

# Biological and Water Quality Assessment of Upper Des Plaines River Subwatersheds: Year 3 Rotation 2019



acent University Drive (Site 14-5) Bull's Brook at Almond Rd. (Site 13-15)

Peter A. Precario, MBI Executive Director James Lane, MBI Board President

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# Biological and Water Quality Assessment of Upper Des Plaines Subwatersheds: Year 3 Rotation 2019

Mill Creek, Bull Creek, and Des Plaines River Tributary Subwatersheds

Lake County, Illinois

Technical Report MBI/2021-7-7

--FINAL REPORT--

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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 2019 Year 2 subwatershed monitoring rotation included 30 sites on Mill Creek, North Mill Creek, Hastings Creek, Bull's Creek and other tributaries to the Des Plaines River all within Lake County. All of these sites were previously sampled in 2016 biological assemblages and habitat. The principal focus of the 2019 bioassessment is on the status of the Illinois General Use for aquatic life and recreation.

#### Scope of the Year 3 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 watershed 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 program objectives include:

- 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 (Illinois EPA 2010a,b; 2011a-g; 2014a,b) and Illinois DNR (2010a,b) and under a project QAPP approved by Illinois EPA (DRWW 2016). Previous biological assessments of the Upper Des Plaines River basin streams and rivers include major surveys by Illinois EPA (Illinois EPA 1988,), Illinois DNR (IDNR; Pescitelli and Widloe 2018; 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 River 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 baseline watershed biological assessment conducted in 2016 (MBI 2017), the Year 1 subwatershed bioassessment of the Indian, Aptakisic, Buffalo Creek subwatersheds (MBI 2018), or the Year 3 subwatershed bioassessment of the Mill Creek, Bull Creek, or Upper Des Plaines Tributary subwatersheds. The recent basin-wide fish surveys by IDNR included three (3) sites in the Year 3 subwatersheds, two in Mill Creek and a single site in Bull Creek. Other fish surveys included locations sampled in the Bull Creek and Bull's Brook subwatersheds by Integrated Lakes Management (2003) that supported the reintroduction of state listed fish species to selected lakes and streams. The initial stocking in Sanctuary Pond at Prairie Crossing for five state listed fish species including Blackchin Shiner (Notropis heterodon), Blacknose Shiner (Notropis heterolepis), Banded Killifish (Fundulus diaphanus), Iowa Darter (Etheostoma exile), and Pugnose Shiner (Notropis anogenus) was accomplished in the mid-1990s (Lake Co. SMC 2008).

The 2019 Year 3 assessment is the second DRWW effort to utilize the analyses and outputs of the Northeastern Illinois Integrated Prioritization System (NE Illinois IPS; MBI 2020a), the first being the 2018 Year 2 bioassessment of the mainstem (MBI 2020b). Specifically biological effect thresholds for five narrative condition categories (i.e., excellent, good, fair, poor, and very poor) were developed for 87 chemical water quality, sediment chemistry, and habitat attributes. These provide biological effect thresholds that are more regionally relevant than what has been used in the watershed bioassessments prior to 2018. For nutrients, this includes not only more refined thresholds for nutrient parameters, but also a nutrient index that synthesizes IPS variables into a more tractable scale of overall nutrient effects, and a modified Stream Nutrient Assessment Procedure (SNAP) that utilizes a combined approach to assessing the severity of nutrient enrichment. The IPS also provides a Restorability factor for fully supporting or attaining sites. The regional relevance of the IPS thresholds and being stratified across five narrative condition categories provides additional clarity and certainty to the assignment of causes and sources of impairment and threats.

#### **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 (Illinois EPA 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; the partial support category was added to clarify instances where only one of the two assemblages attains the General Use support fish or macroinvertebrate threshold. Of the 30 sites assessed for the General Use in the Upper Des Plaines subwatersheds for aquatic life one (1) was in full support (based on a single assemblage), three (3) in partial support, three (3) in non-support fair, and the remainder (23) in non-support poor. As in other NE Illinois watersheds the fish assemblage was the most limiting factor in the non-support and partial support determinations in failing to meet the Illinois EPA General Use threshold for the fIBI in the Upper Des Plaines River tributaries in 2016 (MBI 2017), 2017 (MBI 2018), and most recently the 2019 Year 3 subwatersheds assessment.

Recently derived IPS thresholds for water and sediment chemistry and physical habitat attributes (MBI 2020a) were available to better assess causes of impairment and their comparative severity. The approach for deriving these thresholds included a more refined stratification of biological effect threshold values for parameters that showed valid relationships with biological responses based on species and taxa level analyses and then correlated with the corresponding fish and macroinvertebrate IBI attainment thresholds and narrative ratings (MBI 2020a). This produced thresholds across four or five narrative categories of quality (excellent, good, fair, poor, and very poor). This replaces the formerly used binary (i.e., "pass/fail") approach to evaluating exceedances of chemical and physical effect thresholds and criteria providing for a graded approach to the assignment of causes and sources of Illinois General Use biological impairments. The new IPS framework also offers the semblance of a tiered aquatic life use (TALU) stratification of goals and thresholds that has been incorporated into all IPS outputs to support local restoration and protection efforts by the respective watershed groups and stakeholders.

#### Causes and Sources of Non-attainment

A total of 16 causes associated with varying degrees of impairment of the General Use for aquatic life were determined by relating threshold exceedances of the various physical and chemical parameters measured alongside the biological assemblages in a synthesis analysis. These were then tallied and grouped into five (5) categories and weighted in accordance with the exceedance eclipsing a fair, poor, or very poor threshold. Most of the thresholds are from the NE Illinois IPS (MBI 2020a), but other sources were used for parameters and indicators not directly included or yet derived in the IPS. The weighting was done as follows – 5 times for very

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with meeting five narrative classes (red = very poor; orange = poor; yellow = fair). Restorability, Susceptibility, and Threat scores are included. determined by this study (see footnotes for fIBI and mIBI use support thresholds). fIBI, MIwb, and mIBI values are color coded in accordance Table 1. Aquatic life use attainment status in the 2018-19 study area with causes and sources of impairment listed for non-supporting sites See glossary of terms used next page.

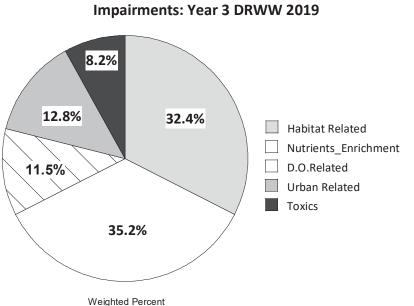
QHEI         Status         Very Pc           296         AOD         MON-Poor         OHEI Ratio;Subs           32.1         52.8         NON-Poor         OHEI Ratio;Subs           43.0         -         FLULI         TKN;           45.1         62.0         NON-Poor         Min.&DelD.O.           62.0         NON-Poor         TKN;         FULI           7         80.0         NON-Poor         TKN;           58.5         68.5         NON-Poor         TKN;           54.3         63.7         NON-Poor         TKN;           54.3         63.7         NON-Poor         TS;           54.3         68.5         NON-Poor         Subst; Diel D.O.           56.0         67.8         NON-Poor         Subst; Diel D.O.           56.0         67.8         NON-Poor         Subst; Diel D.O.           58.2         59.0         NON-Poor         Subst; Diel D.O.	oor <sup>1</sup> tr:TKN	Poor <sup>1</sup>	Eath <sup>1</sup>			bility Score   ibility Score   Score (0-
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		t Fork Belvidere Rd. Tril	West Fork Belvidere Rd. Tributary to DPR @RM 94.0			
25.7 68.8 NON-Poor TKN;	Z;	F	TKN;QHEI;Chan; Max. D.O.;Chloride;	Urban Stormwater	62.5	
45.2 70.0 PARTIAL		TKN; T	TKN; QHEI; Chan; Chloride; Org. Enrich.; Toxicity	Urban Stormwater	67.8	_
	-	Stoneroller Creek	r Creek			
57.6 82.0 PARTIAL Chl	Chloride;Metals		TKN;Conduct;Org. Enrich.;Ammonia;Toxicity	Urban Stormwater	78.0	-
		Bull'S Brook	rook		1	-
49.3 69.0 NON-P001 INN; 49.3 69.0 NON-P001 INN;		Metals	OHEI:	Urban Stormwater IIrhan Stormwater	85.6	
		Bull (	eek			-
19.3 57.5 NON-Poor			TKN;QHEI;Chan;Ammonia;	Urban Stormwater	6.97	
20.0 57.3 NON-Fair		TKN;	QHEI; Substr; Chan;	Urban Stormwater	62.2	
34.8 53.3 NON-Fair PAH	PAH Compounds (	Chloride; T	TKN; QHEI; Substr; Conductivity;	Urban Stormwater	58.7	
47.9 78.0 PARTIAL			TKN; Chloride; Am monia; Toxicity	Urban Stormwater	59.1	
		West Branch Bull Creek	Bull Creek			
24.9 47.8 NON-Poor Min	Min. D.O.;TKN;Chloride	QHEI; Substr; Metals S	Substr;Chan;QHEI Ratio;Ammonia;	Urban Stormwater	63.3	
65.8		Chloride; T	TKN; QHEI;Organic Enrich.	Urban Stormwater	70.4	
mIBI QHEI AQLU Status					IPS Narrati	IPS Narrative Rankings
>73 >84.5 FULL					Very High Ver	Very Low Very Low
9 >75.9					-	-
<75.9					te	Е З
>15-29 <50.1 NON-Fair					Low	High High

**2** | P a g e

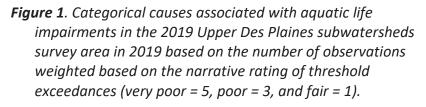
poor, 3 times for poor, and none for fair parameter exceedances and other indicator values. This amplifies the very poor threshold exceedances as being more likely to exert a true causal influence as opposed to simply being associated with an impairment on a spatial basis. Nutrient and organic enrichment indicators included TKN, ammonia-N, and organic enrichment responses in the biota comprised 35.2% of the weighted causes (Figure 1). Habitat related causes followed closely comprising 32.4% of the causes. These were followed by urban related (12.8%), D.O. related (11.5%), and toxics and toxicity (8.2%).

# Synthesis of Results

The baseline biological condition of the Year 3 Upper Des Plaines subwatersheds has been shaped by the naturally low gradient and wetland origins of the region. The current condition of the biological assemblages reflects historical changes that have significantly altered these



Major Causes (Weighted %) Associated with Aquatic Life



natural features, mostly through hydrological and physical alterations related to agricultural, suburban, and urban development throughout the study area. Both the direct and indirect influences of the altered hydrology and habitat were evident in the chemical, habitat, and bioassessment results. The legacy of hydrological and habitat alterations where they are most evident have resulted in sluggish flows, excessive siltation, embedded substrates, sparse instream cover, sediments high in organic matter, and indicators of agricultural and urban runoff that are further exacerbated by the altered flows and habitat. TKN values

were very poor and poor at numerous sites and indication of excessive runoff and instream algal production. Runoff containing sediments that are high in organic matter also combined with sluggish flows and stream channel alterations to exacerbate low D.O. concentrations and high to wide diel D.O. swings in several streams. Another indicator of excessive organic enrichment were the consistently high *E. coli* maximum values at the 2420 cfu/100 mL upper limit of the analytical method at all sites in North Mill Creek, Hastings Creek, Newport Drainage Ditch, Slocum Creek, Unnamed Tributary to Greenleaf Creek, West Fork Belvidere Rd. Tributary, and West Branch of Bull Creek. At sites with more "normal" mean *E. coli* values this is an

indication of periodic spates from periods of runoff. However, some sites had elevated means indicating a more routine bacterial contamination. A higher upper limit for the analytical method could possibly better separate sites with sewage contamination versus general nonpoint source runoff. The introduction of wastewater from the Lindenhurst WWTP into Hastings Creek did not add appreciably to the existing upstream delivery of nutrients, oxygen demanding wastes, and ammonia-N. The LCDPW Mill Creek WWTP discharges to Mill Creek only one mile from the Des Plaines mainstem thus only its immediate and seemingly negligible impact could be assessed. Only four (4) sites had QHEI scores that were considered good with the majority of sites scoring in the fair range. Where habitat alteration was a factor it was severe with two (2) sites exhibiting extremely high poor to modified attribute ratios. Together these have resulted in essentially complete non-attainment of the General Use for aquatic life throughout the study area. However, the severity of the non-attainment varies at the subwatershed, reach, and site scales.

# Restorability, Susceptibility, and Threat Factors

The NE Illinois IPS was developed to provide an organized and robust framework for determining restoration and protection priorities and options for both impaired and attaining watersheds, reaches, and sites (MBI 2020a). A Restorability factor is derived for impaired sites and Susceptibility and Threat factors are derived for attaining sites. These factors are provided in the synthesis (Table 19) and aquatic life use attainment (Table 1) tables. Five narrative ranges of Restorability from very high to very low have been established on an interim basis – these are subject to revision as these factors are applied in NE Illinois watersheds by the watershed groups. Narrative ranges for Susceptibility and Threat from very low to very high run in the reverse of the Restorability narratives.

In the 2019 Upper Des Plaines subwatersheds only one site was in full attainment and this being based on a single assemblage. This site had a moderate susceptibility and a very low threat ranking. The balance of the 30 sites were all impaired and thus were assigned Restorability scores. Two (2) sites, the Unnamed Tributary to the Des Plaines River at RM 89.5 and the downstream site on Bulls Brook had Very High Restorability scores. This means that few precluding factors that might otherwise deter recovery following a restoration project exist. The majority of the remaining sites (18) had High Restorability scores and the remaining 10 sites had Moderate scores. No sites had Low or Very Low scores. Based on the Very High and High scores much of the watershed has good potential to respond positively to restoration. However, restoration projects will need to focus on the limiting factors for each site, reach, and watershed that are available in the IPS databases and dashboard.

# **Recreational Use Assessment**

Levels of fecal bacteria in the form of *Escherichia coli* (*E. coli*) as colony forming units (cfu)/100 mL were used to assess the status of recreation in and on the water. The Illinois EPA General Use criteria are expressed as counts of fecal coliform bacteria, which were not measured, so the U.S. EPA national criteria for *E. coli* were used their place. 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 90th percentile of the data distribution that is not be exceeded by more than 10 percent of the samples. 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 insufficient samples collected at each site to calculate a true geometric mean so the mean of the samples collected May-October was used as a surrogate.

E. coli samples collected during the summer months of 2019 were used to assess recreational status (Table 2). Of the 30 sites sampled, 28 had exceedances of the U.S. EPA maximum STV criterion and 27 exceeded the geometric mean criterion. Only two (2) sites in Bull Creek (14-2, 14-5) had geometric means and maximum STVs below the U.S. EPA E. coli recreational use criteria. Of the highest geometric mean values, 10 exceeded the maximum STV reflecting sustained elevated values. This contrasted with the majority of sites that had minimum values below the geometric mean criterion, but with higher mean and/or maximum values that indicate episodic exceedances related to runoff events in all likelihood. The highest maximum STV levels were observed at all of the North Mill Creek subwatershed sites, Newport Drainage Ditch (12-1 and 12-2), Slocum Creek (13-11), West Fork Belvidere Rd. Tributary (13-11), West Branch Bull Creek (14-3 and 14-4) and the Unnamed Tributary to Greenleaf Creek (13-13). The unnamed tributary to Greenleaf Creek also had the highest minimum and geometric mean values, the latter which was nearly 10 times higher than the U.S. EPA recommended level. A total of 16 sites had the maximum analytical value of 2420 cfu/100 mL reported. The maximum reported analytical value of 2420 cfu/100 mL in 2019 was a limitation in that much higher actual values were likely and would have added to the diagnosis of the E. coli exceedances. For example, raw and poorly treated sewage frequently result in values in the 10,000 or even 100,000 cfu/100 mL ranges. Future surveys should be provided with better resolution by reporting the true maximum values. The non-exceedances in Bull Creek are possibly due to sites 14-2 and 14-5 being located in and downstream from a series of lakes and wetlands that could have diluted the *E. coli* concentrations that were markedly higher elsewhere in the 2019 study area. Only one other site in Mill Creek (11-4) met the geometric mean criterion. Other subwatersheds including Mill Creek, North Mill Creek, Newport Drainage Ditch and Slocum Creek receive runoff from agricultural and suburban areas. The 2019 values represent substantial increases from the 2016 baseline survey the latter of which was conducted under lower flows resulting in reduced runoff events. During the 2019 sampling 14 sites were observed to reach the maximum analytical value of 2420 cfu/100 mL, while the highest value in 2016 was 1100 cfu/100 mL. These increased levels could be attributed to the increase in runoff events that occurred during the 2019 sampling season.

**Table 2**. E. coli values (cfu/100 mL) for samples collected in the Year 3 Upper Des PlainesRiver study area during May-October 2019. Yellow shaded values exceed therecommended U.S. EPA (2012) 90-day geometric mean (126 cfu/100 mL) and orangeshaded values exceeded the maximum STV (410 cfu/100 mL) recreation use criteria.

		Drainage					
	River	Area					
Site ID	Mile	(sq. mi.)	Samples	Minimum	Mean	Maximum	
11.6	17.20	4.5	Mill Creek 4	42	264	612	
11-6	17.20 13.80	4.5	-	42	264	613	
11-5		10.4	4	108	371	1414	
11-4	10.10	18.3	4	13	115	613	
11-3	7.20	21.4	5	88	704	2420	
11-2	1.71	62.3	4	201	503	1986	
11-1	0.70	63.8	4 h Mill Creek (95	119	607	1553	
10-7	11.30	19.2	4	70	261	2420	
10-7	10.20	20.9	4	96	338	2420	
10-3	8.10	20.9	4	128	365	2420	
10-2	1.10	32.0	3	98	286	2420	
10-1	1.10	!	J Hastings Creek	90	200	2420	
10-5	3.12	3.9	4	27	149	2420	
10-3	1.68	5.6	4	67	355	2420	
10-4	!	nnamed Tributa				2420	
10-6	0.04	1.0	4	24	209	2420	
	0.01	-	port Drainage l		200	2120	
12-2	3.03	2.8	4	186	893	2420	
12-1	0.70	7.4	4	219	665	2420	
	Suburba	n Country Club 1	Fributary to Des	Plaines River @	0RM 98.4		
13-10	2.00	4.0	4	148	532	1733	
	•	•	Slocum Creek				
13-11	1.36	2.4	4	20	305	2420	
	U	nnamed Tributa	ary to Greenleaj	Creek @RM 0.6	54		
13-13	0.40	1.1	4	416	1243	2420	
Unnamed Tributary to Des Plaines River @RM 89.5							
13-17	0.13	0.9	4	285	502	1986	
	1	S	toneroller Cree	k			
13-9	0.42	4.1	5	99	295	1011	
		ork Belvidere Rd.	. Tributary @De		RM 94.0		
13-14	0.21	2.3	4	35	369	2420	
13-8	0.15	3.8	5	4	218	2420	
	1		Bull's Brook				
13-15	1.95	1.9	4	104	252	921	
13-7	0.25	2.7	6	5	157	1120	
	5.05		Bull Creek	= 1	0.70	4700	
14-6	5.95	2.4	6	51	372	1733	
14-5	4.70	1.3	5	13	41	161	
14-2	1.00	8.4	5	75	117	194	
14-1	0.50	11.7	6	81	290	1120	
14.4	254	I	t Branch Bull Ci	1	E40	2420	
14-4 14-3	2.54	5.1	5	114	513	2420	
14-3	1.60	7.1 126 cfu/100 mL geor		228	610	2420	
		416 cfu/100 mL stati					
		,		,,			

# Biological and Water Quality Assessment of the Upper Des Plaines River Tributaries: Year 3 Rotation 2019

# **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 2018 American Community Survey estimate there are 700,832 residence in Lake County and 263,360 housing units, making it the third most populated county in Illinois (USCB, 2020). The 2019 study area covers roughly 135 square miles of the Upper Des Plaines River watershed including Mill Creek, Bull Creek, and seven direct tributaries to the Des Plaines River. North Mill Creek originates in Wisconsin near Bristol and flows 17 miles to its confluence with Mill Creek near Lindenhurst, IL. Mill Creek originates near the Village of Grayslake, IL, and flowing 18.5 miles to its confluence with the Des Plaines River near Wadsworth, IL. Mill Creek tributaries as well tributaries to the Des Plaines River throughout northern Lake County offer a mix of agricultural and urban land uses.

# **General Landscape Setting**

The 2019 study area lies mostly within the Kettle Moraine subregion of the Southeastern Wisconsin Till Plains Level III ecoregion with the Newport Drainage Ditch and Suburban Country Club Tributary located in the Chiwaukee Prairie subregion of the Central Corn Belt Plains ecoregion (Table 3; Woods et al. 1995). The Kettle Moraine subregion 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 poorly developed than on the older till and outwash plains of the 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 are also present. 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 early 1900s reduced the tracts of forest and nonforested wetlands replacing them with agricultural, urban, and suburban development. However, wooded areas, lakes, and wetlands are still common especially in Lake County forest preserves.

The Chiwaukee Prairie subregion of the Central Corn Belt Plains ecoregion is characterized by alluvium, outwash deposits, glacial tills, Silurian limestone, thin loess, beach deposits, dolomite and some shale. Alfisols are the primary soil type and are poorly drained. Prior to European settlement this subregion was dominated by tall-grass prairies, scrub oak forests, sand prairies,

sand savannas, fens and marshes (Woods et al. 1995). Today, cropland, urban, and industrial development have replaced much of the prairie and forested land uses. Forested and wetland areas remain common, especially in county owned forest preserves. Land uses are varied and include agriculture and urban and suburban development.

**Table 3.** Level IV subregions of the 2019 Upper Des Plaines River watershed study area and theirkey 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, & bluestem prairie occur on moraines. Wetlands (bogs, fens, seeps, sedge meadows, marshes) were common.	Forest, pastureland, & wetland. Home sites common on moraines and lakes.
Chiwaukee Prairie (54e)	Lake and till plains with beaches, well developed sand dunes, low beach ridges, swales and bluffs	Quaternary nearshore lake deposits, beach deposits, glacial till, thin loess, alluvium, outwash deposits, and colluvium.	Alfisols (Hapludalfs, Endoaqualfs)	Bluestem prairie and oak savanna. Tall- grass prairies, scrub oak forests, sand prairies, sand savannas, fens and marshes.	Cropland, urban and industrial development. Some forested areas.

#### **Major Point Sources**

Point sources of pollution were originally 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. There are two wastewater treatment plants (WWTP) in the 2019 study area. The Mill Creek WWTP discharges to the lower reach of Mill Creek at RM 1.0 and is capable of discharging 2.1 million gallons per day (MGD) of treated wastewater. It is the smallest among the North Shore Sanitary District (NSWRD) facilities many of which discharge to the Des Plaines River mainstem. It was included in the 2018 assessment of the Upper Des Plaines River mainstem (MBI 2020b). This facility provides advanced treatment for oxygen demanding wastes (BOD), ammonia-N, and suspended solids (TSS). Total phosphorus and nitrogen levels are monitored by the Mill Creek WWTP. The Village of Lindenhurst Sewage Treatment Plant (STP) is located on Hastings Creek (RM 2.8) and is capable of discharging 5.7 MGD of treated wastewater. This facility has advanced treatment for BOD, TSS, ammonia-N, and total phosphorus (TP). Nitrate-N, dissolved phosphorus, and total nitrogen are monitored.

**Table 4.** Major wastewater treatment facilities that discharge to the 2019 Upper Des Plaines

 River northern tributaries (NSWRD – North Shore Water Reclamation District; WWTP 

 Wastewater Treatment Plant). Treatment levels and nutrient information from U.S. EPA

 Discharge Monitoring Report (DMR) Pollutant Loading Tool and DRWW.

 (https://cfpub.epa.gov/dmr/facility\_detail.cfm)

Facility	Receiving Water Body	River Mile	Latitude	Longitude	Avg. Flow 2019 (MGD) <sup>1</sup>	Design Avg. Flow (MGD) <sup>2</sup>	Treatment Type <sup>3</sup>	Nutrient Removal
Lake Co. DPW Mill Creek WWTP	Mill Creek/Des Plaines River	1.0/102.0	42°25′00″N	87°55'40"W	0.9	2.1	AWT	Ρ
Village of Lindenhurst STP	Hastings Creek	2.8	42° 26′ 01″ N	88° 01′ 56″ W	1.28	5.7	AWT	P, N

# **NPDES Permit Special Conditions**

All of the major permitted WWTPs are subject to Special Conditions related to the discharge of nutrients, but not all have final language. The first special condition states:

"The Permittee shall, within twelve (12) months of the permit effective date, prepare and submit to the Agency a feasibility study that identifies the method, timeframe, and costs of reducing phosphorus levels in its discharge to a level meeting a potential future effluent standard of 0.5 and 0.1 mg/L. The study shall evaluate the costs of the application of these limits on a monthly, seasonal, and annual average basis."

The second special condition states:

"The Permittee shall submit a Nutrient Implementation Plan (NIP) for Agency approval with the NPDES renewal application. The NIP must identify phosphorus input reductions by point source discharges, non-point source discharges and other measures necessary to remove dissolved oxygen and offensive condition impairments in the Des Plaines River watershed. The Permittee shall implement the recommendations of the plan that are applicable to said Permittee per the schedule approved by the Agency. The Permittee may work cooperatively with the Des Plaines River Watershed Workgroup (DRWW) to prepare a single NIP that is common among DRWW permittees."

In addition all of the WWTPs that are members of the DRWW are subject to additional special conditions in their respective NPDES permits as follows:

"The Permittee shall conduct monthly water quality sampling in the receiving stream both upstream and downstream of the NPDES outfall for the following parameters: dissolved phosphorus, total phosphorus, total organic carbon, chlorophyll a, dissolved oxygen, total ammonia nitrogen, nitrate/nitrite, total Kjeldahl nitrogen, pH, total suspended solids, volatile suspended solids and temperature. The results shall be submitted to the Agency by March 31 of each year. The Permittee may work cooperatively with the DRWW to conduct monitoring and prepare a single annual monitoring report that is common among DRWW permittees."

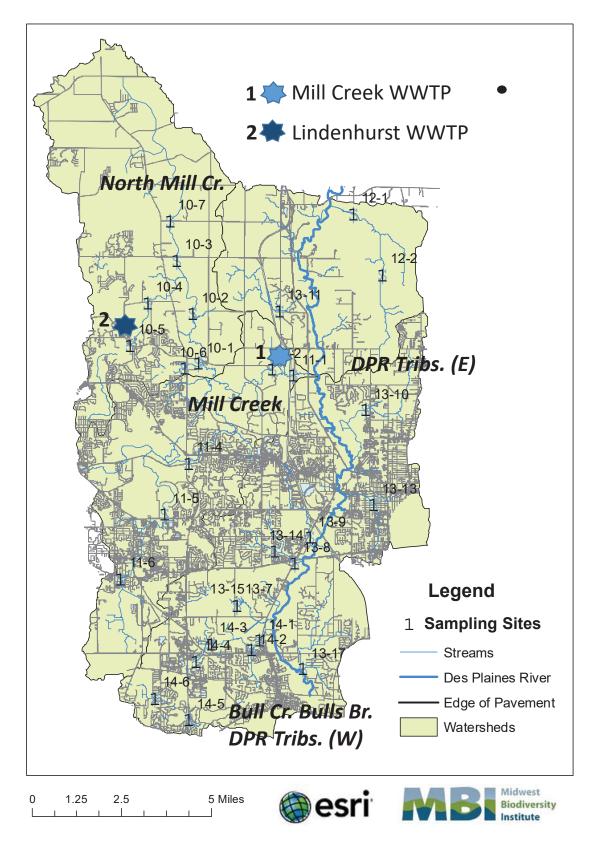
## Nutrient Assessment Reduction Plan (NARP)

The State of Illinois developed the Illinois Nutrient Loss Reduction Strategy (NLRS; State of Illinois 2018) to deal with the enrichment of Illinois surface waters by primary nutrients (N and P). As part of the NLRS Illinois EPA developed a process termed the Nutrient Assessment Reduction Plan (NARP) which is to be developed for major wastewater treatment facilities by December 31, 2023. All of the major WWTPs that are members of the DRWW have initiated planning for meeting the NARP requirements. Depending on the findings of the DRWW NARP process additional controls on discharges of N and P could be forthcoming.

## **Nonpoint Sources**

Nonpoint sources in the Year 3 2019 study area include urban and agricultural sources ranging from light urban and industrial to heavy agricultural and suburban land uses. These have been extensively classified and delineated by the Lake Co. SMC. Alteration of stream flows and habitat related to urban and agricultural land use modifications as well as riparian encroachment and channelization have occurred as the landscape has been modified. The 2019 study area consists of three distinct subwatersheds, Mill Creek, North Mill Creek, and Bull Creek-Bulls Brook for which land use data is available. The remainder of the study area is comprised of direct tributaries to the Des Plaines River mainstem for which specific land use data was not accessed. However, these tributaries have land uses similar to the subwatersheds with which they are bundled in Table 5 and for the portrayal of the chemical, habitat, and biological results.

An edge of pavement coverage illustrates the extent of urbanization in the 2017 study area and between the four subwatershed groupings (Figure 1). Urban land uses are the highest in the southern portion and agricultural and opens space land uses highest in the northern one-half of the Year 3 2019 study area. Land use in the Mill Creek subwatershed is a combination of rural and suburban, with residential and open space/wetlands land uses at 21% and 37%, respectively (Lake Co. SMC 2016). Another Agricultural land uses occupy 18% of the subwatershed. Municipalities cover 12,840 acres, or 64% of the watershed, including the Villages of Grayslake, Gurnee, Libertyville, Lindenhurst, Old Mill Creek, Round Lake Beach, Third Lake, and Wadsworth. Unincorporated areas such as Grandwood Park and Wildwood cover 7,270 acres or 36% of the subwatershed. Future land use projections indicate that impervious surfaces may increase by 2½ times by 2040 covering more than 15% of the subwatershed. The



**Figure 2**. The degree of urbanization in the 2019 Year 3 study area as reflected by the edge of pavement coverage for Lake Co. The 2019 sampling locations are included along with the four subwatershed bundles and the two major WWTPs.

North Mill Creek/Dutch Gap Canal subwatershed encompasses approximately 23,532 acres or 37 square miles in north central Lake County and south central Kenosha County in Wisconsin with a population of 14,860 people, which is expected to increase to more than 36,000 by 2035 (Lake Co. SMC 2011). Land uses are currently predominated by agriculture and open space at 74%, but residential, commercial, institutional, and industrial land uses are expected to increase with the largest changes being from the conversion of agriculture and open space to residential land uses. The Bull Creek/Bull's Brook subwatershed encompasses approximately 14 square miles (8,970 acres) covering portions of Grayslake, Libertyville, and Mundelein in Avon, Warren, Fremont, and Libertyville townships, smaller areas of Gurnee and Waukegan, and interspersed with unincorporated areas. Residential land use accounts for 22%, open space 17.8%, and agriculture 16.0% of the subwatershed, respectively (Lake Co. SMC 2008). The population of 34,777 persons is excepted to increase to 40,172 by 2030 and also corresponding to an increase in residential land use and a corresponding reduction in open space and agriculture land uses.

#### **Sampling Sites Selection and Locations**

The Monitoring Strategy for the Upper Des Plaines River Watershed was developed by the Monitoring Committee of the Des Plaines River Watershed Workgroup in 2015 (DRWW 2016). 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 additional biological and habitat sites. Given that there are hundreds of point sources, numerous stormwater structures, varying degrees of urban and suburban development, legacy pollutants, and habitat and hydrologic alterations, an intensive pollution survey design is needed to capture and characterize the numerous and overlapping pollution gradients that result from these sources. This requires more sites than a condition survey which relies on a comparatively greater extrapolation of data from fewer sampled sites to many more unsampled sites and reaches. This design can result in overlooking local impairments that can evade less spatially intensive condition assessments. The pollution survey design is intended to make quantitative indicators and tools available to guide and support restoration and protection efforts undertaken by DRWW, other watershed groups, and their respective stakeholders. The data and assessments provided by these periodic watershed assessments and by the NE Illinois Integrated Prioritization System (IPS) framework (MBI 2020a), that provides supporting analyses and information on a regional basis to support the restoration of impaired streams and rivers and the protection of high quality watersheds.

While the initial baseline survey of the entire Upper Des Plaines River watershed in 2016 included 70 sites, a rotation through three subsets of the Upper Des Plaines River basin in Lake Co. was initiated in 2017. The 2019 survey of 30 sites in the Mill Creek and Bull Creek subwatersheds and several Des Plaines River tributaries comprises Year 3 of that rotation (Table 5; Figure 1). The sites were assigned to four bundles of subwatersheds and neighboring Des Plaines River tributaries, the latter of which were grouped as east and west tributaries (Table 5). The presentation of the data and results follow this organization throughout the report.

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was performed at each (F – fish; MH – multihabitat macroinvertebrate; QHEI – Qualitative Habitat Evaluation Index; Datasonde; Benthic Chlorophyll a, and Table 5. Locations of sampling sites in the Year 3 Des Plaines River study area in 2019 showing the site ID stream name, location, river mile, and what sampling Mill Creek, salmon for North Mill Creek, blue for East Des Plaines River direct tributaries, and orange for Bulls Creek-Bulls Brook and West Des Plaines River water chemistry in accordance with the Tier 1-4 designation). The four bundles of sites by subwatershed and tributary association are shaded yellow for direct tributaries.

					Drainano								
					Area				Benthic	5	Water Chemistry	emistry	
Site ID	Stream	Location	<b>River Mile</b>	Gradient	(mi. <sup>2</sup> )	Biota	Habitat	Datasode	Chlorophyll-a	Tier 1	Tier 2	Tier 3	Tier 4
11-6	Mill Creek	Wick Street	17.20	10.8	4.5	F, MH	QHEI	Х	Х			3	
11-5	Mill Creek	Washington Street	13.80	6.7	10.4	F, MH	QHEI	×	×			3	
11-4	Mill Creek	U.S. Route 45	10.10	5.4	18.3	ΗM		×	×			m	
11-3	Mill Creek	Sterns School Road	7.20	5.6	21.4	F, MH	QHEI	Х	×			3	
11-2	Mill Creek	Hunt Club Road	1.71	7.4	62.3	ш	QHEI	×	×		2		
11-1	Mill Creek	Dilley's Road	0.70	7.3	63.8	F, MH	QHEI	×	×	1			
10-7	North Mill Creek	Edwards Road	11.30	2.6	19.2	F, MH	QHEI						4
10-3	North Mill Creek	St. Route 173	10.20	7.7	20.9	F, MH	QHEI	Х	х		2		
10-2	North Mill Creek	Kelly Road	8.10	6.7	29.6	F, MH	QHEI	×	×			е	
10-1	North Mill Creek	Milbourne Road	1.10	5.2	32.0	F, MH	QHEI	Х	Х			3	
10-5	Hastings Creek	Grass Lake Rd	3.12	10.5	3.9	F, MH	QHEI	×	×			3	
10-4	Hastings Creek	Miller Rd	1.68	6.9	5.6	F, MH	QHEI	Х	Х		2		
10-6	Unnamed Trib. to North Mill Cr. @RM 0.75	U.S. Route 45	0.04	15.7	0.99	F, MH	QHEI						4
12-2	Newport Drainage Ditch	W. 21st St along Union Pacific RR	3.03	3.7	2.8	F, MH	QHEI					3	
12-1	Newport Drainage Ditch	Kilbourne Avenue	0.70	6.7	7.4	F, MH	QHEI	×	×			ю	
13-10	Suburban Country Club Trib. to DPR @RM 98.4	Shirley Drive	2.00	15.7	4.0	F, MH	QHEI					3	
13-11	Slocum Creek	N. Mill Creek Rd; E. of I-94	1.36	30.6	2.4	F, MH	QHEI					3	
13-13	Unnamed Trib. to Greenleaf Creek @RM 0.64	Swanson Trigg Conservation Area	0.40	27.0	1.1	F, MH	QHEI						4
13-17	Unnamed Trib. to Des Plaines River @RM 89.5	Behind Pump Station off Sprucewood Lane	0.13	26.8	0.90	F, MH	QHEI						4
13-14	West Fork Belvidere Rd. Trib. to DPR @94.0	Leonard Drive	0.21	36.6	2.3	F, MH	QHEI						4
13-8	West Fork Belvidere Rd. Trib. to DPR @94.0	St. Route 21	0.15	33.6	3.8	F, MH	QHEI					3	
13-9	Stoneroller Creek	Lake Carina	0.42	19.2	4.1	F, MH	QHEI					3	
13-15	Bull's Brook	Almond Road	1.95	32.6	1.9	F, MH	QHEI						4
13-7	Bull's Brook	N. Milwaukee Road	0.25	32.8	2.7	F, MH	QHEI					3	
14-6	Bull Creek	Hazelnut Crossing	5.95	9.1	2.4	F, MH	QHEI					3	
14-5	Bull Creek	Adj. University Drive	4.70	14.0	1.3	F, MH	QHEI						4
14-2	Bull Creek	St. Route 137	1.00	4.0	8.4	F, MH	QHEI					3	
14-1	Bull Creek	St. Route 21	0.50	6.3	11.7	F, MH	QHEI	Х	×		2		
14-4	West Branch Bull Creek	Northwind Boulevard	2.54	4.4	5.1	F, MH	QHEI	Х	Х			3	
14-3	West Branch Bull Creek	N. Countryside Drive	1.60	2.9	7.1	F, MH	QHEI					_	4
	Mill Creek Subwatershed			0,	Site Totals	30	30	14	14	1	4	17	∞
	N. Mill Creek Subwatershed												
	Des Plaines R. Tributaries (East)												
	Bull Creek-Bull's Brook DPR Tribs. (West)												

# Spatial Survey Design

MBI developed a combined intensive pollution survey and geometric allocation of sites for the sampling of fish, macroinvertebrates, and habitat in 2016 (MBI 2017). This consisted of deriving progressive geometric panels of drainage area and assigning sampling sites where these occurred throughout the Upper Des Plaines watershed. Adding targeted sites to fill gaps in the longitudinal continuum left by the DRWW tiered design to fulfill a pollution survey design for the mainstem and major tributaries resulted in a total of 70 sites. Each sampling site was assigned a unique DRWW numeric site code, a river mile, and UTM coordinates by individual river or stream.

The 2019 (Year 3) study area included 30 sites total including 13 in the Mill Creek watershed, 6 in the Bull Creek watershed, and 11 in direct tributaries to the Des Plaines River. All sites were sampled for habitat, fish, macroinvertebrates and meter-read water quality at a minimum. Fourteen (14) sites were sampled continuously with YSI Datasonde units with one-half deployed for consecutive one-week low flow periods during August 2019 and with benthic chlorophyll-a samples collected at the same sites at which the Datasondes were deployed. DRWW grab water samples were collected during May-October 2019 in accordance with designations as Tier 1-3, for which specific analytes varied. No water samples were collected at Tier 4 sites, only the four (4) parameters that were measured with a water quality meter.

#### **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 selected parameters, and benthic chlorophyll a. Recreational use attainment was evaluated with *Escherichia coli* and using the U.S. EPA national criteria since none are available in the Illinois WQS.

## **Chemical/Physical Water Quality – Methods**

#### Water Column Sampling

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

- Tier 1: One (1) site located in Mill Creek that was sampled monthly for water May through September and November and March (seven times per year) for all demand<sup>3</sup>, nutrient and bacteria parameters. Sediment samples analyzed for metals and organics are collected concurrent with a bioassessment.
- **Tier 2:** Four (4) sites (1 Mill Creek, 1 North Mill Creek, 1 Hastings Creek, 1 Bull Creek) were sampled monthly from May through September and in November and March (seven times per year) for the majority of demand, nutrient, and bacteria parameters. Sediment samples analyzed for metals and organics are collected concurrent with a bioassessment.
- Tier 3: Eighteen (18) sites (4 Mill Creek, 1 North Mill Creek, 2 Hastings Creek, 3 Bull Creek, 1 West Branch Bull Creek, 6 Des Plaines River Tribs.) were sampled from May through September and in November and March (seven times per year) for the majority of demand, nutrient, and bacteria parameters. Sediment samples analyzed for metals and organics are collected concurrent with bioassessment.
- **Tier 4:** Eight (8) sites (1 North Mill Creek, 1 Bull Creek, 1 West Branch Bull Creek, 5 Des Plaines River Tribs.) were not sampled for water chemistry. These sites were sampled with a water quality meter during each fish sampling event.

#### Sediment Sampling

Surficial sediments were sampled for bulk chemical analysis at 22 mainstem locations (Tier 1- 3) following Illinois EPA methods (Illinois EPA 2011b). Samples were collected in October 2019 and were analyzed by Suburban Labs.

# Nutrient Effect Assessment Procedure

The 2019 assessment of the effects from nutrient enrichment was modeled after the Stream Nutrient Assessment Procedure (SNAP) developed by the Ohio EPA (2015b) and as used in the

Year 1 and 2 DRWW assessments (MBI 2018, 2020b), it includes consideration of the width of the diel variation in continuously measured 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). Other relevant parameters such as volatile suspend solids (VSS), turbidity, and total Kjeldahl nitrogen (TKN) are included when available at the 14 Datasonde and benthic chlorophyll a locations (Table 3). Datasondes were deployed for consecutive 3-4 day periods during times of low stream flow and elevated summer ambient temperatures (YSI 2012, 2017). The number of phosphorus sensitive species derived from the NE IL IPS stressor analyses and a Nutrient Ranking Index that was also developed with IPS outputs were added to the analysis in 2019 (MBI 2020a; Appendix E). Together these results were used to determine five states of nutrient enrichment (none, low, moderate, high, and severe).

A summary of the number of water and sediment parameters and samples collected in 2019 are found in Table 6. The parameters analyzed and frequencies of collection varied by DRWW tier assignment as was previously described.

Devery store (Cotogow)	Wa	ater	Sedir	nent
Parameters/Category	Parameters	Samples	Parameters	Samples
All Parameters	24	3538	73	1606
E. coli	1	306	0	0
Field Parameters	4	342	0	0
Demand <sup>1</sup>	1	304	0	0
Nutrients <sup>2</sup>	6	1375	1	22
Ionic Strength <sup>3</sup>	4	944	0	0
Suspended Materials <sup>4</sup>	2	186	0	0
Metals	8	81	20	440
Organic Compounds	0	0	51	1122
Other (Cyanide)	0	0	1	22

**Table 6**. Summary of the number of water chemistry parameters and samples collected by parameter

Includes field measured g rab and continuous dissolved oxygen.

2 Includes total ammonia, total phosphorus, total nitrate, TKN, benthic chlorophyll a, sestonic chlorophyll a.

3 Includes total chloride, sodium, magnesium, and field/lab conductivity.

4 Includes total suspended solids and volatile suspended solids.

# **Biological Assemblage Sampling**

Biological assemblages in the 2019 Year 3 study area included fish and macroinvertebrates at 30 instream locations. Biological and habitat sampling was conducted within a summer to early fall index period of June 16-October 15 for fish and July 1-September 30 for macroinvertebrates with exceptions noted below. All sampling occurred during periods of summer-fall base flows – periods of higher flows and elevated runoff were avoided. High flows caused by frequent rain events in July, August, and September prevented a second fish sampling pass at sites >20 square miles drainage area, prevented a sample from being conducted at all in Mill Creek at site 11-4, and delayed sampling of Mill Creek site 11-5 until October 18. Macroinvertebrate sampling was likewise affected by elevated flows preventing a sample from being collected in Mill Creek at 11-2. A habitat assessment was performed at all fish sites using the QHEI (Ohio

EPA 2006) and a site description accompanied each of the Illinois EPA multihabitat macroinvertebrate samples.

#### Fish Assemblage Methods

Fish were collected at 29 sites using wadeable electrofishing units and gear. Larger sites (>20 mi.<sup>2</sup>) were sampled with a tote barge mounted electrofishing unit while headwater sites (<20 mi.<sup>2</sup>) were sampled using a bank set long-line unit or a Wisconsin AbP-3 battery-powered backpack electrofishing unit and only where stream width and depth were within specifications for that unit (Ohio EPA 1989). Wadeable sites were sampled over a distance of 0.20 km and headwater sites were sampled at a distance of 0.15 km, each in an upstream direction. Tote barge and bank set long-line units utilized pulsed D.C. current produced by a Smith-Root 2.5 GPP pulsator powered by a 2.5 kW alternator and a 5.5 HP gasoline engine. 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; Ohio EPA 1989). Wider and deeper sites were sampled with the 2.5 GPP generator powered unit as a bank set longline or tote barge arrangement. Dip nets were 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-early fall base flow conditions.

Captured fish were placed in a live well or live net for processing at the end of each site. Water was regularly replaced and/or aerated to maintain adequate oxygen levels in the water as 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 standard water resistant field sheet. The incidence of external anomalies was recorded following procedures outlined by Ohio EPA (1996, 2015a) based on 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, if collected, were not included in a sample and fish measuring less than 25 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 the QHEI field form.

While the majority of captured fish were identified to species in the field, any uncertainty about a 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 and the Modified Index of Well-Being (MIwb; Ohio EPA 1987) in addition to expressions of species richness and relative abundance.

#### Macroinvertebrate Methods

Macroinvertebrate methods followed the Illinois EPA multi-habitat method (Illinois EPA 2011c,d) at all sites (Table 3). The Illinois EPA 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 summerearly fall 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 and a maximum of up to 800 feet. The collection of macroinvertebrates was accomplished with a d-frame 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 Illinois EPA (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 Illinois EPA (2011g). However, the calculation of the Macroinvertebrate IBI (mIBI) adhered to the Illinois EPA methods by using genera as the benchmark level of taxonomic resolution for mIBI scoring. Other analyses using the lowest resolution data were also accomplished.

#### **Habitat Assessment**

The QHEI (Rankin, 1989, 1995; Ohio EPA, 2006) was utilized as the primary habitat assessment methodology at each site. The assessment was conducted as a part of the fish assemblage method by the fish crew leader, who is trained and experienced in using the QHEI, during the initial sampling pass. The QHEI is comprised of six categories of habitat that influence the quality of the aquatic biota. The sum of the six categories ranges from 0-100, with scores of 60 or greater generally being regarded as sufficient to support the Genera Use for aquatic life while scores below 45 indicate substantial deficiencies in habitat for aquatic communities. These rules-of-thumb have been altered by the NE IL IPS analyses and the newer thresholds were used to assess habitat quality. A QHEI matrix (Rankin 1989, 1995) showing the occurrence of good and modified attributes was also developed to evaluate the overall capacity of the stream habitat to support the General Use at each site and to diagnose potential deficiencies that might be limiting to the aquatic assemblages.

#### **Data Management**

All data was managed by MBI in internal databases that permit ready access and analysis.

Biological and habitat data is stored in MBI ECOS which is a routine based on the Ohio ECOS format that MBI uses for all biological data management tasks. Biological data analysis included the calculation of the 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 A-C.

# **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 2019 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. Stressor thresholds, Restorability and Susceptibility/Threat factors, and other analyses based on five narrative categories consisting of excellent, good (meets General Use), fair, poor, and very poor quality were completed. These boundaries simulate the application of a tiered aquatic life use (TALU) framework (MBI 2020a).

# **Determining Use Attainment**

The determination of the attainment status of the Illinois General Use for aquatic life generally followed the guidance in the 2018 Illinois EPA Integrated Report (Illinois EPA 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 and the five narrative condition categories goes beyond the current Illinois EPA structure, the former done to highlight where one assemblage attained their respective fIBI or mIBI biocriterion and the latter to support incremental analyses of condition both above and below the General Use benchmark.

# **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). The Northeastern Illinois Integrated Prioritization System (NE IPS; MBI 2020a) produces regionally derived stressor thresholds for more than 70 chemical and habitat variables as well as Restorability rankings for impaired sites and Susceptibility and Threat rankings for sites that attained the Illinois General Use biological criteria. These were used along with other stressor thresholds to evaluate the severity of any observed exceedances that correspond to biological impairments and response signatures.

#### **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 from the NE Illinois IPS tool and dashboard (MBI 2020) to further refine the relative importance of categorical and/or parameter specific causes (Tables 7-9). 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. The NE IL IPS derived exceedance thresholds for chemical and habitat parameters used in the causal analyses are used in the tabular and graphical presentation of the chemical water and sediment results. When combined with the Restorability and Susceptibility/Threat rankings, this improves the certainty of the assignment of causes and sources that correspond to an observed biological impairment.

## 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 3 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).

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). The administrative steps taken by Illinois EPA to issue NPDES permits (Level 1) and the steps taken by the permit holders (Level 2)

NE Illinois IPS development and used to assess results from the Year 3 Upper Des Plaines River study area. The most limiting of the fish or macroinvertebrate assemblages for each parameter are indicated along with thresholds for excellent, good, fair, poor, and Table 7. Biological effect thresholds derived from Northeast Illinois streams and rivers for 31 water column parameters as part of the very poor biological condition and reference site values (median and 2 times the interquartile range).

						Thi	Thresholds by Narrative Condition Category	Varrative Con	idition Categ	ory	Reference Site	
		Parameter	Limiting			:					Values (Median-2X	Reference
Variable Name	Units	Group	Assemblage	FIT Score	Sample N	Excellent	Good	Fair	Poor	Very Poor	IQR)	Site N
Total Phosphorus	mg/L	Nutrients	Fish	0.04	1464	<0.106	>0.106	>0.277	>1.002	>1.726	0.088 (0.062-0.115)	35
Conductivity	m5/cm	lonic	Fish	0.05	1464	≤739	2739	>1038	>1208	>1378	922 (705-1158)	40
Total Dissolved Solids	mg/L	lonic	Fish	0.10	1464	<u>&lt;</u> 453.8	>453.8	>558.0	>651.2	>744.5	614 (512-664)	28
Minimum DO	mg/L	Demand	Macros	0.10	985	>8.0	<u>&gt;</u> 6.5	>5.47	<4.44	<3.4	8.6 (6.5-9.6)	29
Zinc, Total	hg/L	Metal_Tox	Fish	0.13	1464	<7.47	>7.47	>9.78	>11.00	>12.22	2.0 (2.0-7.0)	23
Total Kjeldahl Nitrogen	mg/L	Demand	Macros	0.14	985	<u>&lt;</u> 1.07	>1.07	>1.12	>1.63	>2.14	0.74 (0.30-0.99)	30
Chloride, Total	mg/L	lonic	Fish	0.17	1464	<40.00	>40.00	>120.0	>184.9	>249.8	154 (80.3-171.3)	33
BOD (5-Day)	mg/L	Demand	Macros	0.21	985	<u>&lt;</u> 1.30	>1.30	>2.35	>3.45	>4.54	2 (2.0-2.2)	27
Total Ammonia	mg/L	Nutrients	Macros	0.28	985	<u>&lt;</u> 0.084	>0.084	>0.100	>0.190	>0.280	0.1 (0.10-0.10)	34
Nitrate-N	mg/L	Nutrients	Fish	0.29	1464	<u>&lt;</u> 3.767	>3.767	>5.045	>7.344	>9.643	0.39 (0.29-0.97)	32
Sodium, Total	mg/L	lonic	Fish	0.29	1464	<u>&lt;</u> 16275	>16275	>45000	>79056	>113112	14200 (10375-22500	21
Total Suspended Solids	mg/L	Demand	Fish	0.32	1464	<17.50	>17.50	>31.60	>35.15	>38.69	9.2 (5.4-20.3)	33
Cadmium, Total	hg/L	Metal_Tox	Fish	0.93	1464	<0.937	>0.937	>0.974	>0.983	>0.991	<mdl (0.17)<="" td=""><td>23</td></mdl>	23
Maximum DO	mg/L	Demand	Macros	0.94	985	<u>&lt;</u> 10.36	<u>&gt;</u> 10.36	>12.21	>14.24	>16.28	8.74 (8.21-9.45)	29
Copper, Total	hg/L	Metal_Tox	Fish	1.75	1464	-	<u>&lt;</u> 4.480	>4.480	>4.969	>5.458	2.00 (1.96-4.15)	22
Lead, Total	µg/L	Metal_Tox	Macros	2.11	985	<2.851	>2.851	>3.335	>3.884	>4.434	0.24 (0.20-0.57)	23
Turbidity	NTU	Demand	Macros	2.61	985	-	<u>&lt;</u> 19.3	>19.3	>25.9	>32.5	11.0 (4.5-24.5)	7
Manganese, Total	hg/L	Metal_Tox	Macros	2.74	985	<53.71	>53.71	>77.03	>107.1	>137.2	32.0 (24.1-38.2)	23
Volatile Suspended Solids	mg/L	Demand	Fish	2.81	1464	<5.000	>5.000	>7.769	>9.825	>11.88	6.0 (4.8-7.4)	5
Nickel, Total	µg/L	Metal_Tox	Macros	3.26	985	I	<3.470	>3.470	>9.585	>15.70	5 (1.5-21)	14
Sulfate, Total	mg/L	lonic	Macros	6.49	985	<58.27	>58.27	>73.10	>83.45	>93.81	74.6 (61.8-81.8)	4
Arsenic	µg/L	Metal_Tox	Macros	9.19	985	I	<u>&lt;</u> 3.616	>3.455	>5.029	>6.603	Insufficient Data	
Potassium, Total	mg/L	lonic	Macros	10.13	985	<3158	>3158	>6300	>7718	>9129	2400 (1574-2817)	21
Barium, Total	µg/L	Metal_Tox	Fish	4.77	1464	<74.1	>74.09	>84.88	>101.8	>118.6	56.3 (44.3-64.7)	21
Chromium, Total	µg/L	Metal_Tox	Fish	10.17	1464	<u>&lt;</u> 1.398	>1.398	>1.540	>2.682	>3.824	1.73 (1.30-2.00)	9
Strontium	hg/L	Metal_Tox	Fish	2.69	1464	<169.1	>169.1	>190.8	>280.4	>370.1	150 (135-181)	21
Aluminum, Total	µg/L	Metal_Tox	Fish	4.54	1464	<u>&lt;</u> 310.0	>310.0	>393.3	>560.2	>727.0	200 (128-449)	21
Calcium, Total	mg/L	lonic	Fish	Unimodal	1464	<u>&lt;</u> 84425	>84425	>86067	>86313	>86559	54,000 (80-74,250)	21
Mean Dissolved Oxygen	mg/L	Demand	Macros	0.21	985	<u>&gt;</u> 9.42	<9.42	<9.25	<6.11	<3.05	8.6 (7.9-9.0)	40
Nitrite-N	mg/L	Nutrients	Macros	0.41	985	<u>&lt;</u> 0.014	>0.014	>0.040	>0.068	>0.096	0.01 (0.01-0.01)	27
Cyanide, Total	µg/L	Metal_Tox	Macros	5.17	985	8	>8	>10	>10	>10	3 (2-10)	9

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the fish or macroinvertebrate assemblages for each parameter are indicated along with thresholds for excellent, good, fair, poor, Table 8. Biological effect thresholds derived from Northeast Illinois streams and rivers for 30 sediment chemical parameters as part of the NE Illinois IPS development and used to assess results from the Year 2 Des Plaines River study area. The most limiting of and very poor biological condition.

odd         Variable Name         Units         Group         Assemblage         FIT Score         Sample N         Kxt           Zinc         mg/kg         PAH         Macros         2.22         985 $\leq 7$ Benzo(g,h,)perylene         µg/kg         PAH         Macros         2.32         985 $\leq 7$ Benzo(g,h,)perylene         µg/kg         PAH         Macros         2.31         985 $\leq 7$ Benzo(g,h,)perylene         µg/kg         PAH         Macros         2.31         985 $\leq 7$ Benzo(a)pyrene         µg/kg         PAH         Macros         2.61         985 $\leq 1$ Dipervision         µg/kg         PAH         Macros         2.85         985 $\leq 1$ Fluoranthene         µg/kg         PAH         Macros         2.81         985 $\leq 1$ Diperz(a,h)anthracene         µg/kg         PAH         Macros         3.301         985 $\leq 1$ Diperz(a,h)anthracene         µg/kg         PAH         Macros         3.51         985 $\leq 2$ Diperz(a,h)anthracene         µg/kg         PAH         Macros         3.51				Parameter	Limiting			Th	resholds by N	Thresholds by Narrative Condition Category	dition Catego	ry
Zincmg/kgMetal_ToxMacros2.22985985Benzo(g,h.)perylene $\mu g/kg$ $PAH$ Macros2.31985985Indeno(1,2,3-cd)pyrene $\mu g/kg$ $PAH$ Macros2.41985985Evac(b)fluoranthene $\mu g/kg$ $PAH$ Macros2.42985985Benzo(a)pyrene $\mu g/kg$ $PAH$ Macros2.51985985Benzo(a)pyrene $\mu g/kg$ $PAH$ Macros2.67985985Pyrene $\mu g/kg$ $PAH$ Macros2.83985985Cropsere $\mu g/kg$ $PAH$ Macros2.84985985Lyrene $\mu g/kg$ $PAH$ Macros3.31985985Chrysene $\mu g/kg$ $PAH$ Macros3.31985985Chrysene $\mu g/kg$ $PAH$ Macros3.31985985Fluoranthene $\mu g/kg$ $PAH$ Macros3.31985985Chrysene $\mu g/kg$ $PAH$ Macros3.31985985Fluoranthene $\mu g/kg$ $PAH$ Macros3.31985985Anthracene $\mu g/kg$ $PAH$ Macros5.10985985Phenanthrene $\mu g/kg$ $PAH$ Macros5.10985985Phenanthrene $\mu g/kg$ $PAH$ Macros5.10985985Phenanthrene $\mu g/kg$ $PAH$ Macros5.10985985Phen	<b>Parameter Code</b>	Variable Name	Units	Group	Assemblage	FIT Score	Sample N	Excellent	Good	Fair	Poor	Very Poor
Benzo(g,h,i)perylene $\mu g/kg$ PAHMacros2.32985Indeno(1,2,3-cd)pyrene $\mu g/kg$ PAHMacros2.41985Copper $m g/kg$ PAHMacros2.41985Benzo(b)fluoranthene $\mu g/kg$ PAHMacros2.42985Benzo(a)pyrene $\mu g/kg$ PAHMacros2.51985Pyrene $\mu g/kg$ PAHMacros2.67985Pyrene $\mu g/kg$ PAHMacros2.85985Pyrene $\mu g/kg$ PAHMacros2.867985Pyrene $\mu g/kg$ PAHMacros2.81985Chrysene $\mu g/kg$ PAHMacros3.91985Chrysene $\mu g/kg$ PAHMacros3.91985Fluoranthene $\mu g/kg$ PAHMacros985985Arsenic $\mu g/kg$ PAHMacros985985Anthracene $\mu g/kg$ Metal_ToxMacros985985Arsenic $\mu g/kg$ Metal_ToxMacros985	P1093	Zinc	mg/kg	Metal_Tox	Macros	2.22	985	<75.00	>75.00	>100.0	>133.9	>167.8
	P34524	Benzo(g,h,i)perylene	µg/kg	PAH	Macros	2.32	985	-	< 335.0	>335.0	>792.1	>1249
Copper $mg/kg$ $metal_Tox$ $Macros$ $2.42$ $985$ Benzo(b)fluoranthene $\mug/kg$ $PAH$ $Macros$ $2.51$ $985$ Nickel $mg/kg$ $Retal_Tox$ $Macros$ $2.51$ $985$ Benzo(a)pyrene $\mug/kg$ $PAH$ $Macros$ $2.67$ $985$ Pyrene $\mug/kg$ $PAH$ $Macros$ $2.85$ $985$ Pyrene $\mug/kg$ $PAH$ $Macros$ $2.85$ $985$ Pyrene $\mug/kg$ $PAH$ $Macros$ $2.85$ $985$ Chysene $\mug/kg$ $PAH$ $Macros$ $2.85$ $985$ Benzo[a]anthracene $\mug/kg$ $PAH$ $Macros$ $3.01$ $985$ Strontium $mg/kg$ $Metal_Tox$ $Macros$ $3.144$ $985$ Dibenz(a,h)anthracene $\mug/kg$ $PAH$ $Macros$ $5.10$ $985$ Anthracene $\mug/kg$ $PAH$ $Macros$ $5.10$ $985$ Dibenz(a,h)anthracene $\mug/kg$ $Metal_Tox$ $Macros$ $5.10$ $985$ Ansenic $mg/kg$ $Metal_Tox$ $Macros$ $5.10$ $985$ Ansenic $mg/kg$ $Metal_Tox$ $Macros$ $6.249$ $985$ Arsenic $mg/kg$ $Metal_Tox$ $Macros$ $6.21$ $985$ Arsenic $mg/kg$ $Metal_Tox$ $Macros$ $6.21$ $985$ Arsenic $mg/kg$ $Metal_Tox$ $Macros$ $6.249$ $985$ Arsenic $mg/kg$ $Metal_Tox$ $Macros$ $6.21$ $985$ <	P34406	Indeno(1,2,3-cd)pyrene	µg/kg	PAH	Macros	2.41	985	-	< 260.5	>260.5	>623.3	>986.2
Benzo(b)fluoranthene $\mu/kg$ $PAH$ Macros $2.51$ 985           Nickel $mg/kg$ $Retal_Tox$ Macros $2.67$ 985           Benzo(a)pyrene $\mu/kg$ $RAH$ Macros $2.67$ 985           Pyrene $\mu/kg$ $RAH$ Macros $2.85$ 985           Pyrene $\mu/kg$ $Retal_Tox$ Macros $2.85$ 985           Elenzo(a)pyrene $\mu/kg$ $Retal_Tox$ Macros $3.01$ 985           Eluoranthene $\mu/kg$ $RAH$ Macros $3.14$ 985           Chrysene $\mu/kg$ $RAH$ Macros $3.14$ 985           Eluoranthene $\mu/kg$ $RAH$ Macros $3.91$ 985           Dibenz(a,h)anthracene $\mu/kg$ $Reta_{-1}Tox$ Macros $5.10$ 985           Arsenic $mg/kg$ $Reta_{-1}Tox$ Macros $5.10$ 985           Dibenz(a,h)anthracene $\mu/kg$ $Reta_{-1}Tox$ Macros $5.10$ 985	P1043	Copper	mg/kg	Metal_Tox	Macros	2.42	985	<u>&lt;</u> 19.00	>19.00	>29.78	>40.45	>51.12
Nickel         mg/kg         Metal_Tox         Macros         2.67         985           Benzo(a)pyrene $\mu g/kg$ $PAH$ Macros         2.85         985           Pyrene $\mu g/kg$ $PAH$ Macros         2.85         985           Pyrene $\mu g/kg$ $PAH$ Macros         2.85         985           Pyrene $\mu g/kg$ $PAH$ Macros         3.01         985           Benzo[a]anthracene $\mu g/kg$ $PAH$ Macros         3.51         985           Chrysene $\mu g/kg$ PAH         Macros         3.51         985         5           Dibenz(a,h)anthracene $\mu g/kg$ PAH         Macros         3.51         985         5           Dibenz(a,h)anthracene $\mu g/kg$ PAH         Macros         3.51         985         5           Dibenz(a,h)anthracene $\mu g/kg$ PAH         Macros         3.51         985         5           Anthracene $\mu g/kg$ PAH         Macros         5.10         985         5           Anthracene $\mu g/kg$ PAH         Macros         5.10	P34233	Benzo(b)fluoranthene	µg/kg	PAH	Macros	2.51	985		<520.8	>520.8	>1437	>2354
Benzo(a)pyrene $\mu g/kg$ PAH         Macros         2.85         985           Pyrene $\mu g/kg$ PAH         Macros         2.85         985           Pyrene $\mu g/kg$ PAH         Macros         2.85         985           Benzo[a]anthracene $\mu g/kg$ PAH         Macros         3.01         985           Benzo[a]anthracene $\mu g/kg$ PAH         Macros         3.51         985           Chrysene $\mu g/kg$ PAH         Macros         3.51         985           Fluoranthene $\mu g/kg$ PAH         Macros         3.51         985           Dibenz(a,h)anthracene $\mu g/kg$ PAH         Macros         5.10         985           Anthracene $\mu g/kg$ PAH         Macros         5.10         985           Anthracene $\mu g/kg$ PAH         Macros         5.10         985           Anthracene $\mu g/kg$ Macros         5.10         985           Anthracene $\mu g/kg$ Macros         5.10         985           Arsenic $m g/kg$ Macros         5.10         985	P1068	Nickel	mg/kg	Metal_Tox	Macros	2.67	985	-	<19.50	>19.50	>22.52	>25.53
Pyrene $\mu g/kg$ PAHMacros $2.85$ $985$ Lead $m g/kg$ Metal_ToxMacros $3.01$ $985$ Benzo[a]anthracene $\mu g/kg$ PAHMacros $3.13$ $985$ Chrysene $\mu g/kg$ PAHMacros $3.51$ $985$ Fluoranthene $\mu g/kg$ PAHMacros $3.51$ $985$ Fluoranthene $\mu g/kg$ PAHMacros $3.51$ $985$ Strontium $m g/kg$ PAHMacros $3.51$ $985$ Dibenz(a,h)anthracene $\mu g/kg$ PAHMacros $5.10$ $985$ Anthracene $\mu g/kg$ PAHMacros $5.10$ $985$ Antonium $m g/kg$ Metal_ToxMacros $5.10$ $985$ Arsenic $m g/kg$ Metal_ToxMacros $5.10$ $985$ Arsenic $m g/kg$ Metal_ToxMacros $5.10$ $985$ Arsenic $m g/kg$ Metal_ToxMacros $7.11$ $985$ Arsenium $m g/kg$ Metal_ToxMacros $7.10$ <td< td=""><td>P34250</td><td>Benzo(a)pyrene</td><td>µg/kg</td><td>PAH</td><td>Macros</td><td>2.85</td><td>985</td><td>-</td><td>&lt;230.0</td><td>&gt;230.0</td><td>&gt;798.3</td><td>&gt;1367</td></td<>	P34250	Benzo(a)pyrene	µg/kg	PAH	Macros	2.85	985	-	<230.0	>230.0	>798.3	>1367
Leadmg/kgMetal ToxMacros $3.01$ 985Berzofalanthracene $\mu g/kg$ PAHMacros $3.48$ 985Chrysene $\mu g/kg$ PAHMacros $3.51$ 985Fluoranthene $\mu g/kg$ PAHMacros $3.91$ 985Fluoranthene $\mu g/kg$ PAHMacros $3.91$ 985Dibenz(a,h)anthracene $\mu g/kg$ PAHMacros $3.91$ 985Pathmg/kgPAHMacros $3.91$ 985Dibenz(a,h)anthracene $\mu g/kg$ PAHMacros $3.91$ 985Pathpg/kgPAHMacros $5.10$ 985Phenanthrene $\mu g/kg$ PAHMacros $6.21$ 985Phenanthrene $\mu g/kg$ PAHMacros $6.21$ 985Chromium $m g/kg$ Metal_ToxMacros $6.21$ 985Manganese $m g/kg$ Metal_ToxMacros $8.26$ 985Silver $m g/kg$ Metal_ToxMacros $8.26$ 985Juminum $m g/kg$ Metal_ToxMacros $8.26$ 985Barium $m g/kg$ Macros $8.26$ 985985Barium $m g/kg$ Macros $8.26$ 985985Marium $m g/kg$ Macros $8.26$ 985985Marium $m g/kg$ Macros $8.26$ 985985Junnium $m g/kg$ Macros $8.26$ 985985Marium $m g/kg$ Macros<	P34472	Pyrene	µg/kg	PAH	Macros	2.85	985	-	< 393.0	0.595<	>1570	>2747
Benzo[a]anthracene $\mu k k$ $PAH$ Macros $3.48$ $985$ Chrysene $\mu k k$ $PAH$ Macros $3.51$ $985$ $1$ Fluoranthene $\mu k k$ $PAH$ Macros $3.51$ $985$ $1$ Strontium $\mu k k$ $Metal_T cox$ $Macros$ $3.51$ $985$ $1$ Dibenz(a,h)anthracene $\mu g / k g$ $PAH$ $Macros$ $4.44$ $985$ $1$ Dibenz(a,h)anthracene $\mu g / k g$ $PAH$ $Macros$ $5.10$ $985$ $1$ Phenanthrene $\mu g / k g$ $PAH$ $Macros$ $5.10$ $985$ $1$ Phenanthrene $\mu g / k g$ $PAH$ $Macros$ $5.10$ $985$ $1$ Manganese $\mu g / k g$ $Metal_T cox$ $Macros$ $5.10$ $985$ $1$ Manganese $m g / k g$ $Metal_T cox$ $Macros$ $5.10$ $985$ $1$ Manganese $m g / k g$ $Metal_T cox$ $Macros$ $5.10$ $985$ $1$ Manganese $m g / k g$ $Metal_T cox$ $Macros$ $6.29$ $985$ $1$ Manganese $m g / k g$ $Metal_T cox$ $Macros$ $8.26$ $985$ $1$ Manganese $m g / k g$ $Matros$ $8.26$ $985$ $1$ $1$ $1$ $1$ Manganese $m g / k g$ $Matros$ $8.26$ $985$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ $1$ <t< td=""><td>P1052</td><td>Lead</td><td>mg/kg</td><td>Metal_Tox</td><td>Macros</td><td>3.01</td><td>985</td><td><u>&lt;</u>15.50</td><td>&gt;15.50</td><td>&gt;24.80</td><td>&gt;33.04</td><td>&gt;41.27</td></t<>	P1052	Lead	mg/kg	Metal_Tox	Macros	3.01	985	<u>&lt;</u> 15.50	>15.50	>24.80	>33.04	>41.27
Image: Chrysene $\mu g/kg$ PAHMacros $3.51$ 985Fluoranthene $\mu g/kg$ PAHMacros $3.51$ 985985Fluoranthene $\mu g/kg$ Metal_ToxMacros $3.91$ 985985Strontium $\mu g/kg$ PAHMacros $4.57$ 985985Dibenz(a,h)anthracene $\mu g/kg$ PAHMacros $5.10$ 985985Anthracene $\mu g/kg$ PAHMacros $5.10$ 985985Chromium $\mu g/kg$ PAHMacros $5.10$ 985985Manganese $\mu g/kg$ Metal_ToxMacros $5.10$ 985985Manganese $m g/kg$ Metal_ToxMacros $8.26$ 985985Manganese $m g/kg$ Metal_ToxMacros $8.26$ 985985Maniuum $m g/kg$ Metal_ToxMacros $8.26$ 985985Marium $m g/kg$ Metal_ToxMacros $9.100$ 985 <td< td=""><td>P34529</td><td>Benzo[a]anthracene</td><td>µg/kg</td><td>PAH</td><td>Macros</td><td>3.48</td><td>985</td><td>-</td><td>&lt; 239.0</td><td>&gt;239.0</td><td>&gt;699.4</td><td>&gt;1160</td></td<>	P34529	Benzo[a]anthracene	µg/kg	PAH	Macros	3.48	985	-	< 239.0	>239.0	>699.4	>1160
Fluoranthene $\mu g/kg$ $PAH$ Macros         3.91         985           Image: Strontium         mg/kg         Metal_Tox         Macros         4.44         985           Image: Strontium         mg/kg         Metal_Tox         Macros         4.57         985           Image: Strontium $\mu g/kg$ PAH         Macros         5.10         985           Image: Strontium $\mu g/kg$ PAH         Macros         5.10         985           Image: Strontium $\mu g/kg$ PAH         Macros         5.10         985           Image: Strontium $\mu g/kg$ Metal_Tox         Macros         6.21         985           Image: Strontium $m g/kg$ Metal_Tox         Macros         6.29         985           Image: Strontium $m g/kg$ Metal_Tox         Macros         7.11         985           Image: Strontium $m g/kg$ Metal_Tox         Macros         8.26         985         985           Image: Strontium $m g/kg$ Metal_Tox         Macros         8.26         985         985           Image: Strontium $m g/kg$ Metal_Tox         Macros <t< td=""><td>P34323</td><td>Chrysene</td><td>µg/kg</td><td>PAH</td><td>Macros</td><td>3.51</td><td>985</td><td>-</td><td>&lt;266.0</td><td>&gt;266.0</td><td>&gt;958.3</td><td>&gt;1651</td></t<>	P34323	Chrysene	µg/kg	PAH	Macros	3.51	985	-	<266.0	>266.0	>958.3	>1651
Strontiummg/kgMetal_ToxMacros $4.44$ 985Dibenz(a,h)anthracene $\mu g/kg$ $PAH$ Macros $4.57$ 985Anthracene $\mu g/kg$ $PAH$ Macros $5.10$ 985Anthracene $\mu g/kg$ $PAH$ Macros $5.10$ 985Anthracene $\mu g/kg$ $PAH$ Macros $5.10$ 985Arsenic $m g/kg$ Metal_ToxMacros $5.10$ 985Arsenic $m g/kg$ Metal_ToxMacros $6.21$ 985Arsenic $m g/kg$ Metal_ToxMacros $6.21$ 985Arsenic $m g/kg$ Metal_ToxMacros $6.21$ 985Arsenic $m g/kg$ Metal_ToxMacros $9.26$ $9.85$ Aluminum $m g/kg$ Metal_ToxMacros $9.826$ $9.85$ Aluminum $m g/kg$ Metal_To	P34379	Fluoranthene	µg/kg	PAH	Macros	3.91	985	I	<774.0	>774.0	>2432	>4091
Dibenz(a,h)anthracene $\mu K_{K}$ PAH         Macros         4.57         985           Anthracene $\mu g/kg$ PAH         Macros         5.10         985           Phenanthrene $\mu g/kg$ PAH         Macros         5.10         985           Phenanthrene $\mu g/kg$ Metal_Tox         Macros         6.21         985           Arsenic $m g/kg$ Metal_Tox         Macros         6.21         985           Manganese $m g/kg$ Metal_Tox         Macros         6.21         985           Manganese $m g/kg$ Metal_Tox         Macros         985         985           Manganese $m g/kg$ Metal_Tox         Macros         985         985           Maninum $m g/kg$ Metal_Tox         Macros         985         985           Maninum $m g/kg$ Metal_Tox         Macros         985         985           Maninum $m g/kg$ Metal_Tox         Macros         985         985           Manunum $m g/kg$ Metal_Tox         Macros         985         985           Manunum $m g/kg$	P1083	Strontium	mg/kg	Metal_Tox	Macros	4.44	985	I	<81.80	>81.80	>106.8	>131.9
Anthracene $\mu K k$ PAH         Macros         5.10         985           Phenanthrene $\mu K k$ PAH         Macros         5.10         985           Phenanthrene $\mu K k$ Metal_Tox         Macros         5.10         985           Chromium $m K k$ Metal_Tox         Macros         6.21         985           Nanganese $m K k$ Metal_Tox         Macros         6.21         985           Nanganese $m K k$ Metal_Tox         Macros         6.21         985           Nanganese $m K k$ Metal_Tox         Macros         985         985           Manganese $m K k$ Metal_Tox         Macros         985         985           Nanunum $m K k$ Metal_Tox         Macros         985         985           Manunum $m K k$ Metal_Tox <td>P34559</td> <td>Dibenz(a,h)anthracene</td> <td>µg/kg</td> <td>PAH</td> <td>Macros</td> <td>4.57</td> <td>985</td> <td>-</td> <td>&lt; 101.0</td> <td>&gt;101.0</td> <td>&gt;167.3</td> <td>&gt;233.7</td>	P34559	Dibenz(a,h)anthracene	µg/kg	PAH	Macros	4.57	985	-	< 101.0	>101.0	>167.3	>233.7
Phenanthrene $\mu K R$ PAH         Macros         5.10         985           Arsenic $m g/k R$ Metal_Tox         Macros         6.29         985           Chromium $m g/k R$ Metal_Tox         Macros         6.29         985           Manganese $m g/k R$ Metal_Tox         Macros         6.29         985           Manganese $m g/k R$ Metal_Tox         Macros         7.01         985           Manganese $m g/k R$ Metal_Tox         Macros         7.11         985           Manganese $m g/k R$ Metal_Tox         Macros         8.26         985         985           Maniuum $m g/k R$ Metal_Tox         Macros         8.26         985         985           Maniuum $m g/k R$ Metal_Tox         Macros         8.26         985         985           Macros $m acros         n acros         n acros         8.26         985         985           Maturo         m g/k R         Metal_Tox         Macros         n D^3         985         985           Macros         m g/k R         Macros         n D^3 $	P34223	Anthracene	µg/kg	PAH	Macros	5.10	985	-	<78.00	>78.00	>119.9	>161.8
Arsenic         mg/kg         Metal_Tox         Macros $6.21$ 985           Chromium         mg/kg         Metal_Tox         Macros $6.29$ 985           Chromium         mg/kg         Metal_Tox         Macros $6.29$ 985           Manganese         mg/kg         Metal_Tox         Macros $6.29$ 985           Nanganese         mg/kg         Metal_Tox         Macros $7.11$ 985           Aluminum         mg/kg         Metal_Tox         Macros $8.26$ 985           Barium         mg/kg         Metal_Tox         Macros $8.26$ 985           Barium         mg/kg         Metal_Tox         Macros $8.26$ 985           Macros         Macros         Nacros $8.26$ 985 $985$ Macros         Macros         Macros         ND <sup>a</sup> 985 $985$ Macros         Macros         ND <sup>a</sup> 985 $985$ $985$ Macros         Macros         ND <sup>a</sup> 985 $985$ $985$ Macros         Macros         ND <sup>a</sup> $985$	P34464	Phenanthrene	µg/kg	PAH	Macros	5.10	985	-	< 243.5	>243.5	>803.3	>1363
Chromium       mg/kg       Metal_Tox       Macros $6.29$ 985       985         Manganese       mg/kg       Metal_Tox       Macros $7.08$ 985       985         Manganese       mg/kg       Metal_Tox       Macros $7.03$ 985       985         Manganese       mg/kg       Metal_Tox       Macros $7.11$ 985       985         Aluminum       mg/kg       Metal_Tox       Macros $8.26$ 985       985         Barium       mg/kg       Metal_Tox       Macros $8.26$ 985       985         Barium       mg/kg       Metal_Tox       Macros $8.26$ 985       985         Macros       mg/kg       Metal_Tox       Macros $9.82$ 985       985         Macros       mg/kg       Metal_Tox       Macros $9.86$ 985       985         Macros       mg/kg       Metal_Tox       Macros $9.82$ 985       985         Macros       mg/kg       Metal_Tox       Macros $9.82$ 985       985         Macros       mg/kg       Metal_Tox       Macros $9.85$ 985       985	P1003	Arsenic	mg/kg	Metal_Tox	Macros	6.21	985		<u>&lt;</u> 8.65	>8.65	>15.82	>23.67
Manganese         mg/kg         Metal_Tox         Macros         7.08         985         985           Nambal Silver         mg/kg         Metal_Tox         Macros         7.11         985         985           Aluminum         mg/kg         Metal_Tox         Macros         7.11         985         985           Barium         mg/kg         Metal_Tox         Macros         8.26         985         985           Barium         mg/kg         Metal_Tox         Macros         8.26         985         985           Baryllium         mg/kg         Metal_Tox         Macros         8.88         985         985           Baryllium         mg/kg         Metal_Tox         Macros         985         985         985           Tin         mg/kg         Metal_Tox         Macros         ND <sup>a</sup> 985         985           Acenaphthene         µg/kg         PAH         Macros         ND         985         985           Acenaphthene         µg/kg         PAH         Macros         ND         985         985           Macros         PAH         Macros         ND         985         985         985           Macros         MO <td>P1029</td> <td>Chromium</td> <td>mg/kg</td> <td>Metal_Tox</td> <td>Macros</td> <td>6.29</td> <td>985</td> <td><u>&lt;</u>20.53</td> <td>&gt;20.53</td> <td>&gt;23.30</td> <td>&gt;26.22</td> <td>&gt;29.15</td>	P1029	Chromium	mg/kg	Metal_Tox	Macros	6.29	985	<u>&lt;</u> 20.53	>20.53	>23.30	>26.22	>29.15
Silver         mg/kg         Metal_Tox         Macros         7.11         985           Aluminum         mg/kg         Metal_Tox         Macros         8.26         985           Barium         mg/kg         Metal_Tox         Macros         8.26         985           Barium         mg/kg         Metal_Tox         Macros         8.38         985           Barium         mg/kg         Metal_Tox         Macros         8.38         985           Baryllium         mg/kg         Metal_Tox         Macros         11.00         985           Tin         mg/kg         Metal_Tox         Macros         11.00         985           Acenaphthene         µg/kg         PAH         Macros         ND <sup>a</sup> 985           Acenaphthene         µg/kg         PAH         Macros         ND         985           Delta-BHC         µg/kg         PAH         Macros         ND         985           Fluorene         µg/kg         PAH         Macros         ND         985	P1053	Manganese	mg/kg	Metal_Tox	Macros	7.08	985	<u>&lt;</u> 841.0	>841.0	>845.5	>996.8	>1148
Aluminum $mg/kg$ Metal_ToxMacros $8.26$ $985$ Barium $mg/kg$ Metal_ToxMacros $8.38$ $985$ Barium $mg/kg$ Metal_ToxMacros $8.88$ $985$ Cadmium $mg/kg$ Metal_ToxMacros $11.00$ $985$ Beryllium $mg/kg$ Metal_ToxMacros $985$ $985$ Tin $mg/kg$ Metal_ToxMacros $ND^a$ $985$ Acenaphthylene $\mug/kg$ PAHMacros $ND$ $985$ Acenaphthene $\mug/kg$ PAHMacros $ND$ $985$ Delta-BHC $\mug/kg$ PAHMacros $ND$ $985$ Fluorene $\mug/kg$ PAHMacros $ND$ $985$ Macros $ND$ $985$ $ND$ $985$	P1078	Silver	mg/kg	Metal_Tox	Macros	7.11	985	-	<0.483	>0.483	>1.261	>2.039
Bariummg/kgMetal_ToxMacros8.88985Cadmiummg/kgMetal_ToxMacros11.00985Berylliummg/kgMetal_ToxMacros11.00985Tinmg/kgMetal_ToxMacrosND <sup>a</sup> 985Acenaphthyleneµg/kgPAHMacrosND985Acenaphthyleneµg/kgPAHMacrosND985Acenaphthyleneµg/kgPAHMacrosND985Acenaphtheneµg/kgPAHMacrosND985Fluoreneµg/kgPAHMacrosND985Polta-BHCµg/kgPAHMacrosND985Fluoreneµg/kgPAHMacrosND985MacrosND985ND985ND	P1108	Aluminum	mg/kg	Metal_Tox	Macros	8.26	985	-	<6480	>6480	>8272	>10064
Cadmiummg/kgMetal_ToxMacros11.00985Berylliummg/kgMetal_ToxMacros11.00985Tinmg/kgMetal_ToxMacrosND <sup>a</sup> 985Acenaphthyleneµg/kgPAHMacrosND985Acenaphtheneµg/kgPAHMacrosND985Delta-BHCµg/kgPAHMacrosND985Fluoreneµg/kgPAHMacrosND985Fluoreneµg/kgPAHMacrosND985	P1008	Barium	mg/kg	Metal_Tox	Macros	8.88	985		<u>&lt;</u> 141.0	>132.0	>150.3	>168.7
Beryllium $mg/kg$ Metal_ToxMacros $ND^3$ 985Tin $mg/kg$ Metal_ToxMacrosND985Acenaphthylene $\mug/kg$ PAHMacrosND985Acenaphthene $\mug/kg$ PAHMacrosND985Delta-BHC $\mug/kg$ PAHMacrosND985Fluorene $\mug/kg$ PAHMacrosND985Fluorene $\mug/kg$ PAHMacrosND985Macros $ndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosND985100MacrosndrosndrosND985Macrosndrosndrosndros100Macrosndrosndrosndros100Macrosndrosndrosndros100Macrosndrosndrosndros100Macrosndrosndrosndros100Macrosndrosndrosndros100$	P1028	Cadmium	mg/kg	Metal_Tox	Macros	11.00	985	I	<u>&lt;</u> 0.933	>0.745	>1.354	>1.963
Tin $mg/kg$ $Metal_Tox$ $Macros$ ND985Acenaphthylene $\mug/kg$ PAHMacrosND985Acenaphthene $\mug/kg$ PAHMacrosND985Delta-BHC $\mug/kg$ PAHMacrosND985Fluorene $\mug/kg$ PAHMacrosND985Fluorene $\mug/kg$ PAHMacrosND985	P1013	Beryllium	mg/kg	Metal_Tox	Macros	$ND^{a}$	985		<u>&lt;</u> 0.411	>0.411	>0.496	>0.581
Acenaphthylene         μg/kg         PAH         Macros         ND         985           Acenaphthene         μg/kg         PAH         Macros         ND         985           Delta-BHC         μg/kg         PAH         Macros         ND         985           Fluorene         μg/kg         PAH         Macros         ND         985	P1103	Tin	mg/kg	Metal_Tox	Macros	ND	985	-	<8.86	>11.00	>16.73	>24.60
Accenaphthene     μg/kg     PAH     Macros     ND     985       Delta-BHC     μg/kg     PAH     Macros     ND     985       Fluorene     μg/kg     PAH     Macros     ND     985	P34203	Acenaphthylene	µg/kg	PAH	Macros	ND	985	I	<86.38	>86.38	>103.6	>120.9
Delta-BHC         μg/kg         PAH         Macros         ND         985           Fluorene         μg/kg         PAH         Macros         ND         985	P34208	Acenaphthene	µg/kg	PAH	Macros	ND	985	1	<84.25	>84.25	>104.8	>125.3
Fluorene µg/kg PAH Macros ND 985	P34262	Delta-BHC	µg/kg	PAH	Macros	ND	985	-	<2.098	>2.098	>6.19	>10.28
	P34384	Fluorene	µg/kg	PAH	Macros	ND	985	1	<84.25	>84.25	>104.8	>125.3
	P34445	Naphthalene	µg/kg	PAH	Macros	ND	985	1	< 86.38	>86.38	>103.6	>120.9

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Table 9. Biological effect thresholds derived from Northeast Illinois streams and rivers for 25 habitat and land use parameters as part the fish or macroinvertebrate assemblages for each parameter are indicated along with thresholds for excellent, good, fair, poor, of the NE Illinois IPS development and used to assess results from the Year 2 Des Plaines River study area. The most limiting of and very poor biological condition.

