUTH BASS	C		C	F	14	28.0	8.59	560	11.33	20.0
77-008	GREEN SUNFISH	I	T	C	S	16	32.0	9.82	440	8.90	13.7
77-009	BLUEGILL SUNFISH	I	P	C	S	15	30.0	9.20	580	11.73	19.3
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.61	80	1.62	40.0

No Species: 9 **Nat. Species:** 9 **Hybrids:** 1 **Total Counted:** 163 **Total Rel. Wt. :** 4944

IBI: 24.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 17-5 River: 95-703 Buffalo Creek RM: 14.00 Date: 08/22/2017

Time Fished: 733 Distance: 0.150 Drainge (sq mi): 1.3 Depth: 0

Location: Quentin Rd. Lat: 42.18589 Long: -88.05815

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	3	6.0	0.80	220	2.66	36.6
43-001	COMMON CARP	O	T	M	G	1	2.0	0.27	400	4.84	200.0
43-013	CREEK CHUB	G	T	N	N	173	346.0	45.89	4260	51.51	12.3
43-043	BLUNTNOSE MINNOW	O	T	C	N	20	40.0	5.31	120	1.45	3.0
47-006	BLACK BULLHEAD	I	P	C		6	12.0	1.59	700	8.46	58.3
77-006	LARGEMOUTH BASS	C		C	F	2	4.0	0.53	140	1.69	35.0
77-008	GREEN SUNFISH	I	T	C	S	86	172.0	22.81	1680	20.31	9.7
77-009	BLUEGILL SUNFISH	I	P	C	S	81	162.0	21.49	700	8.46	4.3
77-015	GREEN SF X BLUEGILL SF					4	8.0	1.06	40	0.48	5.0
77-016	GREEN SF X PUMPKINSEED					1	2.0	0.27	10	0.12	5.0

No Species: 8 **Nat. Species:** 7 **Hybrids:** 2 **Total Counted:** 377 **Total Rel. Wt. :** 8270

IBI: 32.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-11 River: 95-705 Forest Lake Drain RM: 0.83 Date: 08/22/2017

Time Fished: 497 Distance: 0.150 Drainge (sq mi): 1.7 Depth: 0

Location: Hawthorne Grove Rd. Lat: 42.21958 Long: -88.02570

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-003	GOLDEN SHINER	I	T	M	N	7	14.0	17.95	40	12.82	2.8
43-013	CREEK CHUB	G	T	N	N	2	4.0	5.13	20	6.41	5.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	1	2.0	2.56	8	2.56	4.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	2.56	16	5.13	8.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		13	26.0	33.33	30	9.62	1.1
77-006	LARGEMOUTH BASS	C		C	F	5	10.0	12.82	60	19.23	6.0
77-008	GREEN SUNFISH	I	T	C	S	7	14.0	17.95	118	37.82	8.4
77-009	BLUEGILL SUNFISH	I	P	C	S	3	6.0	7.69	20	6.41	3.3

No Species: 8 **Nat. Species:** 8 **Hybrids:** 0 **Total Counted:** 39 **Total Rel. Wt. :** 312

IBI: 36.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-1 River: 95-706 Indian Creek RM: 0.17 Date: 08/25/2017

Time Fished: 1419 Distance: 0.200 Drainge (sq mi): 36.4 Depth: 0

Location: Marriot Inn parking lot - adj. Cranes Landing GC Lat: 42.19810 Long: -87.92312

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	7	10.5	2.01	3082	27.43	293.5
43-004	HORNYHEAD CHUB	I	I	N	N	38	57.0	10.92	1170	10.41	20.5
43-013	CREEK CHUB	G	T	N	N	5	7.5	1.44	30	0.27	4.0
43-034	SAND SHINER	I	M	M	N	2	3.0	0.57	6	0.05	2.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	13	19.5	3.74	22	0.20	1.1
43-117	CARMINE SHINER	I	I	S	N	2	3.0	0.57	6	0.05	2.0
47-004	YELLOW BULLHEAD	I	T	C		23	34.5	6.61	1935	17.22	56.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		7	10.5	2.01	15	0.13	1.4
77-003	ROCK BASS	C		C	S	7	10.5	2.01	840	7.47	80.0
77-006	LARGEMOUTH BASS	C		C	F	9	13.5	2.59	622	5.54	46.1
77-008	GREEN SUNFISH	I	T	C	S	125	187.5	35.92	2550	22.69	13.6
77-009	BLUEGILL SUNFISH	I	P	C	S	45	67.5	12.93	615	5.47	9.1
77-015	GREEN SF X BLUEGILL SF					2	3.0	0.57	90	0.80	30.0
80-005	BLACKSIDE DARTER	I		S	D	24	36.0	6.90	210	1.87	5.8
80-014	JOHNNY DARTER	I		C	D	39	58.5	11.21	45	0.40	0.7

No Species: 14 **Nat. Species:** 14 **Hybrids:** 1 **Total Counted:** 348 **Total Rel. Wt. :** 11239

IBI: 34.0 **MIwb:** 7.4

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-2 River: 95-706 Indian Creek RM: 2.41 Date: 10/25/2017

Time Fished: 2297 Distance: 0.200 Drainge (sq mi): 35.0 Depth: 0

Location: Sullivan Woods Preserve, North of Creekview Dr. Lat: 42.20629 Long: -87.96123

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	NORTHERN PIKE	P		M	F	1	1.5	0.18	840	6.31	560.0
40-016	WHITE SUCKER	O	T	S	W	25	37.5	4.46	7650	57.50	204.0
43-004	HORNYHEAD CHUB	I	I	N	N	83	124.5	14.82	900	6.76	7.2
43-013	CREEK CHUB	G	T	N	N	55	82.5	9.82	750	5.64	9.0
43-042	FATHEAD MINNOW	O	T	C	N	7	10.5	1.25	30	0.23	2.8
43-043	BLUNTNOSE MINNOW	O	T	C	N	51	76.5	9.11	90	0.68	1.1
43-044	CENTRAL STONEROLLER	H		N	N	55	82.5	9.82	390	2.93	4.7
47-004	YELLOW BULLHEAD	I	T	C		12	18.0	2.14	315	2.37	17.5
54-002	BLACKSTRIPE TOPMINNOW	I		M		15	22.5	2.68	30	0.23	1.3
77-003	ROCK BASS	C		C	S	1	1.5	0.18	45	0.34	30.0
77-006	LARGEMOUTH BASS	C		C	F	15	22.5	2.68	300	2.25	13.3
77-008	GREEN SUNFISH	I	T	C	S	27	40.5	4.82	510	3.83	12.5
77-009	BLUEGILL SUNFISH	I	P	C	S	49	73.5	8.75	960	7.22	13.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	1.5	0.18	30	0.23	20.0
77-015	GREEN SF X BLUEGILL SF					1	1.5	0.18	120	0.90	80.0
80-005	BLACKSIDE DARTER	I		S	D	13	19.5	2.32	120	0.90	6.1
80-011	LOGPERCH	I	M	S	D	1	1.5	0.18	15	0.11	10.0
80-014	JOHNNY DARTER	I		C	D	148	222.0	26.43	210	1.58	0.9

No Species: 17 **Nat. Species:** 17 **Hybrids:** 1 **Total Counted:** 560 **Total Rel. Wt. :** 13305

IBI: 38.0 **MIwb:** 7.8

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-5 River: 95-706 Indian Creek RM: 5.40 Date: 08/25/2017

Time Fished: 1273 Distance: 0.150 Drainge (sq mi): 17.2 Depth: 0

Location: Oakwood Rd. Lat: 42.21088 Long: -87.98597

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.60	2400	8.14	1200.0
40-016	WHITE SUCKER	O	T	S	W	25	50.0	15.06	22000	74.60	440.0
43-001	COMMON CARP	O	T	M	G	2	4.0	1.20	1600	5.43	400.0
43-013	CREEK CHUB	G	T	N	N	1	2.0	0.60	140	0.47	70.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	19	38.0	11.45	170	0.58	4.4
54-002	BLACKSTRIPE TOPMINNOW	I		M		2	4.0	1.20	4	0.01	1.0
77-006	LARGEMOUTH BASS	C		C	F	19	38.0	11.45	920	3.12	24.2
77-008	GREEN SUNFISH	I	T	C	S	50	100.0	30.12	1680	5.70	16.8
77-009	BLUEGILL SUNFISH	I	P	C	S	26	52.0	15.66	440	1.49	8.4
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.60	50	0.17	25.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.60	30	0.10	15.0
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	1.20	8	0.03	2.0
80-014	JOHNNY DARTER	I		C	D	17	34.0	10.24	50	0.17	1.4

No Species: 12 **Nat. Species:** 11 **Hybrids:** 1 **Total Counted:** 166 **Total Rel. Wt. :** 29492

IBI: 26.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-6 River: 95-706 Indian Creek RM: 9.83 Date: 08/22/2017

Time Fished: 1052 Distance: 0.150 Drainge (sq mi): 3.7 Depth: 0

Location: Washitay Ave Lat: 42.23809 Long: -88.02246

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	CREEK CHUB	G	T	N	N	40	80.0	15.87	2300	47.54	28.7
43-043	BLUNTNOSE MINNOW	O	T	C	N	1	2.0	0.40	8	0.17	4.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.40	20	0.41	10.0
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.40	40	0.83	20.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		6	12.0	2.38	20	0.41	1.6
77-006	LARGEMOUTH BASS	C		C	F	41	82.0	16.27	340	7.03	4.1
77-008	GREEN SUNFISH	I	T	C	S	22	44.0	8.73	600	12.40	13.6
77-009	BLUEGILL SUNFISH	I	P	C	S	112	224.0	44.44	1300	26.87	5.8
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.40	30	0.62	15.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.40	80	1.65	40.0
80-014	JOHNNY DARTER	I		C	D	26	52.0	10.32	100	2.07	1.9

No Species: 10 **Nat. Species:** 10 **Hybrids:** 1 **Total Counted:** 252 **Total Rel. Wt. :** 4838

IBI: 36.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-9 River: 95-706 Indian Creek RM: 10.83 Date: 08/22/2017

Time Fished: 669 Distance: 0.150 Drainge (sq mi): 2.6 Depth: 0

Location: N. Midlothian Rd. Lat: 42.24454 Long: -88.03565

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-003	GOLDEN SHINER	I	T	M	N	1	2.0	0.45	4	0.18	2.0
43-013	CREEK CHUB	G	T	N	N	1	2.0	0.45	100	4.50	50.0
47-004	YELLOW BULLHEAD	I	T	C		20	40.0	9.05	180	8.10	4.5
54-002	BLACKSTRIPE TOPMINNOW	I		M		2	4.0	0.90	6	0.27	1.5
77-006	LARGEMOUTH BASS	C		C	F	112	224.0	50.68	900	40.50	4.0
77-008	GREEN SUNFISH	I	T	C	S	4	8.0	1.81	120	5.40	15.0
77-009	BLUEGILL SUNFISH	I	P	C	S	67	134.0	30.32	680	30.60	5.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	3	6.0	1.36	12	0.54	2.0
80-003	YELLOW PERCH			M		11	22.0	4.98	220	9.90	10.0

No Species: 9 **Nat. Species:** 9 **Hybrids:** 0 **Total Counted:** 221 **Total Rel. Wt. :** 2222

IBI: 38.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-4 River: 95-707 Kildeer Creek RM: 0.01 Date: 08/23/2017

Time Fished: 1386 Distance: 0.150 Drainge (sq mi): 6.8 Depth: 0

Location: Lat: 42.20552 Long: -87.97467

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		4	8.0	1.66	120	1.45	15.0
40-016	WHITE SUCKER	O	T	S	W	1	2.0	0.41	660	7.97	330.0
43-013	CREEK CHUB	G	T	N	N	1	2.0	0.41	8	0.10	4.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	58	116.0	24.07	110	1.33	0.9
47-002	CHANNEL CATFISH			C	F	2	4.0	0.83	20	0.24	5.0
47-004	YELLOW BULLHEAD	I	T	C		28	56.0	11.62	3780	45.65	67.5
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.41	100	1.21	50.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		22	44.0	9.13	50	0.60	1.1
77-006	LARGEMOUTH BASS	C		C	F	17	34.0	7.05	800	9.66	23.5
77-008	GREEN SUNFISH	I	T	C	S	12	24.0	4.98	230	2.78	9.5
77-009	BLUEGILL SUNFISH	I	P	C	S	92	184.0	38.17	2220	26.81	12.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.41	60	0.72	30.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.41	120	1.45	60.0
80-014	JOHNNY DARTER	I		C	D	1	2.0	0.41	2	0.02	1.0

No Species: 13 **Nat. Species:** 13 **Hybrids:** 1 **Total Counted:** 241 **Total Rel. Wt. :** 8280

IBI: 34.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-13 River: 95-707 Kildeer Creek RM: 2.21 Date: 08/24/2017

Time Fished: 840 Distance: 0.150 Drainge (sq mi): 5.0 Depth: 0

Location: Willowbrook Rd. S. of Half Day Rd. Lat: 42.19357 Long: -88.00230

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		2	4.0	0.64	100	1.30	25.0
40-016	WHITE SUCKER	O	T	S	W	7	14.0	2.24	560	7.26	40.0
43-001	COMMON CARP	O	T	M	G	11	22.0	3.51	280	3.63	12.7
43-013	CREEK CHUB	G	T	N	N	45	90.0	14.38	3080	39.95	34.2
43-043	BLUNTNOSE MINNOW	O	T	C	N	21	42.0	6.71	160	2.08	3.8
47-004	YELLOW BULLHEAD	I	T	C		3	6.0	0.96	20	0.26	3.3
47-006	BLACK BULLHEAD	I	P	C		3	6.0	0.96	280	3.63	46.6
54-002	BLACKSTRIPE TOPMINNOW	I		M		10	20.0	3.19	40	0.52	2.0
77-006	LARGEMOUTH BASS	C		C	F	18	36.0	5.75	240	3.11	6.6
77-007	WARMOUTH SUNFISH	C		C	S	1	2.0	0.32	40	0.52	20.0
77-008	GREEN SUNFISH	I	T	C	S	41	82.0	13.10	620	8.04	7.5
77-009	BLUEGILL SUNFISH	I	P	C	S	150	300.0	47.92	2260	29.31	7.5
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.32	30	0.39	15.0

No Species: 12 **Nat. Species:** 11 **Hybrids:** 1 **Total Counted:** 313 **Total Rel. Wt. :** 7710

IBI: 32.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-7 River: 95-707 Kildeer Creek RM: 4.60 Date: 08/22/2017

Time Fished: 819 Distance: 0.150 Drainge (sq mi): 2.8 Depth: 0

Location: Salem Lake Drive S. of Rt 22 Lat: 42.19297 Long: -88.02905

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		2	4.0	0.60	320	9.61	80.0
40-016	WHITE SUCKER	O	T	S	W	4	8.0	1.19	60	1.80	7.5
43-001	COMMON CARP	O	T	M	G	14	28.0	4.17	120	3.60	4.2
43-003	GOLDEN SHINER	I	T	M	N	23	46.0	6.85	200	6.01	4.3
43-013	CREEK CHUB	G	T	N	N	3	6.0	0.89	180	5.41	30.0
43-042	FATHEAD MINNOW	O	T	C	N	6	12.0	1.79	30	0.90	2.5
43-043	BLUNTNOSE MINNOW	O	T	C	N	39	78.0	11.61	220	6.61	2.8
47-004	YELLOW BULLHEAD	I	T	C		7	14.0	2.08	120	3.60	8.5
54-002	BLACKSTRIPE TOPMINNOW	I		M		8	16.0	2.38	20	0.60	1.2
77-006	LARGEMOUTH BASS	C		C	F	10	20.0	2.98	140	4.20	7.0
77-008	GREEN SUNFISH	I	T	C	S	61	122.0	18.15	480	14.41	3.9
77-009	BLUEGILL SUNFISH	I	P	C	S	158	316.0	47.02	1420	42.64	4.4
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.30	20	0.60	10.0

No Species: 12 **Nat. Species:** 11 **Hybrids:** 1 **Total Counted:** 336 **Total Rel. Wt. :** 3330

IBI: 36.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-12 River: 95-707 Kildeer Creek RM: 5.20 Date: 08/24/2017

Time Fished: 588 Distance: 0.150 Drainge (sq mi): 2.0 Depth: 0

Location: IL Rt. 22 Lat: 42.19621 Long: -88.03919

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	1	2.0	0.24	30	0.51	15.0
43-001	COMMON CARP	O	T	M	G	9	18.0	2.20	400	6.85	22.2
43-003	GOLDEN SHINER	I	T	M	N	2	4.0	0.49	20	0.34	5.0
43-013	CREEK CHUB	G	T	N	N	4	8.0	0.98	420	7.19	52.5
43-043	BLUNTNOSE MINNOW	O	T	C	N	16	32.0	3.90	120	2.05	3.7
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.24	10	0.17	5.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		22	44.0	5.37	40	0.68	0.9
77-006	LARGEMOUTH BASS	C		C	F	10	20.0	2.44	650	11.13	32.5
77-008	GREEN SUNFISH	I	T	C	S	188	376.0	45.85	1060	18.15	2.8
77-009	BLUEGILL SUNFISH	I	P	C	S	155	310.0	37.80	3060	52.40	9.8
77-015	GREEN SF X BLUEGILL SF					2	4.0	0.49	30	0.51	7.5

No Species: 10 **Nat. Species:** 9 **Hybrids:** 1 **Total Counted:** 410 **Total Rel. Wt. :** 5840

IBI: 36.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 18-5 River: 95-712 Unnamed Trib to Aptakisic Creek @ RM4.64 RM: 0.05 Date: 08/24/2017

Time Fished: 422 Distance: 0.150 Drainge (sq mi): 0.9 Depth: 0

Location: Dst. Aptakapsic Rd.; W of N. Buffalo Grove Rd., Twins Cr Prk. Lat: 42.18153 Long: -87.96576

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	CREEK CHUB	G	T	N	N	5	10.0	20.83	60	32.61	6.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	6	12.0	25.00	20	10.87	1.6
77-006	LARGEMOUTH BASS	C		C	F	4	8.0	16.67	40	21.74	5.0
77-008	GREEN SUNFISH	I	T	C	S	8	16.0	33.33	60	32.61	3.7
77-009	BLUEGILL SUNFISH	I	P	C	S	1	2.0	4.17	4	2.17	2.0

No Species: 5 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 24 **Total Rel. Wt. :** 184

IBI: 24.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 17-4 River: 95-713 Unnamed Trib to Buffalo Creek @ RM 7.56 RM: 0.68 Date: 08/23/2017

Time Fished: 1087 Distance: 0.150 Drainge (sq mi): 8.5 Depth: 0

Location: Lake Cook Rd @ Buffalo Creek Trib Lat: 42.15345 Long: -87.99661

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	CREEK CHUB	G	T	N	N	18	36.0	9.63	1780	27.73	49.4
47-004	YELLOW BULLHEAD	I	T	C		4	8.0	2.14	380	5.92	47.5
77-008	GREEN SUNFISH	I	T	C	S	76	152.0	40.64	2100	32.71	13.8
77-009	BLUEGILL SUNFISH	I	P	C	S	84	168.0	44.92	2000	31.15	11.9
77-015	GREEN SF X BLUEGILL SF					5	10.0	2.67	160	2.49	16.0

No Species: 4 **Nat. Species:** 4 **Hybrids:** 1 **Total Counted:** 187 **Total Rel. Wt. :** 6420

IBI: 28.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: 15-10 River: 95-717 W. Branch Indian Creek RM: 0.80 Date: 08/22/2017

Time Fished: 499 Distance: 0.150 Drainge (sq mi): 2.2 Depth: 0

Location: Gilmer Rd. Lat: 42.23022 Long: -88.03770

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-006	LARGEMOUTH BASS	C		C	F	1	2.0	0.93	10	0.64	5.0
77-009	BLUEGILL SUNFISH	I	P	C	S	107	214.0	99.07	1560	99.36	7.2

No Species: 2 **Nat. Species:** 2 **Hybrids:** 0 **Total Counted:** 108 **Total Rel. Wt. :** 1570

IBI: 34.0 **MIwb:** N/A

APPENDIX C

Upper Des Plaines Year 1 2017 Macroinvertebrate Assemblage Data

C-1: Macroinvertebrate IBI Metrics and Scores
C-2: Macroinvertebrate Taxa by Site and Sample

Appendix Table C-1. Illinois Macroinvertebrate IBI metrics and values from the Des Plaines River survey area in 2017.

River Mile	Site ID	Sample	Date	Drainage Area (sq mi)	Sub-samp	Number of: Total Taxa	Coleoptera Taxa	Mayfly Taxa	Intolerant Taxa	MBI	Percent: Percent Scrapers	Percent EPT	MIBI
Seavey Drainage Ditch (95-390)													
Year: 2017													
3.66	15-3		08/24/2017	5.05		18(39.0)	0(0.0)	0(0.0)	1(11.1)	6.6(72.1)	0.0(0.0)	0.0(0.0)	17.5
0.45	15-8	G	08/25/2017	9.77		29(63.0)	1(20.0)	2(19.6)	3(33.3)	7.0(65.6)	2.5(8.6)	2.9(3.9)	30.6
Aptakisic Creek (95-701)													
Year: 2017													
4.70	18-4	G	08/22/2017	1.09		19(41.0)	0(0.0)	0(0.0)	0(0.0)	6.5(73.8)	10.5(35.6)	0.0(0.0)	21.5
4.30	18-3		08/22/2017	2.30		22(48.0)	0(0.0)	0(0.0)	2(22.2)	6.3(77.1)	14.6(49.4)	0.7(0.9)	28.2
0.80	18-2		08/22/2017	4.94		20(43.0)	1(20.0)	1(9.8)	1(11.1)	6.4(75.4)	0.6(2.0)	4.8(6.5)	24.0
0.50	18-1		08/22/2017	5.50		25(54.0)	1(20.0)	0(0.0)	2(22.2)	6.4(75.4)	1.3(4.3)	2.2(3.0)	25.6
Buffalo Creek (95-703)													
Year: 2017													
14.00	17-5	P	08/23/2017	1.37		20(43.0)	1(20.0)	1(9.8)	2(22.2)	6.8(68.9)	0.4(1.4)	0.4(0.5)	23.7
7.70	17-3		08/23/2017	9.61		31(67.0)	3(60.0)	2(19.6)	2(22.2)	5.7(86.9)	13.2(44.7)	34.7(46.9)	49.6
6.10	17-2		08/22/2017	22.10		32(70.0)	2(40.0)	4(39.2)	4(44.4)	6.0(82.0)	20.6(69.6)	7.5(10.1)	50.8
0.75	17-1		08/23/2017	29.14		25(54.0)	2(40.0)	1(9.8)	1(11.1)	6.5(73.8)	7.6(25.7)	1.0(1.3)	30.8
Forest Lake Drain (95-705)													
Year: 2017													
0.83	15-11	P	08/24/2017	1.70		21(46.0)	0(0.0)	0(0.0)	1(11.1)	5.4(91.8)	0.7(2.4)	1.8(2.4)	22.0
Indian Creek (95-706)													
Year: 2017													
10.83	15-9	G	08/24/2017	2.68		18(39.0)	1(20.0)	1(9.8)	1(11.1)	6.8(68.9)	1.8(6.0)	2.8(3.8)	22.7
9.83	15-6		08/24/2017	3.70		26(57.0)	0(0.0)	1(9.8)	2(22.2)	6.8(68.9)	1.3(4.4)	0.3(0.4)	23.2
5.40	15-5		08/24/2017	17.26		31(67.0)	3(60.0)	1(9.8)	2(22.2)	5.3(93.4)	5.6(18.8)	3.1(4.2)	39.4

Appendix Table C-1. Illinois Macroinvertebrate IBI metrics and values from the Des Plaines River survey area in 2017.

River Mile	Site ID	Sample	Date	Drainage Area (sq mi)	Sub-samp	Number of: Total Taxa	Coleoptera Taxa	Mayfly Taxa	Intolerant Taxa	MBI	Percent: Percent Scrapers	Percent EPT	MIBI
2.41	15-2		08/25/2017	35.02		38(83.0)	4(80.0)	1(9.8)	4(44.4)	6.3(77.1)	6.9(23.4)	7.2(9.7)	46.8
0.17	15-1		08/25/2017	36.43		39(85.0)	3(60.0)	3(29.4)	5(55.6)	6.0(82.0)	9.2(31.2)	23.3(31.4)	53.5
Kildeer Creek (95-707)													
Year: 2017													
5.20	15-12	G	08/23/2017	2.08		25(54.0)	1(20.0)	0(0.0)	2(22.2)	5.9(83.6)	62.8(100)	0.3(0.4)	40.0
4.60	15-7		08/23/2017	2.86		31(67.0)	2(40.0)	2(19.6)	1(11.1)	7.1(63.9)	0.6(2.1)	16.1(21.8)	32.2
2.21	15-13	G	08/23/2017	5.01		18(39.0)	1(20.0)	2(19.6)	2(22.2)	5.7(86.9)	6.5(21.8)	51.0(69.0)	39.8
0.01	15-4		08/23/2017	6.80		26(57.0)	2(40.0)	3(29.4)	1(11.1)	5.9(83.6)	1.9(6.3)	2.5(3.3)	33.0
Unnamed Trib to Aptakisic Creek (95-712)													
Year: 2017													
0.05	18-5	G	08/22/2017	0.99		23(50.0)	0(0.0)	1(9.8)	2(22.2)	6.0(82.0)	5.3(18.0)	0.4(0.5)	26.1
Buffalo Creek Tributary (95-713)													
Year: 2017													
0.68	17-4		08/23/2017	8.55		24(52.0)	1(20.0)	2(19.6)	2(22.2)	5.7(86.9)	4.6(15.4)	1.7(2.3)	31.2
W. Branch Indian Creek (95-717)													
Year: 2017													
0.80	15-10	P	08/24/2017	2.22		14(30.0)	0(0.0)	0(0.0)	1(11.1)	5.8(85.3)	0.0(0.0)	0.0(0.0)	18.1

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Gregg's Parkway

Site ID: **15-3**

Sample:

Collection Date: 08/24/2017 River Code: 95-390 River: Seavey Drainage Ditch RM: 3.66

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	9
03600	Oligochaeta	CG	10	69
04666	Helobdella papillata	PA	8	2
06201	Hyalella azteca	CG	5	53
06501	Gammaridae	CG	4	14
22001	Coenagrionidae	PR	5	29
77130	Ablabesmyia rhamphe group	CG	6	1
77500	Conchapelopia sp	PR	6	1
78655	Procladius (Holotanypus) sp	PR	8	2
80410	Cricotopus (C.) sp	SH	8	1
80420	Cricotopus (C.) bicinctus	SH	8	7
80430	Cricotopus (C.) tremulus group	SH	8	1
82730	Chironomus (C.) decorus group	CG	11	3
82820	Cryptochironomus sp	PR	8	11
83040	Dicrotendipes neomodestus	CG	6	9
84210	Paratendipes albimanus or P. duplicatus	CG	3	17
84450	Polypedilum (Uresipedilum) flavum	SH	6	7
84470	Polypedilum (P.) illinoense	SH	6	31
84540	Polypedilum (Tripodura) scalaenum group	SH	6	10
85800	Tanytarsus sp	CF	7	19
92310	Valvata bicarinata		0	2
98200	Pisidium sp	CF	5	1
98600	Sphaerium sp	CG	5	3

No. Quantitative Taxa: 23 Total Taxa: 23

Number of Organisms: 302 mIBI: 17.46

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Vernon Hills GC - hole number 3

Site ID: **15-8**

Sample: G

Collection Date: 08/25/2017 River Code: 95-390 River: Seavey Drainage Ditch RM: 0.45

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	8
03600	Oligochaeta	CG	10	85
04664	Helobdella stagnalis	PR	8	1
04964	Erpobdella microstoma	PR	8	2
05800	Caecidotea sp	CG	6	3
06201	Hyalella azteca	CG	5	17
11130	Baetis intercalaris	CG	4	1
13400	Stenacron sp	SC	4	1
22001	Coenagrionidae	PR	5	25
52200	Cheumatopsyche sp	CF	6	5
53800	Hydroptila sp	SC	2	1
65800	Berosus sp	PR	99	5
68700	Dubiraphia sp	CG	5	2
74100	Simulium sp	CF	6	3
77120	Ablabesmyia mallochi	CG	6	1
77130	Ablabesmyia rhamphe group	CG	6	18
77150	Ablabesmyia simpsoni		0	1
77500	Conchapelopia sp	PR	6	2
77750	Hayesomyia senata or Thienemannimyia norena		5	1
78600	Pentaneura inconspicua	PR	3	5
78655	Procladius (Holotanypus) sp	PR	8	4
80420	Cricotopus (C.) bicinctus	SH	8	1
80430	Cricotopus (C.) tremulus group	SH	8	1
82730	Chironomus (C.) decorus group	CG	11	2
82820	Cryptochironomus sp	PR	8	2
83002	Dicrotendipes modestus	CG	6	3
83040	Dicrotendipes neomodestus	CG	6	19
83300	Glyptotendipes (G.) sp	CF	10	2
84210	Paratendipes albimanus or P. duplicatus	CG	3	8
84450	Polypedilum (Uresipedilum) flavum	SH	6	9
84470	Polypedilum (P.) illinoense	SH	6	10
84540	Polypedilum (Tripodura) scalaenum group	SH	6	12
85625	Rheotanytarsus sp	CF	6	3
85800	Tanytarsus sp	CF	7	2
93200	Hydrobiidae	SC	6	5
98600	Sphaerium sp	CG	5	12

No. Quantitative Taxa: 36 Total Taxa: 36
Number of Organisms: 282 mIBI: 30.57

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: N. Buffalo Grove Rd. (Twin Creeks Park)

Site ID: **18-4**

Sample: **G**

Collection Date: 08/22/2017 River Code: 95-701 River: Aptakisic Creek RM: 4.70

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	110
03600	Oligochaeta	CG	10	60
04664	Helobdella stagnalis	PR	8	2
05800	Caecidotea sp	CG	6	2
06201	Hyalella azteca	CG	5	50
06700	Crangonyx sp	CG	4	3
22001	Coenagrionidae	PR	5	6
60900	Peltodytes sp	SH	99	1
77500	Conchapelopia sp	PR	6	7
78655	Procladius (Holotanypus) sp	PR	8	4
80420	Cricotopus (C.) bicinctus	SH	8	3
82820	Cryptochironomus sp	PR	8	3
83000	Dicrotendipes sp	CG	6	1
84315	Phaenopsectra flavipes	SC	4	1
84470	Polypedilum (P.) illinoense	SH	6	7
84540	Polypedilum (Tripodura) scalaenum group	SH	6	1
85814	Tanytarsus glabrescens group		7	1
93200	Hydrobiidae	SC	6	30
95100	Physella sp	SC	9	3
95501	Planorbidae	SC	6	1
98200	Pisidium sp	CF	5	32
98600	Sphaerium sp	CG	5	5

No. Quantitative Taxa: 22 Total Taxa: 22

Number of Organisms: 333 mIBI: 21.48

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Copperwood Dr. bike xing

Site ID: **18-3**

Sample:

Collection Date: 08/22/2017 River Code: 95-701 River: Aptakisic Creek RM: 4.30

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	31
03600	Oligochaeta	CG	10	36
04660	Helobdella sp	PA	8	1
04664	Helobdella stagnalis	PR	8	6
06201	Hyalella azteca	CG	5	42
22001	Coenagrionidae	PR	5	27
52200	Cheumatopsyche sp	CF	6	1
53800	Hydroptila sp	SC	2	1
77120	Ablabesmyia mallochi	CG	6	4
77130	Ablabesmyia rhamphe group	CG	6	3
77500	Conchapelopia sp	PR	6	3
78655	Procladius (Holotanypus) sp	PR	8	8
80420	Cricotopus (C.) bicinctus	SH	8	5
82820	Cryptochironomus sp	PR	8	1
82880	Cryptotendipes sp	CG	6	1
83002	Dicrotendipes modestus	CG	6	4
83040	Dicrotendipes neomodestus	CG	6	38
83051	Dicrotendipes simpsoni	CG	6	1
83150	Endochironomus sp	SH	6	2
84210	Paratendipes albimanus or P. duplicatus	CG	3	4
84470	Polypedilum (P.) illinoense	SH	6	11
84540	Polypedilum (Tripodura) scalaenum group	SH	6	1
85500	Paratanytarsus sp	CG	6	1
85800	Tanytarsus sp	CF	7	4
93200	Hydrobiidae	SC	6	41
96120	Menetus (Micromenetus) dilatatus	SC	6	3
98200	Pisidium sp	CF	5	27
98600	Sphaerium sp	CG	5	1

No. Quantitative Taxa: 28 Total Taxa: 28

Number of Organisms: 308 mIBI: 28.22

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Pekara Rd, West of Hwy. 21

Site ID: 18-2

Sample:

Collection Date: 08/22/2017 River Code: 95-701 River: Aptakisic Creek RM: 0.80

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	1
03600	Oligochaeta	CG	10	24
05800	Caecidotea sp	CG	6	4
06810	Gammarus fasciatus	CG	3	82
17200	Caenis sp	CG	6	15
22001	Coenagrionidae	PR	5	6
22300	Argia sp	PR	5	2
59500	Oecetis sp	PR	5	1
68700	Dubiraphia sp	CG	5	42
77130	Ablabesmyia rhamphe group	CG	6	11
78655	Procladius (Holotanypus) sp	PR	8	24
82820	Cryptochironomus sp	PR	8	4
82880	Cryptotendipes sp	CG	6	1
83000	Dicrotendipes sp	CG	6	1
83040	Dicrotendipes neomodestus	CG	6	1
83051	Dicrotendipes simpsoni	CG	6	2
83300	Glyptotendipes (G.) sp	CF	10	76
84470	Polypedilum (P.) illinoense	SH	6	18
84520	Polypedilum (Tripodura) halterale group	SH	6	1
84540	Polypedilum (Tripodura) scalaenum group	SH	6	3
85800	Tanytarsus sp	CF	7	1
93200	Hydrobiidae	SC	6	2
97601	Corbicula fluminea	CF	4	6
98600	Sphaerium sp	CG	5	4

No. Quantitative Taxa: 24 Total Taxa: 24

Number of Organisms: 332 mIBI: 23.98

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Aspen Road

Site ID: **18-1**

Sample:

Collection Date: 08/22/2017 River Code: 95-701 River: Aptakisic Creek RM: 0.50

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	24
03600	Oligochaeta	CG	10	27
05800	Caecidotea sp	CG	6	2
06201	Hyalella azteca	CG	5	2
06501	Gammaridae	CG	4	5
22001	Coenagrionidae	PR	5	5
52200	Cheumatopsyche sp	CF	6	3
53800	Hydroptila sp	SC	2	4
68700	Dubiraphia sp	CG	5	4
71900	Tipula sp	SH	4	1
77130	Ablabesmyia rhamphe group	CG	6	12
78655	Procladius (Holotanypus) sp	PR	8	4
80420	Cricotopus (C.) bicinctus	SH	8	2
80510	Cricotopus (Isocladius) sylvestris group	SH	8	2
81240	Nanocladius (N.) distinctus	CG	3	2
82730	Chironomus (C.) decorus group	CG	11	3
82820	Cryptochironomus sp	PR	8	1
83000	Dicrotendipes sp	CG	6	4
83040	Dicrotendipes neomodestus	CG	6	5
83050	Dicrotendipes lucifer	CG	6	1
83300	Glyptotendipes (G.) sp	CF	10	8
84000	Parachironomus sp	PR	8	3
84450	Polypedilum (Uresipedilum) flavum	SH	6	2
84470	Polypedilum (P.) illinoense	SH	6	173
84960	Pseudochironomus sp	CG	5	1
85230	Cladotanytarsus mancus group	CG	7	3
85625	Rheotanytarsus sp	CF	6	1
85800	Tanytarsus sp	CF	7	1
98001	Pisidiidae		5	11

No. Quantitative Taxa: 29 Total Taxa: 29

Number of Organisms: 316 mIBI: 25.56

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Quentin Rd.

Site ID: **17-5**

Sample: **P**

Collection Date: 08/23/2017 River Code: 95-703 River: Buffalo Creek RM: 14.00

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	36
03600	Oligochaeta	CG	10	56
04664	Helobdella stagnalis	PR	8	2
04964	Erpobdella microstoma	PR	8	1
05800	Caecidotea sp	CG	6	6
06201	Hyalella azteca	CG	5	5
06700	Crangonyx sp	CG	4	1
11130	Baetis intercalaris	CG	4	1
69400	Stenelmis sp	SC	7	1
71900	Tipula sp	SH	4	3
77500	Conchapelopia sp	PR	6	1
80420	Cricotopus (C.) bicinctus	SH	8	22
82141	Thienemanniella xena	CG	2	1
82880	Cryptotendipes sp	CG	6	1
83040	Dicrotendipes neomodestus	CG	6	55
83300	Glyptotendipes (G.) sp	CF	10	1
84210	Paratendipes albimanus or P. duplicatus	CG	3	22
84450	Polypedilum (Uresipedilum) flavum	SH	6	17
84470	Polypedilum (P.) illinoense	SH	6	5
84520	Polypedilum (Tripodura) halterale group	SH	6	1
85500	Paratanytarsus sp	CG	6	5
85800	Tanytarsus sp	CF	7	2
98001	Pisidiidae		5	3

No. Quantitative Taxa: 23 Total Taxa: 23

Number of Organisms: 248 mIBI: 23.68

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Checker Road

Site ID: 17-3

Sample:

Collection Date: 08/23/2017 River Code: 95-703 River: Buffalo Creek RM: 7.70

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	4
03600	Oligochaeta	CG	10	14
04964	Erpobdella microstoma	PR	8	2
05800	Caecidotea sp	CG	6	27
06201	Hyalella azteca	CG	5	25
06810	Gammarus fasciatus	CG	3	1
11130	Baetis intercalaris	CG	4	52
13400	Stenacron sp	SC	4	4
21200	Calopteryx sp	PR	4	1
22001	Coenagrionidae	PR	5	9
22300	Argia sp	PR	5	7
48200	Chauliodes sp	PR	4	1
52200	Cheumatopsyche sp	CF	6	62
68700	Dubiraphia sp	CG	5	20
69200	Optioservus sp	SC	4	2
69400	Stenelmis sp	SC	7	38
74100	Simulium sp	CF	6	18
77500	Conchapelopia sp	PR	6	4
78655	Procladius (Holotanypus) sp	PR	8	1
80420	Cricotopus (C.) bicinctus	SH	8	1
81040	Limnophyes sp	CG	6	1
81825	Rheocricotopus (Psilocricotopus) robacki	CG	6	1
82820	Cryptochironomus sp	PR	8	6
83040	Dicrotendipes neomodestus	CG	6	1
84210	Paratendipes albimanus or P. duplicatus	CG	3	2
84450	Polypedilum (Uresipedilum) flavum	SH	6	9
84470	Polypedilum (P.) illinoense	SH	6	12
84750	Stictochironomus sp		5	2
85800	Tanytarsus sp	CF	7	1
95100	Physella sp	SC	9	1
97601	Corbicula fluminea	CF	4	9
98200	Pisidium sp	CF	5	2

No. Quantitative Taxa: 32 Total Taxa: 32

Number of Organisms: 340 mIBI: 49.62

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Lake Cook Rd @ Farington Ditch

Site ID: 17-2

Sample:

Collection Date: 08/22/2017 River Code: 95-703 River: Buffalo Creek RM: 6.10

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	11
03600	Oligochaeta	CG	10	40
04664	Helobdella stagnalis	PR	8	1
05800	Caecidotea sp	CG	6	16
06201	Hyalella azteca	CG	5	37
11130	Baetis intercalaris	CG	4	12
13400	Stenacron sp	SC	4	3
16700	Tricorythodes sp	CG	5	2
17200	Caenis sp	CG	6	1
21300	Hetaerina sp	PR	3	2
22001	Coenagrionidae	PR	5	27
27600	Epitheca (Tetragoneuria) sp	PR	4	1
52200	Cheumatopsyche sp	CF	6	6
53800	Hydroptila sp	SC	2	1
68700	Dubiraphia sp	CG	5	21
69400	Stenelmis sp	SC	7	45
77120	Ablabesmyia mallochi	CG	6	2
77130	Ablabesmyia rhamphe group	CG	6	2
77500	Conchapelopia sp	PR	6	2
78450	Nilotanypus fimbriatus	PR	6	1
78600	Pentaneura inconspicua	PR	3	1
78655	Procladius (Holotanypus) sp	PR	8	4
81825	Rheocricotopus (Psilocricotopus) robacki	CG	6	1
82820	Cryptochironomus sp	PR	8	1
83040	Dicrotendipes neomodestus	CG	6	1
84210	Paratendipes albimanus or P. duplicatus	CG	3	2
84450	Polypedilum (Uresipedilum) flavum	SH	6	2
84470	Polypedilum (P.) illinoense	SH	6	7
84540	Polypedilum (Tripodura) scalaenum group	SH	6	1
84960	Pseudochironomus sp	CG	5	1
85625	Rheotanytarsus sp	CF	6	1
87501	Empididae	PR	6	1
93200	Hydrobiidae	SC	6	20
97601	Corbicula fluminea	CF	4	43
98200	Pisidium sp	CF	5	10
98600	Sphaerium sp	CG	5	6

No. Quantitative Taxa: 36 Total Taxa: 36

Number of Organisms: 335 mIBI: 50.76

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Plum Creek Drive (Wolf Dr) | Site ID: **17-1** | **Sample:**

Collection Date: 08/23/2017 | River Code: 95-703 | River: Buffalo Creek | RM: 0.75

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	1
03600	Oligochaeta	CG	10	81
04664	Helobdella stagnalis	PR	8	1
06201	Hyalella azteca	CG	5	13
06800	Gammarus sp		3	67
17200	Caenis sp	CG	6	2
22001	Coenagrionidae	PR	5	9
43300	Ranatra sp	PR	99	1
52200	Cheumatopsyche sp	CF	6	1
65800	Berosus sp	PR	99	1
68700	Dubiraphia sp	CG	5	7
69400	Stenelmis sp	SC	7	2
77120	Ablabesmyia mallochi	CG	6	1
77500	Conchapelopia sp	PR	6	3
78655	Procladius (Holotanypus) sp	PR	8	5
80420	Cricotopus (C.) bicinctus	SH	8	8
82730	Chironomus (C.) decorus group	CG	11	14
82820	Cryptochironomus sp	PR	8	3
83040	Dicrotendipes neomodestus	CG	6	2
84470	Polypedilum (P.) illinoense	SH	6	9
84540	Polypedilum (Tripodura) scalaenum group	SH	6	3
84750	Stictochironomus sp		5	1
85800	Tanytarsus sp	CF	7	3
93200	Hydrobiidae	SC	6	19
95100	Physella sp	SC	9	1
95501	Planorbidae	SC	6	1
97601	Corbicula fluminea	CF	4	2
98200	Pisidium sp	CF	5	42
98600	Sphaerium sp	CG	5	1

No. Quantitative Taxa: 29 | Total Taxa: 29

Number of Organisms: 304 | mIBI: 30.82

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Hawthorne Grove Rd. | Site ID: **15-11** | Sample: **P**

Collection Date: 08/24/2017 | River Code: 95-705 | River: Forest Lake Drain | RM: 0.83

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
03600	Oligochaeta	CG	10	4
04666	Helobdella papillata	PA	8	1
06201	Hyalella azteca	CG	5	198
21200	Calopteryx sp	PR	4	1
22001	Coenagrionidae	PR	5	6
52200	Cheumatopsyche sp	CF	6	5
59555	Oecetis inconspicua complex sp F (sensu Floyd, 1995)		0	2
74100	Simulium sp	CF	6	1
77120	Ablabesmyia mallochi	CG	6	4
77500	Conchapelopia sp	PR	6	5
78655	Procladius (Holotanypus) sp	PR	8	23
82820	Cryptochironomus sp	PR	8	1
83002	Dicrotendipes modestus	CG	6	3
84210	Paratendipes albimanus or P. duplicatus	CG	3	3
84450	Polypedilum (Uresipedilum) flavum	SH	6	4
84470	Polypedilum (P.) illinoense	SH	6	5
84750	Stictochironomus sp		5	1
85625	Rheotanytarsus sp	CF	6	2
85800	Tanytarsus sp	CF	7	2
86900	Myxosargus sp	CG	10	1
93200	Hydrobiidae	SC	6	2
98600	Sphaerium sp	CG	5	5

No. Quantitative Taxa: 22 | Total Taxa: 22

Number of Organisms: 279 | mIBI: 21.97

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: N. Midlothian Rd. | **Site ID: 15-9** | **Sample: G**

Collection Date: 08/24/2017 | River Code: 95-706 | River: Indian Creek | RM: 10.83

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	8
03600	Oligochaeta	CG	10	71
04666	Helobdella papillata	PA	8	1
06201	Hyalella azteca	CG	5	5
11130	Baetis intercalaris	CG	4	5
22001	Coenagrionidae	PR	5	1
52200	Cheumatopsyche sp	CF	6	3
69400	Stenelmis sp	SC	7	1
77120	Ablabesmyia mallochi	CG	6	3
77500	Conchapelopia sp	PR	6	32
78655	Procladius (Holotanypus) sp	PR	8	1
82820	Cryptochironomus sp	PR	8	4
83300	Glyptotendipes (G.) sp	CF	10	3
84210	Paratendipes albimanus or P. duplicatus	CG	3	2
84450	Polypedilum (Uresipedilum) flavum	SH	6	61
84470	Polypedilum (P.) illinoense	SH	6	9
85625	Rheotanytarsus sp	CF	6	3
95100	Physella sp	SC	9	4
98001	Pisidiidae		5	66

No. Quantitative Taxa: 19 | Total Taxa: 19

Number of Organisms: 283 | mIBI: 22.65

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Washitay Ave

Site ID: 15-6

Sample:

Collection Date: 08/24/2017 River Code: 95-706 River: Indian Creek RM: 9.83

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	31
03600	Oligochaeta	CG	10	67
04964	Erpobdella microstoma	PR	8	2
05800	Caecidotea sp	CG	6	68
06201	Hyalella azteca	CG	5	8
06700	Crangonyx sp	CG	4	4
17200	Caenis sp	CG	6	1
77120	Ablabesmyia mallochi	CG	6	8
77355	Clinotanypus pinguis	PR	6	1
77500	Conchapelopia sp	PR	6	5
78655	Procladius (Holotanypus) sp	PR	8	4
80420	Cricotopus (C.) bicinctus	SH	8	1
81240	Nanocladius (N.) distinctus	CG	3	1
82730	Chironomus (C.) decorus group	CG	11	1
82820	Cryptochironomus sp	PR	8	3
83051	Dicrotendipes simpsoni	CG	6	2
84210	Paratendipes albimanus or P. duplicatus	CG	3	6
84315	Phaenopsectra flavipes	SC	4	2
84450	Polypedilum (Uresipedilum) flavum	SH	6	2
84470	Polypedilum (P.) illinoense	SH	6	7
85400	Micropsectra sp	CG	4	1
85500	Paratanytarsus sp	CG	6	17
85625	Rheotanytarsus sp	CF	6	45
85800	Tanytarsus sp	CF	7	8
87540	Hemerodromia sp	PR	6	1
93200	Hydrobiidae	SC	6	2
98001	Pisidiidae		5	1
98200	Pisidium sp	CF	5	9