			Parameter	Limiting			Ę	Thresholds by Narrative Condition Category	larrative Con	dition Catego	bry	Reference Site Values (Median -	Reference
Parameter Code	Variable Name	Units	Group	Assemblage	<b>FIT Score</b>	Sample N	Excellent	Good	Fair	Poor	Very Poor	2X IQR)	Site N
EMBEDDED	Embeddedness Score	QHEI Units	Habitat	Fish	0.03	1393	<u>&lt;</u> 1.3	>1.3	>1.6	>2.4	>3.2	2 (2-2)	29
Urban	Urban (Ust. WS)	Wtd. %	Land Use	Fish	0.03	2657	≤8.8	>8.8	>45.0	>63.2	>81.3	8.7 (3.0-9.5)	48
QHEI	QHEI Score	QHEI Units	Habitat	Fish	0.04	1393	<u>&gt;</u> 84.5	>75.9	<75.9	<50.1	<25.0	84 (76-90)	34
SUBSTRAT	Substrate Score	QHEI Units	Habitat	Fish	0.04	1393	>16.0	<16.0	<15.0	6.6>	<5.0	8 (7-9)	33
WWH_ATTR	Good Habitat Attributes	Number	Habitat	Fish	0.04	1393	<del>ا</del> ×	6>	8	<5	<2	16 (15-17)	34
Imperv	Impervious (30 m)	Wtd. %	Land Use	Fish	0.04	2657	<u>&lt;</u> 18.3	>18.3	>30.5	<del>7</del> .53.4	>76.4	2.1 (0.0-14.7)	48
Imperv	Impervious (30 m Clipped)	Wtd. %	Land Use	Fish	0.04	2657	<u>&lt;</u> 13.4	>13.4	>26.7	6:05<	>75.1	2.1 (0.0-6.1)	48
CHANNEL	Channel Score	QHEI Units	Habitat	Fish	0.07	1393	>16.8	<16.8	<14.00	<9.2	<4.6	16 (13-19)	34
COVER	Cover Score	QHEI Units	Habitat	Fish	0.07	1393	>16.0	<16.0	<14.0	<9.2	<4.6	16 (16-17)	34
SILTCOVE	Silt Cover Score	QHEI Units	Habitat	Fish	0.07	1393	≤2.0	<2.0	>2.0	>2.7	>3.33	2 (2-3)	29
Develop	Developed (Ust. WS)	Wtd. %	Land Use	Fish	0.07	2657	<u>&lt;</u> 9.1	>9.1	>45.6	>63.6	>81.5	9.1 (2.9-9.6)	48
RIPARIAN	Riparian Score	QHEI Units	Habitat	Fish	0.10	1393	>6.0	>6.0	<6.0	<4.0	<2.0	7.0 (6.0-9.5)	34
Imperv	Impervious (Ust. WS)	Wtd. %	Land Use	Macros	0.10	3096	<5.6	>5.6	>13.2	>41.8	>70.5	5.2 (2.1-5.4)	48
DEPTH	Depth Score	QHEI Units	Habitat	Fish	0.11	1393	>10.0	>10.0	<10.0	<6.6	<3.3	10 (9-11)	33
MWH_ATTR	Poor Habitat Attributes	Number	Habitat	Fish	0.12	1393	4	<1	>1	>3	>6	2 (1-5)	20
нур_онеі	Hydro-QHEI	QHEI Units	Habitat	Fish	0.13	1393	<u>&gt;</u> 17.0	>17.0	<19.5	<12.9	-6.4	20 (14-22)	33
CURRENT	Current Score	QHEI Units	Habitat	Fish	0.14	1393	>7.0	>7.0	<7.0	<4.6	<2.3	11 (5.8-11.0)	33
POOL	Pool Score	QHEI Units		Fish	0.15	1393	<u>&gt;</u> 11.3	<11.3	<10.0	9.65	<3.3	11.5 (10-12)	34
Heavurb	Heavy Urban (Ust. WS)	Wtd. %	Land Use	Macros	0.17	3096	<7.7	>7.7	>29.3	>52.6	>76.0	5.5 (1.1-6.0)	48
RIFFLE	Riff< Score	QHEI Units	Habitat	Fish	0.27	1393	<u>&gt;</u> 5.8	>5.8	<5.8	6'E>	<1.9	6 (5-7)	34
GRAD_S	Gradient Score	QHEI Units	Habitat	Fish	0.31	1393	>10.0	>10.0	<10.0	<6.6	<3.3	10 (10-10)	34
Ag	Agricultural (Ust. WS)	Wtd. %	Land Use	Macros	4.82	3096	<87.1	<87.1	>62.1	>74.6	>87.1	83.9 (11.7-85.4)	48
GRADIENT	Gradient (ft/mi)	feet/mile	Habitat	Fish	12.20	1393	<u>&gt;</u> 8.8	<8.8	<4.3	<2.8	<1.4	8.6 (4.9-11.3)	34
Ag	Agricultural (30 m)	Wtd. %	Land Use	Macros	16.66	3096	<u>&lt;</u> 87.2	<87.2	>43.2	>61.9	>80.7	0.0 (0.0-0.4)	48

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 (Illinois EPA 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.

#### Completing the Cycle of WQ Management: Assessing and Guiding Management Actions with Integrated Environmental Assessment

#### Indicator Levels

1: Management actions	Administrative Indicators
2: Response to management	Administrative Indicators [permits, plans, grants, enforcement, abatements]
3: Stressor abatement	Stressor Indicators [pollutant loadings, land use practices]
4: Ambient conditions	Exposure Indicators [pollutant
5: Assimilation and uptake	<i>Exposure Indicators</i> [pollutant levels, habitat quality, ecosystem process, fate & transport]
6: Biological response	Response Indicators [biological metrics, multimetric indices]
Ecological	"Health" Endpoint

**Figure 3**. 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).

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.

#### **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. This process was strengthened by the availability of regionally derived stressor effect thresholds from the NE Illinois IPS (MBI 2020a) that classified stressor levels into excellent, good, fair, poor, and very poor categories.

#### **RESULTS – CHEMICAL/PHYSICAL WATER QUALITY**

Chemical/physical water quality in the 2019 Year 3 study area was characterized by grab sample data collection from the water column six times at each Tier 1-3 sites during summer-fall base flows and four times at the Tier 4 sites<sup>1</sup>. Sediment chemistry was collected at the 22 Tier 1-3 sites in October 2019. Commonly detected chemical parameters were compared either to the criteria in the Illinois WQS, Illinois EPA non-standard benchmarks, reference benchmarks, and/or biologically derived thresholds from the NE IL IPS tool and dashboard (MBI 2020a; 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).

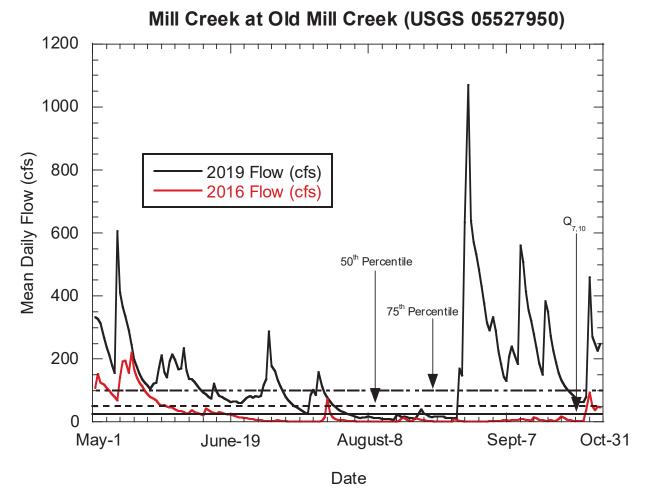
#### **Flow Regime**

The flow regime of the Year 3 study area during the period of May 1 – October 31 for 2016 and 2019 monitoring years is depicted in Figure 4 based on the gauge operated by the U.S. Geological Survey on Mill Creek near Old Mill Creek, IL (USGS 05527950). The flow regime was comparatively higher in 2019, primarily above the 75<sup>th</sup> percentile with a single period below the  $Q_{7,10}$  during the month of August. By contrast flows during the baseline bioassessment in 2016 were much lower with extended periods at or even below the  $Q_{7,10}$  for extended periods during the summer-early fall index period. The high flows during the months of August and September 2019 prevented a second sampling event by the fish crew and samples were not collected in Mill Creek at site 11-4 for fish or site 11-2 for macroinvertebrates. Flows were at levels acceptable to conduct the biological survey in late July-early August and by mid-October 2019.

#### Point Source Effluent Quality

The two major point sources in the 2019 Year 3 study area are the Mill Creek WWTP and the Village of Lindenhurst Sewage Treatment Plant (STP). The Mill Creek WWTP discharges one mile upstream from the confluence of Mill Creek with the Des Plaines River mainstem and has previously been included in the mainstem bioassessment (MBI 2017, 2020b). The WWTP has a maximum discharge rate of 2.1 million gallons per day (MGD) which is 11% of the Q<sub>7,10</sub> of Mill Creek measured at the USGS gauge at Old Mill Creek, IL (05527950). The Village of Lindenhurst WWTP has a maximum discharge rate of 5.7 MGD, which is 2600% of the Q<sub>7,10</sub> flow measured at the gauge in Hastings Creek near Lindenhurst, IL (05527905). As a result Hastings Creek is effluent dominated due to the majority of the flow being provided by the Village of Lindenhurst WWTP, while the lower one mile of Mill Creek has a comparatively lower amount of effluent influencing flow for the lesser distance affected by the Mill Creek WWTP.

<sup>&</sup>lt;sup>1</sup> The DRWW chemical monitoring includes samples collected outside the summer-fall seasonal index period and are not reported herein.



**Figure 4**. Daily flow measured at the USGS gage on Mill Creek (USGS 05527950) at Old Mill Creek, IL during the calendar year of 2019. The horizontal lines are the 75th percentile, 50th percentile and the seven-day, ten year (Q<sub>7,10</sub>) critical low flows.

#### Lake Co. DPW Mill Creek WWTP

An annual average of 0.908 MGD from the Mill Creek plant (NPDES Permit No. IL0071366) was recorded flowing into Mill Creek at river mile 1.2 in 2019. The design average flow (DAF) is 0.9 million gallons per day (MGD) and the design maximum flow (DMF) for the facility is 2.1 MGD. Treatment consists of screening, grit removal, activated sludge, sedimentation, filtration, ultraviolet disinfection, sludge handling facilities, and biological phosphorus removal with chemical addition as a backup system.

#### Village of Lindenhurst WWTP

An annual average of 1.28 MGD from the Village of Lindenhurst STP (NPDES Permit No. IL0020796) was recorded flowing into Hastings Creek at river mile 2.8, downstream of County Highway 18, in 2019. The DAF for the facility is 2.0 MGD and the DMF is 5.7 MGD. Treatment consists of screening, activated sludge, sedimentation, filtration, disinfection, aerobic digestion and sludge storage.

Between the two WWTPs, the Lindenhurst WWTP had the highest effluent flow (1.28 vs. 0.91 MGD), CBOD<sub>5</sub> loading (29.55 vs. 7.41 lbs./day), total suspended solids loading (34.21 vs. 15.97 lbs./day), ammonia-N loading (1.50 vs. 0.77 lbs./day), and total phosphorus loading (6.79 vs. 0.92 lbs./day; Figure 4). The Mill Creek WWTP discharged a higher loading of nitrate-N (85.95 vs. 28.89 lbs./day).

#### Water Column Chemistry

The water column chemistry results were analyzed for spatial patterns resulting from the pollution survey design in the Year 3 Des Plaines River study area. The results were screened for exceedances of Illinois WQS, Illinois non-standard benchmarks, regional reference benchmarks, and biological effect thresholds derived from the NE Illinois IPS (Tables 7 and 8) were assessed. Exceedances of these benchmarks and thresholds are indicated on the plots and tables of the 2019 chemical results.

#### Exceedances of Biological Effect and Reference Thresholds

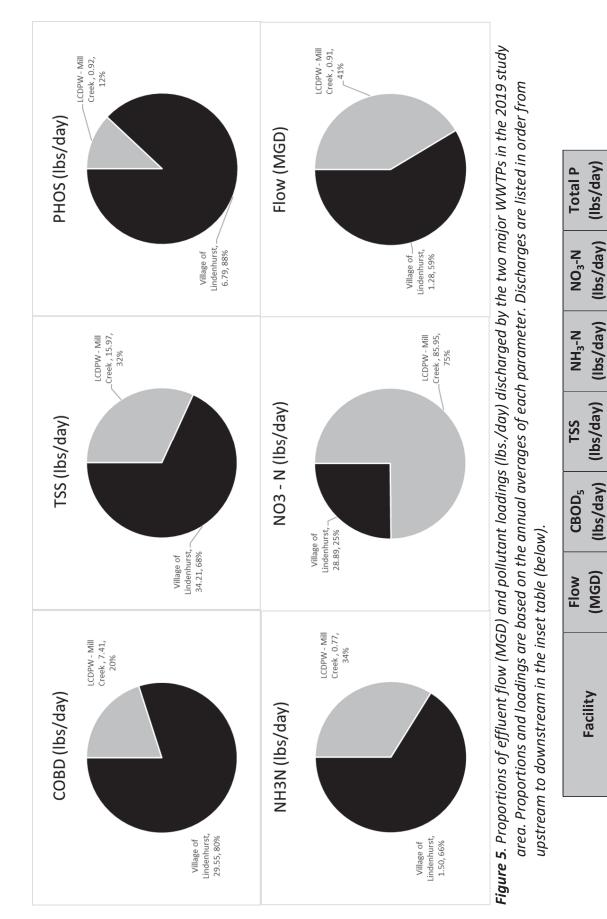
The principal purpose of chemical sampling in a bioassessment is to provide data that supports the interpretation and the assignment of associated causes of biological impairments. Chemical exceedances of biological effect thresholds is essential to that process and has previously included the Illinois water quality criteria, regional reference benchmarks, and national and regional biological effects compendia. Some of these consist of correlations between concentrations of substances that correspond to biological quality gradients across significant geographical areas while others are toxicological endpoints derived from laboratory studies. Two regional studies that have been 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; MBI2015) 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.

The NE Illinois IPS (MBI 2020a) thresholds for water column chemical parameters that are applicable in the Des Plaines Year 3 study area appear in Table 7. Sediment chemical thresholds are provided in Table 8 and were also evaluated against threshold and probable effect levels (TEL and PEL) established by MacDonald et al. (2000) and Illinois EPA (Short 1998). The severity of exceedances of these values offered by the multiple narrative classes (i.e., excellent, good, fair, poor, and very poor) 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 effect thresholds for select parameter groups for both water column and sediment chemistry results. With the exception of D.O. there were no exceedances of parameters that have Illinois EPA water quality criteria.

#### **Demand and Nutrient Related Parameters**

Demand and nutrient related parameters consist of those related to the discharges of treated

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6.79 0.92

28.89 85.95

1.50

29.55 7.41

1.28 0.91

Village of Lindenhurst LCDPW-Mill Creek

0.77

34.21 15.97 and untreated sewage, organic enrichment from point and nonpoint sources, and nutrient related parameters (nitrogen and phosphorus) and those that reflect their effects such as benthic and sestonic chlorophyll a and dissolved oxygen (D.O.).

#### Dissolved Oxygen (D.O.)

Exceedances of dissolved oxygen (D.O.) were assessed primarily with continuous data obtained from short-term Datasonde deployments during mid to late August 2019, but grab samples collected by the fish crew are included in Table 10. The deployments of Datasonde continuous recorders in mid-August 2019 recorded exceedances of parts of the Illinois EPA D.O. criteria (Figure 5). All of the deployments were made after August 1 hence the minimum was evaluated against the 3.5 mg/L minimum criterion and the 5.5 mg/L 30-day average criteria. There was insufficient data to evaluate the weekly and rolling average aspects of the Illinois EPA D.O. criteria. Exceedances of the 3.5 mg/L minimum criterion occurred at four sites in the 2019 study area (Figure 5). The median value indicating that more than one half of the readings were below the 3.5 mg/L minimum criterion occurred in Mill Creek at RM 13.8 (site 11-5 at Washington Str.) and at RM 2.54 in the West Branch of Bull Creek (site 14-4 at Northwind Blvd.). The other two sites, RM 10.1 in Mill Creek (site 11-4) and RM 1.68 in Hastings Creek (site 10-4) had minimum values at or just below the 3.5 mg/L minimum. Exceedances of the 30-day average of 5.5 mg/L occurred at eight (8) sites with exceedances occurring in each of the monitored watersheds. Most exceedances of the 30-day average were minor compared to RM 13.8 and 10.1 in Mill Creek mainstem and RM 2.5 in the West Branch of Bull Creek. More than 75% of the readings at the two Mill Creek sites were below the 30-day average of 5.5 mg/L with nearly all readings in the West Branch of Bull Creek below the 30-day average. The Mill Creek (site 11-5) and West Branch Bull Creek (site 14-4) are located between a wetland pond and a lake, respectively, that correspond to the low D.O. levels. The results in Mill Creek suggest a classic sag and recovery longitudinal pattern with the source as of yet unknown. The site in Hastings Creek at RM 1.68 located downstream and upstream of the Lindenhurst WWTP showed the widest diel variation of nearly 10 mg/L with more than one half of the D.O. values below the 30-day average criterion. The daytime grab sample data did reveal daytime values above the NE Illinois IPS fair threshold indicative of moderate nutrient enrichment at three sites (Newport Drainage Ditch, Slocum Creek, and West Fork Belvidere Rd.) that were not assessed with continuous data nor the SNAP procedure. Three sites with low daytime values below the NE Illinois IPS poor threshold were confirmed by the Datasonde results.

#### Ammonia-Nitrogen (N)

Mean total ammonia-N were mostly at background or only slightly elevated levels in 2019 (Figure 6; Table 10) with the exception of three sites including mean and maximum values of 0.88 mg/L and 2.44 mg/L in the Suburban Country Club Tributary at RM 2.75, 0.77 mg/L and 2.11 mg/L in the Unnamed Tributary to Greenleaf Creek at RM 0.4, and 0.65 mg/L and 1.73 mg/L at the second most upstream site in Mill Creek at RM 13.8. Both the maximum and mean values exceeded a representative ammonia-N criterion for the General Use at a temperature of 25°C and pH of 8.5 S.U. and all exceeded the very poor threshold of the NE Illinois IPS (Table 7). However, ammonia-N criteria exceedances are sensitive to elevated pH especially and, as such,

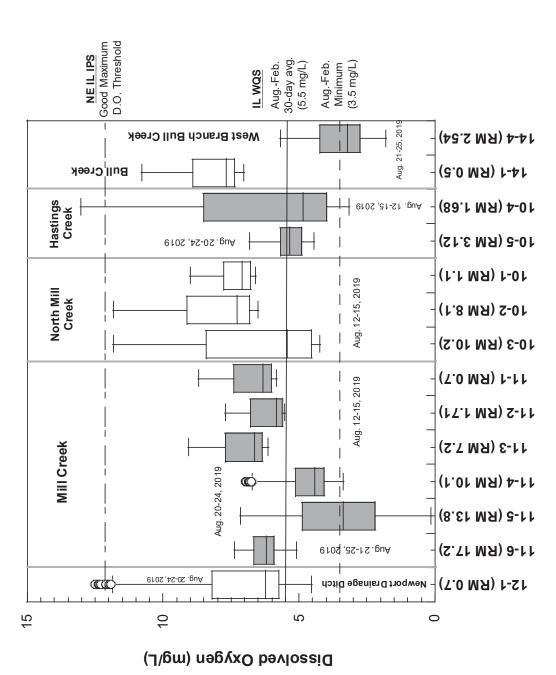
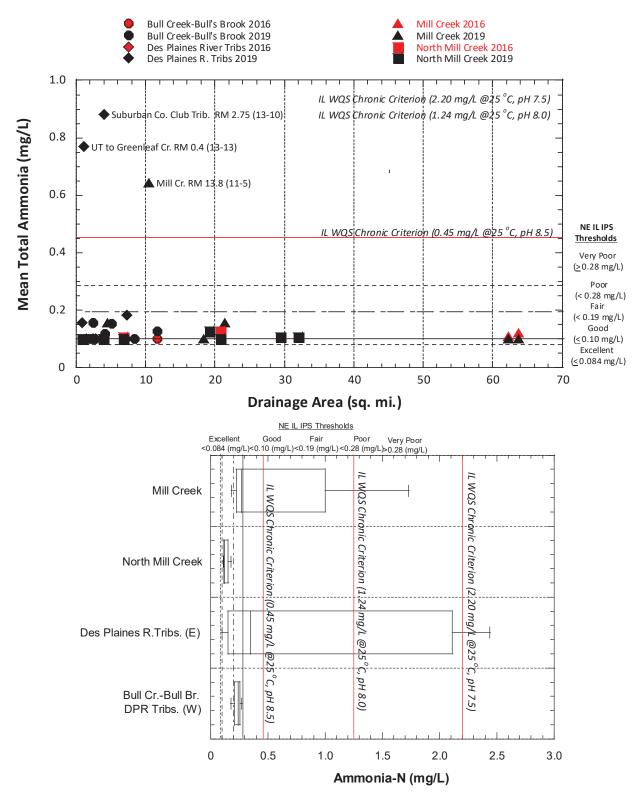


Figure 6. Dissolved oxygen (D.O.) concentrations (mg/L) measured continuously by Datasondes deployed for 3-4 day periods during August 12-15, 2019, August 20-24, 2019, and August 21-25, 2019 at 14 locations in the Year 3 Upper Des Plaines study area. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The Illinois EPA August-February minimum (3.5 mg/L) and the 30-day average D.O. criteria are shown by solid and dashed lines.



*Figure 7.* Concentrations of ammonia-N by subwatershed and stream in the Year 3 2019 study area. Mean values are shown by individual site by drainage area (upper panel) in 2016 and 2019 and in tributary subwatershed bundles as box-and-whisker plots (lower panel). Dashed and solid lines represent effect thresholds from the NE Illinois IPS (Table 7).

locations in the Year 3 2019 Upper Des Plaines River subwatershed study area. Shading is based on threshold exceedances listed at the bottom of the table.

Site ID	River Mile	Drainage Area (sq. mi.)	D.O. (mg/L)	Ammonia- N (mg/L)		TKN (mg/L)	Total Phos- phorus (mg/L)	Chloro- phyll a Benthic	Chloro- phyll a Sestonic
0.00.12		(•9.1)	(8/ =/		Creek	(8/ -/	(		
11-6	17.20	4.50	7.1	0.160	0.824	2.80	0.093	43.42	8.90
11-5	13.80	10.40	10.4	0.640	0.346	1.87	0.100	17.05	8.00
11-4	10.10	18.30	-	ND	0.126	2.37	0.071	29.14	8.40
11-3	7.20	21.40	8.5	0.160	0.177	3.03	0.109	37.19	9.70
11-2	1.71	62.30	6.4	ND	0.617	1.84	0.129	34.45	14.20
11-1	0.70	63.80	7.3	ND	1.013	1.99	0.167	17.64	14.85
			-	North	Mill Creek				
10-7	11.30	19.23	4.1	0.180	0.604	1.45	0.153	-	-
10-3	10.20	20.86	9.3	ND	0.398	2.04	0.144	22.46	4.45
10-2	8.10	29.57	9.0	0.107	0.922	1.46	0.169	37.30	6.85
10-1	1.10	31.97	6.5	0.105	0.909	1.54	0.127	31.30	ND
					ngs Creek				
10-5	3.12	3.91	7.3	ND	ND	2.64	0.061	30.02	7.40
10-4	1.68	5.60	9.3	ND	1.121	2.74	0.146	43.70	11.45
		1				Creek @RM 0.			
10-6	0.04	0.99	8.9	ND	0.381	1.81	0.101	-	ND
				Newport D					
12-2	3.03	2.80	9.5	ND	0.208	2.28	0.116	-	8.80
12-1	0.70	7.35	12.3	0.183	0.161	1.57	0.100	33.61	4.40
42.40	2.00	4.00		urban Coun	_		0.074		4.20
13-10	2.00	4.00	8.8	0.880	ND	2.74	0.074	-	4.30
12 11	1.26	2.40	12.9	0.100	<i>m Creek</i> 0.211	1.99	0.102		7.00
13-11	1.36					reek @RM 0.		-	7.00
13-13	0.40	1.10	7.7	0.770	0.266	1.92	0.097	-	-
15-15	0.40					L.92 River @RM 8:		-	-
13-17	0.13	0.90	11.3	ND	0.508	2.18	0.116	-	-
13 17	0.15	0.50	11.5		oller Creek	2.10	0.110		
13-9	0.42	4.10	9.4	0.117	0.294	ND	0.045	-	5.00
	0112			t Fork Belvi				<b></b>	
13-14	0.21	2.30	12.3	ND	0.150	2.89	0.083	-	-
13-8	0.15	3.80	12.1	ND	0.199	1.65	0.086	-	ND
		·			s Brook				
13-15	1.95	1.90	7.2	ND	ND	3.10	0.065	-	-
13-7	0.25	2.70	8.0	ND	0.180	2.91	0.059	-	6.60
				Bul	l Creek				
14-6	5.95	2.40	3.5	0.117	0.164	2.21	0.161	-	7.35
14-5	4.70	1.30	10.2	ND	0.137	2.39	0.092	-	-
14-2	1.00	8.40	8.6	ND	0.232	ND	0.062	-	5.20
14-1	0.50	11.70	10.6	0.128	0.246	1.86	0.075	48.29	12.00
					ch Bull Cre				
14-4	2.54	5.10	3.9	0.153	0.567	2.42	0.106	19.77	13.00
14-3	1.60	7.10	9.0	ND	0.525	ND	0.107	-	-
		cellent	>8.0;<10.3	< 0.084	<3.767	<1.07	< 0.106	<35	<2.5
Condition		iood	<6.5;>10.4	<0.100	<5.045	<1.12	<0.277	35-79	>2.5-5.1
Category Thresholds		Fair	<5.5;>12.2	<0.190	<7.344	<1.63	<1.022	79-150	>5.1-13.8
mesholus		Poor	<4.5;>14.2	<0.280	<9.643	<2.14	<1.726	150-320	>13.8-28.9
		ry Poor	<3.4;>16.3	>0.280	>9.643	>2.14	>1.726	>320	>28.9
Source			IPS	IPS	IPS	IPS	IPS	SNAP/NSAC	MBI/NSAC
* - at nH 8 0 an		ois WQS	Yes	0.450*	None	None	500.000	None	0.0302

\* - at pH 8.0 and temperature 25°C.

there can be higher total ammonia-N values that are not exceedances of the water quality criterion at lower ambient pH levels. The criterion increases to 2.20 mg/L at a pH of 7.5 and is 1.24 at a pH of 8.0. Nevertheless, ammonia-N levels that exceed the very poor IPS threshold are likely problematic for aquatic life use attainment. The source of these highly elevated ammonia-N values is unknown, but the Mill Creek value corresponds to the very low D.O. value measured at the same site (Figure 5) which corresponds to the influence of wetlands. None of the ammonia-N values seemed to correspond to the two WWTP discharges as each provides ample treatment as evidenced by values below detection immediately downstream from each. While values from 2016 are depicted in Figure 6 there were significantly fewer measurements taken under the prior chemical monitoring strategy and while none were at levels of concern, the comparatively paltry coverage likely missed the "hotspots" revealed by the more spatially robust sampling in 2019.

#### Nitrate-Nitrogen (N)

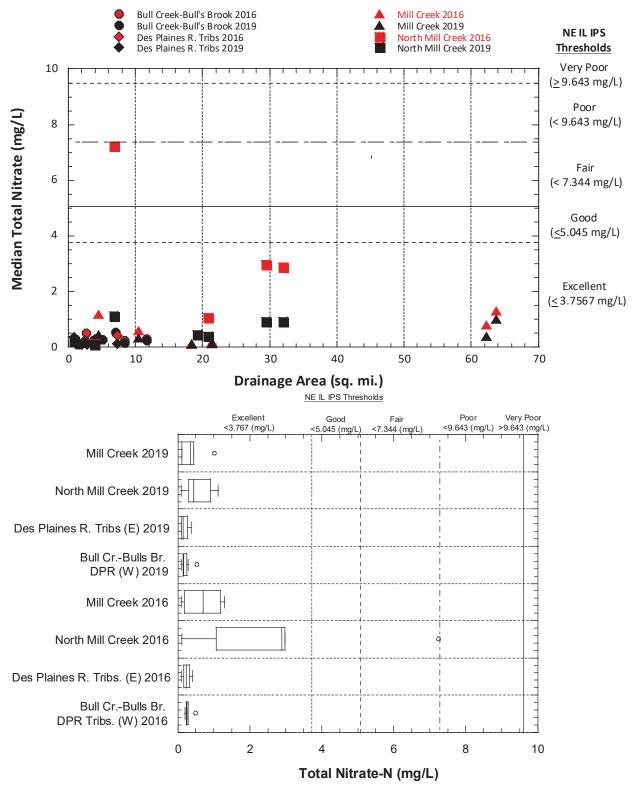
Levels of nitrate-N were low throughout the Year 3 subwatersheds being well within the excellent threshold of the NE Illinois IPS and well below other recognized thresholds including reference values (Table 10; Figure 7). The highest values tended to occur at sites in the lower reaches of the mainstems and the two highest values occurred below the Lindenhurst WWTP on Hastings Creek and the LCDPW Mill Creek WWTP on Mill Creek. By comparison the values in 2016 were higher at selected locations especially in North Mill Creek, but still within the excellent range of the NE Illinois IPS threshold.

#### Total Kjeldahl Nitrogen (TKN)

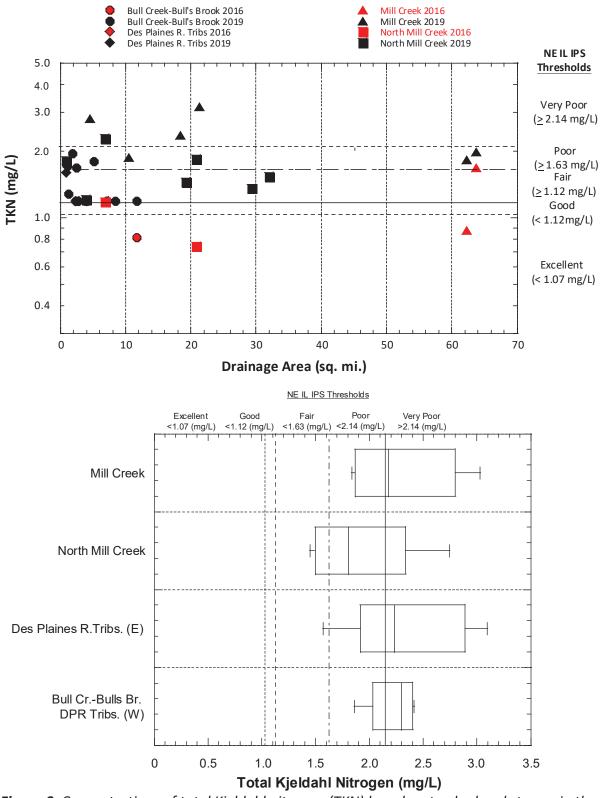
Total organic nitrogen as measured by Total Kjeldahl Nitrogen (TKN), an indicator of the living or recently dead fraction of sestonic algae, can be an indicator of nutrient enrichment. While TKN is not a direct effect parameter, it is indicative of the effects of organic enrichment by nitrogenous biomass. It has proven to be an effective indicator of excessive organic enrichment in runoff from urban and suburban nonpoint sources. Median TKN values were above the poor and very poor NE Illinois IPS threshold at 19 of the 29 sites where it was measured in 2019 (Table 10). With the exception of two sites with values below detection, the remainder were in excess of the fair IPS threshold. Very poor values occurred in Mill Creek, Hastings Creek, Newport Drainage Ditch, Suburban Country Club Tributary, Unnamed Tributary to the Des Plaines River at RM 89.5, the West Fork Belvidere Rd. Tributary, Bulls Brook, upper Bull Creek, and the West Branch Bull Creek. Mill Creek and the Des Plaines East Tributaries had the highest TKN values among the four subwatershed bundles (Figure 8). There were no clear patterns related to stream size (Figure 8). While the 2016 database was comparatively sparse what TKN values were measured were consistently lower than at the same locations in 2019. This is possibly a reflection of the reduced runoff during the much drier seasonal index period in 2016 compared to the frequent runoff events in 2019 as reflected by elevated stream flows.

#### Total Phosphorus (P)

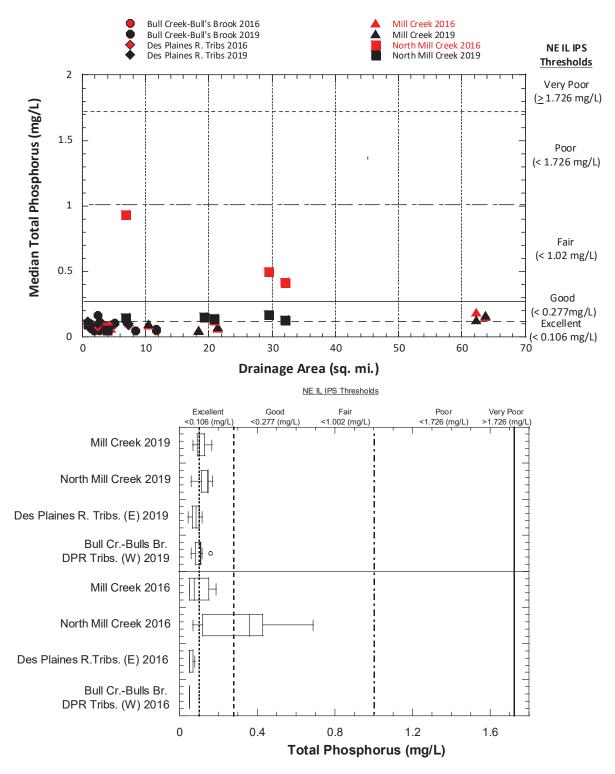
All median total P values were in the excellent or good range of the NE Illinois IPS thresholds in 2019 (Table 10). Values tended to increase with watershed size with the smaller drainages and



*Figure 8.* Concentrations of nitrate-N by subwatershed and stream in the Year 3 2019 study area. Median values are shown by individual site by drainage area (upper panel) in 2016 and 2019 and in tributary subwatershed bundles as box-and-whisker plots (lower panel). Dashed and solid lines represent effect thresholds from the NE Illinois IPS (Table 7).



*Figure 9.* Concentrations of total Kjeldahl nitrogen (TKN) by subwatershed and stream in the Year 3 2019 study area. Median values are shown by individual site by drainage area (upper panel) in 2016 and 2019 and in tributary subwatershed bundles as box-and-whisker plots (lower panel). Dashed and solid lines represent effect thresholds from the NE Illinois IPS (Table 7).



*Figure 10.* Concentrations of total phosphorus (P) by subwatershed and stream in the Year 3 2019 study area. Median values are shown by individual site by drainage area (upper panel) in 2016 and 2019 and in tributary subwatershed bundles as box-and-whisker plots (lower panel). Dashed and solid lines represent effect thresholds from the NE Illinois IPS (Table 7).

the tributaries consistently in the exceptional range (Figure 9). There were no obvious patterns related to the two major WWTPs. Values were similar in 2016 to 2019 with the exception of North Mill Creek that had higher values in 2016 in the fair range of the IPS thresholds (Figure 9).

#### Chlorophyll a

The biomass of chlorophyll a was measured as sestonic (suspended in the water column) at all tier 1-3 sites and as benthic (periphytic growth on substrates) at the 14 Datasonde sites once during their deployment in August 2019 (Table 10). Chlorophyll is a green pigment that is present in all green plants and in cyanobacteria that absorbs light energy for photosynthesis. Generally the sestonic and benthic chlorophyll a samples consist of algae the populations and biomass of which are related to nutrient enrichment, phosphorus in particular. While algae are an expected component of any aquatic system an overabundance can adversely affect water quality via excessive algal and plant photosynthesis (daytime) and respiration (nighttime) that in turn affects the D.O. and pH regimes. Wide diel swings in D.O. between daytime and nighttime can occur and in turn have adverse effects of aquatic life. The same can happen with pH becoming excessively high during the day which can increase the toxicity of pollutants such as unionized ammonia-N. Previous studies of the relationship between chlorophyll a biomass and adverse effects on the D.O. regime and aquatic life (Ohio EPA 2015b; Illinois NSAC 2018) have resulted in MBI developing preliminary thresholds that are associated with aquatic life condition and well-being (Table 10). The 2019 survey was the first attempt to use chlorophyll a biomass in a combined nutrient effects assessment that also included allied parameters in addition to the primary nutrients of phosphorus and nitrate-N. Miltner (2018) identified these other non-nutrient parameters as co-indicators of the adverse effects of nutrient enrichment.

Benthic chlorophyll a values were well within the excellent and good ranges as derived mostly from the Ohio EPA Stream Nutrient Assessment Procedure (Ohio EPA 2015b) and also from the Illinois Nutrient Science Advisory Committee (Illinois NSAC 2018). These results alone do not suggest algal biomass is excessive enough to reflect serious nutrient enrichment, but the Ohio EPA SNAP was developed mostly in streams with moderate gradients and gravel-cobble substrates which are less common in NE Illinois. Nevertheless, MBI has employed this methodology since 2017 beginning with the Year 1 Upper Des Plaines subwatersheds assessment (MBI 2018), the Year 2 Upper Des Plaines mainstem assessment (MBI 2020b), and the 2018-19 North Branch Chicago River watershed assessment (MBI 2021). The results in those surveys were somewhat similar showing mostly excellent and good levels of benthic chlorophyll a biomass with the exception of four Year 1 Upper Des Plaines sites that had two fair, one poor, and one very poor result (MBI 2018). With increasing collection of this data throughout NE Illinois these thresholds will likely be reevaluated.

Sestonic chlorophyll a values in 2019 were excellent and good at six sites, fair at 14 sites, and poor at two sites as derived mostly from the Illinois NSAC (2018) recommendations. In Mill Creek the four upstream sites were fair and the two downstream most sites were poor. The remaining fair sites were located in North Mill Creek (1), Hastings Creek (2), Newport Drainage Ditch (1), Slocum Creek (1), Bulls Brook (1), West Branch Bull Creek, and all sites sampled in Bull Creek (3). These results roughly compare to the 2018-19 North Branch results (MBI 2021).

Values were consistently higher in the Upper Des Plaines mainstem, but this would be expected in a larger river. Here again, as the database is better developed across NE Illinois these thresholds will likely be reevaluated.

#### Nutrient Effects Assessment

The impact of nutrients on aquatic life has been well documented (e.g., Allan 2004), but serious attempts to derive nutrient criteria in terms of their form and application are only recently emerging. Because of the widely varying efforts to develop nutrient criteria by the States, conflicting U.S. EPA oversight, and the potential cost of additional nutrient controls, the impact of nutrients on aquatic life has been controversial (Evans-White et al. 2014). Unlike toxicants, the influence of nutrients on aquatic life is indirect and primarily via their influence on algal photosynthesis and respiration, the resulting increased magnitude of diel D.O. swings, by the biochemical oxygen demand exerted by algal decomposition, and cascading effects therefrom. 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 exposure of the water column to sunlight. Illinois is the leading state in terms of nitrogen (16.8%) and phosphorus (12.9%) loadings exported via the Illinois and Upper Mississippi Rivers 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 develop and modernize nutrient water quality criteria (NSAC 2018). However, nutrient export is not the only concern – local and river reach scale impacts are also important and the focus of this evaluation is on such effects in the DRWW streams and rivers given the localized emphasis of the biological and water quality assessment.

The combined effects of nutrient enrichment were assessed to supplement the more conventional descriptions of concentrations of the key nutrient related parameters. A multiparameter approach modified from the Ohio SNAP method (Ohio EPA 2015a), and as described in the Methods section, was employed in a manner similar to its first use in the DRWW Years 1 and 2 study areas of the upper Des Plaines River watershed in 2017 (MBI 2018) and refinements made in the 2018 Upper Des Plaines River mainstem assessment (MBI 2020b) and the 2018-19 North Branch Chicago River watersheds assessment (MBI 2021). The findings of the Illinois Nutrient Science Advisory Committee (NSAC 2018) were also used. A relatively new addition to the assessment of nutrient impacts is a Biological Nutrient Ranking Index (NRI) that is part of the NE Illinois IPS outputs (MBI 2020a; Appendix E). The NRI consists of a summed ranking of each of the individual nutrient or nutrient-related stressor parameters with each weighted based on a tightness of fit coefficient (FIT). At this point it is a standalone indicator that can be compared to the modified SNAP outcome, but its application in watershed assessments is new and potentially subject to change as more is learned via future assessments.

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 and sestonic chlorophyll a (as biomass), and an overall rating of the degree of nutrient enrichment based on the frequency and magnitude of

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Table 11. Results of applying an interim modified Stream Nutrient Assessment Procedure to 14 sites in the 2019 Year 3 Upper Des Plaines watersheds study area. matrix along with the source of the narrative thresholds for each parameter. Biological sampling sites that lacked sufficient D.O., chemical, and chlorophyll a 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 data are included for comparison of the bioloaic, habitat, and water quality results.

		Rationale for Enrichment Status	Elevated Sestonic; extreme elevated TKN	Wide D.O. swing; elevated TKN, Sestonic	Elevated Sestonic; extreme elevated TKN	Elevated Sestonic; extreme elevated TKN	Highly elevated Sestonic; highly elevated TKN	Highly elevated Sestonic; highly elevated TKN			Wide D.O. swing; highly elevated TKN	High D.O. swing; elevated Sestonic, TKN	TKN only slightly elevated		Elevated Sestonic; extreme elevated TKN	Wide D.O. swing; extreme elev. TKN, Sestonic		•		Wide D.O. swing; extreme elev. IKN, Sestonic																			-	Only elevated TKN, Sestonic; no D.O.swing	Extreme elevated TKN. Sestonic: low min. D.O.	-	All Excellent	All Good, 1-2 exceed Fair	2-3 exceed Fair, 1-2 Poor	2-3 exceed Poor, 1 V. Poor	2-3 exceed Poor; 2-3 V. Poor	MBI
	Biological Nutrient	Index	9.46	7.76	8.98	10.18 E		10.08		8.76	7.58		8.00			13.06	7 5 8	0C: /			6.58	000	0.88	6 60	0.00	7 36	000	8.16		6.88	6.16		5.26	8.18	7.78		8.56	8.38	Т	5.86	8.44		<10	10-15	15-25	25-35	>35	IPS
	Enrichment	Status	Likely Nutrients	Enriched	Enriched	Likely Nutrients	Enriched	Enriched			Enriched	Enriched	Not Nutrients		Likely Nutrients	Enriched	,			Enriched	,				'															Not Nutrients	Likely Nutrients		Not Nutrients	Not Nutrients	Likely Nutrients	Enriched	Highly Enriched	MBI/SNAP
Sestonic	Chloro- phyll a	(mg/L)	8.90	8.00	8.40	9.70	14.20	14.85			4.45	6.85	QN		7.40	11.45	CN	ND	000	08.8	4.40	00.4	4.30	00 2	00. /	,					DN		5.00	,	6.60		7.35		5.20	12.00	13.00		<2.5	>2.5-5.1	>5.1-13.8	>13.8-28.9	>28.9	MBI/NSAC
	TKN	(mg/L)	2.80	1.87	2.37	3.03	1.84	1.99		1.45	2.04	1.46	1.54		2.64	2./4	1 21	10.1	000	27.2	1.5/		2./4	1 00	CC.T	1 97	47.4	2.18		2.89	1.65	4	Q	3.10	2.91		2.21	2.39	QN	1.86	2.42	QN	<1.07	1.07-1.12	1.12-1.63	1.63-2.14		PS
	TSS	(mg/L)		,			62.25	64.25			21.00					15.60									'															16.70			<17.50	>17.50	>31.60	>35.15	>38.69	SdI
	Benthic Chlorophyll a	Narrative	Very Low	Very Low			Very Low	Very Low	Very Low		Very Low	Very Low					Very Low	VI 98.4			10.64		RM 89.5	-	M 94.0	1					1					Very Low	Verv Low	-	Very Low	Low	Moderate	High		MBI/SNAP				
	Benthic Chlorophyll a	(mg/m <sup>-</sup> ) ek	43.42	17.05	29.14	37.19	34.45	17.64	Creek		22.46	37.30	31.30		30.02	9.8/ Wide 43./0 Ve	ו ואווו רו בבע העוא		age Ditch		33.61	Suburban Country Liub Tributary to DPK @KINI 38.4	-	хаа	Unnamed Tributary to Greenleaf Creek @RM 0.64		Unnamed Tributary to the Des Plaines River @RM 89.5	-	West Fork Belvidere Rd. Tributary to DPR @RM 94.0			Creek	•	ook -		ek				48.29 ull Creek	19.77	,	<35	35-79	79-150	150-320	>320	MBI/SNAP MBI/SNAP/NSAC
	D.O. Swing	Narrative Mill Creek	Normal	Wide	Low	row	Low	Low	North Mill Creek		Wide	High	Low	Hastings Creek	Low	Wide	חומו א וח ואחונו	-	Newport Drainage Ditch	wide	- Teihin	untry ciup i ribu	- classing	SIOCUT CLEEK	ibutary to Greel	-	itary to the Des	-	videre Rd. Tribu	-		Stoneroller Creek		Bull's Brook		Bull Creek			•	Normal-Low 48. West Branch Bull Creek	Normal-Low		Normal	Low	Moderate	High		
	D.O. Swing	(mg/L)	1.99	6.51	3.08	2.76	2.18	2.85			7.50	5.33	2.40		2.21	9.8/	II nallinilli			1.37		Innrnan Co			Innamed Tr		named Trib		est Fork Be					,						3.75	3.17		< 2.0	2.0-4.0	4.0-5.0	5.0-6.5	>6.5	MBI/SNAP
	Min D.O.	(mg/L)	5.11	0.16	3.38	6.15	5.53	5.85			4.23	6.51	6.60		4.45	3.15	5		V L V	4.54	, ,	2					nn		M					,						7.02	1.81		6:9<	6-9-9		2.0-3.9		IPS
	-	(mg/L)	7.37	7.16	6.96	9.07	7.71	8.7			11.83	11.84	9.01		6.83	13.02			1 6 7	C'7I					'						•			,	•		•	•	•	10.77	5.68	•	< 10.36	$\sim$	> 12.2-14.2	> 14.2-16.3	<u>&gt;</u> 16.3	IPS
	Nitrate	(mg/L)	0.824	0.346	0.126	0.177	0.617	1.013		0.604	0.398	0.922	0.909		Q	1.121	0.221	TOC'N	0000	0.208	0.161	4	ND	0.011	117.0	0.266	014.00	0.508		0.150	0.199		0.294	QN	0.180		0.164	0.137	0.232	0.246	0.567	0.525	< 3.77	>3.77-5.05		>7.34-9.64	<u>&gt;</u> 9.64	IPS
		TP (mg/L)	0.093	0.100	0.071	0.109	0.129	0.167		0.153	0.144	0.169	0.127		0.061	0.146	0.101	TOT-D	0 4 4 0	911.0	0.100	* EO O	0.0/4	0.10.2	701.0	0.097	1000	0.116		0.083	0.086		0.045	0.065	0.059		0.161	0.092	0.062	0.075	0.106	0.107	< 0.106	> 0.106-0.277	>0.277-1.02	>1.02-1.726	<u>&gt;</u> 1.726	SAI
	AQL Attainment	Status	NON-Poor	NON-Poor	[FULL]	NON-Poor	[NON-Poor]	NON-Poor		NON-Poor	NON-Poor	NON-Poor	NON-Poor		NON-Poor	Non-Poor	NON-DOOL			NUN-POOL	NON-POOL		NUN-POOL	NON-DOOL		NON-POOL		NON-Fair		NON-Poor	PARTIAL		PARTIAL	NON-Poor	NON-Poor		NON-Poor	NON-Fair	NON-Fair	PARTIAL	NON-Poor	NON-Poor	FULL	FULL	_	NON-Fair	NON-Poor	IPS
		QHEI	40.00	52.75	•	62.00	80.00	68.50		37.00	59.00	67.75	59.00		60.00	44.50	C 2 CU	00.00	100	45.00	63.00	00.00	39.00	62 75	n /	63.75		62.00		68.75	70.00	00 00	82.00	76.50	69.00		57.50	57.25	53.25	78.00	47.75	65.75	>84.5	>75.9		<50.1	<25	IPS
	ġ	mBI	29.6	32.1	43.0	45.1	•	58.5		54.2	36.3	56.0	58.2		31.0	<u>5/7</u>	V UV	40.4	, oc	28.4	40.6	10.0	D.8L	0 90	6.00	215		30.9		25.7	45.2	1	57.6	33.2	49.3		19.3	20.0	34.8	47.9	24.9	48.5	>73	41.8-72.9		>15-29	<15	IEPA
		1IBI	20	22	•	21		23			16	15	18		15	71	75	9	0	707	77	00	P2	16		37	5	34		14	34		39	28	23		12	29	30	37	11	26		>41-49	30-<41	>15-29	r <15	IEPA
	Drainage Area	(mi)	4.50	10.40		21.40	62.30	63.80			20.86		31.97		3.91	5.60	000	0.33		7.80	7.35	00 -	4.00	Г С	t: 7	1 10	2111	06.0		2.30	3.80		4.10	1.90	2.70		2.40	1.30	8.40	11.70	5.10	7.10	Excellent	Good	Fair	Poor	Very Poo	IPS
	River	_				3 7.20		1 0.70		$\vdash$	3 10.20		1 1.10		_	1.68			⊢	+	0.0	H	nn.2	1 1 26	-	3 0.40	-	7 0.13			8 0.15	ŀ	9 0.42	5 1.95	_			-	+	1 0.50	1 2.54	-		udition	Category	resholds		Source
	i	SiteID	11-6	11-5	11-4	11-3	11-2	11-1		10-7	10-3	10-2	10-1		10-5	10-4	10.6	0-0T		12-21	1-21		0T-9T	12-11		13-13		13-17		13-14	13-8		13-9	13-15	13-7		14-6	14-5	14-2	14-1	14-4	14-3		3	Ŭ	Th		-1

**40** | P a g e

exceedances of thresholds for the aforementioned indicators and parameters (Table 11). The overall degree of nutrient enrichment effects are represented by five narrative ratings of Enrichment Status that results from the degree to which each of the available nutrient parameters and SNAP indicators exceeded their respective thresholds, the minimum and maximum D.O., the width of the diel D.O. swing, benthic chlorophyll a, and sestonic chlorophyll a biomass. The Highly Enriched and Enriched narratives are assigned where the indicators are exceeded in terms of the number and magnitude of exceedances and that are associated with a biological impairment. The Possibly Nutrients narrative is where there are either an insufficient number and/or magnitude of exceedances to warrant an Enriched status (see Rationale for Enrichment Status column in Table 11) thus it serves as an indication where a threat for excessive nutrient enrichment effects exist. The two Not Nutrients narratives rule out nutrient effects as a cause of impairment and are also assigned to sites with full attainment of the General Use biocriteria regardless of nutrient parameter exceedances. The evaluations based on incomplete data should be regarded as preliminary. Fourteen (14) of the 30 sites had the full array of SNAP indicators due to limitations with the number of Datasondes that could be deployed. The overall results at all 25 sites using whatever data was available indicated "Likely Nutrients" (5 sites) or enriched (8 sites) conditions at 13 of the 14 locations (Table 11) that had the full suite of SNAP parameters. Five of the eight enriched sites had a high or wide diel D.O. swing, a high maximum D.O., and/or low minimum D.O. levels. Two sites had minimum D.O. below very poor, two below poor and, six below fair. Maximum D.O. levels that exceeded the fair IPS threshold occurred at only two sites. As was previously described benthic chlorophyll a biomass was low reflecting excellent and good conditions at all 14 sites. Sestonic chlorophyll a reflected poor conditions at two SNAP sites in lower Mill Creek and fair conditions at 11 sites, and good at only one site. TKN values exceeded very poor threshold at seven of the 14 SNAP sites and exceeded the poor threshold at the remaining seven sites. The highly elevated TKN results along with the elevated sestonic chlorophyll a results drove the assignments of likely nutrients and enriched conditions, the latter being assigned where the corresponding D.O. results also indicated excessive algal activity. All of the SNAP sites in Mill Creek, North Mill Creek, and Hastings Creek were assigned the enriched or likely nutrients status. The single site that was assessed by SNAP in Bull Creek resulted in a "Not Nutrients" assignment. The West Branch Bull Creek was assigned "Likely Nutrients" as a result of highly elevated TKN, elevated sestonic chlorophyll a, and a very poor minimum D.O., but with a narrow diel swing. This suggests the low D.O. being due to a cause other than nutrients. Habitat did not appear to be a major factor in the assignment of enriched status as QHEI values ranged from good to poor seemingly independent of the SNAP results.

#### **Conventional and Urban Parameters**

Conventional parameters include temperature, pH, D.O., and conductivity that are generally collected with a water quality meter as grab samples while collecting chemical and biological samples. Urban parameters are those that originate in runoff from urban and industrial 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. Temperature can also be influenced by the alteration of runoff due to exposure of water to surfaces some of which can more readily absorb solar radiation. Several parameters measured in the water column (Table 12) plus heavy metals and organics measured in sediments (Tables 13 and 14) were used to assess for urban related water quality impacts. TKN was included in Table 12 as it is an indicator of urban nonpoint source runoff in addition to organic enrichment related to nutrients. Some parameters that are normally standard indicators for urban stormwater were measured at many fewer sites and included total suspended solids (TSS), volatile suspended solids (VSS), and common heavy metals. As a result these were limited to assessing only the sites where they were collected and were not sufficient to support analyses of watershed and subwatershed wide patterns.

#### Temperature

Temperature was measured via grab samples (Table 12) collected by the fish crew and continuously (Figure 10) during the short-term deployment of Datasondes in mid to late August 2019. The temperature results were assessed for aquatic life with the Illinois General Use criterion, which is a constant 32.2C (90F) during May-November, and maximum and average criteria applicable to streams in the Ohio River basin developed by Ohio EPA. 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 are based on tolerances of representative fish species with thermal characteristics similar to the Illinois stream fish fauna. The grab sample data indicate temperatures well below the Illinois and Ohio thresholds (Table 12). The continuous data revealed one site in North Mill Creek (site10-2) with a maximum that exceeded the Ohio maximum threshold and two sites in lower Mill Creek (sites 11-1 and 11-2) that approached it and exceeded the Ohio average. None of these results indicate any serious concerns with the thermal regime in the 2019 Year 3 study area.

#### рΗ

pH (S.U.) was measured by grab samples (Table 12) collected by the fish crew as the Datasonde units either lacked pH probes or delivered faulty data. pH can act the same as D.O. being elevated due to algal photosynthesis during daytime and deceasing due to algal respiration at night this producing a diel swing. Elevated daytime values are likewise indicative of nutrient enrichment effects on algal photosynthesis. pH can also be a strong determinant of the toxicity of ammonia-N with the toxic unionized fraction increasing with elevated pH. All of the pH results were well within the 6.5-9.0 water quality criterion and mostly in the range of 7.6-8.4. Values greater than 8.0 can be indicative of moderate nutrient enrichment and occurred in numerous streams across the 2019 Year 3 study area.

#### Specific Conductance

Specific conductance ("conductivity") is a measure of how well water can conduct an electrical current. Conductivity increases with increasing amount and mobility of ions and is positively correlated with the concentration of dissolved substances in the water column. As such it is positively correlated with the concentration of dissolved ions such as sulfates ad chlorides.

**Table 12**. Median conventional and urban related parameter concentrations (mg/L) based on grab samples collected at 30 locations in the Year 3 2019 Upper Des Plaines River subwatershed study area. Shading is based on threshold exceedances listed at the bottom of the table.

					Specific		Volatile		
		Drainage			Conduct-		Suspended		
	River	Area	Tempera-		ivity	TSS	Solids	Chloride	TKN
Site ID	Mile	(sq. mi.)	ture (°C)	pH (S.U.)	μS/cm	(mg/L)	(mg/L)	(mg/L)	(mg/L)
				Mill Cr		-	1		
11-6	17.20	4.50	19.6	7.73	728	-	-	95.1	2.80
11-5	13.80	10.40	10.6	6.54	809	-	-	122.0	1.87
11-4	10.10	18.30	-	-	883	-	-	165.5	2.37
11-3	7.20	21.40	23.8	8.35	779	-	-	131.0	3.03
11-2	1.71	62.30	21.8	7.99	829	62.3	9.17	101.1	1.84
11-1	0.70	63.80	22.2	8.08	851	64.3	8.99	93.5	1.99
40.7	44.20	40.22	24.5	North Mi		[	1	24.2	4.45
10-7	11.30	19.23	21.5	7.72	627	-	-	31.2	1.45
10-3	10.20	20.86	22.5	8.05	728	21.0	3.10	35.9	2.04
10-2	8.10	29.57	20.1	8.25	817	-	-	55.7	1.46
10-1	1.10	31.97	20.1	8.24	765	-	-	65.6	1.54
	0.40			Hastings			1		0.01
10-5	3.12	3.91	20.1	8.08	856	-	-	147.5	2.64
10-4	1.68	5.60	22.0	7.62	873	15.6	2.23	130.5	2.74
40.0	0.01		Innamed Trib	-		@RIVI 0.7		06.4	1.01
10-6	0.04	0.99	19.9	8.18	662	-	-	96.4	1.81
12.2	2.02	2.00		ewport Drai		[	1	00.0	2.20
12-2	3.03	2.80	18.7	7.30	806	-	-	80.2	2.28
12-1	0.70	7.35	19.4	7.53	819	-	-	89.8	1.57
42.42	2.00	4.00			/ Club Tribut	ary	1	4045	0.74
13-10	2.00	4.00	14.8	7.79	823	-	-	104.5	2.74
12.11	4.26	2.40	40.4	Slocum		[	1	06.0	4.00
13-11	1.36	2.40	10.4	7.74	779	-	-	86.3	1.99
42.42	0.40	1	Jnnamed Trib	-		-	1	252.5	1.02
13-13	0.40	1.10	17.6	8.19	1410	-	-	253.5	1.92
12.17	0.12	1	Innamed Trib	-		@RIVI 89.:	>	50.0	2.10
13-17	0.13	0.90	18.2	8.36	640	-	-	59.0	2.18
12.0	0.42	4.10	10.2	Stonerolle			1	270.0	ND
13-9	0.42	4.10	16.3	7.90	1050	-	-	276.0	ND
12.44	0.24	2.20			re Rd. Tribut	ary		1010	2.00
13-14	0.21	2.30	13.8	7.89	1130	-	-	184.0	2.89
13-8	0.15	3.80	13.5	7.86	1020	-	-	179.0	1.65
12.15	1.05	1.00	10.1	Bull's B				04.2	2.10
13-15	1.95	1.90	18.1	8.13	778	-	-	94.2	3.10
13-7	0.25	2.70	19.5	7.91 Bull Cr	765	-	-	88.5	2.91
14-6	EOF	2.40	16.0					55.2	2.21
_	5.95 4.70	2.40	16.9	7.88	555 694	-	-	55.3	2.21
14-5		1.30	12.6	7.97		-	-	121.0 193.0	2.39
14-2	1.00	8.40	21.8	8.23	978				
14-1	0.50	11.70	15.0	7.87 <b>Vest Branch</b>	904 Bull Creek	16.7	2.67	152.5	1.86
14-4	2.54	5.10	19.3	7.62		-	-	218.0	2.42
14-4	1.60	7.10	20.3	8.27	1030 938	-	-	173.0	ND
14-2		ellent	20.3	0.27	<739	- <17.5	<5.00	<40.0	
Condition		od			<1038	<31.6		<120.0	<1.07 <1.12
Condition Category		air					<7.77		
Thresholds		or			<1208 <1378	<35.2 <38.7	<9.83 <11.88	<184.9 <249.8	<1.63 <2.14
		Poor				>38.7		>249.8	
		POUL	None	None	>1378 IPS	IPS	>11.88 IPS	IPS	>2.14 IPS
Source		s WQS	<32.2	>6.0;<9.0	None	None	None	500.0	None
IPS - NE Illinois Int				20.0,5.0	None	None	None	500.0	None

IPS - NE Illinois Integrated Prioritization System (IPS; MBI 2020a)

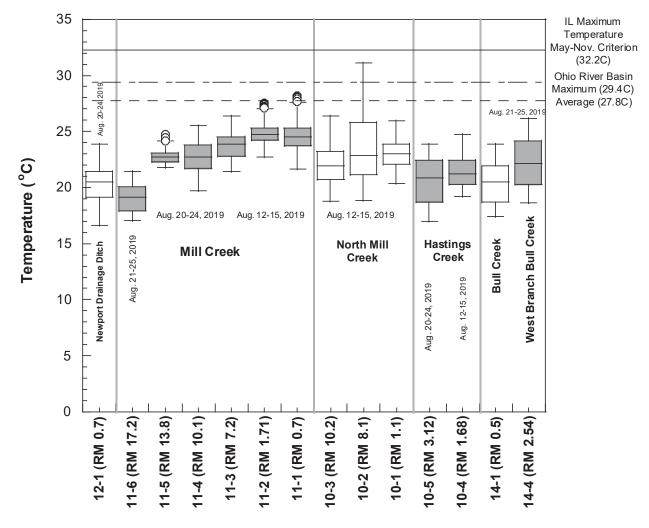
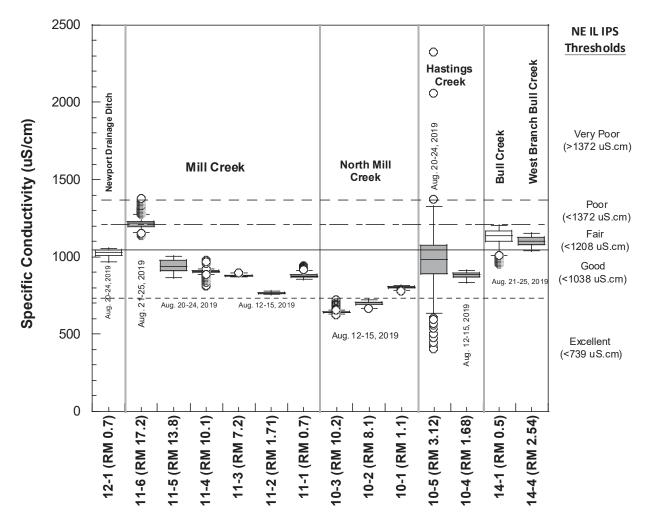
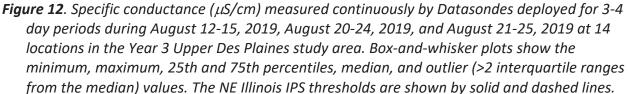


Figure 11. Temperature ( °C) measured continuously by Datasondes deployed for 3-4 day periods during August 12-15, 2019, August 20-24, 2019, and August 21-25, 2019 at 14 locations in the Year 3 Upper Des Plaines study area. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The Illinois EPA May-November maximum temperature criterion (32.2 °C) is shown by a solid line. Maximum (29.4 °C) and average (27.8 °C) Ohio River Basin criteria for streams are shown by solid and dashed lines (from the Ohio WQS).

Conductivity was measured with a water quality meter at each fish sampling site Table 12) and continuously via the short-term Datasonde deployments at 14 locations (Figure11). Single values in the grab samples were with the excellent and good thresholds of the NE Illinois IPS with the exception of three sites, Stoneroller Creek (site 13-9) and the upstream site on the West Fork Belvidere Rd. tributary (site 13-14), each if which were in the fair range, and a very poor value in the unnamed tributary to Greenleaf Creek (site 13-13; Figure 12). The boxplot comparing 2016 and 2019 results showed consistently higher values in 2016 owing largely to the much lower flows experienced in that year compared to the higher flows in 2019. The continuous data measured in mid to late August at the 14 Datasonde sites (Figure 11) was generally in agreement with the exception of consistently fair values in Bull Creek (site 14-1)





and the West Branch Bull Creek (site 14-4), consistently fair and poor values at the upstream most site in Mill Creek (site 11-6), and wide range of values in Hastings Creek at the upstream most site (site 10-5) some well into the poor and very poor ranges. These results indicate the transient nature of dissolved materials inputs in certain parts of the Year 3 subwatersheds.

#### Chlorides

In temperate climates such as northern Illinois, chlorides are an emerging problem because they reflect their accumulation in soils and shallow groundwater resulting from repeated application of deicing materials. It is only over the past two decades that they have been documented to reach concentrations that can threaten and impair aquatic life. Existing aquatic life criteria for chloride (230 mg/L U.S. EPA recommended) do not protect sensitive species (Miltner 2021). Of particular concern in urban areas with high road density is the concentration of chlorides from winter road salt applications and point source loadings from water treatment 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 rising to >300 mg/L by 2003. 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 higher and 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. 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.

Median concentrations of chloride were within the excellent range of the NE Illinois IPS threshold of 40 mg/L at the two upstream sites in North Mill Creek (sites 10-3 and 10-7) reflecting the lower proportion of urban relates land uses (Table 12). The IPS excellent threshold is similar to the value Miltner (2021) described as reflecting unperturbed conditions. An additional 14 sites were within the good range of the IPS thresholds and were also in subwatersheds with comparatively low urban land uses. Another 10 sites were in the fair range. The four remaining sites with values exceeding the poor and very poor thresholds (Figure 13) occurred in the most urbanized portions of the Year 3 subwatersheds and included the upstream West Branch Bull Creek (14-4, poor), a single site in Bull Creek (14-2, poor), unnamed tributary to Greenleaf Creek (13-13, very poor), and the highest value in Stoneroller Creek (13-9, very poor). The concentrations of chloride were substantially lower in 2019 compared to 2016 throughout the Year 3 subwatersheds by one narrative condition class in each if the four subwatershed bundles (Figure 13). This is at least partly due the lower flows experienced throughout the summer-fall of 2016 and the dilution offered by higher flows in 2019, but may also be a reflection of improved deicing practices since 2016.

#### Total Kjeldahl Nitrogen (TKN)

The TKN were previously described in the Demand and Nutrient Related Parameters section of this report, but are included here (Table 12) as an indicator of urban nonpoint source runoff. Major sources of organic nitrogen in urban stormwater runoff include lawn and garden fertilizers, pet waste, leaking septic tanks, landfills, effluent from sewage treatment plants, and vehicle exhaust (U.S. EPA 2020). Nitrogen from aerial and terrestrial sources accumulates on urban roads and parking lots until runoff from a precipitation event carries the pollutants into stormwater drains and directly to local waterbodies. Among different land uses, the highest concentrations of TKN originate from impervious surfaces (e.g., freeways, parking lots, and high density residential). In the Year 3 subwatersheds TKN was highly elevated exceeding the poor and very poor IPS thresholds at 22 of the 31 sites where it was analyzed reflecting impacts by both agricultural and urban sources. It was below detection at only three sites, Stoneroller Creek (13-9), Bull Creek at RM 1.0 (14-2), and the West Branch Bull Creek at RM 1.6 (14-3). The

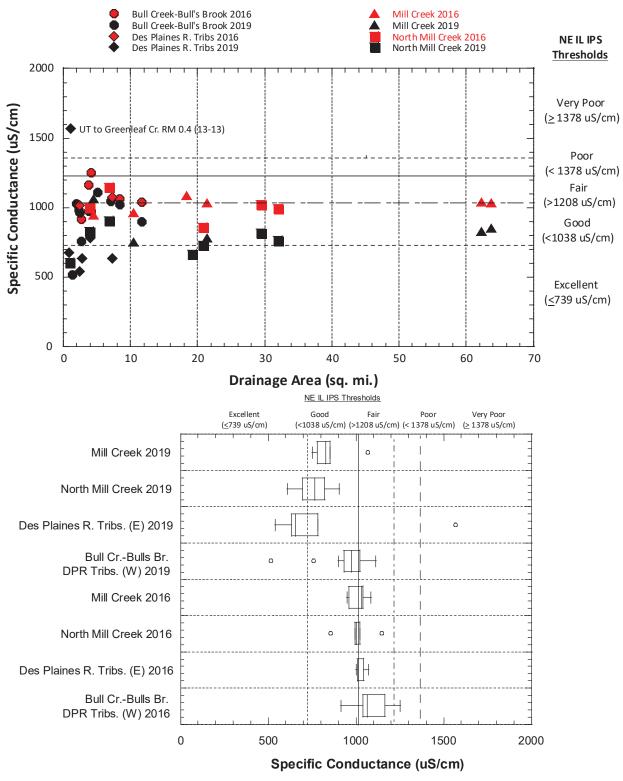
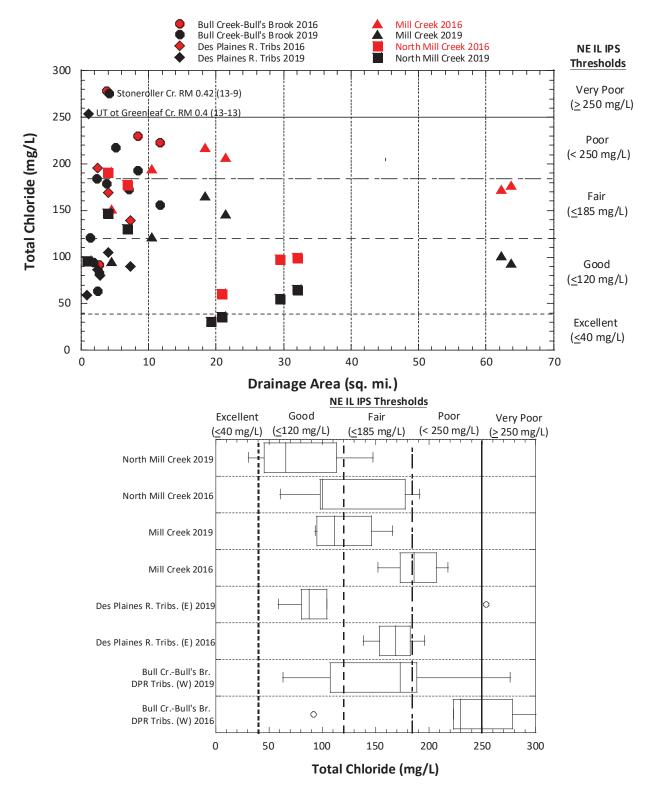


Figure 13. Specific conductance (μS/cm) values by subwatershed and stream in the Year 3 2019 study area. Single grab sample values are shown by individual site by drainage area (upper panel) in 2016 and 2019 and in tributary subwatershed bundles as box-and-whisker plots (lower panel). Dashed and solid lines represent effect thresholds from the NE Illinois IPS (Table 7).



*Figure 14.* Concentrations of chloride (mg/L) by subwatershed and stream in the Year 3 2019 study area. Median values are shown by individual site by drainage area (upper panel) in 2016 and 2019 and in tributary subwatershed bundles as box-and-whisker plots (lower panel). Dashed and solid lines represent effect thresholds from the NE Illinois IPS (Table 7).

sampling in 2019 was more thorough than in 2016, but the median values were higher in 2019 at corresponding sites than in 2016, which corresponds to the higher flows in 2019 reflecting higher runoff.

#### **Other Urban Related Parameters**

Some of the commonly used parameters to assess nonpoint source runoff in general, and urban runoff in particular were collected at only a few sites thus precluding a watershed or subwatershed wide assessment. Total suspended solids (TSS) was collected at five sites (Table 12) and exceeded the NE Illinois very poor threshold at two sites in lower Mill Creek (11-1 and 11-2). Volatile suspended solids (VSS), intended to serve as a proxy for measuring biochemical oxygen demand, exceeded the fair threshold at the same two sites in Mill Creek. Deducing anything about the meaning of these results other than the IPS threshold exceedances is limited by the low spatial density of the data. Heavy metals were sampled at only one site in lower Mill Creek at RM 0.70 (site 11-1) and included arsenic, copper, iron, magnesium (four sites), mercury, nickel, sodium, and zinc. None of the results suggested any serious issues for General Use aquatic life use attainment.

#### **Sediment Chemistry**

Sediment samples were evaluated against guidelines compiled by McDonald et al. (2000), Illinois sediment metals guidelines (Short 1998), and the new IPS derived narrative ranges (see Table 8). The MacDonald et al. (2000) 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. Short (1998) identified elevated and extremely elevated sediment metal concentrations for Illinois streams and rivers. The newer IPS thresholds are based on analyses against the most sensitive species to each sediment metal and PAH parameter (MBI 2020a), but are limited by insufficient samples from excellent quality rivers and streams. Sediment metal sampling results from 2019 are summarized by concentration rating and parameter class in Table 13 and polycyclic aromatic hydrocarbon (PAHs) compounds in Table 14. PAHs result from the incomplete combustion of hydrocarbons and are a common component of stormwater runoff in urban areas – they are not a direct byproduct of any manufacturing process.

#### Metals in Sediment

Nineteen (19) heavy metals were analyzed in sediment samples collected at 22 sites in the 2019 Year 3 subwatersheds (Table 13). The concentrations in bulk sediment were evaluated by the thresholds established by MacDonald et al. (2000), Short (1998), and the NE Illinois IPS (MBI 2020a). Only six (6) parameters had levels that exceeded any of the effect thresholds of the aforementioned sources. The NE Illinois IPS has the more stringent thresholds and anything exceeding the fair threshold was included as an exceedance of concern. Of the six parameters with exceedances that potentially correspond to an impairment of the General Use for aquatic life only two (2), cadmium and zinc occurred at multiple locations. For the remainder a single aluminum value in the Newport Drainage Ditch at RM 3.03 (site 12-2) exceeded the very poor

eavy metal concentrations (mg/kg) in sediment at 22 sites in the 2019 Year 3 Upper Des Plaines River subwatersheds. Highlighted cells	indicate an exceedance of one or more of the effect thresholds listed at the bottom.
<b>Table 13</b> . Heavy metal col	indicate an exceedan

(	(mg/Kg) Zinc		37.20	112.0	59.50	31.30	29.70	50.00		44.40	30.70	35.50		23.10	35.00		164.0	41.00		91.70		93.60	73.00		73.30		42.70		34.10	85.00	48.30		50.50	121.0	459.0	170.0	760.0	<75.0	<100.0	>100.0	>133.9	>167.8
	uibeneV (3X\3m)		12.7	18.2	11.5	8.8	11.4	13.4		11.6	11.6	13.1		7.6	10.4		25.0	12.0		20.5		18.3	12.5		20.7		12.9		13.2	15.3	13.6		14.8	None	None	None	None	None	None	None	None	None
	uitnort2 (88/8m)		22.90	34.30	23.90	14.60	12.90	22.80		16.40	18.60	20.80		12.80	21.50		39.30	13.20		18.40		23.60	22.30		24.40		23.20		12.70	30.10	26.00		18.60	None	None	None	None	None	<81.80	>81.80	>106.8	>131.9
	muibo2 (ฏX\gm)		170	473	453	188	139	761		151	129	162		147	170		574	211		229		310	209		321		151		101	367	202		180	None	None	None	None	None	None	None	None	None
(	Silver (mg/Kg)		ND	ND	ND	QN	DN	ND		ND	QN	DN		ND	ND		ND	QN		DN		ND	ND		ND		ND		ND	ND	QN		ND	1.600	2.200	None	5.000	None	<0.483	>0.483	>1.261	>2.039
	Jisseto9 (33\8m)		1210	2070	1190	587	762	1200		949	821	1080		439	930		3030	749		1540		1590	772		1360		1110		1090	851	762		1365	None	None	None	None	None	None	None	None	None
(	Nickel (ng/Kg)		10.70	18.50	13.10	6.09	8.17	12.30		9.36	8.74	10.90		5.21	9.32		22.30	7.53		16.70		13.80	9.13		14.60		10.30		16.60	9.90	9.65		12.20	22.70	48.60	26.00	45.00	None	<19.50	>19.50	>22.52	>25.53
	Mercury Mercury		ND	0.1	0.1	QN	0.029	0.045		ND	ND	QN		DN	ND		ND	QN		QN		DN	0.030		ND		ND		0.039	ND	ND		0.05	0.180	1.06	0.280	1.40	None	None	None	None	None
	negneM (3X\3m)		379	499	504	334	464	699		470	579	684		277	367		546	360	-	555		616	361		1180		972		850	490	636		224	460	1100	1100	2300	<841.0	<845.5	>845.5	>996.8	>1148
(	(mß/Kg) Lead		7.26	21.50	15.20	7.59	6.13	9.22		7.63	8.19	8.79		9.04	6.87		15.30	7.43	Suburban Country Club Tributary to DPR @RM 98.4	13.20		16.80	14.30		13.70		9.52		10.40	17.20	10.70		9.69	35.80	128.0	60.00	245.0	<15.50	<24.80	>24.80	>33.04	>41.27
(	(mg/Kg) Iron	k	8050	11800	8450	6180	7560	9620	reek	8420	8060	9150	Creek	5700	8040	ige Ditch	13400	7820	ary to DPR	11600	Creek	10300	8750	creek	12000	ok	10300	k	10600	9980	10300	ill Creek	0066	20000	40000	26100	53000	None	None	None	None	None
	(mg/Kg) Copper	Mill Creek	12.00	35.90	21.10	3.40	6.62	13.60	North Mill Creek	9.60	7.47	10.50	Hastings Cr	5.29	10.30	Newport Drainage Ditch	30.40	7.79	Club Tribut	20.10	Slocum Cre	18.70	16.30	Stoneroller Creek	18.00	Bull's Brook	9.26	Bull Creek	11.40	16.70	11.40	West Branch Bull Creek	14.50	31.60	149.0	37.00	170.0	<19.00	<29.78	>29.78	>40.45	>51.12
(	fisdo) (ng/Kg)		4.74	7.80	5.55	3.40	4.40	6.23	~	4.74	5.00	5.38		2.38	4.38	New	8.57	3.65	an Country	7.69		6.30	3.65	S	6.52		5.62		10.20	4.52	4.57	Wes	5.09	None	None	None	None	None	None	None	None	None
	imord) (ŋg/Kg)		8.14	20.70	12.30	6.32	7.15	10.40		8.49	7.15	9.29		5.25	7.17		21.70	7.31	Suburbo	16.60		12.10	7.40		13.10		8.16		9.16	11.60	7.85		10.95	43.40	111.0	37.00	110.0	<20.53	<23.30	>23.30	>26.22	>29.15
	uimbs) (8 <sup>y</sup> \8m)		0.902	1.790	0.992	QN	0.728	1.090		0.928	0.811	1.420		DN	0.796		2.170	0.834		1.480		1.260	1.000		1.540		1.140		1.200	1.230	1.180		1.180	066.0	4.980	2.000	9.300	None	<0.933	>0.933	>1.354	>1.963
(	(mg/Kg) Boron		3.58	4.37	5.19	2.41	2.05	2.75		2.63	2.12	3.36		2.19	2.53		11.50	2.25		4.21		4.24	2.95		3.17		3.45		2.23	4.95	3.31		3.56	None	None	None	None	None	None	None	None	None
	Berylliu (88/Kg)		DN	ND	DN	QN	DN	ND		ND	0.2	0.4		ND	ND		ND	ND		ND		ND	ND		ND		ND		DN	ND	QN		QN					None	<u>&lt;</u> 0.411	>0.411	>0.496	>0.581
(	muins8 (mg/Kg)		30.70	78.20	62.50	23.00	30.60	46.50		37.80	32.80	44.30		25.20	27.70		115.0	34.60		73.80		53.50	26.80		101.0		48.40		56.10	57.30	43.40		44.45	None	None	145.0	230.0	None	<141.0	>141.0	>150.3	>168.7
	ınimulA (ສູ¥\ສູm)		3560	7050	5380	2480	3190	4700		4010	3150	4090		2110	3120		10700	3600		7440		5080	2500		5870		3680		4370	4220	3500		5245	None	None	None	None	None	<6480	>6480	>8272	>10064
	Urainage Area (sq. mi.)		4.5	10.4	18.3	21.4	62.3	63.8		20.9	29.6	32.0		3.9	5.6		2.8	7.4		4.0		2.4	3.8		4.1		2.7		2.4	8.4	11.7		5.1	TEC	PEC	Elevated	Highly Elev.	Excellent	Good	Fair	Poor	Very Poor
	River Mile		17.20	13.80	10.10	7.20	1.71	0.70		10.20	8.10	1.10		3.12	1.68		3.03	0.70		2.00		1.36	0.15		0.42		0.25		5.95	1.00	0.50		2.54		1 di. 2000	000				s IPS		
	Site ID		11-6	11-5	11-4	11-3	11-2	11-1		10-3	10-2	10-1		10-5	10-4		12-2	12-1		13-10		13-11	13-8		13-9		13-7		14-6	14-2	14-1		14-4	MacDonald of al 2000		Chort 1000	1 1010			NE Illinois IPS		

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IPS threshold, two copper values, one in Mill Creek at RM 13.80 (site 11-5) and one at the same Newport Drainage Ditch location (12-2), exceeded the fair IPS threshold, and three manganese values, an exceedance of the very poor threshold in Stoneroller Creek (13-9), and exceedances of the poor threshold in Bulls Brook (site13-15) and Bull Creek (14-6). Cadmium exceeded the very poor threshold at the same Newport Drainage Ditch site (12-2), and the poor threshold in Mill Creek (11-5), North Mill Creek (10-1), and the suburban Country Club tributary (13-10), with another 10 sites exceeding the fair threshold, the majority in the most urbanized portions of the Year 3 study area. Zinc exceeded the IPS poor threshold in the Newport Drainage Ditch site (12-2) and the fair threshold at four other sites scattered throughout the study area. The Newport Drainage Ditch site at RM 3.03 (site 12-2) stood out with exceedances of five (5) parameters, two of which were very poor and one poor. Mill Creek at RM 13.8 (site 11-5) had three parameters in excess of at least an IPS fair threshold with all other sites having only two, one, or no exceedances.

#### PAH Compounds in Sediment

Polycyclic aromatic hydrocarbon (PAH) compounds are a common pollutant found in stream sediments particularly in urbanized or urbanizing watersheds. Most of the common PAH compounds such as benzo(a)pyrene, benzo(ghi)perylene, chrysene, fluoranthene, phenanthrene, and pyrene originate from oil-based and coal tar-based compounds (e.g., asphalt sealants, tars, gasoline, car exhaust, tire residues, motor oil, etc.). Acenaphthylene, anthracene, benzo(a)pyrene, naphthalene, phenanthrene, and pyrene are also manufactured and used in various industrial processes. The remaining PAH compounds are not commercially produced and are solely the result of the incomplete combustion of coal or oil-based products. As such, multiple PAH compounds are usually found in urbanized watersheds with a high density of asphalt paved surfaces and heavy automobile traffic and entering streams via runoff from highways and other paved surfaces.

Fifteen (15) PAH compounds were analyzed in sediment samples collected at 22 sites throughout the 2019 Year 3 subwatersheds (Table 14). The vast majority of the analyses revealed PAH compound concentrations either below the method detection limits or with the excellent/good range of the NE Illinois IPS thresholds. Only one site, Bull Creek at RM 1.0 (site 14-2) had any threshold exceedances with 14 of the 15 compounds exceeding the very poor IPS thresholds and 10 exceeding the Probable Effect Concentration (PEC) of MacDonald et al. (2000) and 12 exceeding the Threshold Effect Concentration (TEC) most by more than one order of magnitude. This site is in one of the most heavily urbanized portions of the Year 3 study area.

#### 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

## MBI/2021-7-7

n (PAH) concentrations ( $\mu g/kg$ ) in sediment at 22 sites in the 2019 Year 3 Upper Des Plaines	ls indicate an exceedance of one or more of the effect thresholds listed at the bottom.
Table 14. Polycyclic aromatic hydrocarbon (PAH) conc	River subwatersheds. Highlighted cells indicate an

ß/Kg) rene		55.3	135.0	QN	165.0	DN	ND		ND	ND	ND		ND	QN		ND	ŊŊ		74.3		QN		Ŋ	-	121.0		ND				243.0		ND	195.0	1520.0	<393.0	>393.0	>1570	>2747
enanthrene K/Kg)		QN	54.3	6.69	56.5	ND	ND		ND	DN	ND		DN	32.2		ND	ND		ND		Ŋ		QN		9.99		QN	4			ND		ND	204.0	1170.0	<243.5	>243.5	>803.3	>1363
anəlenti B/Kg)		QN	DN	DN	QN	ND	ND		ΠN	ΠN	ΠN		ΠN	DN		ΠN	ND		ND		ND		ND		ND		QN				ND		ND			< 86.38	>86.38	>103.6	>120.9
g/Kg) )pyrene deno(Ղ,Հ,Յ-	po	QN	76.4	ΟN	79.9	ND	ND		ND	ND	ND		ND	ND		ND	ND		DN		ΔN		QN		57.3		ND		ND		90.0		ND	200.0	3200.0	<260.5	>260.5	>623.3	>986.2
ዩ\Kዴ) rorene		DN	ND	ND	ND	ND	ND		ND	ND	ND		ND	ND		ND	ND		ND		ND		ND		ND		ND				ND		ND	77.4	536.0	<84.25	>84.25	>104.8	>125.3
g(Kg) soranthene	· · · ·	60.6	153.0	89.3	201.0	ND	ND		ND	ND	ND		ND	ND		ND	ND		83.0		DN		27.4		157.0		ND	4			0.120		ND	423.0	2230.0	<774.0	>774.0	>2432	>4091
gracene thracene benzo(a,h)-	Je	DN	ND	ND	ND	ND	ND		ND	ND	ND		ND	ND		ND	ND	-	QN		DN	0	QN		QN		DN	4			ND		ND	33.0	135.0	<101.0	>101.0	>167.3	>233.7
ß\Kß) ILAseue		192.0	119.0	ND	131.0	ND	ND		ND	ND	ND		ND	ND		ND	ND	RM 98.4	66.7		ND	R @RM94.0	QN		93.1		DN	4		0004T	0.1 / L		ND	166.0	1290.0	<2.66.0	>266.0	>958.3	>1651
grianthene soranthene soranthene	a II	DN	QN	ND	72.5	ND	ND	Creek	ND	ND	ND	reek	ND	ND	age Ditch	ND	DN	<b>Country Club Tributary to DPR</b>	DN	eek	DN	itary to DPR	ND	Creek	ND		ND				C.10	Bull Creek	ND	240.0	13400.0	<520.8	>520.8	>1437	>2354
snzo(g,h,i)- gylene g/Kg)	ed 🗄		95.9	ND	87.4	ND	ND	North Mill C	ND	ND	ND	Hastings Creek	ND	ND	Newport Drainage Ditch	ND	ND	Club Tribu	56.0	Slocum Creek	DN	West Fork Belvidere Rd. Tributary to	QN	Stoneroller Creek	63.7	Bull's Brook	ND				70./	Brancn	ND	170.0	320.0	<335.0	>335.0	>792.1	>1249.0
grianthene sioranthene g/Kg)	ιJ	76.9	106.0	ND	128.0	ND	ND		ND	ND	ND		ND	ND	New	ND	ND	an Country	ND		ND	ork Belvide	ND		79.4		DN	4			0.00T	West	ND	240.0	13400.0	<207.0	>207.0	>434.7	>662.4
ຮ\Kg) ແຣນຣ suzo(a)-	١d	QN	59.7	QN	84.8	ND	ND		ND	ND	ND		ND	ND		ND	ND	Suburban	DN		DN	West F	QN		48.5		DN	4		0707	0.1UL		ND	150.0	1450.0	<230.0	>230.0	>798.3	>1367
grizo(a)- երւոշene g/Kg)	Je	68.1	68.0	ND	90.8	ND	ND		ND	ND	ND		ND	ND		ND	ND		44.3		DN		QN		64.9		DN	4			0.111		ND	108.0	1050.0	<239.0	>239.0	>699.4	>1160
&\KՁ) չlene senaph-	Чł	QN	DN	DN	ND	ND	ND		ND	ND	ND		ND	ND		ND	ND		DN		DN		QN		QN		ND				DN		ND			<86.38	>86.38	>103.6	>120.9
Է\KՑ) senaphthene		QN	DN	DN	ND	ND	ND		ND	DN	ND		DN	ND		DN	ND		DN		QN		QN		ND		QN				ND		ND	None	None	<84.25	>84.25	>104.8	>125.3
Drainage Area	(sq. mi.)	4.50	10.40	18.30	21.40	62.30	63.80		20.86	29.57	31.97		3.91	5.60		2.80	7.35		4.00		2.40		3.80		4.10		2.70		2.40	0.40	0/.11		5.10	TEC	PEC	Exc./Good	Fair	Poor	Very Poor
River	Mile	17.20	13.80	10.10	7.20	1.71	0.70		10.20	8.10	1.10		3.12	1.68		3.03	0.70		2.00		1.36		0.15		0.42		0.25	LOL	CV.C	D0.1	nc.n		2.54	- 2000					
	Site ID	11-6	11-5	11-4	11-3	11-2	11-1		10-3	10-2	10-1		10-5	10-4		12-2	12-1		13-10		13-11		13-8		13-9		13-7		14-D	14-2	14-1		14-4	MacDonald et al. 2000	March		I I I	NEIPS	

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macrophytes. Lower gradient streams may not offer such 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 the basic components of stream and riverine habitat into rankings 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 2019 Year 3 Upper Des Plaines River subwatersheds study area, QHEI scores and physical habitat attributes were recorded in conjunction with the fish sampling conducted at each site.