No. Quantitative Taxa:	28	Total Taxa:	28
Number of Organisms:	308	mIBI:	23.24

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Oakwood Rd. | Site ID: 15-5 | Sample:

Collection Date: 08/24/2017 | River Code: 95-706 | River: Indian Creek | RM: 5.40

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	1
03600	Oligochaeta	CG	10	17
04964	Erpobdella microstoma	PR	8	2
05800	Caecidotea sp	CG	6	14
06201	Hyalella azteca	CG	5	156
06700	Crangonyx sp	CG	4	23
06800	Gammarus sp		3	6
08200	Orconectes sp	CG	5	1
13400	Stenacron sp	SC	4	7
21200	Calopteryx sp	PR	4	1
22001	Coenagrionidae	PR	5	7
22300	Argia sp	PR	5	2
23600	Aeshna sp	PR	4	1
52200	Cheumatopsyche sp	CF	6	2
68700	Dubiraphia sp	CG	5	10
68901	Macronychus glabratus		2	4
69400	Stenelmis sp	SC	7	2
77120	Ablabesmyia mallochi	CG	6	1
78655	Procladius (Holotanypus) sp	PR	8	2
79100	Thienemannimyia group	PR	6	1
82820	Cryptochironomus sp	PR	8	1
82880	Cryptotendipes sp	CG	6	2
83040	Dicrotendipes neomodestus	CG	6	1
84470	Polypedilum (P.) illinoense	SH	6	1
84750	Stictochironomus sp		5	1
85500	Paratanytarsus sp	CG	6	1
85625	Rheotanytarsus sp	CF	6	2
85800	Tanytarsus sp	CF	7	2
86100	Chrysops sp	CG	7	1
93200	Hydrobiidae	SC	6	7
98200	Pisidium sp	CF	5	3
98600	Sphaerium sp	CG	5	5

No. Quantitative Taxa: 32 | Total Taxa: 32

Number of Organisms: 287 | mIBI: 39.36

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Sullivan Woods Preserve, North of Creekview Dr. | **Site ID:** **15-2** | **Sample:**

Collection Date: 08/25/2017 | River Code: 95-706 | River: Indian Creek | RM: 2.41

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	2
03600	Oligochaeta	CG	10	62
04601	Glossiphoniidae	PR	8	1
04664	Helobdella stagnalis	PR	8	1
04930	Erpobdella sp	PR	8	2
05800	Caecidotea sp	CG	6	2
06201	Hyalella azteca	CG	5	98
06700	Crangonyx sp	CG	4	11
08200	Orconectes sp	CG	5	1
13400	Stenacron sp	SC	4	5
21200	Calopteryx sp	PR	4	5
21300	Hetaerina sp	PR	3	1
22001	Coenagrionidae	PR	5	15
22300	Argia sp	PR	5	14
52200	Cheumatopsyche sp	CF	6	20
68700	Dubiraphia sp	CG	5	7
68901	Macronychus glabratus		2	1
69200	Optioservus sp	SC	4	3
69400	Stenelmis sp	SC	7	13
72700	Anopheles sp	CF	6	1
77120	Ablabesmyia mallochi	CG	6	3
77130	Ablabesmyia rhamphe group	CG	6	4
77500	Conchapelopia sp	PR	6	4
77750	Hayesomyia senata or Thienemannimyia norena		5	1
78401	Natarsia species A (sensu Roback, 1978)	PR	6	2
78600	Pentaneura inconspicua	PR	3	1
80420	Cricotopus (C.) bicinctus	SH	8	3
81825	Rheocricotopus (Psilocricotopus) robacki	CG	6	2
82730	Chironomus (C.) decorus group	CG	11	1
82820	Cryptochironomus sp	PR	8	2
83040	Dicrotendipes neomodestus	CG	6	6
83150	Endochironomus sp	SH	6	2
83800	Microtendipes sp	CF	6	1
84210	Paratendipes albimanus or P. duplicatus	CG	3	1
84450	Polypedilum (Uresipedilum) flavum	SH	6	10
84470	Polypedilum (P.) illinoense	SH	6	25
84540	Polypedilum (Tripodura) scalaenum group	SH	6	2
84750	Stictochironomus sp		5	2
85500	Paratanytarsus sp	CG	6	2
85625	Rheotanytarsus sp	CF	6	3
95100	Physella sp	SC	9	2
96120	Menetus (Micromenetus) dilatatus	SC	6	1
97601	Corbicula fluminea	CF	4	2

No. Quantitative Taxa: 43 | Total Taxa: 43

Number of Organisms: 347 | mIBI: 46.77

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Marriot Inn parking lot - adj. Cranes Landing GC

Site ID: **15-1**

Sample:

Collection Date: 08/25/2017 | River Code: 95-706 | River: Indian Creek | RM: 0.17

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	1
03600	Oligochaeta	CG	10	16
05800	Caecidotea sp	CG	6	1
06201	Hyalella azteca	CG	5	6
06810	Gammarus fasciatus	CG	3	2
11120	Baetis flavistriga	CG	4	6
11130	Baetis intercalaris	CG	4	18
13400	Stenacron sp	SC	4	1
16700	Tricorythodes sp	CG	5	2
21200	Calopteryx sp	PR	4	1
22300	Argia sp	PR	5	1
52200	Cheumatopsyche sp	CF	6	35
53800	Hydroptila sp	SC	2	1
68700	Dubiraphia sp	CG	5	2
69200	Optioservus sp	SC	4	1
69400	Stenelmis sp	SC	7	7
74100	Simulium sp	CF	6	5
77120	Ablabesmyia mallochi	CG	6	6
77500	Conchapelopia sp	PR	6	7
77750	Hayesomyia senata or Thienemannimyia norena		5	2
78600	Pentaneura inconspicua	PR	3	3
78655	Procladius (Holotanypus) sp	PR	8	1
80420	Cricotopus (C.) bicinctus	SH	8	9
81825	Rheocricotopus (Psilocricotopus) robacki	CG	6	13
82141	Thienemanniella xena	CG	2	1
82730	Chironomus (C.) decorus group	CG	11	3
82820	Cryptochironomus sp	PR	8	1
83040	Dicrotendipes neomodestus	CG	6	4
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)	CF	6	1
84210	Paratendipes albimanus or P. duplicatus	CG	3	2
84300	Phaenopsectra obediens group	SC	4	1
84450	Polypedilum (Uresipedilum) flavum	SH	6	18
84460	Polypedilum (P.) fallax group	SH	6	1
84470	Polypedilum (P.) illinoense	SH	6	33
84540	Polypedilum (Tripodura) scalaenum group	SH	6	8
85265	Cladotanytarsus vanderwulpi group sp 5	CG	7	1
85615	Rheotanytarsus pellucidus	CF	6	1
85625	Rheotanytarsus sp	CF	6	16
85800	Tanytarsus sp	CF	7	6
85821	Tanytarsus glabrescens group sp 7	CF	7	2
93200	Hydrobiidae	SC	6	7
93900	Elimia sp	SC	6	6
95100	Physella sp	SC	9	1
97601	Corbicula fluminea	CF	4	9
98200	Pisidium sp	CF	5	2

No. Quantitative Taxa: 45 | Total Taxa: 45

Number of Organisms: 271 | mIBI: 53.51

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: IL Rt. 22 | **Site ID: 15-12** | **Sample: G**

Collection Date: 08/23/2017 | River Code: 95-707 | River: Kildeer Creek | RM: 5.20

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
03600	Oligochaeta	CG	10	7
04664	Helobdella stagnalis	PR	8	6
04935	Erpobdella punctata punctata	PR	8	1
04964	Erpobdella microstoma	PR	8	7
05800	Caecidotea sp	CG	6	2
06501	Gammaridae	CG	4	1
21200	Calopteryx sp	PR	4	2
59500	Oecetis sp	PR	5	1
68700	Dubiraphia sp	CG	5	4
74100	Simulium sp	CF	6	1
77120	Ablabesmyia mallochi	CG	6	1
77500	Conchapelopia sp	PR	6	1
78655	Procladius (Holotanypus) sp	PR	8	5
82730	Chironomus (C.) decorus group	CG	11	1
82820	Cryptochironomus sp	PR	8	8
82880	Cryptotendipes sp	CG	6	1
84210	Paratendipes albimanus or P. duplicatus	CG	3	21
84470	Polypedilum (P.) illinoense	SH	6	3
84540	Polypedilum (Tripodura) scalaenum group	SH	6	4
84750	Stictochironomus sp		5	2
84960	Pseudochironomus sp	CG	5	3
85500	Paratanytarsus sp	CG	6	2
85800	Tanytarsus sp	CF	7	1
86100	Chrysops sp	CG	7	1
93200	Hydrobiidae	SC	6	208
95100	Physella sp	SC	9	1
98001	Pisidiidae		5	16
98200	Pisidium sp	CF	5	21
99001	Unionidae	CF	1	1

No. Quantitative Taxa: 29 | Total Taxa: 29

Number of Organisms: 333 | mIBI: 40.03

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Salem Lake Drive S. of Rt 22

Site ID: 15-7

Sample:

Collection Date: 08/23/2017 River Code: 95-707 River: Kildeer Creek RM: 4.60

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	3
03600	Oligochaeta	CG	10	53
06201	Hyalella azteca	CG	5	70
11200	Callibaetis sp	CG	4	7
17200	Caenis sp	CG	6	28
21200	Calopteryx sp	PR	4	1
22001	Coenagrionidae	PR	5	31
43300	Ranatra sp	PR	99	2
52200	Cheumatopsyche sp	CF	6	16
52530	Hydropsyche depravata group	CF	5	2
68700	Dubiraphia sp	CG	5	1
69400	Stenelmis sp	SC	7	2
72700	Anopheles sp	CF	6	1
77500	Conchapelopia sp	PR	6	1
77700	Guttipelopia guttipennis	PR	6	1
78655	Procladius (Holotanypus) sp	PR	8	4
78680	Procladius (Psilotanypus) bellus	PR	8	2
79000	Tanypus sp	PR	8	2
80510	Cricotopus (Isocladius) sylvestris group	SH	8	1
82785	Chironomus (Lobochironomus) dorsalis		0	1
82800	Cladopelma sp	CG	6	2
82820	Cryptochironomus sp	PR	8	1
83002	Dicrotendipes modestus	CG	6	4
83158	Endochironomus nigricans	SH	6	2
83300	Glyptotendipes (G.) sp	CF	10	59
84000	Parachironomus sp	PR	8	6
84210	Paratendipes albimanus or P. duplicatus	CG	3	3
84450	Polypedilum (Uresipedilum) flavum	SH	6	3
84470	Polypedilum (P.) illinoense	SH	6	2
84540	Polypedilum (Tripodura) scalaenum group	SH	6	1
85500	Paratanytarsus sp	CG	6	10
85625	Rheotanytarsus sp	CF	6	2
85800	Tanytarsus sp	CF	7	1
89501	Ephydridae	CG	8	1
98600	Sphaerium sp	CG	5	5

No. Quantitative Taxa: 35 Total Taxa: 35

Number of Organisms: 331 mIBI: 32.21

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Willowbrook Rd. S. of Half Day Rd.

Site ID: **15-13**

Sample: **G**

Collection Date: 08/23/2017 River Code: 95-707 River: Kildeer Creek RM: 2.21

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	2
03600	Oligochaeta	CG	10	11
06810	Gammarus fasciatus	CG	3	2
11130	Baetis intercalaris	CG	4	42
13400	Stenacron sp	SC	4	6
21200	Calopteryx sp	PR	4	20
52200	Cheumatopsyche sp	CF	6	98
52530	Hydropsyche depravata group	CF	5	4
69400	Stenelmis sp	SC	7	13
74100	Simulium sp	CF	6	47
77500	Conchapelopia sp	PR	6	2
77750	Hayesomyia senata or Thienemannimyia norena		5	1
78655	Procladius (Holotanypus) sp	PR	8	3
81825	Rheocricotopus (Psilocricotopus) robacki	CG	6	5
84450	Polypedilum (Uresipedilum) flavum	SH	6	20
84460	Polypedilum (P.) fallax group	SH	6	3
84470	Polypedilum (P.) illinoense	SH	6	7
84540	Polypedilum (Tripodura) scalaenum group	SH	6	1
84700	Stenochironomus sp	SH	3	1
85625	Rheotanytarsus sp	CF	6	1
98001	Pisidiidae		5	5

No. Quantitative Taxa: 21 Total Taxa: 21

Number of Organisms: 294 mIBI: 39.78

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: | Site ID: 15-4 | Sample:

Collection Date: 08/23/2017 | River Code: 95-707 | River: Kildeer Creek | RM: 0.01

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	5
03600	Oligochaeta	CG	10	23
05800	Caecidotea sp	CG	6	2
06201	Hyalella azteca	CG	5	168
06700	Crangonyx sp	CG	4	3
13400	Stenacron sp	SC	4	2
13521	Stenonema femoratum	SC	4	1
17200	Caenis sp	CG	6	2
22001	Coenagrionidae	PR	5	22
22300	Argia sp	PR	5	3
43300	Ranatra sp	PR	99	2
52200	Cheumatopsyche sp	CF	6	3
68700	Dubiraphia sp	CG	5	14
69400	Stenelmis sp	SC	7	2
77120	Ablabesmyia mallochi	CG	6	1
78655	Procladius (Holotanypus) sp	PR	8	10
78680	Procladius (Psilotanypus) bellus	PR	8	1
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"	CG	3	1
82730	Chironomus (C.) decorus group	CG	11	1
82880	Cryptotendipes sp	CG	6	3
83002	Dicrotendipes modestus	CG	6	3
83051	Dicrotendipes simpsoni	CG	6	7
83150	Endochironomus sp	SH	6	1
83300	Glyptotendipes (G.) sp	CF	10	19
84000	Parachironomus sp	PR	8	3
84400	Polypedilum sp	SH	6	1
84470	Polypedilum (P.) illinoense	SH	6	5
85800	Tanytarsus sp	CF	7	3
93200	Hydrobiidae	SC	6	1
98200	Pisidium sp	CF	5	9
98600	Sphaerium sp	CG	5	5

No. Quantitative Taxa: 31 | Total Taxa: 31

Number of Organisms: 326 | mIBI: 32.96

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Dst. Aptakapsic Rd.; W of N. Buffalo Grove Rd., Twins Cr Prk.

Site ID: 18-5

Sample: G

Collection Date: 08/22/2017 River Code: 95-712 River: Unnamed Trib to Aptakisic Creek RM: 0.05

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	40
03600	Oligochaeta	CG	10	31
04664	Helobdella stagnalis	PR	8	3
04666	Helobdella papillata	PA	8	5
04935	Erpobdella punctata punctata	PR	8	2
17200	Caenis sp	CG	6	1
22001	Coenagrionidae	PR	5	2
69901	Curculionidae	SH	99	1
77130	Ablabesmyia rhamphe group	CG	6	5
77500	Conchapelopia sp	PR	6	3
78655	Procladius (Holotanypus) sp	PR	8	3
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"	CG	3	1
82820	Cryptochironomus sp	PR	8	1
82880	Cryptotendipes sp	CG	6	2
83051	Dicrotendipes simpsoni	CG	6	6
84210	Paratendipes albimanus or P. duplicatus	CG	3	3
84315	Phaenopsectra flavipes	SC	4	5
84450	Polypedilum (Uresipedilum) flavum	SH	6	11
84470	Polypedilum (P.) illinoense	SH	6	8
84520	Polypedilum (Tripodura) halterale group	SH	6	9
84540	Polypedilum (Tripodura) scalaenum group	SH	6	5
85400	Micropsectra sp	CG	4	1
85800	Tanytarsus sp	CF	7	1
85814	Tanytarsus glabrescens group		7	1
92201	Valvatidae		0	1
93200	Hydrobiidae	SC	6	7
93900	Elimia sp	SC	6	1
95900	Gyraulus sp	SC	6	1
96100	Menetus (Micromenetus) sp	SC	6	1
98001	Pisidiidae		5	121

No. Quantitative Taxa: 30 Total Taxa: 30

Number of Organisms: 282 mIBI: 26.07

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Lake Cook Rd @ Buffalo Creek Trib

Site ID: 17-4

Sample:

Collection Date: 08/23/2017 River Code: 95-713 River: UT to Buffalo Creek @ RM XX.X RM: 0.68

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	20
03600	Oligochaeta	CG	10	23
05800	Caecidotea sp	CG	6	13
06201	Hyalella azteca	CG	5	174
06700	Crangonyx sp	CG	4	5
11130	Baetis intercalaris	CG	4	2
17200	Caenis sp	CG	6	2
22001	Coenagrionidae	PR	5	37
22300	Argia sp	PR	5	3
52200	Cheumatopsyche sp	CF	6	2
69400	Stenelmis sp	SC	7	14
77120	Ablabesmyia mallochi	CG	6	2
77500	Conchapelopia sp	PR	6	3
78140	Labrundinia pilosella	PR	4	2
78655	Procladius (Holotanypus) sp	PR	8	3
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"	CG	3	1
82820	Cryptochironomus sp	PR	8	2
83040	Dicrotendipes neomodestus	CG	6	3
84210	Paratendipes albimanus or P. duplicatus	CG	3	1
84450	Polypedilum (Uresipedilum) flavum	SH	6	5
84470	Polypedilum (P.) illinoense	SH	6	16
84540	Polypedilum (Tripodura) scalaenum group	SH	6	5
85500	Paratanytarsus sp	CG	6	1
85625	Rheotanytarsus sp	CF	6	4
96120	Menetus (Micromenetus) dilatatus	SC	6	2
98600	Sphaerium sp	CG	5	6

No. Quantitative Taxa: 26 Total Taxa: 26

Number of Organisms: 351 mIBI: 31.21

Appendix Table C-2. Macroinvertebrate taxa collected by MBI at sites in the Des Plaines River study area in 2017.

Site: Gilmer Rd.

Site ID: 15-10

Sample: P

Collection Date: 08/24/2017 River Code: 95-717 River: W. Branch Indian Creek RM: 0.80

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.
01801	Turbellaria	PR	6	3
03600	Oligochaeta	CG	10	13
04666	Helobdella papillata	PA	8	1
05800	Caecidotea sp	CG	6	69
06501	Gammaridae	CG	4	11
22001	Coenagrionidae	PR	5	2
77500	Conchapelopia sp	PR	6	8
82820	Cryptochironomus sp	PR	8	3
83300	Glyptotendipes (G.) sp	CF	10	3
84210	Paratendipes albimanus or P. duplicatus	CG	3	2
84450	Polypedilum (Uresipedilum) flavum	SH	6	56
84470	Polypedilum (P.) illinoense	SH	6	3
84540	Polypedilum (Tripodura) scalaenum group	SH	6	13
85800	Tanytarsus sp	CF	7	1
92310	Valvata bicarinata		0	2
98200	Pisidium sp	CF	5	34
98600	Sphaerium sp	CG	5	62

No. Quantitative Taxa: 17 Total Taxa: 17

Number of Organisms: 286 mIBI: 18.05

APPENDIX D

Upper Des Plaines Year 1 2017 Habitat Data

D-1: Upper Des Plaines 2016 QHEI Metrics and Scores
D-2: QHEI Field Sheets

Appendix D-1. QHEI metric scores for sites sampled in the Des Plaines River study area by MBI during 2017.

River Mile	QHEI	Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient & Score	Narrative
(95390) Seavey Drainage Ditch									
Year: 2017									
3.66	**62.00**	11.0	14.0	12.0	5.00	9.0	1.0	25.48 - (10)	Good
0.45	**55.00**	10.5	14.0	9.0	5.50	5.0	1.0	16.84 - (10)	Fair
(95701) Aptakisic Creek									
Year: 2017									
4.70	**47.00**	8.0	13.0	8.0	4.00	4.0	0.0	20.84 - (10)	Fair
4.30	**55.50**	12.0	13.0	8.5	4.00	6.0	2.0	18.14 - (10)	Fair
0.80	**45.00**	4.5	15.0	8.0	3.50	6.0	0.0	10.70 - (8)	Fair
0.50	**48.00**	9.0	14.0	6.0	5.00	6.0	0.0	10.37 - (8)	Fair
(95703) Buffalo Creek									
Year: 2017									
14.00	**63.00**	14.0	14.0	14.0	5.00	4.0	4.0	38.18 - (8)	Good
7.70	**73.00**	14.0	16.0	14.0	9.00	8.0	2.0	17.56 - (10)	Good
6.10	**64.25**	14.0	17.0	12.0	4.25	7.0	0.0	17.28 - (10)	Good
0.75	**46.50**	12.0	11.0	6.0	4.50	3.0	0.0	15.83 - (10)	Fair
(95705) Forest Lake Drain									
Year: 2017									
0.83	**48.25**	2.0	11.0	11.5	6.75	4.0	5.0	38.51 - (8)	Fair
(95706) Indian Creek									
Year: 2017									
10.83	**55.50**	10.0	12.0	13.0	6.50	3.0	1.0	22.55 - (10)	Fair
9.83	**59.50**	14.0	14.0	11.0	5.00	4.0	1.5	21.94 - (10)	Fair
5.40	**66.50**	12.0	15.0	12.0	5.00	9.0	3.5	16.00 - (10)	Good
2.41	**73.00**	12.0	17.0	14.0	5.00	10.0	5.0	15.13 - (10)	Good
0.17	**65.00**	14.0	14.0	11.0	4.50	8.0	3.5	12.87 - (10)	Good
(95707) Kildeer Creek									
Year: 2017									
5.20	**41.50**	4.0	11.0	11.0	4.50	7.0	0.0	43.04 - (4)	Poor
4.60	**48.50**	9.0	13.0	12.0	5.50	4.0	1.0	40.83 - (4)	Fair
2.21	**61.00**	10.0	14.0	13.0	8.00	6.0	2.0	31.36 - (8)	Good
0.01	**53.50**	4.0	15.0	13.0	4.50	6.0	1.0	23.96 - (10)	Fair
(95712) Unnamed Trib to Aptakisic Creek @ RM4.64									
Year: 2017									
0.05	**43.50**	6.0	12.0	8.5	4.00	3.0	0.0	19.34 - (10)	Poor

Column group "QHEI Metrics:" spans Substrate through Gradient & Score.

Appendix D-1. QHEI metric scores for sites sampled in the Des Plaines River study area by MBI during 2017.