Based on the QHEI scores alone overall habitat quality ranged from good at four (4) sites to poor at five (5) sites with the remaining 20 sites rated fair (Table 15) based on the NE Illinois IPS (Table 9) that are more stringent than the prior usage of narrative ratings from Ohio. The numbers and ratios of good and poor habitat attributes in Table 15 (after Rankin 1989, 1995) are also important to understand in terms of the restorability of altered habitat and when seriously degraded habitat might preclude attainment of the General Use for aquatic life.

The highest scoring sites were all in the good range and included Stoneroller Creek (site 13-9) with a QHEI of 82.0, Mill Creek at RM 1.71 (site 11-2) with a QHEI of 80.0, Bull Creek at RM 0.50 (site 14-1) with a QHEI of 78.5, and Bulls Brook at RM 1.95 (site 13-15) with a QHEI of 76.5. Each of these sites had eight (8) good attributes and only one or two (1-2) poor attributes. Fair scoring sites in terms of the QHEI score that had seven (7) or eight (8) good attributes included both sites on the West Fork Belvidere Rd. Tributary (sites 13-8 and 13-14), Bull Creek at RM 1.0 (site 14-2), and the West Branch Bull Creek at RM 1.6 (site 14-3). Of these sites the lower West Fork Belvidere Rd. Tributary site (13-8) and the Bull Creek site (14-2) had six (6) and five (5) poor attributes that offset the good attributes.

Sites with poor QHEI scores included the upstream most site in Mill Creek at RM 17.2 (site 11-6) with a very poor attributes ratio of 9.0, North Mill Creek at RM 11.3 (site 10-7) also with a very poor attributes ratio of 9.0, Hastings Creek at RM 1.68 (site 10-14) with only two (2) good attributes, the Suburban Country Club Tributary (site 13-10) also with only two (2) good attributes, and the West Branch Bull Creek at RM 2.54 (site 14-4) with six (6) poor attributes. Recent and legacy channelization were associated with most if the poor and several of the fair QHEI scores. Three (3) sites had the high influence poor attribute of being channelized with no recovery evident and nine (9) sites with the moderate influence poor attribute recovering from channelization. The majority were in the upper portion of the more agricultural Year 3 study area and also towards the headwaters of the larger streams and the smaller tributaries that tend to receive the most channel modifications.

Restoring altered habitat will be essential to allowing sites with impaired biota to attain the General Use biocriteria thresholds for the fish and macroinvertebrate IBIs. This task will be more difficult at sites with higher poor to good attribute ratios and perhaps less difficult at sites with fair QHEI scores and higher numbers of good attributes. In the case of the latter eliminating poor attributes will raise the prospects for restoring to good QHEI scores. The

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h	0

			9.00	2.33	0.83	0.25	1.00		9.00	1.67	0.67	2.00		1.00	2.50		0.80
Ratios	Ratio of Poor (IIA) to Good		9.	2.	0	0	1.		.6	1.	0.	2.		1.	2.		C
Ra	katio of Poor (HgiH) to Good		2.00	0.33	0.00	0.00	0.00		4.00	0.33	0.00	0.33		0.00	0.50		0.20
able.	Poor Habitat Attributes		7	6	ъ	2	ъ		ъ	5	4	6		5	5		4
he to	alîtin oN			•					•								
resholds are listed at the bottom of th Moderate Influence Modified Attributes	ssənbəbbədm∃ əlîfi9 əvisnətx3-boM		•		•		•			•		•		•	•		
tom	ssənbəbbədm∃ əvisnətx3-boM		•	•	•		•		•	•	•	•		•	•		
boti	No Fast Current Types		•	•	•	•	•		•	•	•	•		•	•		
the	Intermittent Flow or Pools <20 cm																┢
d at ce M	2 Cover Types																┢
liste	دow Sinuosity		•	•													F
are	Fair- Poor Development		•	•	•				•	•		•		•	•		
olds erate	niginO neqbreH																┢
eshc 10de	(sətis əldəteo8) sətərtədu2 bne2															75	┢
v v v	Mod-High Silt Cover		•	•	•	•	•		•	•	•	•		•		1 0.7	╞
Salik	Recovering from Channelization		•				•				•	•			•	@RM 0.75	╞
g anc	restudirttA roor 900 hill dgiH		2	1	0	0	0		4	1	0	1		0	1		-
e ratings. Color coding High Influence Modified Attributes	ma 045 sdtga xeM							ek	•				k			ill Cr	┝
ys. Color c fluence Mi Attributes	Sparse No Cover	sek	•					Creek					Creek			μM	
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ings A	Silt/Muck Substrates	Mil	•			-		rth	•			•	Hastings			to /	┝
e rat High	Channelized or No Recovery			•				No	•	•			Ï			ibutary to North Mill Creek	┝
rrativ	sətudirttA tetideH booD		-	3	9	∞	ъ		1	3	6	З		5	2	Trib	С
d na	No Riffle Embeddedness															Unnamed Tr	┢
rived	Max Depth > 40 cm															nar	
ccordance with IPS der Good Habitat Attributes	Little to No Embeddedness															5	┝
h IP.	Fast Flow w Eddies																┝
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ance Habi	۷isouni2 AgiH-ətarəboM								_								┝
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<b>G</b>	Silt Free				_	-	-				_						⊢
ed ir	Boulder, Cobble, Gravel				-												╞
had	No Channelization			-			-				-						
ire s						_											
ores c	ОНЕІ		40.0	52.8	62.0	80.0	68.5		37.0	59.0	67.8	59.0		60.0	44.5		ר אר האר
QHEI scores are shaded in accordance with IPS derived narrative ratings. Color coding and IPS thresholds are listed at the bottom of the table.       Good Habitat Attributes     High Influence Modified       Attributes     Attributes	River Mile		17.2	13.8	7.20	1.71	0.70		11.30	10.20	8.10	1.10		3.12	1.68		0.04
2019.	Site ID		11-6	11-5	11-3	11-2	- <u>-</u> -		10-7	10-3	10-2	10-1		10-5	10-4		10-6
	01 04:5			1	1	1	11		0	0	0	0			0		I C

October 15, 2021

so	booD of (IIA) roof fo oiteЯ		2.33	0.80		3.50		0.83		0.80		0.80		0.29	0.86	
Ratios	Ratio of Poor (HgiH) to Good		0.33	0.00		1.00		0.00		0.20		0.00		0.00	0.00	
	Poor Habitat Attributes		9	4		S		5		4		4		2	9	
-	No Riffle		•													ĺ
utes	ssənbəbbədm∃ əlîfilə əvisnətx∃-boM			•		-		•		•		•	-	⊢		
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ed A	No Fast Current Types		•	•			-	•		•		•	-		•	ĺ
odifi	Intermittent Flow or Pools <20 cm	ŀ												⊢		ĺ
ĕ.	< 2 Cover Types	ŀ				$\vdash$								┢──		ĺ
nenc	Low Sinuosity													┢	•	ĺ
Infl	Fair- Poor Development		•	•		•						•			•	ĺ
erate	Hardpan Origin	F														ĺ
Moderate Influence Modified Attributes	(sətis əldətəo8) sətərtədu2 bne2	F			8.4				54		9.5		4.0			ĺ
2	Mod-High Silt Cover		•		M 98.	•		•	A 0.6	•	M 89.		@RM 94.0		•	ĺ
F	Recovering from Channelization		•	•	@RM			•	@RN		@RM		@R		•	ĺ
p	High Influence Poor Attributes	ų	1	0	DPR	2		0	) yəə	1	River	0	DPR	0	0	
difie	Max Depths <40 cm	Ditch				┝─			f Cre	•	es R		v to	┝		ĺ
e Mo	Sparse No Cover	age			itar)		reek		nlea	-	Plaines		utar	-		
High Influence Modified Attributes	Vo Sinuosity	rain			<b><i><u><u></u></u></i></b> <b><i>I</i></b> <b><i>r</i></b> <b>i</b> <b>b</b>	•	Slocum Creek		Gree		Des P		Tributary to	⊢		-
A	Silt/Muck Substrates	ort D	•		l qn	-	locu		, to (		to D		Rd.	⊢		
High	Channelized or No Recovery	Newport Drainage			ntry Club Tributary to	-	S		itary		butary to		videre			ĺ
	sətudirttA tetideH booD		S	5	Count	2		9	Unnamed Tributary to Greenleaf Creek @RM 0.64	ъ	Tribu	ъ	Belvic	7	7	
F	vo Riffle Embeddedness				oan .				pəm		ned		ork			ĺ
s	Max Depth > 40 cm				Suburban		-		nna		Unnamed Tril		West Fork			
bute	Little to No Embeddedness				Su				D		5		Ŵ			
Attril	Fast Flow w Eddies													┢		ĺ
itat /	Moderate-Extensive Cover															
Hab	Voderate-High Sinuosity															ĺ
Good Habitat Attributes	Good-Excellent Development	F														ĺ
	Silt Free	ľ														
-	Boulder, Cobble, Gravel															ĺ
-	No Channelization															ĺ
	ОНЕІ		45.0	63.0		39.0		63.8		63.8		62.0		68.8	70.0	
	River Mile		3.03	0.70		2.00		1.36		0.40		0.13		0.21	0.15	
	Site ID	-	12-2	12-1		13-10		13-11		13-13		13-17	-	13-14	13-8	

October 15, 2021

60 CD

Good Habitat Attributes
QHEI Jo Channelization Jo Channelization Jooderate-High Sinuosity Aoderate-High Sinuosity Aoderate-Extensive Cover ast Flow w Eddies ittle to No Embeddedness
57.5
<b>57.3</b>
23.3
78.0 • • • • • • • • • • • • • • • • • • •
47.8
65.8 65.8
<u>84.5</u>
>75.9
>50.1
<u>&gt;25.0</u>
<25.0

# October 15, 2021

accounting of habitat attributes in Table 15 provides the basis to examine this on a subwatershed and site by site basis. The poor attributes spanned the entire list including channel condition and development, siltation, and substrate embeddedness. The most common poor attribute was no fast current types, but this might be the expected condition for small streams in this region of Illinois.

#### **Biological Assemblages – Fish**

Fish species were ranked by each of the four subwatershed bundles – Mill Creek, North Mill Creek, Bull Creek-Bulls Brook Des Plaines Tributaries (West), and Upper Des Plaines Tributaries (East) – that comprised the 2019 Year 3 study area (Table 16). Tolerant, moderately tolerant, and intermediate species dominated the ranking in each subwatershed. Only one intolerant species (Hornyhead Chub in Bull Creek-Bulls Brook DPR Tributaries E) was ranked in the top ten in any of the four subwatersheds. Only three intolerant species were collected in total and included Hornyhead Chub, Stonecat Madtom, and Carmine Shiner.

#### Species Inventory

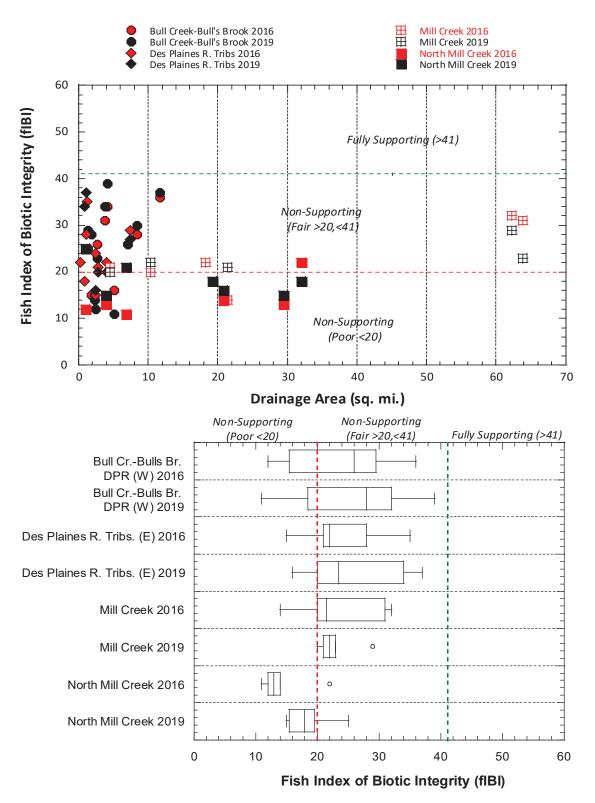
The Mill Creek subwatershed had 29 species, 1 hybrid, and 964 total fish weighing 11.85 Kg. Bluntnose Minnow was predominant by numbers (25.8%) and White Sucker predominated the biomass (18.6%). Tolerant and moderately tolerant species numbered seven (7) by numbers and six (6) by biomass. Hornyhead Chub and Stonecat Madtom were the only intolerant species. North Mill Creek had 22 species, 1 hybrid, and 596 fish weighing 6.73 Kg. Green Sunfish predominated by numbers (30.0%) and Common Carp predominated the biomass (32.3%). Tolerant and moderately tolerant species numbered nine (9) by numbers and eight (8) by weight. Hornyhead Chub was the lone intolerant species. The Bull Creek-Bulls Brook and Des Plaines River Tributaries (West) subwatershed had 30 species, 1 hybrid, and 1585 fish weighing 3.38 Kg. Creek Chub predominated by numbers (27.7%) and White Sucker predominated the biomass (29.1%). Tolerant and moderately tolerant species numbered seven (7) by numbers and weight. Carmine Shiner was the sole intolerant species in the subwatershed. The Upper Des Plaines Tributaries (East) had 21 species, no hybrids, and 524 fish weighing 0.77 Kg. Blackstripe Topminnow predominated by numbers (26.0%) and Creek Chub predominated the biomass (26.3%). Tolerant and moderately tolerant species numbered four (4) by numbers and weight. Stonecat Madtom and Carmine Shiner were the intolerant species in the subwatershed. Several species collected are indicative of low gradient vegetated streams and include Bowfin, Central Mudminnow, Blackside Darter, and Pirate Perch. The full listing of species by subwatershed and site are included in Appendix A.

#### Fish Assemblage Condition

Fish IBI (fIBI) scores are from one or two sampling passes (the mean of the latter) within the summer-early fall index period. The General Use biocriterion of 41 was not met at any of the 29 sites sampled (Figure 14). The median of all fIBI scores by subwatershed bundle was in the non-supporting fair range except in North Mill Creek which consistently in the non-supporting poor range. There were no apparent differences between 2016 and 2019 even though each had

### **Table 16**. Top ten fish species ranked by numbers and biomass in each of the four subwatershedbundles in the 2019 Year 3 Upper Des Plaines River subwatershed study area.

Mill Creek					North Mill Creek				
	Toler	rance	No./Wt.	% Ву		Toler	ance	No./Wt.	% Ву
Species	IL	OH	Collected	Number	Species	IL	OH	Collected	Number
Spec	ies Ranks b	y Number	s		Spec	ies Ranks b	y Number	s	
Bluegill		Р	249	25.8	Green Sunfish	Т	Т	179	30.0
Green Sunfish	Т	Т	158	16.4	Bluegill Sunfish		Р	103	17.3
Spotfin Shiner			115	11.9	Bluntnose Minnow	Т	Т	64	10.7
Bluntnose Minnow	Т	Т	72	7.5	Largemouth Bass			52	8.7
Largemouth Bass		Р	43	4.5	Central Mudminnow	Т	Т	39	6.5
Pumpkinseed Sunfish		Р	35	3.6	Creek Chub	Т	Т	35	5.9
Blackside Darter			31	3.2	Yellow Bullhead	Т	Т	34	5.7
Orangespotted Sunfish			30	3.1	White Sucker	Т	Т	28	4.7
Blackstripe Topminnow		Р	26	2.7	Fathead Minnow	Т	Т	19	3.2
Golden Shiner	Т	Т	26	2.7	Common Carp	Т	Т	13	2.2
Specie	es Ranks by	Weight (I	(g)		Species Ranks by Weight (Kg)				
White Sucker	Т	Т	2.20	18.6	Common Carp	Т	T	2.17	32.3
Bluegill		Р	2.02	17.0	White Sucker	Т	Т	1.59	23.7
Common Carp	Т	Т	1.96	16.6	Northern Pike			0.80	11.9
Channel Catfish			1.38	11.7	Bluegill Sunfish	Т	Т	0.70	10.4
Largemouth Bass			0.92	7.8	Green Sunfish	Т	Т	0.67	9.9
Northern Pike			0.83	7.0	Yellow Bullhead	Т	Т	0.30	4.5
Green Sunfish	Т	Т	0.47	4.0	Black Bullhead	T	T	0.20	3.0
Yellow Bullhead	Т	T	0.40	3.4	Central Mudminnow	T	Т	0.08	1.2
Bowfin		•	0.40	3.4	Largemouth Bass	•		0.07	1.1
Pumpkinseed Sunfish		Р	0.27	2.3	Bluntnose Minnow	Т	Т	0.06	2.3
•				2.0					2.0
Bull Creek-Bul		rance	No./Wt.	% By	Des Plain	es River Tri Toler		No./Wt.	% By
Species	IL	OH	Collected	Number	Species	IL	OH	Collected	Number
	ies Ranks b	-		Number		ies Ranks b	-		Number
Creek Chub	Т	T	439	27.7	Blackstripe Topminnow	ies names b	y Number	136	26.0
Central Stoneroller			234	14.8	Creek Chub	т	т	109	20.8
Green Sunfish	т	т	160	10.1	Green Sunfish	T	т	66	12.6
Bluntnose Minnow	T	T	132	8.3	Central Mudminnow	•	1	51	9.7
White Sucker	Т	T	109	6.9	White Sucker	т	т	44	8.4
Johnny Darter	1	1	72	4.5	Largemouth Bass	1	I	23	4.4
Bluegill Sunfish		Р	69	4.4	Bluegill Sunfish			23	4.4
Blackside Darter		Г	62	3.9	Johnny Darter			20	3.8
Fantail Darter		М	61	3.9	Pumpkinseed Sunfish		Р	16	3.1
Hornyhead Chub		IVI	56	3.5	Pirate Perch		r	13	2.5
Species Ranks by Weight (Kg)						es Ranks by	Maight (	-	2.5
White Sucker			0.98	29.1	Creek Chub			0.20	26.3
Creek Chub Groop Sunfish	T T	T T	0.69	20.5	Green Sunfish White Sucker	T T	T	0.17	21.6
Green Sunfish Northern Pike	1	1	0.44	13.0 8.9	White Sucker Pumpkinseed Sunfish	1	P	0.12 0.06	15.3
Central Stoneroller					Central Mudminnow		۲	0.06	8.0 7.1
			0.23	6.8					
Largemouth Bass		•	0.12	3.7	Largemouth Bass			0.05	6.1
Hornyhead Chub	-	I T	0.11	3.2	Blackstripe Topminnow			0.03	4.4
Yellow Bullhead Pumpkinseed Sunfish	Т	T P	0.10	2.9	Pirate Perch			0.03	3.5
Wumpkincood Suptich									16
Bluntnose Minnow	Т	P T	0.09	2.7 2.4	Bluegill Sunfish Northern Pike			0.02	2.6 1.7



**Figure 15**. Illinois fish IBI scores by subwatershed and stream in the Year 3 2019 study area. Mean values are shown by individual site by drainage area (upper panel) in 2016 and 2019 and in tributary subwatershed bundles as box-and-whisker plots (lower panel). Dashed and solid lines represent full support, non-support fair, and non-support poor.

substantially different flows nor were any drainage size differences.

#### **Biological Assemblages – Macroinvertebrates**

Macroinvertebrate taxa were likewise ranked by each of the four subwatershed bundles – Mill Creek, North Mill Creek, Bull Creek-Bulls Brook Des Plaines Tributaries (West), and Upper Des Plaines Tributaries (East) – that comprised the 2019 Year 3 study area (Table 17). Tolerant, moderately tolerant, and facultative taxa dominated the rankings in each subwatershed.

#### Taxa Inventory

Mill Creek had 96 taxa among 3,376 organisms collected. The scud *Gammarus sp.* comprised 20.7% of the collections followed by the Elmid beetle *Dubiraphia sp.*, Oligochaeta, the mayfly *Baetis intercalaris*, and the caddisfly genus *Cheumatopsyche sp.* North Mill Creek had 126 taxa among 4,363 organisms collected. The Planarian *Turbellaria* comprised 12.56% of the collections followed by *Oligochaeta*, the amphipod *Hyalella azteca*, the scud Gammarus sp., and the caddisfly genus *Cheumatopsyche sp.* The Bull Creek-Bulls Brook and Des Plaines Tributaries (West) had 133 taxa among 7,328 organisms collected. The Asellid crustacean *Caecidotea sp.* comprised 12.34% of the collections flowed by the scud *Gammarus sp., Oligochaeta*, the Elmid beetle *Stenelmis sp.,* and the Planarian *Turbellaria.* The Des Plaines Tributaries (East) had 97 taxa among 3,940 organisms collected. The amphipod *Hyalella azteca* comprised 15.18% of the collections followed by Asellid crustacean *Caecidotea sp., Oligochaeta*, and pea clams of the family Pisidiidae.

#### Macroinvertebrate Assemblage

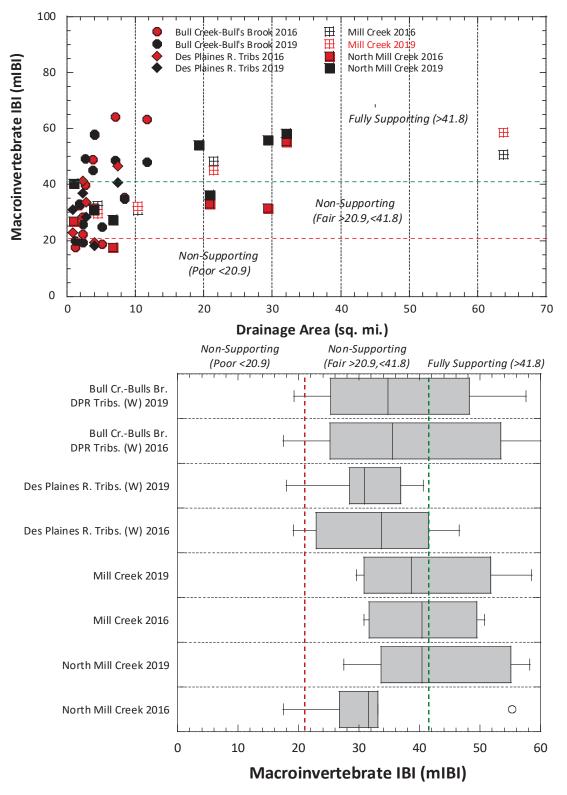
Macroinvertebrate IBI (fIBI) scores are from single multihabitat collections at each of 29 sites within the summer-early fall index period. The General Use biocriterion of 41.8 was met at 10 of the 29 sites sampled and nearly so at two (2) other sites (Figure 15). Of the remaining sites 14 were in the non-support fair range and 3 barely into the non-support poor range. Full support was most frequent in the downstream reaches of major streams and the highest mIBI scores occurred in lower Mill Creek (mIBI = 58.5; site 11-1), the two lowermost sites in North Mill Creek (mIBI = 56.0 and 58.2; sites 10-1 and 10-2), and Stoneroller Creek (mIBI = 57.6; site 13-9).

#### **Biological Assemblages – Response Signatures**

Table 18 lists the fIBI score, selected fIBI metrics, mIBI score, selected mIBI metrics, and other macroinvertebrate assemblage attributes, three (3) of which are key biological response signatures associated with toxic impacts (%DELT anomalies, % toxic tolerant taxa) and organic enrichment (% organic enrichment tolerant taxa; Yoder and DeShon 2003). None of these response indicators were in the very poor range and only four (4) sites were in the poor range for organic enrichment tolerant taxa. Some of the results corresponded to stressor indicators that are relevant to the occurrence of these response signatures, but these also varied somewhat as to their degree and severity of occurrence as described below.

# **Table 17.** Top forty macroinvertebrate taxa ranked by numbers in each of the four subwatershedbundles in the 2019 Year 3 Upper Des Plaines River subwatershed study area.

Taxa Code	Mill Creek Subwatershed Taxa Name	Tolerance	Numbers	Percent		Taxa Code	North Mill Creek Subwaters Taxa Name		Numbers	Percent
06800	Gammarus sp		699	20.70%		01801	Turbellaria		548	12.56%
68700	Dubiraphia sp		326	9.66%	Ц	03600			500	11.46%
03600			239	7.08%	Ц	06201			321	7.36%
	Baetis intercalaris		176	5.21%	Ц	06800			294	6.74%
	Cheumatopsyche sp		147	4.35%	Н		Cheumatopsyche sp		226	5.18%
22001	Coenagrionidae		143	4.24%	Н		Dubiraphia vittata group		192	4.40%
68708			138	4.09%	Н		Baetis intercalaris		136	3.12%
83040			138	4.09%	Н		Glyptotendipes (G.) sp		135	3.09%
05800			136	4.03%	Н		Stenacron sp		115	2.64%
	Glyptotendipes (G.) sp		120	3.55%	Н		Physella sp		108	2.48%
69400	Stenelmis sp		104	3.08%	Н	05800	· · · · · · · · · · · · · · · · · · ·		100	2.29%
84450	Polypedilum (Uresipedilum) flavum		93	2.75%	Ц		Dubiraphia sp		99	2.27%
01801	Turbellaria		77	2.28%	Н	17200	· · ·		93	2.13%
	Polypedilum (Tripodura) scalaenum group		66	1.95%	Ц		Coenagrionidae		87	1.99%
	Pisidiidae		59	1.75%	Н		Pentaneura inconspicua		85	1.95%
	Macronychus glabratus		45	1.33%	Ц		Polypedilum (P.) illinoense		85	1.95%
84470	Polypedilum (P.) illinoense		43	1.27%	Ц	68201			80	1.83%
	Stenacron sp		40	1.18%	Ц	98001			79	1.81%
	Procladius (Holotanypus) sp		40	1.18%	Ц		Polypedilum (Uresipedilum) flavum		77	1.76%
	Cryptochironomus sp		35	1.04%	Ц	74100			73	1.67%
85625	Rheotanytarsus sp		32	0.95%	Ц	78200	Larsia sp		65	1.49%
	Endochironomus nigricans		29	0.86%	μ	85625			55	1.26%
	Physella sp		29	0.86%	μ	69400			52	1.19%
	Caenis sp		28	0.83%	Ц	94400			39	0.89%
	Hayesomyia senata or Thienemannimyia norena		27	0.80%	μ		Polypedilum (Tripodura) scalaenum group		35	0.80%
82730	Chironomus (C.) decorus group		27	0.80%	Ц	52530	Hydropsyche depravata group		33	0.76%
77355	Clinotanypus pinguis		25	0.74%	Ц	77750	Hayesomyia senata or Thienemannimyia norena		30	0.69%
82880	Cryptotendipes sp		19	0.56%	Ц	82820	Cryptochironomus sp		30	0.69%
98600			19	0.56%	Ц	21200	Calopteryx sp		28	0.64%
98200	Pisidium sp		16	0.47%		82730	Chironomus (C.) decorus group		27	0.62%
16700	Tricorythodes sp		14	0.41%		77500	Conchapelopia sp		25	0.57%
68201	Scirtidae		14	0.41%		78655	Procladius (Holotanypus) sp		22	0.50%
84520	Polypedilum (Tripodura) halterale group		14	0.41%	Π	68901	Macronychus glabratus		19	0.44%
97601	Corbicula fluminea		14	0.41%	П	77120	Ablabesmyia mallochi		17	0.39%
78600	Pentaneura inconspicua		12	0.36%	П	84520	Polypedilum (Tripodura) halterale group		17	0.39%
84210	Paratendipes albimanus or P. duplicatus		12	0.36%	П	98200	Pisidium sp		17	0.39%
	Tanytarsus sp		10	0.30%	П	06700	Crangonyx sp		16	0.37%
85800	runytursus sp		10			00700				
85800 06201	Hyalella azteca		9	0.27%	Ħ	53800	Hydroptila sp		16	0.37%
					Π				16 16	0.37%
06201	Hyalella azteca		9	0.27%		53800	Cryptotendipes sp			
06201 22300	Hyalella azteca Argia sp	. (West)	9 9	0.27% 0.27%		53800 82880	Cryptotendipes sp	(East)	16	0.37%
06201 22300 79000 <b>Таха</b>	Hyalelia ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs.		9 9 9	0.27% 0.27% 0.27%		53800 82880 84700 <b>Taxa</b>	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries	(East)	16 16	0.37%
06201 22300 79000 Taxa Code	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name		9 9 9 Numbers	0.27% 0.27% 0.27% Percent		53800 82880 84700 Taxa Code	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name	(East)	16 16 Numbers	0.37% 0.37% Percent
06201 22300 79000 <b>Taxa</b> Code 05800	Hyalella azteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp		9 9 9 <b>Numbers</b> 904	0.27% 0.27% 0.27% Percent 12.34%		53800 82880 84700 <b>Taxa</b> Code 06201	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca	(East)	16 16 Numbers 598	0.37% 0.37% Percent 15.18%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800	Hyalelia ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp		9 9 9 <b>Numbers</b> 904 811	0.27% 0.27% 0.27% Percent 12.34% 11.07%		53800 82880 84700 <b>Taxa</b> Code 06201 05800	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp	(East)	16 16 Numbers 598 501	0.37% 0.37% Percent 15.18% 12.72%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta		9 9 9 <b>Numbers</b> 904 811 750	0.27% 0.27% 0.27% Percent 12.34% 11.07% 10.23%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidatea sp Oligochaeta	(East)	16 16 Numbers 598 501 475	0.37% 0.37% Percent 15.18% 12.72% 12.06%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 03600 69400	Hyalelia ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gligochaeta Stenelmis sp		9 9 9 <b>Numbers</b> 904 811 750 676	0.27% 0.27% 0.27% Percent 12.34% 11.07% 10.23% 9.22%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600 06800	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligachaeta Gammarus sp	(East)	16 16 Numbers 598 501 475 453	0.37% 0.37% Percent 15.18% 12.72% 12.06% 11.50%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 03600 69400 01801	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria		9 9 9 <b>Numbers</b> 904 811 750 676 514	0.27% 0.27% 0.27% Percent 12.34% 11.07% 10.23% 9.22% 7.01%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600 03600 98001	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidatea sp Oligochaeta Gammarus sp Pisidiidae	(East)	16 16 <b>Numbers</b> 598 501 475 453 345	0.37% 0.37% Percent 15.18% 12.72% 12.06% 11.50% 8.76%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 03600 69400 01801 98600	Hyalelia ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp		9 9 9 <b>Numbers</b> 904 811 750 676 514 332	0.27% 0.27% 0.27% Percent 12.34% 11.07% 10.23% 9.22% 7.01% 4.53%		53800 82880 84700 <b>Taxa</b> <b>Code</b> 06201 05800 03600 06800 98001 95100	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidatea sp Oligochaeta Gammarus sp Pisidiidae Physella sp	(East)	16 16 598 501 475 453 345 332	0.37% 0.37% Percent 15.18% 12.72% 12.06% 11.50% 8.76% 8.43%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 03600 03600 01801 98600 06201	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella azteca		9 9 9 <b>Numbers</b> 904 811 750 676 514 332 321	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38%		53800 82880 84700 <b>Taxa</b> <b>Code</b> 06201 05800 03600 06800 98001 95100 22001	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisidiidae Physella sp Coenagrionidae	(East)	16 16 598 501 475 453 345 332 118	0.37% 0.37% Percent 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 03600 69400 01801 98600 06201 98200	Hyalelia ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalelia ozteca Pisidium sp		9 9 9 904 811 750 676 514 332 321 253	0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 4.53% 4.38% 3.45%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600 06800 98001 95100 22001 68700	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp	(East)	16 16 598 501 475 453 345 332 118 111	0.37% 0.37% Percent 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.82%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 03600 69400 01801 98600 06201 98200 52200	Hyalelia ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp		9 9 9 904 811 750 676 514 3321 253 236	0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 4.53% 4.38% 3.45% 3.22%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600 06800 98001 95100 22001 68700 01801	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella ozteca Caecidatea sp Oligochaeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbellaria	(East)	16 16 598 501 475 453 345 332 118 111 106	0.37% 0.37% Percent 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.82% 2.69%
06201 22300 79000 <b>Taxa</b> 05800 06800 03600 03600 04800 03800 04801 98600 05200 98200 52200 04664	Hyalelia ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis		9 9 9 904 811 750 676 514 332 321 253 236 228	0.27% 0.27% 0.27% Percent 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.53% 3.45% 3.45% 3.11%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600 06800 98001 95100 22001 68700 01801 84750	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidatea sp Oligochaeta Gammarus sp Pisidildae Physella sp Coenagrionidae Dubiraphia sp Turbelloria Stictochironomus sp	(East)	16 16 598 501 475 453 345 332 118 111 106 105	0.37% 0.37% Percent 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.82% 2.69% 2.66%
06201 22300 79000 <b>Taxa</b> 05800 06800 03600 03600 04800 04801 98600 052200 04664 98001	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella azteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiidae		9 9 9 904 811 750 676 514 332 321 253 236 228 161	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 4.53% 4.38% 3.45% 3.22%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600 06800 98001 95100 22001 68700 01801 84750 84210	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Ciaecidotea sp Ciaecidotea sp Ciaecidotea sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus	(East)	16 16 598 501 475 345 332 118 111 106 105 88	0.37% 0.37% Percent 15.18% 12.72% 11.06% 11.50% 8.76% 8.43% 2.99% 2.82% 2.69% 2.66% 2.69% 2.62%
06201 22300 79000 <b>Taxa</b> 05800 03800 03600 03900 01801 98600 06201 98200 52200 04664 98001 22001	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuda Coenagrionidae		9 9 9 904 811 750 676 514 322 321 253 236 228 161 137	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.22% 3.11% 2.20% 1.87%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600 06800 98001 95100 22001 68700 01801 84750 84210 94800	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbelloria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp	(East)	16 16 598 501 475 453 345 332 118 111 106 105 888 73	0.37% 0.37% Percent 15.18% 12.72% 11.50% 8.76% 8.43% 2.99% 2.69% 2.66% 2.65% 2.65%
06201 22300 79000 <b>Taxa</b> 05800 06800 03600 03600 03600 03600 03600 03600 03600 03600 03600 03600 04664 98200 04664 98001 822001 84450	Hyalelia ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbelloria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisididae Coenagrionidae Polypedilum (Uresipedilum) flavum		9 9 9 904 811 750 676 514 332 233 236 228 161 137 125	0.27% 0.27% 0.27% 0.27% Percent 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.45% 1.11%		53800 82880 84700 <b>Taxa</b> 06201 05800 03600 05800 98001 95100 22001 68700 01801 84750 84210 94800 82730	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group	(East) (East)	16 16 598 501 475 332 118 111 106 105 88 73 42	0.37% 0.37% 0.37% Percent 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.82% 2.69% 2.69% 2.23% 1.85% 1.07%
06201 22300 79000 <b>Taxa</b> 05800 06800 03600 03600 03600 03600 03600 03600 03600 04664 98200 04664 98001 22201 84450 93200	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Uligochaeta Stenelmis sp Hyalella azteca Pisidium sp Hyalella ozteca Pisidium sp Helobdella stagnalis Pisidiidae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobidae		9 9 9 904 811 750 676 514 332 321 236 228 161 137 125 104	0.27% 0.27% 0.27% 0.27% 12.34% 10.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.41% 2.20% 1.87% 1.71% 1.42%		53800 82880 84700 <b>Taxa</b> 06201 05800 03600 06800 98001 95100 22001 68700 01801 84750 84210 94800 94800 82730 11200	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligachaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (c.) decorus group Callibaetis sp	(East)	16           16           16           598           501           475           453           332           118           111           106           88           73           42           40	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.66% 2.23% 1.85% 1.07% 1.02%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 06800 06800 08000 08000 08200 98200 98001 84450 98001 84450 93200	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Schaerium sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisididae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobidae Dubiraphia sp		9 9 9 904 8111 750 676 514 332 321 253 236 228 161 137 125 104 89	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 4.33% 4.38% 4.38% 3.45% 3.22% 3.11% 1.87% 1.71% 1.42%		53800 82880 84700 70 06201 05800 03600 98001 95100 22001 68700 01801 84750 84210 94800 82730 11200	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Caellibaetis sp Caenis sp	(East) (East)	16           16           16           16           598           501           475           453           345           332           118           111           106           105           88           73           42           40           34	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 8.43% 2.99% 2.89% 2.66% 2.23% 1.85% 1.02% 0.86%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 03600 03600 03600 03600 03600 03800 03800 03800 03800 03800 04644 98001 22001 84450 05220 068700 68700	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiidae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobidae Dubiraphia sp Optioservus sp		9 9 9 904 811 750 676 514 332 321 223 236 228 161 137 125 104 8 9 9 78	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.22% 3.11% 2.20% 1.87% 1.87% 1.71% 1.42% 1.21%		53800 82880 84700 06201 05800 03600 06800 98001 95100 22001 68700 01801 84750 01801 84210 94800 84210 94800 82730 11200 17200 68708	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group	(East)	16           16           16           598           501           475           453           345           332           1118           111           106           105           88           73           42           40           34           32	0.37% 0.37% 0.37% 15.18% 12.05% 12.05% 8.76% 8.43% 2.99% 2.69% 2.82% 2.69% 2.23% 1.85% 1.07% 1.02% 0.86% 0.81%
06201 22300 79000 Taxa Cofe 05800 06800 06800 06800 08800 08800 08200 52200 04664 98001 22001 84450 93200 68700 68700 68700	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisididae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobidae Dubiraphia sp Optioservus sp Hetaerina sp		9 9 9 904 811 750 676 514 332 321 253 236 228 161 137 125 104 89 78 76	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.41% 2.20% 1.87% 1.42% 1.21% 1.06% 1.04%		53800 82880 84700 <b>Taxa</b> Code 06201 05800 03600 03600 98001 95100 22001 68700 01801 84750 84210 94800 94800 94800 82730 11200 17200 68708 68708	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligocheeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbelloria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chirionomus (C.) decorus group Calibaetis sp Caenis sp Dubiraphia vittata group Stenelmia sp	(East)	16           16           16           16           598           501           475           453           332           118           111           105           88           73           42           40           34           32           331	0.37% 0.37% 0.37% 15.18% 12.06% 12.06% 11.50% 8.76% 8.43% 2.69% 2.69% 2.69% 2.69% 2.69% 2.69% 1.07% 1.02% 0.81% 0.81% 0.79%
06201 22300 79000 06800 06800 069400 069400 069400 069400 06201 98200 04664 98001 22001 84450 93200 68700 93200 68700 93200 11130	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiidae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobilae Dubirophia sp Optioservus sp Hetaerina sp Baetis intercalaris		9 9 9 904 8111 750 676 514 332 321 253 236 228 161 137 125 104 89 78 76 75	0.27% 0.27% 0.27% 0.27% 12.34% 10.02% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.45% 1.21% 1.42% 1.42% 1.42% 1.21% 0.6% 1.02%		S3800           82880           84700           Taxa           Code           06201           05800           03600           03600           98001           995100           22001           68700           94800           94800           11200           68708           68708           68708           689400           98600	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stitacchironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp	(East) (East)	16           16           16           598           501           475           453           345           332           118           111           106           88           73           42           40           34           32           31           30	0.37% 0.37% 0.37% 15.18% 12.72% 12.05% 8.76% 8.43% 2.99% 2.82% 2.66% 2.23% 1.85% 1.07% 1.02% 0.86% 0.81% 0.79%
06201 22300 79000 05800 05800 03600 03600 03600 0400 01801 98000 052200 04664 98001 22001 04664 98200 04664 98200 04664 98200 22300 04664 98200 22300 04664 98200 22300 04664 98200 22300 04664 98200 22300 04664 98200 22300 04664 98200 22300 04664 98200 0467 98200 9200 92000 9200000000	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gamnarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella azteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiude Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Dubirophia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes albimanus or P. duplicatus		9 9 9 904 811 750 676 514 332 236 228 161 137 125 104 89 78 76 75 75	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.45% 1.87% 1.87% 1.87% 1.21% 1.06% 1.02%		53800           82880           84700           Taxa           Code           06201           05800           03600           98001           995100           22001           68700           01801           94300           84750           84710           94800           11200           17200           68708           69400           98600	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligachaeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group	(East) (East)	16           16           16           598           501           475           453           345           332           111           106           105           88           73           42           0           34           32           31           30           28	0.37% 0.37% 0.37% Percent 15.18% 12.06% 11.50% 8.76% 8.43% 2.99% 2.82% 2.69% 2.82% 2.69% 2.23% 1.85% 1.02% 0.86% 0.81% 0.86% 0.71%
06201 22300 79000 05800 05800 05800 03600 03600 03600 03600 03600 03600 03600 03600 04640 98200 04664 98001 22001 04664 98200 047000 047000 047000 047000 040000000000	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Dubiraphia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus		9 9 9 904 811 750 676 514 332 321 253 236 228 161 337 125 104 89 78 76 75 5 66	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.22% 3.11% 2.20% 1.87% 1.71% 1.42% 1.71% 1.42% 1.04% 1.04% 0.09%		S3800           82880           84700           Taxa           Code           05201           05800           03600           98001           95100           22001           68700           84210           94800           84250           94800           82730           11200           68708           69400           98601           79000	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbelloria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp	(East)	16           16           16           598           501           475           453           332           118           111           106           105           88           73           42           40           34           31           30           28           27	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.66% 2.23% 1.07% 1.02% 0.81% 0.79% 0.79% 0.79%
06201 22300 79000 <b>Taxa</b> <b>Code</b> 05800 06800 03600 69400 03600 69400 08600 98200 04664 98200 04664 98200 04664 22001 24001 24100 21300 2100000000	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella azteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisididae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobiidae Dubirophia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes neomodestus Baetis flavistriga		9 9 9 904 811 750 676 514 332 321 233 236 228 161 137 125 104 89 78 89 76 75 75 66 65	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.41% 2.20% 1.87% 1.71% 1.42% 1.21% 1.06% 1.02% 0.09% 0.89%		S3800           82880           84700           84700           84700           68700           06201           05300           03600           03600           03600           03600           03600           03600           03600           03600           03600           03600           03600           03600           03600           03800           84210           82730           11200           117200           83780           83800           83840           98601           98602	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligachaeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stitachironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense	(East) (East)	16           16           16           598           501           475           453           332           118           101           105           88           73           42           40           34           32           31           30           28           27           25	0.37% 0.37% 0.37% Percent 15.18% 12.72% 11.50% 8.76% 8.43% 2.99% 2.82% 2.66% 2.23% 1.85% 1.02% 0.66% 0.81% 0.76% 0.76% 0.76% 0.63%
06201 22300 79000 0500 05800 05800 03600 03600 03600 04664 98001 98200 04664 98001 98200 04664 98001 98200 04604 11130 84210 11130 84210 11120 04604 11120 111	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gamarus sp Oligochaeta Sphaerium sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuda Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Dubiraphia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis flavistriga Crangonyx sp		9 9 9 9 04 811 750 676 514 332 236 228 236 228 104 137 125 104 89 78 76 75 75 66 5 65 64	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 1.21% 1.22% 1.21% 1.06% 1.21% 1.02% 0.89% 0.87%		53800           82880           8284700           7000           7000           7000           7000           7000           7000           7000           7000           88400           7000           88400           88400           7000           88400           88400           88400           88400           88400           88400	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stitacchironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinaense Endochironomus ingricans	(East) (East)	16           16           16           16           598           501           475           453           345           332           118           111           106           105           88           73           42           40           34           32           31           30           28           27           18	0.37% 0.37% 0.37% Percent 15.18% 12.72% 11.50% 8.76% 8.43% 2.99% 2.82% 2.82% 2.82% 2.66% 2.23% 1.85% 1.02% 0.86% 0.86% 0.71% 0.76% 0.71% 0.63% 0.46%
06201 22300 7000 7000 05800 05800 03600 69400 08600 06800 06800 06800 06800 0201 98600 06201 98600 02020 04664 98001 22001 22001 84450 84450 84420 83040 84210 83040 84210 83040 84210 83040 84210 84470	Hyalella ozteca         Argia sp         Tanypus sp         Bull Creek- Bulls Brook DPR Tribs.         Taxa Name         Caecidotea sp         Gammarus sp         Oligochoeta         Stenelmis sp         Turbellaria         Sphaerium sp         Hyalella azteca         Pisidium sp         Coenagrionidae         Polypedilum (Uresipedilum) flavum         Hydrolidae         Dubirophia sp         Optioservus sp         Hetaetanias         Paratendiges albimanus or P. duplicatus         Dicrotendiges neomodestus         Baetis flovistriga         Crangonyx sp         Polypedilum (P, jillinoense		9 9 9 904 811 750 676 514 332 321 236 228 161 337 125 104 137 125 104 8 9 9 9 78 76 75 66 65 64 60	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.22% 3.11% 2.20% 1.87% 1.71% 1.42% 1.21% 0.06% 1.04% 1.02% 1.02% 0.90% 0.89% 0.82%		53800           82880           84700           Taxa           Code           05201           05800           03600           98001           95100           22001           01801           84750           98001           11200           68708           69400           98600           79000           831840           94400	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisidiidae Physella sp Coenogrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Calibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans	(East)	16           16           16           598           501           475           453           332           118           111           106           105           88           73           42           40           34           32           31           30           28           27           25           18           17	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 8.76% 2.82% 2.69% 2.66% 2.23% 1.07% 1.02% 0.81% 0.79% 0.71% 0.69% 0.63% 0.43%
06201 22300 79000 Taxa Code 05800 03600 03600 04640 98000 04641 98200 04644 98001 04644 98001 04644 98001 04644 98000 04644 93200 242001 11130 04201 243000 24300 24300 24300 24300 24300 2430000 2430000000000	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisididae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Dubiraphia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes neomodestus Baetis flavistriga Crangonyx sp Polypedilum (P, illinoense Physella sp		9 9 9 904 811 750 676 514 332 321 253 236 228 161 137 125 104 89 78 75 75 75 75 66 65 64 65 64 60 57	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 4.38% 3.45% 3.45% 3.42% 3.22% 3.11% 2.20% 1.87% 1.42% 1.04% 1.02% 1.02% 0.89% 0.82% 0.78%		53800           82880           84700           7axa           Code           06201           05800           03600           98001           95100           22001           68700           84120           84210           84210           84210           84210           84210           84210           84210           84210           84210           84210           84210           94800           82358           94800           83440           83158           94400           94400	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligocheeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbelloria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Spheerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus figricans Fossaria sp Cheumatopsyche sp	(East) (East)	16           16           16           598           501           475           453           332           118           101           105           88           73           40           342           40           34           30           28           27           25           18           17           16	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.82% 2.69% 2.69% 2.66% 2.66% 2.66% 2.66% 2.66% 0.66% 0.79% 0.76% 0.77% 0.63% 0.63% 0.43%
06201 22300 79000 79000 06800 06800 03600 04664 03800 04664 22001 22001 24000 24000 24000 24000 24000 24000 24000 21300 21300 24300 21000 2100000000	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Sphaerium sp Turbellaria Sphaerium sp Hyalella ozteca Pisldium sp Cheumatopsyche sp Helobdella stagnalis Pisldidae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Dubiraphia sp Optioservus sp Hetaerina sp Baetis Intercolaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis flovistriga Crangonyx sp Polypedilum (P. Jillinoense Physella sp Conchapelopia sp		9 9 9 9 9 04 811 750 514 332 235 238 236 228 161 137 125 161 137 125 75 75 66 57 5 66 65 64 65 57 46	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 3.45% 3.45% 3.45% 3.45% 3.45% 1.21% 1.06% 1.21% 1.06% 1.22% 0.87% 0.82% 0.87% 0.82% 0.87%		53800           82880           82880           Gode           06201           05800           98001           95100           98001           92001           98001           94000           94800           84750           94800           83840           94400           83158           94400           82500	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligachaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans Fossaria sp Paratanytarsus sp Paratanytarsus sp	(East) (E	16           16           16           598           501           475           453           345           332           118           101           105           88           73           40           34           32           31           30           28           27           25           18           17           16           16	0.37% 0.37% 0.37% 15.18% 12.72% 11.50% 8.76% 8.76% 2.82% 2.66% 2.23% 1.85% 1.07% 0.86% 0.23% 1.02% 0.86% 0.71% 0.63% 0.63% 0.63% 0.46% 0.41%
06201 22300 7000 7000 7000 06800 06800 06800 069400 0601 98000 52200 04664 98001 52200 04664 98200 21300 69200 21300 69200 21300 884210 883040 11120 69500 884210 883040 11120 70500 77500 74100	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gamnarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella azteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuka Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Dubirophia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis flavistriga Crangonys sp Polypedilum (P.) illinoense Physella sp Conchapelopia sp Simulium sp		9 9 9 904 811 750 676 514 332 236 228 161 253 236 228 161 137 125 104 89 78 75 104 89 78 76 55 66 65 66 65 64 60 57 45	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.45% 1.87% 1.87% 1.87% 1.87% 1.21% 1.06% 1.02% 0.89% 0.82% 0.82% 0.82% 0.82% 0.61%		53800           82880           Razas           Code           06201           05800           03600           04801           95100           022001           01801           84750           01801           95100           01801           84750           01801           84750           94800           83840           79000           84158           94400           52500           95500	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisidiidoe Physella sp Coenagrionidae Dubiraphia sp Turbelloria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Calibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans fossaria sp Cherumatopsyche sp Paratanytarsus sp Gyraulus sp	(East) (East)	16           16           16           16           598           501           475           453           345           332           111           106           105           88           73           42           40           34           32           31           30           28           27           25           18           17           16           16           16           16	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 8.76% 8.43% 2.99% 2.82% 2.66% 2.23% 1.85% 1.02% 0.86% 0.81% 0.77% 1.02% 0.86% 0.81% 0.71% 0.63% 0.43% 0.44%
06201 22300 79000 79000 79000 79000 05800 06800 06800 06800 06800 06201 98200 52200 04664 98200 22001 84450 93200 213000 2100000000	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochoeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Oubiraphia sp Oubiraphia sp Oubiraphia sp Oubiraphia sp Dubiraphia sp Dicrotendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis Intercalaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis Intercalaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis Ifavistriga Crangonyx sp Polypedilum (P.) Illinoense Physella sp Canlibaetis sp		9 9 9 904 811 750 676 514 332 321 253 236 228 161 337 125 104 89 78 76 75 75 66 65 64 65 65 64 60 57 46 60	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.22% 3.11% 2.20% 1.87% 1.21% 1.42% 1.21% 1.04% 1.04% 1.02% 1.04% 0.90% 0.82% 0.82% 0.82% 0.82% 0.82% 0.82% 0.82%		S3800           82880           84700           Raxa           Code           06201           05800           03600           98011           95100           22001           84750           01801           84750           94800           82730           11200           669400           98601           79000           831840           83840           94400           95500           95500           95500	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbelloria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Calibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinaense Endochironomus nigricans Fossaria sp Cheumatopsyche sp Paratenytarsus sp Potypedilum (P.) Sphaeries Paratenytarsus sp Caenis sp Cheumatopsyche sp Paratanytarsus sp Pisidium sp	(East) (East)	16           16           16           16           598           501           475           453           345           332           118           111           105           88           73           42           40           34           30           28           27           25           18           17           16           16           16           16           16           16           16	0.37% 0.37% 0.37% 15.18% 12.72% 12.76% 8.76% 8.43% 2.99% 2.66% 2.23% 1.85% 2.66% 2.23% 1.07% 1.02% 0.81% 0.79% 0.63% 0.41% 0.41%
06201 22300 79000 79000 06800 06800 06800 01801 98000 01801 98001 22001 84200 68200 68200 68200 68200 21300 11300 884210 06700 84210 06700 84210 95100 77500 77500 75100 11200	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Schenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobella stagnalis Pisididae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobidae Dubiraphia sp Optioservus sp Hetaerina sp Baetis fintercalaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis flovistriga Crangonyx sp Polypedilum (P. jillinoense Physella sp Conchapelapia sp Simulium sp Callibaetis sp Tanytarsus sp	Tolerance	9 9 9 904 811 750 676 514 332 321 233 236 228 161 137 125 104 89 78 75 75 75 75 66 65 65 64 65 65 64 65 77 46 43 40	0.27% 0.27% 0.27% 0.27% 0.27% 12.34% 10.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.45% 3.41% 2.20% 1.87% 1.22% 1.02% 1.02% 1.02% 0.89% 0.87% 0.87% 0.87% 0.87% 0.87% 0.87%		S3800           S2880           84700           S2880           84700           Godel           Godol           06201           05300           95001           95100           22001           68708           84210           948001           84210           84210           84300           83480           79000           834470           83458           94400           83500           83420           85500           95900           85800	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligachaeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stitacchironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C) decorus group Callibaetis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans fossaria sp Cheumatopsyche sp Paratanytarsus sp Stanylus sp	(East) (E	16           16           16           598           501           475           453           332           118           101           105           88           73           42           40           34           32           31           30           28           27           25           18           17           16           16           16           16           16           16           16           16           16           16           16           16           16           16           16           16           16           16	0.37% 0.37% 0.37% 15.18% 12.72% 11.00% 11.50% 8.76% 8.43% 2.99% 2.82% 2.66% 2.23% 1.85% 1.07% 1.02% 0.66% 0.81% 0.77% 0.68% 0.63% 0.63% 0.63% 0.44% 0.41% 0.41% 0.33%
06201 22300 27000 7000 7000 7000 7000 7000 70	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gamarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella azteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuda Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Dubiraphia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis flavistriga Crangonyx sp Polypedilum (P.) illinoense Physella sp Conchapelopia sp Simulium sp Calibaetis sp Calibaetis sp Microtendipes "caelum" (sensu Simpson & Bode,	Tolerance	9 9 9 9 9 04 811 750 676 514 332 236 228 236 228 236 228 104 89 78 76 75 75 66 65 65 64 66 65 64 60 57 46 64 60 38	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.22% 3.11% 2.20% 1.87% 1.71% 1.42% 1.22% 1.06% 1.02% 0.89% 0.82% 0.82% 0.63% 0.55%		53800           82880           Robert           Code           05800           05800           05800           05800           05800           05800           05800           05800           05800           05800           06800           98001           94800           82730           11200           68708           69400           98600           83440           83158           944000           525000           952000           952000           952000           952000           952000           952000           952000           952000           952000           952000           952000           95800           95800           95800           95800           95800	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligachaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stitatochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans Fossaria sp Cheumatopsyche sp Paratanytarsus sp Gyraulus sp Pisidium sp Tanypus sp Portanytarsus sp Cheumatopsyche sp Paratanytarsus sp Gyraulus sp Pisidium sp Tanytarsus sp Cangonyx sp	(East) (East)	16           16           16           16           598           501           475           453           345           332           118           111           106           105           88           73           42           40           34           32           40           34           30           28           27           18           17           16           16           16           16           16           13           12	0.37% 0.37% 0.37% 15.18% 12.72% 12.72% 11.50% 8.76% 8.43% 2.99% 2.82% 2.66% 2.23% 1.85% 2.66% 2.23% 1.85% 1.02% 0.86% 0.71% 0.76% 0.71% 0.76% 0.76% 0.71% 0.63% 0.46% 0.41% 0.41% 0.41% 0.33%
06201 22300 79000 79000 79000 69400 005800 005800 005800 005800 00590 52200 04664 98000 52200 04664 98000 52200 04664 98200 21300 69200 21300 69200 21300 884210 884210 884210 884210 84410 95100 77500 84470 95100 84470 95100 84470 95100 84470 95100 84470 85800 85900 85000 85900 85000 80000 80000 80000 80000 80000 80000 80000 80000 80000 80000 80000 80000 8000000	Hyalella ozteca         Argia sp         Tanypus sp         Bull Creek- Bulls Brook DPR Tribs.         Taxa Name         Caecidotea sp         Gammarus sp       Oligochoeta         Stenelmis sp       Turbellaria         Sphaerium sp       Hyalella azteca         Pisidium sp       Cheumatopsyche sp         Helobdella stagnalis       Pisidiudae         Coenagrionidae       Coenagrionidae         Polypedilum (Uresipedilum) flavum       Hydrella sp         Dubirophia sp       Ditoservus sp         Hetaetarina sp       Baetis intercalaris         Paratendiges albimanus or P. duplicatus       Dicrotendiges neomodestus         Baetis flavistriga       Crangonyx sp         Polypedilum (P.) illinoense       Physella sp         Conchapelopia sp       Simulium sp         Cankarologia sp       Simulium sp         Calibaetis sp       Tanytarsus sp         Microtendiges "caelum" (sensu Simpson & Bode, Polypedilum (Tripodura) scalaenum group	Tolerance	9 9 9 9 9 04 811 750 676 514 332 321 236 228 161 332 125 104 137 125 104 137 125 104 8 9 9 9 78 76 66 65 66 66 65 65 64 60 57 46 65 43 43 40 83 8 38	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 1.42% 1.42% 1.21% 1.21% 1.04% 1.02% 1.04% 1.02% 1.02% 0.82% 0.82% 0.63% 0.55% 0.52%		53800           82880           84700           Taxa           Code           05201           05800           03600           98011           98010           98011           01801           84750           01801           84710           94800           82730           11200           68708           69400           83840           98400           83840           94400           52200           835158           95500           98500           82520	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenogrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans Fossaria sp Cheumatopsyche sp Paratanytarsus sp Gyraulus sp Pisidium sp Tanytarsus sp Crangonyx sp Cryptochironomus sp	(East) (East)	16           16           16           16           598           501           475           453           332           118           111           106           105           88           73           42           40           34           30           28           27           25           18           17           16           16           16           12           11	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.66% 2.23% 1.85% 2.66% 2.23% 1.07% 1.02% 0.81% 0.79% 0.69% 0.41% 0.41% 0.41% 0.41% 0.41% 0.42%
06201 22300 79000 Taxa Code 05800 05800 03600 03600 03600 03600 04644 98001 98200 04664 98200 04664 98200 04664 98200 222001 84450 93200 21300 210000 210000 210000 2100000000	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochoeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisididae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobidae Dubiraphia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis flavistriga Crangonyx sp Polypedilum (P.) illinoense Physella sp Conchapelopia sp Simulium sp Canthopelopia sp Simulium sp Canthopelopia sp Conchapelopia sp Simulium sp Canthopelopia sp Simulium sp Simulium sp Canthopelopia sp Simulium sp Canthopelopia sp Simulium s	Tolerance	9 9 9 904 811 750 676 514 332 321 253 236 228 161 137 125 104 89 78 75 75 75 75 66 65 64 65 65 64 60 57 46 43 40 38 38 33	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.22% 3.11% 2.20% 1.42% 1.21% 1.02% 1.02% 1.02% 1.02% 0.89% 0.89% 0.82% 0.82% 0.55% 0.55% 0.52% 0.50%		S3800           82880           84700           Raxa           Code           06201           05800           95001           95100           22001           68700           84120           84210           84210           84210           84210           84210           84210           84210           84210           84210           83400           98600           83840           98000           83840           98000           98000           83548           94000           95900           95200           82820           93200	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidatea sp Oligocheeta Gammarus sp Pisidiidae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Spheerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans Fossaria sp Cheumatopsyche sp Paratanytarsus sp Gyraulus sp Tanytarsus sp Crayptos p Hydrobiroomus sp Hydrobiroomus sp Hydrobiroomus sp Hydrobiroomus sp Hydrobiroomus sp Hydrobiroomus sp Hydrobiroomus sp Hydrobiroomus sp Hydrobiroomus sp Hydrobiroomus sp	(East) (East) (East)	16           16           16           16           598           501           475           453           345           332           118           105           88           73           40           342           40           34           30           28           27           25           18           17           16           16           16           16           11           11	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.82% 2.66% 2.23% 1.85% 1.07% 2.66% 2.23% 1.85% 1.02% 0.66% 0.79% 0.76% 0.76% 0.76% 0.63% 0.63% 0.41% 0.41% 0.33% 0.28%
06201 22300 79000 79000 79000 70000 7000 7000 70	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gamarus sp Oligochaeta Sphaerium sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuda Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobiidae Dubiraphia sp Optioservus sp Hetaerina sp Baetis flottercalaris Partendipes albimanus or P. duplicatus Dicrotendipes neomodestus Baetis flottritiga Crangonyx sp Polypedilum (P.) illinoense Physella sp Canichaelopia sp Simulum sp Calibaetis sp Tanytarus sp Microtendipes "caelum" (sensu Simpson & Bode, Polypedilum (Tripoduro) scalaenum group Paratanytarsus sp Larsia sp	Tolerance	9 9 9 9 9 04 811 750 676 514 332 233 236 228 238 236 228 236 228 104 89 78 75 75 75 75 66 55 64 65 65 64 65 65 64 65 64 65 67 57 53 75 75 66 65 67 67 67 67 67 67 67 67 67 67 67 67 67	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 3.45% 3.45% 3.45% 3.45% 3.45% 3.45% 3.45% 1.21% 1.06% 1.21% 1.06% 1.21% 1.06% 1.02% 0.89% 0.87% 0.82% 0.63% 0.61% 0.55% 0.52% 0.52%		53800           82880           82880           Gode           05800           05800           98001           95100           05800           98001           95100           01801           94000           94400           833840           83458           94400           83158           94400           922000           83500           922000           83500           922000	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligachaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (c.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans Fossaria sp Gyraulus sp Paratanytarsus sp Cryptochironomus sp Histolius sp Cryptochironomus sp Histolius sp Cryptochironomus sp Plasoria sp Cryptochironomus sp Plasoria sp Cryptochironomus sp Plasoria e Planorbella (Pierosoma) pilsbryi	(East) (East) (East)	16           16           16           16           598           501           475           453           345           332           118           111           106           88           73           40           34           32           31           30           28           27           25           18           17           16           16           16           16           12           11           11           11	0.37% 0.37% 0.37% 15.18% 12.72% 11.50% 8.76% 8.76% 2.82% 2.66% 2.23% 1.85% 1.07% 0.86% 0.23% 0.71% 0.68% 0.71% 0.63% 0.41% 0.41% 0.41% 0.41% 0.41% 0.33% 0.28% 0.28%
06201 22300 79000 79000 69400 05800 06800 06800 069400 01801 88200 06201 88200 052200 04664 98200 052200 2001 88200 052200 2001 88200 88200 88200 88400 88400 88400 88500 80000 80000 800000 80000 80000 80000 800000 80000 800	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella azteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuka Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobildae Dubirophia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendipes neomodestus Baetis flavistriga Crangonys sp Polypedilum (P.) illinoense Physella sp Conchapelopia sp Simulium sp Callibaetis sp Tanytarsus sp Paratendipes "caelum" (sensu Simpson & Bode, Polypedilum (Tripodura) scalaenum group Paratanytersus sp Paratendipes Taelum" (sensu Simpson & Bode, Polypedilum (Tripodura) scalaenum group Paratanytersus sp Parachironomus sp	Tolerance	9 9 9 904 811 750 676 514 332 236 228 161 253 236 228 161 137 125 104 89 78 75 104 89 78 75 66 65 65 66 65 65 66 65 65 45 75 66 65 43 89 78 75 66 65 43 89 78 75 75 66 65 43 89 78 75 75 66 66 65 43 77 57 67 67 67 67 67 67 67 67 67 67 67 67 67	0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.45% 3.45% 1.71% 1.42% 1.71% 1.42% 1.21% 1.06% 1.02% 1.02% 1.02% 1.02% 0.87% 0.82% 0.82% 0.82% 0.52% 0.52% 0.52% 0.52%		53800           82880           82700           82880           06201           05800           06501           05800           08001           95100           02100           08001           95100           01801           84750           84210           94800           82730           11200           68708           69400           83400           98600           83458           94400           52000           982000           835800           06700           82820           93200           93200	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidotea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbellaria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Callibaetis sp Caenis sp Dubiraphia vittata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanypus sp Polypedilum (P.) illinoense Endochironomus nigricans Fossaria sp Cheumatopsyche sp Paratanytarsus sp Gryaulus sp Pisidium sp Tanytarsus sp Crangonyx sp Crangonyx sp Cryptochironomus sp Hydrobildae Planorbella (Pierosoma) pilsbryi	(East) (East)	16           16           16           16           598           501           475           453           345           332           118           111           106           105           88           73           42           40           34           32           31           30           28           27           25           18           17           16           16           16           16           16           11           12           111           9	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 2.843% 2.99% 2.66% 2.23% 1.07% 1.02% 2.66% 2.23% 1.07% 1.02% 0.81% 0.79% 0.69% 0.41% 0.41% 0.41% 0.41% 0.41% 0.41% 0.43% 0.28% 0.28% 0.28%
06201 22300 79000 79000 5900 05800 05800 05800 05800 05200 52200 06800 52200 06800 52200 06800 222001 84450 83000 213000 21300 2100000000	Hyalella ozteca Argia sp Tanypus sp Bull Creek- Bulls Brook DPR Tribs. Taxa Name Caecidotea sp Gammarus sp Oligochaeta Stenelmis sp Turbellaria Sphaerium sp Hyalella ozteca Pisidium sp Cheumatopsyche sp Helobdella stagnalis Pisidiuae Coenagrionidae Polypedilum (Uresipedilum) flavum Hydrobidae Dubiraphia sp Optioservus sp Hetaerina sp Baetis intercalaris Paratendiges albimanus or P. duplicatus Dicrotendipes neomodestus Baetis flavistriga Crangonyx sp Polypedlum (P. j illinoense Polygellum (Tripodura) scalaenum group Paratantytarsus sp Larsia sp Parachironomus sp Stictochironomus sp	Tolerance	9 9 9 9 904 811 750 676 514 332 321 253 236 228 161 337 125 104 89 78 76 75 75 66 65 64 65 65 64 60 57 75 66 65 64 60 57 46 65 57 46 60 57 43 38 38 37 36 36 35	0.27% 0.27% 0.27% 0.27% 0.27% 12.34% 11.07% 10.23% 9.22% 7.01% 4.53% 4.38% 3.45% 3.45% 3.45% 3.22% 3.11% 2.20% 1.87% 1.71% 1.42% 1.21% 1.04% 1.04% 1.04% 0.90% 0.82% 0.82% 0.82% 0.55% 0.55% 0.52% 0.52% 0.52% 0.52% 0.49% 0.48%		53800           82880           84700           Taxa           Code           05201           05800           03600           98011           95100           92011           98012           94200           84750           84210           94800           82730           11200           669400           986001           79000           831840           98200           98200           985000           955000           955000           96204           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020           932020	Cryptotendipes sp Stenochironomus sp Upper Des Plaines Tributaries Taxa Name Hyalella azteca Caecidatea sp Oligochaeta Gammarus sp Pisididae Physella sp Coenagrionidae Dubiraphia sp Turbelloria Stictochironomus sp Paratendipes albimanus or P. duplicatus Stagnicola sp Chironomus (C.) decorus group Calibaetis sp Caenis sp Dubiraphia vitata group Stenelmis sp Sphaerium sp Microtendipes pedellus group Tanytus sp Polypedilum (P.) illinaense Endochironomus nigricans Fossaria sp Cheumatopsyche sp Paratanytarsus sp Crangonyx sp Crangonyx sp Crangonyx sp Clinotanypus pinguis Conchapelopia pi	(East) (E	16           16           16           16           598           501           475           453           345           332           118           111           105           88           73           40           34           40           34           30           28           27           25           18           17           16           16           16           16           16           16           17           16           16           17           16           16           17           11           11           11           11           11           11           11           11           11           11	0.37% 0.37% 0.37% 15.18% 12.72% 12.06% 11.50% 8.76% 8.43% 2.99% 2.82% 2.66% 2.23% 2.66% 2.23% 1.85% 1.02% 0.26% 0.76% 0.76% 0.76% 0.76% 0.76% 0.76% 0.63% 0.41% 0.41% 0.41% 0.41% 0.33% 0.28% 0.28% 0.23%
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**Figure 16**. Illinois macroinvertebrate IBI scores by subwatershed and stream in the Year 3 2019 study area. Values are shown by individual site by drainage area (upper panel) in 2016 and 2019 and in tributary subwatershed bundles as box-and-whisker plots (lower panel). Dashed and solid lines represent full support, non-support fair, and non-support poor.

support) - yellow; Poor (non-support) – orange; Very Poor (non-support) - red; metrics used as signatures of toxic or organic Table 18. Selected fish and macroinvertebrate assemblage attributes for sites sampled in the 2019 Year 3 study area. Biological index scores and metrics are shaded by level of use support: Exceptional – blue; Good (fully supporting) - green; Fair (non-

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6		Totol Tour		19	24	27	27		29	20		28	30		27 19	M 0.75	28		14	7/	@RM 98.4	10	22	M 0.64	6	N 89.5	RM 94.0	18	36	27	à	31	24	17	21	29	36	<i>cc</i>	27	i		<u>&gt;</u> 23
1				29.6	32.1	43.0	45.1		58.5	ek -	26.20	56.0	58.2	k	31.0 27.5	ill Creek @R	40.4		28.4	40.6	/ to DPR @F	18.0	36.9	if Creek @R	21.5	ss River @RI	y to DPR @I	25.7	45.2	ек 57.6	2	33.2	49.3	19.3	20.0	34.8	47.9	creek	48.5		>65.0	>65.0 
3).		Percent	Mill Creek	44.4	38.5		38.5	28.6	46.2	North Mill Creek	C.CC	70.0	50.0	Hastings Creek	33.3 25.0	to North M	50.0	Newport Drainage Ditch	28.6	77.7	lub Tributar	12.5 Slocum Creek	57.1	to Greenle	44.4	to Des Plain	Rd. Tributar	66.7	35.3	stoneroller creek	Bulls Brook	50.0	33.3	Bull Creek	25.0	30.0	25.0	West Branch Bull Creek	50.0	-16.1	1.012	<u>&lt;</u> 16.1 <30.3
n (200		%Mineral	pawners	0.0	0.0		2.2	4.9	7.3			1.7	0.0	H	0.0	Unnamed Tributary to North Mill Creek @RM 0.75	0.0	Newport D	0.0	0.0	Suburban Country Club Tributary to DPR	0.0	1.4	Unnamed Tributary to Greenleaf Creek @RM 0.64	6.0	Unnamed Tributary to Des Plaines River @RM 89.5	West Fork Belvidere Rd. Tributary to DPR @RM 94.0	0.0	11.9	50.0	2.22	19.8	4.9	00	0.0	9.1	31.7	1 7 West	46.0			>40.7
DeSho	cators	ant	żb	0	0		1	1	0	c			0		0 0	Unnam	0		0		Suburbo	0	0	Unnam	0	Unname	West For	0	1	2	4	0	0	c	0	0	2	c		, ,	ا× ت	či 🎸
der anc	Fish Assemblage Indicators	-	% DELI	0.00	1.73		0.00	0.25	0.00	000		0.00	0.00		0.00		0.00		0.00	0.00		1.03	0.00		0.00		00.0	0.00	0.52	0.74		0.00	0.00	000	1.33	0.00	0.40		000		0.0	-0.10
are based on Yoder and DeShon (2003)	Fish Assen	2 J J J J J J J J J J J J J J J J J J J	Native op.	6	13		13	21	13	-	n a	10	12		۰ م		9		7	ъ		~	7		6	5	:	9	17	16	2	9	6			10	16	c	9	000	674	>14
e base		4104		NA	NA		6.9	8.9	7.5	VI V	41 1 1	5.0	6.1		NA NA		AN		NA	NA	:	NA	NA		NA	VIV		NA	NA	NA		NA	NA	MA	NA	NA	NA	M	NA	9.07	0.01	>8.5
20		104		20	22		21	29	23	10	16	15	18		15 21		25		20	27		50	16		37	VC	t	14	34	39	2	28	23	12	29	30	37	11	26	017	002	0cc
snt imp		Urainage Area	Ē	4.5	10.4	18.33	21.4	62.3	63.8	, o ,	7.CT	29.5	31.9		3.9		6.0		2.8	7.3		4	2.4		1.1	0	6.0	2.3	3.8	4.1	1	1.9	2.7	2 4	1.3	8.4	11.7	۲ 1	7.1	!	lal	lai
enrichment impact			KIVER MILLE	17.20/17.20	13.80/13.80	10.10/10.10	7.20/7.20	1.71/1.71	0.70/0.70	OC 11/06 11	00.11/00.11	8.10/8.10	1.10/1.10		3.12/3.12		0.04/0.04		3.03/3.03	0.70/0.70	00 10 00	2.00/2.00	1.36/1.36		0.40/0.40	0 1 2 / U 1 2	CT-0/CT-0	0.21/0.21	0.15/0.15	0.42/0.42	71-0/71-0	1.95/1.95	0.25/0.25	ק מק / ק מק	4.70/4.70	1.00/1.00	0.50/0.50	2 54/2 54	1.60/1.60		Exception	Good
, o				11-6 1	11-5 1:	11-4 10	11-3		11-1	1					10-5		10-6	1	_	12-1 (		13-10	13-11		13-13 (	12-17	-	13-14 (	13-8 (	13-9	-	13-15	13-7	14-6			14-1	14-4	-			

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The %DELT anomalies on fish were in the fair range at seven (7) sites scattered throughout the 2019 Year 3 study area. While low, any detection of DELTs greater than 0.1% is noteworthy as a healthy assemblage should have very few or no DELT anomalies. The highest DELT of 1.73% occurred in Mill Creek at RM 13.8 (site 11-5) which also had a very low D.O. value of 0.16 mg/L in the Datasonde results. Low D.O. is one of the key parameters associated with elevated DELT anomalies (Yoder and Rankin 1995; Sanders et al. 1999). The second highest DELT result of 1.33% occurred in Bull Creek at RM 4.70 (site 14-5) followed by the Suburban Country Club Tributary at RM 2.0 (site 13-10) at 1.03%. The other fair DELT values were in the 0.25-0.50% range. The latter site had a high mean ammonia of 0.88 mg/L which is in the very poor range of the IPS and could be an exceedance of the water quality criteria under high pH conditions.

Five (5) sites had poor organic enrichment macroinvertebrate taxa results. Both Hastings Creek sites had 47.5% (site 10-4) and 58.5% (site 10-5) organic enrichment tolerant taxa. The upstream site was designated as likely nutrients and the downstream site as enriched by the modified SNAP procedure. Bull Creek at RM 4.7 (site 14-5) had 50.2% organic enrichment tolerant taxa, the same site that had elevated DELT anomalies on fish. The Unnamed Tributary to the Des Plaines River at RM 89.5 (site 13-17) had 44.8% organic enrichment tolerant taxa which also had a very poor TKN value, but no other chemical indicators of note. West Branch Bull Creek at RM 5.1 (site 14-4) had the remaining poor organic enrichment tolerant taxa at 39.7% which had a very low minimum D.O. value of 1.81 mg/L and was rated as likely nutrients by the modified SNAP procedure.

#### Synthesis

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 attempts to follow the overall intent of the Illinois Integrated Report assessment guidelines, but is supplemented by the more extensive biological effect thresholds provided by the recently developed IPS tools and indicators (MBI 2020a) and are more spatially refined by the intensive pollution survey design. 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 2018-19 are included in Table 18 along with the fish and macroinvertebrate IBI scores and other indicators of stress and response. Habitat alteration is represented by the QHEI and the QHEI modified:good attributes ratio, D.O. includes the minimum measured by Datasondes, the effect of nutrient enrichment by the diel D.O. swing narrative, the nutrient enrichment effect status, the new IPS nutrient index, new IPS chemical threshold exceedances for water and sediment, and biological response signatures for organic enrichment and toxic tolerant indicators.

The baseline biological condition of the Year 3 Upper Des Plaines subwatersheds has been shaped by the naturally low gradient and wetland origins of the region. The current condition of the biological assemblages reflects historical changes that have significantly altered these natural features, mostly through hydrological and physical alterations related to agricultural, suburban, and urban development throughout the study area. Both the direct and indirect influences of the altered hydrology and habitat were evident in the chemical, habitat, and bioassessment results. The legacy of hydrological and habitat alterations where they are most evident have resulted in sluggish flows, excessive siltation, embedded substrates, sparse instream cover, sediments high in organic matter, and indicators of agricultural and urban runoff that are further exacerbated by the altered flows and habitat. TKN values were very poor and poor at numerous sites an indication of excessive runoff and instream algal production. Runoff containing sediments that are high in organic matter also combined with sluggish flows and stream channel alterations to exacerbate low D.O. concentrations and high to wide diel D.O. swings in several streams. Another indicator of excessive organic enrichment were the consistently high *E. coli* maximum values at the 2420 cfu/100 mL upper limit of the analytical method at all sites in North Mill Creek, Hastings Creek, Newport Drainage Ditch, Slocum Creek, Unnamed Tributary to Greenleaf Creek, West Fork Belvidere Rd. Tributary, and West Branch of Bull Creek. At sites with more "normal" mean E. coli values this is an indication of periodic spates from periods of runoff. However, some sites had elevated means indicating a more routine bacterial contamination. A higher upper limit for the analytical method could possibly better separate sites with sewage contamination versus general nonpoint source runoff. The introduction of wastewater from the Lindenhurst WWTP into Hastings Creek did not add appreciably to the existing upstream delivery of nutrients, oxygen demanding wastes, and ammonia-N. The LCDPW Mill Creek WWTP discharges to Mill Creek only one mile from the Des Plaines mainstem thus only its immediate and seemingly negligible impact could be assessed. Only four (4) sites had QHEI scores that were considered good with the majority of sites scoring in the fair range. Where habitat alteration was a factor it was severe with two (2) sites exhibiting extremely high poor to modified attribute ratios. Together these have resulted in essentially complete non-attainment of the General Use for aquatic life throughout the study area. However, the severity of the non-attainment varies at the subwatershed, reach, and site scales.

Recently derived IPS thresholds for water and sediment chemistry and physical habitat attributes (MBI 2020a) were available to better assess causes of impairment and their comparative severity. The approach for deriving these thresholds included a more refined stratification of biological effect threshold values for parameters that showed valid relationships with biological responses based on species and taxa level analyses and then correlated with the corresponding fish and macroinvertebrate IBI attainment thresholds and narrative ratings (MBI 2020a). This produced thresholds across four or five narrative categories of quality (excellent, good, fair, poor, and very poor). This replaces the formerly used binary (i.e., "pass/fail") approach to evaluating exceedances of chemical and physical effect thresholds and criteria providing for a graded approach to the assignment of causes and sources of Illinois General Use biological impairments. The new IPS framework also offers the semblance of a tiered aquatic life use (TALU) stratification of goals and thresholds that has been incorporated into all IPS outputs to support local restoration and protection efforts by the respective watershed groups and stakeholders.

A total of 16 causes associated with varying degrees of impairment of the General Use for aquatic life were determined by relating threshold exceedances of the various physical and

/ chemical, physical, and biological response indicators of impairment observed at each site in the 2019 Upper Des Plaines subwatersheds study area. The causes associated with b ents are drawn from analyses of habitat, nutrient effects, chemical IPS and other threshold exceedances, sediment chemical IPS exceedances, and biological response signatures. C ent are classified as fair, poor, or very poor in accordance with the severity of exceedance of corresponding thresholds. See footnotes for table references and biological, physical, a l intervals.

				OHEI						2000								
							IPS Ch	Chemical		>Poor Sediment	>Poor Sediment							Restora-
AQLU	fill	a a a	OHEI	Good (	(Sonde)	Diel D.O. N Swing	Nutrient WQ	Nutrient WQC Exceed- >Poor Chemical		Thresholds Thresholds	PAH Threeholds	Enrichment Signatures	%Toxic Tolerant	20 Verv Poor <sup>1</sup>	19 Causes by IPS Stressor	2019 Causes by IPS Stressor Threshold Narrative Category	2019 b	bility Score
			-	-		_							Mill Creek		00		2041-023	(001-0)
9	or 20	29.6	40.0	9.00	5.11	1.99	9.46		TKN					QHEI Ratio;Substr;TKN	QHEI;Chan;	Min. D.O.;Ammonia;	Hydromodification; Agricultural NPS	60.1
ON-Poo	r 22	32.1 43.0	52.8	2.33 0.83	0.16 3 38	6.51 3.08	7.76 Min. 8.98 Min	Min. D.O.	TKN TKN	Cd		Macro. (26.5%)	DELT(1.73%)	Min.&Diel D.O. TKN ·	Substr;Chan;TKN	QHEI&RatioChloride;Ammonia;Toxicity; Chloride:Ammonia:	Hydromodification; Agricultural NPS	49.3 -
	r 21		9	-	6.15				TKN					TKN:		QHEI:Substr:Chloride:	Agricultural NPS	68.1
ION-Poo				0.25	5.53		8.54		TSS,TKN			Macro. (24.8%)	DELT (0.25%)		TSS; TKN	TKN;VSS;Organic Enrich.	Agricultural NPS	73.0
	r 23	58.5	68.5	1.00	5.85		10.08		TSS,TKN					TSS;	TSS;TKN	QHEI;Substr;Chan; VSS;	Agricultural NPS; WWTP	53.8
								-				ŀ	North Mill Creek				-	
0	r 18	-	_	9.00	4.10		8.76						Macro. (7.2%)	QHEI Ratio;Substr;	QHEI; Chan; Min. D.O.	TKN;Ammonia;Organic Enrich.;	Hydromodification; Agricultural NPS	55.6
01	r 16	+	_	1.67	4.23		7.58		TKN					Substr; Diel D.O.	TKN;	QHEI;Chan;	Hydromodification; Agricultural NPS	58.7
0	15	56.0	67.8	0.67	6.51	5.33	9.18	+		70		Macro. (19.8%)	100 001		Diel D.O.	TKN;QHEI;Substr;Ammonia;Organic Enrich.	Agricultural NPS	64.5
	10		_	7.00	0.00		0.00						Hastinas Creek		Substi; Metals		Agriculural NP3, Orban Stormwater	D: 40
	or 15	31.0	60.0	1.00	4.45	2.21	7.68		TKN					TKN:	TKN:	QHEI&Ratio:Substr;Chan;Chloride;Min. D.O.	Agricultural NPS	72.6
	NON-Poor 21		-	2.50	3.15			Min D.O.	TKN					Diel D.O.;TKN;	QHEI; Chan; Min. D.O.	Substr;Chloride;	WWTP;Agricultural NPS;Urban Stormwater	61.3
												Unnamed Ti	Unnamed Tributary to North Mill Creek @RM 0.75	Creek @RM 0.75				
	or 25	40.4	53.5	0.80	,	,	7.58		TKN						TKN;	QHEI;Substr;Chan;	Urban Stormwater	67.1
		┢	⊢										Newport Urainage Uiton					0.10
	Poor 20	28.4	45.0	2.33	4.54	/.3/	7.18 6 5 0		TKN	AI,Cd,Zn		140 101 000		Substr;Diel D.O.; IKN;Metals QHEI; Chan;	s QHEI; Chan;	Min. D.O.; QHEI Ratio; Agricultural NPS; Agricultural NPS; TrVN:Max D.O.: OHEI: Substruction Amm. Org. Enviced Agricultural NDS.	Agricultural NPS; Hydromod.;Urban Stormwater	0.69
	7		_	0.00			00.0					Suburban Co	Wacto. (1817%) Suburban Country Club Tributary to DPR @RM 98.4	0 DPR @RM 98.4		ווויאיואא ט.ט.,ערובי,אטאני,טואטיאווווי,טואַיבוווי	ici i Agricului al INF3	00.4
	or 20	18.0	39.0	3.50			6.88	Am	imonia.TKN	Cd			DELT (1.03%)	Chan:Ammonia:TKN	Substr: Metals	OHEI Ratio:TKN:Toxicitv:	Urban Stormwater	52.0
- 10 M		-	-										Slocum Creek			Charmenter of a state of the st		
	or 16	36.9	63.8	0.83		-	6.68		TKN						TKN;	QHEI;Max. D.O.;Ammonia	Urban Stormwater	72.5
		+	-									Unnamed T	Unnamed Tributary to Greenleaf Creek @RM 0.64	Creek @RM 0.64		-	=	
	or 37	21.5	63.8	0.80		,	7.36	Amm	, Cond., TKN, Chl.			Macro. (18.5%) Unnamed	cro. (18.5%) Ammonia;TKN Unnamed Trib to Des Plaines River @RM 89.5	Ammonia;TKN,Chloride ver @RM 89.5		TKN; QHEI; Substr; Conduct; Organic Enrich.;	Urban Stormwater	67.4
NON-Fair	r 34	30.9	62.0	0.80	,		8.16	-	TKN						TKN;	QHEI; Substr; Chan;	Urban Stormwater	82.5
												West Fork Be	Fork Belvidere Rd. Tributary to DPR @RM 94.0	0 DPR @RM 94.0				
0	r 14	25.7	68.8	0.29			6.88		TKN			Macro. (18.4%)		TKN;		TKN;QHEI;Chan;Max. D.O.;Chloride;	Urban Stormwater	62.5
PARTIAL	34	45.2	70.0	0.86			6.16		TKN			Macro. (15.2%)	DELT(0.52%);Macro. (5.2%)		TKN;	TKN;QHEI;Chan;Chloride;Org.Enrich.;Toxicity	Urban Stormwater	67.8
		┢	┢										Stoneroller Creek					
PARTIAL	39	57.6	82.0	0.25	,		5.26		Chloride	Mn		Macro. (15.5%)	DELT (0. 74%) Bulls Brook	Chloride;Metals		TKN;Conduct;Org. Enrich.;Ammonia;Toxicity	Urban Stormwater	78.0
NON-Poo	r 28	33.2	76.5	0.13			8.18		TKN					TKN;			Urban Stormwater	76.7
NON-Poo	or 23	49.3	69.0	0.25	,	,	7.78		TKN	Mn				TKN:	Metals	QHEI;	Urban Stormwater	85.6
			+										Bull Creek					
	_		-	0.60	3.50		_	Min D.O.	TKN	Mn						TKN;QHEI;Chan;Ammonia;	Urban Stormwater	79.9
NON-Fair		+	-	0.80			8.38		TKN	Ī			DELT (1.33%)		TKN;	QHEI; Substr; Chan;	Urban Stormwater	62.2
NON-Fair		+	_	0.71			7.08		Chloride	Î	14 PAH	Macro. (25.5%)		PAH Compounds	Chloride;	TKN; QHEI; Substr; Conductivity;	Urban Stormwater	58.7
PARTIAL	37	47.9	78.0	0.13	7.02	3.75	5.86		TKN				DELT (0.40%)		TKN;	TKN;Chloride;Ammonia;Toxicity	Urban Stormwater	59.1
						-							West Branch Bull Creek	sek				
	_		-	1.20	1.81	3.17	8.44 M	lin D.O. TKI	(N,Chloride					Min. D.O.;TKN;Chloride	QHEI; Substr; Metals	Substr;Chan;QHEI Ratio;Ammonia;	Urban Stormwater	63.3
-	NON-Poor 26	48.5	_	0.29		_	6.34					Macro. (21.8%)			Chloride;	TKN; QHEI;Organic Enrich.	Urban Stormwater	70.4
	>50			<0.50	>6.9	_	<10											Very High
FULL	-	~		+	6-6.9	_	10-15											High
Non-Fair	-		-	+	4.0-5.9	_	15-25											Moderate
Non-Poor	r >15-29	29 >15-29	9 <50.1	>4.00	2.0-3.9	5.0-6.5	25-35	+	T									Low
5	21		0.22	>6.00	0.22	C.0<	232											Very Low

rank >6.8, fair causes rank >4-6, other stressor rankings are in legend at bottom of causes assigned by weighting the stressor rank \* FIT factor - see Appendix D; very poor causes rank >8-10, poor cause chemical parameters measured alongside the biological assemblages in a synthesis analysis (Table 19). These were then tallied and grouped into five (5) categories and weighted in accordance with the exceedance eclipsing a fair, poor, or very poor threshold (Table 20). Most of the thresholds are from the NE Illinois IPS (MBI 2020a), but other sources were used for parameters and indicators not directly included or yet derived in the IPS. The weighting was done as follows – 5 times for very poor, 3 times for poor, and none for fair parameter exceedances and other indicator values. This amplifies the very poor threshold exceedances as being more likely to exert a true causal influence as opposed to simply being associated with an impairment on a spatial basis. Nutrient and organic enrichment indicators included TKN, ammonia-N, and organic enrichment responses in the biota comprised 35.2% of the weighted causes (Table 19). Habitat related causes followed closely comprising 32.4% of the causes. These were followed by urban related (12.8%), D.O. related (11.5%), and toxics and toxicity (8.2%).