River Mile	QHEI	Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient & Score	Narrative
(95713) Unnamed Trib to Buffalo Creek @ RM 7.56									
Year: 2017									
0.68	**57.50**	10.5	13.0	11.0	4.00	8.0	1.0	20.09 - (10)	**Fair**
(95717) W. Branch Indian Creek									
Year: 2017									
0.80	**58.50**	14.0	14.0	13.0	5.00	4.0	0.5	34.19 - (8)	**Fair**

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 73

River Code: 95-703	***RM:*** 7.70	***Stream:*** Buffalo Creek			
Site Code: 17-3	***Project Code:*** DRWW17	***Location:*** Dst Checker Rd			
Date: 8-24-17	***Scorer:*** MAS	***Latitude:*** 42.15952	***Longitude:*** -87.99047		

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
[ ] [ ] -BLDR/SLBS [10]			[ ] [x] -GRAVEL [7]		
[ ] [ ] -Lg BOULD [10]			[x] [ ] -SAND [6]		
[ ] [ ] -BOULDER [9]			[ ] [ ] -BEDROCK [5]		
[ ] [ ] -COBBLE [8]			[ ] [ ] -DETRITUS [3]		
[ ] [ ] -HARDPAN [4]			[ ] [ ] -ARTIFICIAL [0]		
[ ] [ ] -MUCK [2]			[ ] [ ] -SILT [2]		

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
[ ] -LIMESTONE [1]
[x] -TILLS [1]
[ ] -WETLANDS [0]
[ ] -HARDPAN [0]
[ ] -SANDSTONE [0]
[ ] -RIP / RAP [0]
[ ] -LACUSTRINE [0]
[ ] -SHALE [-1]
[ ] -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: [ ] -SILT HEAVY [-2]; [x] -SILT MODERATE [-1]; [ ] -SILT NORMAL [0]; [ ] -SILT FREE [1]
EMBEDDEDNESS: [ ] -EXTENSIVE [-2]; [x] -MODERATE [-1]; [ ] -NORMAL [0]; [ ] -NONE [1]

Substrate: 14 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 16 (Max 20)

COMMENTS:

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILTIY
[ ] -HIGH [4]	[ ] -EXCELLENT [7]	[ ] -NONE [6]	[ ] -HIGH [3]
[x] -MODERATE [3]	[x] -GOOD [5]	[x] -RECOVERED [4]	[x] -MODERATE [2]
[ ] -LOW [2]	[ ] -FAIR [3]	[ ] -RECOVERING [3]	[ ] -LOW [1]
[ ] -NONE [1]	[ ] -POOR [1]	[ ] -RECENT OR NO RECOVERY [1]	
		[ ] -IMPOUNDED [-1]	

MODIFICATIONS / OTHER
[ ] -SNAGGING; [ ] -IMPOUNDMENT
[ ] -RELOCATION; [ ] -ISLAND
[ ] -CANOPY REMOVAL; [ ] -LEVEED
[ ] -DREDGING; [ ] -BANK SHAPING
[ ] -ONE SIDE CHANNEL MODIFICATIONS

Channel: 14 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
[x] [x] -VERY WIDE > 100m [5]
[ ] [ ] -WIDE > 50m [4]
[ ] [ ] -MODERATE 10 - 50m [3]
[ ] [ ] -NARROW 5 - 10m [2]
[ ] [ ] -VERY NARROW < 5m [1]
[ ] [ ] -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) — L R (Most Predominant Per Bank)
[x] [x] -FOREST, SWAMP [3]
[ ] [ ] -SHRUB OR OLD FIELD [2]
[x] [x] -RESIDENTIAL, PARK, NEW FIELD [1]
[ ] [ ] -FENCED PASTURE [1]
[ ] [ ] -CONSERVATION TILLAGE [1]
[ ] [ ] -URBAN OR INDUSTRIAL [0]
[ ] [ ] -OPEN PASTURE, ROWCROP [0]
[ ] [ ] -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
[ ] [ ] -NONE / LITTLE [3]
[x] [x] -MODERATE [2]
[ ] [ ] -HEAVY / SEVERE [1]

Riparian: 9 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
[ ] - 1m [6]
[x] - 0.7m [4]
[ ] - 0.4 to 0.7m [2]
[ ] - 0.2 to 0.4m [1]
[ ] - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
[x] -POOL WIDTH > RIFFLE WIDTH [2]
[ ] -POOL WIDTH = RIFFLE WIDTH [1]
[ ] -POOL WIDTH < RIFFLE WIDTH [0]
[ ] -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
[ ] -EDDIES [1]; [ ] -TORRENTIAL [-1]
[ ] -FAST [1]; [ ] -INTERSTITIAL [-1]
[x] -MODERATE [1]; [ ] -INTERMITTENT [-2]
[x] -SLOW [1]; [ ] -VERY FAST [1]
[ ] -NONE [-1]

Pool / Current: 8 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
[ ] -*Best Areas > 10cm [2]
[x] -Best Areas 5 - 10cm [1]
[ ] -Best Areas < 5cm [0]
[ ] -NO RIFFLE but RUNS present [0]
[ ] -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
[ ] - MAX > 50 cm [2]
[x] - MAX < 50 cm [1]

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

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

Riffle / Run: 2 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 17.56 DRAINAGE AREA (sq.mi.): 9.61

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

Gradient: 10 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

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

- [ ] None
- [ ] Industrial
- [ ] WWTP
- [ ] Agriculture
- [ ] Livestock
- [ ] Silviculture
- [ ] Construction
- [x] Urban Runoff
- [ ] CSOs
- [x] Suburban Impacts
- [ ] Mining
- [x] Channelization
- [ ] Riparian Removal
- [ ] Landfills
- [ ] Natural
- [ ] Dams
- [ ] Other Flow Alteration

Other: ____

Subjective Rating (1-10): 6

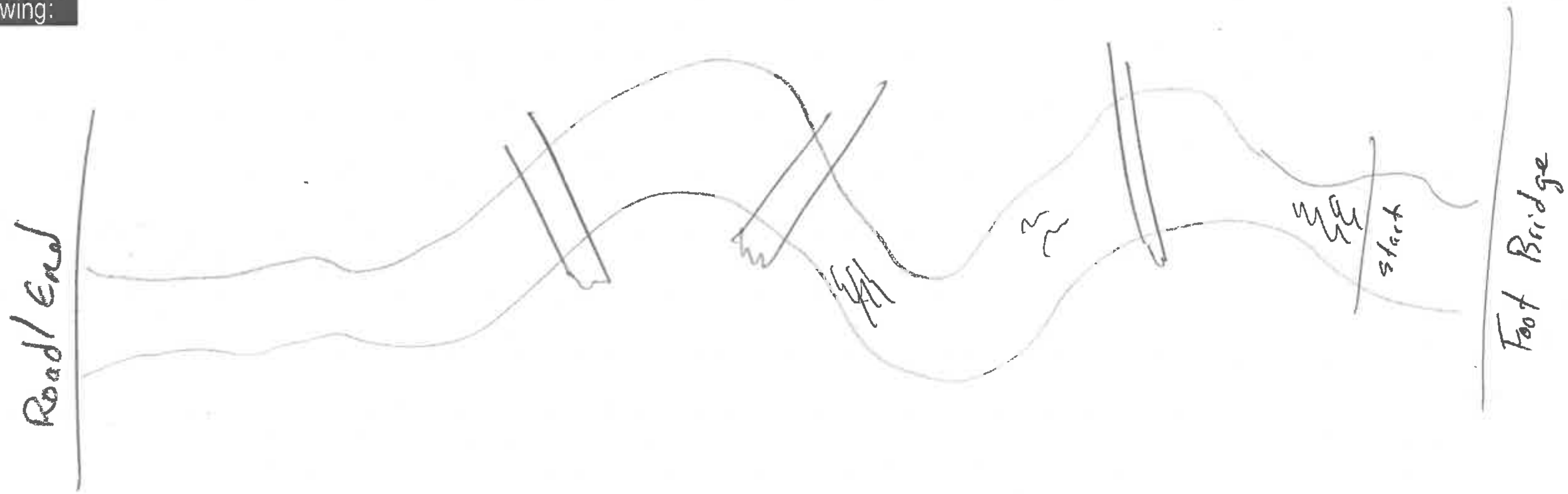
Aesthetic Rating (1-10): 7

Gradient: ☐ -Low ☑ -Moderate ☐ -High

First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	F	150	Clear	Normal	5

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 65

River Code: 95-706 **RM:** 0.17 **Stream:** Indian Creek
Site Code: IS-1 **Project Code:** DRWWT **Location:** Ust Confluence W/ Des Plaines
Date: 8-25-17 **Scorer:** MAS **Latitude:** 42.19810 **Longitude:** -87.92312

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	X	X
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	X
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X	X	☐ ☐ -DETRITUS [3]		
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2] ☑ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☐ -EXTENSIVE [-2] ☑ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 14 (Max 20)

COMMENTS:

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

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

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)

COMMENTS:

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

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☑ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☑ -FAIR [3] ☐ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☑ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☑ -HIGH [3] ☐ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☑ -RELOCATION ☑ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☑ -BANK SHAPING

Channel: 11 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☑ ☑ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) — L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
☑ ☑ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4.5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☑ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☑ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -FAST [1] ☐ -MODERATE [1] ☑ -SLOW [1] ☐ -NONE [-1]
☐ -TORRENTIAL [-1] ☐ -INTERSTITIAL [-1] ☐ -INTERMITTENT [-2] ☐ -VERY FAST [1]

Pool / Current: 8 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☑ -*Best Areas > 10cm [2]
☑ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 3.5 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 12.87 DRAINAGE AREA (sq.mi.): 36.43 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 10 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 6

Aesthetic Rating (1-10): 6

Gradient: ☐ -Low ☐ -Moderate ☐ -High

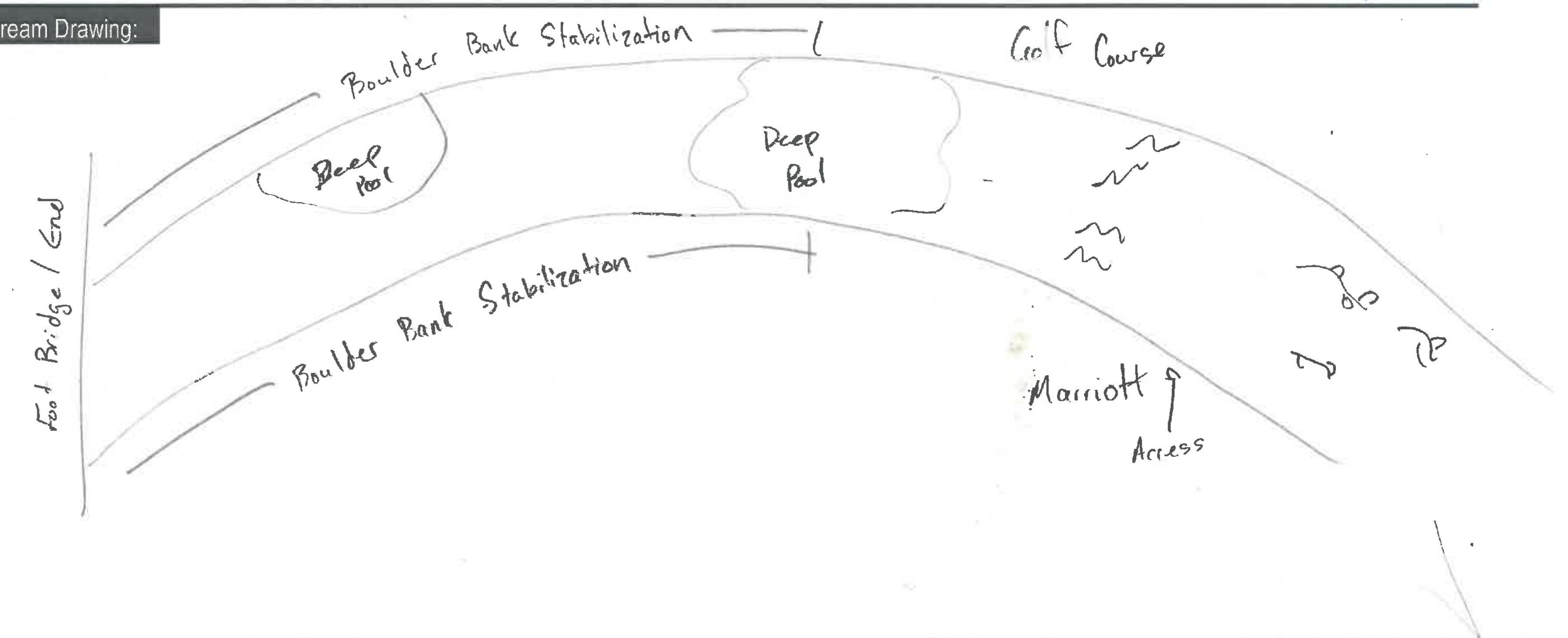
	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	D	200	Clear	Normal	70

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: `73`

River Code: `95-706` **RM:** `2.41` **Stream:** `Indian Creek`
Site Code: `15-2` **Project Code:** `DRWW17` **Location:** `@ Sugar Creek Park`
Date: `8-25-17` **Scorer:** `MHS` **Latitude:** `42.20628` **Longitude:** `-87.96129`

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
-BLDR/SLBS [10]			[ ] [x] -GRAVEL [7]	X	X
-Lg BOULD [10]			[x] [ ] -SAND [6]	X	
-BOULDER [9]	X		-BEDROCK [5]		
-COBBLE [8]	X	X	-DETRITUS [3]	X	
-HARDPAN [4]			-ARTIFICIAL [0]		
-MUCK [2]	X		-SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
- [ ] -LIMESTONE [1]
- [x] -TILLS [1]
- [ ] -WETLANDS [0]
- [ ] -HARDPAN [0]
- [ ] -SANDSTONE [0]
- [ ] -RIP / RAP [0]
- [ ] -LACUSTRINE [0]
- [ ] -SHALE [-1]
- [ ] -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
- SILT: [x] -SILT HEAVY [-2]; [ ] -SILT MODERATE [-1]; [ ] -SILT NORMAL [0]; [ ] -SILT FREE [1]
- EMBEDDEDNESS: [x] -EXTENSIVE [-2]; [ ] -MODERATE [-1]; [ ] -NORMAL [0]; [ ] -NONE [1]

Substrate: `12` Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur
- `1` UNDERCUT BANKS [1]
- `1` OVERHANGING VEGETATION [1]
- `3` SHALLOWS (IN SLOW WATER) [1]
- `1` ROOTMATS [1]
- `1` POOLS > 70 cm [2]
- `1` ROOTWADS [1]
- `1` BOULDERS [1]
- `0` OXBOWS, BACKWATERS [1]
- `2` AQUATIC MACROPHYTES [1]
- `2` LOGS OR WOODY DEBRIS [1]

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

Cover: `17` Max 20

COMMENTS:

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

SINUOSITY: [ ] -HIGH [4]; [x] -MODERATE [3]; [x] -LOW [2]; [ ] -NONE [1]

DEVELOPMENT: [ ] -EXCELLENT [7]; [x] -GOOD [5]; [ ] -FAIR [3]; [ ] -POOR [1]

CHANNELIZATION: [ ] -NONE [6]; [x] -RECOVERED [4]; [x] -RECOVERING [3]; [ ] -RECENT OR NO RECOVERY [1]; [ ] -IMPOUNDED [-1]

STABILTIY: [ ] -HIGH [3]; [x] -MODERATE [2]; [ ] -LOW [1]

MODIFICATIONS / OTHER: [ ] -SNAGGING; [x] -RELOCATION; [ ] -CANOPY REMOVAL; [ ] -DREDGING; [ ] -ONE SIDE CHANNEL MODIFICATIONS; [ ] -IMPOUNDMENT; [ ] -ISLAND; [ ] -LEVEED; [ ] -BANK SHAPING

Channel: `14` Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
- [ ] [ ] -VERY WIDE > 100m [5]
- [ ] [ ] -WIDE > 50m [4]
- [x] [ ] -MODERATE 10 - 50m [3]
- [ ] [x] -NARROW 5 - 10m [2]
- [ ] [ ] -VERY NARROW < 5m [1]
- [ ] [ ] -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) — L R (Most Predominant Per Bank)
- [x] [ ] -FOREST, SWAMP [3]
- [ ] [ ] -SHRUB OR OLD FIELD [2]
- [x] [x] -RESIDENTIAL, PARK, NEW FIELD [1]
- [ ] [ ] -FENCED PASTURE [1]
- [ ] [ ] -CONSERVATION TILLAGE [1]
- [ ] [ ] -URBAN OR INDUSTRIAL [0]
- [ ] [ ] -OPEN PASTURE, ROWCROP [0]
- [ ] [ ] -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
- [ ] [ ] -NONE / LITTLE [3]
- [ ] [ ] -MODERATE [2]
- [x] [x] -HEAVY / SEVERE [1]

Riparian: `6` Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
- [x] - 1m [6]
- [ ] - 0.7m [4]
- [ ] - 0.4 to 0.7m [2]
- [ ] - 0.2 to 0.4m [1]
- [ ] - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- [x] -POOL WIDTH > RIFFLE WIDTH [2]
- [ ] -POOL WIDTH = RIFFLE WIDTH [1]
- [ ] -POOL WIDTH < RIFFLE WIDTH [0]
- [ ] -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- [ ] -EDDIES [1]
- [ ] -FAST [1]
- [x] -MODERATE [1]
- [x] -SLOW [1]
- [ ] -NONE [-1]
- [ ] -TORRENTIAL [-1]
- [ ] -INTERSTITIAL [-1]
- [ ] -INTERMITTENT [-2]
- [ ] -VERY FAST [1]

Pool / Current: `10` Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- [x] -*Best Areas > 10cm [2]
- [ ] -Best Areas 5 - 10cm [1]
- [ ] -Best Areas < 5cm [0]
- [ ] -NO RIFFLE but RUNS present [0]
- [ ] -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
- [x] - MAX > 50 cm [2]
- [ ] - MAX < 50 cm [1]

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

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

Riffle / Run: `5` Max 8

COMMENTS:

6.) GRADIENT (ft / mi): `15.13` DRAINAGE AREA (sq.mi.): `35.02` % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: `10` Max 10

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 6

Aesthetic Rating (1-10): 7

Gradient: ☐ -Low ☑ -Moderate ☐ -High

First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	D	200	Clear	Normal	70

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

Major Suspected Sources of Impacts (Check All That Apply):
- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 62

River Code: 95-390 RM: 3.66 Stream: [struck through] Seavey Drainage Ditch
Site Code: 15-3 Project Code: DRWW17 Location: Ust Crees's Pkwy
Date: 8-24-17 Scorer: MAS Latitude: 42.26306 Longitude: -87.91579

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	X	X	Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	✓		☐ -LIMESTONE [1]	SILT: ☑ -SILT HEAVY [-2]
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]			☑ -TILLS [1]	☑ -SILT MODERATE [-1]
☐ ☐ -COBBLE [8]	X	X	☐ ☐ -DETRITUS [3]	X		☐ -WETLANDS [0]	☐ -SILT NORMAL [0]
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]			☐ -HARDPAN [0]	☐ -SILT FREE [1]
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X		☐ -SANDSTONE [0]	EMBEDDEDNESS: ☑ -EXTENSIVE [-2]
						☐ -RIP / RAP [0]	☑ -MODERATE [-1]
						☐ -LACUSTRINE [0]	☐ -NORMAL [0]
						☐ -SHALE [-1]	☐ -NONE [1]
						☐ -COAL FINES [-2]	

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

Substrate: 11 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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)

COMMENTS:

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILTIY	MODIFICATIONS / OTHER	
☐ -HIGH [4]	☐ -EXCELLENT [7]	☐ -NONE [6]	☐ -HIGH [3]	☐ -SNAGGING	☐ -IMPOUNDMENT
☐ -MODERATE [3]	☑ -GOOD [5]	☑ -RECOVERED [4]	☑ -MODERATE [2]	☑ -RELOCATION	☐ -ISLAND
☑ -LOW [2]	☑ -FAIR [3]	☐ -RECOVERING [3]	☐ -LOW [1]	☐ -CANOPY REMOVAL	☐ -LEVEED
☐ -NONE [1]	☐ -POOR [1]	☐ -RECENT OR NO RECOVERY [1]		☐ -DREDGING	☐ -BANK SHAPING
		☐ -IMPOUNDED [-1]		☐ -ONE SIDE CHANNEL MODIFICATIONS	

Channel: 12 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

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

Riparian: 5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)	
☑ - 1m [6]	☑ -POOL WIDTH > RIFFLE WIDTH [2]	☐ -EDDIES [1]	☐ -TORRENTIAL [-1]
☐ - 0.7m [4]	☐ -POOL WIDTH = RIFFLE WIDTH [1]	☐ -FAST [1]	☐ -INTERSTITIAL [-1]
☐ - 0.4 to 0.7m [2]	☐ -POOL WIDTH < RIFFLE WIDTH [0]	☐ -MODERATE [1]	☐ -INTERMITTENT [-2]
☐ - 0.2 to 0.4m [1]	☐ -IMPOUNDED [-1]	☑ -SLOW [1]	☐ -VERY FAST [1]
☐ - < 0.2m [POOL = 0]		☐ -NONE [-1]	

Pool / Current: 9 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

Riffle / Run: 1 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 25.48 DRAINAGE AREA (sq.mi.): 5.05 % POOL: ____ % GLIDE: ____ % RIFFLE: ____ % RUN: ____

Gradient: 10 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Is Sampling Reach Representative of the Stream? (Y/ N)

If Not, Explain:

Lat / Long (Beg):

Lat / Long (Mid):

Lat / Long (End):

Lat / Long (X-Loc):

Subjective Rating (1-10): 6

Aesthetic Rating (1-10): 6

Gradient: ☐ -Low ☑ -Moderate ☐ -High

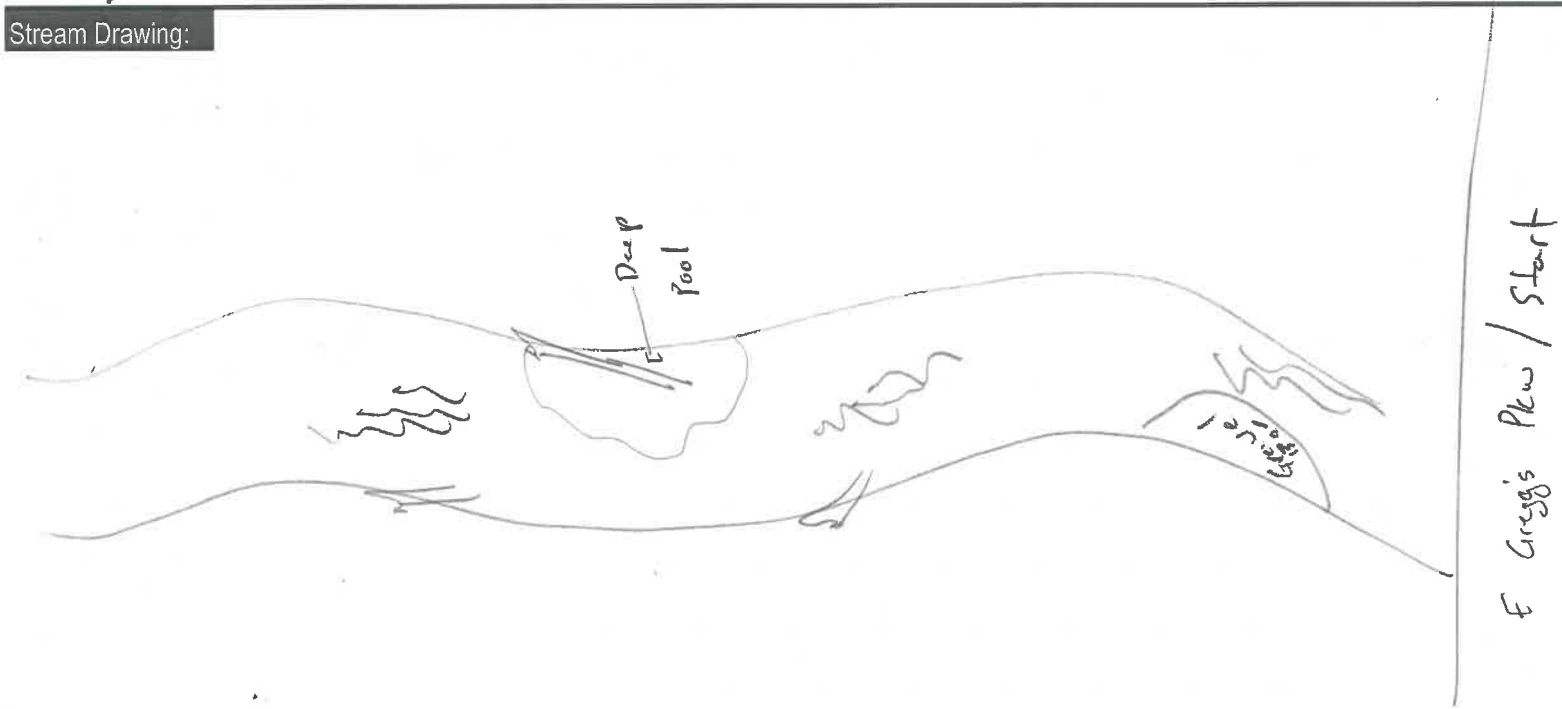
First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	F	150	Clear	Normal	30

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 53.5

River Code: 95-707 **RM:** 0.01 **Stream:** Kildeer Creek
Site Code: 15-4 **Project Code:** DRWW17 **Location:** Dst W Port Clinton Rd
Date: 8-23-17 **Scorer:** MAS **Latitude:** 42.20552 **Longitude:** -87.97471

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]	X	X
☐ ☐ -Lg BOULD [10]*			☑ ☐ -SAND [6]	X	X
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X		☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☑ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☐ -TILLS [1]
☑ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☑ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 4 (Max 20)

COMMENTS:

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

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

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: 15 (Max 20)

COMMENTS:

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

SINUOSITY: ☑ -HIGH [4] ☐ -MODERATE [3] ☐ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☑ -FAIR [3] ☐ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☑ -RECOVERED [4] ☐ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☑ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☑ -RELOCATION ☐ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 13 (Max 20)

COMMENTS:

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

RIPARIAN WIDTH (L R Per Bank)
- L☐ R☐ -VERY WIDE > 100m [5]
- L☐ R☐ -WIDE > 50m [4]
- L☐ R☐ -MODERATE 10 - 50m [3]
- L☑ R☐ -NARROW 5 - 10m [2]
- L☐ R☑ -VERY NARROW < 5m [1]
- L☐ R☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R Most Predominant Per Bank)
- ☐ ☐ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R Per Bank)
- ☐ ☐ -NONE / LITTLE [3]
- ☑ ☑ -MODERATE [2]
- ☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4.5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
- ☐ - 1m [6]
- ☑ - 0.7m [4]
- ☐ - 0.4 to 0.7m [2]
- ☐ - 0.2 to 0.4m [1]
- ☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☑ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE WIDTH [0]
- ☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- ☐ -EDDIES [1]
- ☐ -FAST [1]
- ☐ -MODERATE [1]
- ☑ -SLOW [1]
- ☐ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

Pool / Current: 6 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☑ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ☐ -NO RIFFLE but RUNS present [0]
- ☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 1 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 23.96 DRAINAGE AREA (sq.mi.): 6.8 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 10 (Max 10)

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

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☑ -Moderate ☐ -High

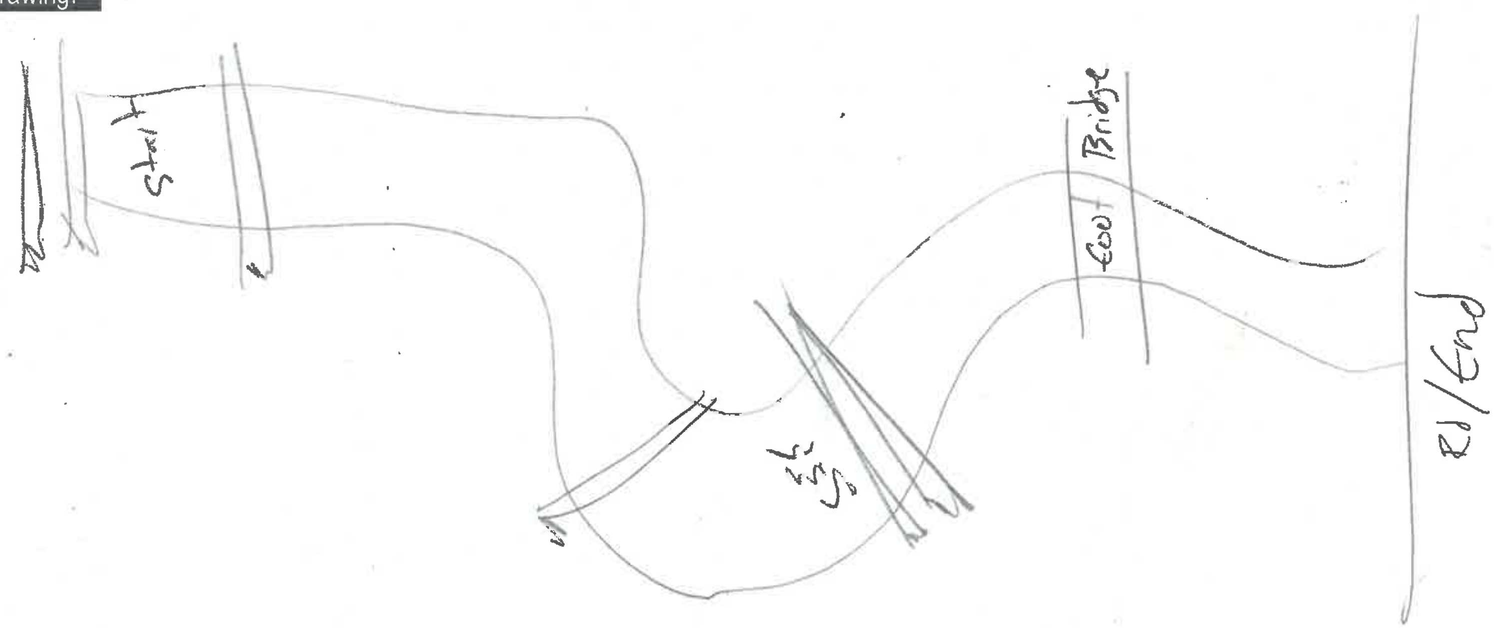
	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	E	156	Poor	Normal	5

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☑
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: Golf Course

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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 66.5

River Code: 95-706 RM: 5.40 Stream: Indian Creek
Site Code: 15-5 Project Code: D2WW17 Location: Dst. Checker Rd
Date: 8-25-17 Scorer: MRS Latitude: 42.21687 Longitude: -87.98594

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	X	X
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	✓
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X	X	☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☑ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 12 Max 20

COMMENTS:

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

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

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: 15 Max 20

COMMENTS:

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

SINUOSITY: ☐ -HIGH [4] ☑ -MODERATE [3] ☐ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☑ -FAIR [3] ☐ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☑ -RECOVERED [4] ☐ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☑ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☑ -RELOCATION ☑ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 12 Max 20

COMMENTS:

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

RIPARIAN WIDTH (L R, Per Bank): ☐☐ -VERY WIDE > 100m [5] ☐☐ -WIDE > 50m [4] ☐☐ -MODERATE 10 - 50m [3] ☑☑ -NARROW 5 - 10m [2] ☐☐ -VERY NARROW < 5m [1] ☐☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) (L R, Most Predominant Per Bank): ☐☐ -FOREST, SWAMP [3] ☐☐ -SHRUB OR OLD FIELD [2] ☑☑ -RESIDENTIAL, PARK, NEW FIELD [1] ☐☐ -FENCED PASTURE [1] ☐☐ -CONSERVATION TILLAGE [1] ☐☐ -URBAN OR INDUSTRIAL [0] ☐☐ -OPEN PASTURE, ROWCROP [0] ☐☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R, Per Bank): ☐☐ -NONE / LITTLE [3] ☑☑ -MODERATE [2] ☐☐ -HEAVY / SEVERE [1]

Riparian: 6 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!): ☑ - 1m [6] ☐ - 0.7m [4] ☐ - 0.4 to 0.7m [2] ☐ - 0.2 to 0.4m [1] ☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE): ☑ -POOL WIDTH > RIFFLE WIDTH [2] ☐ -POOL WIDTH = RIFFLE WIDTH [1] ☐ -POOL WIDTH < RIFFLE WIDTH [0] ☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply): ☐ -EDDIES [1] ☐ -FAST [1] ☐ -MODERATE [1] ☑ -SLOW [1] ☐ -NONE [-1] ☐ -TORRENTIAL [-1] ☐ -INTERSTITIAL [-1] ☐ -INTERMITTENT [-2] ☐ -VERY FAST [1]

Pool / Current: 9 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH: ☐ -*Best Areas > 10cm [2] ☑ -Best Areas 5 - 10cm [1] ☐ -Best Areas < 5cm [0] ☐ -NO RIFFLE but RUNS present [0] ☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 3.5 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 16.0 DRAINAGE AREA (sq.mi.): 17.26 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 10 Max 10

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10)	Aesthetic Rating (1-10)
6	6

Gradient: ☐ -Low ☑ -Moderate ☐ -High

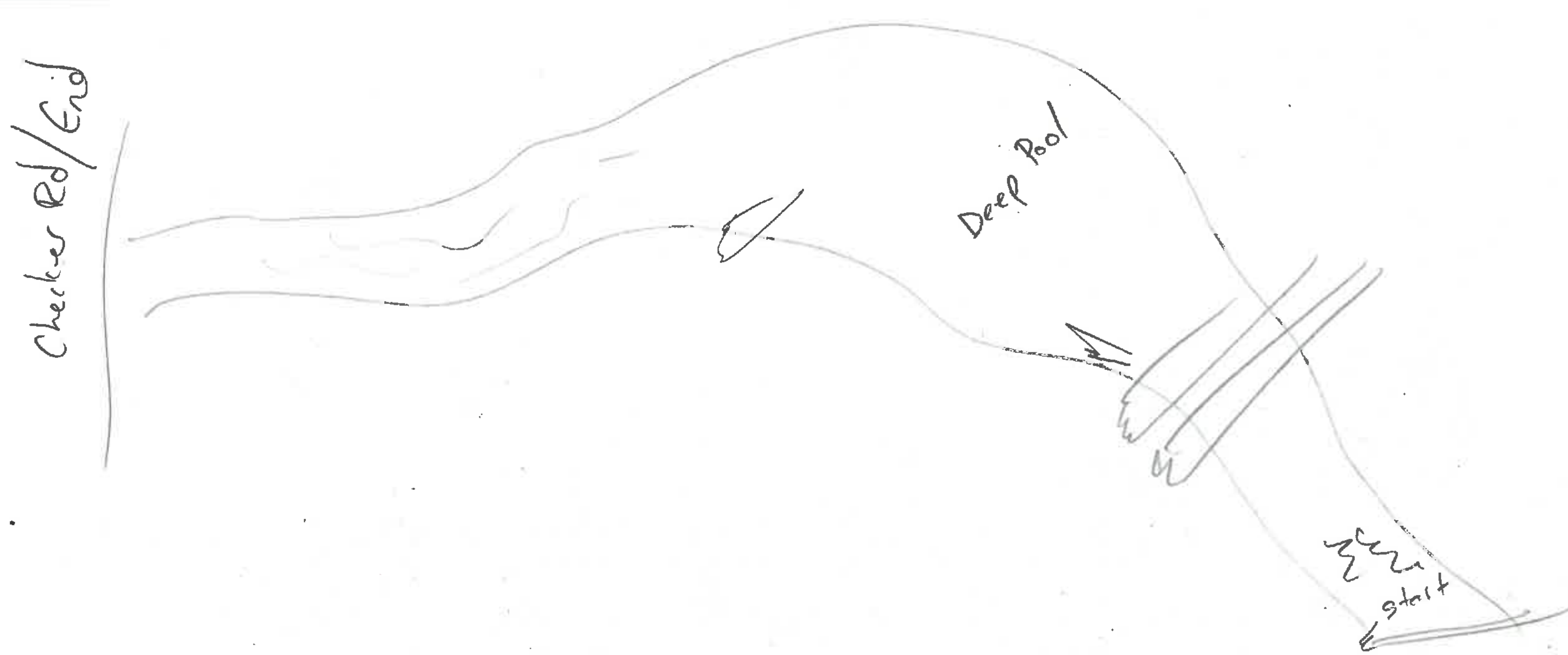
	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	E	150	Poor	Normal	60

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 59.5

River Code: 95-706 RM: 9.83 Stream: Indian Creek
Site Code: 15-6 Project Code: Dewwi7 Location: Dst. Washita Ave
Date: 8-22-17 Scorer: MAS Latitude: 42.23809 Longitude: -88.02249

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]		X
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]		X
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X		☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2] ☑ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☐ -EXTENSIVE [-2] ☑ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 14 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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)

COMMENTS:

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

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☑ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☑ -FAIR [3] ☐ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☑ -RECOVERED [4] ☐ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☑ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☑ -RELOCATION ☐ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 11 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☑ ☑ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) — L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☑ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☑ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☑ -MODERATE [1]
☑ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 4 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☑ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 1.5 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 21.94 DRAINAGE AREA (sq.mi.): 3.7

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

Gradient: 10 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 5

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	10

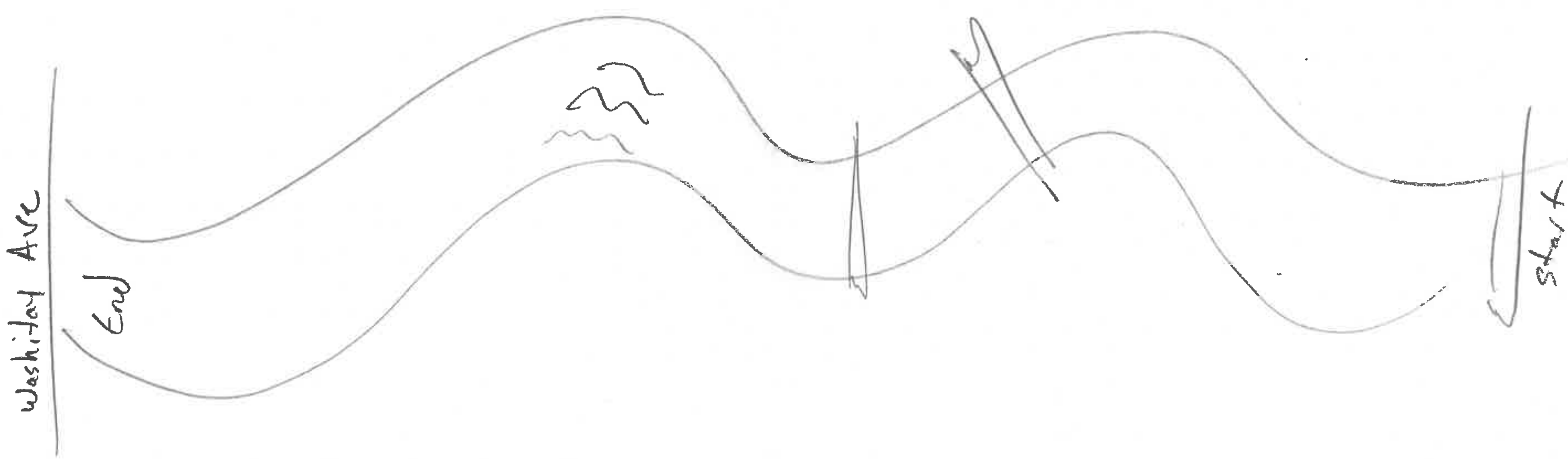
Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

Gradient: ☐ -Low ☑ -Moderate ☐ -High

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 48.5

River Code: 95-707 RM: 4.6 Stream: [redacted] Kildeer Creek
Site Code: 15-7 Project Code: DRWW17 Location: Ds. Salem Lake Dr
Date: 8-22-17 Scorer: MAS Latitude: 42.19294 Longitude: -88.02913

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]		X
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]		X
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X		☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☐ -TILLS [1]
☑ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☑ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 9 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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: 13 (Max 20)

COMMENTS:

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

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

MODIFICATIONS / OTHER
☐ -SNAGGING ☐ -IMPOUNDMENT
☐ -RELOCATION ☐ -ISLAND
☐ -CANOPY REMOVAL ☐ -LEVEED
☐ -DREDGING ☐ -BANK SHAPING
☐ -ONE SIDE CHANNEL MODIFICATIONS

Channel: 12 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☑ ☐ -MODERATE 10 - 50m [3]
☐ ☑ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) — L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 5.5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☑ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☑ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -TORRENTIAL [-1]
☐ -FAST [1] ☐ -INTERSTITIAL [-1]
☐ -MODERATE [1] ☐ -INTERMITTENT [-2]
☑ -SLOW [1] ☐ -VERY FAST [1]
☐ -NONE [-1]

Pool / Current: 4 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☑ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 1 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 40.83 DRAINAGE AREA (sq.mi.): 2.86 % POOL: % GLIDE:
% RIFFLE: % RUN:

Gradient: 4 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Is Sampling Reach Representative of the Stream? (Y/ N) ______

If Not, Explain: ______

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

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

- [ ] None
- [ ] Industrial
- [ ] WWTP
- [ ] Agriculture
- [ ] Livestock
- [ ] Silviculture
- [ ] Construction
- [x] Urban Runoff
- [ ] CSOs
- [x] Suburban Impacts
- [ ] Mining
- [ ] Channelization
- [ ] Riparian Removal
- [ ] Landfills
- [ ] Natural
- [ ] Dams
- [ ] Other Flow Alteration

Other: ______

Subjective Rating (1-10): 5

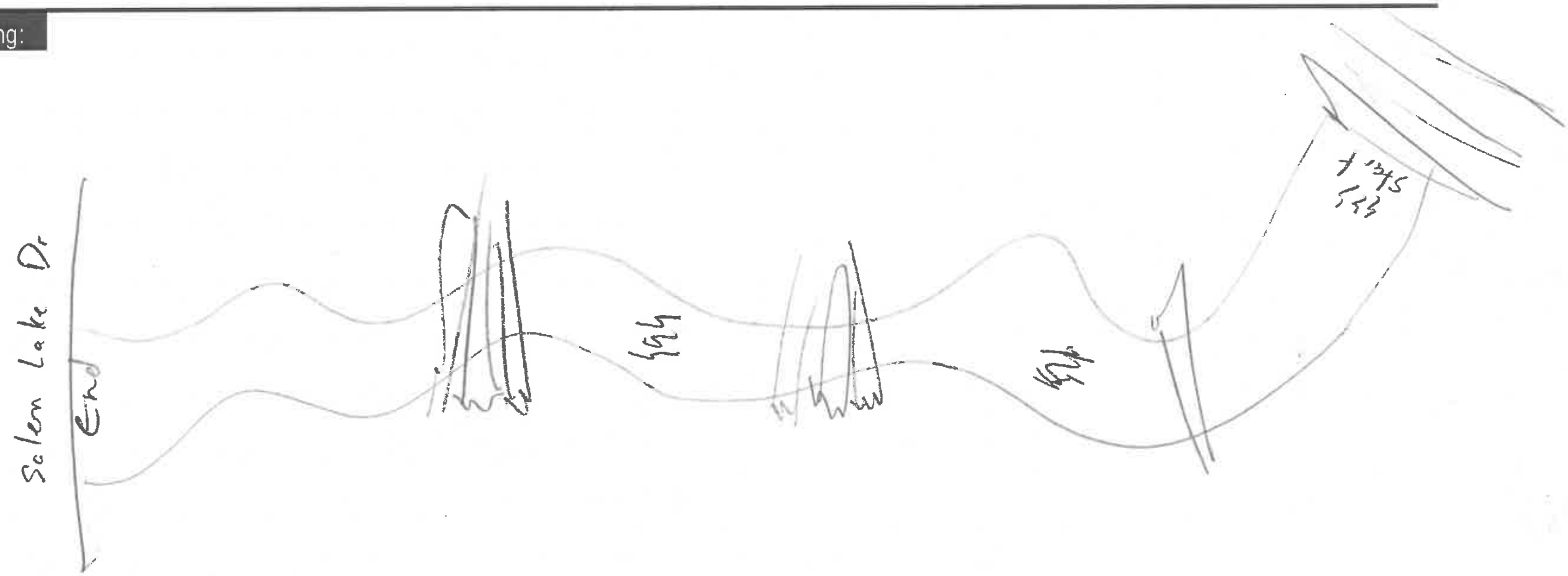
Aesthetic Rating (1-10): 3

First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	F	150	Poor	Normal	0

Yes	No	
[ ]	[x]	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
[x]	[ ]	Is there water upstream? How far:
[x]	[ ]	Is there water close downstream? How far:
[ ]	[x]	Is Dry Channel mostly natural?