#### Restorability, Susceptibility, and Threat Factors

The NE Illinois IPS was developed to provide an organized and robust framework for determining restoration and protection priorities and options for both impaired and attaining watersheds, reaches, and sites (MBI 2020a). A Restorability factor is derived for impaired sites and Susceptibility and Threat factors are derived for attaining sites. These factors are provided in the synthesis (Table 19) and aquatic life use attainment (Table 1) tables. Five narrative ranges of Restorability from very high to very low have been established on an interim basis – these are subject to revision as these factors are applied in NE Illinois watersheds by the watershed groups. Narrative ranges for Susceptibility and Threat from very low to very high run in the reverse of the Restorability narratives.

In the 2019 Upper Des Plaines subwatersheds only one site was in full attainment and this being based on a single assemblage. This site had a moderate susceptibility and a very low threat ranking. The balance of the 30 sites were all impaired and thus were assigned Restorability scores. Two (2) sites, the Unnamed Tributary to the Des Plaines River at RM 89.5 and the downstream site on Bulls Brook had Very High Restorability scores. This means that few precluding factors that might otherwise deter recovery following a restoration project exist. The majority of the remaining sites (18) had High Restorability scores and the remaining 10 sites had Moderate scores. No sites had Low or Very Low scores. Based on the Very High and High scores much of the watershed has good potential to respond positively to restoration. However, restoration projects will need to focus on the limiting factors for each site, reach, and watershed that are available in the IPS databases and dashboard.

Table 20. Summary of causal agents and categories identified from the synthesis of key chemical, physical, and biological response indicators of impairment observed at each site in the 2019 Upper Des Plaines subwatersheds study area. Total and weighted observations by very poor, poor, and fair exceedances are tallied for each causal agent and category to provide a relative accounting for the Year 3 study area.

Causal Agents	Very Poor	VP%	VP Wtd.	VP Wtd.%	Poor	Poor%	Poor Wtd.	Poor Wtd. Poor Wtd.%	Fair	Fair%	Fair Wtd.%	Total	Total%	Total Wtd.	Wtd. %
QHEI Score	0	0.0%	0	%0.0	4	2.2%	12	3.1%	20	11.1%	5.1%	4	13.3%	32	8.2%
QHEI Ratios	2	1.1%	10	2.6%	1	%9'0	3	0.8%	9	3.3%	1.5%	3	5.0%	19	4.8%
Substrate	4	2.2%	20	5.1%	4	2.2%	12	3.1%	12	6.7%	3.1%	8	11.1%	44	11.2%
Channel Condition	1	0.6%	5	1.3%	5	2.8%	15	3.8%	12	6.7%	3.1%	9	10.0%	32	8.2%
Habitat Related	7	1.8%	35	8.9%	14	7.8%	42	10.7%	50	27.8%	12.8%	71	39.4%	127	32.4%
TKN	11	6.1%	55	14.0%	11	6.1%	33	8.4%	13	7.2%	3.3%	22	19.4%	101	25.8%
Ammonia-N	2	1.1%	10	2.6%	2	1.1%	9	1.5%	13	7.2%	3.3%	4	9.4%	29	7.4%
Organic Enrichment	0	0.0%	0	%0.0	0	%0.0	0	0.0%	8	4.4%	2.0%	0	4.4%	8	2.0%
Nutrient_Enrichment	13	3.3%	65	16.6%	13	7.2%	39	9.9%	34	18.9%	8.7%	60	33.3%	138	35.2%
Minimum D.O.	2	1.1%	10	2.6%	2	1.1%	9	1.5%	m	1.7%	0.8%	4	3.9%	19	4.8%
Maximum D.O.	0	0.0%	0	%0.0	0	0.0%	0	0.0%	ю	1.7%	0.8%	0	1.7%	æ	0.8%
Diel D.O.	4	2.2%	20	5.1%	1	0.6%	æ	0.8%	0	0.0%	0.0%	ъ	2.8%	23	5.9%
D.O. Related	9	3.3%	30	7.7%	з	1.7%	6	2.3%	9	3.3%	1.5%	15	8.3%	45	11.5%
Chlorides	ю	1.7%	15	3.8%	m	1.7%	6	2.3%	8	4.4%	2.0%	9	7.8%	32	8.2%
Conductivity	0	0.0%	0	0.0%	0	0.0%	0	0.0%	ю	1.7%	0.8%	0	1.7%	ε	0.8%
TSS_VSS	2	1.1%	10	2.6%	1	%9.0	3	0.8%	2	1.1%	0.5%	3	2.8%	15	3.8%
Urban Related	5	2.8%	25	6.4%	4	2.2%	12	3.1%	13	7.2%	3.3%	22	12.2%	50	12.8%
Metals	2	1.1%	10	2.6%	4	2.2%	12	3.1%	0	0.0%	0.0%	9	3.3%	22	5.6%
PAH	1	0.6%	5	1.3%	0	%0'0	0	0.0%	0	0.0%	%0.0	1	0.6%	5	1.3%
Toxicity	0	0.0%	0	%0.0	0	%0.0	0	0.0%	5	2.8%	1.3%	0	2.8%	5	1.3%
Toxics	3	1.7%	15	3.8%	4	2.2%	12	3.1%	5	2.8%	1.3%	12	6.7%	32	8.2%
Total Observations	34	12.9%	170	43.4%	38	21.1%	114	29.1%	108	60.0%	27.6%	180	100.0%	392	100.0%

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#### **APPENDIX A**

#### Upper Des Plaines River Year 3 Subwatersheds 2019 Fish Assemblage Data

A-1: Fish Index of Biotic Integrity (IBI) Metrics & ScoresA-2: Fish Species Grand (all sites combined by four subwatershed bundles)A-3: Fish Species by Sampling Event

									Nur	Number of				Per	Percent				
Site ID	River Mile	Type	Date so	DA v Mi Wi	DA Wetted sq mi Width (ft)	Reg.	Native species	Sunfish species	Sucker species	Intolerant species	Benthic Invert. species	Minnow species	Mineral Substrate Spawners	Tolerant Fish (as Species)	Generalist Feeders	Specialized Benthic Invert- ivores	Rel.No. /(0.3km)	N IBI	Modified Iwb
	BULL	BULL CREEK - (95051)	(9505.	1)															
Yea	Year: 2019	ć																	
14-6	5.95	F 08/29/2019	2019	2.4	11.8	З	1(0)	(0)0	(0)	0(0)	(0)0	0(0)	0(0)	0(6)	0(6)	0(0)	* * 0	12.0	0.0
14-5	4.70	F 10/13/2019	2019	1.3	0.6	З	8(6)	4(6)	(0)	(0)0	(0)0	1(6)	0(0)	25(6)	65(5)	0(0)	225	29.0	5.4
14-2	1.00	F 08/28/2019	2019	8.4	34.8	З	10(2)	3(4)	1(2)	(0)0	1(1)	3(2)	9(2)	30(5)	58(6)	28(6)	396	30.0	5.3
14-1	0.50	E 10/10/2019	2019	11.7	40.9	З	16(3)	5(6)	(0)	2(2)	3(2)	5(3)	32(4)	25(5)	51(6)	28(6)	498	37.0	7.5
	HAST	HASTINGS CREEK - (95702)	EK - (	(95702)	<u> </u>														
Yea	Year: 2019	ć																	
10-5	3.12	F 08/28/2019	2019	3.9	20.7	З	6(1)	3(5)	(0)	0(0)	(0)0	(0)0	0(0)	33(5)	70(4)	0(0)	80 *	15.0	4.7
10-4	1.68	F 08/28/2019	2019	5.6	27.4	З	8(2)	4(6)	(0)0	(0)0	1(1)	0(0)	0(0)	25(5)	41(6)	2(1)	112 *	21.0	5.4
	BULL	BULL'S BROOK - (95704)	<u>(</u> - (95)	704)															
Yea	Year: 2019	6																	
13-15	1.95	F 10/08/2019	2019	1.9	7. <del>X</del>	б	6(2)	2(6)	1(3)	(0)0	1(1)	2(2)	20(2)	50(4)	68(4)	11(4)	354	28.0	4.9
13-7	0.25	F 08/30/2019	2019	2.7	14.0	З	9(2)	2(5)	(0)	(0)0	2(2)	3(2)	5(1)	33(5)	78(3)	7(3)	288	23.0	3.4
	NEW	NEWPORT DRAINAGE DITCH - (95708)	AINAC	JE DIT	CH - (9:	5708)													
Yea	Year: 2019	ć																	
12-2	3.03	E 10/13/2019	2019	2.8	14.6	З	7(1)	4(6)	1(2)	(0)0	(0)0	0(0)	0(0)	29(5)	57(6)	(0)0	28 * *	20.0	4.5
12-1	0.70	F 10/13/2019	2019	7.3	32.2	б	9(2)	2(3)	(0)0	(0)0	2(2)	2(2)	0(0)	22(6)	11(6)	19(6)	224	27.0	5.8
	STON	STONEROLLER CREEK - (95709)	<b>CRE</b>	EK - (9	(6025														
Yea	Year: 2019	ć																	
13-9	0.42	E 10/10/2019	2019	4.1	21.7	б	16(4)	4(6)	1(2)	2(2)	2(2)	6(3)	50(6)	38(5)	43(6)	7(3)	540	39.0	7.7
) - eu	Dualitat	na - Oualitative data. Modified Iwb not annlicable.	dified I	wh not :	annlicahl	_0				-									1
X - I	BI extra	X - IBI extrapolated				5				A - I							1/00/1	05/18/2020	

Appendix Table A-1. Fish IBI results for data collected in the upper Des Plaines River study area during 2019.

\* - < 200 Total individuals in sample</li>
\*\* - < 50 Total individuals in sample</li>
• One or more species excluded from IBI calculation.

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				NU	Number of				Percent					
e River	d IBI			Sucker	Intolerant		Minnow	Mineral Substrate	Tolerant Fish (as	په ``	Specialized Benthic Invert-	Rel.No.	Mo	Modified
ID Mile Lype Date sq mi Width (ft)	(tt) Keg.	species	species	species	species	species	species	spawners	species)	Feeders	ivores	/(0.3km)	E B	dwl
SUBURBAN COUNTRY CLUB TRIB - (95710)	IRIB - (9	5710)												
Year: 2019														
13-10 2.00 E 10/10/2019 4.0 21.2	2 3	8(2)	5(6)	(0)	(0)0	(0)0	(0)0	0(0)	13(6)	11(6)	(0)0	194 *	20.0	5.6
SLOCUM CONRNERS CREEK - (95711)	(95711)													
Year: 2019														
13-11 1.36 E 10/13/2019 2.4 11.8	8	7(1)	1(3)	1(3)	(0)0	2(2)	2(1)	1(1)	57(3)	96(1)	3(1)	146 *	16.0	3.3
UNNAMED TRIB TO DESPLAINES RIVER - (95714)	<b>VES RIV</b>	ER - (957	14)											
Year: 2019														
13-17 0.13 F 08/30/2019 0.9 1.	1.ľ <sup>×</sup> 3	11(6)	4(6)	1(6)	(0)0	(0)0	2(6)	0(0)	45(4)	43(6)	(0)	222	34.0	6.3
UT TO NORTH MILL CREEK - (95715)	95715)													
Year: 2019														
10-6 0.04 F 08/28/2019 0.9 1.	1. f <sup>X</sup> 3	6(6)	4(6)	(0)0	0(0)	(0)0	1(6)	0(0)	50(4)	81(3)	(0)0	128 *	25.0	4.9
UT GREENLEAF CREEK - (95716)	(9)													
Year: 2019														
13-13 0.40 F 08/30/2019 1.1 $1.1^{\text{X}}$	ľ <sup>×</sup> 3	9(6)	2(6)	1(6)	0(0)	2(6)	4(6)	1(1)	44(4)	93(1)	1(1)	234	37.0	3.4
WEST BRANCH BULL CREEK - (95719)	- (95719)													
Year: 2019														
14-4 2.54 F 08/29/2019 5.1 25.7	7 3	6(1)	1(2)	(0)0	(0)0	(0)0	2(1)	2(1)	50(4)	88(2)	0(0)	120 *	11.0	2.1
14-3 1.60 F 08/29/2019 7.1 31.7	7 3	6(1)	3(5)	1(2)	(0)0	(0)0	2(2)	46(6)	50(4)	50(6)	0(0)	274	26.0	5.8
WEST FORK BELVIDERE RD. TRIB - (95720)	[RIB - (9	5720)												
na - Qualitative data, Modified Iwb not applicable. Y _ IBI extranolated	icable.				A - 2							05/18	05/18/2020	

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.

05/18/2020

Appendix Table A-1. Fish IBI results for data collected in the upper Des Plaines River study area during 2019.

	Modified I Iwb		3.7	7.1			4.0	7.8	6.9	8.9	7.4			5.8	6.1	5.0	6.1
	≥ ∎		14.0	34.0			20.0	22.0	21.0	29.0	23.0			18.0	16.0	15.0	18.0
	Rel.No. /(0.3km)		162 *	388			172 *	260	270	609	246			132 *	220	344	176 *
	Specialized Benthic Invert- ivores		(0)0	11(4)			2(1)	(0)0	3(1)	5(2)	7(3)			2(1)	1(1)	0(0)	1(1)
Percent	Generalist Feeders		99(1)	52(6)			73(4)	59(6)	77(3)	72(4)	84(3)			70(4)	85(2)	93(1)	89(2)
Perc	Tolerant Fish (as Species)		67(3)	35(5)			44(4)	38(4)	38(4)	29(5)	46(4)			33(5)	44(4)	70(2)	50(4)
	Mineral Substrate Spawners		(0)0	12(2)			0(0)	0(0)	2(1)	5(1)	7(2)			0(0)	0(0)	2(1)	0(0)
	Minnow species		1(1)	4(2)			1(1)	2(2)	3(2)	4(3)	3(2)			0(0)	0(0)	4(3)	2(2)
	Benthic Invert. species		(0)0	2(2)			1(1)	(0)0	1(1)	3(2)	1(1)			1(1)	1(1)	(0)0	1(1)
Number of	Intolerant species		(0)0	1(1)			(0)0	(0)0	1(1)	1(1)	(0)0			(0)0	(0)0	1(1)	0(0)
Nui	Sucker species		1(3)	1(2)			1(2)	1(1)	1(1)	1(1)	1(1)			1(1)	1(1)	1(1)	1(1)
	Sunfish species		2(5)	4(6)			3(5)	(9)9	3(4)	7(6)	4(4)			3(4)	4(5)	3(4)	4(5)
	Native species		6(1)	17(4)			9(2)	13(3)	13(3)	21(4)	13(3)			9(2)	9(2)	10(2)	12(2)
	IBI Reg.		ю	ю			3	б	б	б	б			б	б	б	б
	Wetted Nidth (ft)		11.0	20.3			23.4	38.7	52.0	71.6	72.1	(96)		50.0	51.5	57.9	59.3
	DA Wetted sq mi Width (ft)		2.3	3.8	5)		4.5	10.4	21.4	62.3	63.8	ζ - (959		19.2	20.8	29.5	31.9
	Date		F 10/08/2019	E 10/08/2019	MILL CREEK - (95995)		17.20 F 08/28/2019	D 10/18/2019	E 08/15/2019	D 08/15/2019	D 08/15/2019	NORTH MILL CREEK - (95996)		11.30 E 08/16/2019	E 08/16/2019	08/16/2019	E 08/16/2019
	er le Type	19			L CR	19	20 F	13.80 D				RTH N	19	30 E		Щ	
	e River Mile	Year: 2019	4 0.21	3 0.15	MIL	Year: 2019			3 7.20	2 1.71	1 0.70	ION	Year: 2019		3 10.20	2 8.10	1.10
	Site	Y	13-14	13-8		Y	11-6	11-5	11-3	11-2	11-1		Y	10-7	10-3	10-2	10-1

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.

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05/18/2020

#### Rivers: Mill Creek

	er of Samples: 5	I	Data Sour	ces:		99		Data Ty	pes:	D; E; F	
Species Code:	Species Name:	Feed Guild		Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
15-001	BOWFIN	Р		С		1	0.3	0.10	399	3.37	1200.0
20-003	GIZZARD SHAD	0		Μ		3	1.0	0.31	9	0.08	10.0
34-001	CENTRAL MUDMINNOW	I	Т	С		5	1.7	0.52	3	0.03	2.0
37-001	REDFIN PICKEREL	Ρ	Р	Μ		1	0.3	0.10	1	0.01	5.0
37-003	NORTHERN PIKE	Ρ		Μ	F	3	1.0	0.31	832	7.03	833.3
40-016	WHITE SUCKER	0	Т	S	W	22	7.3	2.28	2199	18.56	300.1
43-001	COMMON CARP	0	Т	Μ	G	9	3.0	0.93	1964	16.58	655.5
43-003	GOLDEN SHINER	Ι	Т	Μ	Ν	26	8.7	2.70	93	0.79	10.8
43-004	HORNYHEAD CHUB	Ι	I	Ν	Ν	4	1.3	0.41	49	0.42	37.5
43-013	CREEK CHUB	G	Т	Ν	Ν	4	1.3	0.41	33	0.28	25.0
43-032	SPOTFIN SHINER	I		Μ	Ν	115	38.3	11.93	73	0.62	1.9
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	72	24.0	7.47	67	0.57	2.8
47-002	CHANNEL CATFISH			С	F	23	7.7	2.39	1381	11.66	180.4
47-004	YELLOW BULLHEAD	I	Т	С		18	6.0	1.87	402	3.40	67.2
47-006	BLACK BULLHEAD	I	Р	С		1	0.3	0.10	5	0.04	15.0
47-008	STONECAT MADTOM	I	I	С		7	2.3	0.73	33	0.28	14.2
54-002	BLACKSTRIPE TOPMINNOW	I		Μ		26	8.7	2.70	9	0.08	1.1
74-006	YELLOW BASS	Р	Р	Μ		11	3.7	1.14	24	0.21	6.8
77-001	WHITE CRAPPIE	Ι		С	S	2	0.7	0.21	8	0.07	12.5
77-002	BLACK CRAPPIE	I		С	S	19	6.3	1.97	158	1.34	25.0
77-006	LARGEMOUTH BASS	С		С	F	43	14.3	4.46	919	7.76	64.1
77-007	WARMOUTH SUNFISH	С		С	S	8	2.7	0.83	116	0.98	43.7
77-008	GREEN SUNFISH	I	Т	С	S	158	52.6	16.39	477	4.03	9.0
77-009	BLUEGILL SUNFISH	Ι	Р	С	S	249	82.9	25.83	2017	17.03	24.3
77-010	ORANGESPOTTED SUNFISH	Ι		С	S	30	10.0	3.11	33	0.28	3.3
77-013	PUMPKINSEED SUNFISH	Ι	Р	С	S	35	11.7	3.63	268	2.26	23.0
77-015	GREEN SF X BLUEGILL SF					5	1.7	0.52	58	0.49	35.0
80-003	YELLOW PERCH			Μ		25	8.3	2.59	168	1.42	20.2
80-005	BLACKSIDE DARTER	Ι		S	D	31	10.3	3.22	33	0.28	3.2
80-014	JOHNNY DARTER	Ι		С	D	8	2.7	0.83	2	0.02	1.0
No Spec	ies: 30 Nat. Species:	28	Hybrids:	1		Total Counte	ed:	964 <b>To</b>	tal Rel. W	/t. :	11848

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

Rivers: Hastings Creek; Unnamed Trib to N. Mill Creek; North Mill Creek

Numb	er of Samples: 7	I	Data Sour	ces:		99		Data Ty	pes:	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.
34-001	CENTRAL MUDMINNOW	I	Т	С		39	11.2	6.54	82	1.23	7.4
37-003	NORTHERN PIKE	Р		М	F	5	1.4	0.84	800	11.90	560.0
40-016	WHITE SUCKER	0	Т	S	W	28	8.0	4.70	1593	23.67	198.9
43-001	COMMON CARP	0	Т	М	G	13	3.7	2.18	2174	32.30	584.7
43-004	HORNYHEAD CHUB	I	I	Ν	Ν	3	0.9	0.50	14	0.21	16.6
43-013	CREEK CHUB	G	Т	Ν	Ν	35	10.0	5.87	28	0.42	2.8
43-042	FATHEAD MINNOW	0	Т	С	Ν	19	5.4	3.19	9	0.14	1.6
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	64	18.3	10.74	62	0.93	3.4
47-002	CHANNEL CATFISH			С	F	2	0.6	0.34	0	0.01	1.0
47-004	YELLOW BULLHEAD	I	Т	С		34	9.7	5.70	301	4.48	31.0
47-006	BLACK BULLHEAD	I	Р	С		4	1.1	0.67	200	2.97	175.0
47-013	TADPOLE MADTOM	I		С		1	0.3	0.17	1	0.02	4.0
54-002	BLACKSTRIPE TOPMINNOW	I		М		5	1.4	0.84	1	0.02	1.0
77-002	BLACK CRAPPIE	I		С	S	1	0.3	0.17	2	0.04	10.0
77-006	LARGEMOUTH BASS	С		С	F	52	14.9	8.72	70	1.05	4.7
77-007	WARMOUTH SUNFISH	С		С	S	2	0.6	0.34	8	0.13	15.0
77-008	GREEN SUNFISH	I	Т	С	S	179	51.2	30.03	667	9.92	13.0
77-009	BLUEGILL SUNFISH	I	Р	С	S	103	29.5	17.28	702	10.43	23.8
77-010	ORANGESPOTTED SUNFISH			С	S	1	0.3	0.17	1	0.02	4.0
77-013	PUMPKINSEED SUNFISH	I	Р	С	S	1	0.3	0.17	1	0.02	5.0
77-015	GREEN SF X BLUEGILL SF					1	0.3	0.17	2	0.04	10.0
80-003	YELLOW PERCH			М		1	0.3	0.17	1	0.02	5.0
80-014	JOHNNY DARTER	I		С	D	3	0.9	0.50	0	0.01	1.0
No Spec	cies: 23 Nat. Species:	21	Hybrids:	1		Total Counte	ed:	596 <b>To</b>	tal Rel. W	't. :	6730

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

Rivers: Bull Creek; Bull's Brook; Stoneroller Creek; West Branch Bull Creek; West Fork Belvidere Rd. Trib

Numbe	er of Samples: 11	I	Data Soui	rces:		99		Data Ty	pes:	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.
34-001	CENTRAL MUDMINNOW	I	Т	С		21	4.0	1.32	19	0.58	4.9
37-003	NORTHERN PIKE	Р		М	F	6	1.1	0.38	300	8.90	266.6
40-016	WHITE SUCKER	0	Т	S	W	109	20.5	6.88	983	29.11	48.0
43-001	COMMON CARP	0	Т	М	G	1	0.2	0.06	7	0.22	40.0
43-002	GOLDFISH	0	Т	М	G	3	0.6	0.19	5	0.17	10.0
43-003	GOLDEN SHINER	I	Т	М	Ν	4	0.8	0.25	1	0.04	2.0
43-004	HORNYHEAD CHUB	I	I	Ν	Ν	56	10.5	3.53	109	3.23	10.3
43-013	CREEK CHUB	G	Т	Ν	Ν	439	82.5	27.70	691	20.47	8.3
43-042	FATHEAD MINNOW	0	Т	С	Ν	3	0.6	0.19	0	0.02	1.3
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	132	24.8	8.33	79	2.36	3.2
43-044	CENTRAL STONEROLLER	Н		Ν	Ν	234	44.0	14.76	228	6.76	5.1
43-117	CARMINE SHINER	I	Ι	S	Ν	9	1.7	0.57	4	0.13	2.5
47-004	YELLOW BULLHEAD	Ι	Т	С		19	3.6	1.20	97	2.88	27.2
47-006	BLACK BULLHEAD	I	Р	С		3	0.6	0.19	21	0.63	37.6
47-008	STONECAT MADTOM	Ι	I	С		4	0.8	0.25	9	0.28	12.5
54-000	WESTERN BANDED KILLIFISH	I	S	М		2	0.4	0.13	0	0.01	1.0
54-002	BLACKSTRIPE TOPMINNOW	I		М		22	4.1	1.39	4	0.14	1.1
68-001	PIRATE PERCH	I		С		1	0.2	0.06	5	0.17	30.0
70-001	BROOK SILVERSIDE	I	Μ	М		3	0.6	0.19	0	0.02	1.0
77-002	BLACK CRAPPIE	Ι		С	S	1	0.2	0.06	0	0.02	3.0
77-006	LARGEMOUTH BASS	С		С	F	53	10.0	3.34	124	3.67	12.4
77-007	WARMOUTH SUNFISH	С		С	S	5	0.9	0.32	13	0.39	14.0
77-008	GREEN SUNFISH	I	Т	С	S	160	30.1	10.09	441	13.07	14.6
77-009	BLUEGILL SUNFISH	I	Р	С	S	69	13.0	4.35	62	1.86	4.8
77-013	PUMPKINSEED SUNFISH	Ι	Р	С	S	26	4.9	1.64	91	2.72	18.8
77-015	GREEN SF X BLUEGILL SF					3	0.6	0.19	2	0.08	5.0
80-003	YELLOW PERCH			М		2	0.4	0.13	1	0.06	5.0
80-005	BLACKSIDE DARTER	Ι		S	D	62	11.7	3.91	41	1.22	3.5
80-014	JOHNNY DARTER	Ι		С	D	72	13.5	4.54	16	0.48	1.2
80-024	FANTAIL DARTER	Ι		С	D	61	11.5	3.85	10	0.32	0.9
99-999	NO FISH					0	0.0	0.00	0	0.00	*******
No Spec	ies: 31 Nat. Species:	28	Hybrids	: 1		Total Count	ed:	1585 <b>To</b>	tal Rel. W	/t. :	3380

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

Rivers: Newport Drainage Ditch; Suburban Country Club Tributary; Slocum Conrners Creek; Unnamed Trib to DesPlaines River; Unnamed Trib -Greenleaf Creek

Numb	er of Samples:	6	Data So	ources:		99		Data Ty	pes:	E; F	
Species Code:	Species Name:	Feed Guild		Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	0		М		1	0.3	0.19	1	0.22	5.0
34-001	CENTRAL MUDMINNOW	I	Т	С		51	17.0	9.73	54	7.14	3.2
37-003	NORTHERN PIKE	Р		М	F	1	0.3	0.19	13	1.73	40.0
40-016	WHITE SUCKER	0	Т	S	W	44	14.7	8.40	117	15.32	8.0
43-003	GOLDEN SHINER	I	Т	Μ	Ν	3	1.0	0.57	1	0.13	1.0
43-013	CREEK CHUB	G	Т	Ν	Ν	109	36.3	20.80	202	26.27	5.5
43-032	SPOTFIN SHINER	I		Μ	Ν	1	0.3	0.19	1	0.13	3.0
43-033	<b>BIGMOUTH SHINER</b>	I		Μ	Ν	1	0.3	0.19	0	0.04	1.0
43-042	FATHEAD MINNOW	0	Т	С	Ν	4	1.3	0.76	2	0.26	1.5
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	5	1.7	0.95	3	0.43	2.0
47-004	YELLOW BULLHEAD	I	Т	С		1	0.3	0.19	0	0.09	2.0
47-013	TADPOLE MADTOM	I		С		2	0.7	0.38	1	0.17	2.0
54-002	BLACKSTRIPE TOPMINNC	I WC		Μ		136	45.3	25.95	33	4.37	0.7
68-001	PIRATE PERCH	I		С		13	4.3	2.48	26	3.46	6.1
77-006	LARGEMOUTH BASS	С		С	F	23	7.7	4.39	46	6.10	6.1
77-007	WARMOUTH SUNFISH	С		С	S	2	0.7	0.38	6	0.87	10.0
77-008	GREEN SUNFISH	I	Т	С	S	66	22.0	12.60	166	21.64	7.5
77-009	BLUEGILL SUNFISH	I	Р	С	S	23	7.7	4.39	19	2.60	2.6
77-013	PUMPKINSEED SUNFISH	I	Р	С	S	16	5.3	3.05	61	8.01	11.5
80-005	BLACKSIDE DARTER	I		S	D	2	0.7	0.38	1	0.13	1.5
80-014	JOHNNY DARTER	I		С	D	20	6.7	3.82	6	0.91	1.0
No Spec	cies: 21 Nat. Species	<b>s:</b> 21	Hybrid	<b>ds:</b> 0		Total Counte	d:	524 <b>To</b>	tal Rel. W	′t.:	769

	Appendi	x Table A	A-3. Midwes	t Biodive	ersity	Institu	te		
			Fish Species	s List					
Site ID:	River: 95-05	51 Bull Cre	eek		RM:	5.95	Date: (	08/29/20	19
Time Fished:	87 Dista	ance: 0.1	50 Drainge (s	q mi):	2.4	Dept	h:	0	
Location: at Haz	elnut Xing			L	at: 42.2	28815 I	_ong:	-88.0215	5
Species Code: Specie	es Name:	Feed Toler- Guild ance		No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
99-999 NO FISH			·	0	0.0	*** **	0	0.00	*****
No Species: 0	Nat. Species:	1 Hybr	<b>ids:</b> 0	Total Cou	unted:	0 <b>To</b>	tal Rel. W	′t. :	0
<b>IBI:</b> 12.0	Miwb: N	/A							

Site IE	D: River: 95	-051 Bi	ull Creeł	<				RM:	4.70	Date:	10/13/20	19
Time I	Fished: 616 D	istance:	0.100	Dr	ainge (so	q mi):		1.3	Dep	oth:	0	
Locati	on: at St. Mary of the	Lake Colle	ege				Lat	42	.27954	Long:	-88.0030	0
Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No Fis	-	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	NORTHERN PIKE	Р		М	F		1	3.0	1.33	2100	72.99	700.0
43-003	GOLDEN SHINER	I.	Т	М	Ν		4	12.0	5.33	24	0.83	2.0
70-001	BROOK SILVERSIDE	I	М	М			3	9.0	4.00	9	0.31	1.0
77-002	BLACK CRAPPIE	I		С	S		1	3.0	1.33	9	0.31	3.0
77-006	LARGEMOUTH BASS	С		С	F	:	20	60.0	26.67	300	10.43	5.0
77-008	GREEN SUNFISH	I	Т	С	S		3	9.0	4.00	75	2.61	8.3
77-009	BLUEGILL SUNFISH	I	Р	С	S		12 1	26.0	56.00	345	11.99	2.7
80-003	YELLOW PERCH			М			1	3.0	1.33	15	0.52	5.0
No Spec	cies: 8 Nat. Specie	<b>s:</b> 8	Hybrids	<b>s:</b> 0		Total	Coun	ted:	75 <b>T</b>	otal Rel. V	Vt. :	2877

**IBI:** 42.0

Mlwb: N/A

Site ID:	River	: 95-051 Bu	ull Creek		RM:	1.00	Date: 08/28/2019
Time Fished:	1177	Distance:	0.150	Drainge (sq mi):	8.4	Depth:	0
Location: at Rt	e 137				Lat: 42.	30768 Lo	ng: -87.96867

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	Т	С		1	2.0	0.51	4	0.31	2.0
40-016	WHITE SUCKER	0	Т	S	W	14	28.0	7.07	28	2.16	1.0
43-013	CREEK CHUB	G	Т	Ν	Ν	84	168.0	42.42	880	67.90	5.2
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	15	30.0	7.58	30	2.31	1.0
43-044	CENTRAL STONEROLLER	Н		Ν	Ν	18	36.0	9.09	74	5.71	2.0
54-002	BLACKSTRIPE TOPMINNOW	Ι		Μ		3	6.0	1.52	10	0.77	1.6
77-006	LARGEMOUTH BASS	С		С	F	5	10.0	2.53	40	3.09	4.0
77-009	BLUEGILL SUNFISH	Ι	Р	С	S	2	4.0	1.01	80	6.17	20.0
77-013	PUMPKINSEED SUNFISH	Ι	Р	С	S	1	2.0	0.51	10	0.77	5.0
80-014	JOHNNY DARTER	Ι		С	D	55	110.0	27.78	140	10.80	1.2
No Spec	ties: 10 Nat. Species: 24.0 Mlwb: N/A	10	Hybrids	: 0		Total Co	unted:	198 <b>To</b>	tal Rel. W	't. :	1296

Site ID:	River	: 95-051 Bi	ull Creek		RM:	0.50	Date: 10/10/2019
Time Fished:	1086	Distance:	0.150	Drainge (sq mi):	11.7	Depth	n: 0
Location: Ust.	IL 21				Lat: 42.	31157 L	ong: -87.96423

Species		Feed	Toler-	Breed	IBI	No.	Rel.	% by	Rel.	% by	Av.
Code:	Species Name:	Guild	ance	Guild	Group	Fish	No.	No.	Wt.	Wt.	Wt.
37-003	NORTHERN PIKE	Р		М	F	2	4.0	0.80	1100	18.21	275.0
43-004	HORNYHEAD CHUB	I	Ι	Ν	Ν	18	36.0	7.23	540	8.94	15.0
43-013	CREEK CHUB	G	Т	Ν	Ν	34	68.0	13.65	1000	16.55	14.7
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	47	94.0	18.88	300	4.97	3.1
43-044	CENTRAL STONEROLLER	н		Ν	Ν	18	36.0	7.23	300	4.97	8.3
43-117	CARMINE SHINER	I	I	S	Ν	7	14.0	2.81	40	0.66	2.8
47-004	YELLOW BULLHEAD	I	Т	С		12	24.0	4.82	1000	16.55	41.6
77-006	LARGEMOUTH BASS	С		С	F	1	2.0	0.40	20	0.33	10.0
77-007	WARMOUTH SUNFISH	С		С	S	4	8.0	1.61	120	1.99	15.0
77-008	GREEN SUNFISH	I	Т	С	S	33	66.0	13.25	1300	21.52	19.7
77-009	BLUEGILL SUNFISH	I	Р	С	S	1	2.0	0.40	10	0.17	5.0
77-013	PUMPKINSEED SUNFISH	I	Р	С	S	1	2.0	0.40	40	0.66	20.0
80-003	YELLOW PERCH			М		1	2.0	0.40	10	0.17	5.0
80-005	BLACKSIDE DARTER	I		S	D	36	72.0	14.46	200	3.31	2.7
80-014	JOHNNY DARTER	I		С	D	1	2.0	0.40	2	0.03	1.0
80-024	FANTAIL DARTER	I		С	D	33	66.0	13.25	60	0.99	0.9
No Spec	ies: 16 Nat. Species:	16	Hybrids	: 0		Total Co	unted:	249 <b>To</b>	tal Rel. W	't. :	6042

IBI:

36.0

N/A Mlwb:

Site II	D:	River: 9	5-702	Н	astings C	reek				RM:	3.12	Date:	08/28/201	9
Time	Fished:	748	Distanc	e:	0.150	Dr	ainge (so	mi):		3.9	Dep	oth:	0	
Locat	ion: at Gras	s Lake Rd							Lat:	42.	43071	Long:	-88.03447	
Species Code:		s Name:	-	<sup>-</sup> eed Guild	Toler- ance	Breed Guild	IBI Group	No Fisł			% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL M	UDMINNOV	V	Ι	Т	С			4	8.0	10.00	40	12.74	5.0
47-004	YELLOW BU	LLHEAD		Т	Т	С		1	53	0.0	37.50	30	9.55	1.0
54-002	BLACKSTRIF	PE TOPMIN	INOW	Т		Μ			1	2.0	2.50	2	0.64	1.0
77-006	LARGEMOU	TH BASS		С		С	F		7 1	4.0	17.50	70	22.29	5.0
77-008	GREEN SUN	FISH		Т	Т	С	S		2	4.0	5.00	22	7.01	5.5
77-009	BLUEGILL SI	UNFISH		Ι	Р	С	S	1	1 2	2.0	27.50	150	47.77	6.8
No Spec	<b>cies:</b> 6 32.0	Nat. Spec Mlwb:	ies: N/A	6	Hybrids	: 0		Total C	Counte	ed:	40 <b>1</b>	Γotal Rel. V	Vt. :	314

Site IE	): River: 9	95-702 H	astings C	reek				RM:	1.68	Date:	08/28/20	19
Time I	Fished: 790	Distance:	0.150	Dr	ainge (sq	mi):		5.6	Dep	oth:	0	
Locati	on: at Miller Rd.						Lat:	42.	44790	Long:	-88.02470	C
Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No Fisl			% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL MUDMINNOV	V I	Т	С			8 1	6.0	14.29	80	12.74	5.0
47-004	YELLOW BULLHEAD	I	Т	С			2	4.0	3.57	220	35.03	55.0
47-013	TADPOLE MADTOM	I		С			1	2.0	1.79	8	1.27	4.0
77-006	LARGEMOUTH BASS	С		С	F	2	2 4	4.0	39.29	100	15.92	2.2
77-008	GREEN SUNFISH	I	Т	С	S		6 1	2.0	10.71	50	7.96	4.1
77-009	BLUEGILL SUNFISH	I	Р	С	S	1	53	0.0	26.79	150	23.89	5.0
77-013	PUMPKINSEED SUNFIS	SH I	Р	С	S		1	2.0	1.79	10	1.59	5.0
80-003	YELLOW PERCH			Μ			1	2.0	1.79	10	1.59	5.0
No Spec	ties: 8 Nat. Spec	i <b>es:</b> 8	Hybrids	: 0		Total (	Counte	d:	56 <b>T</b>	otal Rel. V	Vt. :	628

**IBI:** 34.0

Mlwb: N/A

A3 - 11

Site I	D:	River:	95-704	l B	ull's Broo	ok				RM:	1.95	Date:	10/08/201	9
Time	Fished:	563	Distar	nce:	0.150	) Dr	ainge (s	q mi):		1.9	Dep	oth:	0	
Locat	ion: Dst. A	lmond Rd							Lat	42	.32563	Long:	-87.97668	
Species Code:		es Name:		Feed Guild	Toler- ance	Breed Guild	IBI Group			Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUG	CKER		0	Т	S	W		35	70.0	19.77	220	8.53	3.1
43-013	CREEK CH	UB		G	Т	Ν	Ν		65 1	30.0	36.72	1900	73.64	14.6
43-044	CENTRAL	STONEROL	LER	Н		Ν	Ν		35	70.0	19.77	260	10.08	3.7
77-008	GREEN SU	NFISH		Ι	Т	С	S		15	30.0	8.47	90	3.49	3.0
77-009	BLUEGILL	SUNFISH		I	Р	С	S		5	10.0	2.82	60	2.33	6.0
77-015	GREEN SF	X BLUEGIL	L SF						2	4.0	1.13	20	0.78	5.0
80-024	FANTAIL D	ARTER		I		С	D		20	40.0	11.30	30	1.16	0.7
-	<b>cies:</b> 6	Nat. Spe		6	Hybrids	<b>s:</b> 1		Total	Coun	ted:	177 <b>1</b>	otal Rel. V	Vt. :	2580
IBI:	26.0	Mlwb:	N/A	4										

Site ID:	River	: 95-704 B	ull's Brook		RM	: 0.25	Date: 08/30/2019
Time Fished:	728	Distance:	0.150	Drainge (sq mi):	2.7	Depth	ו: 0
Location: North	Milwauk	ee Ave.			Lat: 42	2.32570 L	ong: -87.97661

80-014	LARGEMOUTH BASS GREEN SUNFISH JOHNNY DARTER FANTAIL DARTER	C     	Т	с с с	S D D	3 2 8	6.0 4.0 16.0	2.08 1.39 5.56	20 20 4 24	0.81 0.81 0.16 0.98	3.3 1.0 1.5
	GREEN SUNFISH	I I	Т	С	S	3	6.0	2.08	20	0.81	3.3
//-008 0		I I	т		-						
77 000 /	LARGEMOUTH BASS	C		C	1	5	10.0	3.47	20	0.01	2.0
77-006 L		0		С	F	5	10.0	3.47	20	0.81	2.0
54-000 \	WESTERN BANDED KILLIFISI	H I	S	М		2	4.0	1.39	4	0.16	1.0
43-044 (	CENTRAL STONEROLLER	Н		Ν	Ν	7	14.0	4.86	30	1.22	2.1
43-042 F	FATHEAD MINNOW	0	Т	С	Ν	2	4.0	1.39	4	0.16	1.0
43-013 (	CREEK CHUB	G	Т	Ν	Ν	107	214.0	74.31	2270	92.43	10.6
34-001 (	CENTRAL MUDMINNOW	I	Т	С		8	16.0	5.56	80	3.26	5.0
Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.

**IBI:** 28.0

Mlwb: N/A

08/09/2021

	Appendix	Tab			dwest <u>pecies</u>		vers	sity	Institu	ute		
Site II	D: 12-2 River: 95-708	3 N	ewport D	raina	ge Ditch			RM:	3.03	Date:	10/13/20	19
Time	Fished: 693 Dista	nce:	0.150	Dr	ainge (s	q mi):		2.8	Dep	oth:	0	
Locati	ion: dst 21st St.						Lat:	42	.45876	Long:	-87.8966	5
Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No Fisł		Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	NORTHERN PIKE	Р		М	F		1	2.0	7.14	80	13.29	40.0
40-016	WHITE SUCKER	0	Т	S	W		2	4.0	14.29	310	51.50	77.5
54-002	BLACKSTRIPE TOPMINNOW	I		М			2	4.0	14.29	2	0.33	0.5
77-006	LARGEMOUTH BASS	С		С	F		1	2.0	7.14	10	1.66	5.0
77-008	GREEN SUNFISH	Ι	Т	С	S		5	10.0	35.71	120	19.93	12.0
77-009	BLUEGILL SUNFISH	Ι	Р	С	S		1	2.0	7.14	20	3.32	10.0
77-013	PUMPKINSEED SUNFISH	Ι	Р	С	S		2	4.0	14.29	60	9.97	15.0
No Spec IBI:	cies: 7 Nat. Species: 28.0 Miwb: N/A	7	Hybrids	: 0		Total (	Count	ed:	14 <b>T</b>	otal Rel. V	Vt. :	602

Site ID:	River: 95-708 Newport Drainage Ditch			ainage Ditch		RM:	0.70	D	Date: 10/13/2019		
Time Fished:	633	Distance:	0.150	Drainge (sq mi):	-	7.3	Dep	oth:	0		
Location: ust. Kilbourne Rd.						42.4	8341	Long	g: -87.91242		

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	Т	С		14	28.0	12.50	106	28.80	3.7
43-013	CREEK CHUB		Т	Ν	Ν	1	2.0	0.89	4	1.09	2.0
43-032	2 SPOTFIN SHINER			М	Ν	1	2.0	0.89	6	1.63	3.0
47-013	3 TADPOLE MADTOM			С		2	4.0	1.79	8	2.17	2.0
54-002	54-002 BLACKSTRIPE TOPMINNOW			М		58	116.0	51.79	60	16.30	0.5
68-001	68-001 PIRATE PERCH			С		7	14.0	6.25	80	21.74	5.7
77-008	7-008 GREEN SUNFISH		Т	С	S	9	18.0	8.04	60	16.30	3.3
77-009	BLUEGILL SUNFISH		Р	С	S	1	2.0	0.89	4	1.09	2.0
80-014	JOHNNY DARTER			С	D	19	38.0	16.96	40	10.87	1.0
No Species: 9 Nat. Species:		9	Hybrids	: 0		Total Co	unted:	112 <b>To</b>	tal Rel. W	′t.:	368

**IBI:** 34.0

Mlwb: N/A

	Appendix	Tab					ersity	Institu	ute		
			ΓI;	511.54	<u>pecies</u>	LISU					
Site ID	): River: 95-709	St	tonerolle	er Cree	ek		RM:	0.42	Date:	10/10/20	19
Time I	Fished: 1079 Distar	nce:	0.150	Dr	ainge (so	mi):	4.1	Dep	oth:	0	
Locati	on: Dst. IL 21					L	at: 42	.35290	Long:	-87.9366	51
Species Code:	Species Name:	Feed	Toler-	Breed	IBI	No.	Rel.	% by	Rel.	% by	Av.
37-003	NORTHERN PIKE	Guild P	ance	Guild M	Group F	Fish 2	No. 4.0	<u>No.</u> 0.74	Wt. 500	Wt. 8.55	<u>Wt</u> . 125.0
40-016	WHITE SUCKER	г О	т	S	W	5	4.0	1.85	1300	22.23	120.0
40-010	HORNYHEAD CHUB	1	1	N	N	26	52.0	9.63	460	7.87	8.8
43-004 43-013	CREEK CHUB	G	Т	N	N	20 36	72.0	9.03 13.33	400	6.84	5.5
43-042	FATHEAD MINNOW	0	Т	C	N	1	2.0	0.37	400	0.04	2.0
43-043	BLUNTNOSE MINNOW	0	Т	c	N	45	90.0	16.67	400	6.84	4.4
43-044	CENTRAL STONEROLLER	н		N	N	89	178.0	32.96	1200	20.52	6.7
43-117	CARMINE SHINER		I.	S	N	2	4.0	0.74	6	0.10	1.5
47-004	YELLOW BULLHEAD		T	c		3	6.0	1.11	20	0.10	3.3
47-008	STONECAT MADTOM			c		4	8.0	1.48	100	1.71	12.5
54-002	BLACKSTRIPE TOPMINNOW		·	M		4	8.0	1.48	10	0.17	1.2
77-006	LARGEMOUTH BASS	C		С	F	7	14.0	2.59	600	10.26	42.8
77-007	WARMOUTH SUNFISH	C		C	S	1	2.0	0.37	20	0.34	10.0
77-008	GREEN SUNFISH	l	т	C	S	26	52.0	9.63	600	10.26	11.5
77-013	PUMPKINSEED SUNFISH		P	C	S	-0	2.0	0.37	8	0.14	4.0
80-005	BLACKSIDE DARTER	I	·	S	D	18	36.0	6.67	220	3.76	6.1
No Spec	ies: 16 Nat. Species:	16	Hybrids	: 0		Total Co	unted:	270 <b>T</b>	otal Rel. V	Vt. :	5848

34.0

Mlwb:

N/A

Site ID:	River	: 95-710	Suburban Co	ountry Club Tributary	/	RM:	2.00	Da	ate: 10/10/2019
Time Fished:	778	Distance:	: 0.150	Drainge (sq mi):	2	4.0	Dep	oth:	0
Location: Dst. N	lorth Del	any Rd.			Lat:	42.40	0424	Long	-87.90610

Species		Lord	Talan	Due e d	וסו	No.	Dal	0/ 1	Del	0/ 6.	•
Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL MUDMINNOW	I	Т	С		2	4.0	2.06	60	5.88	15.0
54-002	BLACKSTRIPE TOPMINNOW	I		Μ		65	130.0	67.01	100	9.80	0.7
68-001	PIRATE PERCH	I		С		5	10.0	5.15	60	5.88	6.0
77-006	LARGEMOUTH BASS	С		С	F	1	2.0	1.03	200	19.61	100.0
77-007	WARMOUTH SUNFISH	С		С	S	2	4.0	2.06	40	3.92	10.0
77-008	GREEN SUNFISH	Ι	Т	С	S	9	18.0	9.28	200	19.61	11.1
77-009	BLUEGILL SUNFISH	Ι	Р	С	S	2	4.0	2.06	60	5.88	15.0
77-013	PUMPKINSEED SUNFISH	Ι	Р	С	S	11	22.0	11.34	300	29.41	13.6
No Spec	ies: 8 Nat. Species:	8	Hybrids	: 0		Total Co	unted:	97 <b>To</b>	tal Rel. W	/t. :	1020

**IBI:** 36.0

Mlwb: N/A

Site ID	): F	River: 95-	711 SI	Slocum Conrners Creek						1.36	Date:	10/13/20 <sup>-</sup>	19
Time I	Fished: 58	37 Dis	stance:	0.150	) Dr	ainge (sc	mi):		2.4	Dep	oth:	0	
Locati	on: Ust. North	n Mill Cre	ek Rd.					Lat:	42	.44442	Long:	-87.9528	3
Species Code:	Species N	ame:	Feed Guild	Toler- ance	Breed Guild	IBI Group	Nc Fis	-	lel. Io.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKEI	٦	0	Т	S	W		6	12.0	8.22	300	18.36	25.0
43-013	CREEK CHUB		G	Т	Ν	Ν	2	26	52.0	35.62	700	42.84	13.4
43-042	FATHEAD MINN	WOW	0	Т	С	Ν		3	6.0	4.11	8	0.49	1.3
68-001	PIRATE PERCH	ł	I.		С			1	2.0	1.37	20	1.22	10.0
77-008	GREEN SUNFIS	SH	I	Т	С	S	3	5	70.0	47.95	600	36.72	8.5
80-005	BLACKSIDE DA	RTER	I.		S	D		1	2.0	1.37	4	0.24	2.0
80-014	JOHNNY DART	ER	I		С	D		1	2.0	1.37	2	0.12	1.0
No Spec	cies: 7 Na	it. Species	<b>s:</b> 7	Hybrid	<b>s:</b> 0		Total	Count	ed:	73 <b>1</b>	otal Rel. V	Vt. :	1634

**IBI:** 28.0

MIwb: N/A

Site ID:	River	: 95-714	Unnamed Tr	rib to DesPlaines Rive	er R	RM: 0.13	Date: 08/30/2019
Time Fished:	862	Distance:	0.150	Drainge (sq mi):	0.	9 Depth	n: 0
Location: behin	d pump s	station off S	prucewood L	ane	Lat:	42.29978 L	ong: -87.94074

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	0		М			1 2.	0 0.9	0 10	1.77	5.0
34-001	CENTRAL MUDMINNOW	I	Т	С		3	I 62.	0 27.9	3 130	23.05	2.1
40-016	WHITE SUCKER	0	Т	S	W	14	1 28.	0 12.6	60	10.64	2.1
43-003	GOLDEN SHINER	I	Т	М	Ν	;	6.	0 2.7	0 6	1.06	1.0
43-013	CREEK CHUB	G	Т	Ν	Ν	Į	5 10.	0 4.5	0 10	1.77	1.0
47-004	YELLOW BULLHEAD	Ι	Т	С			1 2.	0 0.9	0 4	0.71	2.0
54-002	BLACKSTRIPE TOPMINNOW	Ι		М		1	1 22.	0 9.9	1 40	7.09	1.8
77-006	LARGEMOUTH BASS	С		С	F	18	3 36.	0 16.2	.2 64	11.35	1.7
77-008	GREEN SUNFISH	Ι	Т	С	S	8	3 16.	0 7.2	1 70	12.41	4.3
77-009	BLUEGILL SUNFISH	Ι	Р	С	S	16	<b>3</b> 2.	0 14.4	1 140	24.82	4.3
77-013	PUMPKINSEED SUNFISH	I	Р	С	S		6.	0 2.7	0 30	5.32	5.0
No Spec	ies: 11 Nat. Species:	11	Hybrids	: 0		Total C	ounted	: 111	Total Rel. V	Vt. :	564

**IBI:** 38.0 **Miwb:** 

N/A

		Apper	ndix Tab			dwest becies		ersity	Institu	ute		
Site I	D:	River: 9	95-715 U	nnamed	Trib to	o N. Mill	Creek	RM	: 0.04	Date:	08/28/20	19
Time	Fished:	428	Distance:	0.150	) Dr	ainge (s	q mi):	0.9	Dep	oth:	0	
Locat	ion: at ust	. of Rte 45					I	_at: 42	2.42142	Long:	-88.0046	5
Species Code:		ies Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL	MUDMINNO	N I	Т	С		1	2.0	1.56	10	2.63	5.0
43-001	COMMON	CARP	0	Т	Μ	G	1	2.0	1.56	4	1.05	2.0
43-013	CREEK CH	IUB	G	Т	Ν	Ν	33	66.0	51.56	132	34.74	2.0
77-006	LARGEMO	UTH BASS	С		С	F	9	18.0	14.06	38	10.00	2.1
77-007	WARMOUT	TH SUNFISH	С		С	S	2	4.0	3.13	60	15.79	15.0
77-008	GREEN SL	JNFISH	I	Т	С	S	8	16.0	12.50	46	12.11	2.8
77-009	BLUEGILL	SUNFISH	I	Р	С	S	10	20.0	15.63	90	23.68	4.5
-	cies: 7	Nat. Spec		Hybrid	<b>s:</b> 0		Total Co	ounted:	64 <b>T</b>	otal Rel. V	Vt. :	380
IBI:	28.0	Mlwb:	N/A									

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	Appendix Table B-3. Midwest Biodiversity Institute Fish Species List												
Site ID	D: River: 95-71	6 U				af Creek	RM	: 0.40	Date:	08/30/20	19		
Time I	Fished: 761 Dista	ance:	0.150	Dr	ainge (s	q mi):	1.1	Dep	oth:	0			
Location: dst. Kenwood Lat: 42.36604 Long: -87.90196													
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		T	C	Oroup	4		3.42	40	5.31	5.0		
40-016	WHITE SUCKER	0	Т	S	W	22	44.0	18.80	88	11.67	2.0		
43-013	CREEK CHUB	G	Т	Ν	Ν	77	154.0	65.81	580	76.92	3.7		
43-033	<b>BIGMOUTH SHINER</b>	I		Μ	Ν	1	2.0	0.85	2	0.27	1.0		
43-042	FATHEAD MINNOW	0	Т	С	Ν	1	2.0	0.85	4	0.53	2.0		
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	5	10.0	4.27	20	2.65	2.0		
77-006	LARGEMOUTH BASS	С		С	F	3	6.0	2.56	12	1.59	2.0		
77-009	BLUEGILL SUNFISH	I	Р	С	S	3	6.0	2.56	6	0.80	1.0		
80-005	BLACKSIDE DARTER	I		S	D	1	2.0	0.85	2	0.27	1.0		
No Spec	cies: 9 Nat. Species:	9	Hybrids	: 0		Total Co	ounted:	117 <b>1</b>	otal Rel. V	Vt. :	754		

**IBI:** 28.0

MIwb: N/A

Appendix Table B-3. Midwest Biodiversity Institute Fish Species List													
Site I	D: River: 95-71	9 W	/est Branc				RM:	2.54	Date:	08/29/20	19		
Time	Fished: 539 Dista	ince:	0.150	Dr	ainge (sq ı	mi):	5.1	Dep	oth:	0			
Locati	Location: behind World Bioproducts across field Lat: 42.30297 Long: -87.99916												
Spacias													
Species Code:	Species Name:	Feed Guild		Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.		
34-001	CENTRAL MUDMINNOW		Т	C	0.000	6	12.0	10.00	24	2.26	2.0		
43-013	CREEK CHUB	G	Т	Ν	Ν	47	94.0	78.33	900	84.59	9.5		
43-044	CENTRAL STONEROLLER	Н		Ν	Ν	1	2.0	1.67	100	9.40	50.0		
47-004	YELLOW BULLHEAD	I	Т	С		2	4.0	3.33	14	1.32	3.5		
47-006	BLACK BULLHEAD	I	Р	С		1	2.0	1.67	6	0.56	3.0		
77-008	GREEN SUNFISH	I	Т	С	S	3	6.0	5.00	20	1.88	3.3		
No Spec	No Species: 6 Nat. Species: 6 Hybrids: 0 Total Counted: 60 Total Rel. Wt. : 1064												
IBI:	24.0 <b>Miwb:</b> N/	A											

	Append	ix Tab			dwest pecies		ver	rsity	Institu	ute		
Site II	D: River: 95-	719 W	lest Brand	ch Bul	II Creek			RM:	1.60	Date:	08/29/20	19
Time	Fished: 1129 Dis	stance:	0.150	Dr	ainge (so	q mi):		7.1	Dep	oth:	0	
Locat	ion: N. Countryside Dr.						La	t: 42.	31017	Long:	-87.9906	5
Species Code:	Species Name:	Feed Guild		Breed Guild	IBI Group	No Fis		Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	0	Т	S	W		5	10.0	3.65	1204	18.45	120.4
43-013	CREEK CHUB	G	Т	Ν	Ν	2	10	80.0	29.20	2400	36.79	30.0
43-044	CENTRAL STONEROLLER	н		Ν	Ν	6	63	126.0	45.99	2106	32.28	16.7
77-006	LARGEMOUTH BASS	С		С	F		4	8.0	2.92	204	3.13	25.5
77-008	GREEN SUNFISH	I	Т	С	S		11	22.0	8.03	400	6.13	18.1
77-009	BLUEGILL SUNFISH	I	Р	С	S		13	26.0	9.49	200	3.07	7.6
77-015	GREEN SF X BLUEGILL SI	=					1	2.0	0.73	10	0.15	5.0
No Spec	cies: 6 Nat. Species 24.0 Miwb:	s: 6 N/A	Hybrids:	1		Total	Cour	nted:	137 <b>T</b>	otal Rel. V	Vt. :	6524

	Appendix Table B-3. Midwest Biodiversity Institute Fish Species List													
					<b>FI</b> S	su sh	Jecles							
Site II	D:	River: 9	5-720	W	est Fork	Belvio	dere Rd.	Trib		RM:	0.21	Date:	10/08/20	19
Time	Fished:	639 [	Distan	ce:	0.150	Dr	ainge (s	q mi):		2.3	Dep	oth:	0	
Locat	Location: Dst. Leonard Dr. Lat: 42.34737 Long: -87.95589													
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 SUCK	ER		0	Т	S	W		22	44.0	27.16	3420	57.08	77.7
43-002	GOLDFISH			0	Т	М	G		3	6.0	3.70	60	1.00	10.0
43-013	CREEK CHUE	3		G	Т	Ν	Ν		17	34.0	20.99	1460	24.37	42.9
47-006	BLACK BULL	HEAD		Ι	Р	С			1	2.0	1.23	20	0.33	10.0
54-002	BLACKSTRIP		NOW	Ι		М			1	2.0	1.23	2	0.03	1.0
77-008	GREEN SUN	FISH		Ι	Т	С	S		33	66.0	40.74	980	16.36	14.8
77-009	BLUEGILL SL	JNFISH		Ι	Р	С	S		4	8.0	4.94	50	0.83	6.2
No Spe	cies: 7 I	Nat. Speci	es:	6	Hybrids	: 0		Tota	al Co	unted:	81 <b>T</b>	otal Rel. V	Vt. :	5992
IBI:	22.0	Mlwb:	N/A											

	Appendix	Tab			dwest becies		ive	rsity	Institu	ute		
Site IE	D: River: 95-720	) W	lest Fork	•				RM:	0.15	Date:	10/08/20	19
Time I	Fished: 900 Distar	nce:	0.150	Dr	ainge (so	q mi):		3.8	Dep	oth:	0	
Locati	on: Ust. abandoned bridge	e					La	at: 42	.34253	Long:	-87.9449	4
Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group		lo. sh	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL MUDMINNOW	I	Т	С	· · · ·		6	12.0	3.09	100	1.06	8.3
37-003	NORTHERN PIKE	Р		Μ	F		1	2.0	0.52	200	2.13	100.0
40-016	WHITE SUCKER	0	Т	S	W		28	56.0	14.43	5000	53.24	89.2
43-001	COMMON CARP	0	Т	Μ	G		1	2.0	0.52	80	0.85	40.0
43-004	HORNYHEAD CHUB	I	I	Ν	Ν		12	24.0	6.19	260	2.77	10.8
43-013	CREEK CHUB	G	Т	Ν	Ν		9	18.0	4.64	740	7.88	41.1
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν		25	50.0	12.89	120	1.28	2.4
43-044	CENTRAL STONEROLLER	Н		Ν	Ν		3	6.0	1.55	10	0.11	1.6
47-004	YELLOW BULLHEAD	I	Т	С			2	4.0	1.03	106	1.13	26.5
47-006	BLACK BULLHEAD	I	Р	С			1	2.0	0.52	200	2.13	100.0
54-002	BLACKSTRIPE TOPMINNOW	I		Μ			14	28.0	7.22	28	0.30	1.0
68-001	PIRATE PERCH	I		С			1	2.0	0.52	60	0.64	30.0
77-006	LARGEMOUTH BASS	С		С	F		11	22.0	5.67	240	2.56	10.9
77-008	GREEN SUNFISH	I	Т	С	S		33	66.0	17.01	1240	13.20	18.7
77-009	BLUEGILL SUNFISH	Ι	Р	С	S		2	4.0	1.03	40	0.43	10.0
77-013	PUMPKINSEED SUNFISH	I	Р	С	S		23	46.0	11.86	920	9.80	20.0
80-005	BLACKSIDE DARTER	I		S	D		8	16.0	4.12	20	0.21	1.2
80-014	JOHNNY DARTER	Ι		С	D		14	28.0	7.22	28	0.30	1.0
No Spec	ies: 18 Nat. Species:	17	Hybrids	: 0		Total	Cοι	inted:	194 <b>T</b>	otal Rel. V	Vt. :	9392

**IBI:** 34.0

Mlwb: N/A

Site ID:	River	: 95-995 M	ill Creek		RM: 17.20 Date: 08/28/2019
Time Fished:	790	Distance:	0.150	Drainge (sq mi):	4.5 Depth: 0
Location: at Wid	ck St.				Lat: 42.33642 Long: -88.03989

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	Т	С		5	10.0	5.81	20	1.31	2.0
40-016	WHITE SUCKER	0	Т	S	W	2	4.0	2.33	8	0.52	2.0
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	1	2.0	1.16	2	0.13	1.0
47-004	YELLOW BULLHEAD	I	Т	С		1	2.0	1.16	400	26.25	200.0
77-006	LARGEMOUTH BASS	С		С	F	15	30.0	17.44	60	3.94	2.0
77-008	GREEN SUNFISH	I	Т	С	S	56	112.0	65.12	1000	65.62	8.9
77-009	BLUEGILL SUNFISH	I	Р	С	S	3	6.0	3.49	20	1.31	3.3
80-003	YELLOW PERCH			М		1	2.0	1.16	10	0.66	5.0
80-014	JOHNNY DARTER	I		С	D	2	4.0	2.33	4	0.26	1.0
No Spec	ies: 9 Nat. Species:	9	Hybrids	s: 0		Total Co	unted:	86 <b>To</b>	tal Rel. W	′t. :	1524

**IBI:** 26.0

MIwb: N/A

Site ID:	River	: 95-995 M	ill Creek		RM	1: 13.80	Date: 10/18/2019
Time Fished:	1550	Distance:	0.200	Drainge (sq mi):	10.4	Depth	: 0
Location: Wash	nington St				Lat: 4	2.36249 Lo	ong: -88.01576

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	Р		М	F	2	3.0	1.16	2250	10.87	750.0
40-016	WHITE SUCKER	0	Т	S	W	1	1.5	0.58	900	4.35	600.0
43-001	COMMON CARP	0	Т	М	G	3	4.5	1.73	6165	29.79	1370.0
43-003	GOLDEN SHINER	I	Т	М	Ν	16	24.0	9.25	315	1.52	13.1
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	2	3.0	1.16	9	0.04	3.0
54-002	BLACKSTRIPE TOPMINNOW	I		М		4	6.0	2.31	6	0.03	1.0
74-006	YELLOW BASS	Р	Р	М		11	16.5	6.36	112	0.54	6.8
77-001	WHITE CRAPPIE	I		С	S	2	3.0	1.16	37	0.18	12.5
77-002	BLACK CRAPPIE	I		С	S	15	22.5	8.67	487	2.36	21.6
77-006	LARGEMOUTH BASS	С		С	F	10	15.0	5.78	6960	33.64	464.0
77-008	GREEN SUNFISH	I	Т	С	S	8	12.0	4.62	112	0.54	9.3
77-009	BLUEGILL SUNFISH	I	Р	С	S	72	108.0	41.62	2325	11.24	21.5
77-013	PUMPKINSEED SUNFISH	I	Р	С	S	6	9.0	3.47	262	1.27	29.1
77-015	GREEN SF X BLUEGILL SF					1	1.5	0.58	112	0.54	75.0
80-003	YELLOW PERCH			М		20	30.0	11.56	637	3.08	21.2

No Species: 14

Nat. Species: N/A 13 **Hybrids:** 1

Total Counted: 173 Total Rel. Wt. : 20692

IBI: 32.0 Mlwb:

Site ID:	River	: 95-995 M	ill Creek		RM:	7.20	Date: 08/15/2019
Time Fished:	1235	Distance:	0.150	Drainge (sq mi):	21.4	Depth	n: 0
Location: Dst.	Stearns So	chool Rd.			Lat: 42.9	99890 L	ong: -87.98277

Species Code:	Species Name:	Feed	Toler-	Breed	IBI	No.	Rel.	% by	Rel.	% by	Av.
	Species Name.	Guild	ance	Guild	Group	Fish	No.	No.	Wt.	Wt.	Wt.
40-016	WHITE SUCKER	0	Т	S	W	4	8.0	2.96	4000	32.71	500.0
43-004	HORNYHEAD CHUB	I	I	Ν	Ν	3	6.0	2.22	200	1.64	33.3
43-013	CREEK CHUB	G	Т	Ν	Ν	4	8.0	2.96	250	2.04	31.2
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	10	20.0	7.41	30	0.25	1.5
47-002	CHANNEL CATFISH			С	F	1	2.0	0.74	4000	32.71	2000.0
47-004	YELLOW BULLHEAD	Ι	Т	С		12	24.0	8.89	1400	11.45	58.3
47-006	BLACK BULLHEAD	Ι	Р	С		1	2.0	0.74	30	0.25	15.0
54-002	BLACKSTRIPE TOPMINNOW	Ι		Μ		5	10.0	3.70	10	0.08	1.0
77-006	LARGEMOUTH BASS	С		С	F	11	22.0	8.15	100	0.82	4.5
77-008	GREEN SUNFISH	Ι	Т	С	S	46	92.0	34.07	800	6.54	8.7
77-009	BLUEGILL SUNFISH	Ι	Р	С	S	26	52.0	19.26	1000	8.18	19.2
77-015	GREEN SF X BLUEGILL SF					4	8.0	2.96	200	1.64	25.0
80-003	YELLOW PERCH			Μ		4	8.0	2.96	200	1.64	25.0
80-014	JOHNNY DARTER	Ι		С	D	4	8.0	2.96	8	0.07	1.0
No Spec	ies: 13 Nat. Species:	13	Hybrids	: 1		Total C	ounted:	135 <b>Tc</b>	otal Rel. W	/t. :	12228

IBI: 32.0 Mlwb:

6.9

Site ID:	River	: 95-995 M	ill Creek		RI	VI: 1.71	Date: 08/15/2019	)
Time Fished:	1385	Distance:	0.200	Drainge (sq mi):	62.3	3 Depth	n: 0	
Location: ust.	WWTP ou	tfall			Lat: 4	12.42095 L	ong: -87.95677	

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
15-001	BOWFIN	P		С	- 1	1	1.5	0.25	1800	11.64	1200.0
20-003	GIZZARD SHAD	0		М		3	4.5	0.74	45	0.29	10.0
37-003	NORTHERN PIKE	Р		М	F	1	1.5	0.25	1500	9.70	1000.0
40-016	WHITE SUCKER	0	Т	S	W	5	7.5	1.23	1500	9.70	200.0
43-001	COMMON CARP	0	Т	М	G	2	3.0	0.49	3000	19.40	1000.0
43-003	GOLDEN SHINER	Ι	Т	М	Ν	9	13.5	2.22	90	0.58	6.6
43-004	HORNYHEAD CHUB	Ι	I	Ν	Ν	1	1.5	0.25	75	0.49	50.0
43-032	SPOTFIN SHINER	Ι		М	Ν	90	135.0	22.17	255	1.65	1.8
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	46	69.0	11.33	225	1.46	3.2
47-002	CHANNEL CATFISH			С	F	17	25.5	4.19	975	6.31	38.2
47-004	YELLOW BULLHEAD	Ι	Т	С		2	3.0	0.49	300	1.94	100.0
47-008	STONECAT MADTOM	Ι	I	С		7	10.5	1.72	150	0.97	14.2
54-002	BLACKSTRIPE TOPMINNOW	Ι		Μ		10	15.0	2.46	22	0.15	1.5
77-002	BLACK CRAPPIE	Ι		С	S	4	6.0	0.99	225	1.46	37.5
77-006	LARGEMOUTH BASS	С		С	F	2	3.0	0.49	90	0.58	30.0
77-007	WARMOUTH SUNFISH	С		С	S	8	12.0	1.97	525	3.40	43.7
77-008	GREEN SUNFISH	I	Т	С	S	17	25.5	4.19	300	1.94	11.7
77-009	BLUEGILL SUNFISH	Ι	Р	С	S	103	154.5	25.37	3375	21.83	21.8
77-010	ORANGESPOTTED SUNFISH	Ι		С	S	30	45.0	7.39	150	0.97	3.3
77-013	PUMPKINSEED SUNFISH	Ι	Р	С	S	27	40.5	6.65	750	4.85	18.5
80-005	BLACKSIDE DARTER	I		S	D	19	28.5	4.68	105	0.68	3.6
80-014	JOHNNY DARTER	Ι		С	D	2	3.0	0.49	3	0.02	1.0
No Spec	cies: 22 Nat. Species: 40.0 Miwb: 8.9	21	Hybrids	: 0		Total Co	unted:	406 <b>T</b>	otal Rel. W	t. :	15460

Site ID:	River	: 95-995 M	ill Creek		RM:	0.70	Date: 08/15/2019	
Time Fished:	1456	Distance:	0.200	Drainge (sq mi):	63.8	Depth	: 0	
Location: ust.	Dillys Rd.				Lat: 42	.41830 Lo	ong: -87.94527	

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group		No. -ish	Rel. No.	% by	Rel. Wt.	% by Wt.	Av. Wt.
37-001	REDFIN PICKEREL	P	P	M	Group		1	1.5	<u>No.</u> 0.61	7	0.04	<u></u> 5.0
40-016	WHITE SUCKER	0	Т	S	W		10	15.0	6.10	, 5670	29.21	378.0
43-001	COMMON CARP	0	Т	М	G		4	6.0	2.44	5250	27.04	875.0
43-003	GOLDEN SHINER	I	Т	М	N		1	1.5	0.61	18	0.09	12.0
43-032	SPOTFIN SHINER	I		М	Ν		25	37.5	15.24	75	0.39	2.0
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν		13	19.5	7.93	45	0.23	2.3
47-002	CHANNEL CATFISH			С	F		5	7.5	3.05	2415	12.44	322.0
47-004	YELLOW BULLHEAD	Ι	Т	С			3	4.5	1.83	165	0.85	36.6
54-002	BLACKSTRIPE TOPMINNOW	I		М			7	10.5	4.27	7	0.04	0.7
77-006	LARGEMOUTH BASS	С		С	F		5	7.5	3.05	2430	12.52	324.0
77-008	GREEN SUNFISH	I	Т	С	S		31	46.5	18.90	390	2.01	8.3
77-009	BLUEGILL SUNFISH	I	Р	С	S		45	67.5	27.44	2700	13.91	40.0
77-013	PUMPKINSEED SUNFISH	I	Р	С	S		2	3.0	1.22	195	1.00	65.0
80-005	BLACKSIDE DARTER	I		S	D		12	18.0	7.32	45	0.23	2.5
No Spec	ties: 14 Nat. Species:	13	Hybrids	: 0		Tota	al Cou	unted:	164 <b>T</b> o	otal Rel. W	′t. :	19413

IBI:

32.0

Mlwb:

7.4

Site ID:	e ID: River: 95-996 North Mill Creek					11.30 D	ate: 08/16/2019
Time Fished:	1273	Distance:	0.150	Drainge (sq mi):	19.2	Depth:	0
Location: Ust E	dwards R	d.			Lat: 42.4	8082 Long	: -88.01196

No Spec	cies: 9 Nat. Species:	9	Hybrids	: 0		Total Cou	unted:	66 <b>To</b>	tal Rel. W	/t. :	4514
80-014	JOHNNY DARTER	I		С	D	1	2.0	1.52	2	0.04	1.0
77-009	BLUEGILL SUNFISH	I	Р	С	S	12	24.0	18.18	1000	22.15	41.6
77-008	GREEN SUNFISH	I	Т	С	S	26	52.0	39.39	700	15.51	13.4
77-006	LARGEMOUTH BASS	С		С	F	3	6.0	4.55	12	0.27	2.0
47-006	BLACK BULLHEAD	L	Р	С		4	8.0	6.06	1400	31.01	175.0
47-004	YELLOW BULLHEAD	I	Т	С		3	6.0	4.55	400	8.86	66.6
40-016	WHITE SUCKER	0	Т	S	W	1	2.0	1.52	500	11.08	250.0
37-003	NORTHERN PIKE	Р		Μ	F	2	4.0	3.03	200	4.43	50.0
34-001	CENTRAL MUDMINNOW	I	Т	С		14	28.0	21.21	300	6.65	10.7
Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.

**IBI:** 28.0

Mlwb: N/A

Site ID:	River	: 95-996 No	orth Mill C	reek	RN	M: 10.20	Date: 08/16/2019
Time Fished:	1125	Distance:	0.150	Drainge (sq mi):	20.8	B Depth	: 0
Location: Dst.	IL 173				Lat: 4	2.46497 Lo	ong: -88.00859

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	Т	С		10	20.0	9.09	140	0.57	7.0
37-003	NORTHERN PIKE	Р		Μ	F	1	2.0	0.91	2400	9.74	1200.0
40-016	WHITE SUCKER	0	Т	S	W	8	16.0	7.27	6300	25.57	393.7
43-001	COMMON CARP	0	Т	Μ	G	4	8.0	3.64	10480	42.53	1310.0
47-004	YELLOW BULLHEAD	I	Т	С		4	8.0	3.64	340	1.38	42.5
77-002	BLACK CRAPPIE	I		С	S	1	2.0	0.91	20	0.08	10.0
77-006	LARGEMOUTH BASS	С		С	F	2	4.0	1.82	200	0.81	50.0
77-008	GREEN SUNFISH	I	Т	С	S	45	90.0	40.91	1960	7.95	21.7
77-009	BLUEGILL SUNFISH	I	Р	С	S	33	66.0	30.00	2780	11.28	42.1
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.91	20	0.08	10.0
80-014	JOHNNY DARTER	I		С	D	1	2.0	0.91	2	0.01	1.0
No Spec	cies: 10 Nat. Species:	9	Hybrids	: 1		Total Co	unted:	110 <b>To</b>	otal Rel. W	't.:	24642
IBI:	<b>30.0 Miwb:</b> 6.	1									

Site ID:	River	: 95-996 N	orth Mill C	reek	RM:	8.10	Date: 08/16/2019
Time Fished:	1195	Distance:	0.150	Drainge (sq mi):	29.5	Depth	. 0
Location: Dst.	closed bri	idge			Lat: 42.	44342 Lo	ong: -87.99981

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	Т	С		2	4.0	1.16	10	0.16	2.5
40-016	WHITE SUCKER	0	Т	S	W	7	14.0	4.07	440	6.91	31.4
43-001	COMMON CARP	0	Т	Μ	G	1	2.0	0.58	3200	50.24	1600.0
43-004	HORNYHEAD CHUB	I.	Ι	Ν	Ν	3	6.0	1.74	100	1.57	16.6
43-013	CREEK CHUB	G	Т	Ν	Ν	2	4.0	1.16	120	1.88	30.0
43-042	FATHEAD MINNOW	0	Т	С	Ν	18	36.0	10.47	60	0.94	1.6
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	57	114.0	33.14	420	6.59	3.6
47-004	YELLOW BULLHEAD	I	Т	С		6	12.0	3.49	440	6.91	36.6
77-006	LARGEMOUTH BASS	С		С	F	7	14.0	4.07	100	1.57	7.1
77-008	GREEN SUNFISH	I	Т	С	S	64	128.0	37.21	1200	18.84	9.3
77-009	BLUEGILL SUNFISH	I	Р	С	S	5	10.0	2.91	280	4.40	28.0
No Spec	cies: 11 Nat. Species:	10	Hybrids	0		Total Co	unted:	172 <b>To</b>	tal Rel. W	t. :	6370
IBI:	24.0 <b>Miwb:</b> 5	.0									

Site ID:	River	: 95-996 N	orth Mill C	Creek	RM:	1.10	Date: 08/16/2019
Time Fished:	1056	Distance:	0.150	Drainge (sq mi):	31.9	Depth	. 0
Location: Dst.	Millburn F	Rd.			Lat: 42.4	42340 Lo	ng: -87.99709

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	Р		М	F	2	4.0	2.27	3000	14.18	750.0
40-016	WHITE SUCKER	0	Т	S	W	12	24.0	13.64	9000	42.54	375.0
43-001	COMMON CARP	0	Т	М	G	7	14.0	7.95	7200	34.03	514.2
43-042	FATHEAD MINNOW	0	Т	С	Ν	1	2.0	1.14	4	0.02	2.0
43-043	BLUNTNOSE MINNOW	0	Т	С	Ν	7	14.0	7.95	20	0.09	1.4
47-002	CHANNEL CATFISH			С	F	2	4.0	2.27	8	0.04	2.0
47-004	YELLOW BULLHEAD	Ι	Т	С		4	8.0	4.55	700	3.31	87.5
54-002	BLACKSTRIPE TOPMINNOW	Ι		М		4	8.0	4.55	8	0.04	1.0
77-006	LARGEMOUTH BASS	С		С	F	2	4.0	2.27	8	0.04	2.0
77-008	GREEN SUNFISH	Ι	Т	С	S	28	56.0	31.82	700	3.31	12.5
77-009	BLUEGILL SUNFISH	Ι	Р	С	S	17	34.0	19.32	500	2.36	14.7
77-010	ORANGESPOTTED SUNFISH	Ι		С	S	1	2.0	1.14	8	0.04	4.0
80-014	JOHNNY DARTER	Ι		С	D	1	2.0	1.14	2	0.01	1.0
No Spec IBI:	cies: 13 Nat. Species: 28.0 Mlwb: 6.1	12	Hybrids	: 0		Total Co	unted:	88 <b>To</b>	tal Rel. W	't. :	21158

#### **APPENDIX B**

#### Upper Des Plaines River Year 3 Subwatersheds 2019 Macroinvertebrate Assemblage Data

**B-1**: Macroinvertebrate IBI Metrics and Scores

B-2: Macroinvertebrate Taxa Grand (all sites combined by four subwatershed bundles)B-3: Macroinvertebrate Taxa by Site and Sample

		_	Drainage			Num	Number of			Percent:	nt:	
River Mile S	Site ID	Sample Date	Area (sq mi)	Sub- samp	Total Taxa	Coleoptera Taxa	Mayfly Taxa	Intolerant Taxa	MBI	Percent Scrapers	Percent EPT	MIBI
Bull Creek (95-051)	(95-051)											
Year: 2019	-											
5.95	14-6	07/30/2019	2.40	-	17( 37.0)	1(20.0)	0( 0.0)	0( 0.0)	6.3(77.1)	0.3( 1.1)	0.0( 0.0)	19.3
4.70	14-5	09/09/2019	1.30		21( 46.0)	0( 0.0)	0( 0.0)	3(33.3)	7.3(60.7)	0.0( 0.0)	0.0( 0.0)	20.0
1.00	14-2	07/31/2019	8.40		29( 63.0)	3(60.0)	0( 0.0)	1(11.1)	6.3(77.1)	7.1(23.9)	6.1( 8.3)	34.8
0.50	14-1	07/30/2019	11.70		36( 78.0)	3(60.0)	2(19.6)	1(11.1)	5.6(88.5)	14.0(47.3)	22.5(30.4)	47.9
Hastings Creek (95-702)	.eek (95	-702)										
Year: 2019	~											
3.12	10-5	08/03/2019	3.90		27( 59.0)	0( 0.0)	1( 9.8)	3(33.3)	6.3(77.1)	3.0(10.0)	20.7(27.9)	31.0
1.68	10-4	08/04/2019	5.60	-	19( 41.0)	0( 0.0)	0( 0.0)	4(44.4)	5.4(91.8)	3.3(11.1)	3.3( 4.5)	27.5
Bull's Brook (95-704)	k (95-70	4)										
Year: 2019	-											
1.95	13-15	08/01/2019	1.90		31( 67.0)	1(20.0)	1( 9.8)	2(22.2)	5.3(93.4)	1.4( 4.7)	11.2(15.1)	33.2
0.25	13-7	08/01/2019	2.70		24( 52.0)	4(80.0)	1( 9.8)	4(44.4)	4.1(100)	14.9(50.3)	6.0( 8.1)	49.3
ewport Dra	ainage D	Newport Drainage Ditch (95-708)										
Year: 2019	~											
3.03	12-2	10/18/2019	2.80	-	14( 30.0)	0( 0.0)	3(29.4)	1(11.1)	4.9(100)	4.8(16.1)	9.2(12.4)	28.4
0.70	12-1	08/04/2019	7.30		27( 59.0)	1(20.0)	2(19.6)	3(33.3)	5.3(93.4)	15.8(53.4)	4.2( 5.7)	40.6
Stoneroller Creek (95-709)	Creek (	95-709)										
Year: 2019	~											
0.42	13-9	08/02/2019	4.10		27( 59.0)	4(80.0)	2(19.6)	3(33.3)	6.1(80.3)	46.2( 100)	22.8(30.8)	57.6
Suburban C	ountry (	Suburban Country Club Tributary (95-710)	710)									
Year: 2019	~											
00 0	07 07		00 1									

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		1	Drainage			Num	Number of			Percent:	nt:	
River Mile S	Site ID	Sample Date	Area (sq mi)	Sub- samp	Total Taxa	Coleoptera Taxa	Mayfiy Taxa	Intolerant Taxa	MBI	Percent Scrapers	Percent EPT	MIBI
Slocum Con	Irners CI	Slocum Conrners Creek (95-711)										
Year: 2019	<b>C</b>											
1.36	13-11	08/04/2019	2.40		22( 48.0)	2(40.0)	2(19.6)	3(33.3)	4.0(100)	3.5(11.9)	3.9( 5.2)	36.9
Jnnamed Tr	rib to De	Unnamed Trib to DesPlaines River (95-714)	-714)									
Year: 2019	•											
0.13	13-17	07/31/2019	0.90		19( 41.0)	0( 0.0)	0( 0.0)	1(11.1)	7.1(63.9)	40.2(100)	0.0( 0.0)	30.9
Jnnamed Tr	rib to N.	Unnamed Trib to N. Mill Creek (95-715)	-									
Year: 2019	•											
0.04	10-6	08/03/2019	06.0		28( 61.0)	1(20.0)	2(19.6)	4(44.4)	4.7(100)	1.0( 3.4)	25.6(34.6)	40.4
Jnnamed Tr	rib - Gree	Unnamed Trib - Greenleaf Creek (95-716)	16)									
Year: 2019	<b>C</b>											
0.40	13-13	08/02/2019	1.10		9( 20.0)	1(20.0)	0( 0.0)	2(22.2)	5.7(86.9)	0.3( 1.1)	0.0( 0.0)	21.5
Vest Brancl	h Bull Cr	West Branch Bull Creek (95-719)										
Year: 2019	•											
2.54	14-4	07/31/2019	5.10		22( 48.0)	2(40.0)	0( 0.0)	0( 0.0)	6.1(80.3)	0.7( 2.2)	3.0( 4.0)	24.9
1.60	14-3	07/31/2019	7.10		27( 59.0)	2(40.0)	1( 9.8)	2(22.2)	5.8(85.3)	21.6(73.0)	37.1(50.1)	48.5
Vest Fork B	3elvidere	West Fork Belvidere Rd. Trib (95-720)										
Year: 2019	•											
0.21	13-14	08/01/2019	2.30		18( 39.0)	2(40.0)	0( 0.0)	1(11.1)	6.0(82.0)	2.1( 6.9)	0.9( 1.2)	25.7
0.15	13-8	08/01/2019	3.80		36( 78.0)	2(40.0)	2(19.6)	3(33.3)	5.6(88.5)	14.0(47.2)	7.0( 9.5)	45.2
Mill Creek (95-995)	(36-395)											
Year: 2019	•											
17.20	11-6	08/03/2019	4.50		19( 41.0)	2(40.0)	0( 0.0)	2(22.2)	4.6( 100)	0.6( 2.1)	1.6( 2.1)	29.6
00 01												

01/06/2021

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		1	Drainage			Numk	Number of			Percent:	nt:	
River Mile	Site ID	Site ID Sample Date	Area (sq mi)	Sub- samp	Total Taxa	Coleoptera Taxa	Mayfly Taxa	Intolerant Taxa	MBI	Percent Scrapers	Percent EPT	MIBI
10.10	11-4	08/03/2019	18.33		27( 59.0)	2(40.0)	4(39.2)	4(44.4)	5.5(90.2)	1.0( 3.5)	18.4(24.9)	43.0
7.20	11-3	07/30/2019	21.40		27( 59.0)	3(60.0)	2(19.6)	3(33.3)	5.3(93.4)	2.4( 8.1)	31.4(42.4)	45.1
0.70	11-1	08/03/2019	63.80		29( 63.0)	3(60.0)	4(39.2)	3(33.3)	5.2(95.1)	19.2(64.9)	40.1(54.2)	58.5
orth Mil	North Mill Creek (95-996)	<b>5-996)</b>										
Year: 2019	019											
11.30	10-7	08/04/2019	19.20		36( 78.0)	2(40.0)	3(29.4)	4(44.4)	5.4(91.8)	15.9(53.7)	31.1(42.0)	54.2
1.10	10-1	08/03/2019	31.90		30( 65.0)	4(80.0)	3(29.4)	4(44.4)	5.4(91.8)	20.1(68.0)	21.2(28.7)	58.2

Appendix Table B-1. Illinois Macroinvertebrate IBI metrics and values from the upper Des Plaines study area in 2019.

		Illinois			Samples
		Tolerance	Total		Collected
Taxa Code	Taxa Name	Rating	Number	Percent	In
06800	Gammarus sp	3	356	23.06	5
68708	Dubiraphia vittata group	5	138	8.94	5
03600	Oligochaeta	10	111	7.19	5
52200	Cheumatopsyche sp	6	110	7.12	4
11130	Baetis intercalaris	4	108	6.99	3
68700	Dubiraphia sp	5	72	4.66	4
05800	Caecidotea sp	6	59	3.82	3
84450	Polypedilum (Uresipedilum) flavum	6	49	3.17	4
22001	Coenagrionidae	5.5	47	3.04	5
69400	Stenelmis sp	7	42	2.72	4
	Polypedilum (Tripodura) scalaenum group	6	39	2.53	4
	Macronychus glabratus	2	35	2.27	2
	Polypedilum (P.) illinoense	6	31	2.01	4
	Dicrotendipes neomodestus	6	26	1.68	4
83300	Glyptotendipes (G.) sp	10	23	1.49	1
13400	Stenacron sp	4	22	1.42	4
	Hayesomyia senata or Thienemannimyia norena	5	22	1.42	3
17200	Caenis sp	6	21	1.36	2
	Endochironomus nigricans	6	21	1.36	1
82820	Cryptochironomus sp	8	19	1.23	4
85625	Rheotanytarsus sp	6	18	1.17	2
	Physella sp	9	18	1.17	2
	Sphaerium sp	5	17	1.1	4
	Tricorythodes sp	5	13	0.84	1
78655	Procladius (Holotanypus) sp	8	11	0.71	4
22300	Argia sp	5	9	0.58	3
06201	Hyalella azteca	4	8	0.52	3
98200	Pisidium sp	5	8	0.52	3
52570	Hydropsyche simulans	5	7	0.45	1
01801	Turbellaria	6	5	0.32	4
68201	Scirtidae	7	5	0.32	3
84000	Parachironomus sp	8	5	0.32	1
65800	Berosus sp		4	0.26	1
78600	Pentaneura inconspicua	3	4	0.26	1
82880	Cryptotendipes sp	6	4	0.26	3
84520	Polypedilum (Tripodura) halterale group	6	4	0.26	2
08200	Orconectes sp	5	3	0.19	3
13000	Leucrocuta sp	3	3	0.19	1
21200	Calopteryx sp	4	3	0.19	2
44501	Corixidae		2	0.13	2
74100	Simulium sp	6	2	0.13	1

		Illinois			Samples
		Tolerance	Total		Collected
Taxa Code	Taxa Name	Rating	Number	Percent	In
77120	Ablabesmyia mallochi	6	2	0.13	2
77130	Ablabesmyia rhamphe group	6	2	0.13	2
78200	Larsia sp	6	2	0.13	1
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"	3	2	0.13	2
83840	Microtendipes pedellus group	6	2	0.13	1
84010	Parachironomus "abortivus" (sensu Simpson & Bode, 1980)	8	2	0.13	1
84700	Stenochironomus sp	3	2	0.13	2
85265	Cladotanytarsus vanderwulpi group sp 5	7	2	0.13	1
85500	Paratanytarsus sp	6	2	0.13	2
86100	Chrysops sp	7	2	0.13	1
11200	Callibaetis sp	4	1	0.06	1
23700	Anax sp	5	1	0.06	1
48200	Chauliodes sp	4	1	0.06	1
54601	Phryganeidae	3.5	1	0.06	1
59100	Ceraclea sp	3	1	0.06	1
59570	Oecetis nocturna	5	1	0.06	1
59950	Parapoynx sp		1	0.06	1
77001	Tanypodinae	6	1	0.06	1
77355	Clinotanypus pinguis	6	1	0.06	1
77500	Conchapelopia sp	6	1	0.06	1
80510	Cricotopus (Isocladius) sylvestris group	8	1	0.06	1
81825	Rheocricotopus (Psilocricotopus) robacki	6	1	0.06	1
82730	Chironomus (C.) decorus group	11	1	0.06	1
83051	Dicrotendipes simpsoni	6	1	0.06	1
84400	Polypedilum sp	6	1	0.06	1
84460	Polypedilum (P.) fallax group	6	1	0.06	1
84750	Stictochironomus sp	5	1	0.06	1
85800	Tanytarsus sp	7	1	0.06	1
85821	Tanytarsus glabrescens group sp 7	7	1	0.06	1
89601	Muscidae	8	1	0.06	1
	Totals(71 Taxa)		1544	100%	

		Illinois			
		Tolerance	Total		Samples
Taxa Code	Taxa Name	Rating	Number	Percent	Collected In
01801	Turbellaria	6	278	12.75	6
52200	Cheumatopsyche sp	6	190	8.72	6
06201	Hyalella azteca	4	154	7.06	6
68708	Dubiraphia vittata group	5	147	6.74	5
03600	Oligochaeta	10	122	5.6	7
11130	Baetis intercalaris	4	120	5.5	4
06800	Gammarus sp	3	114	5.23	5
13400	Stenacron sp	4	98	4.5	4
74100	Simulium sp	6	73	3.35	2
84450	Polypedilum (Uresipedilum) flavum	6	73	3.35	7
78600	Pentaneura inconspicua	3	67	3.07	5
84470	Polypedilum (P.) illinoense	6	66	3.03	6
68700	Dubiraphia sp	5	63	2.89	3
85625	Rheotanytarsus sp	6	52	2.39	5
05800	Caecidotea sp	6	42	1.93	4
17200	Caenis sp	6	36	1.65	2
68201	Scirtidae	7	33	1.51	5
52530	Hydropsyche depravata group	5	27	1.24	3
77500	Conchapelopia sp	6	24	1.1	5
84540	Polypedilum (Tripodura) scalaenum group	6	21	0.96	5
82820	Cryptochironomus sp	8	20	0.92	6
77750	Hayesomyia senata or Thienemannimyia norena	5	19	0.87	3
98200	Pisidium sp	5	17	0.78	5
06700	Crangonyx sp	4	16	0.73	1
53800	Hydroptila sp	2	16	0.73	4
68901	Macronychus glabratus	2	16	0.73	2
21001	Calopterygidae	3.5	14	0.64	3
22001	Coenagrionidae	5.5	14	0.64	5
69400	Stenelmis sp	7	14	0.64	2
84520	Polypedilum (Tripodura) halterale group	6	12	0.55	2
84700	Stenochironomus sp	3	12	0.55	4
21200	Calopteryx sp	4	11	0.5	1
	Physella sp	9	10	0.46	3
08200	Orconectes sp	5	9	0.41	3
85500	Paratanytarsus sp	6	9	0.41	4
	Argia sp	5	8	0.37	2
77120	Ablabesmyia mallochi	6	8	0.37	4
77355	Clinotanypus pinguis	6	7	0.32	1
78655	Procladius (Holotanypus) sp	8	7	0.32	4
05900	Lirceus sp	4	6	0.28	1
59580	Oecetis persimilis	5	6	0.28	3

		Illinois			
		Tolerance	Total		Samples
Taxa Code	Taxa Name	Rating	Number	Percent	Collected In
80420	Cricotopus (C.) bicinctus	8	6	0.28	1
42700	Belostoma sp		5	0.23	2
67700	Paracymus sp		5	0.23	2
82880	Cryptotendipes sp	6	5	0.23	2
84300	Phaenopsectra obediens group	4	5	0.23	1
84750	Stictochironomus sp	5	5	0.23	2
87540	Hemerodromia sp	6	5	0.23	3
44501	Corixidae		4	0.18	2
53501	Hydroptilidae	3.5	4	0.18	1
65800	Berosus sp		4	0.18	2
	Nanocladius (N.) crassicornus or N. (N.)				
81231	"rectinervis"	3	4	0.18	2
83300	Glyptotendipes (G.) sp	10	4	0.18	1
98600	Sphaerium sp	5	4	0.18	1
52430	Ceratopsyche morosa group	4	3	0.14	1
	Oecetis inconspicua complex sp A (sensu Floyd,				
59550	1995)	5	3	0.14	2
77001	Tanypodinae	6	3	0.14	2
78200	Larsia sp	6	3	0.14	2
80510	Cricotopus (Isocladius) sylvestris group	8	3	0.14	1
82730	Chironomus (C.) decorus group	11	3	0.14	2
84460	Polypedilum (P.) fallax group	6	3	0.14	3
85001	Tanytarsini	6	3	0.14	1
04930	Erpobdella sp	8	2	0.09	1
23909	Boyeria vinosa	3	2	0.09	2
60350	Gyretes sinuatus	0	2	0.09	1
71900	Tipula sp	4	2	0.09	2
83840	Microtendipes pedellus group	6	2	0.09	2
84210	Paratendipes albimanus or P. duplicatus	3	2	0.09	1
04666	Helobdella papillata	8	1	0.05	1
04901	Erpobdellidae	8	1	0.05	1
04935	Erpobdella punctata punctata	8	1	0.05	1
11120	Baetis flavistriga	4	1	0.05	1
12501	Heptageniidae	3.5	1	0.05	1
16700	Tricorythodes sp	5	1	0.05	1
43570	Neoplea sp		1	0.05	1
48200	Chauliodes sp	4	1	0.05	1
59500	Oecetis sp	5	1	0.05	1
60400	Gyrinus sp	4	1	0.05	1
63300	Hydroporini		1	0.05	1
63900	Laccophilus sp		1	0.05	1

		Illinois	Tatal		Commission
		Tolerance	Total		Samples
Taxa Code	Taxa Name	Rating	Number	Percent	Collected In
67100	Hydrobius sp	0	1	0.05	1
67800	Tropisternus sp		1	0.05	1
68601	Ancyronyx variegata	2	1	0.05	1
77140	Ablabesmyia peleensis	6	1	0.05	1
77700	Guttipelopia guttipennis	6	1	0.05	1
78140	Labrundinia pilosella	4	1	0.05	1
80410	Cricotopus (C.) sp	8	1	0.05	1
81825	Rheocricotopus (Psilocricotopus) robacki	6	1	0.05	1
82141	Thienemanniella xena	2	1	0.05	1
82501	Chironomini	6	1	0.05	1
82885	Cryptotendipes pseudotener	6	1	0.05	1
	Microtendipes "caelum" (sensu Simpson & Bode,				
83820	1980)	6	1	0.05	1
84000	Parachironomus sp	8	1	0.05	1
84601	Saetheria species 1 (sensu Jackson, 1977)	6	1	0.05	1
84960	Pseudochironomus sp	5	1	0.05	1
85615	Rheotanytarsus pellucidus	6	1	0.05	1
85800	Tanytarsus sp	7	1	0.05	1
86001	Tabanidae	7	1	0.05	1
94201	Lymnaeidae	7	1	0.05	1
95900	Gyraulus sp	6	1	0.05	1
96264	Planorbella (Pierosoma) pilsbryi	6.5	1	0.05	1
	Totals(101 Taxa)		2180	100%	

**Appendix Table B-4.** Macroinvertebrate taxa collected at all sites in the Bull Creek-Bulls Brook DPR Tributaries (W) subwatershed, 2019.

		Illinois			
		Tolerance	Total		Samples
Taxa Code	Taxa Name	Rating	Number	Percent	Collected In
05800	Caecidotea sp	6	620	17.69	8
01801	Turbellaria	6	271	7.73	9
69400	Stenelmis sp	7	268	7.65	9
03600	Oligochaeta	10	265	7.56	11
06800	Gammarus sp	3	251	7.16	4
06201	Hyalella azteca	4	244	6.96	8
52200	Cheumatopsyche sp	6	215	6.13	9
98600	Sphaerium sp	5	206	5.88	8
84450	Polypedilum (Uresipedilum) flavum	6	108	3.08	10
22001	Coenagrionidae	5.5	75	2.14	8
06700	Crangonyx sp	4	63	1.8	3
11120	Baetis flavistriga	4	48	1.37	4
11130	Baetis intercalaris	4	45	1.28	4
74100	Simulium sp	6	45	1.28	7
84470	Polypedilum (P.) illinoense	6	42	1.2	7
98200	Pisidium sp	5	38	1.08	6
69200	Optioservus sp	4	34	0.97	5
04664	Helobdella stagnalis	8	33	0.94	4
68708	Dubiraphia vittata group	5	33	0.94	8
77500	Conchapelopia sp	6	29	0.83	8
85500	Paratanytarsus sp	6	27	0.77	6
84000	Parachironomus sp	8	26	0.74	2
93200	Hydrobiidae	6	26	0.74	3
53800	Hydroptila sp	2	24	0.68	4
83040	Dicrotendipes neomodestus	6	23	0.66	6
82820	Cryptochironomus sp	8	22	0.63	8
85625	Rheotanytarsus sp	6	22	0.63	4
95100	Physella sp	9	22	0.63	4
85800	Tanytarsus sp	7	21	0.6	5
84540	Polypedilum (Tripodura) scalaenum group	6	20	0.57	6
82730	Chironomus (C.) decorus group	11	19	0.54	7
78655	Procladius (Holotanypus) sp	8	18	0.51	4
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980	6	18	0.51	5
84750	Stictochironomus sp	5	17	0.49	8
22300	Argia sp	5	16	0.46	3
52530	Hydropsyche depravata group	5	15	0.43	4
83300	Glyptotendipes (G.) sp	10	15	0.43	3
21001	Calopterygidae	3.5	14	0.4	5
84210	Paratendipes albimanus or P. duplicatus	3	12	0.34	6
08200	Orconectes sp	5	9	0.26	5
17200	Caenis sp	6	8	0.23	3

**Appendix Table B-4.** Macroinvertebrate taxa collected at all sites in the Bull Creek-Bulls Brook DPR Tributaries (W) subwatershed, 2019.

		Illinois			
		Tolerance	Total		Samples
Taxa Code	Taxa Name	Rating	Number	Percent	Collected In
21200	Calopteryx sp	4	8	0.23	2
44501	Corixidae	99.9	8	0.23	1
83158	Endochironomus nigricans	6	8	0.23	3
04935	Erpobdella punctata punctata	8	7	0.2	3
68901	Macronychus glabratus	2	7	0.2	2
83051	Dicrotendipes simpsoni	6	7	0.2	3
60900	Peltodytes sp	99.9	6	0.17	2
71900	Tipula sp	4	6	0.17	3
77750	Hayesomyia senata or Thienemannimyia norena	5	6	0.17	4
81650	Parametriocnemus sp	4	6	0.17	3
85001	Tanytarsini	6	6	0.17	1
04930	Erpobdella sp	8	5	0.14	1
77120	Ablabesmyia mallochi	6	5	0.14	3
78599	Pentaneura sp	3	5	0.14	1
80420	Cricotopus (C.) bicinctus	8	5	0.14	3
80430	Cricotopus (C.) tremulus group	8	5	0.14	3
83840	Microtendipes pedellus group	6	5	0.14	3
97601	Corbicula fluminea	4	5	0.14	2
98001	Pisidiidae	5	5	0.14	1
04901	Erpobdellidae	8	4	0.11	2
82880	Cryptotendipes sp	6	4	0.11	3
85400	Micropsectra sp	4	4	0.11	2
87540	Hemerodromia sp	6	4	0.11	2
08601	Hydrachnidia	99.9	3	0.09	2
29000	Sympetrum sp	0	3	0.09	1
82800	Cladopelma sp	6	3	0.09	1
58505	Helicopsyche borealis	2	2	0.06	1
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	5	2	0.06	2
68201	Scirtidae	7	2	0.06	1
68700	Dubiraphia sp	5	2	0.06	1
79000	Tanypus sp	8	2	0.06	2
80001	Orthocladiinae	6	2	0.06	1
84300	Phaenopsectra obediens group	4	2	0.06	2
94400	Fossaria sp	7	2	0.06	2
01900	Nemertea	99.9	1	0.03	1
04660	Helobdella sp	8	1	0.03	1
07800	Cambarus sp	5	1	0.03	1
13400	Stenacron sp	4	1	0.03	1
23700	Anax sp	5	1	0.03	1
28001	Libellulidae	4.5	1	0.03	1
42700	Belostoma sp	99.9	1	0.03	1

**Appendix Table B-4.** Macroinvertebrate taxa collected at all sites in the Bull Creek-Bulls Brook DPR Tributaries (W) subwatershed, 2019.

		Illinois			
		Tolerance	Total		Samples
Taxa Code	Taxa Name	Rating	Number	Percent	Collected In
57900	Pycnopsyche sp	3	1	0.03	1
60800	Haliplus sp	99.9	1	0.03	1
65800	Berosus sp	99.9	1	0.03	1
66500	Enochrus sp	99.9	1	0.03	1
78130	Labrundinia neopilosella	4	1	0.03	1
78450	Nilotanypus fimbriatus	6	1	0.03	1
80440	Cricotopus (C.) trifascia	6	1	0.03	1
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"	3	1	0.03	1
83590	Kiefferulus sp	7	1	0.03	1
84400	Polypedilum sp	6	1	0.03	1
84460	Polypedilum (P.) fallax group	6	1	0.03	1
84480	Polypedilum (P.) laetum group	0	1	0.03	1
84800	Tribelos jucundum	5	1	0.03	1
95501	Planorbidae	6.5	1	0.03	1
96200	Planorbella sp	6.5	1	0.03	1
	Totals(97 Taxa)		3505	100%	

**Appendix Table B-5**. Macroinvertebrate taxa collected at all sites in the Upper Des Plaines Tributaries (E) subwatershed, 2019.

		Illinois			Samples
		Tolerance	Total		Collected
Taxa Code	Taxa Name	Rating	Number	Percent	In
06201	Hyalella azteca	4	394	21.78	3
06800	Gammarus sp	3	379	20.95	4
05800	Caecidotea sp	6	211	11.66	5
95100	Physella sp	9	166	9.18	5
03600	Oligochaeta	10	105	5.8	6
98001	Pisidiidae	5	103	5.69	1
22001	Coenagrionidae	5.5	45	2.49	4
84750	Stictochironomus sp	5	44	2.43	2
01801	Turbellaria	6	38	2.1	3
68708	Dubiraphia vittata group	5	32	1.77	2
98600	Sphaerium sp	5	30	1.66	3
17200	Caenis sp	6	27	1.49	1
84210	Paratendipes albimanus or P. duplicatus	3	25	1.38	4
84470	Polypedilum (P.) illinoense	6	16	0.88	3
98200	Pisidium sp	5	16	0.88	2
85500	Paratanytarsus sp	6	14	0.77	3
06700	Crangonyx sp	4	12	0.66	2
52200	Cheumatopsyche sp	6	12	0.66	2
68700	Dubiraphia sp	5	12	0.66	2
83840	Microtendipes pedellus group	6	11	0.61	2
80420	Cricotopus (C.) bicinctus	8	9	0.5	1
93200	Hydrobiidae	6	9	0.5	1
96264	Planorbella (Pierosoma) pilsbryi	6.5	9	0.5	1
82820	Cryptochironomus sp	8	8	0.44	4
77500	Conchapelopia sp	6	6	0.33	3
83002	Dicrotendipes modestus	6	6	0.33	1
13400	Stenacron sp	4	5	0.28	3
94400	Fossaria sp	7	5	0.28	1
04901	Erpobdellidae	8	4	0.22	1
21200	Calopteryx sp	4	4	0.22	1
69400	Stenelmis sp	7	4	0.22	2
04666	Helobdella papillata	8	3	0.17	1
52530	Hydropsyche depravata group	5	3	0.17	1
82880	Cryptotendipes sp	6	3	0.17	1
83040	Dicrotendipes neomodestus	6	3	0.17	1
84450	Polypedilum (Uresipedilum) flavum	6	3	0.17	1
84540	Polypedilum (Tripodura) scalaenum group	6	3	0.17	2
48200	Chauliodes sp	4	2	0.11	1
53800	Hydroptila sp	2	2	0.11	2
84315	Phaenopsectra flavipes	4	2	0.11	1
96002	Helisoma anceps	7	2	0.11	1

Illinois Samples Tolerance Collected Total Number In Taxa Code Taxa Name Rating Percent 04664 Helobdella stagnalis 8 1 0.06 1 08200 Orconectes sp 5 1 0.06 1 1 11001 Baetidae 4 1 0.06 4 11120 Baetis flavistriga 1 0.06 1 4 1 11200 Callibaetis sp 1 0.06 42700 Belostoma sp 1 0.06 1 45900 1 0.06 1 Notonecta sp 52570 Hydropsyche simulans 5 1 0.06 1 5 59550 Oecetis inconspicua complex sp A (sensu Flo 1 0.06 1 60900 1 0.06 1 Peltodytes sp 7 1 1 68201 Scirtidae 0.06 1 77001 Tanypodinae 6 0.06 1 77355 Clinotanypus pinguis 6 1 0.06 1 78655 Procladius (Holotanypus) sp 8 1 0.06 1 79400 Zavrelimyia sp 8 1 0.06 1 1 83158 Endochironomus nigricans 6 0.06 1 7 83590 Kiefferulus sp 1 0.06 1 84400 Polypedilum sp 1 0.06 1 6 84520 Polypedilum (Tripodura) halterale group 6 1 0.06 1 85625 Rheotanytarsus sp 6 1 0.06 1 7 85800 1 1 Tanytarsus sp 0.06 95900 Gyraulus sp 6 1 0.06 1 Totals(63 Taxa) 1809 100%

**Appendix Table B-5**. Macroinvertebrate taxa collected at all sites in the Upper Des Plaines Tributaries (E) subwatershed, 2019.

Site <sup>.</sup>	at Hazelnut Xing						Site ID:	14-6			
onto:	at hazoniat yang						Subsample	:			
Colle	ction Date: 07/30/2019	River C	ode: 9	5-051		River: Bull Creek				RM:	5.95
Taxa Code	Таха	Taxa Grp	Tol.	Qt./Q	l.	Taxa Code	Таха		Feed Grp	Tol.	Qt./QI.
03600	Oligochaeta		10.0	2	0						
04660	Helobdella sp		8.0		1						
04664	Helobdella stagnalis		8.0	1	2						
04935	Erpobdella punctata punctata		8.0		5						
05800	Caecidotea sp		6.0	22	1						
06201	Hyalella azteca		4.0	2	1						
68708	Dubiraphia vittata group	CO	5.0		1						
77500	Conchapelopia sp		6.0		1						
81650	Parametriocnemus sp		4.0		1						
82730	Chironomus (C.) decorus group		11.0		4						
82820	Cryptochironomus sp		8.0		3						
83051	Dicrotendipes simpsoni		6.0		1						
83158	Endochironomus nigricans		6.0		2						
83300	Glyptotendipes (G.) sp		10.0		1						
83590	Kiefferulus sp		7.0		1						
84450	Polypedilum (Uresipedilum) flavum		6.0		2						
85400	Micropsectra sp		4.0		3						
94400	Fossaria sp		7.0		1						
98200	Pisidium sp		5.0		8						
98600	Sphaerium sp		5.0		7						
No. (	Quantitative Taxa: 20	Total T	axa:	20							
Num	ber of Organisms: 316	mIBI:		19	.30						

#### Appendix Table B-6. Macroinvertebrate taxa collected in the Upper Des Plaines River study area during 2019.

Site: at St. Ma	ary of the Lake Colle	ege				4-5		
Collection Date	-	River Code: 9	5-051	River: Bull Creek	Subsample:	R	M:	4.7
Taxa Code	Таха	Taxa Grp Tol.	Qt./QI.	Taxa Code	Таха	Feed Grp T	ol.	Qt./QI.
01801 Turbellaria	I	6.0	48					
03600 Oligochaet	ta	10.0	83					
04664 Helobdella	stagnalis	8.0	17					
04901 Erpobdellio	dae	8.0	3					
04935 Erpobdella	a punctata punctata	8.0	1					
05800 Caecidotea	a sp	6.0	10					
06700 Crangonyx	< sp	4.0	41					
22001 Coenagrio	nidae	5.5	3					
28001 Libellulidae	e	4.5	1					
78599 Pentaneur	a sp	3.0	5					
78655 Procladius	(Holotanypus) sp	8.0	9					
79000 Tanypus s	р	8.0	1					
81231 Nanocladiu "rectinervis	us (N.) crassicornus or N s"	I. (N.) 3.0	1					
82730 Chironomu	us (C.) decorus group	11.0	6					
82800 Cladopelm	na sp	6.0	3					
83040 Dicrotendi	pes neomodestus	6.0	7					
83051 Dicrotendi	pes simpsoni	6.0	4					
83158 Endochiro	nomus nigricans	6.0	5					
83300 Glyptotend	lipes (G.) sp	10.0	13					
84000 Parachiror	nomus sp	8.0	25					
84210 Paratendip	bes albimanus or P. dup	icatus 3.0	2					
85001 Tanytarsin	i	6.0	6					
85800 Tanytarsus	s sp	7.0	12					
98200 Pisidium s	р	5.0	2					
98600 Sphaerium	ı sp	5.0	5					
No. Quantitativ	ve Taxa: 25	Total Taxa:	25	-				
Number of Org	ganisms: 313	mIBI:	20.00					

#### Appendix Table C-2. Macroinvertebrate taxa collected in the Upper Des Plaines River study area during 2019.

Site: at Rte 137					Site ID:	14-2		
					Subsample	<b>:</b>		
Collection Date: 07/31/2019 F	River C	ode: 9	5-051	River: Bull Creel	K		RM:	1
Taxa Code Taxa	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха	Fee Grp	d > Tol.	Qt./Q
1801 Turbellaria		6.0	1					
)3600 Oligochaeta		10.0	74					
94664 Helobdella stagnalis		8.0	1					
)6201 Hyalella azteca		4.0	15					
)6700 Crangonyx sp		4.0	15					
)7800 Cambarus sp		5.0	1					
8200 Orconectes sp		5.0	4					
21001 Calopterygidae		3.5	2					
22001 Coenagrionidae		5.5	10					
52200 Cheumatopsyche sp	CA	6.0	20					
88708 Dubiraphia vittata group	СО	5.0	1					
69200 Optioservus sp	CO	4.0	3					
9400 Stenelmis sp	СО	7.0	3					
/1900 Tipula sp		4.0	1					
7500 Conchapelopia sp		6.0	1					
30001 Orthocladiinae		6.0	2					
30420 Cricotopus (C.) bicinctus		8.0	1					
2820 Cryptochironomus sp		8.0	2					
3040 Dicrotendipes neomodestus		6.0	2					
<ul> <li>33820 Microtendipes "caelum" (sensu Simp: &amp; Bode, 1980)</li> </ul>	son	6.0	1					
34210 Paratendipes albimanus or P. duplica	itus	3.0	2					
4300 Phaenopsectra obediens group		4.0	1					
34450 Polypedilum (Uresipedilum) flavum		6.0	13					
34470 Polypedilum (P.) illinoense		6.0	6					
34540 Polypedilum (Tripodura) scalaenum group		6.0	6					
4750 Stictochironomus sp		5.0	4					
35500 Paratanytarsus sp		6.0	2					
35625 Rheotanytarsus sp		6.0	2					
35800 Tanytarsus sp		7.0	4					
3200 Hydrobiidae		6.0	16					
7601 Corbicula fluminea		4.0	4					
98200 Pisidium sp		5.0	20					
98600 Sphaerium sp		5.0	86					
No. Quantitative Taxa: 33	Total T	axa:	33					
	mIBI:		34.76					

#### Appendix Table C-2. Macroinvertebrate taxa collected in the Upper Des Plaines River study area during 2019.

	Ust. IL 21									
Collect	tion Date: 07/30/2019 I	River Co	ode: 9	5-051	River:	Sul Bull Creek	osample:		RM:	0.50
Таха		Таха			Таха			Feed	4	
Code	Таха		Tol.	Qt./QI.	Code	Таха			Tol.	Qt./QI.
01801	Turbellaria		6.0	4		group				
01900	Nemertea		99.9	1	84750	Stictochironomus sp			5.0	5
03600	Oligochaeta		10.0	16	84800	Tribelos jucundum			5.0	1
04901 E	Erpobdellidae		8.0	1	85500	Paratanytarsus sp			6.0	8
05800	Caecidotea sp		6.0	1	85800	Tanytarsus sp			7.0	2
06201 H	Hyalella azteca		4.0	69	93200	Hydrobiidae			6.0	9
08601 H	Hydrachnidia		99.9	1	95100	Physella sp			9.0	11
11120 E	Baetis flavistriga	MA	4.0	16	95501	Planorbidae			6.5	1
11130 E	Baetis intercalaris	MA	4.0	2	98600	Sphaerium sp			5.0	7
13400 \$	Stenacron sp	MA	4.0	1						
21001	Calopterygidae		3.5	1	No. G	uantitative Taxa:	47	Total	Taxa:	47
22001	Coenagrionidae		5.5	20	Numb	per of Organisms:	325	mIBI:		47.85
22300 A	Argia sp		5.0	14						
44501 0	Corixidae		99.9	8						
52200	Cheumatopsyche sp	CA	6.0	37						
53800 H	Hydroptila sp	CA	2.0	12						
	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1						
60800 H	Haliplus sp	CO	99.9	1						
60900 F	Peltodytes sp	CO	99.9	5						
65800 E	Berosus sp	CO	99.9	1						
66500 E	Enochrus sp	CO	99.9	1						
68708 <sup>[</sup>	Dubiraphia vittata group	CO	5.0	1						
69200	Optioservus sp	CO	4.0	2						
69400 \$	Stenelmis sp	CO	7.0	7						
74100 \$	Simulium sp		6.0	2						
77120 A	Ablabesmyia mallochi		6.0	2						
	Hayesomyia senata or Thienemannimyia norena		5.0	1						
78655 F	Procladius (Holotanypus) sp		8.0	2						
80420	Cricotopus (C.) bicinctus		8.0	3						
82730	Chironomus (C.) decorus group		11.0	3						
82820	Cryptochironomus sp		8.0	3						
82880	Cryptotendipes sp		6.0	1						
83040	Dicrotendipes neomodestus		6.0	6						
83300	Glyptotendipes (G.) sp		10.0	1						
	Microtendipes "caelum" (sensu Simp & Bode, 1980)	son	6.0	8						
83840 1	Microtendipes pedellus group		6.0	3						
84450 F	Polypedilum (Uresipedilum) flavum		6.0	13						
84470 F	Polypedilum (P.) illinoense		6.0	8						
84540 F	Polypedilum (Tripodura) scalaenum		6.0	2						

Sito	at Grass Lake Rd.					Site ID:	10-5	
Sile.	al Glass Lake Nu.					Subsample:		
Colle	ction Date: 08/03/2019	River Co	ode: 9	5-702	River: Hasti	ngs Creek	RM:	3.12
Taxa Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха	Feed Grp Tol.	Qt./QI.
01801	Turbellaria		6.0	72				
03600	Oligochaeta		10.0	61				
04935	Erpobdella punctata punctata		8.0	1				
06201	Hyalella azteca		4.0	34				
06700	Crangonyx sp		4.0	16				
17200	Caenis sp	MA	6.0	14				
22001	Coenagrionidae		5.5	3				
52200	Cheumatopsyche sp	CA	6.0	38				
52530	Hydropsyche depravata group	CA	5.0	3				
53501	Hydroptilidae	CA	3.5	4				
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	2				
59580	Oecetis persimilis	CA	5.0	2				
67100	Hydrobius sp		0.0	1				
68201	Scirtidae		7.0	1				
77001	Tanypodinae		6.0	1				
77500	Conchapelopia sp		6.0	1				
77700	Guttipelopia guttipennis		6.0	1				
78600	Pentaneura inconspicua		3.0	20				
81231	Nanocladius (N.) crassicornus or N. "rectinervis"	(N.)	3.0	3				
82820	Cryptochironomus sp		8.0	4				
83300	Glyptotendipes (G.) sp		10.0	4				
84000	Parachironomus sp		8.0	1				
84210	Paratendipes albimanus or P. duplic	catus	3.0	2				
84450	Polypedilum (Uresipedilum) flavum		6.0	2				
84470	Polypedilum (P.) illinoense		6.0	1				
84540	Polypedilum (Tripodura) scalaenum group	I	6.0	1				
85500	Paratanytarsus sp		6.0	1				
85625	Rheotanytarsus sp		6.0	3				
95100	Physella sp		9.0	7				
95900	Gyraulus sp		6.0	1				
	Quantitative Taxa: 30 ber of Organisms: 305	Total T mIBI:	axa:	30 31.01				

Site:	Dst. Almond Rd.					Site ID:	13-15
	tion Date: 08/01/2019	River Co	nde <sup>.</sup> 9	5-704	River: Bull's E	Subsample:	RM:
Гаха				0 1 0 1	Таха		Feed
Code	Таха	Taxa Grp	Tol.	Qt./QI.	Code	Таха	Grp Tol.
600	Oligochaeta		10.0	8			
935	Erpobdella punctata punctata		8.0	1			
800	Caecidotea sp		6.0	73			
6201	Hyalella azteca		4.0	75			
6800	Gammarus sp		3.0	13			
7200	Caenis sp	MA	6.0	1			
1001	Calopterygidae		3.5	6			
2001	Coenagrionidae		5.5	11			
9000	Sympetrum sp		0.0	3			
2200	Cheumatopsyche sp	CA	6.0	21			
2530	Hydropsyche depravata group	CA	5.0	9			
	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1			
	Peltodytes sp	СО	99.9	1			
9400	Stenelmis sp	СО	7.0	1			
1900	Tipula sp		4.0	3			
	Simulium sp		6.0	1			
	Conchapelopia sp		6.0	7			
	Nilotanypus fimbriatus		6.0	1			
	Procladius (Holotanypus) sp		8.0	4			
	Chironomus (C.) decorus group		11.0	1			
	Cryptochironomus sp		8.0	3			
2880	Cryptotendipes sp		6.0	2			
1210	Paratendipes albimanus or P. duplic	atus	3.0	1			
4450	Polypedilum (Uresipedilum) flavum		6.0	5			
	Polypedilum (Tripodura) scalaenum group		6.0	1			
	Stictochironomus sp		5.0	1			
5400	Micropsectra sp		4.0	1			
5500	Paratanytarsus sp		6.0	4			
5625	Rheotanytarsus sp		6.0	18			
′540	Hemerodromia sp		6.0	3			
5100	Physella sp		9.0	2			
	Planorbella sp		6.5	1			
8001	Pisidiidae		5.0	5			
No. Q	uantitative Taxa: 33	Total T	axa:	33			
	er of Organisms: 288	mIBI:	and.	33.18			

Site:	North Milwaukee Ave.					Site ID:	13-7		
one.	North Milwaukee Ave.					Subsample			
Colle	ction Date: 08/01/2019	River C	ode: 95	-704	River: Bull's Brook	k		RM:	0.2
Taxa Code	Таха	Taxa Grp	Tol. (	Qt./QI.	Taxa Code	Таха		eed Grp Tol.	Qt./QI.
01801	Turbellaria		6.0	4					
03600	Oligochaeta		10.0	3					
05800	Caecidotea sp		6.0	37					
06800	Gammarus sp		3.0	200					
08200	Orconectes sp		5.0	2					
11120	Baetis flavistriga	MA	4.0	4					
21001	Calopterygidae		3.5	3					
52200	Cheumatopsyche sp	CA	6.0	13					
52530	Hydropsyche depravata group	CA	5.0	3					
57900	Pycnopsyche sp	CA	3.0	1					
68700	Dubiraphia sp	CO	5.0	2					
68708	Dubiraphia vittata group	CO	5.0	11					
68901	Macronychus glabratus	CO	2.0	2					
69200	Optioservus sp	CO	4.0	27					
69400	Stenelmis sp	CO	7.0	25					
74100	Simulium sp		6.0	1					
80430	Cricotopus (C.) tremulus group		8.0	1					
81650	Parametriocnemus sp		4.0	1					
83040	Dicrotendipes neomodestus		6.0	1					
83840	Microtendipes pedellus group		6.0	1					
84210	Paratendipes albimanus or P. dup	licatus	3.0	1					
84450	Polypedilum (Uresipedilum) flavun	n	6.0	1					
84460	Polypedilum (P.) fallax group		6.0	1					
84750	Stictochironomus sp		5.0	2					
85500	Paratanytarsus sp		6.0	1					
98600	Sphaerium sp		5.0	1					
		<b>T</b> . ( ) <b>T</b>	•						
	Quantitative Taxa: 26		axa: 2						
Num	ber of Organisms: 349	mIBI:		49.25					

	dst 21st St. ction Date: 10/18/2019 F	River C	ode: 9	5-708	River: Newp	Subsample: ort Drainage Ditch		RM:	3.03
Taxa Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха	Feed Grp	Tol.	Qt./QI.
03600	Oligochaeta		10.0	12					
05800	Caecidotea sp		6.0	1					
06201	Hyalella azteca		4.0	192					
06700	Crangonyx sp		4.0	6					
06800	Gammarus sp		3.0	1					
11200	Callibaetis sp	MA	4.0	1					
13400	Stenacron sp	MA	4.0	1					
17200	Caenis sp	MA	6.0	27					
22001	Coenagrionidae		5.5	21					
42700	Belostoma sp		99.9	1					
77355	Clinotanypus pinguis		6.0	1					
77500	Conchapelopia sp		6.0	2					
84520	Polypedilum (Tripodura) halterale gro	up	6.0	1					
95100	Physella sp		9.0	14					
98200	Pisidium sp		5.0	15					
98600	Sphaerium sp		5.0	21					
No. G	Quantitative Taxa: 16	Total T	axa:	16					
	-	nIBI:		28.43					

Site <sup>.</sup>	ust. Kilbourne Rd.				Site ID: 12-1					
one.	ust. Ribbume Ru.					Subsample:				
Colle	ction Date: 08/04/2019	River C	ode: 95	-708	River: Newp	ort Drainage Ditch	RM:	0.70		
Taxa Code	Таха	Taxa Grp	Tol. (	Qt./QI.	Taxa Code	Таха	Feed Grp Tol.	Qt./QI.		
01801	Turbellaria		6.0	1						
03600	Oligochaeta		10.0	13						
05800	Caecidotea sp		6.0	7						
06800	Gammarus sp		3.0	102						
08200	Orconectes sp		5.0	1						
11001	Baetidae	MA	4.0	1						
13400	Stenacron sp	MA	4.0	1						
52200	Cheumatopsyche sp	CA	6.0	8						
52570	Hydropsyche simulans	CA	5.0	1						
53800	Hydroptila sp	CA	2.0	1						
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1						
68201	Scirtidae		7.0	1						
68700	Dubiraphia sp	CO	5.0	10						
68708	Dubiraphia vittata group	CO	5.0	19						
77500	Conchapelopia sp		6.0	2						
78655	Procladius (Holotanypus) sp		8.0	1						
80420	Cricotopus (C.) bicinctus		8.0	9						
82820	Cryptochironomus sp		8.0	3						
82880	Cryptotendipes sp		6.0	3						
83040	Dicrotendipes neomodestus		6.0	3						
83840	Microtendipes pedellus group		6.0	9						
84210	Paratendipes albimanus or P. dupli	catus	3.0	6						
84450	Polypedilum (Uresipedilum) flavum		6.0	3						
84470	Polypedilum (P.) illinoense		6.0	9						
84540	Polypedilum (Tripodura) scalaenum group	1	6.0	2						
84750	Stictochironomus sp		5.0	43						
85500	Paratanytarsus sp		6.0	3						
85625	Rheotanytarsus sp		6.0	1						
93200	Hydrobiidae		6.0	9						
95100	Physella sp		9.0	37						
	Quantitative Taxa: 30 per of Organisms: 310	Total T mIBI:	axa: 3	30 40.64						

ost. IL 21 ion Date: 08/02/2019	River C	odo: 05			Subsample	):		
ion Date: 08/02/2019	River C	ada: 05						
аха		River Code: 95-709		River: Stoneroller Creek			RM:	0
Таха	Taxa Grp	Tol. C	Qt./QI.	Taxa Code	Таха	Fee Gr	ed rp Tol.	Qt./QI
urbellaria		6.0	30					
Dligochaeta		10.0	9					
lyalella azteca		4.0	3					
Drconectes sp		5.0	1					
Baetis flavistriga	MA	4.0	13					
Baetis intercalaris	MA	4.0	32					
Caenis sp	MA	6.0	1					
Argia sp		5.0	1					
Cheumatopsyche sp	CA	6.0	19					
lydropsyche depravata group	CA	5.0	1					
lydroptila sp	CA	2.0	1					
elicopsyche borealis	CA	2.0	2					
Dubiraphia vittata group	CO	5.0	10					
/acronychus glabratus	CO	2.0	5					
Optioservus sp	CO	4.0	1					
Stenelmis sp	CO	7.0	134					
blabesmyia mallochi		6.0	1					
Conchapelopia sp		6.0	2					
layesomyia senata or <sup>-</sup> hienemannimyia norena		5.0	2					
Cricotopus (C.) tremulus group		8.0	1					
Chironomus (C.) decorus group		11.0	1					
Cryptochironomus sp		8.0	2					
Dicrotendipes neomodestus		6.0	5					
/licrotendipes "caelum" (sensu Sim & Bode, 1980)	pson	6.0	2					
Polypedilum (Uresipedilum) flavum		6.0	11					
Polypedilum (P.) illinoense		6.0	3					
Stictochironomus sp		5.0	2					
Paratanytarsus sp		6.0	6					
Physella sp		9.0	2					
	Vigochaeta yalella azteca yrconectes sp aetis flavistriga aetis intercalaris aenis sp rgia sp rgia sp ydropsyche depravata group ydropsyche depravata group ydroptila sp lelicopsyche borealis ubiraphia vittata group lacronychus glabratus optioservus sp tenelmis sp blabesmyia mallochi conchapelopia sp ayesomyia senata or hienemannimyia norena ricotopus (C.) tremulus group chironomus (C.) decorus group chironomus (C.) decorus group chironomus sp icrotendipes neomodestus licrotendipes neomodestus licrotendipes "caelum" (sensu Sim Bode, 1980) olypedilum (Uresipedilum) flavum olypedilum (P.) illinoense tictochironomus sp aratanytarsus sp	Vigochaeta yalella azteca yaconectes sp aetis flavistriga MA aetis intercalaris MA automator MA aetis intercalaris MA automator MA automator MA automator MA aetis intercalaris MA automator MA automator MA aetis intercalaris MA automator MA aut	Nigochaeta10.0yalella azteca4.0yalella azteca4.0rconectes sp5.0aetis flavistrigaMAaetis intercalarisMAaenis spMAcaenis spMAcheumatopsyche spCAcheumatopsyche depravata groupCAydropsyche depravata groupCAydropsyche borealisCAubiraphia vittata groupCOtacronychus glabratusCOoptioservus spCOtenelmis spCOblabesmyia mallochi6.0conchapelopia sp6.0ayesomyia senata or5.0hienemannimyia norena5.0ricotopus (C.) tremulus group8.0circotendipes neomodestus6.0Bode, 1980)6.0olypedilum (Uresipedilum) flavum6.0olypedilum (P.) illinoense6.0hysella sp9.0	Nigochaeta10.09yalella azteca4.03vrconectes sp5.01aetis flavistrigaMA4.013aetis intercalarisMA4.032aetis intercalarisMA6.01rgia sp5.01theumatopsyche spCA6.019tydropsyche depravata groupCA5.01ydropsyche borealisCA2.01telicopsyche borealisCA2.02ubiraphia vittata groupCO5.010tacronychus glabratusCO2.05optioservus spCO7.0134blabesmyia mallochi6.01conchapelopia sp6.02ayesomyia senata or5.02ricotopus (C.) tremulus group8.01thironomus (C.) decorus group11.01ryptochironomus sp8.02icrotendipes "caelum" (sensu Simpson6.02Bode, 1980)5.02aratanytarsus sp6.06hysella sp9.02	Nigochaeta       10.0       9         yalella azteca       4.0       3         irconectes sp       5.0       1         aetis flavistriga       MA       4.0       32         aetis intercalaris       MA       4.0       32         aetis intercalaris       MA       4.0       32         aetis intercalaris       MA       6.0       1         rgia sp       5.0       1       1         heumatopsyche sp       CA       6.0       19         ydropsyche depravata group       CA       5.0       1         ydropsyche borealis       CA       2.0       1         lelicopsyche borealis       CA       2.0       1         terronychus glabratus       CO       5.0       10         tacronychus glabratus       CO       7.0       134         blabesmyia mallochi       6.0       1       1         tenelmis sp       CO       7.0       134         blabesmyia senata or       5.0       2       2         ricotaplus (C.) tremulus group       8.0       1       1         riptorommus sp       8.0       1       2         Bode, 1980)       0	Nigochaeta       10.0       9         yalella azteca       4.0       3         irconectes sp       5.0       1         aetis flavistriga       MA       4.0       32         aenis sp       MA       6.0       1         rgia sp       5.0       1         heumatopsyche sp       CA       6.0       19         ydropsyche depravata group       CA       5.0       1         heumatopsyche sp       CA       6.0       19         ydropsyche depravata group       CA       2.0       1         leilcopsyche borealis       CA       2.0       1         leilcopsyche sp       CO       4.0       1         orcontychus glabratus       CO       2.0       1         blabesmyia mallochi       6.0       1       1         onchapelopia sp       6.0       2       2         hironomus (C.) termulus group       8.0       2       2         icrotendipes neomodestus       6.0	nigochaeta       10.0       9         yalella azteca       4.0       3         irconectes sp       5.0       1         aetis flavistriga       MA       4.0       32         aenis flavistriga       MA       4.0       32         aenis sp       MA       6.0       1         rgia sp       5.0       1         heumatopsyche sp       CA       6.0       1         ydroptila sp       CA       2.0       1         elicopsyche borealis       CA       2.0       1         leicopsyche borealis       CO       7.0       134         blabesmyja senata or       5.0       2       2         ricotopus (C.) tremulus group       8.0       1       1         riptochironomus sp       8.0       2       2         icotopulopes reaelum' (sensu Simpson Co       5       2	Nigochaeta10.09yalella azteca4.03rconectes sp5.01aetis flavistrigaMA4.013aetis flavistrigaMA4.032aenis spMA6.01rgia sp5.01heumatopsyche spCA6.0ydropsyche depravata groupCA5.0ydropsyche borealisCA2.0lelicopsyche borealisCA2.0lelicopsyche spCO5.0pitoservus spCO5.0pitoservus spCO7.0laaronychus glabratusCO2.0ihenematinninyia norena5.02ricotopa (C.) tremulus group8.02ibroomus (C.) decorus group11.01pitoservus sp6.05icordendipes "caelum" (sensu Simpson6.01ohypedilum (Presipedilum) flavum6.01olypedilum (Presipedilum) flavum6.01olypedilum (Presipedilum) flavum6.02spot5.02spot5.02aratanytarsus sp6.06hypedila sp5.02spot5.02istochrinomus sp5.02aratanytarsus sp6.06hypedila sp5.02aratanytarsus sp6.06hypedila sp5.02aratanytarsus sp6.06hypedila sp5.02<

Site: Dst. North Delany Rd.		Site ID:	13-10
Collection Date: 08/02/2019	River Code: 95-710	Subsample River: Suburban Country Club Tril	
		-	
Taxa Code Taxa	Taxa Grp Tol. Qt./Q	Taxa . Code Taxa	Feed Grp Tol. Qt./QI.
01801 Turbellaria	6.0 1	8	
03600 Oligochaeta	10.0	2	
05800 Caecidotea sp	6.0	1	
06201 Hyalella azteca	4.0 18	9	
22001 Coenagrionidae	5.5 1	9	
48200 Chauliodes sp	4.0	2	
60900 Peltodytes sp	CO 99.9	1	
83002 Dicrotendipes modestus	6.0	6	
83158 Endochironomus nigricans	6.0	1	
84470 Polypedilum (P.) illinoense	6.0	3	
95100 Physella sp	9.0	3	
No. Quantitative Taxa: 11	Total Taxa: 11		
Number of Organisms: 245	mIBI: 18	02	

Sitor	Lat North Mill Crook Dd					Site ID:	13-11	
Sile:	Ust. North Mill Creek Rd.					Subsample:		
Collec	ction Date: 08/04/2019	River C	ode: 9	5-711	River: Slocu	m Conrners Creek	RM:	1.36
Taxa Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха	Feed Grp Tol.	Qt./QI.
03600	Oligochaeta		10.0	6				
05800	Caecidotea sp		6.0	43				
06700	Crangonyx sp		4.0	6				
06800	Gammarus sp		3.0	201				
11120	Baetis flavistriga	MA	4.0	1				
13400	Stenacron sp	MA	4.0	3				
21200	Calopteryx sp		4.0	4				
22001	Coenagrionidae		5.5	1				
52200	Cheumatopsyche sp	CA	6.0	4				
52530	Hydropsyche depravata group	CA	5.0	3				
53800	Hydroptila sp	CA	2.0	1				
68700	Dubiraphia sp	CO	5.0	2				
68708	Dubiraphia vittata group	CO	5.0	13				
69400	Stenelmis sp	CO	7.0	3				
77001	Tanypodinae		6.0	1				
82820	Cryptochironomus sp		8.0	1				
83840	Microtendipes pedellus group		6.0	2				
84210	Paratendipes albimanus or P. duplic	catus	3.0	1				
84470	Polypedilum (P.) illinoense		6.0	4				
84540	Polypedilum (Tripodura) scalaenum group		6.0	1				
84750	Stictochironomus sp		5.0	1				
85500	Paratanytarsus sp		6.0	1				
95100	Physella sp		9.0	4				
98200	Pisidium sp		5.0	1				
98600	Sphaerium sp		5.0	4				
	Quantitative Taxa: 25 per of Organisms: 312	Total T mIBI:	axa:	25 36.87				

Site:	behind pump station off Spru	cewood La	ne				13-17		
	ction Date: 07/31/2019	River Code		5-714	River: Unnar	Subsample: med Trib to DesPLaines	s River	RM:	0.13
Taxa Code	Таха	Taxa Grp To	I. (	Qt./QI.	Taxa Code	Таха	Feed Grp	Tol.	Qt./QI.
03600	Oligochaeta	10	0.0	34					
04666	Helobdella papillata	8	.0	3					
04901	Erpobdellidae	8	.0	4					
06201	Hyalella azteca	4	.0	13					
22001	Coenagrionidae	5	5.5	4					
45900	Notonecta sp	99	.9	1					
77500	Conchapelopia sp	6	5.0	2					
79400	Zavrelimyia sp	8	6.0	1					
82820	Cryptochironomus sp	8	6.0	3					
83590	Kiefferulus sp	7	.0	1					
84210	Paratendipes albimanus or P. duplic	catus 3	6.0	9					
84315	Phaenopsectra flavipes	4	.0	2					
84400	Polypedilum sp	6	5.0	1					
85500	Paratanytarsus sp	6	5.0	10					
85800	Tanytarsus sp	7	.0	1					
94400	Fossaria sp	7	.0	5					
95100	Physella sp	ç	0.0	108					
95900	Gyraulus sp	6	5.0	1					
96002	Helisoma anceps anceps	7	.0	2					
96264	Planorbella (Pierosoma) pilsbryi	6	5.5	9					
98001	Pisidiidae	5	6.0	103					
No. C	Quantitative Taxa: 21	Total Taxa	: 2	21					
Numb	per of Organisms: 317	mIBI:		30.86					

Site:	at ust. of Rte 45					Site ID: 1	0-6	
		River C	odo: 04	715		Subsample:	RM:	
	ction Date: 08/03/2019	River C	oue. 9:	5-715		North Mill Creek		
Faxa Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха	Feed Grp Tol.	Qt./0
1801	Turbellaria		6.0	17				
3600	Oligochaeta		10.0	6				
4930	Erpobdella sp		8.0	2				
5800	Caecidotea sp		6.0	27				
6800	Gammarus sp		3.0	95				
1130	Baetis intercalaris	MA	4.0	39				
2501	Heptageniidae	MA	3.5	1				
1001	Calopterygidae		3.5	11				
2001	Coenagrionidae		5.5	1				
3909	Boyeria vinosa		3.0	1				
2200	Cheumatopsyche sp	CA	6.0	24				
2530	Hydropsyche depravata group	CA	5.0	11				
3800	Hydroptila sp	CA	2.0	1				
9500	Oecetis sp	CA	5.0	1				
8201	Scirtidae		7.0	1				
8708	Dubiraphia vittata group	CO	5.0	1				
1900	Tipula sp		4.0	1				
4100	Simulium sp		6.0	9				
7500	Conchapelopia sp		6.0	11				
7750	Hayesomyia senata or Thienemannimyia norena		5.0	1				
8655	Procladius (Holotanypus) sp		8.0	1				
2820	Cryptochironomus sp		8.0	2				
2885	Cryptotendipes pseudotener		6.0	1				
4450	Polypedilum (Uresipedilum) flavum		6.0	21				
4460	Polypedilum (P.) fallax group		6.0	1				
4470	Polypedilum (P.) illinoense		6.0	4				
4540	Polypedilum (Tripodura) scalaenum group		6.0	1				
4601	Saetheria species 1 (sensu Jackson 1977)	١,	6.0	1				
4700	Stenochironomus sp		3.0	1				
7540	Hemerodromia sp		6.0	2				
8200	Pisidium sp		5.0	5				
	Quantitative Taxa: 31 ber of Organisms: 301	Total T mIBI:	axa:	31 40.43				

Site	dst. Kenwood					Site ID:	13-12	
one.						Subsample	:	
Colle	ction Date: 08/02/2	019 River C	ode: 9	5-716	River: UT	Greenleaf Creek	RM:	0.40
Taxa Code	Таха	Taxa Grp		Qt./QI.	Taxa Code	Таха	Feed Grp Tol.	Qt./QI.
01801	Turbellaria		6.0	19				
03600	Oligochaeta		10.0	38				
04664	Helobdella stagnalis		8.0	1				
05800	Caecidotea sp		6.0	159				
06800	Gammarus sp		3.0	75				
69400	Stenelmis sp	CO	7.0	1				
82820	Cryptochironomus sp		8.0	1				
84210	Paratendipes albimanus	s or P. duplicatus	3.0	9				
98600	Sphaerium sp		5.0	5				
No. C	Quantitative Taxa:	9 Total 1	axa:	9				
Num	per of Organisms:	308 mlBI:		0.00				

Site: behind World Bioproducts a	d		Site ID: 14-4						
one. Definite worke Dioproducts a		u			Subsample:				
Collection Date: 07/31/2019	River C	ode: 9	5-719	River: West	Branch Bull Creek	RM:	2.54		
Taxa Code Taxa	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха	Feed Grp Tol.	Qt./QI.		
01801 Turbellaria		6.0	68						
03600 Oligochaeta		10.0	27						
04664 Helobdella stagnalis		8.0	3						
04930 Erpobdella sp		8.0	5						
05800 Caecidotea sp		6.0	16						
06201 Hyalella azteca		4.0	5						
22001 Coenagrionidae		5.5	8						
23700 Anax sp		5.0	1						
42700 Belostoma sp		99.9	1						
52200 Cheumatopsyche sp	CA	6.0	9						
69200 Optioservus sp	СО	4.0	1						
69400 Stenelmis sp	СО	7.0	1						
74100 Simulium sp		6.0	22						
77500 Conchapelopia sp		6.0	2						
77750 Hayesomyia senata or Thienemannimyia norena		5.0	1						
78655 Procladius (Holotanypus) sp		8.0	3						
79000 Tanypus sp		8.0	1						
80420 Cricotopus (C.) bicinctus		8.0	1						
82730 Chironomus (C.) decorus group		11.0	2						
83158 Endochironomus nigricans		6.0	1						
84000 Parachironomus sp		8.0	1						
84400 Polypedilum sp		6.0	1						
84450 Polypedilum (Uresipedilum) flavun	n	6.0	21						
84470 Polypedilum (P.) illinoense		6.0	4						
84540 Polypedilum (Tripodura) scalaenu group	m	6.0	1						
85625 Rheotanytarsus sp		6.0	1						
98200 Pisidium sp		5.0	5						
98600 Sphaerium sp		5.0	90						
No. Quantitative Taxa: 28	Total T	axa:	28						
Number of Organisms: 302	mlBl:		24.94						

Site:	N. Countryside Dr.					Site ID:	14-3	
	·	Divor C		710		Subsample:	RM	. 1.6
	ction Date: 07/31/2019	River Co	Jue. 90	-719		Branch Bull Creek		1.60
Taxa Code	Таха	Taxa Grp	Tol. (	Qt./QI.	Taxa Code	Таха	Feed Grp Tol	. Qt./QI.
01801	Turbellaria		6.0	56				
03600	Oligochaeta		10.0	5				
06201	Hyalella azteca		4.0	1				
06800	Gammarus sp		3.0	9				
08601	Hydrachnidia		99.9	2				
11120	Baetis flavistriga	MA	4.0	15				
11130	Baetis intercalaris	MA	4.0	2				
21001	Calopterygidae		3.5	2				
22001	Coenagrionidae		5.5	2				
52200	Cheumatopsyche sp	CA	6.0	86				
52530	Hydropsyche depravata group	CA	5.0	2				
53800	Hydroptila sp	CA	2.0	10				
68708	Dubiraphia vittata group	CO	5.0	1				
69400	Stenelmis sp	CO	7.0	56				
71900	Tipula sp		4.0	2				
74100	Simulium sp		6.0	7				
77500	Conchapelopia sp		6.0	3				
80430	Cricotopus (C.) tremulus group		8.0	3				
81650	Parametriocnemus sp		4.0	4				
82820	Cryptochironomus sp		8.0	1				
83820	Microtendipes "caelum" (sensu Sin & Bode, 1980)	npson	6.0	6				
83840	Microtendipes pedellus group		6.0	1				
84300	Phaenopsectra obediens group		4.0	1				
84450	Polypedilum (Uresipedilum) flavum		6.0	15				
84470	Polypedilum (P.) illinoense		6.0	5				
84480	Polypedilum (P.) laetum group		0.0	1				
84750	Stictochironomus sp		5.0	1				
85625	Rheotanytarsus sp		6.0	1				
85800	Tanytarsus sp		7.0	2				
87540	Hemerodromia sp		6.0	1				
98600	Sphaerium sp		5.0	9				
	Quantitative Taxa: 31 ber of Organisms: 312	Total T mIBI:	axa: (	31 48.49				

Site <sup>.</sup>	Dst. Leonard Dr.					Site ID: 13	-14	
ono.						Subsample:		
Colle	ction Date: 08/01/2019	River C	ode: 9	5-720	River: West	t Fork Belvidere Rd. Trib	RM:	0.21
Таха		Таха			Таха		Feed	
Code	Таха	Grp	Tol.	Qt./QI.	Code	Таха	Grp Tol.	Qt./QI.
01801	Turbellaria		6.0	53				
03600	Oligochaeta		10.0	7				
05800	Caecidotea sp		6.0	241				
08200	Orconectes sp		5.0	1				
21200	Calopteryx sp		4.0	1				
22001	Coenagrionidae		5.5	5				
52200	Cheumatopsyche sp	CA	6.0	3				
68708	Dubiraphia vittata group	CO	5.0	1				
69400	Stenelmis sp	CO	7.0	6				
74100	Simulium sp		6.0	2				
77500	Conchapelopia sp		6.0	6				
80440	Cricotopus (C.) trifascia		6.0	1				
82820	Cryptochironomus sp		8.0	2				
84210	Paratendipes albimanus or P. duplic	catus	3.0	5				
84450	Polypedilum (Uresipedilum) flavum		6.0	1				
84470	Polypedilum (P.) illinoense		6.0	1				
84540	Polypedilum (Tripodura) scalaenum group		6.0	1				
84750	Stictochironomus sp		5.0	1				
94400	Fossaria sp		7.0	1				
98200	Pisidium sp		5.0	2				
98600	Sphaerium sp		5.0	1				
No. C	Quantitative Taxa: 21	Total T	axa:	21				
	ber of Organisms: 342	mIBI:		25.74				
				20.14				

Site:	Ust. abandoned bridge					Sit	te ID: 1	13-8	
	-	River C	ode: 9	5-720	River: Wes	Sut t Fork Belvidere	sample: Rd Trib	RM:	0.15
Таха					Таха			Feed	
Code	Таха	Taxa Grp	Tol.	Qt./QI.	Code	Таха		Grp Tol.	Qt./QI.
01801	Turbellaria		6.0	7					
03600	Oligochaeta		10.0	13		titative Taxa:	39	Total Taxa:	39
05800	Caecidotea sp		6.0	21	Number o	f Organisms:	329	mIBI:	45.16
06201	Hyalella azteca		4.0	55					
06700	Crangonyx sp		4.0	7					
06800	Gammarus sp		3.0	29					
08200	Orconectes sp		5.0	1					
11130	Baetis intercalaris	MA	4.0	9					
17200	Caenis sp	MA	6.0	6					
21200	Calopteryx sp		4.0	7					
22001	Coenagrionidae		5.5	16					
22300	Argia sp		5.0	1					
52200	Cheumatopsyche sp	CA	6.0	7					
53800	Hydroptila sp	CA	2.0	1					
68201	Scirtidae		7.0	2					
68708	Dubiraphia vittata group	СО	5.0	7					
69400	Stenelmis sp	СО	7.0	35					
74100	Simulium sp		6.0	10					
77120	Ablabesmyia mallochi		6.0	2					
77500	Conchapelopia sp		6.0	7					
77750	Hayesomyia senata or Thienemannimyia norena		5.0	2					
78130	Labrundinia neopilosella		4.0	1					
82730	Chironomus (C.) decorus group		11.0	2					
82820	Cryptochironomus sp		8.0	6					
82880	Cryptotendipes sp		6.0	1					
83040	Dicrotendipes neomodestus		6.0	2					
83051	Dicrotendipes simpsoni		6.0	2					
83820	Microtendipes "caelum" (sensu Simp & Bode, 1980)	son	6.0	1					
84210	Paratendipes albimanus or P. duplica	tus	3.0	1					
84450	Polypedilum (Uresipedilum) flavum		6.0	26					
84470	Polypedilum (P.) illinoense		6.0	15					
84540	Polypedilum (Tripodura) scalaenum group		6.0	9					
84750	Stictochironomus sp		5.0	1					
85500	Paratanytarsus sp		6.0	6					
85800	Tanytarsus sp		7.0	1					
			6.0	1					
95100	Physella sp		9.0	7					
	Corbicula fluminea		4.0	1					
98200	Pisidium sp		5.0	1					

Site:	at Wick St.					Site ID:	11-6			
Collec	ction Date: 08/03/2019	River C	ode: 9	5-995	River: Mill Creek	Subsample	:	RM	l: 17	7.20
Taxa Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха		Feed Grp To	. Qt./Q	<b>≥I</b> .
01801	Turbellaria		6.0	1						
03600	Oligochaeta		10.0	8						
05800	Caecidotea sp		6.0	51						
06201	Hyalella azteca		4.0	4						
06800	Gammarus sp		3.0	130						
08200	Orconectes sp		5.0	1						
21200	Calopteryx sp		4.0	2						
22001	Coenagrionidae		5.5	1						
52200	Cheumatopsyche sp	CA	6.0	5						
54601	Phryganeidae		3.5	1						
68700	Dubiraphia sp	CO	5.0	9						
68708	Dubiraphia vittata group	CO	5.0	86						
69400	Stenelmis sp	CO	7.0	2						
77001	Tanypodinae		6.0	1						
78655	Procladius (Holotanypus) sp		8.0	1						
82820	Cryptochironomus sp		8.0	6						
84450	Polypedilum (Uresipedilum) flavum		6.0	1						
84540	Polypedilum (Tripodura) scalaenum group		6.0	1						
84700	Stenochironomus sp		3.0	1						
85500	Paratanytarsus sp		6.0	1						
98200	Pisidium sp		5.0	4						
98600	Sphaerium sp		5.0	4						
	Quantitative Taxa: 22 per of Organisms: 321	Total T mIBI:	axa:	22 29.63						

Site:	Washington St.					Site ID:	11-5	
	-					Subsample:		
Colle	ction Date: 08/01/2019	River C	ode: 95	-995	River: Mill Creek		RN	1: 13.80
Taxa Code	Таха	Taxa Grp	Tol. (	Qt./QI.	Taxa Code	Таха	Feed Grp To	I. Qt./QI.
01801	Turbellaria		6.0	1				
03600	Oligochaeta		10.0	46				
06201	Hyalella azteca		4.0	2				
06800	Gammarus sp		3.0	125				
13400	Stenacron sp	MA	4.0	1				
17200	Caenis sp	MA	6.0	13				
22001	Coenagrionidae		5.5	30				
23700	Anax sp		5.0	1				
44501	Corixidae		99.9	1				
59570	Oecetis nocturna	CA	5.0	1				
65800	Berosus sp	CO	99.9	4				
68201	Scirtidae		7.0	1				
68700	Dubiraphia sp	CO	5.0	6				
68708	Dubiraphia vittata group	CO	5.0	9				
77120	Ablabesmyia mallochi		6.0	1				
77130	Ablabesmyia rhamphe group		6.0	1				
78200	Larsia sp		6.0	2				
78655	Procladius (Holotanypus) sp		8.0	6				
80510	Cricotopus (Isocladius) sylvestris gro	oup	8.0	1				
81231	Nanocladius (N.) crassicornus or N. "rectinervis"	(N.)	3.0	1				
82880	Cryptotendipes sp		6.0	1				
83040	Dicrotendipes neomodestus		6.0	2				
83051	Dicrotendipes simpsoni		6.0	1				
83158	Endochironomus nigricans		6.0	21				
83300	Glyptotendipes (G.) sp		10.0	23				
84000	Parachironomus sp		8.0	5				
84010	Parachironomus "abortivus" (sensu Simpson & Bode, 1980)		8.0	2				
84470	Polypedilum (P.) illinoense		6.0	8				
95100	Physella sp		9.0	17				
98600	Sphaerium sp		5.0	3				
	Quantitative Taxa: 30 ber of Organisms: 336	Total T mIBI:	axa: ;	30 32.08				

Site:	Dst. Stearns School Rd.				Site ID: 11-3					
Colleo	ction Date: 07/30/2019	River C	ode: 98	5-995	River: Mill Creek	Subsample:		RM:	7.2	
Taxa Code	Таха	Taxa Grp	Tol.	Qt./Ql.	Taxa Code	Таха	Feed Grp	Tol.	Qt./Ql.	
03600	Oligochaeta		10.0	20						
06800	Gammarus sp		3.0	30						
08200	Orconectes sp		5.0	1						
11130	Baetis intercalaris	MA	4.0	72						
13400	Stenacron sp	MA	4.0	2						
22001	Coenagrionidae		5.5	1						
22300	Argia sp		5.0	1						
52200	Cheumatopsyche sp	CA	6.0	16						
59100	Ceraclea sp	CA	3.0	1						
68201	Scirtidae		7.0	2						
68700	Dubiraphia sp	СО	5.0	3						
68708	Dubiraphia vittata group	СО	5.0	1						
68901	Macronychus glabratus	СО	2.0	10						
69400	Stenelmis sp	СО	7.0	3						
74100	Simulium sp		6.0	2						
77750	Hayesomyia senata or Thienemannimyia norena		5.0	7						
81825	Rheocricotopus (Psilocricotopus) robacki		6.0	1						
82820	Cryptochironomus sp		8.0	6						
82880	Cryptotendipes sp		6.0	2						
83040	Dicrotendipes neomodestus		6.0	20						
83840	Microtendipes pedellus group		6.0	2						
84450	Polypedilum (Uresipedilum) flavum		6.0	29						
84470	Polypedilum (P.) illinoense		6.0	4						
84540	Polypedilum (Tripodura) scalaenum group	1	6.0	30						
85500	Paratanytarsus sp		6.0	1						
85625	Rheotanytarsus sp		6.0	16						
85800	Tanytarsus sp		7.0	1						
85821	Tanytarsus glabrescens group sp 7		7.0	1						
86100	Chrysops sp		7.0	2						
89601	Muscidae		8.0	1						
	Pisidium sp		5.0	1						
	Sphaerium sp		5.0	1						
	Quantitative Taxa: 32 Der of Organisms: 290	Total T mIBI:	axa:	32 45.13	-					

Buter Code: 95-995         River: Mill Creek         Rule         RM:         0.7           Taxa         Taxa         Taxa         Taxa         Feed Grg         Tol.         QL/QL           1000         Cade         Taxa         Grg         Tol.         QL/QL         Code         Taxa         Feed Grg         Tol.         QL/QL           0100         Cade         Taxa         Grg         Tol.         QL/QL         Code         Taxa         Feed Grg         Tol.         QL/QL           0100         Cade         Taxa         Grg         Tol.         QL/QL         Code         Taxa         Feed Grg         QL/QL         Code         Taxa         Feed Grg         QL/QL         Code         Taxa         Grg         Tol.         QL/QL         Code         Taxa         Grg         Tol.         QL/QL         Code         Toxa         Code<	Site <sup>.</sup>	ust. Dillys Rd.					Site ID:	11-1	
Taxa         Taxa         Taxa         Taxa         Taxa         Feed         Grp Tol.         QL/Ql.           01801         Turbellaria         6.0         1         Code         Taxa         Grp Tol.         QL/Ql.           01801         Turbellaria         6.0         1         Code         Taxa         Grp Tol.         QL/Ql.           01801         Guochauta         10.0         6         Stepson         Galobal S		-							
Code         Taxa         Grave         Tol.         QL/QI.         Code         Taxa         Grave         Tol.         QL/QI.           01801         Turbellaria         6.0         1         1         Grave         Tol.         QL/QI.           01801         Turbellaria         6.0         1         1         Grave         Grave         QL/QI.           01801         Turbellaria         6.0         1	Colle	ction Date: 08/03/2019	River Co	ode: 9	5-995	River: Mill Cre	ek	RM:	0.70
03800       Olipochaeta       10.0       6         05800       Caexidolea sp       6.0       1         06201       Hyslelfa azteca       4.0       2         05800       Caexidolea sp       3.0       22         11130       Baetis intercalaris       MA       3.0       3         13000       Leuronouta sp       MA       3.0       3         13100       Stancoros p       MA       4.0       17         18700       Tricerythodes sp       MA       5.0       13         22001       Caenagionidae       5.5       2         23000       Agia sp       5.0       6         52000       Chaulades sp       A.0       1         52001       Chaulades sp       CA       6.0       53         52002       Scritidae       7.0       2         68701       Dubriophia vittal group       CO       5.0       5         68901       Macronychus glabratuis       CO       7.0       36         77120       Ablabesmyia manlochi       6.0       1         77120       Ablabesmyia thampho group       6.0       1         77121       Ablabesmyia mallochi       6.0		Таха		Tol.	Qt./QI.		Таха		Qt./QI.
No. Cu antilative Tax:         6.0         1           0201         Hypiella azieca         4.0         2           08000         Gammarus sp         3.0         22           08000         Gammarus sp         3.0         30           13000         Leurocuta sp         MA         3.0         3           13000         Leurocuta sp         MA         4.0         17           17000         Tricotyfroles sp         MA         5.0         13           21200         Colapteryx sp         4.0         1           22010         Colapteryx sp         4.0         1           22020         Colapteryx sp         4.0         1           22030         Argia sp         5.5         2           22030         Argia sp         5.0         5           22040         Chauldoets sp         4.0         1           22030         Argia sp         5.0         5           22041         Scidas         7.0         2           28020         Scidas         7.0         2           28040         Scheemian imphi group         6.0         1           7710         Ablabesmyra mallochi         6.0	01801	Turbellaria		6.0	1				
De201       Hysielia aztecia       4.0       2         De800       Gammarus sp       3.0       22         11130       Baetis intercalaris       MA       4.0       30         D1300       Leurocotala sp       MA       3.0       17         D1300       Leurocotala sp       MA       4.0       17         D1700       Thoroythodes sp       MA       5.0       13         21200       Congaronidae       5.5       2         22300       Argia sp       5.0       6         22000       Chaudodes sp       4.0       1         22000       Chaudodes sp       4.0       5         22010       Chaudodes sp       7.0       2         22020       Chaudodes sp       7.0       2         28070       Dubirsphia vitata group       CO       7.0         28070       Stenetrins sp       CO       7.0         28070       Notovidus giabratus       CO       1         77170       Hajaesmyia mallochi       6.0       1         7718       Alabaesmyia nanorena       1       2         77170       Hajaesmyia sonza       6.0       1         81440	03600	Oligochaeta		10.0	6				
06800       Germanus sp       3.0       22         11100       Beateis intercalaris       MA       4.0       30         13000       Leucrocuta sp       MA       3.0       13         13000       Leucrocuta sp       MA       4.0       17         16700       Tricorythodes sp       MA       5.0       13         12000       Calopteryx sp       4.0       1         22001       Calopteryx sp       5.0       6         48200       Chaluidoes sp       4.0       1         52001       Strides       7.0       2         87802       Schrides       7.0       2         88703       Subiraphia vitata group       CO       5.0       5         88704       Macronychus glabratus       CO       2.0       25         88705       Nubraphia vitata group       CO       7.0       36         77120       Ablabesmyia malloch       6.0       1         77120       Ablabesmyia malloch       6.0       1         78656       Produdius (Holdamyous) sp       8.0       1         82404       Polypedilum (P.) faltax group       6.0       1         82440       Polypedilum	05800	Caecidotea sp		6.0	1				
11130       Baelis intercalaris       MA       4.0       30         13000       Loucrocuta sp       MA       3.0       3         13400       Stenacron sp       MA       5.0       13         13400       Stenacron sp       MA       5.0       13         21200       Calopteryx sp       4.0       1         22001       Calopteryx sp       5.0       2         22002       Cheumatopsyche sp       CA       6.0       53         52070       Hydropsyche simulans       CA       5.0       7         58201       Scritidae       7.0       2         58201       Scritidae       7.0       2         58201       Scritidae       7.0       2         58201       Scritidae       6.0       1         7112       Ablabesmyla manloch       6.0       1         7124       Ablabesmyla manloch       6.0       1         71713       Ablabesmyla manloch       6.0       1         7124       Ablabesmyla manloch       6.0       1         7135       Ablabesmyla manloch       6.0       1         7146       Folopdilum (P) Inlincense       6.0       1 </td <td>06201</td> <td>Hyalella azteca</td> <td></td> <td>4.0</td> <td>2</td> <td></td> <td></td> <td></td> <td></td>	06201	Hyalella azteca		4.0	2				
13000       Leucrocuta sp       MA       3.0       3         13400       Stenacron sp       MA       4.0       17         16700       Tricorythodes sp       MA       5.0       13         21200       Calopteryx sp       4.0       1         22301       Argia sp       5.0       6         42020       Chaulides sp       4.0       1         52230       Argia sp       5.0       6         42020       Chaulides sp       4.0       1         52230       Hydropsyche simulans       CA       5.0         5257       Hydropsyche simulans       CA       5.0         5270       Dubrisphia vittat group       CO       5.0         52871       Bucrosychus glabratus       CO       2.0         58701       Macronychus glabratus       CO       1         77120       Ablabesmyla malloch       6.0       1         77121       Ablabesmyla senata or       5.0       14         77120       Ablabesmyla malloch       6.0       1         77120       Ablabesmyla senata or       5.0       14         77120       Hydrodilum (P.) lilinoense       6.0       1	06800	Gammarus sp		3.0	22				
13400       Stenacron sp       MA       4.0       17         16700       Tricorythodes sp       MA       5.0       13         12100       Calopteryx sp       4.0       1         22001       Coenagrionidae       5.5       2         22001       Coenagrionidae       5.0       6         48200       Chauliodes sp       4.0       1         52020       Argin sp       5.0       6         52021       Scritidae       7.0       2         58201       Scritidae       7.0       2         58201       Scritidae       7.0       2         58201       Macronychus glabratus       CO       2.0         58401       Macronychus glabratus       CO       1         77712       Ablabesmyla mallochi       6.0       1         77715       Hayesornyla senata or       5.0       14         77755       Hayesornyla senata or       5.0       1         7712       Ablabesmyla mallochi       6.0       1         84400       Polypedilum (P) allax group       6.0       1         84401       Polypedilum (P) allax group       6.0       1         84402       Polyp	11130	Baetis intercalaris	MA	4.0	30				
16700       Tricorythodes sp       MA       5.0       13         121200       Colopteryx sp       4.0       1         22001       Argia sp       5.5       2         22300       Argia sp       5.0       6         4200       Chauliddes sp       4.0       1         52200       Cheumatopsyche sp       CA       6.0       53         52577       Hydropsyche simulans       CA       5.0       7         52670       Scintidae       7.0       2         58708       Dubiraphia vittata group       CO       2.0         58890       Macromychus glabratus       CO       2.0         589400       Stenelmis sp       CO       7.0       36         77120       Ablabesmyla mallochi       6.0       1         77750       Hayesomyla senata or       5.0       14         77160       Polypedilum (Politamypus sp       8.0       1         82820       Cryptochironomus sp       8.0       1         828400       Polypedilum (P.) Inlianz group       6.0       1         84440       Polypedilum (P.) Inlianz group       6.0       1         84440       Polypedilum (P.) Inliana group sp 5	13000	Leucrocuta sp	MA	3.0	3				
21200       Calopteryx sp       4.0       1         22001       Coenagrionidae       5.5       2         Argia sp       5.0       6         4200       Chauliodes sp       4.0       1         5257       Hydropsyche sp       CA       6.0       53         5257       Hydropsyche simulans       CA       5.0       7         68201       Sciritidae       7.0       2         58703       Dubiraphia vitata group       CO       5.0       5         68404       Macronychus glabratus       CO       2.0       25         69404       Stenelmis sp       CO       7.0       36         7712       Ablabesmyia nallochi       6.0       1         7713       Ablabesmyia norena       5.0       14         7714       Halsesomyia senata or       5.0       14         7715       Halsesperiyai norena       6.0       1         82400       Polypedilum (Vreispedilum)       6.0       1         82440       Polypedilum (Vreispedilum)       6.0       1         84440       Polypedilum (Vreispedilum)       6.0       1         84452       Polypedilum (Tripodura) scalaenum       6.0	13400	Stenacron sp	MA	4.0	17				
22001         Coveragrionidae         5.5         2           22300         Argia sp         5.0         6           42000         Chaulidoes sp         4.0         1           52200         Cheumatopsyche sp         CA         6.0         53           5270         Urdorsyche simulans         CA         5.0         7           58201         Sciridae         7.0         2           68708         Dubiraphia vittata group         CO         5.0         5           59400         Stenelmis sp         CO         7.0         36           7712         Ablabesmyia thamphe group         6.0         1           7775         Hayesomyia senata or Thienemanimyia norena         5.0         14           7716         Polypedilum (Hobinypus) sp         8.0         1           82820         Cryotochironomus sp         8.0         1           824400         Polypedilum (Uresipedilum) flaw group         6.0         1           84450         Polypedilum (P) Illineense         6.0         12           84520         Polypedilum (P) Illineense         6.0         12           84540         Polypedilum (P) Illineense         6.0         12           <	16700	Tricorythodes sp	MA	5.0	13				
22200       Argia sp       5.0       6         48200       Chauliodes sp       4.0       1         5200       Cheumatopsyche sp       CA       6.0       53         5207       Hydropsyche simulans       CA       5.0       7         58201       Scintidae       7.0       2         58708       Dubraphia vittata group       CO       5.0       5         58901       Macronychus glabratus       CO       2.0       25         589400       Stenelmis sp       CO       7.0       36         77120       Ablabesmyia mallochi       6.0       1         77130       Ablabesmyia innamphe group       6.0       1         77140       Hayesomyias enata or       5.0       14         Thienemannimyia norena       7       7       7         78655       Procladius (Holotanypus) sp       8.0       4         82400       Polypedilum (Uresipedilum) flavum       6.0       14         84410       Polypedilum (P. Jallax group       6.0       12         84540       Polypedilum (Tripodura) scalaenum group       6.0       12         85255       Iadotanytarsus vanderwulpi group sp 5       7.0       2      <	21200	Calopteryx sp		4.0	1				
48200       Chauliodes sp       4.0       1         52200       Cheumatopsyche sp       CA       6.0       53         5257       Hydropsyche simulans       CA       5.0       7         58201       Sciridae       7.0       2         58703       Dubiraphia vitata group       CO       5.0       55         68801       Macronychus glabratus       CO       2.0       255         68804       Steinelmis sp       CO       1         77120       Ablabesmyia mallochi       6.0       1         77771       Hayesomyia senata or Thienemanimiya norena       5.0       14         77750       Hayesomyia senata or Thienemanimiya norena       6.0       1         78655       Procladius (Holotanypus) sp       8.0       4         83040       Dicrotendipes neomodestus       6.0       1         84420       Polypedilum (Uresipedilum) flavum       6.0       1         84450       Polypedilum (P.) fallax group       6.0       12         84450       Polypedilum (P.) fallax group       6.0       12         85255       Cladonylarsus vanderwulp group sp 5       7.0       2         85265       Rhotanytarsus sp       6.0	22001	Coenagrionidae		5.5	2				
S2200       Cheumatopsyche sp       CA       6.0       53         52570       Hydropsyche simulans       CA       5.0       7         58201       Sciritidae       7.0       2         88708       Dubiraphia vittata group       CO       5.0       5         58901       Macronychus glabratus       CO       2.0       25         589400       Stenelmis sp       CO       7.0       1         77120       Ablabesmyla mallochi       6.0       1         77750       Hayesomyla senata or       5.0       14         77750       Hayesomyla senata or       5.0       14         78655       Procladius (Holotanypus) sp       8.0       4         82400       Cryptochironomus sp       8.0       1         82420       Cryptodilum (P.) fallax group       6.0       1         84440       Polypedilum (P.) fallax group       6.0       1         84450       Polypedilum (Tripodura) scalaenum group       6.0       2         85255       Cladotanytarsus vanderwulpi group sp 5       7.0       2         85265       Rheotanytarsus sp       6.0       2         85265       Rheotanytarsus sp       5.0       3 </td <td>22300</td> <td>Argia sp</td> <td></td> <td>5.0</td> <td>6</td> <td></td> <td></td> <td></td> <td></td>	22300	Argia sp		5.0	6				
S2570       Hydropsyche simulans       CA       5.0       7         68201       Sciritidae       7.0       2         68708       Dubiraphia vittata group       CO       5.0       5         68901       Macronychus glabratus       CO       2.0       25         68900       Stenefinis sp       CO       7.0       36         77112       Ablabesmyla mamlochi       6.0       1         77750       Hayesomyla senata or       5.0       14         77655       Procladius (Holotanypus) sp       8.0       1         82820       Cryptochironomus sp       8.0       1         828400       Dolypedilum (Posipedilum) flavum       6.0       14         84400       Polypedilum (P.) fallas group       6.0       12         84400       Polypedilum (Ir.P.) fallas group       6.0       12         84400       Polypedilum (Tripodura) halterale group       6.0       12         84520       Polypedilum (Tripodura) scalaenum       6.0       2         85265       Cladoanytarsus vanderwulpi group sp 5       7.0       2         85265       Cladoanytarsus sp       5.0       3         98200       Shaterium sp       5.0       3<	48200	Chauliodes sp		4.0	1				
88201       Sciridae       7.0       2         68708       Dubiraphia vittata group       CO       5.0       5         68708       Macronychus glabratus       CO       2.0       25         689400       Stenelmis sp       CO       7.0       36         77112       Ablabesmyia mallochi       6.0       1         77713       Ablabesmyia nample group       6.0       1         77750       Hayesomyia senata or       5.0       14         Thienemanimyia norena       7       1       1         78655       Procladius (Holotanypus) sp       8.0       1         82820       Cryptochironomus sp       6.0       1         84400       Polypedilum (P) fallax group       6.0       1         84420       Polypedilum (P) illincense       6.0       1         84420       Polypedilum (Tripodura) halterale group       6.0       1         84420       Polypedilum (Tripodura) scalaenum       6.0       2         85265       Cladotanytarsus vandenwulpi group sp 5       7.0       2         85265       Cladotanytarsus sp       5.0       3         85260       Siduan yps       5.0       3         89200	52200	Cheumatopsyche sp	CA	6.0	53				
88708       Dubiraphia vitata group       CO       5.0       5         688901       Macronychus glabratus       CO       2.0       25         69400       Stenelmis sp       CO       7.0       36         77112       Ablabesmyia mallochi       6.0       1         77130       Ablabesmyia rhamphe group       6.0       1         77170       Hayesomyia senata or       5.0       14         77170       Hayesomyia senata or       5.0       14         78655       Procladius (Holotanypus) sp       8.0       1         82820       Cryptochironomus sp       8.0       4         82440       Polypedilum (Uresipedilum) flavum       6.0       1         84450       Polypedilum (P.) fallax group       6.0       12         84450       Polypedilum (Tripodura) haiteraie group       6.0       12         84526       Polypedilum (Tripodura) scalaenum       6.0       2         85265       Cladotanytarsus vanderwulpi group sp 5       7.0       2         85265       Cladotanytarsus sp       6.0       2         95100       Physella sp       9.0       1         98200       Stenerium sp       5.0       3	52570	Hydropsyche simulans	CA	5.0	7				
88901       Macronychus glabratus       CO       2.0       25         69400       Stenelmis sp       CO       7.0       36         77120       Ablabesmyia mallochi       6.0       1         77130       Ablabesmyia rhamphe group       6.0       1         77750       Hayesomyia senata or       5.0       14         77650       Frocladius (Holotanypus) sp       8.0       1         82620       Cryptochironomus sp       8.0       4         82640       Polypedilum (Uresipedilum) flavum       6.0       1         84450       Polypedilum (P.) fallax group       6.0       1         84450       Polypedilum (P.) scalaenum       6.0       12         84520       Polypedilum (Tripodura) halterale group       6.0       2         84540       Polypedilum (Tripodura) scalaenum       6.0       12         84520       Polypedilum (Tripodura) scalaenum       6.0       2         85265       Claotanytarsus vanderwulpi group sp 5       7.0       2         85265       Claotanytarsus sp       6.0       2         98200       Pisella sp       9.0       1         98200       Pisela sp       9.0       1	68201	Scirtidae		7.0	2				
B9400         Stenelmis sp         CO         7.0         36           77120         Ablabesmyia mallochi         6.0         1           77130         Ablabesmyia rhamphe group         6.0         1           77750         Hayesomyia senata or Thienemannimyia norena         5.0         14           77750         Hayesomyia senata or Thienemannimyia norena         5.0         14           78655         Procladius (Holotanypus) sp         8.0         1           82820         Cryptochironomus sp         8.0         4           83040         Dicrotendipes neomodestus         6.0         2           84400         Polypedilum (Uresipedilum) flavum         6.0         14           84450         Polypedilum (IP.) fallax group         6.0         12           84520         Polypedilum (Tripodura) halterale group         6.0         12           84540         Polypedilum (Tripodura) scalaenum group         6.0         2           85265         Cladotanytarsus vandenwulpi group sp 5         7.0         2           85265         Rheotanytarsus sp         6.0         2           98200         Piselium sp         5.0         3           98200         Sphaerium sp         5.0         9<	68708	Dubiraphia vittata group	CO	5.0	5				
77120       Ablabesmyia mallochi       6.0       1         77130       Ablabesmyia rhamphe group       6.0       1         77750       Hayesomyia senata or       5.0       14         77750       Hayesomyia senata or       5.0       14         77865       Procladius (Holotanypus) sp       8.0       1         82820       Cryptochironomus sp       8.0       4         83040       Dicrotendipes neomodestus       6.0       1         84450       Polypedilum (Uresipedilum) flavum       6.0       14         84460       Polypedilum (P.) fallax group       6.0       12         84452       Polypedilum (Tripodura) halterale group       6.0       12         84545       Polypedilum (Tripodura) scalaenum       6.0       2         85265       Cladotanytarsus vanderwulpi group sp 5       7.0       2         85265       Cladotanytarsus sp       6.0       2         95100       Physella sp       9.0       1         98200       Shaerium sp       5.0       3         98600       Sphaerium sp       5.0       3         98600       Sphaerium sp       5.0       9	68901	Macronychus glabratus	CO	2.0	25				
Ablabes wire hamphe group6.0177750Hayesomyia senata or Thienemannimyia norena5.01478655Procladius (Holotanypus) sp8.0182820Cryptochironomus sp8.0483040Dicrotendipes neomodestus6.0284400Polypedilum sp6.0184450Polypedilum (Uresipedilum) flavum6.01484460Polypedilum (P.) fallax group6.0184470Polypedilum (P.) fallax group6.01284525Polypedilum (Tripodura) halterale group6.0284526Cladotanytarsus vanderwulpi group sp 57.0285265Cladotanytarsus vanderwulpi group sp 57.0285265Rheotanytarsus sp6.0295100Physella sp9.01982000Sphaerium sp5.03986000Sphaerium sp5.09700000007000000000000000000000000000000000000	69400	Stenelmis sp	CO	7.0	36				
Ar7750Hayesomyia senata or Thienemannimyia norena5.01478655Procladius (Holotanypus) sp8.0182820Cryptochironomus sp8.0483040Dicrotendipes neomodestus6.0284400Polypedilum sp6.0184450Polypedilum (Uresipedilum) flavum6.01484460Polypedilum (P.) fallax group6.0184470Polypedilum (P.) fallax group6.01284520Polypedilum (Tripodura) halterale group6.0284520Polypedilum (Tripodura) scalaenum group6.0285255Rheotanytarsus vanderwulpi group sp 57.0285625Rheotanytarsus sp6.0295100Physella sp9.0198200Sphaerium sp5.0398600Sphaerium sp5.09Total Taxa: 36	77120	Ablabesmyia mallochi		6.0	1				
Thienemannimyia norena         78655       Procladius (Holotanypus) sp       8.0       1         82820       Cryptochironomus sp       8.0       4         83040       Dicrotendipes neomodestus       6.0       2         84400       Polypedilum sp       6.0       1         84450       Polypedilum (Uresipedilum) flavum       6.0       14         84460       Polypedilum (P.) fallax group       6.0       12         84470       Polypedilum (P.) fallax group       6.0       12         84520       Polypedilum (Tripodura) halterale group       6.0       2         84540       Polypedilum (Tripodura) scalaenum group       6.0       2         84555       Cladotanytarsus vanderwulpi group sp 5       7.0       2         85265       Cladotanytarsus sp       6.0       2         95100       Physella sp       9.0       1         98200       Pisidium sp       5.0       3         98600       Sphaerium sp       5.0       9         Wo. Quantitative Taxa:       36       Total Taxa:       36	77130	Ablabesmyia rhamphe group		6.0	1				
82820Cryptochironomus sp8.0483040Dicrotendipes neomodestus6.0284400Polypedilum sp6.0184450Polypedilum (Uresipedilum) flavum6.01484460Polypedilum (P.) fallax group6.0184470Polypedilum (P.) illinoense6.01284520Polypedilum (Tripodura) halterale group6.0284525Cladotanytarsus vanderwulpi group sp7.0285265Cladotanytarsus vanderwulpi group sp7.0295100Physella sp9.0198200Pisidium sp5.0398600Sphaerium sp5.09No. Quantitative Taxa: 36Total Taxa: 36Total Taxa: 36	77750			5.0	14				
83040Dicrotendipes neomodestus6.0284400Polypedilum sp6.0184450Polypedilum (Uresipedilum) flavum6.01484460Polypedilum (P.) fallax group6.0184470Polypedilum (P.) illinoense6.01284520Polypedilum (Tripodura) halterale group6.0284520Polypedilum (Tripodura) scalaenum group6.0485265Cladotanytarsus vanderwulpi group sp 57.0285625Rheotanytarsus sp6.02995100Physella sp9.0198200Pisidium sp5.0398600Sphaerium sp5.09Total Taxa: 36Total Taxa: 36	78655	Procladius (Holotanypus) sp		8.0	1				
84400Polypedilum sp6.0184450Polypedilum (Uresipedilum) flavum6.01484460Polypedilum (P.) fallax group6.0184470Polypedilum (P.) illinoense6.01284520Polypedilum (Tripodura) halterale group6.0284540Polypedilum (Tripodura) scalaenum6.04group85265Cladotanytarsus vanderwulpi group sp 57.0285625Rheotanytarsus sp6.0295100Physella sp9.0198200Pisidium sp5.0398600Sphaerium sp5.09Total Taxa: 36	82820	Cryptochironomus sp		8.0	4				
B4450Polypedilum (Uresipedilum) flavum6.014B4460Polypedilum (P.) fallax group6.01B4470Polypedilum (P.) illinoense6.012B4520Polypedilum (Tripodura) halterale group6.02B4540Polypedilum (Tripodura) scalaenum6.04groupgroup7.02B5265Cladotanytarsus vanderwulpi group sp 57.02B5625Rheotanytarsus sp6.0295100Physella sp9.0198200Pisidium sp5.0398600Sphaerium sp5.09Total Taxa: 36Total Taxa: 36	83040	Dicrotendipes neomodestus		6.0	2				
84460Polypedilum (P.) fallax group6.0184470Polypedilum (P.) illinoense6.01284520Polypedilum (Tripodura) halterale group6.0284540Polypedilum (Tripodura) scalaenum6.04group85265Cladotanytarsus vanderwulpi group sp 57.0285625Rheotanytarsus sp6.0295100Physella sp9.0198200Pisidium sp5.0398600Sphaerium sp5.09No. Quantitative Taxa: 36Total Taxa: 36	84400	Polypedilum sp		6.0	1				
84470Polypedilum (P.) illinoense6.01284520Polypedilum (Tripodura) halterale group6.0284540Polypedilum (Tripodura) scalaenum group6.0485265Cladotanytarsus vanderwulpi group sp 57.0285625Rheotanytarsus sp6.0295100Physella sp9.0198200Pisidium sp5.0398600Sphaerium sp5.09No. Quantitative Taxa: 36Total Taxa: 36	84450	Polypedilum (Uresipedilum) flavun	n	6.0	14				
84520Polypedilum (Tripodura) halterale group6.0284540Polypedilum (Tripodura) scalaenum group6.0485265Cladotanytarsus vanderwulpi group sp 57.0285625Rheotanytarsus sp6.0295100Physella sp9.0198200Pisidium sp5.0398600Sphaerium sp5.09No. Quantitative Taxa: 36Total Taxa: 36	84460	Polypedilum (P.) fallax group		6.0	1				
84540Polypedilum (Tripodura) scalaenum group6.0485265Cladotanytarsus vanderwulpi group sp 57.0285625Rheotanytarsus sp6.0295100Physella sp9.0198200Pisidium sp5.0398600Sphaerium sp5.09No. Quantitative Taxa: 36Total Taxa: 36	84470	Polypedilum (P.) illinoense		6.0	12				
group 85265 Cladotanytarsus vanderwulpi group sp 5 7.0 2 85625 Rheotanytarsus sp 6.0 2 95100 Physella sp 9.0 1 98200 Pisidium sp 5.0 3 98600 Sphaerium sp 5.0 9 No. Quantitative Taxa: 36 Total Taxa: 36	84520	Polypedilum (Tripodura) halterale	group	6.0	2				
85625       Rheotanytarsus sp       6.0       2         95100       Physella sp       9.0       1         98200       Pisidium sp       5.0       3         98600       Sphaerium sp       5.0       9         No. Quantitative Taxa:       36       Total Taxa:       36	84540		m	6.0	4				
95100       Physella sp       9.0       1         98200       Pisidium sp       5.0       3         98600       Sphaerium sp       5.0       9         No. Quantitative Taxa: 36       Total Taxa: 36	85265	Cladotanytarsus vanderwulpi grou	ıp sp 5	7.0	2				
98200       Pisidium sp       5.0       3         98600       Sphaerium sp       5.0       9         No. Quantitative Taxa:       36       Total Taxa:       36	85625	Rheotanytarsus sp		6.0	2				
98600 Sphaerium sp     5.0     9       No. Quantitative Taxa:     36     Total Taxa:     36	95100	Physella sp		9.0	1				
No. Quantitative Taxa: 36 Total Taxa: 36	98200	Pisidium sp		5.0	3				
	98600	Sphaerium sp		5.0	9				
	No. C	Quantitative Taxa: 36	Total T	axa:	36				
			mIBI:		58.53				