Gradient:
- [ ] -Low
- [x] -Moderate
- [ ] -High

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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 55

River Code: 95-390 RM: 0.45 Stream: Seavy Drainage Ditch
Site Code: 15-8 Project Code: DRWW17 Location: Dst Vernon Hills Golf Course
Date: 8-23-17 Scorer: MAS Latitude: 42.21452 Longitude: -87.96537

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	X	
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	X
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☑ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☑ -SILT HEAVY [-2] ☑ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☑ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 10.5 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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)

COMMENTS:

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

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☐ -LOW [2] ☑ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☑ -FAIR [3] ☑ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☑ -RECOVERING [3] ☑ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☑ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☑ -RELOCATION ☑ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 9 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
☑ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☑ ☐ -MODERATE 10 - 50m [3]
☐ ☑ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) — L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 5.5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☑ - 0.4 to 0.7m [2]
☑ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☑ -POOL WIDTH = RIFFLE WIDTH [1]
☑ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☑ -MODERATE [1]
☑ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 5 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☑ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 1 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 16.843 DRAINAGE AREA (sq.mi.): 9.77 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 10 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 4

First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	E	150	Clear	Normal	40

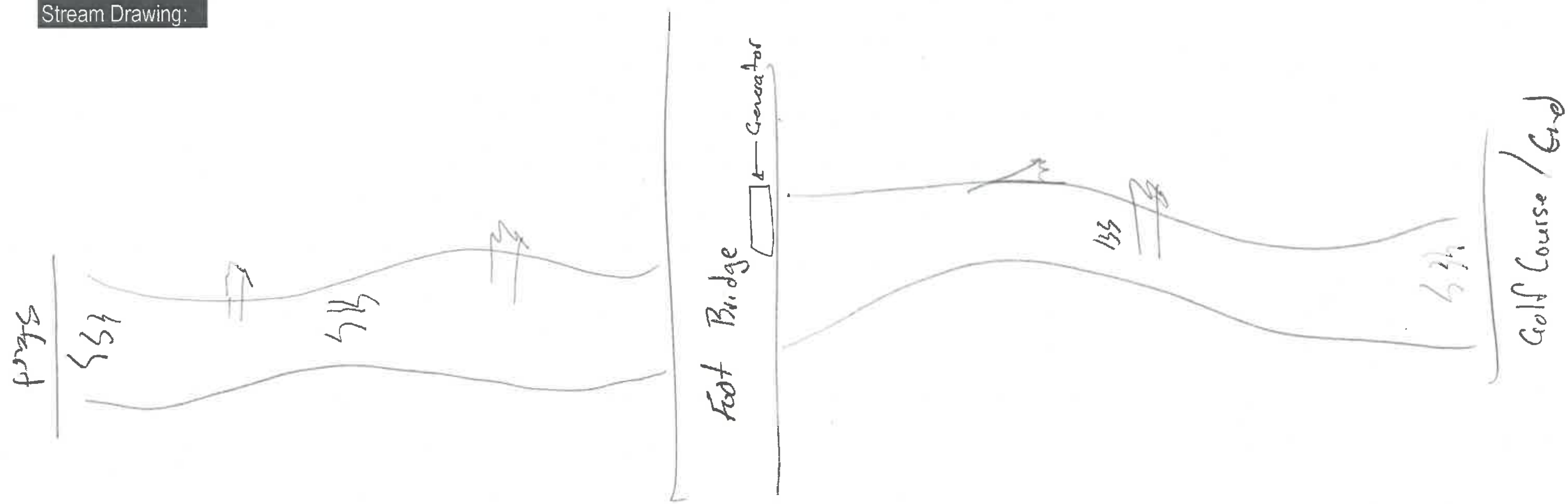
Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

Gradient: ☐ -Low ☑ -Moderate ☐ -High

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☑
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☑
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: Golf Course

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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

MBI Biodiversity Institute

QHEI Score: 55.5

River Code: 95-706 **RM:** 10.83 **Stream:** Indian Creek
Site Code: 15-9 **Project Code:** DRWW17 **Location:** Ust N Midlothian Rd
Date: 8-22-17 **Scorer:** MAS **Latitude:** 42.24460 **Longitude:** -88.03566

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
[ ] [ ] -BLDR/SLBS [10]			[ ] [x] -GRAVEL [7]	X	X
[ ] [ ] -Lg BOULD [10]			[x] [ ] -SAND [6]	X	✓
[ ] [ ] -BOULDER [9]			[ ] [ ] -BEDROCK [5]		
[ ] [ ] -COBBLE [8]			[ ] [ ] -DETRITUS [3]	X	
[ ] [ ] -HARDPAN [4]			[ ] [ ] -ARTIFICIAL [0]		
[ ] [ ] -MUCK [2]	X		[ ] [ ] -SILT [2]	X	

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

SUBSTRATE ORIGIN Check ONE (OR 2 & AVERAGE)
- [ ] -LIMESTONE [1]
- [x] -TILLS [1]
- [ ] -WETLANDS [0]
- [ ] -HARDPAN [0]
- [ ] -SANDSTONE [0]
- [ ] -RIP / RAP [0]
- [ ] -LACUSTRINE [0]
- [ ] -SHALE [-1]
- [ ] -COAL FINES [-2]

SUBSTRATE QUALITY Check ONE (OR 2 & AVERAGE)

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

EMBEDDEDNESS:
- [x] -EXTENSIVE [-2]
- [ ] -MODERATE [-1]
- [ ] -NORMAL [0]
- [ ] -NONE [1]

Substrate: 10 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 12 (Max 20)

COMMENTS:

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

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

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

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

STABILTIY
- [ ] -HIGH [3]
- [x] -MODERATE [2]
- [ ] -LOW [1]

MODIFICATIONS / OTHER
- [ ] -SNAGGING
- [x] -RELOCATION
- [ ] -CANOPY REMOVAL
- [ ] -DREDGING
- [ ] -ONE SIDE CHANNEL MODIFICATIONS
- [ ] -IMPOUNDMENT
- [ ] -ISLAND
- [ ] -LEVEED
- [ ] -BANK SHAPING

Channel: 13 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)
- [ ] [ ] -VERY WIDE > 100m [5]
- [ ] [x] -WIDE > 50m [4]
- [x] [ ] -MODERATE 10 - 50m [3]
- [ ] [ ] -NARROW 5 - 10m [2]
- [ ] [ ] -VERY NARROW < 5m [1]
- [ ] [ ] -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank)
- [ ] [ ] -FOREST, SWAMP [3]
- [ ] [ ] -SHRUB OR OLD FIELD [2]
- [x] [x] -RESIDENTIAL, PARK, NEW FIELD [1]
- [ ] [ ] -FENCED PASTURE [1]
- [ ] [ ] -CONSERVATION TILLAGE [1]
- [ ] [ ] -URBAN OR INDUSTRIAL [0]
- [ ] [ ] -OPEN PASTURE, ROWCROP [0]
- [ ] [ ] -MINING / CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
- [ ] [ ] -NONE / LITTLE [3]
- [x] [x] -MODERATE [2]
- [ ] [ ] -HEAVY / SEVERE [1]

Riparian: 6.5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
- [ ] - 1m [6]
- [ ] - 0.7m [4]
- [ ] - 0.4 to 0.7m [2]
- [x] - 0.2 to 0.4m [1]
- [ ] - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- [ ] -POOL WIDTH > RIFFLE WIDTH [2]
- [x] -POOL WIDTH = RIFFLE WIDTH [1]
- [ ] -POOL WIDTH < RIFFLE WIDTH [0]
- [ ] -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- [ ] -EDDIES [1]
- [ ] -FAST [1]
- [ ] -MODERATE [1]
- [x] -SLOW [1]
- [ ] -NONE [-1]
- [ ] -TORRENTIAL [-1]
- [ ] -INTERSTITIAL [-1]
- [ ] -INTERMITTENT [-2]
- [ ] -VERY FAST [1]

Pool / Current: 3 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- [ ] -*Best Areas > 10cm [2]
- [x] -Best Areas 5 - 10cm [1]
- [ ] -Best Areas < 5cm
- [ ] -NO Riffle but RUNS present [0]
- [ ] -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
- [ ] - MAX > 50 [2]
- [x] - MAX < 50 [1]

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

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

Riffle / Run: 1 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 22.55 DRAINAGE AREA (sq.mi.): 2.68

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

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

Gradient: 10 (Max 10)

6/29/2010

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

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

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

Other: ____

Subjective Rating (1-10): 5

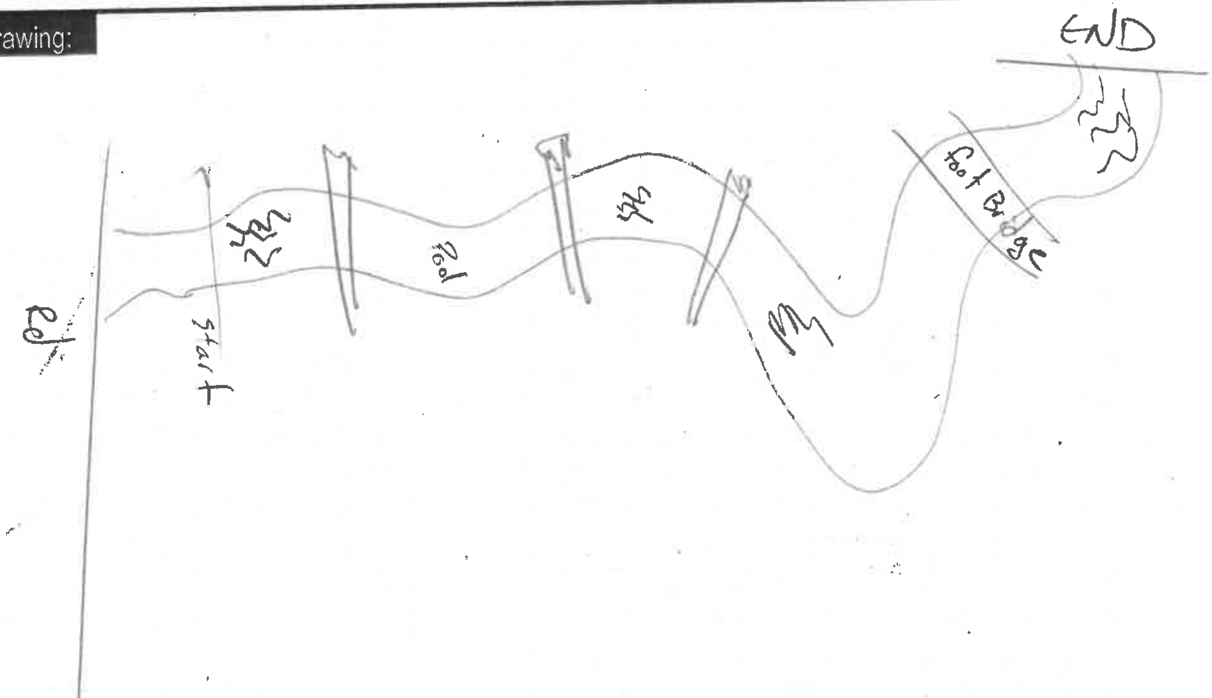
Aesthetic Rating (1-10): 6

Gradient: ☐ -Low ☑ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	10

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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 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.

MBI Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 58.5

River Code: 95-717 RM: 0.80 Stream: N Br. Indian Creek
Site Code: 15-16 Project Code: DRWW17 Location: Ust N Gilmer Rd
Date: 8-22-17 Scorer: MHS Latitude: 42.23023 Longitude: -88.03773

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	X	X
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	X
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X		☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2] ☑ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☐ -EXTENSIVE [-2] ☑ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 14 (Max 20)

COMMENTS:

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

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

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)

COMMENTS:

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

SINUOSITY: ☑ -HIGH [4] ☐ -MODERATE [3] ☐ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☑ -FAIR [3] ☐ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☑ -RECOVERED [4] ☐ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILITY: ☐ -HIGH [3] ☑ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☑ -RELOCATION ☐ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 13 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☑ ☑ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 6 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☑ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☑ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -FAST [1] ☐ -MODERATE [1] ☑ -SLOW [1] ☐ -NONE [-1]
☐ -TORRENTIAL [-1] ☐ -INTERSTITIAL [-1] ☐ -INTERMITTENT [-2] ☐ -VERY FAST [1]

Pool / Current: 4 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☑ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 0.5 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 34.19 DRAINAGE AREA (sq.mi.): 2.22 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 8 (Max 10)

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

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 5

Gradient: ☐ -Low ☑ -Moderate ☐ -High

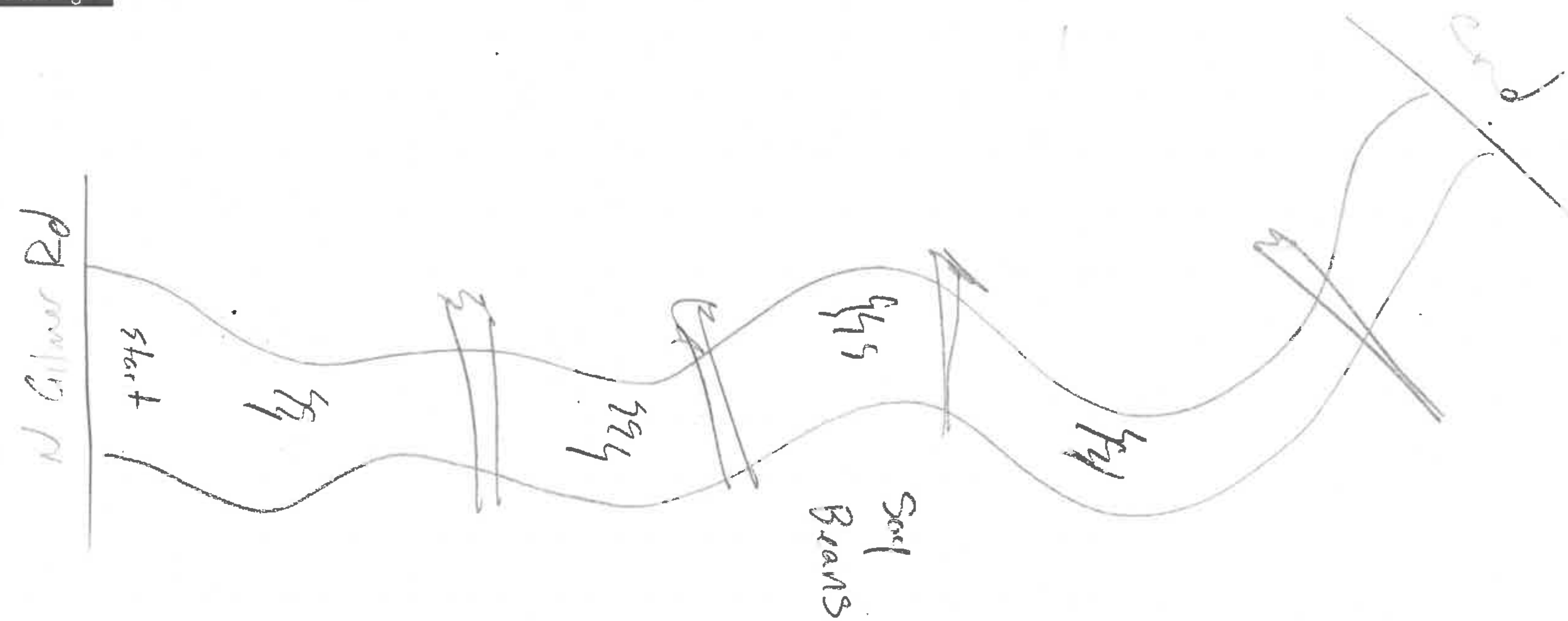
	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	0

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 48.25

River Code: 95-705 RM: 0.83 Stream: Forest Lake Drain
Site Code: 15-11 Project Code: DRWW17 Location: Ust. Hawthorn Grove Rd
Date: 8-27-17 Scorer: MAS Latitude: 42.21962 Longitude: -88.08873

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]	X	
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]	X	
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]	X	
☐ ☑ -HARDPAN [4]		✓	☐ ☐ -ARTIFICIAL [0]		
☑ ☐ -MUCK [2]	✓		☐ ☐ -SILT [2]	X	

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☐ -TILLS [1]
- ☑ -WETLANDS [0]
- ☐ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☐ -RIP / RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

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

COMMENTS:

Substrate: 7 (Max 20)

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

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

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

COMMENTS:

Cover: 11 (Max 20)

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

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

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

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

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

MODIFICATIONS / OTHER
- ☐ -SNAGGING
- ☑ -RELOCATION
- ☐ -CANOPY REMOVAL
- ☐ -DREDGING
- ☐ -ONE SIDE CHANNEL MODIFICATIONS
- ☐ -IMPOUNDMENT
- ☐ -ISLAND
- ☐ -LEVEED
- ☐ -BANK SHAPING

COMMENTS:

Channel: 11.5 (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
L R (Per Bank)
- ☑ ☐ -VERY WIDE > 100m [5]
- ☐ ☑ -WIDE > 50m [4]
- ☐ ☐ -MODERATE 10 - 50m [3]
- ☑ ☐ -NARROW 5 - 10m [2]
- ☐ ☐ -VERY NARROW < 5m [1]
- ☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
- ☐ ☐ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION
L R (Per Bank)
- ☐ ☐ -NONE / LITTLE [3]
- ☑ ☑ -MODERATE [2]
- ☐ ☐ -HEAVY / SEVERE [1]

COMMENTS:

Riparian: 6.75 (Max 10)

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
- ☐ - 1m [6]
- ☐ - 0.7m [4]
- ☐ - 0.4 to 0.7m [2]
- ☑ - 0.2 to 0.4m [1]
- ☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- ☑ -POOL WIDTH > RIFFLE WIDTH [2]
- ☐ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE WIDTH [0]
- ☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- ☐ -EDDIES [1]
- ☐ -FAST [1]
- ☐ -MODERATE [1]
- ☑ -SLOW [1]
- ☐ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

COMMENTS:

Pool / Current: 4 (Max 12)

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☑ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ☐ -NO RIFFLE but RUNS present [0]
- ☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

COMMENTS:

Riffle / Run: 5 (Max 8)

6.) GRADIENT (ft / mi): 38.51 DRAINAGE AREA (sq.mi.): 1.7

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

Gradient: 8 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☑ -Moderate ☐ -High

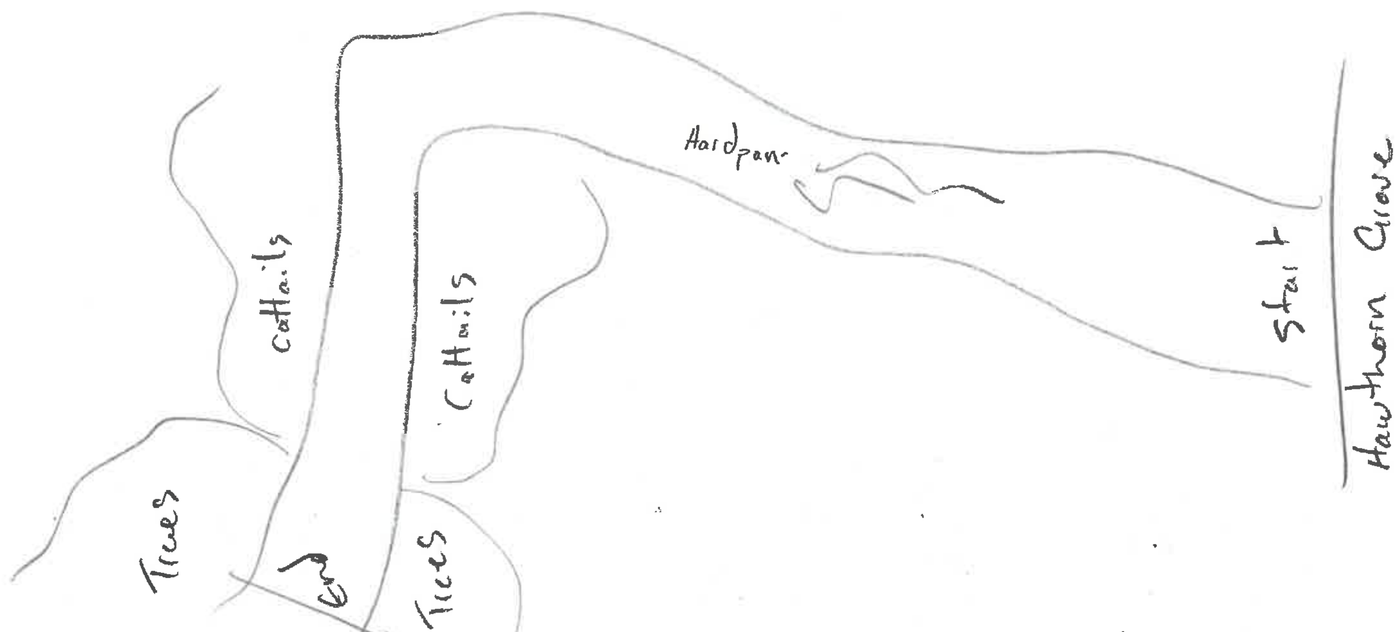
	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	50

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 41.5

River Code: 95-707 RM: 5.2 Stream: Kildeer Creek
Site Code: 15-12 Project Code: DRWW17 Location: D/S Half Day Rd.
Date: 8-24-17 Scorer: MAS Latitude: 42.19623 Longitude: -88.0396

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]	X	X	Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	X	☐ -LIMESTONE [1]	SILT: ☑ -SILT HEAVY [-2]
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]			☐ -TILLS [1]	☐ -SILT MODERATE [-1]
☐ ☐ -COBBLE [8]	X		☐ ☐ -DETRITUS [3]	X		☑ -WETLANDS [0]	☐ -SILT NORMAL [0]
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]			☐ -HARDPAN [0]	☐ -SILT FREE [1]
☐ ☑ -MUCK [2]	X		☐ ☐ -SILT [2]	X		☐ -SANDSTONE [0]	EMBEDDEDNESS: ☑ -EXTENSIVE [-2]
						☐ -RIP / RAP [0]	☐ -MODERATE [-1]
						☐ -LACUSTRINE [0]	☐ -NORMAL [0]
						☐ -SHALE [-1]	☐ -NONE [1]
						☐ -COAL FINES [-2]	

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

COMMENTS:

Substrate: 4 (Max 20)

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

(Structure) TYPE: Score All That Occur

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

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

COMMENTS:

Cover: 11 (Max 20)

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS / OTHER	
☐ -HIGH [4]	☐ -EXCELLENT [7]	☐ -NONE [6]	☐ -HIGH [3]	☐ -SNAGGING	☐ -IMPOUNDMENT
☐ -MODERATE [3]	☐ -GOOD [5]	☑ -RECOVERED [4]	☑ -MODERATE [2]	☑ -RELOCATION	☐ -ISLAND
☑ -LOW [2]	☑ -FAIR [3]	☐ -RECOVERING [3]	☐ -LOW [1]	☐ -CANOPY REMOVAL	☐ -LEVEED
☐ -NONE [1]	☐ -POOR [1]	☐ -RECENT OR NO RECOVERY [1]		☐ -DREDGING	☐ -BANK SHAPING
		☐ -IMPOUNDED [-1]		☐ -ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS:

Channel: 11 (Max 20)

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

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

COMMENTS:

Riparian: 4.5 (Max 10)

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☑ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☑ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -TORRENTIAL [-1]
☐ -FAST [1] ☐ -INTERSTITIAL [-1]
☐ -MODERATE [1] ☐ -INTERMITTENT [-2]
☑ -SLOW [1] ☐ -VERY FAST [1]
☐ -NONE [-1]

COMMENTS:

Pool / Current: 7 (Max 12)

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☑ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

COMMENTS:

Riffle / Run: 0 (Max 8)

6.) GRADIENT (ft / mi): 43.04 DRAINAGE AREA (sq.mi.): 2.08 % POOL: ___ % GLIDE: ___ % RIFFLE: ___ % RUN: ___

Gradient: 4 (Max 10)

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

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☑
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: ____

Subjective Rating (1-10): 5

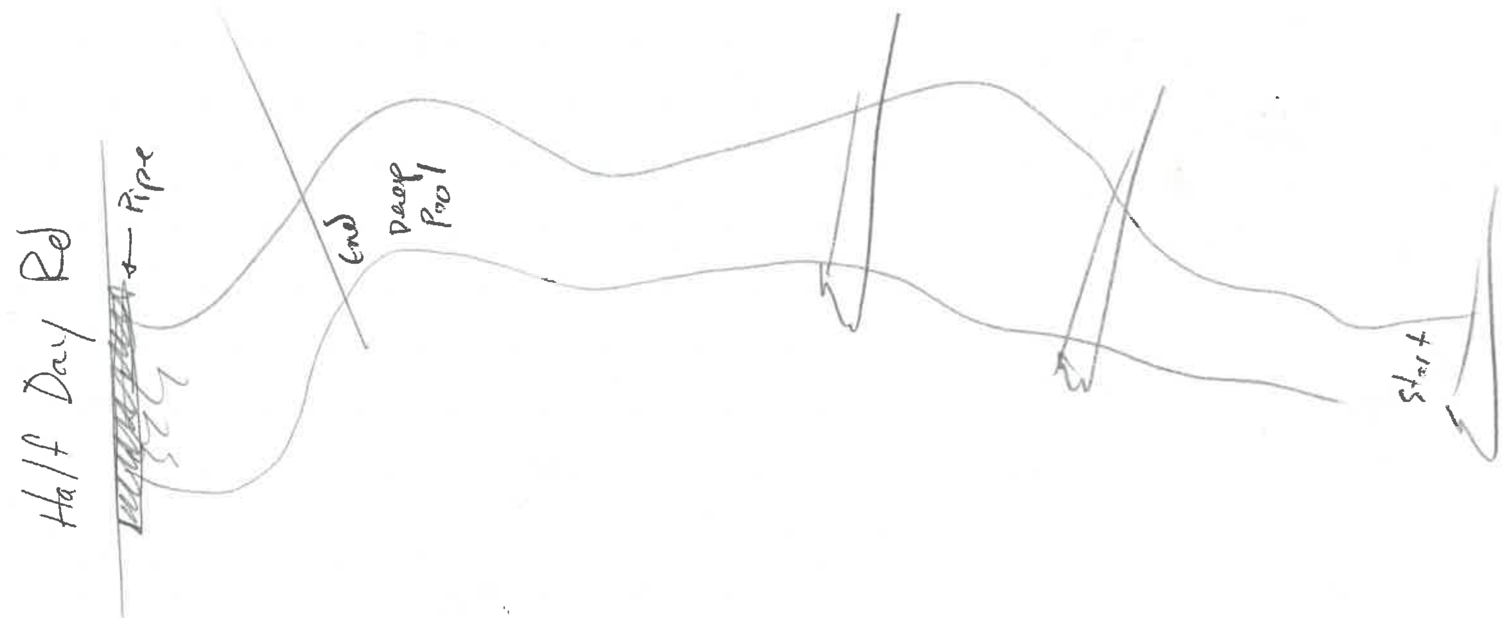
Aesthetic Rating (1-10): 5

Gradient: ☐ -Low ☑ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	15

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 61

River Code: 95-707 **RM:** 2.21 **Stream:** Kildeer Creek
Site Code: 15-13 **Project Code:** DRWWI17 **Location:** Willow Brook Rd
Date: 8-24-17 **Scorer:** MAS **Latitude:** 42.19359 **Longitude:** -88.00020