Site:	Ust Edwards Rd.					Sit	e ID:	10-7		
		River C	ode <sup>.</sup> 0	5-996	River:	Sub North Mill Creek	sample:		RM:	11.30
	Silon Date: 00/04/2013		ouc. o	0-000		North Mill Oreck				11.00
Taxa Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха		Feed Grp	Tol.	Qt./QI.
01801	Turbellaria		6.0	4	85001	Tanytarsini			6.0	3
03600	Oligochaeta		10.0	9	85500	Paratanytarsus sp			6.0	3
05800	Caecidotea sp		6.0	5	85625	Rheotanytarsus sp			6.0	9
05900	Lirceus sp		4.0	6	95100	Physella sp			9.0	1
06201	Hyalella azteca		4.0	37	96264	Planorbella (Pierosoma	a) pilsbryi		6.5	1
06800	Gammarus sp		3.0	9	98200	Pisidium sp			5.0	5
08200	Orconectes sp		5.0	4	98600	Sphaerium sp			5.0	4
11130	Baetis intercalaris	MA	4.0	1						
13400	Stenacron sp	MA	4.0	38	No. C	uantitative Taxa:	46	Total	Taxa:	46
17200	Caenis sp	MA	6.0	22	Num	per of Organisms:	304	mIBI:		54.19
21001	Calopterygidae		3.5	2						
22001	Coenagrionidae		5.5	1						
42700	Belostoma sp		99.9	4						
44501	Corixidae		99.9	2						
48200	Chauliodes sp		4.0	1						
52200	Cheumatopsyche sp	CA	6.0	28						
53800	Hydroptila sp	CA	2.0	2						
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1						
60400	Gyrinus sp	CO	4.0	1						
67700	Paracymus sp	CO	99.9	1						
67800	Tropisternus sp	CO	99.9	1						
68700	Dubiraphia sp	CO	5.0	4						
68708	Dubiraphia vittata group	CO	5.0	1						
77120	Ablabesmyia mallochi		6.0	4						
77355	Clinotanypus pinguis		6.0	7						
77500	Conchapelopia sp		6.0	6						
78600	Pentaneura inconspicua		3.0	3						
78655	Procladius (Holotanypus) sp		8.0	2						
82730	Chironomus (C.) decorus group		11.0	2						
32820	Cryptochironomus sp		8.0	6						
82880	Cryptotendipes sp		6.0	3						
83840	Microtendipes pedellus group		6.0	1						
84300	Phaenopsectra obediens group		4.0	5						
84450	Polypedilum (Uresipedilum) flavum		6.0	12						
34470	Polypedilum (P.) illinoense		6.0	22						
84520	Polypedilum (Tripodura) halterale gro	oup	6.0	9						
84540	Polypedilum (Tripodura) scalaenum group		6.0	2						
34540	Polypedilum (Tripodura) scalaenum group		6.0	9						
34700	Stenochironomus sp		3.0	1						

	Dst. IL 173				Site ID: 10-3						
Colle	ction Date: 08/04/2019	River Co	odo: 0	5 006	Divor: North	RM:	10.0				
	Clion Dale. 00/04/2019	River Co	Jue. 9	5-990	River: North	Mill Creek		10.2			
Taxa Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха	Feed Grp Tol.	Qt./QI.			
1801	Turbellaria		6.0	5							
3600	Oligochaeta		10.0	22							
4666	Helobdella papillata		8.0	1							
5800	Caecidotea sp		6.0	6							
6201	Hyalella azteca		4.0	70							
00860	Gammarus sp		3.0	3							
8200	Orconectes sp		5.0	1							
3400	Stenacron sp	MA	4.0	7							
2001	Coenagrionidae		5.5	2							
4501	Corixidae		99.9	2							
52200	Cheumatopsyche sp	CA	6.0	3							
53800	Hydroptila sp	CA	2.0	3							
59580	Oecetis persimilis	CA	5.0	1							
60350	Gyretes sinuatus		0.0	2							
5800	Berosus sp	СО	99.9	2							
8201	Scirtidae		7.0	13							
8700	Dubiraphia sp	СО	5.0	44							
8708	Dubiraphia vittata group	СО	5.0	104							
7120	Ablabesmyia mallochi		6.0	2							
7140	Ablabesmyia peleensis		6.0	1							
8200	Larsia sp		6.0	1							
8600	Pentaneura inconspicua		3.0	2							
'8655	Procladius (Holotanypus) sp		8.0	2							
	Chironomini		6.0	1							
2730	Chironomus (C.) decorus group		11.0	1							
2820	Cryptochironomus sp		8.0	3							
	Polypedilum (Uresipedilum) flavum		6.0	1							
35500			6.0	4							
5615	Rheotanytarsus pellucidus		6.0	1							
	Rheotanytarsus sp		6.0	9							
	Tanytarsus sp		7.0	1							
	Tabanidae		7.0	1							
	Hemerodromia sp		6.0	1							
	Physella sp		9.0	2							
	Pisidium sp		5.0	- 1							
		Tatal T									
	Quantitative Taxa: 35 ber of Organisms: 325	Total T mIBI:	axa:	35 36.25							

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Site	e: Dst. closed bridge							
Sile.	Dat. closed blidge					Subsample:		
Colle	ction Date: 08/03/2019	River Co	ode: 9	5-996	River: North	Mill Creek	RM:	1
Taxa Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха	Feed Grp Tol.	Qt./C
03600	Oligochaeta		10.0	5				
04901	Erpobdellidae		8.0	1				
06201	Hyalella azteca		4.0	1				
06800	Gammarus sp		3.0	2				
1120	Baetis flavistriga	MA	4.0	1				
1130	Baetis intercalaris	MA	4.0	64				
3400	Stenacron sp	MA	4.0	23				
1200	Calopteryx sp		4.0	11				
3909	Boyeria vinosa		3.0	1				
2700	Belostoma sp		99.9	1				
2200	Cheumatopsyche sp	CA	6.0	88				
2430	Ceratopsyche morosa group	CA	4.0	3				
2530	Hydropsyche depravata group	CA	5.0	13				
8201	Scirtidae		7.0	3				
8708	Dubiraphia vittata group	СО	5.0	3				
8901	Macronychus glabratus	СО	2.0	4				
9400	Stenelmis sp	СО	7.0	3				
4100	Simulium sp		6.0	64				
7120	Ablabesmyia mallochi		6.0	1				
7500	Conchapelopia sp		6.0	3				
7750	Hayesomyia senata or Thienemannimyia norena		5.0	2				
8600	Pentaneura inconspicua		3.0	2				
1825	Rheocricotopus (Psilocricotopus) robacki		6.0	1				
2820	Cryptochironomus sp		8.0	1				
3840	Microtendipes pedellus group		6.0	1				
4450	Polypedilum (Uresipedilum) flavum		6.0	28				
4460	Polypedilum (P.) fallax group		6.0	1				
4470	Polypedilum (P.) illinoense		6.0	10				
4540	Polypedilum (Tripodura) scalaenum group	I	6.0	1				
4700	Stenochironomus sp		3.0	1				
4750	Stictochironomus sp		5.0	4				
5625	Rheotanytarsus sp		6.0	6				
4201	Lymnaeidae		7.0	1				
N- (		Total T	<u></u>					
	Quantitative Taxa: 33 ber of Organisms: 354	Total T mIBI:	axa:	33 55.98				

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Site:	Dst. Millburn Rd.					Sit	te ID:	10-1	
		River C	ode: 9	5-996	River: North I		osample:	RM:	1.10
Таха									
Code	Таха	Taxa Grp	Tol.	Qt./QI.	Taxa Code	Таха		Feed Grp Tol.	Qt./QI.
01801	Turbellaria		6.0	2					
03600	Oligochaeta		10.0	18	No. Quantita	ative Taxa:	39	Total Taxa:	39
05800	Caecidotea sp		6.0	4	Number of (	Organisms:	285	mlBl:	58.20
06201	Hyalella azteca		4.0	1					
06800	Gammarus sp		3.0	5					
08200	Orconectes sp		5.0	4					
11130	Baetis intercalaris	MA	4.0	16					
13400	Stenacron sp	MA	4.0	30					
16700	Tricorythodes sp	MA	5.0	1					
21001	Calopterygidae		3.5	1					
22300	Argia sp		5.0	7					
43570	Neoplea sp		99.9	1					
52200	Cheumatopsyche sp	CA	6.0	9					
59580	Oecetis persimilis	CA	5.0	3					
63300	Hydroporini	CO	99.9	1					
63900	Laccophilus sp	СО	99.9	1					
67700	Paracymus sp	СО	99.9	4					
68201	Scirtidae		7.0	15					
68601	Ancyronyx variegata	СО	2.0	1					
68700	Dubiraphia sp	СО	5.0	15					
68708	Dubiraphia vittata group	СО	5.0	38					
68901		СО	2.0	12					
	Stenelmis sp	СО	7.0	11					
	Ablabesmyia mallochi		6.0	1					
	Hayesomyia senata or Thienemannimyia norena		5.0	16					
78140	Labrundinia pilosella		4.0	1					
	Larsia sp		6.0	2					
	Cryptochironomus sp		8.0	4					
82880			6.0	2					
	Microtendipes "caelum" (sensu Simp & Bode, 1980)	son	6.0	1					
84450	Polypedilum (Uresipedilum) flavum		6.0	3					
	Polypedilum (P.) fallax group		6.0	1					
	Polypedilum (P.) illinoense		6.0	27					
	Polypedilum (Tripodura) halterale gro	an	6.0	3					
	Polypedilum (Tripodura) scalaenum group		6.0	7					
84700	Stenochironomus sp		3.0	9					
	Stictochironomus sp		5.0	1					
	' Hemerodromia sp		6.0	2					
	Pisidium sp		5.0	5					

# **APPENDIX C**

# Upper Des Plaines River Year 3 Subwatersheds 2019 Habitat Data

C-1: QHEI Metrics and Scores C-2: QHEI Field Sheets 2019

		QHEI Metrics:							
River Mile	QHEI	Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient & Score	Narrative
(95051) Bull Year:2019	Creek								
5.95	57.50	18.0	12.0	13.0	6.50	2.0	0.0	9.05 - ( 6)	Fair
4.70	57.25	14.0	11.0	11.5	7.75	4.0	1.0	13.95 - ( 8)	Fair
1.00	53.25	12.5	11.0	14.0	4.25	5.0	2.5	3.96 - ( 4)	Fair
0.50	78.00	18.0	16.0	15.0	5.50	8.0	5.5	6.26 - (10)	Excellent
 (95702) Hast Year:2019	ings Cree	ek							
3.12	60.00	12.0	13.0	13.0	5.50	6.0	2.5	10.50 - ( 8)	Good
1.68	44.50	11.0	12.0	6.0	2.50	7.0	0.0	6.86 - ( 6)	Poor
(95704) Bull's Year:2019	s Brook							·	
1.95	76.50	18.0	14.0	15.0	10.00	6.0	5.5	32.57 - ( 8)	Excellent
0.25	69.00	15.5	10.0	16.0	9.50	6.0	4.0	32.77 - ( 8)	Good
 (95708)  New Year:2019	port Drair	nage Ditch						·	
3.03	45.00	0.0	17.0	9.0	9.00	6.0	0.0	3.68 - ( 4)	Fair
0.70	63.00	14.0	16.0	12.0	5.00	9.0	1.0	6.65 - ( 6)	Good
(95709) Ston Year:2019	eroller Cr	reek						·	
0.42	82.00	18.0	12.0	16.5	10.00	9.0	6.5	19.18 - (10)	Excellent
(95710) Subi Year:2019	urban Cou	untry Club	Trib						
2.00	39.00	6.0	12.0	3.0	4.00	4.0	0.0	15.72 - (10)	Poor
(95711) Sloc Year:2019	um Conrr	ners Creek							
1.36	63.75	16.0	13.0	14.5	3.75	5.0	3.5	30.60 - ( 8)	Good
	amed Trib	to DesPL	aines F	River				·	
0.13	62.00	13.0	11.0	13.0	10.00	4.0	1.0	26.83 - (10)	Good
— — — — (95715)  UT to Year:2019	o North M	lill Creek							
0.04	53.50	13.0	7.0	13.5	5.50	4.0	0.5	15.69 - (10)	Fair
 (95716)  UT 0 Year:2019	Greenleaf	Creek						· · ·	
0.40	63.75	14.0	10.0	18.0	6.25	4.0	15	26.98 - (10)	Good

Appendix C-1. QHEI metric scores	for citos in the upper Dec Plaines	Pivor study area during 2010
Appendix C-1. QHEI metric scores	IOI SILES III LITE UPPER DES FIAILLES	River Sludy area during 2013.

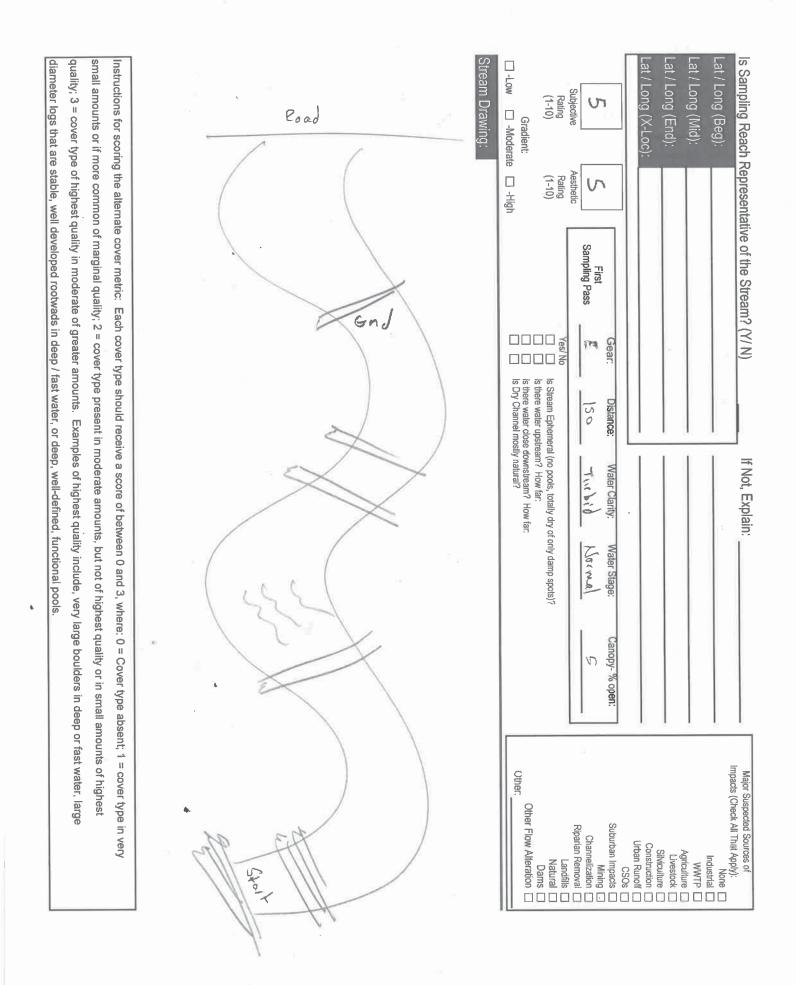
					QHI	El Metri	cs:		
River Mile	QHEI	Substrate	eCover	Channel	Riparian	Pool	Riffle	Gradient & Score	Narrative
(95719) Wes	st Branch	Bull Creek							
Year:2019									
2.54	47.75	11.0	12.0	10.0	5.75	5.0	0.0	4.40 - ( 4)	Fair
1.60	65.75	16.5	13.0	16.0	4.25	9.0	3.0	2.85 - ( 4)	Good
(95720) Wes Year:2019	st Fork Be	lvidere Rd	. Trib						
0.21	68.75	18.0	14.0	13.0	6.25	5.0	4.5	36.62 - ( 8)	Good
0.15	70.00	17.0	14.0	11.5	6.00	9.0	4.5	33.63 - ( 8)	Excellent
(95995) Mill Year:2019	Creek								
17.20	40.00	5.0	7.0	9.0	5.00	5.0	1.0	10.78 - ( 8)	Poor
13.80	52.75	9.0	14.0	5.0	8.75	6.0	0.0	6.71 - (10)	Fair
7.20	62.00	13.0	14.0	14.0	9.00	5.0	1.0	5.56 - ( 6)	Good
1.71	80.00	16.0	17.0	15.0	10.00	8.0	6.0	7.40 - ( 8)	Excellent
0.70	68.50	14.0	16.0	13.5	7.00	8.0	2.0	7.30 - ( 8)	Good
(95996) Nor Year:2019	th Mill Cre	ek							
11.30	37.00	4.0	12.0	5.0	10.00	2.0	0.0	2.60 - ( 4)	Poor
10.20	59.00	2.0	16.0	10.0	9.00	8.0	4.0	7.68 - (10)	Fair
8.10	67.75	11.5	14.0	14.0	8.25	5.0	5.0	6.74 - (10)	Good
1.10	59.00	6.5	16.0	11.5	9.50	7.0	2.5	5.24 - ( 6)	Fair

# Appendix C-1. QHEI metric scores for sites in the upper Des Plaines River study area during 2019.

	RM: 1.10	stream: Mill Creek	C Field Sheet QHEI Sco	re: b
River Code: <u>95 - 996</u> Site Code: 10 - 1	Project Code: DRUUU!	The second	1	
Date: 8-15-19	Scorer: MAS	Latitude: 42, 42,340	Longitude: -87.99709	
.) SUBSTRATE (Check ONLY Two	o Substrate TYPE BOXES; Estimate % pe	arcent		
	RIFFLE	POOL RIFFLE SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
-BLDR/SLBS [10]	GRAVEL [7]	Check ONE (OR 2 & A)		
	Z			Substra
BOULDER [9]			SILT MODERATE I-11	
				6.5
			-SILT FREE [1]	Max 2
	□ Ø -SILT [2]			NIGA 2
			NESS:MODERATE [-1]	
UMBER OF SUBSTRATE TYPES:	-4 or More [2]			
High Quality Only, Score 5 or >)	-3 or Less [0]			
		-COAL FINES [-2		
COMMENTS:				
	cover type a score of 0 to 3; see back for		AMOUNT: (Check ONLY one or	
(Structure) / UNDERCUT BANKS [1]	TYPE: Score All That Occur / POOLS > 70 cm [2]	/	check 2 and AVERAGE)	Cover
OVERHANGING VEGETAT			-EXTENSIVE > 75% [11] -MODERATE 25 - 75% [7]	16
L SHALLOWS (IN SLOW WAT		3 LOGS OR WOODY DEBRIS [1]	→ -SPARSE 5 - 25% [3]	Max 2
ROOTMATS [1]			-NEARLY ABSENT < 5% [1]	IAIGY 7.
OMMENTS:				
) CHANNEL MORPHOLOGY: (CH	heck ONLY one PER Category OR check	2 and AVERAGE)		
	EVELOPMENT CHANNELIZA	ATION STABILTIY	MODIFICATIONS / OTHER	
	-EXCELLENT [7] -NONE	,	SNAGGING -IMPOUNDMENT	Chann
	-GOOD [5] RECOV		-RELOCATION -ISLAND	11.5
		/ERING [3] [2-LOW [1]		
-NONE [1]	POOR [1] -RECEN RECOV		-DREDGING -BANK SHAPING -ONE SIDE CHANNEL MODIFICATIONS	Max 2
			-ONE SIDE CHANNEL MODIFICATIONS	
OMMENTS:				
			River Right Looking Downstream	
V DIDADIAN ZONE AND DANK CO	DODON (shash ONE has DED )	heck 2 and AVERAGE per bank)	River Right Looking Downstream	
	ROSION (check ONE box PER bank or ch		-	
IPARIAN WIDTH	FLOOD PLAIN QUA	ALITY (PAST 100 Meter RIPARIAN)	BANK EROSION	
IPARIAN WIDTH L_R (Per Bank)	FLOOD PLAIN QUA L R (Most Predominant Per Bank	() LR	L R (Per Bank)	Riparia
IPARIAN WIDTH L_R (Per Bank) VERY WIDE > 100m [5]	FLOOD PLAIN QUA L R (Most Predominant Per Bank C C -FOREST, SWAMP [3]	() L R	L R (Per Bank) AGE [1]NONE / LITTLE [3]	
IPARIAN WIDTH ↓ R (Per Bank) ☐ ☐ -VERY WIDE > 100m [5] ☐ ☐/-WIDE > 50m [4]	FLOOD PLAIN QUA           L         R           (Most Predominant Per Bank           2         -FOREST, SWAMP [3]	L R CONSERVATION TILL U - URBAN OR INDUSTRI	L R (Per Bank) AGE [1] -NONE / LITTLE [3] AL [0] -MODERATE [2]	9.5
IPARIAN WIDTH └ R (Per Bank) └ C -VERY WIDE > 100m [5] └ C -VERY WIDE > 50m [4] └ C -MODERATE 10 - 50m [3]	FLOOD PLAIN QU/ L R (Most Predominant Per Bank C Q -FOREST, SWAMP [3] - SHRUB OR OLD FIELD [2] - RESIDENTIAL, PARK, NEW	<ul> <li>L R</li> <li>CONSERVATION TILL</li> <li>URBAN OR INDUSTRI</li> <li>URBAN OR INDUSTRI</li> </ul>	L R (Per Bank) AGE [1] -NONE / LITTLE [3] AL [0] -MODERATE [2] WCROP [0] -HEAVY / SEVERE [1]	9.5
IPARIAN WIDTH ↓ R (Per Bank) ↓ □ -VERY WIDE > 100m [5] ↓ □ -WIDE > 50m [4] ↓ □ -MODERATE 10 - 50m [3] ↓ □ -NARROW 5 - 10m [2]	FLOOD PLAIN QUA           L         R           (Most Predominant Per Bank           2         -FOREST, SWAMP [3]	L R CONSERVATION TILL U - URBAN OR INDUSTRI	L R (Per Bank) AGE [1] -NONE / LITTLE [3] AL [0] -MODERATE [2] WCROP [0] -HEAVY / SEVERE [1]	9.5
PARIAN WIDTH R (Per Bank) - VERY WIDE > 100m [5] - VERY WIDE > 50m [4] MODERATE 10 - 50m [3] - NARROW 5 - 10m [2] - VERY NARROW < 5m [1]	FLOOD PLAIN QU/ L R (Most Predominant Per Bank C Q -FOREST, SWAMP [3] - SHRUB OR OLD FIELD [2] - RESIDENTIAL, PARK, NEW	<ul> <li>L R</li> <li>CONSERVATION TILL</li> <li>URBAN OR INDUSTRI</li> <li>URBAN OR INDUSTRI</li> </ul>	L R (Per Bank) AGE [1] -NONE / LITTLE [3] AL [0] -MODERATE [2] WCROP [0] -HEAVY / SEVERE [1]	9.5
IPARIAN WIDTH R (Per Bank) 	FLOOD PLAIN QUA         L R       (Most Predominant Per Bank         Image: Construct of the structure       -FOREST, SWAMP [3]         Image: Constructure       -SHRUB OR OLD FIELD [2]         Image: Constructure       -RESIDENTIAL, PARK, NEW         Image: Constructure       -FENCED PASTURE [1]         COMMENTS:	<ul> <li>L R</li> <li>CONSERVATION TILL</li> <li>URBAN OR INDUSTRI</li> <li>URBAN OR INDUSTRI</li> </ul>	L R (Per Bank) AGE [1] -NONE / LITTLE [3] AL [0] -MODERATE [2] WCROP [0] -HEAVY / SEVERE [1]	9.5
IPARIAN WIDTH        R       (Per Bank)        VERY WIDE > 100m [5]        VERY WIDE > 50m [4]        NODERATE 10 - 50m [3]        NARROW 5 - 10m [2]        VERY NARROW < 5m [1]	FLOOD PLAIN QUA L R (Most Predominant Per Bank P I - FOREST, SWAMP [3] - SHRUB OR OLD FIELD [2] - RESIDENTIAL, PARK, NEW - FENCED PASTURE [1] COMMENTS:	<ul> <li>L R</li> <li>CONSERVATION TILL</li> <li>U-URBAN OR INDUSTRI</li> <li>U-FIELD [1]</li> <li>O-PEN PASTURE, ROV</li> <li>-MINING / CONSTRUCT</li> </ul>	L R (Per Bank) AGE [1]	9.5
IPARIAN WIDTH        R (Per Bank)        VERY WIDE > 100m [5]        VMIDE > 50m [4]        NODERATE 10 - 50m [3]        NARROW 5 - 10m [2]        VERY NARROW < 5m [1]	FLOOD PLAIN QUA L R (Most Predominant Per Bank P I POREST, SWAMP [3] SHRUB OR OLD FIELD [2] RESIDENTIAL, PARK, NEW FENCED PASTURE [1] COMMENTS: NOUALITY MORPHOLOGY	<ul> <li>L R</li> <li>CONSERVATION TILL</li> <li>URBAN OR INDUSTRI</li> <li>URBAN OR INDUSTRI</li> <li>OPEN PASTURE, ROU</li> <li>OPEN PASTURE, ROU</li> <li>ORINING / CONSTRUCT</li> </ul>	L R (Per Bank) AGE [1]	Max 1
IPARIAN WIDTH        R (Per Bank)        VERY WIDE > 100m [5]        VMIDE > 50m [4]        NODERATE 10 - 50m [3]        NARROW 5 - 10m [2]        NARROW 5 - 10m [2]        NONE [0]        NONE [0]        NONE [0]        NONE [1]        NONE [0]        NONE [1]        NONE [1]        NONE [1]        NONE [1]        NONE [1]	FLOOD PLAIN QUA         L       R       (Most Predominant Per Bank         Process       -FOREST, SWAMP [3]         -       -FOREST, SWAMP [3]         -       -SHRUB OR OLD FIELD [2]         -       -RESIDENTIAL, PARK, NEW         -       -FENCED PASTURE [1]         COMMENTS:	(i) L R (i) CONSERVATION TILL (i) URBAN OR INDUSTRI (i) URBAN OR INDUSTRI (CURBAN OR INDUSTRI (CURRENT VELOO (Check	L R (Per Bank) AGE [1]	Max 1
IPARIAN WIDTH        R (Per Bank)        VERY WIDE > 100m [5]        VMIDE > 50m [4]        NODERATE 10 - 50m [3]        NARROW 5 - 10m [2]        VERY NARROW < 5m [1]	FLOOD PLAIN QUA L R (Most Predominant Per Bank P I POREST, SWAMP [3] SHRUB OR OLD FIELD [2] RESIDENTIAL, PARK, NEW FENCED PASTURE [1] COMMENTS: NOUALITY MORPHOLOGY	<ul> <li>L R</li> <li>CONSERVATION TILL</li> <li>URBAN OR INDUSTRI</li> <li>URBAN OR INDUSTRI</li> <li>OPEN PASTURE, ROU</li> <li>O</li></ul>	L R (Per Bank) AGE [1]	Pool / Curren
IPARIAN WIDTH        R (Per Bank)        VERY WIDE > 100m [5]        VUIDE > 50m [4]        NODERATE 10 - 50m [3]        NARROW 5 - 10m [2]        VERY NARROW < 5m [1]	FLOOD PLAIN QUA         L R (Most Predominant Per Bank         I I -FOREST, SWAMP [3]         I -FENCED PASTURE [1]         COMMENTS:         JN QUALITY         MORPHOLOGY         (Check 1 or 2 & AVERAGE         I -POOL WIDTH > RIFFLE WI	ILR           Image: Conservation till           Image: Conservationtitee	L R (Per Bank) AGE [1]	Max 11
IPARIAN WIDTH         ↓ R (Per Bank)         ↓ -VERY WIDE > 100m [5]         ↓ -VERY WIDE > 50m [4]         ↓ -MODERATE 10 - 50m [3]         ↓ -MODERATE 10 - 50m [2]         ↓ -NARROW 5 - 10m [2]         ↓ -VERY NARROW < 5m [1]	FLOOD PLAIN QUA         L R (Most Predominant Per Bank         I I -FOREST, SWAMP [3]         I -FENCED PASTURE [1]         COMMENTS:         JN QUALITY         MORPHOLOGY         (Check 1 or 2 & AVERAGE)         -POOL WIDTH > RIFFLE WI         -POOL WIDTH = RIFFLE WI	I         R           I         - CONSERVATION TILL           I         - URBAN OR INDUSTRI           I         - URBAN OR INDUSTRI           V         FIELD [1]         I           I         - OPEN PASTURE, ROU           I         - MINING / CONSTRUCT	L R (Per Bank) AGE [1]	Pool / Curren
IPARIAN WIDTH         ↓ R (Per Bank)         ↓ -VERY WIDE > 100m [5]         ↓ -VERY WIDE > 50m [4]         ↓ -MODERATE 10 - 50m [3]         ↓ -MODERATE 10 - 50m [2]         ↓ -NARROW 5 - 10m [2]         ↓ -VERY NARROW < 5m [1]	FLOOD PLAIN QUA         L       R       (Most Predominant Per Bank         Image: Process of the system      FOREST, SWAMP [3]         Image: Process of the system      FENCED PASTURE [1]         Image: Process of the system      FENCED PASTURE [1]         COMMENTS:      FENCED PASTURE [1]         COMMENTS:      FENCED PASTURE [1]         Image: Process of the system      FENCED PASTURE [1]         COMMENTS:      FENCED PASTURE [1]         Image: Process of the system      F	Image: Rest of the second se	L R (Per Bank) AGE [1]	Pool / Curren
IPARIAN WIDTH R (Per Bank) - VERY WIDE > 100m [5] - VERY WIDE > 50m [4] - HODERATE 10 - 50m [3] - NORE 10 - 50m [2] - VERY NARROW 5 - 10m [2] - VERY NARROW 5 - 10m [2] - VERY NARROW 5 m [1] - NONE [0] POOL / GLIDE AND RIFFLE / RU AX. DEPTH - NONE [0] - 1m [6] - 0.7m [4] - 0.2 to 0.4m [1] 0.2 to 0.4m [1] 0.2m [POOL = 0]	FLOOD PLAIN QUA         L       R       (Most Predominant Per Bank         Image: Process of the system      FOREST, SWAMP [3]         Image: Process of the system      FENCED PASTURE [1]         Image: Process of the system      FENCED PASTURE [1]         COMMENTS:      FENCED PASTURE [1]         COMMENTS:      FENCED PASTURE [1]         Image: Process of the system      FENCED PASTURE [1]         COMMENTS:      FENCED PASTURE [1]         Image: Process of the system      F	Image: Rest of the second se	L R (Per Bank) AGE [1]	Pool / Curren
IPARIAN WIDTH R (Per Bank) - VERY WIDE > 100m [5] - VERY WIDE > 50m [4] - HODERATE 10 - 50m [3] - NORE 10 - 50m [2] - VERY NARROW 5 - 10m [2] - VERY NARROW 5 - 10m [2] - VERY NARROW 5 m [1] - NONE [0] POOL / GLIDE AND RIFFLE / RU AX. DEPTH - NONE [0] - 1m [6] - 0.7m [4] - 0.2 to 0.4m [1] 0.2 to 0.4m [1] 0.2m [POOL = 0]	FLOOD PLAIN QUA         L       R       (Most Predominant Per Bank         Image: Process in the second	k)       L       R	L R (Per Bank) AGE [1]	Pool / Curren
IPARIAN WIDTH         L       R       (Per Bank)	FLOOD PLAIN QUA         L R (Most Predominant Per Bank         I - FOREST, SWAMP [3]        FOREST, SWAMP [3]        SHRUB OR OLD FIELD [2]        RESIDENTIAL, PARK, NEW        FENCED PASTURE [1]         COMMENTS:	Image: Rest of the second se	L R (Per Bank) AGE [1]	Pool / Curren Max 12 Max 12
IPARIAN WIDTH         ↓ R (Per Bank)         ↓ -VERY WIDE > 100m [5]         ↓ -VERY WIDE > 50m [4]         ↓ -MODERATE 10 - 50m [3]         ↓ -MODERATE 10 - 50m [2]         ↓ -NARROW 5 - 10m [2]         ↓ -VERY NARROW < 5m [1]	FLOOD PLAIN QUAL         L       R       (Most Predominant Per Bank         Image: Process of the structure o	Image: Rest of the second se	L R (Per Bank) AGE [1]	Pool / Curren
IPARIAN WIDTH         □       R (Per Bank)         □       -VERY WIDE > 100m [5]         □       -VERY WIDE > 50m [4]         □       -MODERATE 10 - 50m [3]         □       -MODERATE 10 - 50m [3]         □       -NARROW 5 - 10m [2]         □       -NONE [0]         )       POOL / GLIDE AND RIFFLE / RU         AX. DEPTH         Check 1 ONLY[]         □       -1m [6]         □       -0.7m [4]         □       -0.2 to 0.4m [1]         □       -0.2 to 0.4m [1]         □       -0.2 to 0.4m [1]         □       -<0.2 m [POOL = 0]	FLOOD PLAIN QUA         L R (Most Predominant Per Bank         I - FOREST, SWAMP [3]        FOREST, SWAMP [3]        SHRUB OR OLD FIELD [2]        RESIDENTIAL, PARK, NEW        FENCED PASTURE [1]         COMMENTS:	Image: Rest of the second se	L R (Per Bank) AGE [1]	Pool / Curren 1 Max 12 Riffle / R
IPARIAN WIDTH         □       R (Per Bank)         □       -VERY WIDE > 100m [5]         □       -VERY WIDE > 50m [4]         □       -MODERATE 10 - 50m [3]         □       -MODERATE 10 - 50m [3]         □       -NARROW 5 - 10m [2]         □       -NONE [0]         POOL / GLIDE AND RIFFLE / RI         AX. DEPTH         □       -0.7m [4]         □       -0.7m [4]         □       -0.2 to 0.4m [1]         □       -0.2 to 0.4m [1]         □       -0.2 to 0.4m [2]         POOL       -0.2 to 0.4m [2]	FLOOD PLAIN QU//         L R (Most Predominant Per Bank         I -FOREST, SWAMP [3]         -SHRUB OR OLD FIELD [2]         -SHRUB OR OLD FIELD [2]         -FESIDENTIAL, PARK, NEW         -FENCED PASTURE [1]         COMMENTS:         JN QUALITY         MORPHOLOGY         (Check 1 or 2 & AVERAGE         -POOL WIDTH > RIFFLE WI         -POOL WIDTH = RIFFLE WI         -POOL WIDTH < RIFFLE WI	I         R           I         -CONSERVATION TILL           I         -URBAN OR INDUSTRI           I         -URBAN OR INDUSTRI           V         FIELD [1]         I           I         -OPEN PASTURE, ROW           I         -MINING / CONSTRUCT           I         -MINING / CONSTRUCT           IDTH [2]         -EDDIES [1]           IDTH [2]         -FAST [1]           IDTH [1]         I           -FAST [1]           IDTH [0]         INODERATE [1]           IDTH [0]         -NONE [-1]           IDTH [0]         NONE [-1]           IDTH [0]         SLOW [1]           IDTH [0]         -NONE [-1]	L R (Per Bank) AGE [1]	Pool / Curren Max 12 Riffle / R
IPARIAN WIDTH        R (Per Bank)	FLOOD PLAIN QUAL         L       R       (Most Predominant Per Bank         Image: Process of the second structure	Image: Rest of the second se	L R (Per Bank) AGE [1]	Pool / Curren 1 Max 12 Riffle / R
IPARIAN WIDTH         □       R (Per Bank)         □       -VERY WIDE > 100m [5]         □       -WIDE > 50m [4]         □       -MODERATE 10 - 50m [3]         □       -MODERATE 10 - 50m [3]         □       -NARROW 5 - 10m [2]         □       -NARROW 5 - 10m [2]         □       -NARROW 5 - 10m [2]         □       -NERY NARROW < 5m [1]	FLOOD PLAIN QUAL         L       R       (Most Predominant Per Bank         Image: Process of the second structure	Image: Rest of the second se	L R (Per Bank) AGE [1]	Pool / Curren Max 12 Max 12 Max 12 Max 8
IPARIAN WIDTH         □       R (Per Bank)         □       -VERY WIDE > 100m [5]         □       -WIDE > 50m [4]         □       -MODERATE 10 - 50m [3]         □       -MODERATE 10 - 50m [3]         □       -NARROW 5 - 10m [2]         □       -VERY NARROW < 5m [1]	FLOOD PLAIN QU//         L R (Most Predominant Per Bank         I -FOREST, SWAMP [3]         -SHRUB OR OLD FIELD [2]         -RESIDENTIAL, PARK, NEW         -FENCED PASTURE [1]         COMMENTS:         JN QUALITY         MORPHOLOGY         (Check 1 or 2 & AVERAGE)         -POOL WIDTH > RIFFLE WI         -POOL WIDTH = RIFFLE WI         -MAX > 50 cm [2]         Ø         -MAX > 50 cm [1]         Int [0]         int [0]         int [0]	A) L R CONSERVATION TILL URBAN OR INDUSTRICHARCHARCHARCHARCHARCHARCHARCHARCHARCHAR	L R (Per Bank) AGE [1]	Pool / Curren 1 Max 11 Max 12 Max 12 Max 8 Gradier
IPARIAN WIDTH        R (Per Bank)        VERY WIDE > 100m [5]        WIDE > 50m [4]        MODERATE 10 - 50m [3]        NARROW 5 - 10m [2]        VERY NARROW < 5m [1]	FLOOD PLAIN QUAL         L       R       (Most Predominant Per Bank         Image: Process of the second structure	A) L R CONSERVATION TILL URBAN OR INDUSTRICHARCHARCHARCHARCHARCHARCHARCHARCHARCHAR	L       R       (Per Bank)         AGE [1]       -NONE / LITTLE [3]         AL [0]       -MODERATE [2]         NCROP [0]       -HEAVY / SEVERE [1]         TION [0]       -HEAVY / SEVERE [1]         CITY       (POOLS & RIFFLES!)         k All That Apply)       -TORRENTIAL [-1]         -INTERSTITIAL [-1]       -INTERMITTENT [-2]         -VERY FAST [1]       -VERY FAST [1]         RIFFLE / RUN EMBEDDEDNESS       -NONE [2]         -LOW [1]       -HODERATE [0]         -EXTENSIVE [-1]       -EXTENSIVE [-1]	Pool / Curren I Max 11 Max 12 Max 12 Max 8 Gradier

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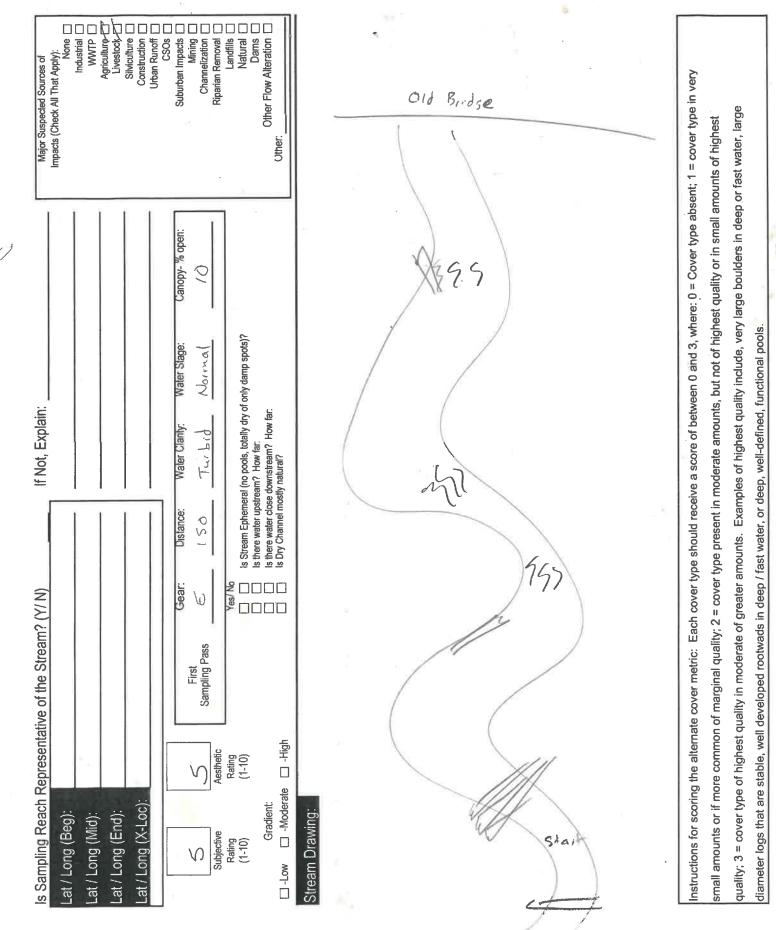


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Mid A Gt Biodiversity Institute	Qualitative	Habita	at Evaluation Index	Field Sheet QHEI Sc	ore: (1.15)
River Code: 95-996	RM: 8,10	Stream:	N mill Craek		
Site Code: _ 10 - 2	Project Code: DRUSUSL9	Location			
Date: 8-16-19	Scorer: MAS	Latitude:	76,49396	Longitude: - 87, 99981	
	Substrate TYPE BOXES; Estimate %   RIFFLE	POOL	RIFFLE SUBSTRATE ORIGIN		
TYPE         POOL		PUUL	RIFFLE <u>SUBSTRATE ORIGIN</u> Check ONE (OR 2 & AVE	SUBSTRATE QUALITY RAGE) Check ONE (OR 2 & AVERAGE)	
-Lg BOULD [10]	C -SAND [6]	<u> </u>		SILT: SILT HEAVY [-2]	Substrate
	BEDROCK [5]			-SILT MODERATE [-1]	
			-WETLANDS [0]	SILT NORMAL [0]	1.5
	ARTIFICIAL [0]		-HARDPAN [0]		Max 20
-MUCK [2]	[] · [] -SILT [2]		SANDSTONE [0]	EMBEDDED -EXTENSIVE [-2]	
			-RIP / RAP [0]	NESS: -MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES:	-4 or More [2]			-NORMAL [0]	
(High Quality Only, Score 5 or >)	-3 or Less [0]		-SHALE [-1] -COAL FINES [-2]	-NONE [1]	
COMMENTS:			U -OUAL HINES [-2]		
	over type a score of 0 to 3; see back for	r instruction	is)	AMOUNT: (Check ONLY one or	
(Structure) UNDERCUT BANKS [1]	TYPE: Score All That Occur O POOLS > 70 cm [2]	$\sim$		check 2 and AVERAGE)	Cover
OVERHANGING VEGETATIO			OXBOWS, BACKWATERS [1] AQUATIC MACROPHYTES [1]	<ul> <li>-EXTENSIVE &gt; 75% [11]</li> <li>-MODERATE 25 - 75% [7]</li> </ul>	14
3 SHALLOWS (IN SLOW WAT			LOGS OR WOODY DEBRIS [1]		Max 20
ROOTMATS [1]				-NEARLY ABSENT < 5% [1]	
COMMENTS:	eck ONLY one PER Category OR chec	1 2 and 61/			
	ECK ONLY ONE PER Category OR check		STABILTIY	MODIFICATIONS / OTHER	
	EXCELLENT [7] -NONE [0		-HIGH [3]	SNAGGING -IMPOUNDMENT	Channel
	-GOOD [5] -RECOV		MODERATE [2]	-RELOCATION -ISLAND	14
			( -LOW [1] ·		
	POOR [1] -RECENT RECOVE			-DREDGING -BANK SHAPING -ONE SIDE CHANNEL MODIFICATIONS	Max 20
				······································	
COMMENTS:				۰	
4.) RIPARIAN ZONE AND BANK ER	OSION (check ONE box PER bank or	check 2 and	AVERAGE per bank	River Right Looking Downstream	
RIPARIAN WIDTH			100 Meter RIPARIAN)	BANK EROSION	
L R (Per Bank)	L R (Most Predominant Per Bank	)	LR	L R (Per Bank)	Riparian
-VERY WIDE > 100m [5]	-FOREST, SWAMP [3]		CONSERVATION TILLA     URBAN OR INDUSTRIAI		8.25
-MODERATE 10 - 50m [3]	-STIKOB OK OLD FIELD [2]	FIELD [1]			Max 10
	FENCED PASTURE [1]				
-VERY NARROW < 5m [1]					
-NONE [0]	COMMENTS:				
5.) POOL / GLIDE AND RIFFLE / RU	N QUALITY				
MAX. DEPTH	MORPHOLOGY		CURRENT VELOCIT	Y (POOLS & RIFFLES!)	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)			II That Apply)	Pool /
□ - 1m [6] □ - 0.7m [4]	-POOL WIDTH > RIFFLE WI -POOL WIDTH = RIFFLE WI		-EDDIES [1]	-TORRENTIAL [-1] -INTERSTITIAL [-1]	Current
- 0.4 to 0.7m [2]			-MODERATE [1]		15
- 0.2 to 0.4m [1]	-IMPOUNDED [-1]		-SLOW [1]	-VERY FAST [1]	Max 12
- < 0.2m [POOL = 0]			-NONE [-1]		
COMMENTS:		1000			
	CHECK ONE OF	CHECK 2	AND ADVERAGE		Riffle / Run
RIFFLE DEPTH	RUN DEPTH		UN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS	4
-*Best Areas > 10cm [2]			e.g., Cobble, Boulder) [2]		5
✓ -Best Areas 5 - 10cm [1] □ -Best Areas < 5cm [0]	· · · · ·		ABLE (e.g., Large Gravel) [1] E (Fine Gravel, Sand) [0]	-LOW [1]	Max 8
-NO RIFFLE but RUNS preser		-UNGTADL	n filme oraver, oand) [0]		Gradient
-NO RIFFLE / NO RUN [Metric				· · ·	
COMMENTS:					
6.) GRADIENT (ft / mi): 6.74	DRAINAGE AREA (sq.mi.): 29.5-	F	% POOL: % GLIDE		10
Best areas must be large enough to support a			% RIFFLE: % RUN	Menual based on gradient and drainag eres.	Max 10
					1
					112

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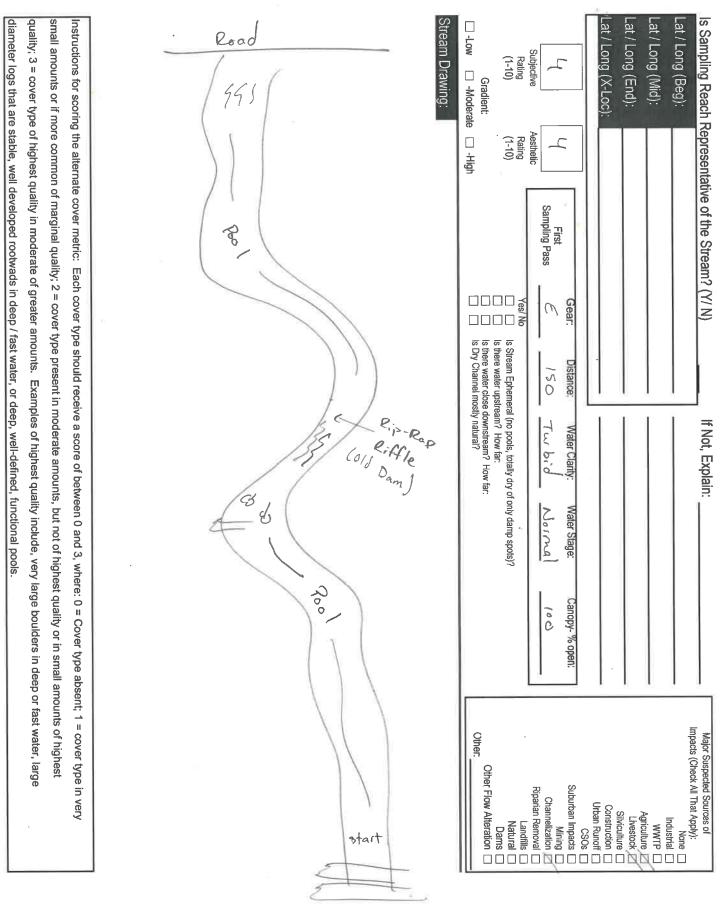


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Qualitative	e Habita	at Evaluation Index F	ield Sh	eet QHEIS	core: 6
River Code: 95-996 RM: 10.2	Stream:	N Mill Creek			المستخبريا
Site Code: 10-3 Project Code: DRWW18	Location:	Dst 11 173			
Date: 8-16-19 Scorer: MAS	Latitude:	42.46497	Longitude:	-88.00859	
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % p	ercent				
TYPE POOL RIFFLE	POOL	RIFFLE SUBSTRATE ORIGIN		SUBSTRATE QUALITY	<b>1</b>
		Check ONE (OR 2 & AVER	AGE)	Check ONE (OR 2 & AVERAGE)	
□ □ -Lg BOULD [10]		-LIMESTONE [1]	SILT:	SILT HEAVY [-2]	Cubatrata
			OILT.	1	Substrate
				SILT MODERATE [-1]	2
	<u> </u>	, 🗹 -WETLANDS [0]		SILT NORMAL [0]	
		HARDPAN [0]		SILT FREE [1]	Max 20
		SANDSTONE [0]	EMBEDDED	/	
		RIP / RAP [0]	NESS:	-MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES: 4 or More [2]		-LACUSTRINE [0]		-NORMAL [0]	
(High Quality Only, Score 5 or >)		-SHALE [-1]		-NONE [1]	
		-COAL FINES [-2]			
COMMENTS:					
2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for				AMOUNT: (Check ONLY one or	_
(Structure) TYPE: Score All That Occu UNDERCUT BANKS [1] 3 POOLS > 70 cm (2	-			check 2 and AVERAGE)	Cover
UNDERCUT BANKS [1] 3 POOLS > 70 cm [2 O OVERHANGING VEGETATION [1] 2 ROOTWADS [1]		DXBOWS, BACKWATERS [1] AQUATIC MACROPHYTES [1]		-EXTENSIVE > 75% [11]	12
COVERHANGING VEGETATION [1] CONTINUES [1]				-MODERATE 25 - 75% [7]	
2_ROOTMATS [1]		OGS OR WOODY DEBRIS [1]		-SPARSE 5 - 25% [3]	Max 20
				-NEARLY ABSENT < 5% [1]	
COMMENTS:	(2 and AVEDA	GE)			
<u>SINUOSITY</u> <u>DEVELOPMENT</u> CHANNELIZ		GE) <u>STABILTIY</u>	MODIFICATI	ONS / OTHER	
Z -HIGH [4]     DEVELOPMENT CHANNELIZ					Channel
□ -MODERATE [3] □ -GOOD [5] □ -RECO		MODERATE [2]	-SNAG		Chaintei
□ -LOW [2] □ -FAIR [3] □ -RECO		□ -LOW [1]		PY REMOVAL -LEVEED	0
- NONE [1] - POOR [1] - RECE					Max 20
	/ERY [1]			IDE CHANNEL MODIFICATIONS	MOA 20
COMMENTS:					
A.)         RIPARIAN ZONE AND BANK EROSION         (check ONE box PER bank or c           RIPARIAN WIDTH         FLOOD PLAIN QL           L         R         (Per Bank)         L         R         (Most Predominant Per Ban           Image: Comparison of the system of the syste	IALITY ( <i>PAST.</i> ik) ]	100 Meter RIPARIAN )         L         R	E [1] [0] ROP [0]	ight Looking Downstream	Riparian 9 Max 10
5.1 POOL / GLIDE AND RIFFLE / RUN QUALITY         MAX. DEPTH-       MORPHOLOGY         (Check 1 ONLYI)       (Check 1 or 2 & AVERAG         - 1m [6]       -POOL WIDTH > RIFFLE W         - 0.7m [4]       -POOL WIDTH = RIFFLE W         - 0.4 to 0.7m [2]       -POOL WIDTH < RIFFLE W	/IDTH [2] /IDTH [1]	CURRENT VELOCIT (Check A - EDDIES [1] - FAST [1] - MODERATE [1] - SLOW [1] - NONE [-1]	That Apply)	ENTIAL [-1] STITIAL [-1] MITT'ENT [-2]	Pool / Current - Max 12
RIFFLE DEPTH         RUN DEPTH           -*Best Areas > 10cm [2]         - MAX > 50 cm [2]           -Best Areas > 10cm [1]         - MAX < 50 cm [1]	RIFFLE / F ☐ -STABLE (¢ ☐ -MOD. STA ☐ -UNSTABL	AND ADVERAGE RUN SUBSTRATE Pip - Pap 2.g., Cobble, Boulder) [2] BLE (e.g., Large Gravel) [1] E (Fine Gravel, Sand) [0]	-NONE -LOW [1 -LOW [1 -MODE]	] RATE [0]	Riffle / Run L Max 8 Gradient
6.) GRADIENT (ft/mi): 7. 68 DRAINAGE AREA (sq.mi.): 20.9	54	% POOL: % GLIDE		Gradient Score from Table 2 of User	10
Best areas must be large enough to support a population of riffle-obligate species		% RIFFLE: % RUN		Gradient Score from Table 2 of User based on gradient and drainage area	
		n			A CONTRACTOR

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Qualitative	Habitat Evaluation Index Field Sheet QHEI Score	е: ЦЦ, <sup>5</sup>
River Code:         95-702         RM:         1.68           Site Code:         10-4         Project Code:         DRWW19           Date:         8-28-2019         Scorer:         V/A	Stream: Hastings Creek Location: @ Miller Rd. Latitude: 42.4479 Longitude: -88.0247	
1.) SUBSTRATE       (Check ONLY Two Substrate TYPE BOXES; Estimate % per         TYPE       POOL       RIFFLE         Image: Image	Cent         SUBSTRATE ORIGIN         SUBSTRATE QUALITY          Check ONE (OR 2 & AVERAGE)         Check ONE (OR 2 & AVERAGE)         Check ONE (OR 2 & AVERAGE)          Check ONE (OR 2 & AVERAGE)        Check ONE (OR 2 & AVERAGE)        Check ONE (OR 2 & AVERAGE)          Check ONE (OR 2 & AVERAGE)        Check ONE (OR 2 & AVERAGE)        Check ONE (OR 2 & AVERAGE)          Check ONE (OR 2 & AVERAGE)        Check ONE (OR 2 & AVERAGE)        Check ONE (OR 2 & AVERAGE)          Check ONE (I)        CHECk ONE (I)         SILT MODERATE [-1]          CHARDPAN [0]        CHECK ONE (I)        CHECK ONE [1]          CHARDPAN [0]        CHECK ONE [2]        CHECK ONE [1]          CHARDPAN [0]        CHECK ONE [2]        CHECK ONE [2]          CHARDPAN [0]        CHECK ONE [2]        CHECK ONE [2]          CHARDPAN [0]        CHECK ONE [2]        CHECK ONE [2]          CHARDPAN [0]        CHECK ONE [2]	Substrate
2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for ii (Structure)         TYPE: Score All That Occur           UNDERCUT BANKS [1]         POOLS > 70 cm [2]           OVERHANGING VEGETATION [1]         ROOTWADS [1]           SHALLOWS (IN SLOW WATER) [1]         BOULDERS [1]           ROOTMATS [1]         COMMENTS:	AMOUNT: (Check ONLY one or check 2 and AVERAGE) OXBOWS, BACKWATERS [1] AQUATIC MACROPHYTES [1] LOGS OR WOODY DEBRIS [1] AQUATIC MACROPHYTES	Cover
3.) CHANNEL MORPHOLOGY:         (Check ONLY one PER Category OR check :           SINUOSITY         DEVELOPMENT         CHANNELIZA          HIGH [4]         -EXCELLENT [7]         -NONE [0          MODERATE [3]         -GOOD [5]         -RECOV           -LOW [2]         -FAIR [3]         -RECOVE           -NONE [1]         -POOR [1]         -RECOVE           -NONE [1]         -IMPOUNT         -IMPOUNT	TION     STABILITY     MODIFICATIONS / OTHER       5)     -HIGH [3]     -SNAGGING     -IMPOUNDMENT       ERED [4]     -MODERATE [2]     -RELOCATION     -ISLAND       ERING [3]     -LOW [1]     -CANOPY REMOVAL     -LEVEED       If OR NO     -DREDGING     -BANK SHAPING       ERIY [1]     -ONE SIDE CHANNEL MODIFICATIONS	Channel
A.)         RIPARIAN ZONE AND BANK EROSION         (check ONE box PER bank or ch           RIPARIAN WIDTH         FLOOD PLAIN QUA           L         R         (Per Bank)         L         R         (Most Predominant Per Bank           Order         -VERY WIDE > 100m [5]         -FOREST, SWAMP [3]         -FOREST, SWAMP [3]         -FOREST, SWAMP [3]           Order         -WIDE > 50m [4]         -SHRUB OR OLD FIELD [2]         -SHRUB OR OLD FIELD [2]           Order         -WIDE > 50m [3]         -RESIDENTIAL, PARK, NEW           Order         -NARROW 5 - 10m [2]         -FENCED PASTURE [1]           Order         -VERY NARROW < 5m [1]	LITY (PAST 100 Meter RIPARIAN)       BANK EROSION         I       R       L       R       (Per Bank)         I       -CONSERVATION TILLAGE [1]       I       -NONE / LITTLE [3]         I       -URBAN OR INDUSTRIAL [0]       I       -MODERATE [2]	Riparian 2.5 Max 10
5.) POOL / GLIDE AND RIFFLE / RUN QUALITY         MAX. DEPTH       MORPHOLOGY         (Check 1 ONLYI)       (Check 1 or 2 & AVERAGE)         - 1m [6]       -POOL WIDTH > RIFFLE WI         - 0.7m [4]       -POOL WIDTH = RIFFLE WI         - 0.4 to 0.7m [2]       -POOL WIDTH < RIFFLE WI	DTH [2] <ul> <li>-EDDIES [1]</li> <li>-TORRENTIAL [-1]</li> <li>DTH [1]</li> <li>-FAST [1]</li> <li>-INTERSTITIAL [-1]</li> </ul>	Pool / Current Max 12
RUFFLE DEPTH         RUN DEPTH           -*Best Areas > 10cm [2]         - MAX > 50 cm [2]           -Best Areas 5 - 10cm [1]         - MAX < 50 cm [1]	R CHECK 2 AND ADVERAGE         RIFFLE / RUN SUBSTRATE         -STABLE (e.g., Cobble, Boulder) [2]         -MOD. STABLE (e.g., Large Gravel) [1]         -LOW [1]         '-UNSTABLE (Fine Gravel, Sand) [0]         '-EXTENSIVE [-1]         % POOL:         '' GLIDE:	Riffle / Run Max 8 Gradient
*Best areas must be large enough to support a population of riffle-obligate species	Gradient Score from Table 2 of Users Manue % RIFFLE: % RUN: based on gradient and drainage area.	Max 10 Max 10 Max 10 Max 10 Max 10

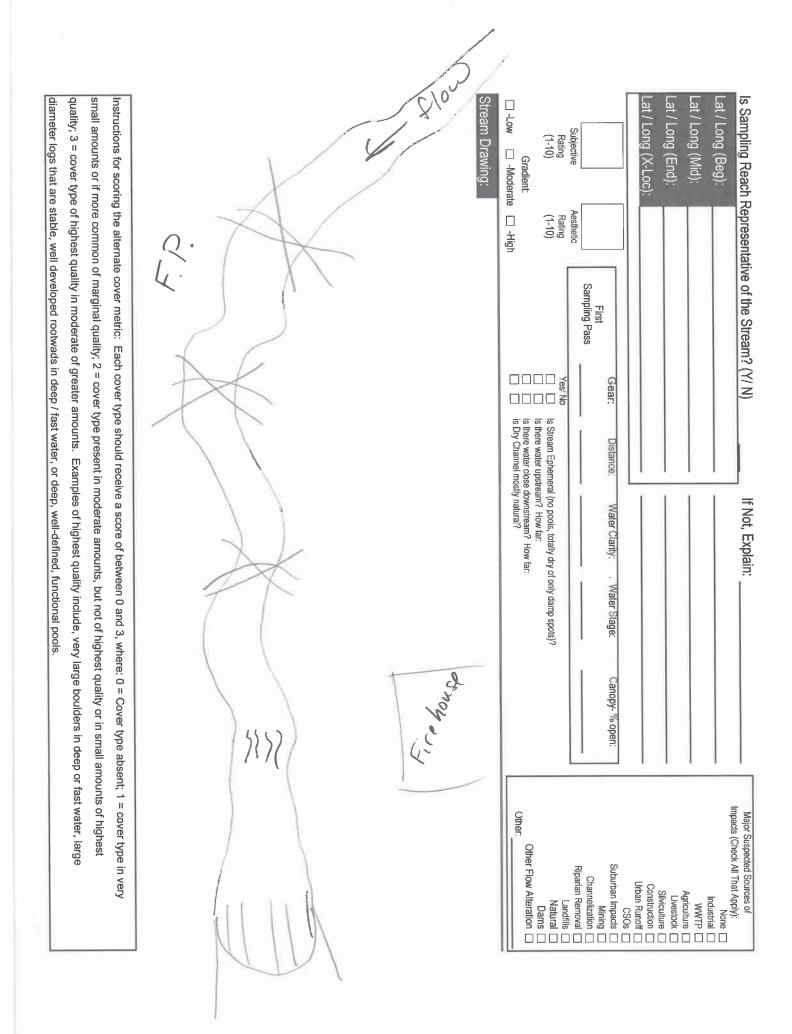
•

Instructions for scoring the alternate cover metric: small amounts or if more common of marginal qua quality; 3 = cover type of highest quality in modera diameter logs that are stable, well developed root	12	Flow	Corm	adient: -Moderate	Subjective Aesthetic	Is Sampling Reach Representative of the Stream? (Y/ N) Lat / Long (Beg): Lat / Long (Mid): Lat / Long (End): Lat / Long (X-Loc):
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.	bean s	macophytes		Yes/ No Stream Ephemeral (no pools, totally dry of only damp spots)? Sthere water upstream? How far: Sthere water close downstream? How far: Is Dry Channel mostly natural?	First Gear: Distance: Water Clarity: Water Stage: Canopy-% open: Sampling Pass	e of the Stream? (Y/ N) If Not, Explain:
osent; 1 = cover type in very amounts of highest p or fast water, large	6	bridge	I parked	Uther:	Suburban Impacts I Mining I Channelization I Riparian Removal I	

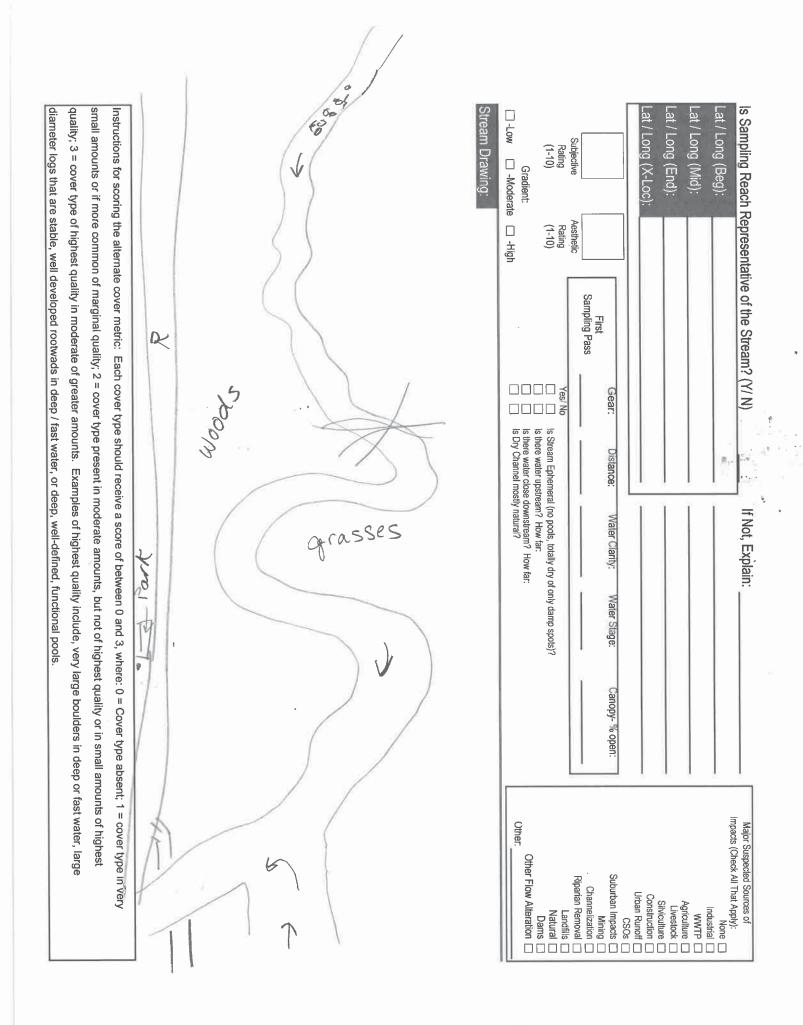
Qualitative Habitat Evaluation Index Field Sheet QHEI Score:	60
River Code: 95-702 RM: 3.12 Stream: Hastings Creek	
Site Code: 10-5 Project Code: DRWW9- Location: @ Cass Lake Ray	
Date: 8-28-19 Scorer: VIC Letitude: 42, 43071 Longitude: - 88.03447	
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent	
TYPE     POOL     RIFFLE     POOL     RIFFLE     SUBSTRATE ORIGIN     SUBSTRATE QUALITY	
	Culturate
	Substrate
	V
	Max 20
□ □ -MUCK [2] □ -SILT [2] □ -SANDSTONE [0] EMBEDDED □ -EXTENSIVE [-2] □ -RIP / RAP [0] NESS: □ -MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES:     -4 or More [2]     -LACUSTRINE [0]     -NORMAL [0]	
(High Quality Only, Score 5 or >) 2 -3 or Less [0] -SHALE [-1] -NONE [1]	
COMMENTS:	
2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions) AMOUNT: (Check ONLY one or	
(Structure) TYPE: Score All That Occur check 2 and AVERAGE)	Cover
UNDERCUT BANKS [1] POOLS > 70 cm [2]OXBOWS, BACKWATERS [1] EXTENSIVE > 75% [11]	.2
🚺 OVERHANGING VEGETATION [1] ROOTWADS [1] AQUATIC MACROPHYTES [1] MODERATE 25 - 75% [7]	13
2SHALLOWS (IN SLOW WATER) [1]BOULDERS [1]BOULDERS [1]SPARSE 5 - 25% [3]	Max 20
ROOTMATS [1]	
3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE) SINUOSITY DEVELOPMENT CHANNELIZATION STABILITY MODIFICATIONS / OTHER	
SINUOSITY     DEVELOPMENT     CHANNELIZATION     STABILITY     MODIFICATIONS / OTHER       □ -HIGH [4]     □ -EXCELLENT [7]     □ -NONE [6]     □ -HIGH [3]     □ -SNAGGING     □ -IMPOUNDMENT	Channel
□ -filen [3] □ -GOOD [5] □ -RECOVERED [4] □ -MODERATE [2] □ -RELOCATION □ -ISLAND	
□ -LOW [2] □ -FAIR [3] □ -RECOVERING [3] □ -LOW [1] □ -CANOPY REMOVAL □ -LEVEED	13
-BANK SHAPING -BANK SHAPING -BANK SHAPING	Max 20
RECOVERY [1]	
-IMPOUNDED [-1]	
COMMENTS:	
4) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)	
RIPARIAN WIDTH         FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)         BANK EROSION           L R (Per Bank)         L R (Most Predominant Per Bank)         L R         L R (Per Bank)	Dingrion
CONSERVATION TILLAGE [1]     CONSERVATION TILLAGE [1]     ONNE / LITTLE [3]	Riparian
□ □-WIDE > 50m [4] □ □ -SHRUB OR OLD FIELD [2] □ □ -URBAN OR INDUSTRIAL [0] □ □ MODERATE [2]	65
C MODERATE 10 - 50m [3] C -HEAVY / SEVERE [1]	Max 10
□ □ -VERY NARROW < 5m [1]	
COMMENTS:	
5.) POOL / GLIDE AND RIFFLE / RUN QUALITY	
MAX. DEPTH MORPHOLOGY CURRENT VELOCITY (POOLS & RIFFLES!)	
(Check 10NLY!) (Check 1 or 2 & AVERAGE) (Check All That Apply)	Pool /
□ - 1m [6]	Current
□ - 0.7m [4] □ -POOL WIDTH = RIFFLE WIDTH [1] □ -FAST [1] □ -INTERSTITIAL [-1] □ - 0.4 to 0.7m [2] □ -POOL WIDTH < RIFFLE WIDTH [0] □ -INTERMITTENT [-2]	6
-0.2 to 0.4m [1]     -IMPOUNDED [-1]     -IMPOUNDED [-1]     -VERY FAST [1]	Max 12
□ -<0.2m [POOL = 0] □ -NONE [-1]	
COMMENTS:	
CHECK ONE OR CHECK 2 AND ADVERAGE	Riffle / Run
RIFFLE DEPTH RIFFLE / RUN SUBSTRATE RIFFLE / RUN EMBEDDEDNESS	15
□ -*Best Areas > 10cm [2] □ - MAX > 50 cm [2] □ -STABLE (e.g., Cobble, Boulder) [2] □ -NONE [2]	1.
Zr -Best Areas 5 - 10cm [1]         Zr - MAX < 50 cm [1]         Zr -MOD. STABLE (e.g., Large Gravel) [1]         □ -LOW [1]	Max 8
-Best Areas < 5cm [0] - '- '- '- UNSTABLE (Fine Gravel, Sand) [0]	Orediant
-NO RIFFLE but RUNS present [0]     -EXTENSIVE [-1]	Gradient
	8
6.) GRADIENT (ft / mi): 10.5 DRAINAGE AREA (sq.mi.): 3.91 % POOL: % GLIDE: Gredient Score from Table 2 of Users Manual Gredient Score from Table 2 of Users Manual	
*Best areas must be large enough to support a population of riffle-obligate species % RIFFLE: % RUN: based on gradient and drainage area	Max 10

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21/21-2020

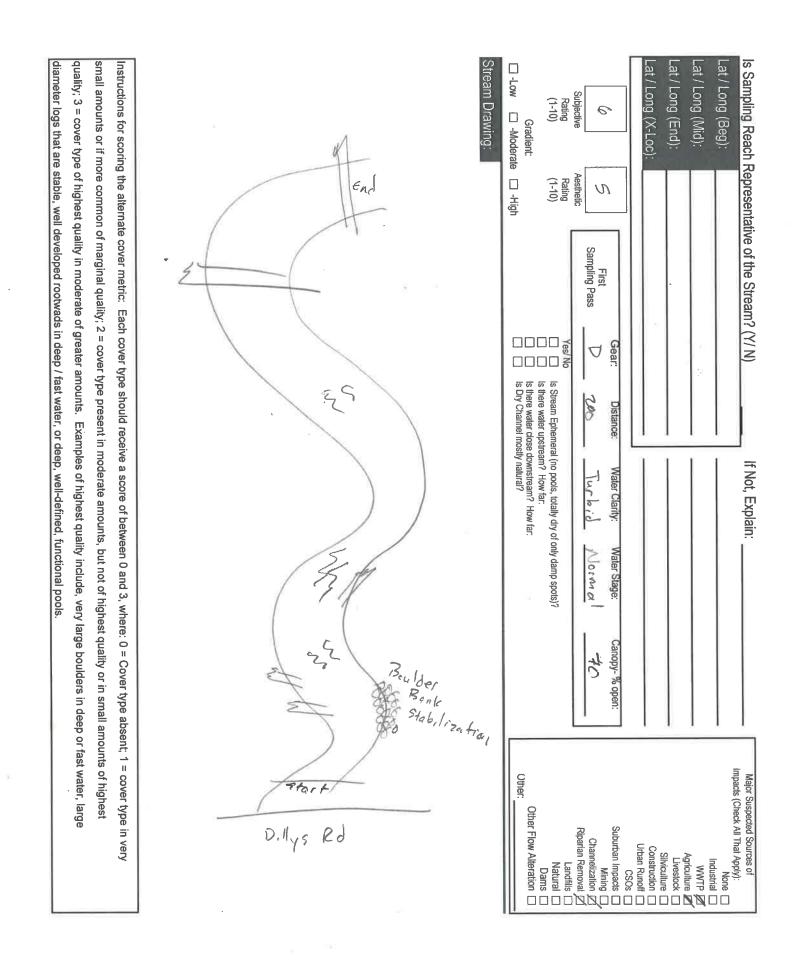


Biodiversity Qualitative	Habitat Evaluation Index Field Sheet	63.
River Code: 95-715 RM: 0.04	stream: Ist to North Mill Creek	
Site Code: 10- 9 Project Code: DRWW19-	Location: UST. of Rte 45	54 25
Date: 8-28-19 Scorer: 44	Latitude: 42,42,142 Longitude: -88,00465	-
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % pe	rcent	
TYPE POOL RIFFLE	POOL RIFFLE SUBSTRATE ORIGIN SUBSTRATE QUALITY	
□ □ -BLDR/SLBS [10] □ -GRAVEL [7]	Check ONE (OR 2 & AVERAGE) Check ONE (OR 2 & AVERAGE)	
□ □ -Lg BOULD [10] □ ☑ -SAND [6]	LIMESTONE [1] SILT: SILT HEAVY [-2]	Substrate
		3
		. Max 20
□ □ -MUCK [2] □ -SILT [2]		
NUMBER OF SUBSTRATE TYPES: -4 or More [2]	-LACUSTRINE [0] -NORMAL [0]	
(High Quality Only, Score 5 or >) 3 or Less [0]	□ -SHALE [-1] □ -NONE [1]	
COMMENTS	-COAL FINES [-2]	
COMMENTS:	instructions) AMOUNT: (Check ONLY one or	-
(Structure) TYPE: Score All That Occur	check 2 and AVERAGE)	Cover
UNDERCUT BANKS [1] POOLS > 70 cm [2]		
OVERHANGING VEGETATION [1]     ROOTWADS [1]	AQUATIC MACROPHYTES [1]	1
2 SHALLOWS (IN SLOW WATER) [1]	LOGS OR WOODY DEBRIS [1]	Max 20
ROOTMATS [1]		THEST LO
COMMENTS:		
3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check	2 and AVERAGE)	2
SINUOSITY DEVELOPMENT CHANNELIZ/		
✓ -HIGH [4] □ -EXCELLENT [7] □ -NONE		Channel
-MODERATE [3] Z -GOOD [5] Z -RECOV		
	/ERING [3] Z-LOW [1] CANOPY REMOVAL -LEVEED	13.2
-NONE [1] -POOR [1] -RECEN	IT OR NO	Max 20
	ERY [1]ONE SIDE CHANNEL MODIFICATIONS	
-IMPOU		
COMMENTS:	di ta ma	a 3
	Es ba	- 19. I
4) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or ch	heck 2 and AVERAGE per bank) 🖗 River Right Looking Downstream	
RIPARIAN WIDTH FLOOD PLAIN QU/	ALITY (PAST 100 Meter RIPARIAN) BANK EROSION	
RIPARIAN WIDTH         FLOOD PLAIN QU/           L R (Per Bank)         L R (Most Predominant Per Bank)		Riparian
		10
L R (Per Bank) L R (Most Predominant Per Bank	K)         L R         (Per Bank)           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]	10
L R (Per Bank)         L R (Most Predominant Per Bank)           I - VERY WIDE > 100m [5]         -FOREST, SWAMP [3]	k)         L R         L R (Per Bank)           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]	
L R (Per Bank)         L R (Most Predominant Per Bank)           I - VERY WIDE > 100m [5]         - FOREST, SWAMP [3]           I - WIDE > 50m [4]         - SHRUB OR OLD FIELD [2]	k)         L R         L R (Per Bank)           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]           Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]         Image: Conservation Tillage [1]	5.5
L R (Per Bank)         L R (Most Predominant Per Bank)                □ -VERY WIDE > 100m [5]              □ -FOREST, SWAMP [3]                □ -WIDE > 50m [4]              □ -SHRUB OR OLD FIELD [2]                □ -MODERATE 10 - 50m [3]              □ -RESIDENTIAL, PARK, NEV	k)         L         R         (Per Bank)	5.5
L R (Per Bank)         L R (Most Predominant Per Bank)	k)         L         R         (Per Bank)	5.5
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Display transmission of the structure of the struc	k)         L         R         (Per Bank)	5.5
L R (Per Bank)       L R (Most Predominant Per Bank)	k)         L         R         (Per Bank)	5.5
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Optimized structure      VERY WIDE > 100m [5]       Image: -FOREST, SWAMP [3]         Image: Optimized structure       Image: -SHRUB OR OLD FIELD [2]         Image: Optimized structure      SHRUB OR OLD FIELD [2]         Image: Optimized structure      FENCED PASTURE [1]         Image: Optimized structure      FENCED PASTURE         Image: Optimized structure      FENC	k)         L         R         (Per Bank)	5.5
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)          -VERY WIDE > 100m [5]        -FOREST, SWAMP [3]          -WIDE > 50m [4]        -SHRUB OR OLD FIELD [2]         WIDE > 50m [3]        -RESIDENTIAL, PARK, NEV         NARROW 5 - 10m [2]        -FENCED PASTURE [1]         VERY NARROW < 5m [1]	k)       L R       (Per Bank)         CONSERVATION TILLAGE [1]       -NONE / LITTLE [3]          -URBAN OR INDUSTRIAL [0]       -MODERATE [2]          -OPEN PASTURE, ROWCROP [0]       -HEAVY / SEVERE [1]          -MINING / CONSTRUCTION [0]	5.5
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)          -VERY WIDE > 100m [5]        -FOREST, SWAMP [3]          -WIDE > 50m [4]        -SHRUB OR OLD FIELD [2]            -RESIDENTIAL, PARK, NEW  <	k)       L R       (Per Bank)         CONSERVATION TILLAGE [1]       -NONE / LITTLE [3]          -URBAN OR INDUSTRIAL [0]       -MODERATE [2]          -OPEN PASTURE, ROWCROP [0]       -HEAVY / SEVERE [1]          -MINING / CONSTRUCTION [0]          -MINING / CONSTRUCTION [0]          CURRENT VELOCITY (POOLS & RIFFLES!)          (Check All That Apply)	5.5 Max 10
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)          -VERY WIDE > 100m [5]        -FOREST, SWAMP [3]          -WIDE > 50m [4]        -SHRUB OR OLD FIELD [2]            -RESIDENTIAL, PARK, NEW  <	k)       L R       (Per Bank)         CONSERVATION TILLAGE [1]       -NONE / LITTLE [3]         J       -URBAN OR INDUSTRIAL [0]       -MODERATE [2]         J       -OPEN PASTURE, ROWCROP [0]       -HEAVY / SEVERE [1]         J       -MINING / CONSTRUCTION [0]         CURRENT VELOCITY       (POOLS & RIFFLES!)         (Check All That Apply)       (Check All That Apply)         IDTH [2]       -EDDIES [1]       -TORRENTIAL [-1]	Max 10 Pool /
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)          -VERY WIDE > 100m [5]        -FOREST, SWAMP [3]          -WIDE > 50m [4]        -SHRUB OR OLD FIELD [2]             -SHRUB OR OLD FIELD [2]             -SHRUB OR OLD FIELD [2]	k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrowcrowcrop [1]       Image: -NEAVY / SE	Max 10 Pool /
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Proceeding of the system of the	k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [1]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrowcrowcrop [1]       Image: -NEAVY / SE	Max 10 Pool /
L       R       (Per Bank)       L       R       (Most Predominant Per Bani          -VERY WIDE > 100m [5]        -FOREST, SWAMP [3]          -WIDE > 50m [4]        -FOREST, SWAMP [3]            -SHRUB OR OLD FIELD [2]            -SHRUB OR OLD FIELD [2] <td>k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]</td> <td>Pool / Current</td>	k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, ROWCROP [0]       Image: -NEAVY / SEVERE [1]	Pool / Current
L       R       (Per Bank)       L       R       (Most Predominant Per Bani          -VERY WIDE > 100m [5]        -FOREST, SWAMP [3]          -WIDE > 50m [4]        -FOREST, SWAMP [3]            -SHRUB OR OLD FIELD [2]            -SHRUB OR OLD FIELD [2] <td>k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [1]       Image: -NEAVY / SEVERE [1]</td> <td>Pool / Current</td>	k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [1]       Image: -NEAVY / SEVERE [1]	Pool / Current
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)          -VERY WIDE > 100m [5]        -FOREST, SWAMP [3]          -WIDE > 50m [4]        -SHRUB OR OLD FIELD [2]          -WIDE > 50m [3]        -RESIDENTIAL, PARK, NEW          -MODERATE 10 - 50m [3]        -RESIDENTIAL, PARK, NEW          -MODERATE 10 - 50m [3]        -RESIDENTIAL, PARK, NEW          -MODERATE 10 - 50m [3]        -RESIDENTIAL, PARK, NEW            -RESIDENTIAL, PARK, NEW            -RESIDENTIAL, PARK, NEW	k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [1]       Image: -NEAVY / SEVERE [1]	Pool / Current
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Optimized system       -VERY WIDE > 100m [5]       Image: -FOREST, SWAMP [3]         Image: Optimized system       -SHRUB OR OLD FIELD [2]         Image: Optimized system       -SHRUB OR OLD [2]         Image: Optimized system       -SHRUB OR OLD [2]         Image: Optimized system       -SHRUB OR OLD [2]	k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [1]       Image: -NEAVY / SEVERE [1]	Pool / Current
L       R       (Per Bank)       L       R       (Most Predominant Per Bani         Image: Optimized system      VERY WIDE > 100m [5]       Image: -FOREST, SWAMP [3]         Image: Optimized system      VERY WIDE > 100m [5]       Image: -FOREST, SWAMP [3]         Image: Optimized system      VERY MARROW 5 - 10m [2]       Image: -FENCED PASTURE [1]         Image: Optimized system      VERY NARROW < 5m [1]	k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE [-1]	Pool / Current Max 12
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Straight of the straight of	k)       L       R       (Per Bank)         Image: Conservation Tillage [1]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NONE / LITTLE [3]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [0]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrop [1]       Image: -NEAVY / SEVERE [1]         Image: Open Pasture, Rowcrowrowrowcrowcrowcrowrowrowcrowcrowcr	Pool / Current
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)          -VERY WIDE > 100m [5]       -FOREST, SWAMP [3]          -WIDE > 50m [4]       -SHRUB OR OLD FIELD [2]          -WIDE > 50m [3]        -SHRUB OR OLD FIELD [2]          -MODERATE 10 - 50m [3]        -RESIDENTIAL, PARK, NEW          -NARROW 5 - 10m [2]        -FENCED PASTURE [1]          -VERY NARROW < 5m [1]	k)       L       R       (Per Bank)         CONSERVATION TILLAGE [1]       -NONE / LITTLE [3]         Image: Structure of the	Pool / Current Max 12
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Straight of the straight of	k)       L       R       (Per Bank)	Pool / Current Max 12 Riffle / Run
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Straight of the straight of	k)       L       R       (Per Bank)         CONSERVATION TILLAGE [1]       -NONE / LITTLE [3]         Image: Structure of the	Pool / Current Max 12 Riffle / Run
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)          -VERY WIDE > 100m [5]       -FOREST, SWAMP [3]          -WIDE > 50m [4]       -SHRUB OR OLD FIELD [2]          -WIDE > 50m [3]        -SHRUB OR OLD FIELD [2]          -MODERATE 10 - 50m [3]        -RESIDENTIAL, PARK, NEW          -NARROW 5 - 10m [2]        -FENCED PASTURE [1]          -VERY NARROW < 5m [1]	k)       L       R       (Per Bank)	Pool / Current Max 10 Riffle / Run 5 Max 8
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)        VERY WIDE > 100m [5]      FOREST, SWAMP [3]        WIDE > 50m [4]      SHRUB OR OLD FIELD [2]        WIDE > 50m [4]      SHRUB OR OLD FIELD [2]        MODERATE 10 - 50m [3]      RESIDENTIAL, PARK, NEW        MODERATE 10 - 50m [3]      RESIDENTIAL, PARK, NEW        MODERATE 10 - 50m [1]      FENCED PASTURE [1]        VERY NARROW 5 - 10m [2]      FENCED PASTURE [1]        VERY NARROW < 5m [1]	k)       L       R       (Per Bank)	Pool / Current Max 12 Max 12 Riffle / Run S Max 8 Gradient
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Straight of the straight of	k)       L R       L R       (Per Bank)         CURRENT VELOCITY       -NONE / LITTLE [3]         OPEN PASTURE, ROWCROP [0]       OPEN PASTURE, ROWCROP [0]         IDTH [2]       OPEN PASTURE, ROWCROP [1]         IDTH [2]       OPEN PASTURE, ROWCROP [1]         IDTH [1]       OPEN PASTURE, ROWCROP [1]         IDTH [2]       OPEN PASTURE, ROWCROP [1]         IDTH [2]       OPEN PASTURE, ROWCROP [2]         IDTH [0]       OPEN PASTURE, ROWCROP [2]         IDTH [0]       OPEN PASTURE, ROWCROP, ROMCROP [2]	Pool / Current Max 10 Riffle / Run 5 Max 8
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)	k)       L R       L R (Per Bank)         iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Pool / Current Max 12 Max 12 Riffle / Run 5 Max 8 Gradient
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)        VERY WIDE > 100m [5]      FOREST, SWAMP [3]        WIDE > 50m [4]      SHRUB OR OLD FIELD [2]        WIDE > 50m [3]      RESIDENTIAL, PARK, NEW        MODERATE 10 - 50m [3]      RESIDENTIAL, PARK, NEW        MODERATE 10 - 50m [3]      RESIDENTIAL, PARK, NEW        NARROW 5 - 10m [2]      FENCED PASTURE [1]        VERY NARROW < 5m [1]	k)       L R       L R       Per Bank)         Image: Construction Tillage [1]       Image:	Pool / Current Max 12 Max 12 Riffle / Run S Max 8 Gradient
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Second Sec	k)       L R       L R (Per Bank)         iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Pool / Current A Max 10 Max 12 Riffle / Run S Max 8 Gradient Q Max 10
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Second Sec	k)       L R       L R (Per Bank)         iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Pool / Current A Max 10 Max 12 Riffle / Run S Max 8 Gradient Q Max 10
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Construct of the state of the s	k)       L R       L R (Per Bank)         iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Pool / Current A Max 10 Max 12 Riffle / Run S Max 8 Gradient Q Max 10
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Construct of the state of the s	k)       L R       L R (Per Bank)         iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Pool / Current A Max 10 Max 12 Riffle / Run S Max 8 Gradient Q Max 10
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)         Image: Construct of the state of the s	k)       L R       L R (Per Bank)         iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Pool / Current Max 12 Max 12 Riffle / Run 5 Max 8 Gradient



	Qualitative Habitat Evaluation Index Field Sheet QHEI Score:	18.5
	River Code: 95-995 RM: 0.7 Stream: Mill Creek	-
	Site Code: 11-1 Project Code: DRWW(6 Location: Ust Dillys R) Date: 8-15-19 Scorer: MAS Latitude: 42,41830 Longitude: -87,94527-	2
	Date:       Score:       Pressor       Cannot be and be	Substrate
	COMMENTS:	Cover
	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]       -EXCELLENT [7]       -NONE [6]       -HIGH [3]       -SNAGGING       -IMPOUNDMENT         -MODERATE [3]       -EXCELLENT [7]       -NONE [6]       -HIGH [3]       -SNAGGING       -IMPOUNDMENT         -MODERATE [3]       -EXCELLENT [7]       -NONE [6]       -HIGH [3]       -SNAGGING       -ISLAND         -MODERATE [3]       -FAIR [3]       -RECOVERING [3]       -LOW [1]       -CANOPY REMOVAL       -LEVEED         -NONE [1]       -FOOR [1]       -RECOVERING [3]       -LOW [1]       -CANOPY REMOVAL       -LEVEED         RECOVERY [1]       -RECOVERY [1]       -ONE SIDE CHANNEL MODIFICATIONS       -ONE SIDE CHANNEL MODIFICATIONS         -IMPOUNDED [-1]       -IMPOUNDED [-1]       -IMPOUNDED [-1]       -ONE SIDE CHANNEL MODIFICATIONS	Channel
	COMMENTS:	Riparian
	MAX_DEPTH       MORPHOLOGY       CURRENT VELOCITY       (POOLS & RIFFLES!)         Check 1 ONLY!)       (Check 1 or 2 & AVERAGE)       (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]	Pool / Current Max 12
;	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]	Riffle / Run 2 Max 8 Gradient
(	A) GRADIENT (ft / mi): 7.3 DRAINAGE AREA (sq.ml.): 63.8 % POOL: % GLIDE:         Best areas must be large enough to support a population of riffle-colligate species         % RIFFLE: % RUN:	8 Max 10

M. 11- 2020



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Midwest Biodiversity	C	Vuolitetivo	Llabit	at Evol	luction Index	Field Ch	aat		<del>4</del> 0
a w a antitute					luation Index		30L	QHEI Score:	
the second se	RM:	.71	Stream:		Mill Creak	1.1			ē
	Project Code:	Dewuria	Location: Latitude:		12095	Longitude:	-87.95677		Ē
1.) SUBSTRATE (Check ONLY Two Sul					2010	Longitubor			5
	RIFFLE	LO, Louinate in perc	POOL	RIFFLE	SUBSTRATE ORIGIN		SUBSTRATE QUALITY		
		GRAVEL [7]	1002		Check ONE (OR 2 & AV	ERAGE)	Check ONE (OR 2 & AVERAGE	E)	
		SAND [6]			LIMESTONE [1]	SILT:	SILT HEAVY [-2]		Substrate
BOULDER [9]	[] [] +	BEDROCK [5]			_ 🗹 - TILLS [1]		SILT MODERATE [-1]		10
		DETRITUS [3]			-WETLANDS [0]		-SILT NORMAL [0]		16
		ARTIFICIAL [0]			-HARDPAN [0]		-SILT FREE [1]		Max 20
-MUCK [2]		SIL1 [2]			- SANDSTONE [0]	EMBEDDED NESS:	-EXTENSIVE [-2]	æ.	
NUMBER OF SUBSTRATE TYPES:		4 or More [2]			-LACUSTRINE [0]				
(High Quality Only, Score 5 or >)	6	3 or Less [0]			-SHALE [-1]	/	-NONE [1]		
	•.e				-COAL FINES [-2]				
2.) INSTREAM COVER (Give each cover	or type a coord of A	to 3. ees hart for in	etructione'				AMOUNT: (Check ONLY	one or	A
(Structure)		ore All That Occur	iou uouuns)				check 2 and AVERAGE)		Cover
UNDERCUT BANKS [1]		POOLS > 70 cm [2]		OXBOWS, B	BACKWATERS [1]		-EXTENSIVE > 75% [11]		.1
VERHANGING VEGETATION		ROOTWADS [1]			ACROPHYTES [1]		-MODERATE 25 - 75% [7]		
2_SHALLOWS (IN SLOW WATER / ROOTMATS [1]	)[1] <u>· /</u> B	BOULDERS [1]		LOGSORW	VOODY DÉBRIS [1]		<ul> <li>-SPARSE 5 - 25% [3]</li> <li>-NEARLY ABSENT &lt; 5%</li> </ul>	[1]	Max 20
COMMENTS:							-NEARLI ABSENT S 370	[1]	
3.) CHANNEL MORPHOLOGY: (Check	ONLY one PER C	ategory OR check 2	and AVER	AGE)					a
0	ELOPMENT				BILTIY		ONS / OTHER		0
/	EXCELLENT [7] GOOD [5]		-		] -HIGH [3] ] -MODERATE [2]	-SNAGG		IDMENT	Channel
	500D [5] FAIR [3]	-RECOVE		· · · ·	-LOW [1]		YREMOVAL -LEVEED	)	15
	POOR [1]	-RECENT			[.]	-DREDG			Max 20
		RECOVE				-ONE Si	DE CHANNEL MODIFICATIONS	6	
COMMENTS		-Impoun	DED [-1]						
COMMENTS:							L.d.		
4.) RIPARIAN ZONE AND BANK EROS	ION (check ONE b	oox PER bank or che	eck 2 and A	/ERAGE per	r bank)	River River	ght Looking Downstream		
RIPARIAN WIDTH		LOOD PLAIN QUAL		10.000	RIPARIAN)	-	BANK EROSION		
<u>1</u>	1 1	dominant Per Bank) , SWAMP [3]			-CONSERVATION TILL	AGE [1]	LR (Per Bank)	- [3]	Riparian
		DR OLD FIELD [2]			-URBAN OR INDUSTRIA		-MODERATE [2]		0
		ITIAL, PARK, NEW	FIELD [1]		-OPEN PASTURE, ROW	CROP [0]	-HEAVY / SEVE	RE [1]	Max 10
	-FENCED	PASTURE [1]			-MINING / CONSTRUCT	'ION [0]			
-VERY NARROW < 5m [1] -NONE [0] . C	COMMENTS:								
	JONNINE (TO:		_						
5.) POOL / GLIDE AND RIFFLE / RUN (									
MAX. DEPTH		RPHOLOGY			CURRENT VELOC		RIFFLES!)		Bool /
(Check 1 ONLY!) 1m [6]		l or 2 & AVERAGE) IDTH > RIFFLE WID	)TH [2]		(Check	All That Apply)	NTIAL I-11		Pool / Current
- 0.7m [4]		IDTH = RIFFLE WID							Q
- 0.4 to 0.7m [2]	POOL WI	IDTH < RIFFLE WID			-MODERATE [1]		AITTENT [-2]	<i>a</i> 1	8
- 0.2 to 0.4m [1]		DED [-1]			-SLOW [1]	C -VERY F	AST [1]		Max 12
- < 0.2m [POOL = 0] COMMENTS:			9		-NONE [-1]				
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		CHECK ONE OF							Riffle / Run
RIFFLE DEPTH	RUN DEPTH	0	4	RUN SUBST			EMBEDDEDNESS		10
-*Best Areas > 10cm [2] -Best Areas 5 - 10cm [1]	- MAX > 5	•• 6		-	e, Boulder) [2] Large Gravel) [1]	-NONE [ -NONE [1]	•		Max 8
-Best Areas < 5cm [0]					vel, Sand) [0]	-MODEF			and the second s
-NO RIFFLE but RUNS present	[0]					-EXTEN			Gradient
-NO RIFFLE / NO RUN [Metric =	: 0]								<u>,</u> 1
COMMENTS:		112							8
		(sq.mi.): <u>62,3</u>	<u>)</u>	% POOL:	% GUI		Gradieni Score	e from Table 2 of Users Manual	
*Best areas must be large enough to support a p	opulation of riffle-obliga	ate species		% RIFFLE:	% RI	UN:		lient and drainage area.	Max 10
								<i>N</i> .	8
									K.V.V
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									3 Vr
									all a
									122

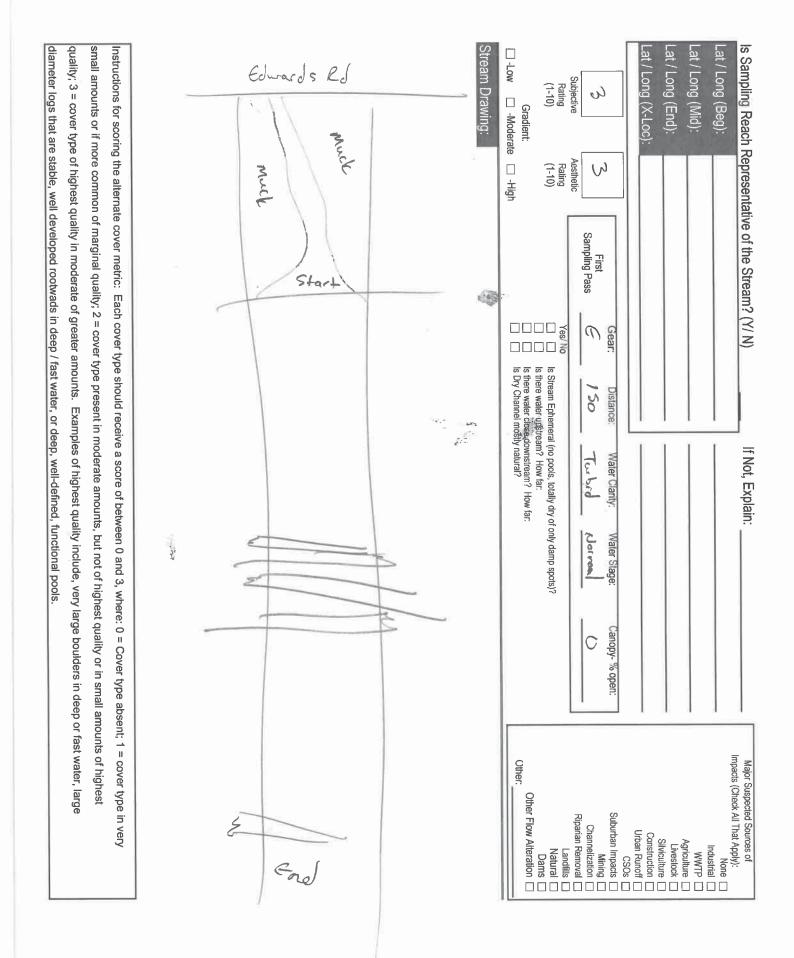
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diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large 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 Stream Drawing: Lat / Long (Beg): Is Sampling Reach Representative of the Stream? (Y/ N) 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 \_at / Long (End): Lat / Long (Mid): -Low \_at / Long (X-Loc) Subjective Rating (1-10) 4 -Moderate Gradient: Dam Aesthetic -High Rating (1-10) 4 First Sampling Pass Deep Pool end Gear: D Is there water upstream? How far: Is there water close downstream? How far: Is Dry Channel mostly natural? Is Stream Ephemeral (no pools, totally dry of only damp spots)? 200 Distance: Turbid If Not, Explain: Water Clarity: Norma Water Stage: Gravel 1 Canopy- % open: Impacts (Check Ali That Apply): Other: Major Suspected Sources of Other Flow Alteration Suburban Impacts Riparian Removal Channelization Urban Runoff CSOs Construction Silviculture Agriculture Livestock Industrial Landfills Natural Mining WWTP Dams None start

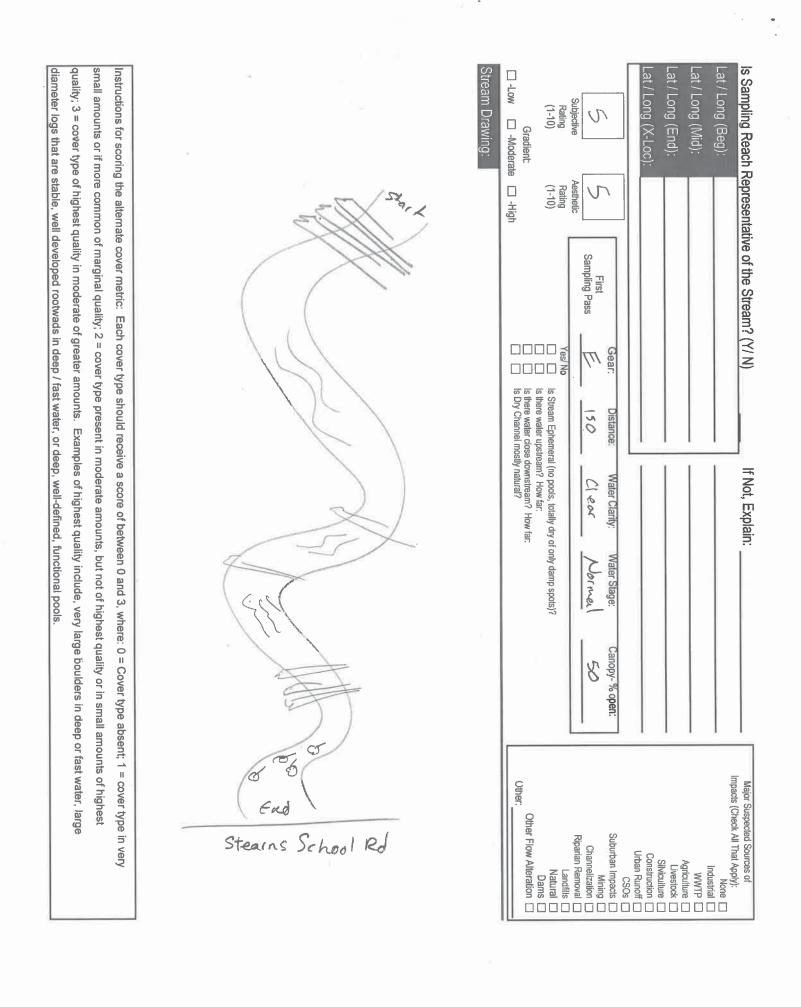
QHEI Score:	31
River Code: 95-996 RM: 11,3 Stream: N Mill Creek Site Code: 10-7 Project Code: Dlwy 9 Location: US+ Edwards Rd Date: 8-16-19 Scorer: MAS Latitude: 42,48082 Longitude: -88,01196	
1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent         TYPE       POOL       RIFFLE       POOL       RIFFLE       SUBSTRATE ORIGIN       SUBSTRATE QUALITY            □ -BLDR/SLBS [10]          □ -GRAVEL [7]       Check ONE (OR 2 & AVERAGE)       Check ONE (OR 2 & AVERAGE)            □ -Lg BOULD [10]          □ -GRAVEL [7]       Check ONE (OR 2 & AVERAGE)       Check ONE (OR 2 & AVERAGE)            □ -Lg BOULD [10]          □ -GRAVEL [7]       Check ONE (OR 2 & AVERAGE)       Check ONE (OR 2 & AVERAGE)            □ -Lg BOULD [10]          □ -GRAVEL [7]       Check ONE (OR 2 & AVERAGE)       Check ONE (OR 2 & AVERAGE)            □ -Lg BOULD [10]          □ -GRAVEL [7]       Check ONE (OR 2 & AVERAGE)       Check ONE (OR 2 & AVERAGE)            □ -Lg BOULD [10]          □ -GRAVEL [7]       Check ONE (OR 2 & AVERAGE)       Check ONE (OR 2 & AVERAGE)            □ -BUDK // SUBSTRATE TYPES:          □ -BEDROCK [5]          □ -TILLS [1]          □ -SILT FREE [1]            □ -MUCK [2]          □ -SILT [2]          □ -SANDSTONE [0]       EMBEDDED          -EXTENSIVE [-2]            □ -MUCK [2]          □ -SILT [2]          □ -ACUSTRINE [0]          □ NORMAL [0]            □ HIMED ONIY, Score 5 or >)          □ -G	Substrate
21 INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)       AMOUNT: (Check ONLY one or check 2 and AVERAGE)         (Structure)       TYPE: Score All That Occur       check 2 and AVERAGE)         OUNDERCUT BANKS [1]       POOLS > 70 cm [2]       OXBOWS, BACKWATERS [1]       -EXTENSIVE > 75% [11]         OVERHANGING VEGETATION [1]       // ROOTWADS [1]       2       AQUATIC MACROPHYTES [1]       -MODERATE 25 - 75% [7]         SHALLOWS (IN SLOW WATER) [1]       _/ ROOTMATS [1]       _/ BOULDERS [1]       _/ SPARSE 5 - 25% [3]       _/ SPARSE 5 - 25% [3]         COMMENTS:	Cover
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]       -RECOVERY [1]      LOW [1]      ONE SIDE CHANNEL MODIFICATIONS        NONE [1]      IMPOUNDED [-1]      ONE SIDE CHANNEL MODIFICATIONS      ONE SIDE CHANNEL MODIFICATIONS	Channel 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       FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)       BANK EROSION         L       R (Per Bank)       L       R       L       R (Per Bank)       -NONE / LITTLE [3]       -NONE / LITTLE [3]       -NONE / NODERATE [2]       -NONE / NODERATE [2]       -NONE / NODERATE [2]       -NODERATE [2]       -NODERATE [2]       -NODERATE [2]       -NODERATE [2]       -HEAVY / SEVERE [1]       -HEAVY / SEVERE [1]	Riparian <u>V</u> Max 10
S.) POOL/GLIDE AND RIFFLE / RUN QUALITY         MAX. DEPTH       MORPHOLOGY       CURRENT VELOCITY (POOLS & RIFFLESI)         [Check 1 ONLY]]       (Check 1 or 2 & AVERAGE)       (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]       -INTERSTITAL [-1]         - 0.7m [4]       -POOL WIDTH = RIFFLE WIDTH [0]       -MODERATE [1]       -INTERMITTENT [-2]         - 0.4 to 0.7m [2]       -POOL WIDTH < RIFFLE WIDTH [0]	Pool / Current J Max 12
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]	Riffle / Run Max 8 Gradient
6.) GRADIENT (ft / mi): 2·1/2 DRAINAGE AREA (sq.mi.): 19.2.3 % POOL: % GLIDE: % GLIDE: % GLIDE: % GLIDE: % GLIDE: % Gradient Score from Table 2 of Users Manual based on gradient and drainage area.	A Max 10

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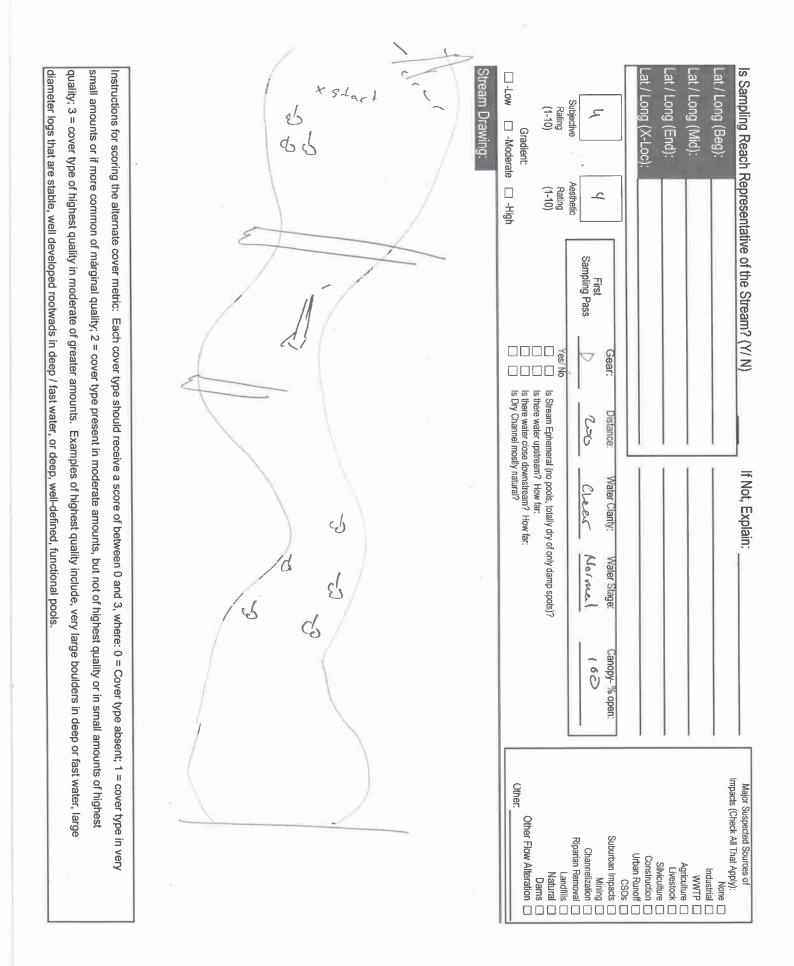


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QUALITATIVE Habitat Evaluation Index Field Sheet QHEI Score:	F
River Code: 95-995 RM: 7.2 Stream: Mil Creek	
site Code: 11-3 Project Code: DRWW19 Location: Dst. Stearns School Rd	
Date:         8-15-A         Scorer:         MAS         Latitude:         H2,39989         Longitude:         -87,98277	
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent	
TYPE         POOL         RIFFLE         SUBSTRATE ORIGIN         SUBSTRATE QUALITY	
Check ONE (OR 2 & AVERAGE)     Check ONE (OR 2 & AVERAGE)     Check ONE (OR 2 & AVERAGE)	
🗔 🗔 - LIMESTONE [1] SILT: 🖉 - SILT HEAVY [-2]	Substrate
	3
COBBLE [8]     OBBLE [8]	
-HARDPAN [4]      -ARTIFICIAL [0]HARDPAN [0]SILT FREE [1]	Max 20 🛛 🗸
RIP / RAP [0] NESS:	
High Quality Only, Score 5 or >)         Image: Score 5 or >)         <	
COMMENTS:	
2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions) AMOUNT: (Check ONLY one or	
(Structure) TYPE: Score All That Occur check 2 and AVERAGE)	Cover
1         0         POOLS > 70 cm [2]         0         OXBOWS, BACKWATERS [1]         □         -EXTENSIVE > 75% [1]           /         OVERHANGING VEGETATION [1]         O         ROOTWADS [1]         2         AQUATIC MACROPHYTES [1]         □         -EXTENSIVE > 75% [7]	14
3 SHALLOWS (IN SLOW WATER) [1] / BOULDERS [1] 3 LOGS OR WOODY DEBRIS [1] SPARSE 5 - 25% [3]	Max 20
COMMENTS:	
3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)	
SINUOSITY DEVELOPMENT CHANNELIZATION STABILITY MODIFICATIONS / OTHER	Channel
-HIGH [4]      -EXCELLENT [7]      -NONE [6]      -HIGH [3]      -SNAGGING      -IMPOUNDMENT     -MODERATE [3]      -GOOD [5]      -RECOVERED [4]      -MODERATE [2]      -RELOCATION      -ISLAND	Channel
	14
-NONE [1]     -POOR [1]     -RECENT OR NO     -DREDGING     -BANK SHAPING	Max 20
RECOVERY [1]	
COMMENTS:	
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) RIPARIAN WIDTH FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) BANK EROSION	
L R (Per Bank) L R (Most Predominant Per Bank) L R L R (Per Bank)	Riparian
-VERY WIDE > 100m [5] -FOREST, SWAMP [3] -CONSERVATION TILLAGE [1] -NONE / LITTLE [3]	a
	Max 10
(1) -FENCED PASTURE [1]     (1) -FENCED PASTURE [1]     (1) -MINING / CONSTRUCTION [0]     (1) -VERY NARROW < 5m [1]	
5.) POOL / GLIDE AND RIFFLE / RUN QUALITY	
MAX, DEPTH <u>MORPHOLOGY</u> (POOLS & RIFFLESI)	
(Check 1 ONLY!) (Check 1 or 2 & AVERAGE) (Check All That Apply)	Pool /
-1m [6]     -POOL WIDTH > RIFFLE WIDTH [2]     -cDDIES [1]     -TORRENTIAL [-1]     -0.7m [4]     -POOL WIDTH = RIFFLE WIDTH [1]     -FAST [1]     -INTERSTITIAL [-1]	Current
□ - 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]	5
□ -0.2 to 0.4m [1] □ -IMPOUNDED [-1] □ -VERY FAST [1]	Max 12
□ -< 0.2m [POOL ≈ 0} □ -NONE [-1]	
COMMENTS:	
	Riffle / Run
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]	Max 8
□ -Best Areas < 5cm [0] □ -UNSTABLE (Fine Gravel, Sand) [0] □ -MODERATE [0]	
-NO RIFFLE but RUNS present [0] -EXTENSIVE [-1]	Gradient
-NO RIFFLE / NO RUN [Metric = 0]	
COMMENTS:	
6.) GRADIENT (ft / mi): 5.56 DRAINAGE AREA (sq.mi.): 21.4 % POOL: % GLIDE: Gradient Score from Table 2 of Users Manuel Gradient Score from Table 2 of Users Manuel	6
*Best areas must be large enough to support a population of riffle-obligate species % RIFFLE: % RUN: based on gradient and drainage area.	Max 10
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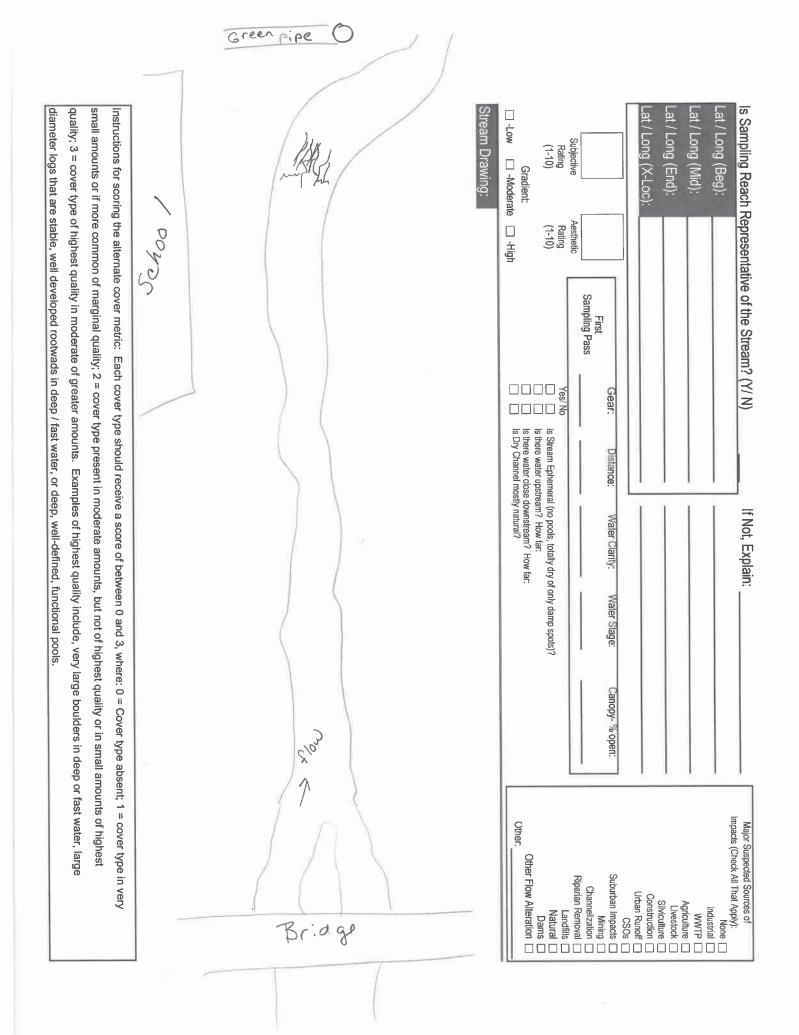


Qualitative	Habitat Evaluation Index Field Sheet	I Score: 52.13
River Code: 95-995 RM: 13,8	Stream: Mill Creek	
Site Code: <u>II-5</u> Project Code: <u>Dlusu19</u> Date: 10-18-19 Scorer: MHS	Location: Washington St. Latitude: 42,362490 Longitude: - 88,01576	
1.) SUBSTRATE         (Check ONLY Two Substrate TYPE BOXES; Estimate % per TYPE           POOL         RIFFLE           -BLDR/SLBS [10]	POOL RIFFLE <u>SUBSTRATE ORIGIN</u> <u>SUBSTRATE QUALITY</u> Check ONE (OR 2 & AVERAGE) Check ONE (OR 2 & AVERAGE)	
🗀 🗀 -Lg BOULD [10] 🛛 🔟 -SAND [6]	LIMESTONE [1] SILT: 🖊 -SILT HEAVY [-2]	Substrate
	TILLS [1]	9
		Max 20
	SANDSTONE [0] EMBEDDED - CTENSIVE [-2]	
NUMBER OF SUBSTRATE TYPES: -4 or More [2]	-LACUSTRINE [0]     -NORMAL [0]	
(High Quality Only, Score 5 or >)	□ -SHALE [-1] □ -NONE [1]	
	-COAL FINES [-2]	
COMMENTS:		
2.1 INSTREAM COVER (Give each cover type a score of 0 to 3; see back for (Structure) TYPE: Score All That Occur	instructions) <u>AMOUNT</u> : (Check ONLY one or check 2 and AVERAGE)	Cover
/ UNDERCUT BANKS [1] 3 POOLS > 70 cm [2		
OVERHANGING VEGETATION [1] / ROOTWADS [1]	3 AQUATIC MACROPHYTES [1] // -MODERATE 25 - 75% [7]	14
SHALLOWS (IN SLOW WATER) [1] O BOULDERS [1]	LOGS OR WOODY DEBRIS [1]SPARSE 5 - 25% [3]	Max 20
ROOTMATS [1]	□ -NEARLY ABSENT < 5% [1]	
COMMENTS:	2 and AVERAGE)	
SINUOSITY DEVELOPMENT CHANNELIZ		
-HIGH [4] -EXCELLENT [7] -NONE	[6] -HIGH [3] -IMPOUNDMENT	Channel
-MODERATE [3] -GOOD [5] -RECO'		5
	/ERING [3]	Max 20
-RECEI		Max 20
COMMENTS:		
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or or RIPARIAN WIDTH       FLOOD PLAIN QU         L       R       (Per Bank)       L       R       (Most Predominant Per Bank)        VERY WIDE > 100m [5]       Z       -FOREST, SWAMP [3]         Z       WIDE > 50m [4]       -SHRUB OR OLD FIELD [2]        MODERATE 10 - 50m [3]       -RESIDENTIAL, PARK, NEI        NARROW 5 - 10m [2]       -FENCED PASTURE [1]        NONE [0]       COMMENTS:	ALITY (PAST 100 Meter RIPARIAN) ALITY (PAST 100 Meter RIPARIAN) C L R L R (Per Bank) CONSERVATION TILLAGE [1] URBAN OR INDUSTRIAL [0] C -MODERATE [2]	Riparian S.17 Max 10
5. POOL / GLIDE AND RIFFLE / RUN QUALITY		
MAX. DEPTH MORPHOLOGY	CURRENT VELOCITY (POOLS & RIFFLES!)	
(Check 1 ONLYI)         (Check 1 or 2 & AVERAGI           ✓         - 1m [6]         □           - 1m [6]         □		Pool / Current
-0.7m [4]     -0.7m [4]     -0.7m [4]		4
- 0.4 to 0.7m [2] -POOL WIDTH < RIFFLE W	IDTH [0] -MODERATE [1] -INTERMITTENT [-2]	6
- 0.2 to 0.4m [1]	SLOW [1] -VERY FAST [1]	Max 12
- < 0.2m [POOL = 0] COMMENTS:	[]] -NONE [-1]	
		Riffle / Run
RIFFLE DEPTH         RUN DEPTH	RIFFLE / RUN SUBSTRATE         RIFFLE / RUN EMBEDDEDNESS           -STABLE (e.g., Cobble, Boulder) [2]         -NONE [2]	0
		Max 8
-Best Areas < 5cm [0]	UNSTABLE (Fine Gravel, Sand) [0]	
-NO RIFFLE but RUNS present [0]	-EXTENSIVE [-1]	Gradient
-NO RIFFLE / NO RUN [Metric = 0]		, 
6.) GRADIENT (ft / mi): 6.71 DRAINAGE AREA (sq.mi.): 10,4	% POOL: % GLIDE:	
B.) GRADIENT (TL/III): <u>0.11</u> DRAINAGE AREA (sq.ml.): <u>10,-</u> *Best areas must be large enough to support a population of riffle-obligate species	% POUL: 76 GLIDE: Gradient Score from Table 2 o % RIFFLE: % RUN: based on gradient and draining	f Users Manuel
Less areas must ne raige enough to support a population of mile-obligate species	70 INIT CLL. 70 INIT CLL. based on gradient and drainag	
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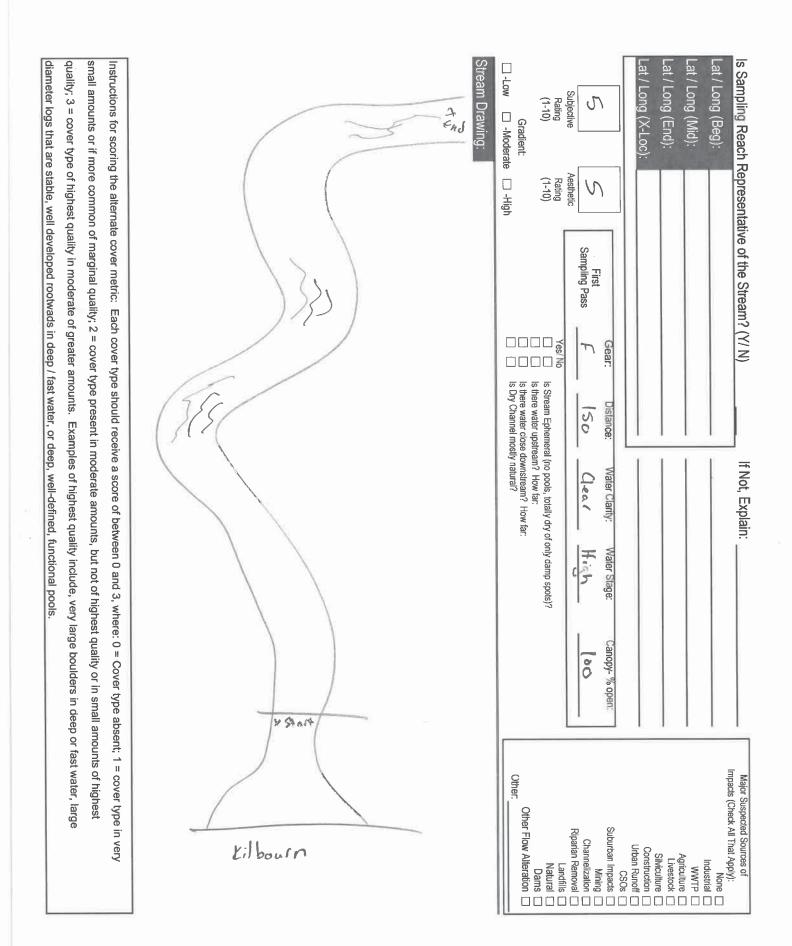
Midwest Biodiversity Institute         Qualitative Habitat Evaluation Index Field Sheet         QHEI Score:	40
River Code: 95-995 RM: 17.2 Stream: Mill Creek	
Site Code: 11-6 Project Code: DRWW19- Location: @ Wick Str.	
Date: 8-28-19 Scorer: 142.131/2 Latitude: 42.33/242 Longitude: -88.03989	
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent	
TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE ORIGIN SUBSTRATE QUALITY	
Check ONE (OR 2 & AVERAGE)     Check ONE (OR 2 & AVERAGE)	
	Cubatrata
	Substrate
C -BOULDER [9] C -BEDROCK [5] FILLS [1] -SILT MODERATE [-1]	5
COBBLE [8]     DETRITUS [3]     WETLANDS [0]     SILT NORMAL [0]	
C -HARDPAN [4]     C -ARTIFICIAL [0]     C -HARDPAN [0]     C -SILT FREE [1]	Max 20
RIP / RAP [0] NESS: MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES: -4 or More [2] -LACUSTRINE [0] -NORMAL [0]	
(High Quality Only, Score 5 or >) 2 - 3 or Less [0] - SHALE [-1] - NONE [1]	
□ -COAL FINES [-2]	
COMMENTS:	
2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions) AMOUNT: (Check ONLY one or	
(Structure) TYPE: Score All That Occur check 2 and AVERAGE)	Cover
UNDERCUT BANKS [1] ODLS > 70 cm [2] OXBOWS, BACKWATERS [1]EXTENSIVE > 75% [11]	1
OVERHANGING VEGETATION [1] ROOTWADS [1] AQUATIC MACROPHYTES [1] -MODERATE 25 - 75% [7]	1.1
SHALLOWS (IN SLOW WATER) [1] / BOULDERS [1] / LOGS OR WOODY DEBRIS [1] - SPARSE 5 - 25% [3]	Max 20
2 ROOTMATS [1]	
COMMENTS:	
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	Channel
🗀 -MODERATE [3] 🛛 -GOOD [5] 💭 -RECOVERED [4] 🖉 -MODERATE [2] -RELOCATION 💭 -ISLAND	a
🖉 -LOW [2] 🖉 -FAIR [3] 🖉 -RECOVERING [3] 🔤 -LOW [1] 🔤 -CANOPY REMOVAL 🔤 -LEVEED	171
□ -NONE [1] □ -RECENT OR NO □-DREDGING □ -BANK SHAPING	Max 20
RECOVERY [1] ONE SIDE CHANNEL MODIFICATIONS	
- IMPOUNDED [-1]	
COMMENTS:	
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)	
RIPARIAN WIDTH FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) BANK EROSION	
L R (Per Bank) L R (Most Predominant Per Bank) L R L R (Per Bank)	Riparian
□ □ -VERY WIDE > 100m [5] □ □ -FOREST, SWAMP [3] □ □ -CONSERVATION TILLAGE [1] □ □ -NONE / LITTLE [3]	2
□ □ -WIDE > 50m [4] □ □ -SHRUB OR OLD FIELD [2] □ □ -URBAN OR INDUSTRIAL [0] ∠ □ -MODERATE [2]	2
🗀 _MODERATE 10 - 50m [3] 🖉 🖉 -RESIDENTIAL, PARK, NEW FIELD [1] 🔄 🖸 -OPEN PASTURE, ROWCROP [0] 🔅 🖂 -HEAVY / SEVERE [1]	Max 10
Image: Solution with the second sec	
□ □-VERY NARROW < 5m [1]	
OMMENTS:	
5.) POOL/GLIDE AND RIFFLE / RUN QUALITY	
MAX. DEPTH MORPHOLOGY CURRENT VELOCITY (POOLS & RIFFLES!)	
Interview         Interview <t< td=""><td>Pool /</td></t<>	Pool /
□ - 1m [6] □ -POOL WIDTH > RIFFLE WIDTH [2] □ -EDDIES [1] □ -TORRENTIAL [-1]	Current
□ - 0.7m [4] □ -POOL WIDTH = RIFFLE WIDTH [1] □ -FAST [1] □ -INTERSTITIAL [-1]	4
. 2 - 0.4 to 0.7m [2] □ -POOL WIDTH < RIFFLE WIDTH [0] 2 -MODERATE [1] □ -INTERMITTENT [-2]	2
- 0.2 to 0.4m [1]	Max 12
□ -< 0.2m [POOL = 0] □ -NONE [-1]	
COMMENTS:	
CHECK ONE OR CHECK 2 AND ADVERAGE	Riffle / Run
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]	Max 8
-MODERATE (0)	
-NO RIFFLE but RUNS present [0]	Gradient
-NO RIFFLE / NO RUN [Metric = 0]	
COMMENTS:	P
6.) GRADIENT (fi / mi): 10.78 DRAINAGE AREA (sq.mi.): 4.5 % POOL: % GLIDE:	8
*Best areas must be large enough to support a population of riffle-obligate species % RIFFLE: % RUN: based on gradient and drainage area	Max 10
	k.

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Pin vite	

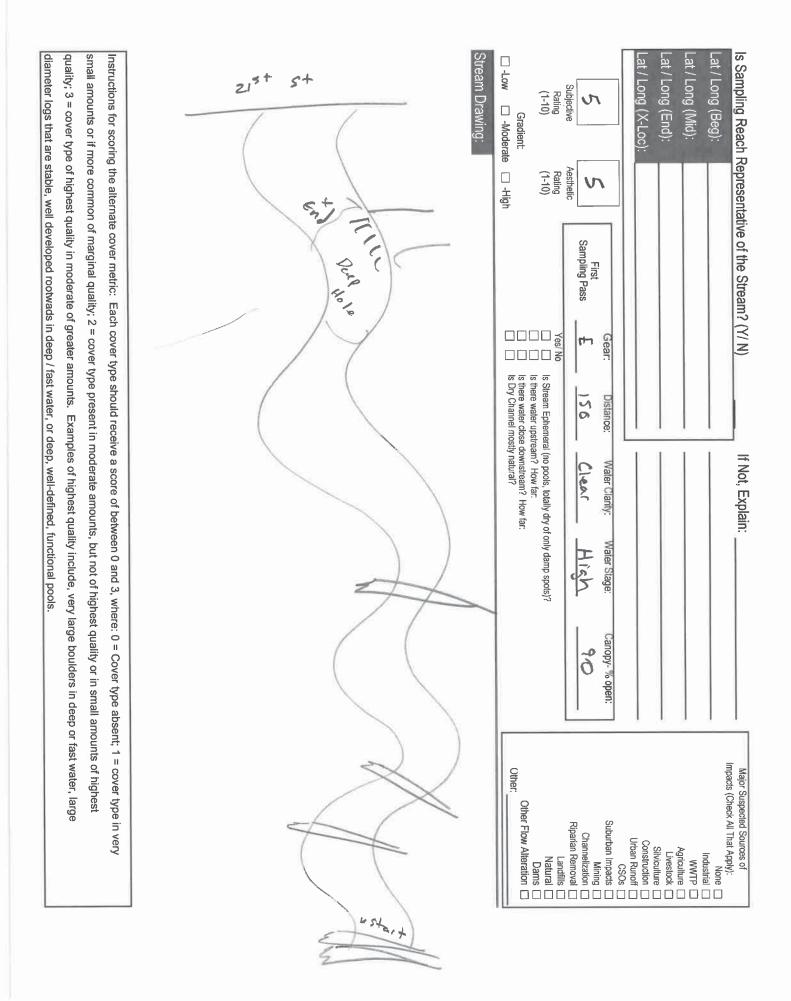


Midwest Biodiversity Institute	Qualitative	Habitat Evalua	ation Index F	Field Shee	et QHEI Score	e: 43
River Code: 95- 708	RM: 0.7	Stream: Newpo	ort Prain	age Dit	ch	
Site Code: 2-	Project Code: DRWW19		(il bourne	E		
Date: 0-13-19	Scorer: MAS	Latitude: 42.483	41	_Longitude:	87.91242	
1.) SUBSTRATE (Check ONLY Two S	Substrate TYPE BOXES; Estimate % pe	rcent				
TYPE POOL	RIFFLE		JBSTRATE ORIGIN	.9	UBSTRATE QUALITY	
	□ 🔽 -GRAVEL [7]		heck ONE (OR 2 & AVE		heck ONE (OR 2 & AVERAGE)	
-Lg BOULD [10]	C - SAND [6]		-LIMESTONE [1]			Pubatrata
· · · ·	/		1.22			Substrate
-BOULDER [9]		/	-TILLS [1]	L	SILT MODERATE [-1]	1st
-COBBLE [8]			-WETLANDS [0]	×	SILT NORMAL [0]	
			-HARDPAN [0]		SILT FREE [1]	Max 20
-MUCK [2]	🗌 🔲 -SILT [2]		-SANDSTONE [0]	EMBEDDED	-EXTENSIVE [-2]	
		L	-RIP / RAP [0]		-MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES:	-4 or More [2]	L	-LACUSTRINE [0]		-NORMAL [0]	
(High Quality Only, Score 5 or >)	-3 or Less [0]		SHALE [-1]	L	-NONE [1]	
COMMENTS:			-COAL FINES [-2]			
	over type a score of 0 to 3; see back for i	nota rationa)			AMOUNT: (Check ONLY one or	
(Structure)	TYPE: Score All That Occur	nstructions)			check 2 and AVERAGE)	Cover
UNDERCUT BANKS [1]	POOLS > 70 cm [2]	D OXBOWS, BAC	KWATERS [1]	L.		Cover
3 OVERHANGING VEGETATIO					-MODERATE 25 - 75% [7]	14
3 SHALLOWS (IN SLOW WAT		LOGS OR WOO			SPARSE 5 - 25% [3]	Max 20
2 ROOTMATS [1]				- -		
COMMENTS:				_		
3.) CHANNEL MORPHOLOGY: (Che	eck ONLY one PER Category OR check	2 and AVERAGE)				
SINUOSITY DE	VELOPMENT CHANNELIZA	TION STABIL	TIY	MODIFICATION	S/OTHER	
🖉 -HIGH [4]	-EXCELLENT [7] -NONE [	6] 🗌 -H	IIGH [3]	-SNAGGIN	IG -IMPOUNDMENT	Channel
-MODERATE [3]	-GOOD [5] 🗌 -RECOV	ERED [4] 🛛 📈 - N	IODERATE [2]	-RELOCAT	TON -ISLAND	.0.
🗆 -LOW [2]	-FAIR [3] -RECOV	ERING [3] 👘 -Li	OW [1]	CANOPY	REMOVAL 🛄 -LEVEED	12
-NONE [1]	-POOR [1] -RECEN	T OR NO		DREDGIN	IG -BANK SHAPING	Max 20
	RECOVE			-ONE SIDE	E CHANNEL MODIFICATIONS	
		NDED [-1]				
COMMENTS:						<u></u>
			-14		Looking Downstream	
	OSION (check ONE box PER bank or ch		,	Nor River Right	le l	
RIPARIAN WIDTH L R (Per Bank)	L R (Most Predominant Per Bank	LITY (PAST 100 Meter RIPA ) LR	<u>ARGAIN )</u>		BANK EROSION L R (Per Bank)	Dinarian
	-FOREST, SWAMP [3]	·	ONSERVATION TILLA	GENI		Riparian
"□ □ -WIDE > 50m [4]	SHRUB OR OLD FIELD [2]		RBAN OR INDUSTRIAL		-MODERATE [2]	15
-MODERATE 10 - 50m [3]	-RESIDENTIAL, PARK, NEW		PEN PASTURE, ROWO			Max 10
-NARROW 5 - 10m [2]	-FENCED PASTURE [1]		INING / CONSTRUCTION			11001 10
□ □ -VERY NARROW < 5m [1]						
	COMMENTS:					
	). <u>.</u>					
5.) POOL / GLIDE AND RIFFLE / RUI	N QUALITY					
MAX. DEPTH	MORPHOLOGY		CURRENT VELOCIT	TY (POOLS & RIF	FLES!)	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE	)	(Check A	All That Apply)		Pool /
- 1m [6]	-POOL WIDTH > RIFFLE WI		-EDDIES [1]	-TORRENT		Current
— - 0.7m [4]	-POOL WIDTH = RIFFLE WI		-FAST [1]			a
- 0.4 to 0.7m [2]	-POOL WIDTH < RIFFLE WI		-MODERATE [1]			
- 0.2 to 0.4m [1]	-IMPOUNDED [-1]		Z -SLOW [1]	-VERY FAS	ST [1]	Max 12
- < 0.2m [POOL = 0]			-NONE [-1]			
COMMENTS:						
		R CHECK 2 AND ADVERA	2E .			Riffle / Run
<b>RIFFLE DEPTH</b>	RUN DEPTH	RIFFLE / RUN SUBSTRA			MPEDDEDNESS	Rime / Run
		-STABLE (e.g., Cobble, Bo		-NONE [2]	MBEDDEDNESS	
-*Rect Areas > 10cm [2]						
-*Best Areas > 10cm [2] -Best Areas 5 - 10cm [1]		I -MOD STARLETAR Lan				May 8
-Best Areas 5 - 10cm [1]	Z - MAX < 50 cm [1]	] -MOD. STABLE (e.g., Larg -UNSTABLE (Fine Gravel.		-LOW [1] -MODERA	TE [0]	Max 8
-Best Areas 5 - 10cm [1] -Best Areas < 5cm [0]	✓ - MAX < 50 cm [1]	J -MOD. STABLE (e.g., Larg -UNSTABLE (Fine Gravel,		-MODERA	* *	
-Best Areas 5 - 10cm [1]	□ - MAX < 50 cm [1] □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	/			* *	Max 8 Gradient
-Best Areas 5 - 10cm [1] -Best Areas < 5cm [0] -NO RIFFLE but RUNS prese	□ - MAX < 50 cm [1] □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	/		-MODERA	* *	
Best Areas 5 - 10cm [1]     Best Areas < 5cm [0]     -NO RIFFLE but RUNS prese     -NO RIFFLE / NO RUN [Metri COMMENTS:	nt [0] c = 0]	J-UNSTABLE (Fine Gravel,	Sand) [0]		* *	
-Best Areas 5 - 10cm [1] -Best Areas 5 cm [0] -NO RIFFLE but RUNS prese -NO RIFFLE / NO RUN [Metri COMMENTS: 6.) GRADIENT (ft / mi):	D - MAX < 50 cm [1]	UNSTABLE (Fine Gravel,	Sand) [0] % GLID		VE [-1] Gredient Score from Table 2 of Users Manu	Gradient
Best Areas 5 - 10cm [1]     Best Areas < 5cm [0]     -NO RIFFLE but RUNS prese     -NO RIFFLE / NO RUN [Metri COMMENTS:	D - MAX < 50 cm [1]	J-UNSTABLE (Fine Gravel,	Sand) [0]		VE [-1]	Gradient

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Qualitative	e Habita	at Evaluation In	dex Field Sh	eet o	QHEI Score: 45
River Code: 95-708 RM: 3.03	Stream:	Newport	Drainage	Ditch	
Site Code: <u>12-7</u> Project Code: <u>DP.JWW (9</u> Date: 10-13-19 Scorer: MAS	Location:	Dot 217 St 42.45876	Longitude:	-87.87445	
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % p         TYPE       POOL       RIFFLE	ercent	RIFFLE SUBSTRATE OF Check ONE (OR	RIGIN	SUBSTRATE QUALITY	
				Check ONE (OR 2 & AVERAGE)	Substrate
				SILT MODERATE [-1]	
		-WETLAN	••	SILT NORMAL [0]	0
		HARDPAI		SILT FREE [1]	Max 20
		RIP./ RAF		-MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES: -4 or More [2]		-LACUSTF		-NORMAL [0]	
(High Quality Only, Score 5 or >) 3 or Less [0]		-SHALE [- -COAL FIN	-	-NONE [1]	
COMMENTS:			100 [-2]		
2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for (Structure) TYPE: Score All That Occu UNDERCUT BANKS [1] / POOLS > 70 cm [ OVERHANGING VEGETATION [1] / ROOTWADS [1]	<sup>r</sup> <sub>2]</sub> <u>3</u>	DXBOWS, BACKWATERS [1] AQUATIC MACROPHYTES [1		AMOUNT: (Check ONLY one check 2 and AVERAGE)  -EXTENSIVE > 75% [11]  -MODERATE 25 - 75% [7]	cover
Shallows (in SLOW WATER) [1] BOULDERS [1] ROOTMATS [1] COMMENTS:	<u>_</u> 3_	.ogs or woody debris [	]	<ul> <li>-SPARSE 5 - 25% [3]</li> <li>-NEARLY ABSENT &lt; 5% [1]</li> </ul>	Max 20
3.) CHANNEL MORPHOLOGY:         (Check ONLY one PER Category OR check           SINUOSITY         DEVELOPMENT         CHANNELL          HIGH [4]        EXCELLENT [7]         -NONE          MODERATE [3]         -GOOD [5]         -RECC           -LOW [2]        FAIR [3]         -RECC          NONE [1]         -RECC         RECO	ZATION [6] IVERED [4] IVERING [3] INT OR NO VERY [1]	IGE) STABILTIY -HIGH [3] -MODERATE [2] -LOW [1]	-SNAG -RELOC -CANO -CANO	CATION -ISLAND PY REMOVAL -LEVEED	9
COMMENTS:	UNDED [-1]				
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or RIPARIAN WIDTH       FLOOD PLAIN OF FLOOD FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT FLOOT	J <u>ALITY (<i>PAST</i></u> nk) ?]	/ERAGE per bank) 100 Meter RIPARIAN) L R - CONSERVATIO - URBAN OR IND - URBAN OR IND - OPEN PASTUR - MINING / CONS	N TILLAGE [1] NUSTRIAL [0] E, ROWCROP [0]	ight Looking Downstream BANK EROSION L R (Per Bank) -NONE / LITTLE [3] -MODERATE [2] -HEAVY / SEVERE	9
5.)         POOL / GLIDE AND RIFFLE / RUN QUALITY           MAX. DEPTH         MORPHOLOGY           (Check 1 ONLY)         (Check 1 or 2 & AVERAC           - 1m [6]         - POOL WIDTH > RIFFLE 1           - 0.7m [4]         - POOL WIDTH = RIFFLE 1           - 0.4 to 0.7m [2]         - POOL WIDTH < RIFFLE 1	VIDTH [2] VIDTH [1]	CURRENT C -EDDIES { FAST [1] G -FAST [1] G -MODERA C -SLOW [1] C -NONE [-1]	TE [1] -INTER	ENTIAL [-1] STITIAL [-1] MITTENT [-2]	Pool / Current Q Max 12
CHECK ONE	OR CHECK 2	AND ADVERAGE			Riffle / Run
RIFFLE DEPTH         RUN DEPTH           -*Best Areas > 10cm [2]         - MAX > 50 cm [2]           - Best Areas > 10cm [1]         - MAX > 50 cm [1]           - Best Areas < 5cm [0]	RIFFLE / F	RUN SUBSTRATE e.g., Cobble, Boulder) [2] (BLE (e.g., Large Gravel) [1] E (Fine Gravel, Sand) [0]	RIFFLE / RU -NONE -LOW [ -MODE -EXTEN	1] RATE [0]	Max 8 Gradient
COMMENTS:	d				——— Y
6.) GRADIENT (ft / mi): <u>3.68</u> DRAINAGE AREA (sq.mi.): <u>2.</u>	<u>ŏ</u>	% POOL:	% GLIDE:		Table 2 of Users Manual
*Best areas must be large enough to support a population of riffie-obligate species			/0 KU(Y,	bassed on gradient ac	nd drainage area. Max 10

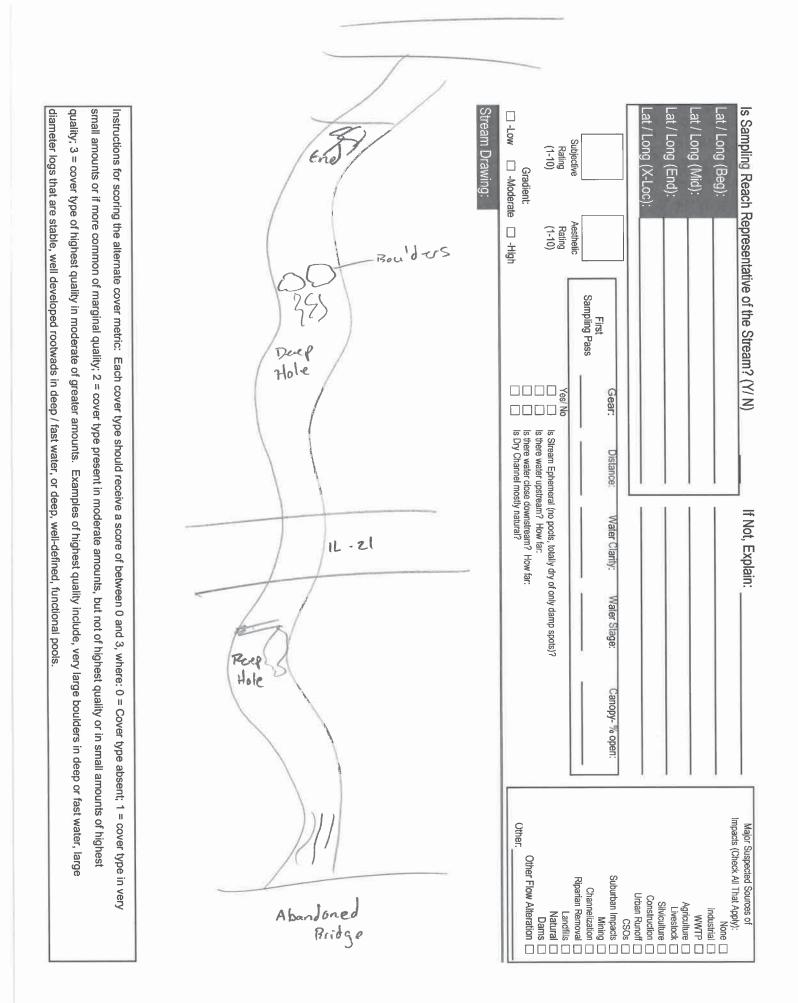


MBI Midwast Biodiversity Institute		Qualitative	Habita			Field She	eet	QHEI Score:	6
River Code: 95-704	RM:	0.25	Stream:		Brook				0
Site Code: 13-7 Date: 8-30-19	Project Code: Scorer:	DRWW19	Location: Latitude:	42,3257		Longitude:	- 87.97461		
Date:         9 - 30 - [9]           1.) SUBSTRATE         (Check ONLY Two Stress of the			-	RIFFLE SUBS Chec	STRATE ORIGIN k ONE (OR 2 & AVE -LIMESTONE [1] -TILLS [1] -WETLANDS [0] -HARDPAN [0] -SANDSTONE [0] -RIP / RAP [0] -LACUSTRINE [0] -SHALE [-1]	Longitude: :RAGE) SILT: EMBEDDED NESS:	SUBSTRATE QUALITY Check ONE (OR 2 & AVERAGE) - SILT HEAVY [-2] - SILT MODERATE [-1] - SILT NORMAL [0] - SILT FREE [1]		Substrate
COMMENTS:					-COAL FINES [-2]				
2.) INSTREAM COVER (Give each cov (Structure) UNDERCUT BANKS [1] OVERHANGING VEGETATIOI SHALLOWS (IN SLOW WATE COMMENTS:	TYPE:	of 0 to 3; see back for in Score All That Occur _POOLS > 70 cm [2] _ROOTWADS [1] _BOULDERS [1]	2	OXBOWS, BACKW AQUATIC MACRO LOGS OR WOODY	PHYTES [1]		AMOUNT:         (Check ONLY of check 2 and AVERAGE)           □         -EXTENSIVE > 75% [11]           □         -MODERATE 25 - 75% [7]           □         -SPARSE 5 - 25% [3]           □         -NEARLY ABSENT < 5% [1]		Cover
3.) CHANNEL MORPHOLOGY:         (Check           SINUOSITY         DEV           -HIGH [4]         -           -MODERATE [3]         -           -LOW [2]         -	X ONLY one PER <u>ELOPMENT</u> EXCELLENT [7] GOOD [5] FAIR [3] POOR [1]	CHANNELIZA	TION [] ERED [4] ERING [3] OR NO RY [1]	STABILTIY	H [3] DERATE [2]	-SNAGO -RELOC -CANOF -DREDO	ATION -ISLAND PY REMOVAL -LEVEED		Channel IQ Max 20
COMMENTS:									
4.) RIPARIAN ZONE AND BANK ERO. 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]	LR (Most	E box PER bank or chu <u>FLOOD PLAIN QUA</u> Predominant Per Bank) ST, SWAMP [3] JB OR OLD FIELD [2] DENTIAL, PARK, NEW SED PASTURE [1]	LITY (PAST	<u>100 Meter RIPARI</u> L R 		% GE [1] L [0] CROP [0]	ght Looking Downstream <u>BANK EROSION</u> L R (Per Bank) C -NONE / LITTLE C -MODERATE [2] C -HEAVY / SEVER		Riparian Q.5 Max 10
5) POOL / GLIDE AND RIFFLE / RUN									
MAX. DEPTH (Check 1 ONLYI) - 1m [6] - 0.7m [4] - 0.2 to 0.4m [1] - <0.2m [POOL = 0] COMMENTS:	(Che C -POOL	MORPHOLOGY ck 1 or 2 & AVERAGE) . WIDTH > RIFFLE WIC . WIDTH = RIFFLE WIC . WIDTH < RIFFLE WIC UNDED [-1]	DTH [1]		CURRENT VELOCI (Check / -EDDIES [1] -FAST [1] -MODERATE [1] -SLOW [1] -NONE [-1]	TY (POOLS &   All That Apply) - TORRE - INTERS - INTER - VERY F	ENTIAL [-1] STITIAL [-1] MITTENT [-2]		Pool / Current Max 12
		A. 197-1-1 - 4-1							
RIFFLE DEPTH   -*Best Areas > 10cm [2]  -Best Areas 5 - 10cm [1]  -Best Areas < 5cm [0]  -NO RIFFLE but RUNS presen  -NO RIFFLE / NO RUN [Metric COMMENTS:		H > 50 cm [2] < 50 cm [1]	RIFFLE / -STABLE -MOD. ST.	2 AND ADVERAGE RUN SUBSTRATE (e.g., Cobble, Bould ABLE (e.g., Large ( LE (Fine Gravel, Sa	der) [2] Gravel) [1]	RIFFLE / RUI -NONE -LOW [1 -LOW [1 -MODEF -EXTEN	] RATE [0]		Riffle / Run A Max 8 Gradient
		EA (sq.mi.): 2.7		% POOL:	% GLID	)E·			8
*Best areas must be large enough to support a			-	% FOOL:	% GLID		Gredient Score fi based on gradier	rom Table 2 of Users Manual A and drainage area.	Max 10

July 21. 2 VA

quality; 3 = cover type of highest qu diameter logs that are stable, well c	small amounts or if more common of marginal qua	Instructions for scoring the alternate	Stream Drawing:	adient: Moderate	Subjective Aesthetic	Lat / Long (X-Loc):	Lat / Long (Mid):	Lat / Long (Beg):	Is Sampling Reach Representative of the Stream? (Y/ N)
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.	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	onver metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very		Yes/ No <ul> <li>Yes/ No</li> <li>Is Stream Ephemeral (no pools, totally dry of only damp spots)?</li> <li>Is there water upstream? How far:</li> <li>Is there water close downstream? How far:</li> <li>Is there water close downstream? How far:</li> <li>Is Dry Channel mostly natural?</li> </ul>	First Gear: Distance: Water Clarity: Water Stage: Canopy- % open: Sampling Pass				re of the Stream? (Y/ N) If Not, Explain:
ep or fast water, large	l amounts of highest	absent; 1 = cover type in very		Landifits	Suburban Impacts	Urban Runoff	Agriculture	None Industrial	Major Suspected Sources of Imnacts (Check All That Applw):

Qualitative	Habitat Evaluation Index Field Sheet QHEI Score:	10
River Code: 95-720 RM: 0.15	Stream: West Fork Belvidere Rd. Trib	
Site Code: 13-8 Project Code: Deworld Date: 10-19 Scorer: MAS	Location: Ust Abandoned Bride Latitude: 42,34253 Longitude: -87,9449	
Date:         I Or Or - I 'f''         Scorer:         I'''' S           1.] SUBSTRATE         (Check ONLY Two Substrate TYPE BOXES; Estimate % per           TYPE         POOL         RIFFLE           II BLDR/SLBS [10]         II GRAVEL [7]           II Lg BOULD [10]         II SAND [6]           II COBBLE [8]         II DETRITUS [3]           II HARDPAN [4]         II ARTIFICIAL [0]           II MUCK [2]         II SILT [2]	POOL RIFFLE <u>SUBSTRATE ORIGIN</u> Check ONE (OR 2 & AVERAGE) Check ONE (OR 2 & AVERAGE)	Substrate
(High Quality Only, Score 5 or >)		
COMMENTS:	-COAL FINES [-2]	
2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for in (Structure)       TYPE: Score All That Occur         D       UNDERCUT BANKS [1]       / POOLS > 70 cm [2]         O       OVERHANGING VEGETATION [1]       ROOTWADS [1]         3       SHALLOWS (IN SLOW WATER) [1]       BOULDERS [1]         COMMENTS:	O         OXBOWS, BACKWATERS [1]        EXTENSIVE > 75% [11]           O         AQUATIC MACROPHYTES [1]        MODERATE 25 - 75% [7]            LOGS OR WOODY DEBRIS [1]        SPARSE 5 - 25% [3]            -NEARLY ABSENT < 5% [1]	Cover 14 Max 20
3.) CHANNEL MORPHOLOGY:         (Check ONLY one PER Category OR check // SINUOSITY         DEVELOPMENT         CHANNELIZA          HIGH [4]        EXCELLENT [7]        NONE [6]        NONE [7]        NONE [7]          MODERATE [3]        GOOD [5]        RECOVI          LOW [2]        FAIR [3]        RECOVI          NONE [1]        POOR [1]        RECOVI          NONE [1]        POOR [1]         -RECOVIE	TION     STABILITY     MODIFICATIONS / OTHER       [3]     -HIGH [3]     -SNAGGING     -IMPOUNDMENT       ERED [4]     -MODERATE [2]     -RELOCATION     -ISLAND       ERING [3]     -LOW [1]     -CANOPY REMOVAL     -LEVEED       FOR NO     -DREDGING     -BANK SHAPING       RY [1]     -ONE SIDE CHANNEL MODIFICATIONS	Channel
COMMENTS:		
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or ch         RIPARIAN WIDTH       FLOOD PLAIN QUA         L       R (Per Bank)       L       R (Most Predominant Per Bank)        VERY WIDE > 100m [5]       -FOREST, SWAMP [3]        WIDE > 50m [4]       -SHRUB OR OLD FIELD [2]         - WIDE > 50m [4]       -RESIDENTIAL, PARK, NEW        NARROW 5 - 10m [2]       -FENCED PASTURE [1]        VERY NARROW < 5m [1]	LITY (PAST 100 Meter RIPARIAN)         BANK EROSION           L         R         L         R         (Per Bank)           Image: Description of the second	Riparian Ve Max 10
5.1         POOL / GLIDE AND RIFFLE / RUN QUALITY           MAX. DEPTH         MORPHOLOGY           (Check 1 ONLY!)         (Check 1 or 2 & AVERAGE)           - 1m [6]         -POOL WIDTH > RIFFLE WII           - 0.7m [4]         -POOL WIDTH = RIFFLE WII           - 0.4 to 0.7m [2]         -POOL WIDTH < RIFFLE WII	DTH [1] -FAST [1] -INTERSTITIAL [-1]	Pool / Current 9 Max 12
CHECK ONE O	R CHECK 2 AND ADVERAGE	Riffie / Run
RIFFLE DEPTH         RUN DEPTH           -*Best Areas > 10cm [2]         - MAX > 50 cm [2]           -Best Areas > 10cm [1]         - MAX < 50 cm [1]	RIFFLE / RUN SUBSTRATE       RIFFLE / RUN EMBEDDEDNESS         -STABLE (e.g., Cobble, Boulder) [2]       -NONE [2]         -MOD. STABLE (e.g., Large Gravel) [1]       Image: Comparison of the second s	Max 8 Gradient
6.) GRADIENT (ft / mi): 33.63 DRAINAGE AREA (sq.mi.): 3.8	% POOL: % GLIDE:	8
*Best areas must be large enough to support a population of riffle-obligate species	% RIFFLE: % RUN: based on gradient and drainage area.	Max 10
		1400 L

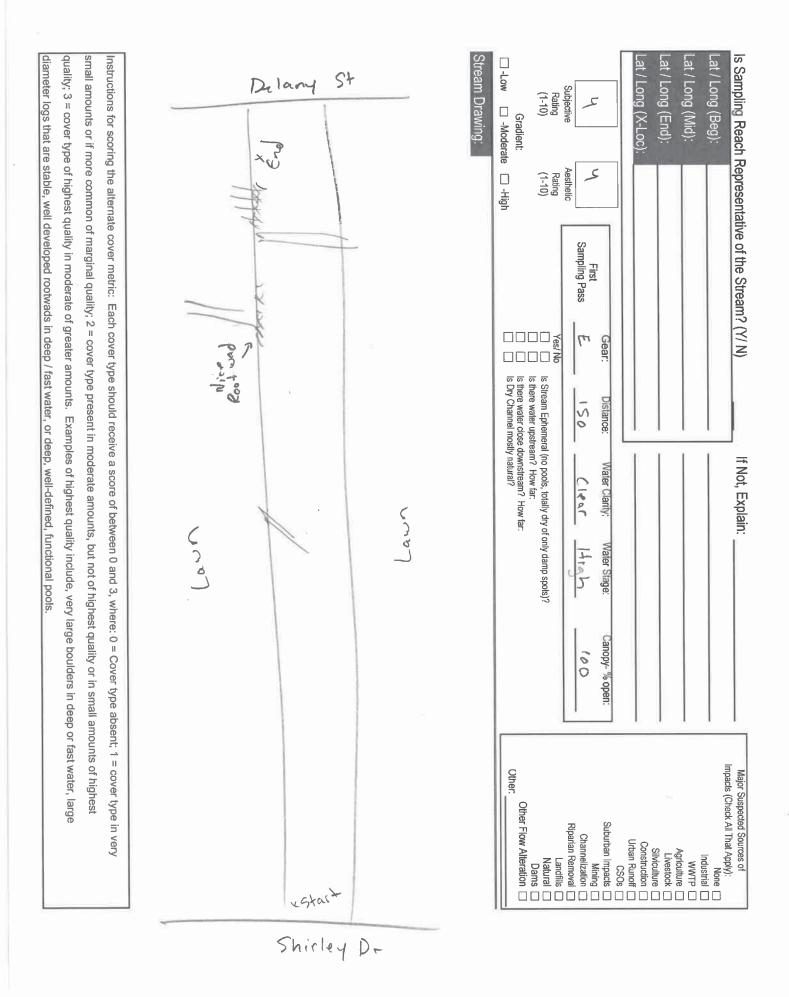


Rest Biodiversity Qu		Evaluation Index F		QHE	Score: GV
River Code: 95 - 709 RM: 0,4		toneroller Ci	reek		
Site Code: 13-9 Project Code: De Date: 10-10-19 Scorer: MAS		2.35290	Longitude: - C	7.93661	
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; TYPE POOL RIFFLE				STRATE QUALITY	
	AVEL [7]	Check ONE (OR 2 & AVER		k ONE (OR 2 & AVERAGE)	
-Lg BOULD [10]	ND [6]	LIMESTONE [1]	SILT: -	-SILT HEAVY [-2]	Substrate
	DROCK [5]	TILLS [1]		-SILT MODERATE [-1]	d
		-WETLANDS [0]		-SILT NORMAL [0]	10
-HARDPAN [4]				-SILT FREE [1]	Max 20
	[2]	SANDSTONE [0]		-EXTENSIVE [-2] -MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES: 24 or	r More [2]			-NORMAL [0]	
F	r Less [0]	-SHALE [-1] .	/	-NONE [1]	
COMMENTS:		-COAL FINES [-2]			
2.) INSTREAM COVER (Give each cover type a score of 0 to 3	3; see back for instructions)			AMOUNT: (Check ONLY one or	
	All That Occur		(	check 2 and AVERAGE)	Cover
		OWS, BACKWATERS [1]		-EXTENSIVE > 75% [11]	N
		ATIC MACROPHYTES [1] S OR WOODY DEBRIS [1]		-MODERATE 25 - 75% [7] -SPARSE 5 - 25% [3]	Max 20
O ROOTMATS [1]		on noop rechto[i]		-NEARLY ABSENT < 5% [1]	Millio 20
COMMENTS:					
3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Cates				OTHER	
SINUOSITY DEVELOPMENT HIGH [4] -EXCELLENT [7]	CHANNELIZATION	STABILTIY -HIGH [3]	MODIFICATIONS / C		Channel
-MODERATE [3] GOOD [5]	-RECOVERED [4]	MODERATE [2]	-RELOCATION		5
-LOW [2] -FAIR [3]	-RECOVERING [3]	-LOW [1]	CANOPY REM	MOVAL 🗌 -LEVEED	16.
-NONE [1] -POOR [1]	-RECENT OR NO			-BANK SHAPING	Max 20
	RECOVERY [1]		ONE SIDE CH	ANNEL MODIFICATIONS	
COMMENTS:					
L R (Per Bank) L R (Most Predom	OD PLAIN QUALITY (PAST 100 i minant Per Bank) WAMP [3] [ OLD FIELD [2] [ AL, PARK, NEW FIELD [1] [		GE [1] .[0] .ROP [0]	oking Downstream BANK EROSION L R (Per Bank) -NONE / LITTLE [3] - MODERATE [2] - HEAVY / SEVERE [1]	Riparian V Max 10
5.1 POOL / GLIDE AND RIFFLE / RUN QUALITY MAX. DEPTH MORF	PHOLOGY	CURRENT VELOCIT	Y (POOLS & RIFFLE	ES!)	
	2 & AVERAGE)	Carteria de la companya de la company	I That Apply)		Pool /
1	TH > RIFFLE WIDTH [2]	-EDDIES [1]	-TORRENTIAL		Current
	TH = RIFFLE WIDTH [1] TH < RIFFLE WIDTH [0]	- 🗔 -FAST [1]			9
- 0.2 to 0.4m [1]		SLOW [1]	-VERY FAST [		Max 12
- < 0.2m [POOL = 0]		-NONE [-1]			
COMMENTS:					
	CHECK ONE OR CHECK 2 AND	ADVERAGE		********	Riffle / Run
RIFFLE DEPTH RUN DEPTH	RIFFLE / RUN		RIFFLE / RUN EMB	BEDDEDNESS	10.2
		Cobble, Boulder) [2] (e.g., Large Gravel) [1]	-NONE [2]		Max 8
-Best Areas < 5cm [0]	UNSTABLE (Fi		-MODERATE [	[0]	IVIER O
-NO RIFFLE but RUNS present [0]			-EXTENSIVE [-	[-1]	Gradient
-NO RIFFLE / NO RUN [Metric = 0] COMMENTS:					
6.) GRADIENT (ft / mi): 19,18 DRAINAGE AREA (sq.	mi): 4.1 % E	200L: % GLID	=		10
BADIENT (IT THI):      I I D DRAINAGE AREA (sq.     "Best areas must be large enough to support a population of rifle-obligate s		NFFLE: % RUI		Gradient Score from Table 2 of based on gradient and drainag	
	/01			and a stand of the stand of the stand	1860/10

1. 21-2 VA

Instructions for scoring the alternations small amounts or if more common quality; 3 = cover type of highest diameter logs that are stable, wel	Stream Drawing:	adient: -Moderate	Subjective Aesthetic	Lat / Long (Mid): Lat / Long (End): Lat / Long (X-Loc):	Is Sampling Reach Representative of the Stream? (Y/ N) Lat / Long (Beg):
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.	1092 - 001 - 23	Yes/ No  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?	First Gear: Distance: Water Clarity: Sampling Pass <u> </u>		tive of the Stream? (Y/ N) If Not, Explain:
een 0 and 3, where: 0 = Cover type absent; 1 = cover type in very , but not of highest quality or in small amounts of highest lity include, very large boulders in deep or fast water, large unctional pools.	1000 1000 123 1000 123 1000 12-21	only damp spots)? Natural Dams Other Flow Alteration Other: אין	Water Stage:       Canopy-% open:       Suburban Impacts         Mining       Mining       Channelization         Channelization       Riparian Removal       Riparian Removal	Agriculture Livestock Silviculture Construction Urban Runoff	Major Suspected Sources of Impacts (Check All That Apply): None Industrial

Midwest Biodiversity Institute	Qualitative	Habita	at Evaluation Index Field Sheet QHEI Score:	39
River Code: 95-710	RM: 2.0	Stream:	Suburban Country Club Trib	
	Project Code: Dewiji?	Location:		
Date: 10-10-19	Scorer: MAS	Latitude:	42.40424 Longitude: -87.90610	
1.) SUBSTRATE (Check ONLY Two Su	Ibstrate TYPE BOXES; Estimate % perc	ent		
TYPE POOL	RIFFLE	POOL	RIFFLE SUBSTRATE ORIGIN SUBSTRATE QUALITY	
-BLDR/SLBS [10]	🗌 🖂 -GRAVEL [7]		Check ONE (OR 2 & AVERAGE) Check ONE (OR 2 & AVERAGE)	
🗆 🗔 -Lg BOULD [10]	🖾 📈 -SAND [6]		LIMESTONE [1] SILT: 🖉 -SILT HEAVY [-2]	Substrate
BOULDER [9]	[] -BEDROCK [5]			
-COBBLE [8]	🔲 🗌 -DETRITUS [3]		WETLANDS [0]	0
💋 🗀 -HARDPAN [4]	ARTIFICIAL [0]		HARDPAN [0]SILT FREE [1]	Max 20
MUCK [2]			SANDSTONE [0] EMBEDDED 🗹 -EXTENSIVE [-2]	
	No 184 ha ier de de ser de sit wit er er ste de de ser som hit maam ich de secon och alt ha 184 186 186 186 186 188 186 188		RIP / RAP [0] NESS:MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES:	-4 or More [2]		-LACUSTRINE [0] -NORMAL [0]	
(High Quality Only, Score 5 or >)	📈 -3 or Less [0]		-SHALE [-1] -NONE [1]	
	(		COAL FINES [-2]	
COMMENTS:				
2.) INSTREAM COVER (Give each cov		structions)	AMOUNT: (Check ONLY one or	
(Structure) UNDERCUT BANKS [1]	TYPE: Score All That Occur POOLS > 70 cm [2]	0	CXBOWS, BACKWATERS [1]	Cover
VERHANGING VEGETATION		_	OXBOWS, BACKWATERS [1]	12
SHALLOWS (IN SLOW WATER			LOGŚ OR WOODY DEBRIS [1]	Max 20
ROOTMATS [1]	····	<u> </u>	□ -NEARLY ABSENT < 5% [1]	
COMMENTS:				
3.) CHANNEL MORPHOLOGY: (Check	k ONLY one PER Category OR check 2	and AVER	AGE)	
	ELOPMENT CHANNELIZAT		STABILTIY MODIFICATIONS / OTHER	
	EXCELLENT [7] -NONE [6		-HIGH [3] -IMPOUNDMENT	Channel
	GOOD [5] -RECOVE		MODERATE [2] -ISLAND	3
			-LOW [1]     -CANOPY REMOVAL     -LEVEED     -DATE: CANOPY REMOVAL     -LEVEED	_
-NONE [1]	POOR [1] -RECENT			Max 20
	RECOVE		-ONE SIDE CHANNEL MODIFICATIONS	
COMMENTS:	CET "INFOON	ניין עבע		
			<u>م</u> ا بد	
4. RIPARIAN ZONE AND BANK EROS	SION (check ONE box PER bank or che	ck 2 and A	VERAGE per bank) River Right Looking Downstream	
RIPARIAN WIDTH	FLOOD PLAIN QUAL	ITY IPAST	100 Meter RIPARIAN) BANK EROSION	
L R (Per Bank)	L R (Most Predominant Per Bank)		LR (Per Bank)	Riparian
-VERY WIDE > 100m [5]	-FOREST, SWAMP [3]		CONSERVATION TILLAGE [1]     ONNE / LITTLE [3]	1
	SHRUB OR OLD FIELD [2]		URBAN OR INDUSTRIAL [0] -MODERATE [2]	4
	-RESIDENTIAL, PARK, NEW	FIELD [1]		Max 10
	-FENCED PASTURE [1]			
VERY NARROW < 5m [1]	COMMENTS:			
-NONE [0]	JOWMEN 13.			
5.) POOL / GLIDE AND RIFFLE / RUN	QUALITY			
MAX. DEPTH	MORPHOLOGY		CURRENT VELOCITY (POOLS & RIFFLES!)	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)		(Check All That Apply)	Pool /
- 1m [6]	-POOL WIDTH > RIFFLE WID	TH [2]	-EDDIES [1] -TORRENTIAL [-1]	Current
- 0.7m [4]	-POOL WIDTH = RIFFLE WID	)TH [1]	-FAST [1] -INTERSTITIAL [-1]	
- 0.4 to 0.7m [2]	-POOL WIDTH < RIFFLE WID	DTH [0]	-MODERATE [1] INTERMITTENT [-2]	4
- 0.2 to 0.4m [1]	-IMPOUNDED [-1]			Max 12
- < 0.2m [POOL = 0]			-NONE [-1]	
COMMENTS:				
		R CHECK 2	AND ADVERAGE	Riffle / Run
RIFFLE DEPTH	RUN DEPTH		RUN SUBSTRATE RIFFLE / RUN EMBEDDEDNESS	
-*Best Areas > 10cm [2]		-	(e.g., Cobble, Boulder) [2] -NONE [2]	0
-Best Areas 5 - 10cm [1]			ABLE (e.g., Large Gravel) [1]	Max 8
-Best Areas < 5cm [0]			LE (Fine Gravel, Sand) [0]	
-NO RIFFLE but RUNS present			-EXTENSIVE [-1]	Gradient
-NO RIFFLE / NO RUN [Metric	= 0]			
COMMENTS:				
6.) GRADIENT (ft / mi): 15.72	DRAINAGE AREA (sq.mi.): 4.0		% POOL: % GLIDE:	10
*Best areas must be large enough to support a p			% RIFFLE: % RUN: based on gradient and drainage area	Max 10
				Max 10
				N. V. O
				35-2-
				9.1
				10