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	X	X
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☑ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 10 — Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

COMMENTS:

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

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

MODIFICATIONS / OTHER
☐ -SNAGGING ☐ -IMPOUNDMENT
☑ -RELOCATION ☐ -ISLAND
☐ -CANOPY REMOVAL ☐ -LEVEED
☐ -DREDGING ☐ -BANK SHAPING
☐ -ONE SIDE CHANNEL MODIFICATIONS

Channel: 13 — Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH (L R, Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☑ ☑ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R, Most Predominant Per Bank)
☑ ☑ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R, Per Bank)
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 8 — Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☑ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☑ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -TORRENTIAL [-1]
☐ -FAST [1] ☐ -INTERSTITIAL [-1]
☑ -MODERATE [1] ☐ -INTERMITTENT [-2]
☑ -SLOW [1] ☐ -VERY FAST [1]
☐ -NONE [-1]

Pool / Current: 6 — Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☑ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 2 — Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 31.36 DRAINAGE AREA (sq.mi.): 5.01

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

Gradient: 8 — Max 10

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

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

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

Other: ____

Subjective Rating (1-10): 5

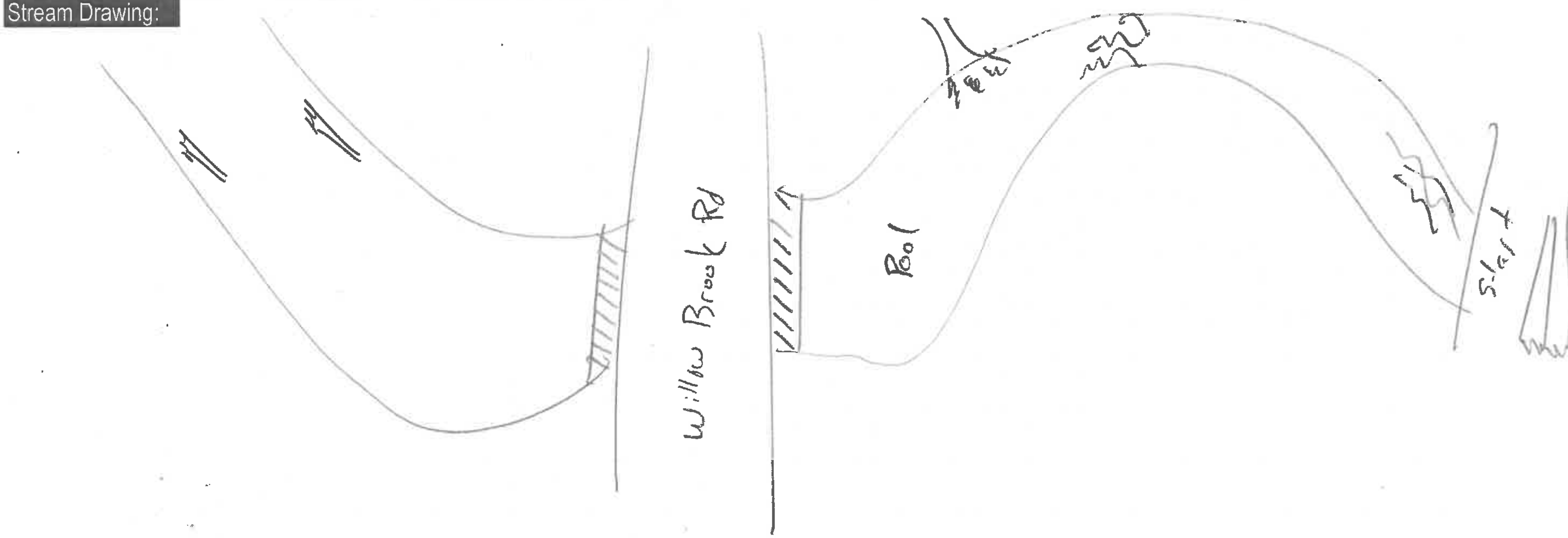
Aesthetic Rating (1-10): 5

Gradient: ☐ -Low ☑ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Poor	Normal	20

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 46.5

River Code: 95-703 **RM:** 0.75 **Stream:** Buffalo Creek
Site Code: 17-1 **Project Code:** DRWW17 **Location:** Ust Wolf Rd
Date: 8-23-17 **Scorer:** MAS **Latitude:** 42.12674 **Longitude:** -87.90836

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	X	X
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	X
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X		☐ ☐ -DETRITUS [3]		
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☑ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 12 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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: 11 (Max 20)

COMMENTS:

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

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

MODIFICATIONS / OTHER
☐ -SNAGGING ☐ -IMPOUNDMENT
☑ -RELOCATION ☐ -ISLAND
☐ -CANOPY REMOVAL ☐ -LEVEED
☐ -DREDGING ☐ -BANK SHAPING
☐ -ONE SIDE CHANNEL MODIFICATIONS

Channel: 6 (Max 20)

COMMENTS:

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

RIPARIAN WIDTH — L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☑ ☑ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) — L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
☑ ☑ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4.5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☑ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☑ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -TORRENTIAL [-1]
☐ -FAST [1] ☐ -INTERSTITIAL [-1]
☐ -MODERATE [1] ☐ -INTERMITTENT [-2]
☑ -SLOW [1] ☐ -VERY FAST [1]
☐ -NONE [-1]

Pool / Current: 3 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☑ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 0 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 15.83 **DRAINAGE AREA (sq.mi.):** 29.14 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 10 (Max 10)

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

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 4

Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☑ -Moderate ☐ -High

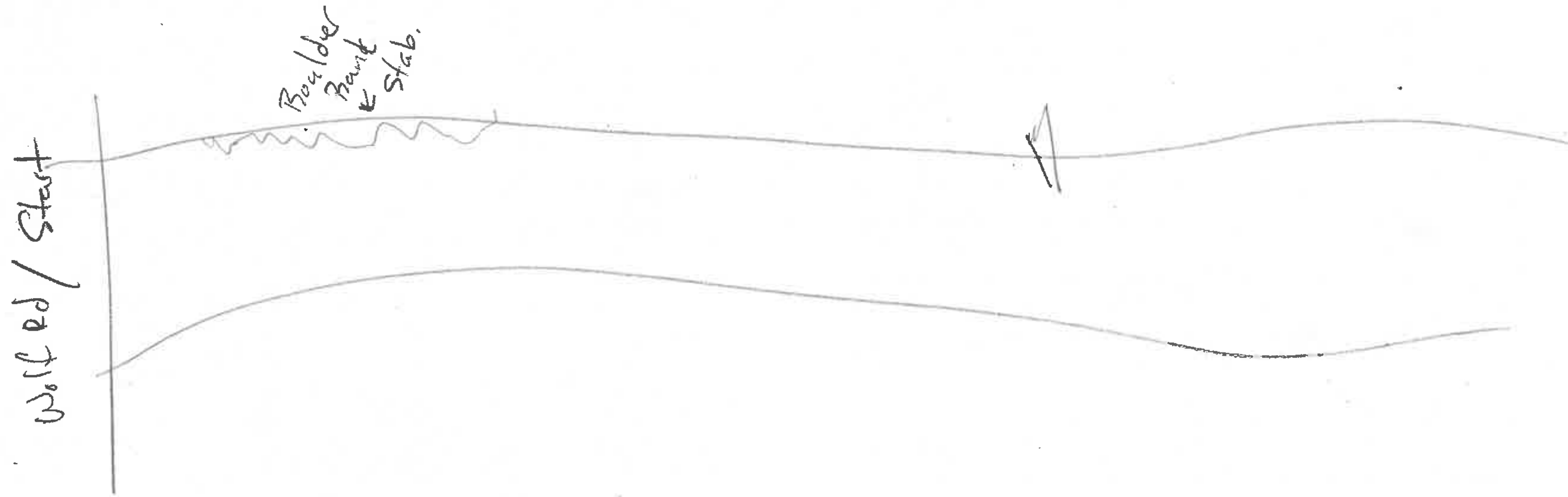
First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	E	150	Clear	Normal	100

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 64.25

River Code: 95-703 **RM:** 6.1 **Stream:** Buffalo Creek
Site Code: 17-2 **Project Code:** DRUWIT **Location:** Ust W Lake Cook Rd
Date: 8-23-17 **Scorer:** MAS **Latitude:** 42.15218 **Longitude:** -87.96141

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☑ ☐ -GRAVEL [7]	X	X
☐ ☐ -Lg BOULD [10]			☐ ☑ -SAND [6]	X	
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X	X	☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2] ☑ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☐ -EXTENSIVE [-2] ☑ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 14 (Max 20)

COMMENTS:

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

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

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: 17 (Max 20)

COMMENTS:

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

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

MODIFICATIONS / OTHER
☐ -SNAGGING ☐ -IMPOUNDMENT
☐ -RELOCATION ☐ -ISLAND
☐ -CANOPY REMOVAL ☐ -LEVEED
☐ -DREDGING ☐ -BANK SHAPING
☐ -ONE SIDE CHANNEL MODIFICATIONS

Channel: 12 (Max 20)

COMMENTS:

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

RIPARIAN WIDTH (L R, Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☑ ☑ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R, Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R, Per Bank)
☑ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4.25 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX DEPTH (Check 1 ONLY!)
☐ -1m [6]
☑ -0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☑ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -TORRENTIAL [-1]
☐ -FAST [1] ☐ -INTERSTITIAL [-1]
☑ -MODERATE [1] ☐ -INTERMITTENT [-2]
☑ -SLOW [1] ☐ -VERY FAST [1]
☐ -NONE [-1]

Pool / Current: 4 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas >10cm [2]
☐ -Best Areas 5 - 10cm [1]
☑ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 0 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 17.25 DRAINAGE AREA (sq.mi.): 22.1 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 10 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Is Sampling Reach Representative of the Stream? (Y/ N) ______

If Not, Explain: ______

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

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

- [ ] None
- [ ] Industrial
- [ ] WWTP
- [ ] Agriculture
- [ ] Livestock
- [ ] Silviculture
- [ ] Construction
- [x] Urban Runoff
- [ ] CSOs
- [x] Suburban Impacts
- [ ] Mining
- [x] Channelization
- [x] Riparian Removal
- [ ] Landfills
- [ ] Natural
- [ ] Dams
- [ ] Other Flow Alteration

Other: Golf Course

Subjective Rating (1-10): 5

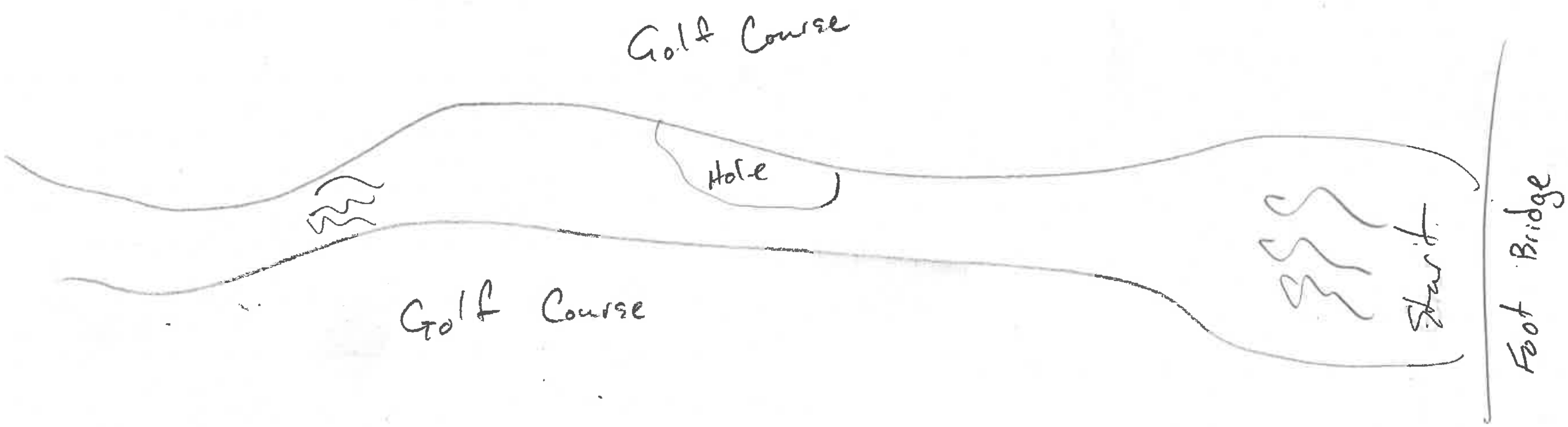
Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☑ -Moderate ☐ -High

First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	E	150	Clear	Normal	80

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 57.5

River Code: 95-713 **RM:** 0.68 **Stream:** Buffalo Creek Tributary
Site Code: 17-4 **Project Code:** DRWW 17 **Location:** U/S Lake Cook Rd
Date: 8-23-17 **Scorer:** MAS **Latitude:** 42.15328 **Longitude:** -87.99660

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	✓	
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]	X	
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X		☐ ☐ -DETRITUS [3]	X	
☑ ☐ -HARDPAN [4]		X	☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☐ -WETLANDS [0]
☑ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY Check ONE (OR 2 & AVERAGE)
SILT: ☑ -SILT HEAVY [-2] ☑ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☑ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 10.5 (Max 20)

COMMENTS:

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

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

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: 13 (Max 20)

COMMENTS:

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

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☑ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☑ -FAIR [3] ☐ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☑ -RECOVERED [4] ☐ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☑ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☑ -RELOCATION ☐ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 11 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☑ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)* L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☑ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☑ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -FAST [1] ☐ -MODERATE [1] ☑ -SLOW [1] ☐ -NONE [-1]
☐ -TORRENTIAL [-1] ☐ -INTERSTITIAL [-1] ☐ -INTERMITTENT [-2] ☐ -VERY FAST [1]

Pool / Current: 8 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☑ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 1 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 20.09 DRAINAGE AREA (sq.mi.): 8.55 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 10 (Max 10)

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

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 5

Gradient: ☐ -Low ☑ -Moderate ☐ -High

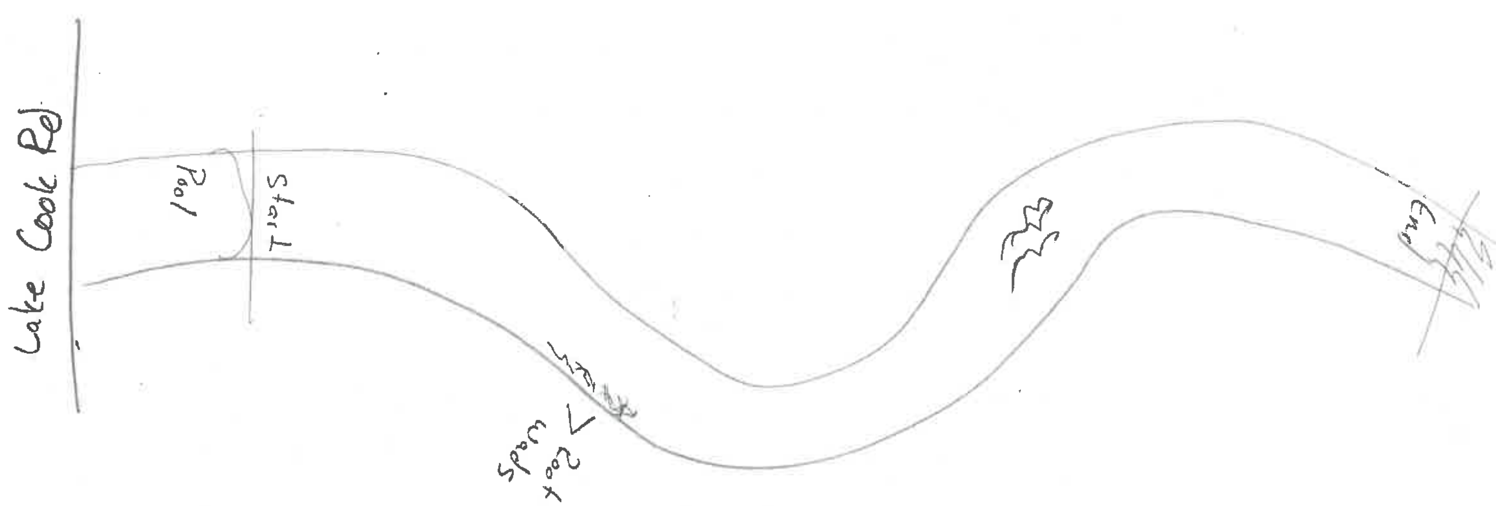
First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	E	150	Clear	Normal	25

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 63

River Code: 95-703 **RM:** 14.0 **Stream:** ~~[illegible]~~ Buffalo Creek
Site Code: 17-5 **Project Code:** DRWW17 **Location:** Ust Quentin Rd
Date: 8-22-17 **Scorer:** MAS **Latitude:** 42.18587 **Longitude:** -88.05817

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
[ ] [ ] -BLDR/SLBS [10]			[ ] [x] -GRAVEL [7]	X	
[ ] [ ] -Lg BOULD [10]			[x] [ ] -SAND [6]	X	
[ ] [ ] -BOULDER [9]	X	X	[ ] [ ] -BEDROCK [5]		
[ ] [ ] -COBBLE [8]	X	X	[ ] [ ] -DETRITUS [3]	X	
[ ] [ ] -HARDPAN [4]			[ ] [ ] -ARTIFICIAL [0]		
[ ] [ ] -MUCK [2]	X		[ ] [ ] -SILT [2]	X	

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

SUBSTRATE ORIGIN Check ONE (OR 2 & AVERAGE)
- [ ] -LIMESTONE [1]
- [x] -TILLS [1]
- [ ] -WETLANDS [0]
- [ ] -HARDPAN [0]
- [ ] -SANDSTONE [0]
- [ ] -RIP / RAP [0]
- [ ] -LACUSTRINE [0]
- [ ] -SHALE [-1]
- [ ] -COAL FINES [-2]

SUBSTRATE QUALITY Check ONE (OR 2 & AVERAGE)

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

EMBEDDEDNESS:
- [ ] -EXTENSIVE [-2]
- [x] -MODERATE [-1]
- [ ] -NORMAL [0]
- [ ] -NONE [1]

Substrate: 14 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 14 (Max 20)

COMMENTS:

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

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

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

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

STABILTIY
- [ ] -HIGH [3]
- [x] -MODERATE [2]
- [ ] -LOW [1]

MODIFICATIONS / OTHER
- [ ] -SNAGGING
- [x] -RELOCATION
- [ ] -CANOPY REMOVAL
- [ ] -DREDGING
- [ ] -ONE SIDE CHANNEL MODIFICATIONS
- [ ] -IMPOUNDMENT
- [ ] -ISLAND
- [ ] -LEVEED
- [ ] -BANK SHAPING

Channel: 14 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)
- [ ] [ ] -VERY WIDE > 100m [5]
- [ ] [ ] -WIDE > 50m [4]
- [ ] [ ] -MODERATE 10 - 50m [3]
- [x] [x] -NARROW 5 - 10m [2]
- [ ] [ ] -VERY NARROW < 5m [1]
- [ ] [ ] -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) L R (Most Predominant Per Bank)
- [ ] [ ] -FOREST, SWAMP [3]
- [ ] [ ] -SHRUB OR OLD FIELD [2]
- [x] [x] -RESIDENTIAL, PARK, NEW FIELD [1]
- [ ] [ ] -FENCED PASTURE [1]
- [ ] [ ] -CONSERVATION TILLAGE [1]
- [ ] [ ] -URBAN OR INDUSTRIAL [0]
- [ ] [ ] -OPEN PASTURE, ROWCROP [0]
- [ ] [ ] -MINING / CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
- [ ] [ ] -NONE / LITTLE [3]
- [x] [x] -MODERATE [2]
- [ ] [ ] -HEAVY / SEVERE [1]

Riparian: 5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
- [ ] - 1m [6]
- [ ] - 0.7m [4]
- [x] - 0.4 to 0.7m [2]
- [ ] - 0.2 to 0.4m [1]
- [ ] - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- [ ] -POOL WIDTH > RIFFLE WIDTH [2]
- [x] -POOL WIDTH = RIFFLE WIDTH [1]
- [ ] -POOL WIDTH < RIFFLE WIDTH [0]
- [ ] -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- [ ] -EDDIES [1]
- [ ] -FAST [1]
- [ ] -MODERATE [1]
- [x] -SLOW [1]
- [ ] -NONE [-1]
- [ ] -TORRENTIAL [-1]
- [ ] -INTERSTITIAL [-1]
- [ ] -INTERMITTENT [-2]
- [ ] -VERY FAST [1]

Pool / Current: 4 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- [ ] -*Best Areas > 10cm [2]
- [x] -Best Areas 5 - 10cm [1]
- [ ] -Best Areas < 5cm [0]
- [ ] -NO RIFFLE but RUNS present [0]
- [ ] -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
- [ ] - MAX > 50 cm [2]
- [x] - MAX < 50 cm [1]

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

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

Riffle / Run: 4 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 38.18 DRAINAGE AREA (sq.mi.): 1.37 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 8 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 5

Gradient: ☐ -Low ☑ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	0

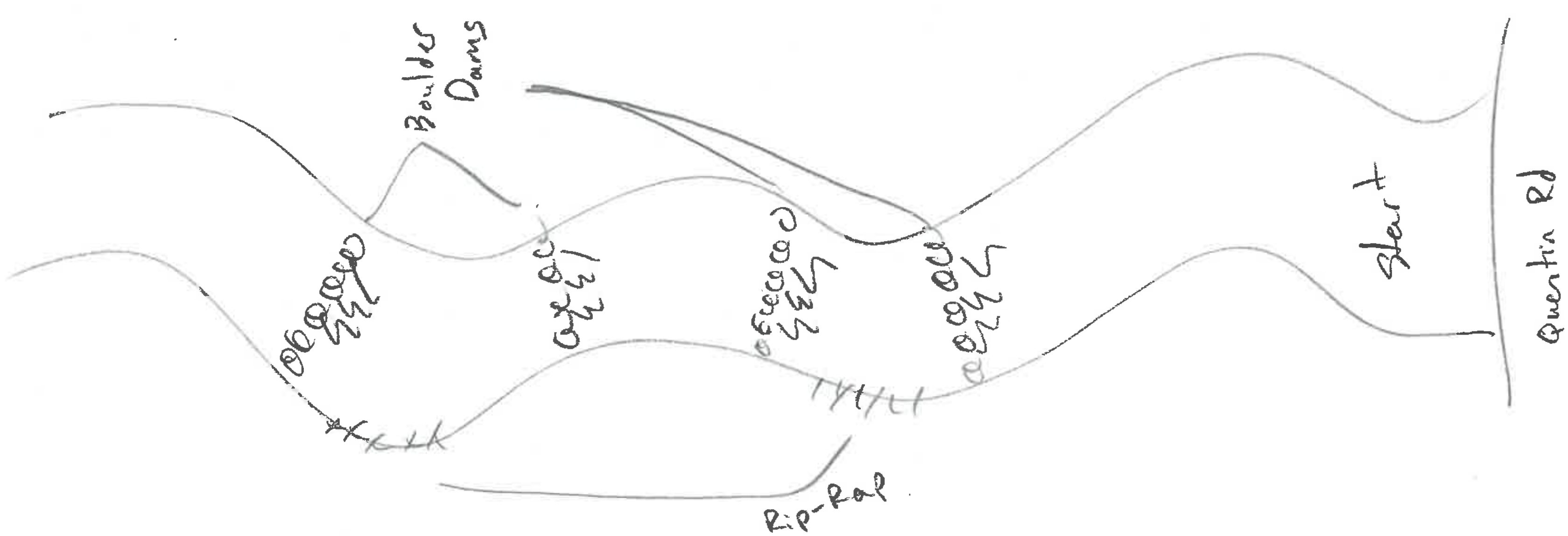
Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 48

River Code: 95-701 **RM:** 0.50 **Stream:** Aptakisic Creek
Site Code: 18-1 **Project Code:** DRWW17 **Location:** Dst WWTP
Date: 8-25-17 **Scorer:** MAS **Latitude:** 42.16349 **Longitude:** -87.92248

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
[ ] [ ] -BLDR/SLBS [10]			[ ] [ ] -GRAVEL [7]	X	
[ ] [ ] -Lg BOULD [10]			[ ] [x] -SAND [6]	X	
[ ] [ ] -BOULDER [9]	X		[ ] [ ] -BEDROCK [5]		
[ ] [ ] -COBBLE [8]	X		[ ] [ ] -DETRITUS [3]		
[x] [ ] -HARDPAN [4]			[ ] [ ] -ARTIFICIAL [0]	X	
[ ] [ ] -MUCK [2]			[ ] [ ] -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
[ ] -LIMESTONE [1]
[x] -TILLS [1]
[ ] -WETLANDS [0]
[ ] -HARDPAN [0]
[ ] -SANDSTONE [0]
[ ] -RIP / RAP [0]
[ ] -LACUSTRINE [0]
[ ] -SHALE [-1]
[ ] -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: [x] -SILT HEAVY [-2] [ ] -SILT MODERATE [-1] [ ] -SILT NORMAL [0] [ ] -SILT FREE [1]
EMBEDDEDNESS: [x] -EXTENSIVE [-2] [ ] -MODERATE [-1] [ ] -NORMAL [0] [ ] -NONE [1]

Substrate: 9 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 14 (Max 20)

COMMENTS:

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

SINUOSITY: [ ] -HIGH [4] [ ] -MODERATE [3] [ ] -LOW [2] [x] -NONE [1]
DEVELOPMENT: [ ] -EXCELLENT [7] [ ] -GOOD [5] [ ] -FAIR [3] [x] -POOR [1]
CHANNELIZATION: [ ] -NONE [6] [ ] -RECOVERED [4] [ ] -RECOVERING [3] [x] -RECENT OR NO RECOVERY [1] [ ] -IMPOUNDED [-1]
STABILTIY: [x] -HIGH [3] [ ] -MODERATE [2] [ ] -LOW [1]
MODIFICATIONS / OTHER: [ ] -SNAGGING [x] -RELOCATION [x] -CANOPY REMOVAL [ ] -DREDGING [ ] -ONE SIDE CHANNEL MODIFICATIONS [ ] -IMPOUNDMENT [ ] -ISLAND [x] -LEVEED [x] -BANK SHAPING

Channel: 6 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
[ ] [ ] -VERY WIDE > 100m [5]
[ ] [ ] -WIDE > 50m [4]
[ ] [ ] -MODERATE 10 - 50m [3]
[ ] [x] -NARROW 5 - 10m [2]
[x] [ ] -VERY NARROW < 5m [1]
[ ] [ ] -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) — L R (Most Predominant Per Bank)
[ ] [ ] -FOREST, SWAMP [3]
[ ] [ ] -SHRUB OR OLD FIELD [2]
[x] [x] -RESIDENTIAL, PARK, NEW FIELD [1]
[ ] [ ] -FENCED PASTURE [1]
[ ] [ ] -CONSERVATION TILLAGE [1]
[ ] [ ] -URBAN OR INDUSTRIAL [0]
[ ] [ ] -OPEN PASTURE, ROWCROP [0]
[ ] [ ] -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
[ ] [x] -NONE / LITTLE [3]
[x] [ ] -MODERATE [2]
[ ] [ ] -HEAVY / SEVERE [1]

Riparian: 5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
[ ] - 1m [6]
[x] - 0.7m [4]
[ ] - 0.4 to 0.7m [2]
[ ] - 0.2 to 0.4m [1]
[ ] - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
[ ] -POOL WIDTH > RIFFLE WIDTH [2]
[x] -POOL WIDTH = RIFFLE WIDTH [1]
[ ] -POOL WIDTH < RIFFLE WIDTH [0]
[ ] -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
[ ] -EDDIES [1]
[ ] -FAST [1]
[ ] -MODERATE [1]
[x] -SLOW [1]
[ ] -NONE [-1]
[ ] -TORRENTIAL [-1]
[ ] -INTERSTITIAL [-1]
[ ] -INTERMITTENT [-2]
[ ] -VERY FAST [1]

Pool / Current: 6 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
[ ] -*Best Areas > 10cm [2]
[ ] -Best Areas 5 - 10cm [1]
[ ] -Best Areas < 5cm [0]
[ ] -NO RIFFLE but RUNS present [0]
[x] -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
[ ] - MAX > 50 cm [2]
[ ] - MAX < 50 cm [1]

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

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

Riffle / Run: 0 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 10.37 DRAINAGE AREA (sq.mi.): 5.5

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

Gradient: 8 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 4

Aesthetic Rating (1-10): 3

Gradient: ☐ -Low ☑ -Moderate ☐ -High

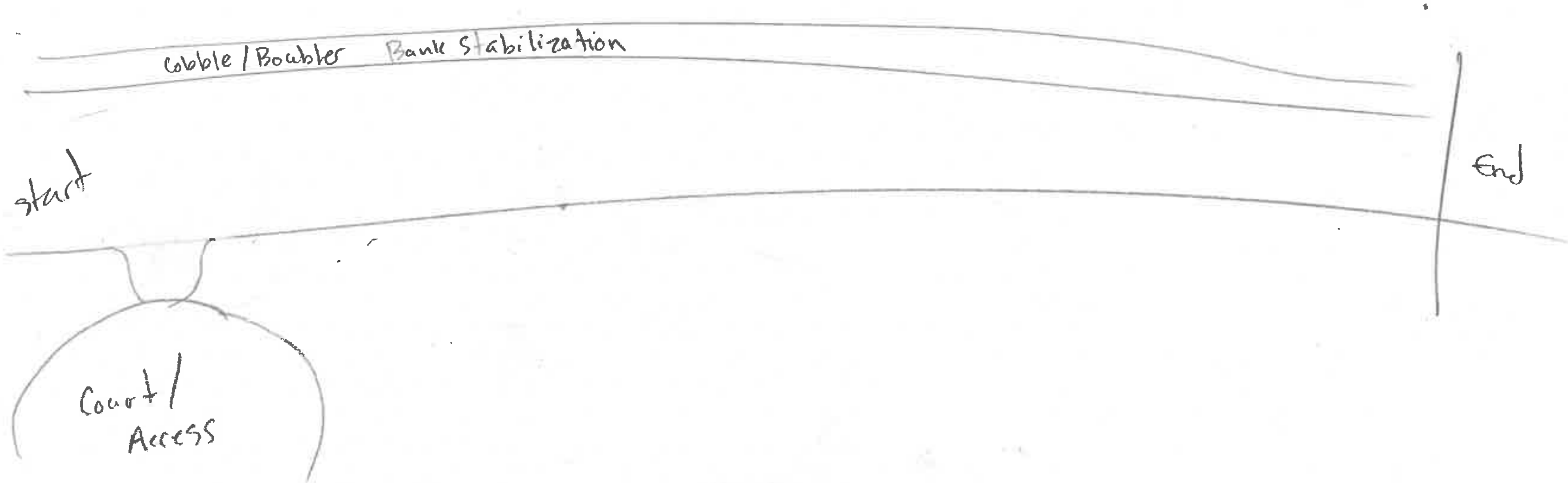
	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	D	200	Clear	Normal	100

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☑
- Agriculture ☐
- 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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 45

River Code: 95-701 RM: 0.8 Stream: Aptakisic Creek
Site Code: 18-2 Project Code: DRWW17 Location: Ust Pekara Dr
Date: 8-23-17 Scorer: MAS Latitude: 42.16473 Longitude: -87.92782

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]	X	
☐ ☐ -Lg BOULD [10]			☐ ☑ -SAND [6]	X	
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☑ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
- ☐ -LIMESTONE [1]
- ☑ -TILLS [1]
- ☑ -WETLANDS [0]
- ☐ -HARDPAN [0]
- ☐ -SANDSTONE [0]
- ☐ -RIP / RAP [0]
- ☐ -LACUSTRINE [0]
- ☐ -SHALE [-1]
- ☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
- SILT: ☑ -SILT HEAVY [-2]; ☐ -SILT MODERATE [-1]; ☐ -SILT NORMAL [0]; ☐ -SILT FREE [1]
- EMBEDDEDNESS: ☑ -EXTENSIVE [-2]; ☐ -MODERATE [-1]; ☐ -NORMAL [0]; ☐ -NONE [1]

Substrate: 4.5 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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: 15 (Max 20)

COMMENTS:

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

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

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

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

STABILTIY: ☑ -HIGH [3]; ☐ -MODERATE [2]; ☐ -LOW [1]

MODIFICATIONS / OTHER: ☐ -SNAGGING; ☑ -RELOCATION; ☐ -CANOPY REMOVAL; ☐ -DREDGING; ☐ -ONE SIDE CHANNEL MODIFICATIONS; ☐ -IMPOUNDMENT; ☐ -ISLAND; ☑ -LEVEED; ☐ -BANK SHAPING

Channel: 8 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
- ☐ ☐ -VERY WIDE > 100m [5]
- ☐ ☐ -WIDE > 50m [4]
- ☐ ☐ -MODERATE 10 - 50m [3]
- ☐ ☐ -NARROW 5 - 10m [2]
- ☑ ☑ -VERY NARROW < 5m [1]
- ☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) — L R (Most Predominant Per Bank)
- ☐ ☐ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
- ☐ ☐ -NONE / LITTLE [3]
- ☑ ☑ -MODERATE [2]
- ☑ ☑ -HEAVY / SEVERE [1]

Riparian: 3.5 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
- ☐ - 1m [6]
- ☑ - 0.7m [4]
- ☐ - 0.4 to 0.7m [2]
- ☐ - 0.2 to 0.4m [1]
- ☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
- ☐ -POOL WIDTH > RIFFLE WIDTH [2]
- ☑ -POOL WIDTH = RIFFLE WIDTH [1]
- ☐ -POOL WIDTH < RIFFLE WIDTH [0]
- ☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
- ☐ -EDDIES [1]
- ☐ -FAST [1]
- ☐ -MODERATE [1]
- ☑ -SLOW [1]
- ☐ -NONE [-1]
- ☐ -TORRENTIAL [-1]
- ☐ -INTERSTITIAL [-1]
- ☐ -INTERMITTENT [-2]
- ☐ -VERY FAST [1]

Pool / Current: 6 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
- ☐ -*Best Areas > 10cm [2]
- ☐ -Best Areas 5 - 10cm [1]
- ☐ -Best Areas < 5cm [0]
- ☐ -NO RIFFLE but RUNS present [0]
- ☑ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 0 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 10.7 DRAINAGE AREA (sq.mi.): 4.94 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 8 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☑
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☑
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: ____

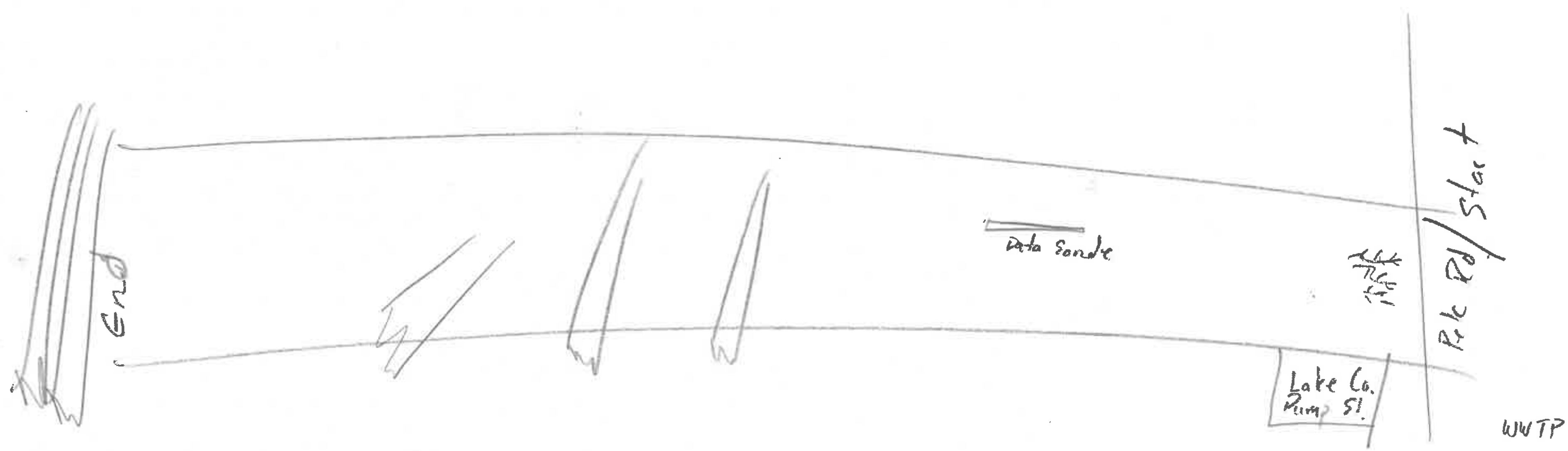
Subjective Rating (1-10)	Aesthetic Rating (1-10)
5	3

Gradient: ☐ -Low ☑ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	E	150	Poor	Normal	0

Yes	No	
☐	☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 65.5

River Code: 95-701 **RM:** 4.30 **Stream:** Aptakisic Creek
Site Code: 18-3 **Project Code:** DRWW17 **Location:** Dst Copperwood Dr.
Date: 8-24-17 **Scorer:** MAS **Latitude:** 42.17704 **Longitude:** -87.95918

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]	X	X
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	X
☐ ☐ -BOULDER [9]	X		☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]	X		☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☑ -TILLS [1]
☑ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☑ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☑ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 12 (Max 20)

COMMENTS:

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

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

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: 13 (Max 20)

COMMENTS:

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

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☑ -LOW [2] ☑ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☐ -FAIR [3] ☑ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☑ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☑ -HIGH [3] ☐ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☐ -RELOCATION ☐ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 8.5 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☑ ☑ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)* L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☑ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☑ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☑ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 6 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☑ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 2 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 18.14 DRAINAGE AREA (sq.mi.): 2.3

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

Gradient: 10 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Is Sampling Reach Representative of the Stream? (Y/ N) ______

If Not, Explain: ______

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☑
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☑
- Riparian Removal ☑
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: ______

Subjective Rating (1-10): 5

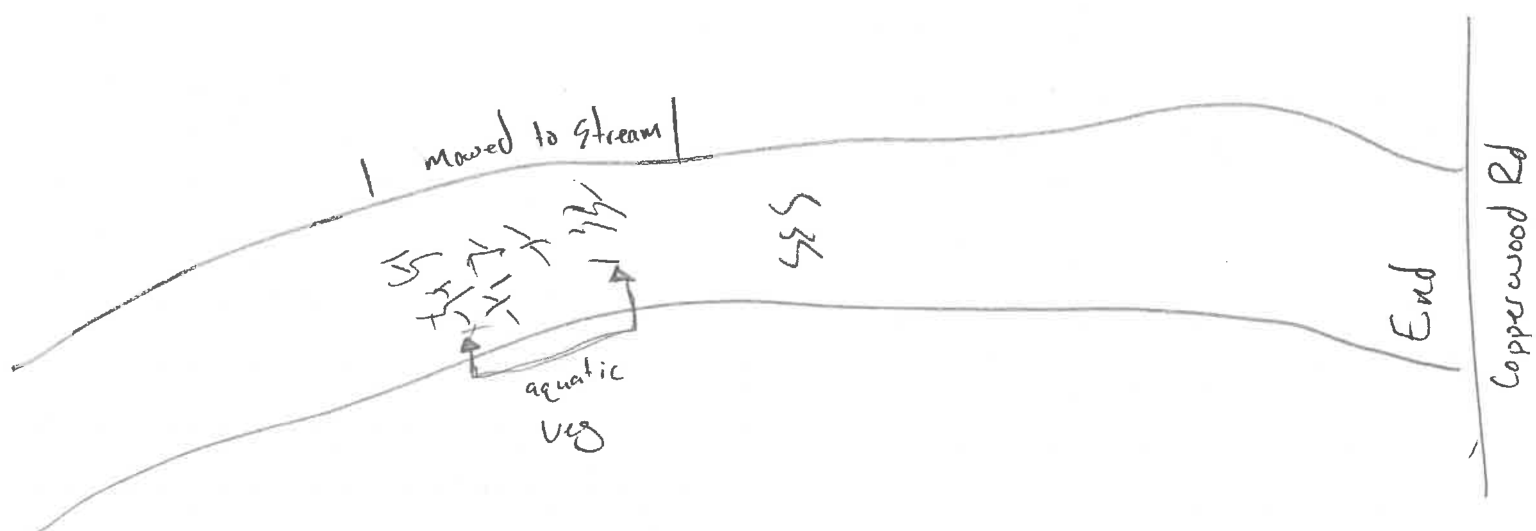
Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☑ -Moderate ☐ -High

First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	F	150	Clear	Normal	100

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☑	Is Dry Channel mostly natural?

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 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 of 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.

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 47

River Code: 95-701 RM: 4.7 Stream: Aptakisic Creek
Site Code: G-10, 18-4 Project Code: DRWW17 Location: Twin Creeks Park
Date: 8-24-17 Scorer: MAS Latitude: 42.18116 Longitude: -87.96680

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]	X	
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]	X	
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☑ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN
Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☐ -TILLS [1]
☑ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☑ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☐ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☑ -NORMAL [0] ☐ -NONE [1]

Substrate: 8 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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: 13 Max 20

COMMENTS:

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

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☑ -LOW [2] ☑ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☐ -FAIR [3] ☑ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☑ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☑ -HIGH [3] ☑ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☑ -RELOCATION ☑ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 8 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☑ ☑ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☑ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☑ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -FAST [1] ☐ -MODERATE [1] ☑ -SLOW [1] ☐ -NONE [-1]
☐ -TORRENTIAL [-1] ☐ -INTERSTITIAL [-1] ☐ -INTERMITTENT [-2] ☐ -VERY FAST [1]

Pool / Current: 4 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☑ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 20.84 DRAINAGE AREA (sq.mi.): 1.09 % POOL: % GLIDE: % RIFFLE: % RUN:

Gradient: 10 Max 10

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg): ____

Lat / Long (Mid): ____

Lat / Long (End): ____

Lat / Long (X-Loc): ____

Subjective Rating (1-10): 4

Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☑ -Moderate ☐ -High

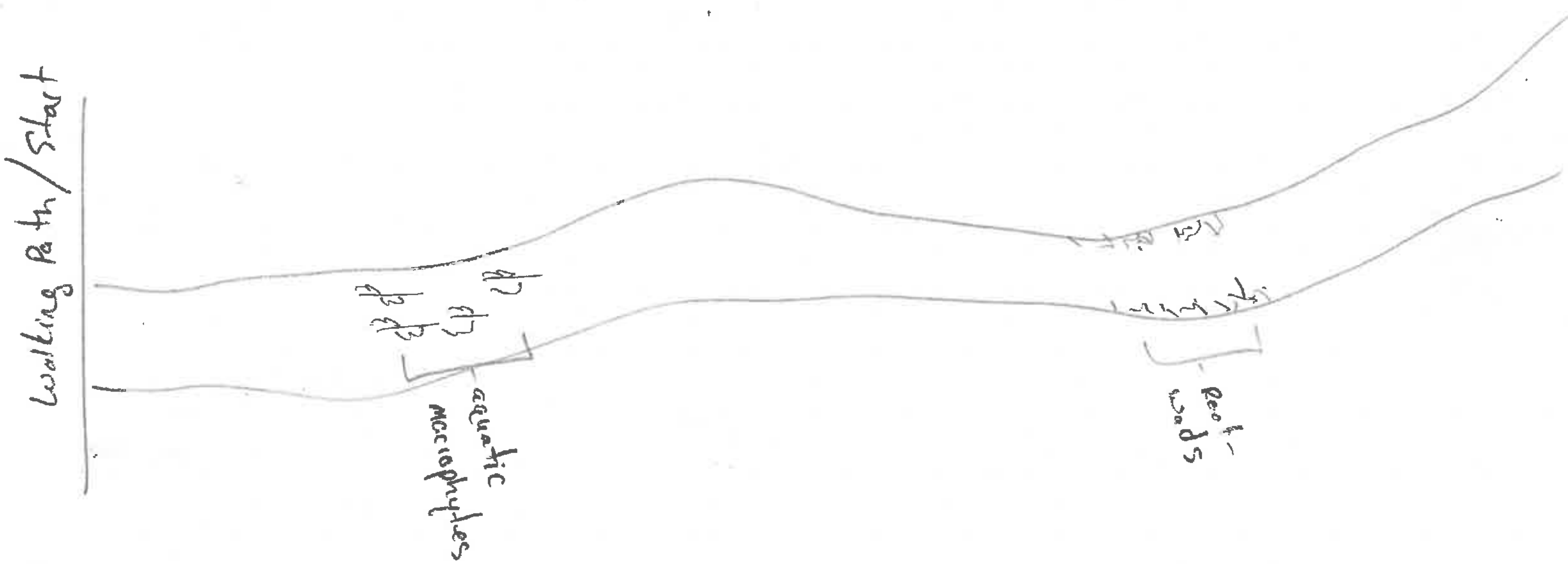
First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	F	150	Clear	Normal	95

Yes	No	
☐	☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐	☐	Is there water upstream? How far:
☐	☐	Is there water close downstream? How far:
☐	☐	Is Dry Channel mostly natural?

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

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 43.5

River Code: 95-712	**RM:** 0.05	**Stream:** Unnamed Trib to Aptakisic Creek			
Site Code: G-11	**Project Code:** DRWW17	**Location:** Twin Creek Park			
Date: 8-24-17	**Scorer:** MAS	**Latitude:** 42.18153	**Longitude:** -87.96581		

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

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]	X	
☐ ☐ -Lg BOULD [10]			☒ ☐ -SAND [6]	X	
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]	X	
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☒ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☐ -TILLS [1]
☒ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT: ☐ -SILT HEAVY [-2] ☒ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☐ -EXTENSIVE [-2] ☒ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 6 (Max 20)

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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: 12 (Max 20)

COMMENTS:

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

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

MODIFICATIONS / OTHER
☐ -SNAGGING ☐ -IMPOUNDMENT
☐ -RELOCATION ☐ -ISLAND
☐ -CANOPY REMOVAL ☐ -LEVEED
☐ -DREDGING ☐ -BANK SHAPING
☐ -ONE SIDE CHANNEL MODIFICATIONS

Channel: 8.5 (Max 20)

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☒ ☒ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)* — L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION — L R (Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4 (Max 10)

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☒ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☒ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -TORRENTIAL [-1]
☐ -FAST [1] ☐ -INTERSTITIAL [-1]
☐ -MODERATE [1] ☐ -INTERMITTENT [-2]
☒ -SLOW [1] ☐ -VERY FAST [1]
☐ -NONE [-1]

Pool / Current: 3 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☒ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

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

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

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

Riffle / Run: 0 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 19.34 DRAINAGE AREA (sq.mi.): 0.99

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

Gradient: 10 (Max 10)

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

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

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

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 3

Gradient: ☐ -Low ☑ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	0

Yes	No	
☐	☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐	☐	Is there water upstream? How far:
☐	☐	Is there water close downstream? How far:
☐	☐	Is Dry Channel mostly natural?

Major Suspected Sources of Impacts (Check All That Apply):
- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- 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 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 of 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.