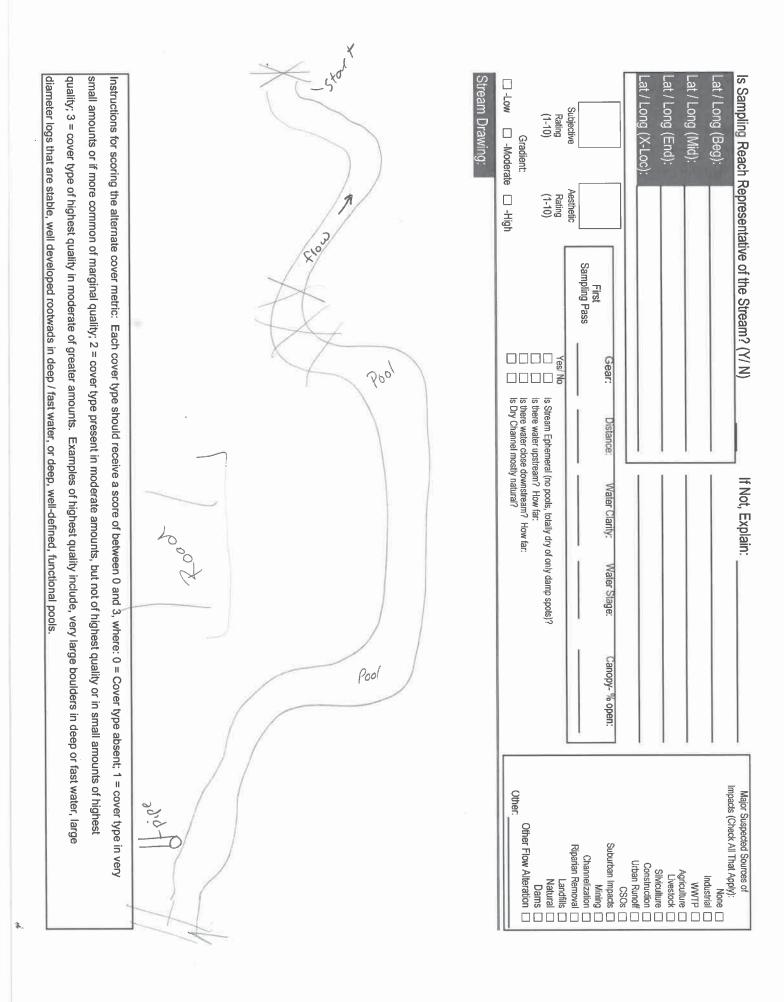
Midwest Biodiversity Institute	Qualitative	Habitat Eva	luation Index F	ield Sh	eet	QHEI Score:	3.
River Code: 95-7/1	RM: 1.36		cum Con		Creek		
Site Code: 13-1 (	Project Code: DRWW19		N. Mill Creek 1		A- 05003		
Date: 16-13-19	Scorer: MAS	Latitude: 42.4	4442	Longitude:	-87,95283		
TYPE         POOL          BLDR/SLBS [10]	ubstrate TYPE BOXES; Estimate % perc           RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN _Check ONE (OR 2 & AVEI LIMESTONE [1] TILLS [1]	RAGE) SILT:	SUBSTRATE QUALITY Check ONE (OR 2 & AVERAI SILT HEAVY [-2]	GE)	Substrate
Z-COBBLE [8]       -HARDPAN [4]       -MUCK [2]	□DETRITUS [3] □ARTIFICIAL [0] □SILT [2]	······································	-wetlands [0]     -Hardpan [0]     -Sandstone [0]     -RIP / Rap [0]	EMBEDDED NESS:	-SILT NORMAL [0]     -SILT FREE [1]     -EXTENSIVE [-2]     -MODERATE [-1]		Max 20
NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >) COMMENTS:	-4 or More [2]		-LACUSTRINE [0]     -SHALE [-1]     -COAL FINES [-2]		-NORMAL [0] .NONE [1]		
2) INSTREAM COVER (Give each co (Structure) UNDERCUT BANKS [1] OVERHANGING VEGETATIO SHALLOWS (IN SLOW WATE ROOTMATS [1] COMMENTS:	R) [1]BOULDERS [1]	OXBOWS, AQUATIC M COGS OR	BACKWATERS [1] MACROPHYTES [1] MOODY DEBRIS [1]		AMOUNT: (Check ONL check 2 and AVERAGE → EXTENSIVE > 75% [11 → MODERATE 25 - 75% → SPARSE 5 - 25% [3] → NEARLY ABSENT < 55	)  ] [7]	Cover
SINUOSITY         DEV           Image: High [4]         Image: High [4]         Image: High [4]           Image: High [4]         Image: High [4]         Image: High [4]         Image: High [4]           Image: High [4]         Imag	Ck ONLY one PER Category OR check 2           ZELOPMENT         CHANNELIZAT           -EXCELLENT [7]         -NONE [6           -GOOD [5]         2           -FAIR [3]         2           -POOR [1]         -RECOVE           -RECOVE         -IMPOUN	JON         STA           RED [4]            RING [3]            OR NO            RY [1]	<u>NBILTIY</u> ] -HIGH [3] <b>[</b> -MODERATE [2] ] -LOW [1]	-SNAG	CATION -ISLAN	ID ED SHAPING	Channel
COMMENTS:							
A.)         RIPARIAN ZONE AND BANK ERC           RIPARIAN WIDTH         L           R         (Per Bank)          VERY WIDE > 100m [5]          WIDE > 50m [4]          MOREATE 10 - 50m [3]          NARROW 5 - 10m [2]          VERY NARROW < 5m [1]	SION       (check ONE box PER bank or che         FLOOD PLAIN QUA         L       R         (Most Predominant Per Bank)        FOREST, SWAMP [3]        SHRUB OR OLD FIELD [2]         P        RESIDENTIAL, PARK, NEW        FENCED PASTURE [1]         COMMENTS:	ITY (PAST 100 Meter L R C FIELD [1]		GE [1] . [0] CROP [0]	ight Looking Downstream <u>BANK EROSION</u> L R (Per Bank)       	[2]	Riparian 3. Max 10
5.) POOL / GLIDE AND RIFFLE / RUN MAX. DEPTH (Check 1 ONLY!) - 1m [6] - 0.7m [4] - 0.2 to 0.7m [2] - 0.2 to 0.4m [1] - < 0.2m [POOL = 0} COMMENTS:	A QUALITY MORPHOLOGY (Check 1 or 2 & AVERAGE) -POOL WIDTH > RIFFLE WII -POOL WIDTH = RIFFLE WII -POOL WIDTH < RIFFLE WII -IMPOUNDED [-1]	TH [1]	CURRENT VELOCI (Check / - EDDIES [1] - FAST [1] - MODERATE [1] - SLOW [1] - NONE [-1]	I That Apply)	ENTIAL [-1] STITIAL [-1] MITTENT [-2]		Pool / Current 6 Max 12
RIFFLE DEPTH -*Best Areas > 10cm [2] -Best Areas 5 - 10cm [1] -Best Areas < 5cm [0] -NO RIFFLE but RUNS preser -NO RIFFLE / NO RUN [Metric COMMENTS:	RUN DEPTH           -           -           MAX > 50 cm [2]           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -           -	R CHECK 2 AND ADVE RIFFLE / RUN SUBS -STABLE (e.g., Cobbl -MOD. STABLE (e.g., -UNSTABLE (Fine Gr	ETRATE le, Boulder) [2] Large Gravel) [1]		1]	I	Riffle / Run 3.5 Max 8 Gradient
6.) GRADIENT (ft / mi): 30.6	DRAINAGE AREA (sa.mi) 2.4	% POOL:	% GLID	E:			8
*Best areas must be large enough to support a		- % RIFFLE				core from Table 2 of Users Manual gradient and drainage area.	Max 10
						J.	Jar 10 202

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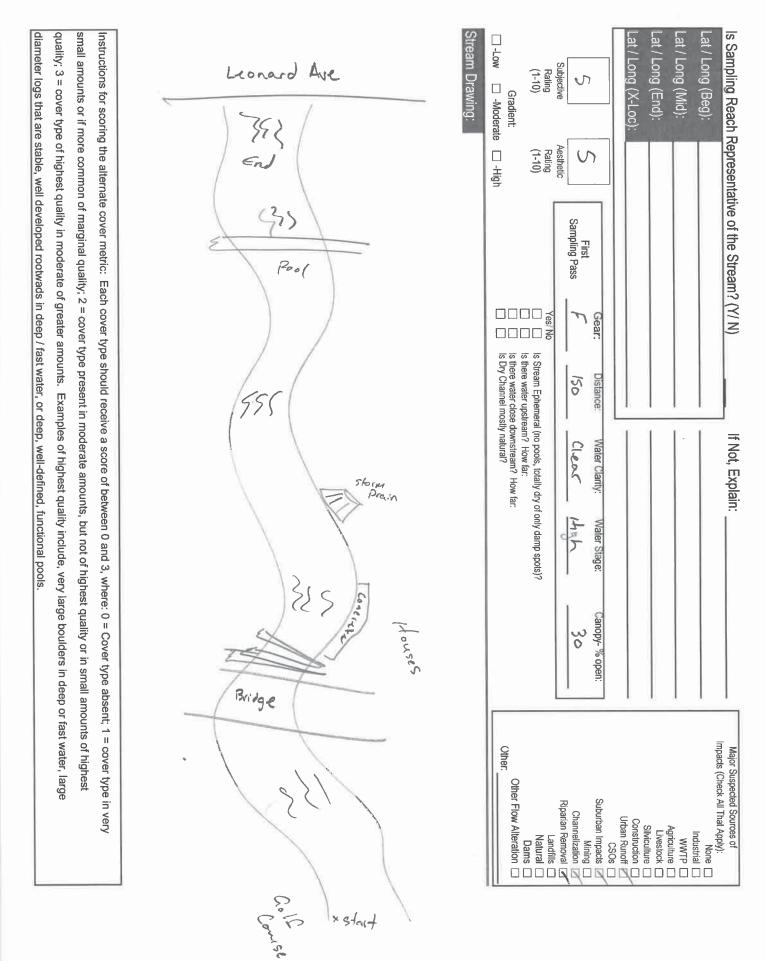
Instructions for scori small amounts or if r quality; 3 = cover typ	Stream Drawing:	(1-10) Gradient:	Subjective	Lat / Long (Ivild): Lat / Long (End): Lat / Long (X-Loc):	Is Sampling Reach Lat / Long (Beg):	
Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type 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		Rating (1-10)	First Gear: Distance: Sampling Pass $F$ 150		Is Sampling Reach Representative of the Stream? (Y/ N) If Not Lat / Long (Beg):	
Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very lity; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest te of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large	235	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?	Water Clarity:     Water Stage:     Canopy-% open:       Two bed     Head     56		If Not, Explain:	1
1 = cover type in very nts of highest ast water, large	× start Bridge	Other Flow Alteration	Suburban Impacts Mining Channelization Riparian Removal	Agriculture	Major Suspected Sources of Impacts (Check All That Apply): None Industrial	

diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

QUALITATIVE Habitat Evaluation Index Field Sheet QHEIS	core: 45
River Code: 95-716 RM: 0.4 Stream: UT Greenleaf Creek	
Site Code: 13-13 Project Code: DRWW19- Location: det Kenwood Date: 8-30-19 Scorer: VA Latitude: 42,36604 Longitude: -87,90196	
Date:         X-3         I         Scorer:         V/A         Latitude:         42,36604         Longitude:         - 87,90196           1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent         TYPE         POOL         RIFFLE         POOL         RIFFLE         SUBSTRATE ORIGIN         SUBSTRATE QUALITY           [] -8LDR/SLBS[10]         []         -9RAVEL [7]         Check ONE (OR 2 & AVERAGE)         Check ONE (OR 2 & AVERAGE)           [] -1.4g BOULD [10]         []         -9RAVEL [7]         Check ONE [0]         SILT HEAVY [-2]           [] -8DULD ER [9]         []         -9EDROCK [5]         IIILS [1]         SILT MODERATE [-1]           [] -0COBBLE [8]         []         -0ETRITUS [3]         IVETLANDS [0]         SILT NORMAL [0]           [] -4RADPAN [4]         []         -4RTIFICIAL [0]         IVETLANDS [0]         SILT FREE [1]           [] -4MUCK [2]         []         -SILT [2]         SANDSTONE [0]         EMBEDDED         -EXTENSIVE [-2]           [] -4MUCK [2]         []         -SILT [2]         SANDSTONE [0]         EMBEDDED         -EXTENSIVE [-2]           [] -4MUCK [2]         []         -SILT [2]         SANDSTONE [0]         EMBEDDED         -EXTENSIVE [-2]           [] -4MUCK [2]         []         -SILT [2] <t< td=""><td>Substrate</td></t<>	Substrate
OVERHANGING VEGETATION [1]       I ROOTWADS [1]       AQUATIC MACROPHYTES [1]       -MODERATE 25 - 75% [7]         SHALLOWS (IN SLOW WATER) [1]       BOULDERS [1]       3       LOGS OR WOODY DEBRIS [1]       -SPARSE 5 - 25% [3]         ROOTMATS [1]       BOULDERS [1]       -NEARLY ABSENT < 5% [1]	\D Max 20
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]      RECOVERY [1]      ONE SIDE CHANNEL MODIFICATIONS      BANK SHAPING         RECOVERY [1]      IMPOUNDED [-1]      IMPOUNDED [-1]      ONE SIDE CHANNEL MODIFICATIONS	Channel S Max 20
A.J. RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)       River Right Looking Downstream         RIPARIAN WIDTH       FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)       BANK EROSION         L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank)       L R (Per Bank)        VERY WIDE > 100m [5]      FOREST, SWAMP [3]      CONSERVATION TILLAGE [1]       -////////////////////////////////////	Riparian
51 POOL / GLIDE AND RIFFLE / RUN QUALITY         MAX. DEPTH       MORPHOLOGY       CURRENT VELOCITY       (POOLS & RIFFLES!)         (Check 1 ONLYI)       (Check 1 or 2 & AVERAGE)       (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]	Pool / Current L Max 12
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]	Riffle / Run Kiffle / Run Max 8 Gradient
6.) GRADIENT (ft / mi): 26,98 DRAINAGE AREA (sq.mi.): 1,1 % POOL: % GLIDE: Gradient Score from Table 2 of User: % RIFFLE: % RUN: Based on gradient and drainage area	

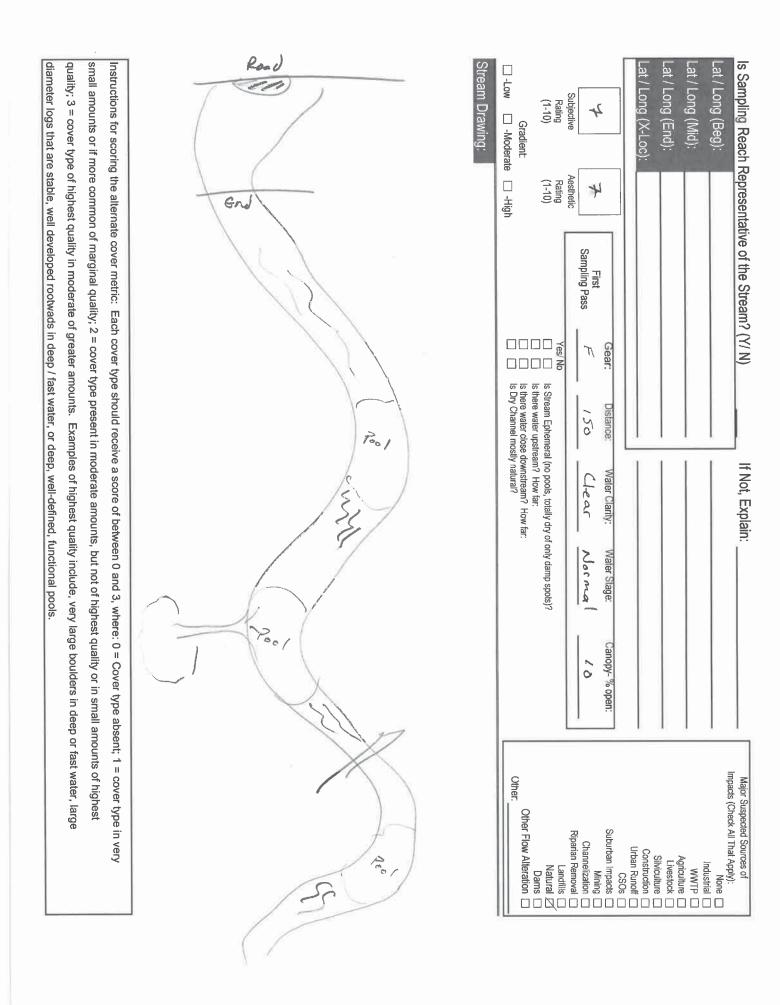


Number OF SET 720         Mark         Outest         Fork         Comparity         Comparity <thcomparity< th=""> <thcomparity< th=""> <thcompar< th=""><th>QHEI Score: QHEI Score:</th><th>68.12</th></thcompar<></thcomparity<></thcomparity<>	QHEI Score: QHEI Score:	68.12
Date:         Doi:         T.Y. 147 3 #         Longing:         Control           DEBUIKSE:         FOX:         MPTE:         MEDITALE CRADIN         MEDITALE CRADIN           DEBUIKSE:         FOX:         MPTE:         MEDITALE CRADIN         MEDITALE CRADIN           DEBUIKSE:         FOX:         MPTE:         MEDITALE CRADIN         MEDITALE CRADIN         MEDITALE CRADIN           DEBUIKSE:         FOX:         MPTE:         MEDITALE CRADIN		
LINETERATE (Over ONLY The Solids) Edimes % porter:       POOL	Site Code: 13-14 Project Code: Dewulg Location: Dst Leonard DF	E.
TOP         POOL         REFLE         SUBSTRUE (SMULT)           II-BURNELING (I)	Date: 10-8-19 Scorer: MAS Latitude: 42,34734 Longitude: 47589	8
BURGEREE [19]     CORRECTOR IN CORPORATION     Section     Automatical and a section of the	1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent	
Image: Appliciting       Image: Ap		
Constraints     Constrain		
CONSERTING       Construction       Set Transfer (c)       Nor 20         Construction       Construction       Construction       Construction       Nor 20         Construction       Construction       Construction       Construction       Construction       Nor 20         Construction		Substrate
HARDONALIQ		18
ANDER OF SUBSTRATE TYPES  AND A LOW CREATE TYPES  AND A LOW TYPE SCALE TYPE CAN A THE THOUGHT AND A LOW TYPE SCALE TYPE CAN A THE THOUGHT AND A LOW CREATE TYPE  AND A LOW CREATE TYPES  AND A LOW CREATE TYPE  AND A		· · · · · · · · · · · · · · · · · · ·
NUMBER OF USETANLE TYPES:       4 or weigi		induction in the second s
Pipth Guilty Only, Some S or 2)        - 3 or Less [0]        - 4-KLE [1]        - 4-KDLE [1]         COMMENTS:        - COAL FIRES [2]        MADALE: (Direk ONLY one or organ of 0 to 2 see back for instructions)         MADALE: (Direk ONLY one or organ of 0 to 2 see back for instructions)         MADALE: (Direk ONLY one or organ of 0 to 2 see back for instructions)              OVERHANDEN YES:        - CONTENNES: TO XIT:         - CONTENNES: TO XIT:         - CONTENNES: TO XIT:              OVERHANDEN YES:               CONTENNES: TO XIT:		
□ COAL FIRES [2]       □ COAL FIRES [2]         2LINSTERAL SOZER (dive each cover fyce a some of 01:3 are back for instructions)	NUMBER OF SUBSTRATE TYPES: 4 or More [2] -LACUSTRINE [0]NORMAL [0]	
COMMENTS: INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERNMENT INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre for a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over fyre for a soon of 0 is 3; see back for instructions) INSTERMA COVERS (Give each over for k2 and AVERAGE per bank) INSTERMA COVERS (Give each over for k2 and AVERAGE per bank) INSTERMA COVERS (Give each over for k2 and AVERAGE per bank) INSTERMA COVERS (Give each over for k2 and AVERAGE per bank) INSTERMA COVERS (Give each over for k2 and AVERAGE per bank) INSTERMA COVERS (Give each over for for k2 and AVERAGE per bank) INSTERMA COVERS (Give each over for for k2 and AVERAG	(High Quality Only, Score 5 or >)	
21.INSTRUMENT       Construction       AMAQUE: (Avec NUM Yes or (Structure)       AMAQUE: (Avec NUM Yes or (Avec NUM SPECIATION)       Construction       AMAQUE: (Avec NUM Yes or (Avec NUM SPECIATION)       Construction       AMAQUE: (Avec NUM Yes or (Avec NUM SPECIATION)       Construction       Avec Num Speciation		
Structure         TYPE: Boark AT hat Court		ē.
ODERHANSING VEGETATION [1]         CONTRACTS [1]         OLOUTINE MACCORPATES 17 (% (%)         March           SHALLOWS IN SLOW WATER[1]         Z. DOGS OR WOODY DEBRIS [1]         SAMAGENATES 25.75% (%)         March           COMMENTS:         SHALLOWS IN SLOW WATER[1]         Z. DOGS OR WOODY DEBRIS [1]         SAMAGENATES 25.75% (%)         March           COMMENTS:         SAMAGENATES 25.75% (%)         SAMAGENATES 25.75% (%)         March           CAMORE AND BANK EROSIGN (MARCH AND MARCH AND MAR	(Structure) TYPE: Score All That Occur check 2 and AVERAGE)	Cover
3       HULLOWS (IN SLOW WATER) (I)       2       LOGS OR WOODY DEBRIS (I)		14
COMMENTS:		Max 20
STAULGIY         DEVELOPMENT         CHANELIZATION         STAULTY         MODECATIONS / OTHER           -High (a)         -EXCELLENT (7)         -HIGH (a)         -HIGH (a)         -SMAGGING         -HIGH (a)         -HIGH (a)         -HIGH (a)         -SMAGGING         -HIGH (a)         -HIGH (a)         -HIGH (a)         -SMAGGING         -HIGH (a)		
→HOH H(I)      EXCELLENT (7)      HONE (6)      HER (3)      HAR (	3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)	29
<sup>4</sup> NODERATE [2] <td< td=""><td></td><td></td></td<>		
□ LOW [2]       □ -AR (3]       □ -RECOVERING [3]       □ -LOW [1]       □ -CANDOPY REMOVAL       □ -LEEED       1/2         □ -HONE [1]       □ -PACR [3]       □ -RECOVERING [3]       □ -LOW [1]       □ -CANDOPY REMOVAL       □ -LEEDD       1/2         □ -HONE [1]       □ -RECOVERING [3]       □ -LOW [1]       □ -CANDOPY REMOVAL       □ -LEEDD       1/2         □ -HONE [1]       □ -RECOVERING [3]       □ -CONE SIDE CHANNEL MODIFICATIONS       □ -CANDOPY REMOVAL       □ -LEEDD       1/2         □ -HONE [1]       □ -HONE [1]       □ -CANDOPY REMOVAL       □ -LEEDD       1/2       -RECOVERY [1]       □ -CANDOPY REMOVAL       □ -LEEDD       1/2         □ -HONE [1]       □ -HONE [1]       □ -CANDOPY REMOVAL       □ -RECOVERY [1]       □ -CANDOPY REMOVAL       □ -LEEDD       1/2       -RECOVERY [1]       □ -CANDOPY REMOVAL       □ -LEEDD       1/2       -RECOVERY [1]       □ -RE		
- NONE[1]      POOR[1]      RECENT OR NO RECOVERY [1]      OREDGING      BANK SHAPPING       Mox 20         - ONNE FIT		3
□ -IMPOUNDED [-1]         21. RIPARIAN ZONE AND BANK EROSION (dnext ONE box PER bank or check 2 and AVERAGE per bank)		
COMMENTS:	RECOVERY [1] ONE SIDE CHANNEL MODIFICATIONS	
4) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)       River Right Looking Downstream       River Right Looking Downstream       River Right Looking Downstream         RIPARIAN WICH       ELOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)       BANK EROSION       River Right Looking Downstream       River Right Looking Downstream         I = 0 (Per Bank)       L R       (Most Predominant Per Bank)       L R       R (Per Bank)       River Right Looking Downstream         I = 0 (Per Bank)       L R       (Most Predominant Per Bank)       L R       (Per Bank)       River Right Looking Downstream         I = 0 (Per Bank)       L R       (Per Bank)       L R       (Per Bank)       River Right Looking Downstream         I = 0 (Per Bank)       L R       (Per Bank)       L R       River Right Looking Downstream       River Right Looking Downstream         I = 0 (Per Bank)       L R       (Per Bank)       L R       River Right Looking Downstream       River Right Looking Downstream         I = 0 (Per Viet)       -0 (Per Viet)       -0 (Per Viet)       -0 (Per Viet)       -0 (Per Viet)       Most Per Viet)       Mos		
RIPARIAN WIDTH       ELOOD PLAIN QUALITY (PAST 100 Matter RIPARIAN)       DANK ERCSION         L R (Most Predominant Per Bank)       L R (Most Predominant Per Bank)       L R (Most Predominant Per Bank)       Ripadian		h1
L       R       (Most Predominant Per Bank)       L       R       I       R       (Per Bank)       Ripatian         U       VERY WIDE > 100m [6]       I       FOREST, SWAMP [2]       I       -CONSERVATION TILLAGE [1]       I       -NONE/LTTLE [3]         U       WIDE > 50m [4]       I       SHRUB OR OLD FIELD [2]       I       URBAN OR INDUSTRIAL [0]       Image of the NONE/LTTLE [3]       Image of the NONE/LTTLE [3]         U       WIDE > 50m [3]       I       -ESIDENTIAL, PARK, NEW FIELD [1]       Image of the NONE/RTTLE [3]       Image of the NONE/LTTLE [3]       Image of the NONE/LTTLE [3]         Image of the NONE Not Distributed of the None/Line of the None/L	4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)	
∴ VERY WIDE > 100m [5]       ∴ FOREST, SWAMP [3]       ∴ -CONSERVATION TILLAGE [1]       ∴ NONE / LITTLE [3]         ∴ WIDE > 50m [4]       ∴ SHRUB OR OLD FIED [2]       ∴ URRAN OR INDUSTRIAL [0]       ∴ MODERATE [2]         ∴ WIDE > 50m [3]       ∴ -ENCED PASTURE, NEW FIED [1]       ∴ OPEN PASTURE, ROWCROP [0]       ∴ HEAVY / SEVERE [1]         ∴ NOME [0]       ∴ FENCED PASTURE [1]       ∴ OPEN PASTURE, ROWCROP [0]       . +HEAVY / SEVERE [1]         ∴ NOME [0]       COMMENTS:	RIPARIAN WIDTH FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) BANK EROSION	
<ul> <li>-MODERATE 10 - Som [3]</li></ul>		
<ul> <li>-MODERATE 10 - Som [3]</li></ul>		22
□       -VARROW 5- 10m [2]       □       -FENCED PASTURE [1]       □       -MINING / CONSTRUCTION [0]         □       -VERY NARROW <5m [1]		Max 10
Oracle (0)       COMMENTS:         5.) POOL /GLIDE AND RIFFLE / RUN QUALITY         MAX. DEPTH       MORPHOLOGY         Check 1 ONLYI)       (Check 1 or 2 & AVERAGE)         (Check 10NLYI)       (AVERAGE)         (Check 10NLYI)       (AVERAGE)         (Check 10NLYI)       (AVERAGE)         (CHECK 2 AND ADVERAGE)       (I)         (CHECK ONE OR CHECK 2 AND ADVERAGE)       (I)         (CHECK ONE OR CHECK 2 AND ADVERAGE)       (I) <tr< td=""><td></td><td></td></tr<>		
5.1 POOL/GLIDE AND RIFFLE / RUN QUALITY         MAX. DEPTH       MCRPHOLOGY         CURRENT VELOCITY       (POOLS & RIFFLES))         (Check 1 or 2 & AVERAGE)       (Check AII That Apply)         - 1000 (WIDTH > RIFFLE WIDTH [2]       - EDDIES [1]       - TORRENTIAL [-1]         - 0.7m [4]       - POOL WIDTH > RIFFLE WIDTH [1]       - FAST [1]       - INTERSTITIAL [-1]         - 0.7m [4]       - POOL WIDTH > RIFFLE WIDTH [0]       - MODERATE [1]       - INTERSTITIAL [-1]         - 0.7m [4]       - POOL WIDTH < RIFFLE WIDTH [0]		
MAX. DEPTH       MORPHOLOGY       CURRENT VELOCITY       (POOLS & RIFFLES!)         (Check 1 ONLYI)       (Check 1 or 2 & AVERAGE)       (Check All That Apply)       Pool /         - 1m (6]       -POOL WIDTH > RIFFLE WIDTH [2]       -EDDIES [1]       -TORRENTIAL [-1]       Current         - 0.7m [4]       -POOL WIDTH > RIFFLE WIDTH [2]       -EDDIES [1]       -INTERSTITIAL [-1]       Current         - 0.7m [4]       -POOL WIDTH > RIFFLE WIDTH [0]       -MODERATE [1]       -INTERSTITIAL [-1]       6         - 0.7m [4]       -POOL WIDTH > RIFFLE WIDTH [0]       -MODERATE [1]       -INTERMITTENT [-2]       6         - 0.2 to 0.4m [1]       -HPOOL WIDTH > RIFFLE WIDTH [0]       -MODERATE [1]       -INTERMITTENT [-2]       6         COMMENTS:	COMMENTS:	97
MAX. DEPTH       MORPHOLOGY       CURRENT VELOCITY       (POOLS & RIFFLES!)         (check 1 ONLYI)       (check 1 or 2 & AVERAGE)       (check All That Apply)       Pool /         - 1m (6]       -POOL WIDTH > RIFFLE WIDTH [2]       -EDDIES [1]       -TORRENTIAL [-1]       Current         - 0.7m [4]       -POOL WIDTH > RIFFLE WIDTH [2]       -EDDIES [1]       -INTERSTITIAL [-1]       Current         - 0.7m [4]       -POOL WIDTH > RIFFLE WIDTH [0]       -MODERATE [1]       -INTERMITTENT [-2]       Max 12         - 0.7m [4]       -POOL WIDTH < RIFFLE WIDTH [0]		
ICheck 1 ONLY1)       (Check 1 or 2 & AVERAGE)       (Check 1 or 2 & AVERAGE)       Pool /         Image: Check 1 ONLY1)       (Check 1 or 2 & AVERAGE)       (Check 1 or 2 & AVERAGE)       (Check All That Apply)       Pool /         Image: Check 1 ONLY1)       Image: Check 1 or 2 & AVERAGE)       (Check 1 or 2 & AVERAGE)       (Check All That Apply)       Pool /         Image: Check 1 or 2 & AVERAGE)       Image: Check 1 or 2 & AVERAGE)       (Check All That Apply)       Image: Check 1 or 2 & AVERAGE)       Current         Image: Check 1 or 2 & AVERAGE)       Image: Check 1 or 2 & AVERAGE)       Image: Check 1 or 2 & AVERAGE)       Current         Image: Check 1 or 2 & AVERAGE)       Image: Check 1 or 2 & AVERAGE)       Image: Check 1 or 2 & AVERAGE)       Current         Image: Check 1 or 2 & AVERAGE)         Image: Check 0 or 0 o		
- 0.7m [4]     -POOL WIDTH = RIFFLE WIDTH [1]     -FAST [1]     -INTERSTITIAL [-1]     -O.4 to 0.7m [2]     -POOL WIDTH < RIFFLE WIDTH [0]     -MODERATE [1]     -INTERMITTENT [-2]     -O.2 to 0.4m [1]     -POOL WIDTH < RIFFLE WIDTH [0]     -NONE [-1]     -VERY FAST [1]     -VERY FAST [1]     Max 12     -O.2 to 0.4m [1]     -O.2 to 0.4m [2]     -O.2 to 0.4m [2]     -O.2 to 0.4m [2]     -O.2 to 0.4m [2]     -O.MARX > 50 cm [2]     -O.MARX > 50 cm [2]     -O.MAX > 50 cm [1]     -MAX < 50 cm [1]     -MOND.STABLE (Fine Gravel, Sand) [0]     -MODERATE [0]     -MODERATE [0]     -MON RIFFLE IND RUN IN IMEtric = 0]     -MON RIFFLE IND RUN IMEtric = 0]     -MOM RIFFLE IND RUN IM IMETRE = 0]     -MAX = 0 (Jtees Max 44 (sq.mi.)):     -		Pool /
<sup>1</sup> - 0.4 to 0.7m [2] <sup>1</sup> - POOL WIDTH < RIFFLE WIDTH [0]		Current
- 0.2 to 0.4m [1]      IMPOUNDED [-1]      VERY FAST [1]       Max 12         - < 0.2m [POOL = 0]		6
□ - < 0.2m [POOL = 0]		
COMMENTS:		IVICA 12
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]      NONE [2]        Best Areas > 10cm [1]      MAX < 50 cm [1]		
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]      NONE [2]        Best Areas > 10cm [1]      MAX < 50 cm [1]		
-*Best Areas > 10cm [2]     - MAX > 50 cm [2]     - STABLE (e.g., Cobble, Boulder) [2]     - NONE [2]     - NONE [2]     - MAX < 50 cm [1]     - MOL STABLE (e.g., Large Gravel) [1]     - LOW [1]     - MODERATE [0]     - NO RIFFLE but RUNS present [0]     - NO RIFFLE / NO RUN [Metric = 0] COMMENTS:		
-Best Areas 5 - 10cm [1]     -MAX < 50 cm [1]     -MOD. STABLE (e.g., Large Gravel) [1]     -LOW [1]     -MODERATE [0]     -MODERATE [0]     -NO RIFFLE but RUNS present [0]     -NO RIFFLE / NO RUN [Metric = 0] COMMENTS:     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -     -		4.5
-Best Areas < 5cm [0]     -UNSTABLE (Fine Gravel, Sand) [0]     -MODERATE [0]     -NO RIFFLE but RUNS present [0]     -NO RIFFLE / NO RUN [Metric = 0] COMMENTS:		Max 8
-NO RIFFLE / NO RUN [Metric = 0] COMMENTS: 6.) GRADIENT (ft / mi): 36.62 DRAINAGE AREA (sq.mi.): 2.3 % POOL: % GLIDE: Greater Score from Teble 2 of Users Masced	Best Areas < 5cm [0] UNSTABLE (Fine Gravel, Sand) [0] -MODERATE [0]	
COMMENTS:		Gradient
6.) GRADIENT (ft / mi): 36.62 DRAINAGE AREA (sq.mi.): 2.3 % POOL: % GLIDE: Greater Score from Teble 2 of Users Manual Greater Score from Teble 2 of Users Manual		
Gredent Score from Table 2 of Users Manuel		8
Desit areas must be raige enough to support a population of mine-obniate serves 70 FLIFFLE. 70 FLIFFLE.		Max 10



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	Λ <sup>μ, ή</sup>
River Code: 95-704 RM: 1,95 Stream: Bulls Brook	
Site Code: 13-15 Project Code: Deww19 Location: Det Almond Rd	
Date: 10-8-15 Scorer: MAS Latitude: 42.32563 Longitude: -87.97668	
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent	
TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE ORIGIN SUBSTRATE QUALITY	
🗌 🔄 -BLDR/SLBS [10] // Check ONE (OR 2 & AVERAGE) Check ONE (OR 2 & AVERAGE)	
	Substrate
	8,
□ 2 -COBBLE [8] □ □ -DETRITUS [3] □ -WETLANDS [0] 2 -SILT NORMAL [0]	10
	Max 20
□ -RIP / RAP [0] NESS: □ -MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES: 2 -4 or More [2] -LACUSTRINE [0] -NORMAL [0]	
(High Quality Only, Score 5 or >)	
□ -COAL FINES [-2]	
COMMENTS:	
2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions) AMOUNT: (Check ONLY one or	
(Structure) TYPE: Score All That Occur check 2 and AVERAGE)	Cover
2         UNDERCUT BANKS [1]         0         POOLS > 70 cm [2]         CoxBOWS, BACKWATERS [1]	14
Overhanging vegetation [1]       2_rootwads [1]       / aquatic macrophytes [1]       Moderate 25 - 75% [7]         3 shallows (in slow water) [1]       / boulders [1]       / Logs or woody debris [1]       - sparse 5 - 25% [3]	Max 20
3         ROOTMATS [1]	IVIDA ZU
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	Channel
-MODERATE [3] -GOOD [5] -RECOVERED [4] -MODERATE [2] -RELOCATION -ISLAND	1
□ -LOW [2] □ -FAIR [3] □ -RECOVERING [3] □ -LOW [1] □ -CANOPY REMOVAL □ -LEVEED	3
□ -NONE [1] □ -POOR [1] □ -RECENT OR NO □-DREDGING □ -BANK SHAPING	Max 20
RECOVERY [1]	
-IMPOUNDED [-1]	
COMMENTS:	
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)	
RIPARIAN WIDTH FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) BANK EROSION	
	Riparian
L R (Per Bank) L R (Most Predominant Per Bank) L R L R (Per Bank)	Riparian
L R (Per Bank) L R (Most Predominant Per Bank) L R L R (Per Bank)	Riparian
L R (Per Bank)         L R (Most Predominant Per Bank)         L R         L R (Per Bank)           Image: Second S	
L R (Per Bank)         L R (Most Predominant Per Bank)         L R         L R (Per Bank)           Image: Construction Constructing Construction Cons	10
L R (Per Bank)         L R (Most Predominant Per Bank)         L R         L R (Per Bank)	10
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank)         Point       -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]       -HEAVY / SEVERE [1]	10
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank)         P-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]       -HEAVY / SEVERE [1]        VERY NARROW < 5m [1]	10
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank) <sup>O</sup> -VERY WIDE > 100m [5] <sup>O</sup> -FOREST, SWAMP [3] <sup>O</sup> -CONSERVATION TILLAGE [1] <sup>O</sup> -NONE / LITTLE [3] <sup>O</sup> -WIDE > 50m [4] <sup>O</sup> -SHRUB OR OLD FIELD [2] <sup>O</sup> -URBAN OR INDUSTRIAL [0] <sup>O</sup> -MODERATE [2] <sup>O</sup> -MODERATE 10 - 50m [3] <sup>O</sup> -RESIDENTIAL, PARK, NEW FIELD [1] <sup>O</sup> -OPEN PASTURE, ROWCROP [0] <sup>O</sup> -HEAVY / SEVERE [1] <sup>O</sup> -NARROW 5 - 10m [2] <sup>O</sup> -FENCED PASTURE [1] <sup>O</sup> -MINING / CONSTRUCTION [0] <sup>O</sup> -HEAVY / SEVERE [1] <sup>O</sup> -VERY NARROW < 5m [1]	10
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank) <sup>O</sup> -VERY WIDE > 100m [5] <sup>O</sup> -FOREST, SWAMP [3] <sup>O</sup> -CONSERVATION TILLAGE [1] <sup>O</sup> -NONE / LITTLE [3] <sup>O</sup> -WIDE > 50m [4] <sup>O</sup> -SHRUB OR OLD FIELD [2] <sup>O</sup> -URBAN OR INDUSTRIAL [0] <sup>O</sup> -MODERATE [2] <sup>O</sup> -WIDE > 50m [4] <sup>O</sup> -RESIDENTIAL, PARK, NEW FIELD [1] <sup>O</sup> -OPEN PASTURE, ROWCROP [0] <sup>O</sup> -HEAVY / SEVERE [1] <sup>O</sup> -NARROW 5 - 10m [2] <sup>O</sup> -FENCED PASTURE [1] <sup>O</sup> -MINING / CONSTRUCTION [0] <sup>O</sup> -HEAVY / SEVERE [1] <sup>O</sup> -VERY NARROW < 5m [1]	No Max 10
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank) <sup>2</sup> VERY WIDE > 100m [5] <sup>-</sup> FOREST, SWAMP [3] <sup>-</sup> CONSERVATION TILLAGE [1] <sup>-</sup> NONE / LITTLE [3] <sup>-</sup> -WIDE > 50m [4] <sup>-</sup> SHRUB OR OLD FIELD [2] <sup>-</sup> URBAN OR INDUSTRIAL [0] <sup>-</sup> MODERATE [2] <sup>-</sup> -WIDE > 50m [4] <sup>-</sup> RESIDENTIAL, PARK, NEW FIELD [1] <sup>-</sup> OPEN PASTURE, ROWCROP [0] <sup>-</sup> HEAVY / SEVERE [1] <sup>-</sup> -NARROW 5 - 10m [2] <sup>-</sup> FENCED PASTURE [1] <sup>-</sup> OPEN PASTURE, ROWCROP [0] <sup>-</sup> HEAVY / SEVERE [1] <sup>-</sup> -VERY NARROW < 5m [1]	Nax 10 Pool /
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank) <sup>C</sup> -VERY WIDE > 100m [5] <sup>C</sup> -FOREST, SWAMP [3] <sup>C</sup> -CONSERVATION TILLAGE [1] <sup>NONE</sup> / LITTLE [3] <sup>C</sup> -WIDE > 50m [4] <sup>C</sup> -SHRUB OR OLD FIELD [2] <sup>C</sup> -URBAN OR INDUSTRIAL [0] <sup>NONE</sup> / LITTLE [3] <sup>C</sup> -WIDE > 50m [4] <sup>C</sup> -SHRUB OR OLD FIELD [2] <sup>O</sup> -URBAN OR INDUSTRIAL [0] <sup>NODERATE [2]</sup> <sup>C</sup> -MODERATE 10 - 50m [3] <sup>C</sup> -RESIDENTIAL, PARK, NEW FIELD [1] <sup>O</sup> -OPEN PASTURE, ROWCROP [0] <sup>HEAVY / SEVERE [1]            <sup>O</sup>-NARROW 5 - 10m [2]          <sup>-</sup>FENCED PASTURE [1]          <sup>O</sup>-MINING / CONSTRUCTION [0]          <sup>HEAVY / SEVERE [1]            <sup>O</sup>-VERY NARROW &lt; 5m [1]</sup></sup>	No Max 10
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank) <sup>C</sup> -VERY WIDE > 100m [5] <sup>C</sup> -FOREST, SWAMP [3] <sup>C</sup> -CONSERVATION TILLAGE [1] <sup>NONE</sup> /LITTLE [3] <sup>C</sup> -WIDE > 50m [4] <sup>C</sup> -SHRUB OR OLD FIELD [2] <sup>C</sup> -URBAN OR INDUSTRIAL [0] <sup>NONE</sup> /LITTLE [3] <sup>C</sup> -WIDE > 50m [4] <sup>C</sup> -SHRUB OR OLD FIELD [2] <sup>O</sup> -URBAN OR INDUSTRIAL [0] <sup>NODERATE [2]</sup> <sup>C</sup> -MODERATE 10 - 50m [3] <sup>C</sup> -RESIDENTIAL, PARK, NEW FIELD [1] <sup>O</sup> -OPEN PASTURE, ROWCROP [0] <sup>HEAVY / SEVERE [1]            <sup>O</sup>-NARROW 5 - 10m [2]          <sup>-</sup>FENCED PASTURE [1]          <sup>O</sup>-OPEN PASTURE, ROWCROP [0]          <sup>HEAVY / SEVERE [1]            <sup>O</sup>-VERY NARROW &lt; 5m [1]</sup></sup>	NO Max 10 Pool / Current
L       R       (Most Predominant Per Bank)       L       R       L       R       (Per Bank)         P       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]         -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]       -HEAVY / SEVERE [1]         -VERY NARROW < 5m [1]	Nax 10 Pool /
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank) <sup>C</sup> -VERY WIDE > 100m [5] <sup>C</sup> -FOREST, SWAMP [3] <sup>C</sup> -CONSERVATION TILLAGE [1] <sup>NONE</sup> /LITTLE [3] <sup>C</sup> -WIDE > 50m [4] <sup>C</sup> -SHRUB OR OLD FIELD [2] <sup>C</sup> -URBAN OR INDUSTRIAL [0] <sup>NONE</sup> /LITTLE [3] <sup>C</sup> -WIDE > 50m [4] <sup>C</sup> -SHRUB OR OLD FIELD [2] <sup>O</sup> -URBAN OR INDUSTRIAL [0] <sup>NODERATE [2]</sup> <sup>C</sup> -MODERATE 10 - 50m [3] <sup>C</sup> -RESIDENTIAL, PARK, NEW FIELD [1] <sup>O</sup> -OPEN PASTURE, ROWCROP [0] <sup>HEAVY / SEVERE [1]            <sup>O</sup>-NARROW 5 - 10m [2]          <sup>-</sup>FENCED PASTURE [1]          <sup>O</sup>-OPEN PASTURE, ROWCROP [0]          <sup>HEAVY / SEVERE [1]            <sup>O</sup>-VERY NARROW &lt; 5m [1]</sup></sup>	Nov 10 Max 10 Pool / Current
L R (Per Bank)       L R (Most Predominant Per Bank)       L R       L R (Per Bank) <sup>C</sup> -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]          -NONE / LITTLE [3]            -WIDE > 50m [4]          -SHRUB OR OLD FIELD [2]          -URBAN OR INDUSTRIAL [0]          -NONE / LITTLE [3]            -WIDE > 50m [4]          -SHRUB OR OLD FIELD [2]          -URBAN OR INDUSTRIAL [0]          -MODERATE [2]            -WIDE > 50m [3]          -RESIDENTIAL, PARK, NEW FIELD [1]          -OPEN PASTURE, ROWCROP [0]          -HEAVY / SEVERE [1]            -NARROW 5 - 10m [2]          -FENCED PASTURE [1]          -MINING / CONSTRUCTION [0]          -HEAVY / SEVERE [1]            -VERY NARROW < 5m [1]	NO Max 10 Pool / Current
L       R       (Per Bank)       L       R       (Per Bank)         C-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]       -HEAVY / SEVERE [1]        NONE [0]       COMMENTS:       -SIPPOL / GLIDE AND RIFFLE / RUN QUALITY       CURRENT VELOCITY (POOLS & RIFFLES)         (Check 1 ONLY)       (Check 1 or 2 & AVERAGE)       (Check 1 or 2 & AVERAGE)       (Check AII That Apply)        10T [4]       -POOL WIDTH > RIFFLE WIDTH [2]       -EDDIES [1]       -TORRENTIAL [-1]        0.7m [4]       -POOL WIDTH < RIFFLE WIDTH [2]	NO Max 10 Pool / Current
L       R       (Most Predominant Per Bank)       L       R       L       R       (Per Bank)         2       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]         -       -WIDE > 50m [3]       - RESIDENTIAL, PARK, NEW FIELD [1]       - OPEN PASTURE, ROWCROP [0]       - HEAVY / SEVERE [1]         -       -MODERATE 10 - 50m [3]       - RESIDENTIAL, PARK, NEW FIELD [1]       - OPEN PASTURE, ROWCROP [0]       - HEAVY / SEVERE [1]         -       -MODERATE 10 - 50m [3]       - FENCED PASTURE [1]       - OPEN PASTURE, ROWCROP [0]       - HEAVY / SEVERE [1]         -       -NARROW < 5m [1]	NO Max 10 Pool / Current
L       R       (Por Bank)       L       R       (Por Bank)       L       R       (Por Bank)         Image: Construction (Construction (Con	Pool / Current Q Max 12
L       R       (Per Bank)       L       R       (Most Predominant Per Bank)       L       R       L       R       (Per Bank)         Image: Construction of Signed Construction (Signed Construction	Pool / Current Max 12
L       R       (Most Predominant Per Bank)       L       R       L       R       (Per Bank)         Image: Construction of Constructi	Pool / Current Q Max 12
L       R       (Most Predominant Per Bank)       L       R       L       R       (Per Bank)         Image: Construction of the state of the stat	Pool / Current Wax 12 Riffle / Run G. S. Max 8
L       R       (Per Bank)       L       R       L       R       (Per Bank)         L       R       (Per Bank)       L       R       L       R       (Per Bank)         L       R       (Per Bank)       L       R       L       R       (Per Bank)         L       NUDE > 50n [4]       - SHRUB OR OLD FIELD [2]       - ODSERVATION TILLAGE [1]       - NONE / LITTLE [3]	Pool / Current Max 12
L       R       (Per Bank)       L       R       L       R       (Per Bank)         L       R       (Per Bank)       L       R       L       R       (Per Bank)         L       R       (Per Bank)       L       R       (Per Bank)       L       R       (Per Bank)         L       NUDE > 50m (3)      FOREST, SWAMP (3)      OCONSERVATION TILLAGE (1)      ONDBA NOR INDUSTRIAL (0)      MODERATE (2)	Pool / Current Max 10 Max 10 Max 12 Riffle / Run Sciffle / Run Max 8 Gradient
L       R       (Per Bank)       L       R       L       R       (Per Bank)         L       R       (Per Bank)       L       R       L       R       (Per Bank)         L       R       (Per Bank)       L       R       L       R       (Per Bank)         L       NUDE > 50n [4]       - SHRUB OR OLD FIELD [2]       - ODSERVATION TILLAGE [1]       - NONE / LITTLE [3]	Pool / Current Wax 12 Riffle / Run G. S. Max 8



Midwest Biodiversity Institute	Qualitative	Habitat Evaluation Index Field	d Sheet QHEI Score:	62
River Code: 95-714	RM: 0.13	Stream: Unmaned Trib to Des	Plaines River	
Site Code: 3-17	Project Code: DRWW19-	Location: behind pump station	off Sprucewood Lane	
Date: 8-30-19	Scorer: VA	Latitude: <u>42, 29978</u> Lon	gitude: <u>-87.94074</u>	
1 SUBSTRATE (Check ONLY Two S	Substrate TYPE BOXES; Estimate % per	cent	4	
	RIFFLE	POOL RIFFLE SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
	□ 📈 -GRAVEL [7]	Check ONE (OR 2 & AVERAGE)		
				Outestasta
-Lg BOULD [10]	🖾 🗔 -SAND [6]		L 1	Substrate
BOULDER [9]	BEDROCK [5]	// -TILLS [1]	SILT MODERATE [-1]	13
-COBBLE [8]	🗆 🗔 -DETRITUS [3]		SILT NORMAL [0]	1-
-HARDPAN [4]	CARTIFICIAL [0]	HARDPAN [0]		Max 20
-MUCK [2]	🗋 🗔 -SILT [2]		BEDDED 🔲 -EXTENSIVE [-2]	
		RIP / RAP [0] NES	SS: MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES;	-4 or More [2]	-LACUSTRINE [0]	-NORMAL [0]	
(High Quality Only, Score 5 or >)	-3 or Less [0]	-SHALE [-1]	-NONE [1]	
(high adding only, coole o of )		-COAL FINES [-2]		
COMMENTS:				
	over type a score of 0 to 3; see back for in	nstructions)	AMOUNT: (Check ONLY one or	
(Structure)	TYPE: Score All That Occur		check 2 and AVERAGE)	Cover
2 UNDERCUT BANKS [1]	POOLS > 70 cm [2]	OXBOWS, BACKWATERS [1]	-EXTENSIVE > 75% [11]	
OVERHANGING VEGETATIO		2 AQUATIC MACROPHYTES [1]		
3 SHALLOWS (IN SLOW WAT		2 LOGS OR WOODY DEBRIS [1]	-SPARSE 5 - 25% [3]	Max 20
		COGS OK WOODT DEBKIS [1]		IVIER ZV
ROOTMATS [1]			-NEARLT ADSENT S 5% [1]	
COMMENTS:	di ONI Mara RER Ostana OR shadi i			
	ck ONLY one PER Category OR check			
	VELOPMENT CHANNELIZA		DIFICATIONS / OTHER	
	-EXCELLENT [7] Z -NONE [		-SNAGGING -IMPOUNDMENT	Channel
	-GOOD [5]RECOV		-RELOCATION -ISLAND	13
🗆 -LOW [2] 🛛 🖊	-FAIR [3] -RECOV	ERING [3] 🗌 -LOW [1]	-CANOPY REMOVAL 🔲 -LEVEED	10
-NONE [1]	-POOR [1] .RECEN	T OR NO	DREDGINGBANK SHAPING	Max 20
	RECOVE	RY [1]	-ONE SIDE CHANNEL MODIFICATIONS	
		NDED [-1]		
COMMENTS:				
		<u>}_</u>	Î.	
4.) RIPARIAN ZONE AND BANK ERG	SION (check ONE box PER bank or ch	eck 2 and AVERAGE per bank)	River Right Looking Downstream	
RIPARIAN WIDTH	FLOOD PLAIN QUA	LITY (PAST 100 Meter RIPARIAN)	BANK EROSION	
L R (Per Bank)	L R (Most Predominant Per Bank	) LR	L R (Per Bank)	Riparian
VERY WIDE > 100m [5]	-FOREST, SWAMP [3]	CONSERVATION TILLAGE [1]		
	-SHRUB OR OLD FIELD [2]	URBAN OR INDUSTRIAL [0]	MODERATE [2]	10
	-RESIDENTIAL, PARK, NEW			Max 10
-NARROW 5 - 10m [2]	-FENCED PASTURE [1]			INDA TO
	COMMENTO.			
-NONE [0]	COMMENTS:			
5.) POOL / GLIDE AND RIFFLE / RU				
MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY (P	OOLS & RIFFLES!)	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE			Pool /
🗔 - 1m [6]	-POOL WIDTH > RIFFLE WI	DTH [2]  -EDDIES [1]	-TORRENTIAL [-1]	Current
- 0.7m [4]	-POOL WIDTH = RIFFLE WI	DTH [1] -FAST [1]	-INTERSTITIAL [-1]	
- 0.4 to 0.7m [2]	-POOL WIDTH < RIFFLE WI	DTH [0] -MODERATE [1]	-INTERMITTENT [-2]	K
- 0.2 to 0.4m [1]	-IMPOUNDED [-1]		-VERY FAST [1]	Max 12
- < 0.2m [POOL = 0]		-NONE [-1]		
COMMENTS:		- none(n)		
	CHECK ONE C	R CHECK 2 AND ADVERAGE		Riffle / Run
RIFFLE DEPTH	RUN DEPTH		FLE / RUN EMBEDDEDNESS	
-*Best Areas > 10cm [2]	- Inc.		J -NONE [2]	
-Best Areas 5 - 10cm [1]			LOW [1]	Max 8
-Best Areas < 5cm [0]			-MODERATE [0]	
-NO RIFFLE but RUNS prese	nt [0]		-EXTENSIVE [-1]	Gradient
-NO RIFFLE / NO RUN [Metri	c = 0]			
COMMENTS:				
6.) GRADIENT (ft / mi): 26.83	DRAINAGE AREA (so.mi.)	% POOL: % GLIDE:		10
			Gradient Score from Table 2 of Users Manuel	Mey 10
*Best areas must be large enough to support	a population of nitle-obligate species	% RIFFLE: % RUN:	based on gradient and drainage area.	Max 10

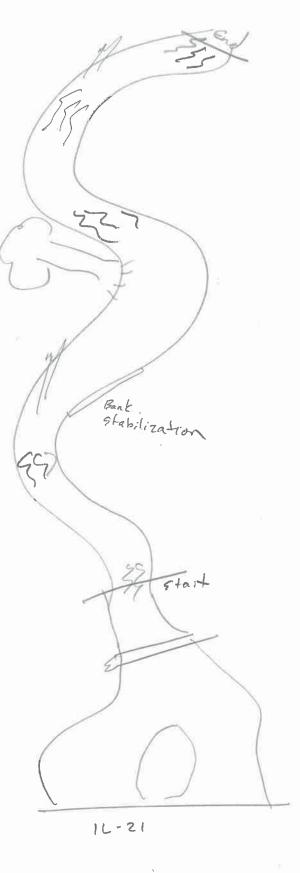
Instructions for scoring the alternate cover metric: Each cover type shoul small amounts or if more common of marginal quality; 2 = cover type preaduality; 3 = cover type of highest quality in moderate of greater amounts. diameter logs that are stable, well developed rootwads in deep / fast wate	Stream Drawing:	Is Sampling Reach Representative of the Stream? (Y/ N) Lat / Long (Mid): Lat / Long (End): Lat / Long (End): Lat / Long (End): Lat / Long (End): Lat / Long (K-Loc): Subjective Rating (1-10) First Geat Rating (1-10) First Sampling Pass (1-10) Gradient:	
d receive a score of between 0 and 3, where sent in moderate amounts, but not of highest Examples of highest quality include, very la ar, or deep, well-defined, functional pools.	I House end pop Road Park grass	If Not, Explain:	
3: 0 = Cover type absent; 1 = cover type in very t quality or in small amounts of highest rge boulders in deep or fast water, large	A Flow Kend	Major Suspected Sources of Impacts (Check All That Apply): None : Industrial I MWTP - Agriculture - Livestock - Sliviculture - Construction - Urban Runoff - CSOS - Suburban Impacts - Channelization - Landfills - Dams - Other Flow Alteration -	Hains Cranssled Chirmon of

Internet         Car Lot - L4         Source         Arr 3         Lethick           LSUBSTRATE (Check ONLY The Schedule Try FOOL         RIFFLE         Substrate Control         Substrate Contro         Substr	iver Code: <u>45 - 051</u> ite Code: 14 - 1	RM: 0.5 Project Code: ORWW19	_Stream: _ Location:	Bull Creek		
YEE         POOL         RIFLE         POOL         RIFLE         SUBSTRATE CREATE           BLDRSER_10         MLDRSER_10         BLDRSER_10         MLDRSER_10         MLDRSER_10<			-	42.31157	Longitude:,96423	
□ BLAREASE (10)         □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	SUBSTRATE (Check ONLY Two	Substrate TYPE BOXES; Estimate % per	cent			
□ ↓ GOULD (19)         □ ↓ GO				RIFFLE SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
□ @00LUBER[0]         □ @00ERCOPE[0]         □ @FTRUES[0]         □ @FTTRUES[0]         □ @FTRUES[0]         □ @FTRUE	-BLDR/SLBS [10]	,		Check ONE (OR 2 & AVEF	RAGE) Check ONE (OR 2 & AVERAGE)	
□ CABLE (ER)         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ HARDAWIN(I)         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ HARDAWIN(I)         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ HARDAWIN(I)         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF SUBSTRATE TYPES:         □ OF MODING         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF SUBSTRATE TYPES:         □ OF MODING         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF SUBSTRATE TYPES:         □ OF MODING         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF SUBSTRATE TYPES:         □ OF MODING         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF SUBSTRATE TYPES:         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF SUBSTRATE TYPES:         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF SUBSTRATE TYPES:         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF MARKE (F)         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OF MARKE (F)         □ OFERTOLS (F)         □ OFERTOLS (F)         □ OFERTOLS (F)           □ MURCE OFERTOLS (F)						Sub
□ HARDPAN [4]       □ ATTRICAL [6]       → ANDPONE [7]       ■ MERCORD [7						1
□ MUCK [2]         □ SILT						
UNDER OF SUBSTRATE TYPES:         4 or More [2]         4.00 USTRINE [0]         NODERATE [1]           UNDER OF SUBSTRATE TYPES:         4 or More [2]         4.00 USTRINE [0]         NODERATE [1]           OMMENTS:         0 of Les [0]         - ONDER NET [1]         MOURL [1]         NODERATE [1]           UNDERCOT BANKS [1]         3 or Les [0]         - ONDER NET [1]         MOURL [1]         NODERATE [1]           UNDERCOT BANKS [1]         3 or Les [0]         - ONDER NET STRUCT TYPES         - ONDER NET STRUCT TYPES         - ONDER NET STRUCT TYPES           UNDERCOT BANKS [1]         2 NOTEXAL (NODERATE [1])         - ONDER NET STRUCT TYPES         - ONDER NET STRUCT TYPES         - ONDER NET STRUCT TYPES           OVERHARD KORK GESTATION [1]         2 NOTEXAL (NOT MARKS [1])         - ADULT MARKS [1]         - ADULT MARKS [1]         - ONDER NET STRUCT TYPES           ONDERATE [3]         - ONDER NET STRUCT TYPES           INDUMENTS         - ONDER NET STRUCT TYPES           INDUMENTS         - ONDER NET STRUCT TYPES           INDUMENTS         -						
tigh 0 unlike Coll, Score 5 or >>						
OWNERTS:	UMBER OF SUBSTRATE TYPES:	-4 or More [2]		-LACUSTRINE [0]	NORMAL [0]	
OMMENTS:         MADLINE:         AMOUNT:         Check Over type a score of 0 to 3; see back for instructions)         AMOUNT:         Check ONLY one or otherad 2 and AVERAGE)           INDEREMENT COZEDE:         (Sincurve)         TYPE: Soore AIT That Occur         Overows, BACKWATERS [1]         - OVERATE [1]         - OVERA	ligh Quality Only, Score 5 or >)	-3 or Less [0]			-NONE [1]	
INSTEREAL GOVER (Owner over type a score of to 16 3: see back for instructions)         MADURE: (Deck ONLY one or (instruction)         MADURE: (Deck ONLY one or other 2 and AVERAGE)         OVER (Deck 2 and AVERAGE)         OVER (Deck 2 and AVERAGE) <th< td=""><td>OMMENTS:</td><td></td><td></td><td>-COAL FINES [-2]</td><td></td><td></td></th<>	OMMENTS:			-COAL FINES [-2]		
✓ UNDERCUT BANKS [1]         3         POOLS > 70 m [2]         ✓ OVERHANDON VEGETATION [1]		over type a score of 0 to 3; see back for in	structions)		AMOUNT: (Check ONLY one or	<u> </u>
Q         OVERHANGING VEGETATION [1]         Z. ROOTWADE [1]         SPARABES 5: 25% [0]         M           Z         SHALLOWS (NLOW WARER) [1]         Z. BOULDERS [1]         Z. LOGS OR WOODY DEBRIS [1]         SPARABES 5: 25% [0]         M           Z         ROOTMATS [1]	· · ·		,		,	Co
SHALLOWS (IN SLOW WATER) (I)       2       BOULDERS (I)       1       INCOMENTS:						11
						Ma
1_CHANKEL_MORPHOLOGY:         (Check ONLY one PERC category OR Allexis 2 and AVERAGE)           SINUGOSTY:         DEVELOPMENT         CHANNELIZATION         STABILITY:         MODIFICATIONS / OTHER           IMIGE [1]         DEVELOPMENT         CHANNELIZATION         STABILITY:         MODIFICATIONS / OTHER           IMIGE [1]         DEVELOPMENT         CHANNELIZATION         STABLITY:         MODIFICATIONS / OTHER           IMIGE [1]         DEVELOPMENT         CHANNELIZATION         STABLITY:         MODIFICATIONS / OTHER           IMIGE [1]         DEVELOPMENT         CHANNELIZATION         STABLITY:         MODIFICATIONS / OTHER           IMIGE [1]         DEVELOPMENT         CHANNEL MODIFICATIONS         DEVELOPMENT         CANNER YREMOVAL         - LEVERD           IMIGE [1]         DEVELOPMENT         CHANNEL MODIFICATIONS         DEVELOPMENT         CANNER YREMOVAL         - LEVERD           INFORMATION         DEVELOPMENT         CHANNEL MODIFICATIONS         DEVELOPMENT         DEVELOPMENT         DEVELOPMENT           INFORMATION         DEVELOPMENT         CHANNEL MODIFICATIONS         DEVELOPMENT						1010
SNUCSTY         DEVELOPMENT         CLANNELIZATION         STABLITY         MODEFICATIONS / OTHER           -HIGH [4]         -EXCELLENT [7]         -NONE [6]         -HIGH [3]         SNAGGING         -IMPOUNDMENT           -MODEFATE [3]         -GOODENTE [3]         -FRECOVERD [4]         -FR						_
HIGH [4]       -EXCELLENT [7]       -NONE [6]       -HIGH [3]       -SNAGGING       -HIPOUNDMENT         MODERATE [3]       -GOOD [5]       -RECOVERED [4]       -MODERATE [2]       -MELOCATION       -ISLAND         -LOW [3]       -RECOVERED [4]       -MODERATE [2]       -MELOCATION       -ISLAND       -ISLAND         -LOW [3]       -RECOVERED [4]       -MODERATE [2]       -MELOCATION       -ISLAND         -MONE [1]       -RECOVERN [5]       -OW [1]       -RECOVERN [5]       -OW [1]       -LEVED         -MONE [1]       -RECOVERN [6]       -OW [1]       -RECOVERN [6]       -OW [1]       -RECOVERN [7]         OMMENTS:		• •		,		
→MODERATE [3]       GOOD [5]       -RECOVERED [4]       →MODERATE [2]       RELOCATION       -ISLAND         →MODERATE [3]       -FARRS        -RECOVERING [3]       -LOW [1]       CAMOPY REMOVAL       -Levered         →MODERATE [3]       -POOR [1]       -RECOVERING [3]       -LOW [1]       CAMOPY REMOVAL       -Levered         →MODE [1]       -POOR [1]       -RECOVERY [1]       -OME SIDE CHANNEL MODIFICATIONS       -AMONE SIDE CHANNEL MODIFICATIONS         OMMENTS:						Cha
→NONE [1]       →POOR [1]       →RECENT OR NO       →DREDGING       →BANK SHAPING       MA         RECOVERY [1]       →ONE SIDE CHANNEL MODIFICATIONS       →ONE SIDE CHANNEL MODIFICATIONS       MA         INPOLINDED [-1]       →MOOLDED [-1]       →ONE SIDE CHANNEL MODIFICATIONS       MA         INPOLINDED [-1]       →MOOLDED [-1]       BANK EROSION       EANK EROSION       EANK EROSION         - R (Per Bank)       L R (Mest Predaminent Per Bank)       L R (Per Bank)       L R (Per Bank)       Rig         - VERY MIDE > 100m [3]       → FERCED FASTL (PARK, NEW FIELD [1]       → CONSERVATION TILLAGE [1]       → NONE / LITTLE [3]         - VERY MIDE > 100m [3]       → FERCED PASTURE (1)       → URBAN GOR NDUSTRIAL [0]       → TEXENCED PASTURE, ROWCROP [0]       → HEAVY / SEVERE [1]         - VERY MARCW 5-10m [2]       → FENCED PASTURE (1)       → URBAN GOR NDUSTRIAL [0]       → HEAVY / SEVERE [1]       M         - VERY MARCW 5-50 m [3]       - FENCED PASTURE (1)       → MINING / CONSTRUCTION [0]       → HEAVY / SEVERE [1]       M         - VERY MARCW 5-50 m [3]       - FENCED PASTURE (1)       → MINING / CONSTRUCTION [0]       → HEAVY / SEVERE [1]       M         - VERY MARCW 5-50 m [3]       - FENCED PASTURE (1)       → MINING / CONSTRUCTION [0]       → HEAVY / SEVERE [1]       M         - VOOL (2)       MOOLDET FIFTLE WID			-			
RECOVERY [1]       ONNE SIDE CHANNEL MODIFICATIONS         INPOUNDED[-1]         OMMENTS:         INPARIAN WIDTH       ELCOD PLAN QUALITY (PAST 100 Meder RIPARIAN)         INPRAINA WIDTH       ELCOD PLAN QUALITY (PAST 100 Meder RIPARIAN)         INPORT       INPORT				🗆 -LOW [1]		1
□-IMPOUNDED[-1]           OMMENTS:	□ -NONE [1] □					Ма
I. RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)       Priver Right Looking Downstream         I. RIPARIAN WIDTH       ELOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)       BANK EROSION         I. R. (Per Bank)       L. R. (Most Predominant Per Bank)       L. R. (Per Bank)       Right EROSION         I. VERY WIDE > 100m [5]      FOREST, SWAMP [3]      CONSERVATION TILLAGE [1]      NONE / UTTLE [3]         I. VERY WIDE > 50m [4]      SHRUB OR OLD FIELD [2]      URBAN OR INJOINTRUAL [0]      TONDERATE [2]         I. VERY WARROW 5- 10m [2]      FENCED PASTURE [1]      OPEN PASTURE, ROWORD [0]      HEAVY / SEVERE [1]         I. VERY WARROW 5- 6m [1]      FENCED PASTURE [1]      MINING / CONSTRUCTION [0]      HEAVY / SEVERE [1]         I. POOL / GLIDE AND RIFFLE / RUN QUALITY       AX DEPTH       MORPHOLOGY       CURRENT VELOCITY (POOLS & RIFFLES)         MAX DEPTH       MORPHOLOGY       CURRENT VELOCITY (POOLS & RIFFLES)      HEAVY / SEVERE [1]       MORPHOLOGY         I. POOL / GLIDE AND RIFFLE / RUN QUALITY       AX DEPTH       MORPHOLOGY       CURRENT VELOCITY (POOLS & RIFFLES)         I. POOL WIDTH - RIFFLE WIDTH [2]      EODES [1]       -TORRENTIAL [-1]       C.         I. AND REPTH       MORPHOLOGY       CURRENT VELOCITY (POOLS & RIFFLES)       MORPHOLOGY         I. POOL WIDTH - RIFFLE WIDTH					-ONE SIDE CHANNEL MODIFICATIONS	
PARAN WIDTH       FLOOD PLAIN QUALITY (PAST 100 Mater RIPARIAN)       BANK EROSION         R. (Per Bank)       L. R. (Most Predominant Per Bank)       L. R.       L. R. (Per Bank)       Rift         IVERY WIDE>1000 [5]      FOREST, SWAMP [3]      CONSERVATION TILLAGE [1]      NONE / LITTLE [3]         IWIDE>50m [4]      SKNBU Do ROLD FILE [2]      URBAN OR INDUSTRIAL [0]      WOERATE [2]       ////////////////////////////////////	DMMENTS:					-
IPARRAN WIDTH       FLOOD PLAIN QUALITY (PAST 100 Mater RIPARIAN)       BANK EROSION         I. R (Most Predominant Per Bank)       L R       L R (Per Bank)	RIPARIAN ZONE AND BANK ER	OSION (check ONE box PER bank or che	eck 2 and AV	ERAGE per bank)	River Right Looking Downstream	
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]      Z'-MODERATE [2]        WIDE > 50m [3]      RESIDENTIAL, PARK, NEW FIELD [1]      OPEN PASTURE, ROWCROP [0]      HEAVY / SEVERE [1]        WIDE > 50m [3]      RESIDENTIAL, PARK, NEW FIELD [1]      OPEN PASTURE, ROWCROP [0]      HEAVY / SEVERE [1]        WIDE > 50m [3]      FENCED PASTURE [1]      OPEN PASTURE, ROWCROP [0]       -HEAVY / SEVERE [1]        VERY NARROW < 5m [1]				00 Meter RIPARIAN)	BANK EROSION	
WIDE > 50m [4]      SHRUB OR OLD FIELD [2]      URBAN OR INDUSTRIAL [0]      MODERATE [2]      MODERATE [2]      MODERATE [2]      MINING / CONSTRUCTION [0]        WERY NARROW 5- 10m [2]      FENCED PASTURE [1]      MINING / CONSTRUCTION [0]      HEAVY / SEVERE [1]       Mathematical Structure [2]      MINING / CONSTRUCTION [0]        WERY NARROW 5- 10m [2]      FENCED PASTURE [1]      MINING / CONSTRUCTION [0]      HEAVY / SEVERE [1]       Mathematical Structure [1]        WERY NARROW 5- 10m [2]      FENCED PASTURE [1]      MINING / CONSTRUCTION [0]      HEAVY / SEVERE [1]       Mathematical Structure [2]        WERY NARROW 5- 10m [2]      FENCED PASTURE [1]      MINING / CONSTRUCTION [0]      HEAVY / SEVERE [1]       Mathematical Structure [2]        WERY NARROW 5- 5m [1]       COMMENTS:      MINING / CONSTRUCTION [0]      HEAVY / SEVERE [1]       Mathematical Structure [2]        WERY NARROW 5- 5m [1]       (Check 1 or 2 & AVERAGE)       (Check 1 That Apply)       P        1m [6]      000L wIDTH - RIFFLE WIDTH [2]      EAST [1]      TORRENTIAL [-1]       C        0.2m [7]      00L wIDTH - RIFFLE WIDTH [1]      FAST [1]      NTERSHITTENT [-2]       Mathematical Structure [2]       Mathematical Structure [2]       Mathematical Structure [2]       Mathematical Structure [2]       Mathematical Structur			ł			Ripa
Image: State in the image: State in						6
- VERY NARROW < 5m [1]			FIELD [1]			Ma
Omega       COMMENTS:         POOL/GLIDE AND RIFFLE / RUN QUALITY         AX. DEPTH       MORPHOLOGY         CURRENT VELOCITY (POOLS & RIFFLESI)         Stack 1 ONLY])       (Check 1 or 2 & AVERAGE)         (Check All That Apply)       P         - 1m [6]       -POOL WIDTH > RIFFLE WIDTH [2]       -EDDIES [1]       -TORRENTIAL [-1]         C.0.7m [4]       -POOL WIDTH > RIFFLE WIDTH [1]       -FAST [1]       -INTERSTITIAL [-1]       CL         - 0.7m [4]       -POOL WIDTH < RIFFLE WIDTH [0]	• • • •	-FENCED PASTURE [1]				
POOL / GLIDE AND RIFFLE / RUN QUALITY         AX. DEPTH       MORPHOLOGY       CURRENT VELOCITY       (POOLS & RIFFLESI)         head: 1 ONLYI)       (Check 1 or 2 & AVERAGE)       (Check All That Apply)       P						
MAX_DEPTH         MORPHOLOGY         CURRENT VELOCITY         (POOLS & RIFFLES)           heck 1 ONLYI)         (Check 1 or 2 & AVERAGE)         (Check All That Apply)         P           - 1m (6]         -POOL WIDTH > RIFFLE WIDTH [2]         -EDDIES [1]         -TORRENTIAL [-1]         Current Apply           - 0.7m [4]         -POOL WIDTH = RIFFLE WIDTH [1]         -FAST [1]         -INTERSTITIAL [-1]         Current Apply           - 0.4 to 0.7m [2]         -POOL WIDTH < RIFFLE WIDTH [0]		COMMENTS:				-2
heck 1 ONLY[1]       (Check 1 or 2 & AVERAGE)       (Check All That Apply)       P <ul> <li>-1m [6]</li> <li>-POOL WIDTH &gt; RIFFLE WIDTH [2]</li> <li>-EDDIES [1]</li> <li>-TORRENTIAL [-1]</li> <li>-0.7m [4]</li> <li>-POOL WIDTH = RIFFLE WIDTH [1]</li> <li>-FAST [1]</li> <li>-INTERSTITIAL [-1]</li> <li>-0.4 to 0.7m [2]</li> <li>-POOL WIDTH &lt; RIFFLE WIDTH [0]</li> <li>-MODERATE [1]</li> <li>-INTERMITTENT [-2]</li> <li>-0.2 to 0.4m [1]</li> <li>-IMPOUNDED [-1]</li> <li>-SLOW [1]</li> <li>-VERY FAST [1]</li> <li>MADERATE [1]</li> <li>-INTERMITTENT [-2]</li> <li>-O.2 to 0.4m [1]</li> <li>-IMPOUNDED [-1]</li> <li>-SLOW [1]</li> <li>-VERY FAST [1]</li> <li>MADERATE [1]</li> <li>-NONE [-1]</li> </ul> CHECK ONE OR CHECK 2 AND ADVERAGE           FELE DEPTH         RUN DEPTH         RIFFLE / RUN SUBSTRATE         RIFFLE / RUN EMBEDDEDNESS           '*Best Areas > 10cm [2]         - MAX > 50 cm [2]         - STABLE (e.g., Cobble, Boulder) [2]         - 4NONE [2] <ld>-Best Areas 5 - 10cm [1]             <li>-MAX &lt; 50 cm [1]</li> <li>-MOD. STABLE (e.g., Large Gravel) [1]</li> <li>-Best Areas &lt; 5cm [0]</li> <li>-UNSTABLE (Fine Gravel, Sand) [0]</li> <li>-MODERATE [0]</li> <li>-NO RIFFLE but RUNS present [0]</li> <li>-NO RIFFLE / NO RUN [Metric = 0]</li> </ld>						
- 1m [6]       -POOL WIDTH > RIFFLE WIDTH [2]       -EDDIES [1]       -TORRENTIAL [-1]         - 0.7m [4]       -POOL WIDTH = RIFFLE WIDTH [1]       -FAST [1]       -INTERSTITIAL [-1]         - 0.7m [4]       -POOL WIDTH < RIFFLE WIDTH [0]						Po
- 0.4 to 0.7m [2]       - POOL WIDTH < RIFFLE WIDTH [0]			DTH [2]			Cur
-0.2 to 0.4 m [1]    IMPOUNDED [-1]     -0.2 to 0.4 m [1]    VERY FAST [1]	- 0.7m [4]	-POOL WIDTH = RIFFLE WID	DTH [1]	-FAST [1]		
- < 0.2m [POOL = 0]     -NONE [-1]      -MMENTS: <u>CHECK ONE OR CHECK 2 AND ADVERAGE     FFLE DEPTH     RUN DEPTH     RIFFLE / RUN SUBSTRATE     RIFFLE / RUN EMBEDDEDNESS     -// *Best Areas &gt; 10cm [2]     - MAX &gt; 50 cm [2]     - STABLE (e.g., Cobble, Boulder) [2]     -NONE [2]     - MAX &lt; 50 cm [1]     - MAX &lt; 50 cm [1]     - MOD. STABLE (e.g., Large Gravel) [1]     - LOW [1]     - MODERATE [0]     -NO RIFFLE but RUNS present [0]     -NO RIFFLE / NO RUN [Metric = 0] </u>			О́ТН [0]			
CHECK ONE OR CHECK 2 AND ADVERAGE       Riffle         FFLE DEPTH       RUN DEPTH       RIFFLE / RUN SUBSTRATE       RIFFLE / RUN EMBEDDEDNESS         Image: Provide the state in the st		-IMPOUNDED [-1]			U -VERY FAST [1]	Ma
CHECK ONE OR CHECK 2 AND ADVERAGE       Riffle         FFLE DEPTH       RUN DEPTH       RIFLE / RUN SUBSTRATE       RIFLE / RUN EMBEDDEDNESS       Colspan="2">Colspan="2">Colspan="2">Riffle         CM ** Best Areas > 10cm [2]       - MAX > 50 cm [2]       - STABLE (e.g., Cobble, Boulder) [2]       - NONE [						
EFLE DEPTH       RUN DEPTH       RIFFLE / RUN SUBSTRATE       RIFFLE / RUN EMBEDDEDNESS         Image: Provide the state in the s						
Image: Problem 1       - MAX > 50 cm [2]       Image: Problem 2       - NONE [2]       Image: Problem 2       Imag		CHECK ONE OF				Riffle
□       -Best Areas 5 - 10cm [1]       □       -MAX < 50 cm [1]			RIFFLE/R			6
□         -Best Areas < 5cm [0]	FLE DEPTH		-STABLE (e	.d., Cobble, Boulder) 121		
-NO RIFFLE / NO RUN [Metric = 0]	FLE DEPTH	- MAX > 50 cm [2]				Ма
	FLE DEPTH           P.*Best Areas > 10cm [2]           -Best Areas 5 - 10cm [1]           -Best Areas < 5cm [0]	- MAX > 50 cm [2] / 1 / - MAX < 50 cm [1]	-MOD. STAI	BLE (e.g., Large Gravel) [1]	-LOW [1]	Ma
	FLE DEPTH           P.*Best Areas > 10cm [2]           -Best Areas 5 - 10cm [1]           -Best Areas < 5cm [0]	- MAX > 50 cm [2] - MAX < 50 cm [1]	-MOD. STAI	BLE (e.g., Large Gravel) [1]	-LOW [1]	Ma

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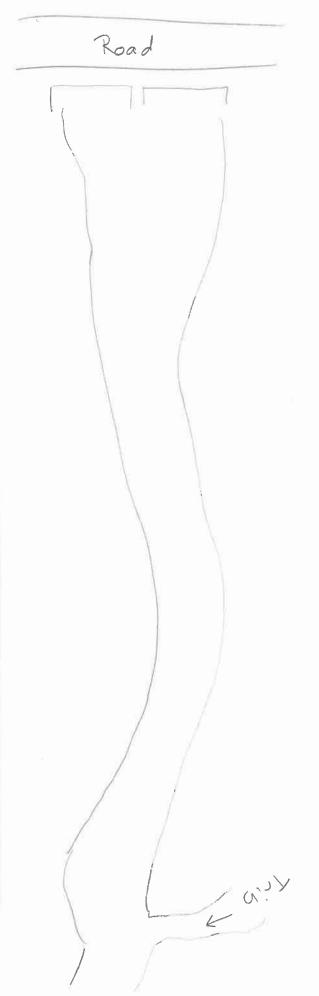
small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools. quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large 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

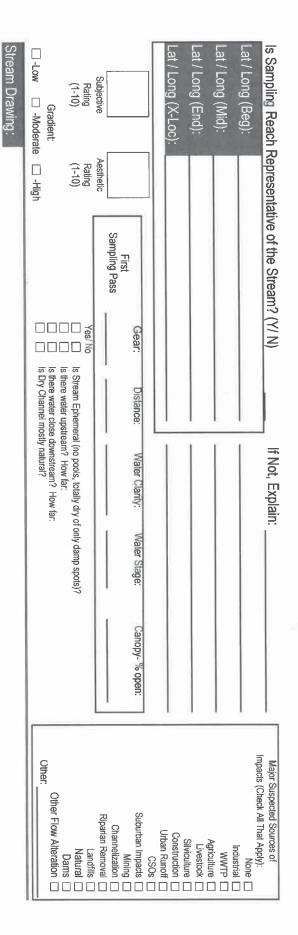


Stream Drawing:	Rating (1-10) (1-10) Gradient: -Low -Moderate -High	Subjective Aesthetic	Is Sampling Reach Represe Lat / Long (Beg): Lat / Long (Mid): Lat / Long (End): Lat / Long (X-Loc):
		First Gear: Dist	Is Sampling Reach Representative of the Stream? (Y/ N) Lat / Long (Beg): Lat / Long (Mid): Lat / Long (End): Lat / Long (Z-Loc):
	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?	Distance: Water Clarity: Water Stage: Canopy-% open: 150 Clear normal-High So	If Not, Explain:
	Natural Dams Dams Cther Flow Alteration	CSOs Suburban Impacts Mining Channelization	Major Suspected Sources of Impacts (Check All That Apply): None Industrial I WWTP Agriculture I Livestock I Silviculture I Construction I Urban Runoff

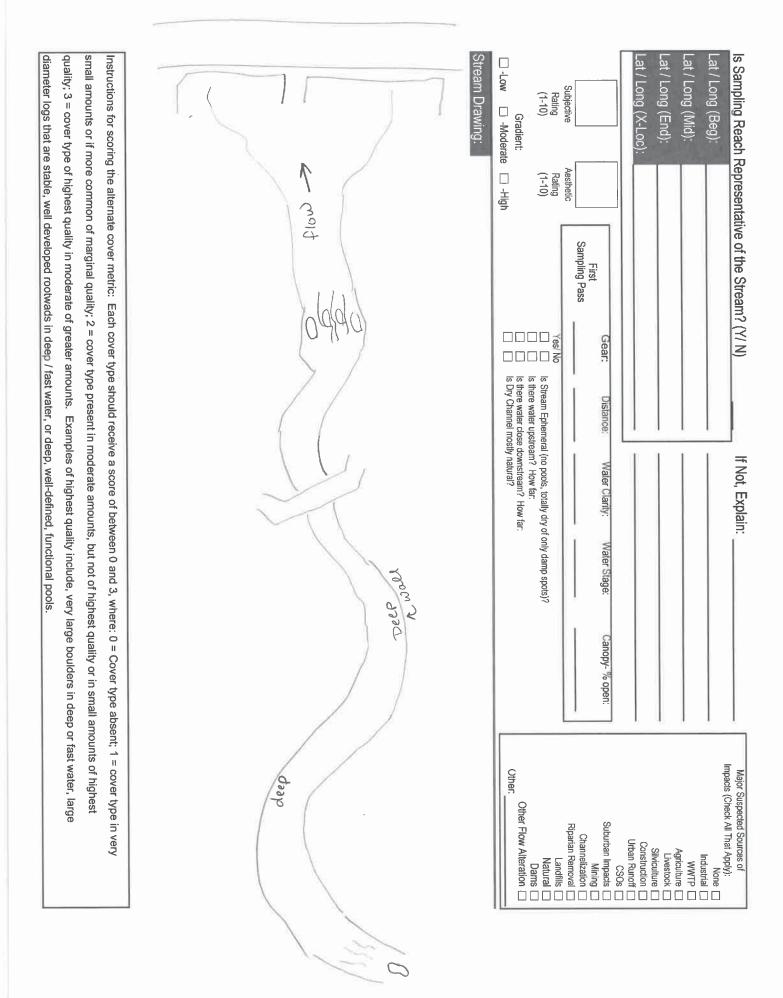
Midwest Biodiversity Institute	Qualitative Ha	abitat Evaluation Index F	ield Sheet QHEI Sc	ore: 5 <sup>3,22</sup>
River Code: 95-05/		eam: Bull Creek		
Site Code: 14-2	1 14	cation: <u>CRoute 137</u>	00 91 01 7	
Date: 8-28-19	Scorer: VAL La	titude: <u>42.30768</u>	Longitude:	
1.) SUBSTRATE (Check ONLY Two S	Substrate TYPE BOXES; Estimate % percent			
TYPE POOL	RIFFLE PC	OL RIFFLE SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
BLDR/SLBS [10]	GRAVEL [7]	Check ONE (OR 2 & AVER	AGE) Check ONE (OR 2 & AVERAGE)	
🗌 🗋 -Lg BOULD [10]	C 🖂 -SAND [6]		SILT: SILT HEAVY [-2]	Substrate
BOULDER [9]	BEDROCK [5]		SILT MODERATE [-1]	15
	🗇 🗂 -DETRITUS [3]	-WETLANDS [0]	SILT NORMAL [0]	14
-HARDPAN [4]	ARTIFICIAL [0]	HARDPAN [0]		Max 20
- MUCK [2]		SANDSTONE [0]	EMBEDDED E -EXTENSIVE [-2]	
		-RIP / RAP [0]	NESS: P -MODERATE [-1]	
NUMBER OF SUBSTRATE TYPES:	-4 or More [2]	-LACUSTRINE [0]	-NORMAL [0]	
(High Quality Only, Score 5 or >)	-3 or Less [0]	-SHALE [-1]	-NONE [1]	
	<i>x</i>	-COAL FINES [-2]		
COMMENTS:				
	ver type a score of 0 to 3; see back for instru	ctions)	AMOUNT: (Check ONLY one or	
(Structure)	TYPE: Score All That Occur		check 2 and AVERAGE)	Cover
UNDERCUT BANKS [1]	POOLS > 70 cm [2]	OXBOWS, BACKWATERS [1]	-EXTENSIVE > 75% [11] -MODERATE 25 - 75% [7]	$ \rangle$
		AQUATIC MACROPHYTES [1]		Max 20
SHALLOWS (IN SLOW WATE ROOTMATS [1]				IVIAX 20
COMMENTS:				
	ck ONLY one PER Category OR check 2 and	AVERAGE)		
	ELOPMENT CHANNELIZATION		MODIFICATIONS / OTHER	
	-EXCELLENT [7]			Channel
	-GOOD [5] C -RECOVERE		-RELOCATION -ISLAND	
	-FAIR [3] -RECOVERIN		-CANOPY REMOVAL -LEVEED	14
-NONE [1]	-POOR [1] -RECENT OF	NO	-DREDGING -BANK SHAPING	Max 20
	RECOVERY	1}	-ONE SIDE CHANNEL MODIFICATIONS	
		) [-1]		
COMMENTS:				
	SION (check ONE box PER bank or check 3		River Right Looking Downstream	
RIPARIAN WIDTH	L R (Most Predominant Per Bank)	(PAST 100 Meter RIPARIAN)	BANK EROSION L R (Per Bank)	Disorian
L R (Per Bank)		L R		Riparian
-VERY WIDE > 100m [5] -WIDE > 50m [4]	-FOREST, SWAMP [3] -SHRUB OR OLD FIELD [2]	-URBAN OR INDUSTRIAL		1.25
	-SERVEROR OLD FIELD [2]			Max 10
	-FENCED PASTURE [1]			TVIDA TO
	COMMENTS:			
	2			
5.) POOL / GLIDE AND RIFFLE / RUI	QUALITY			
MAX. DEPTH	MORPHOLOGY	CURRENT VELOCIT	Y_ (POOLS & RIFFLES!)	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check A	ll That Apply)	Pool /
🛄 - 1m [6]	-POOL WIDTH > RIFFLE WIDTH		-TORRENTIAL [-1]	Current
. 🗌 - 0.7m [4] .	-POOL WIDTH = RIFFLE WIDTH		-INTERSTITIAL [-1]	5
2 - 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]	Max 12
< 0.2m [POOL = 0]		-NONE [-1]		
COMMENTS:				
RIFFLE DEPTH		HECK 2 AND ADVERAGE FFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS	
-*Best Areas > 10cm [2]		TABLE (e.g., Cobble, Boulder) [2]	-NONE [2]	5
-Best Areas 5 - 10cm [1]		OD. STABLE (e.g., Large Gravel) [1]	∠ -LOW [1]	Max 8
-Best Areas < 5cm [0]		VSTABLE (Fine Gravel, Sand) [0]	-MODERATE [0]	HALEN D
-NO RIFFLE but RUNS prese		to the first density density [6]	-EXTENSIVE [-1]	Gradient
-NO RIFFLE / NO RUN [Metri		and the second sec		
COMMENTS:				
6.) GRADIENT (ft / mi): 3.96	DRAINAGE AREA (sq.mi.): 8.4	% POOL: % GLIDE		K
*Best areas must be large enough to support		% RIFFLE: % RUN	Gradient Score from Table 2 of Users I based on gradient and drainage area.	Manual Max 10

diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools. 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 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 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



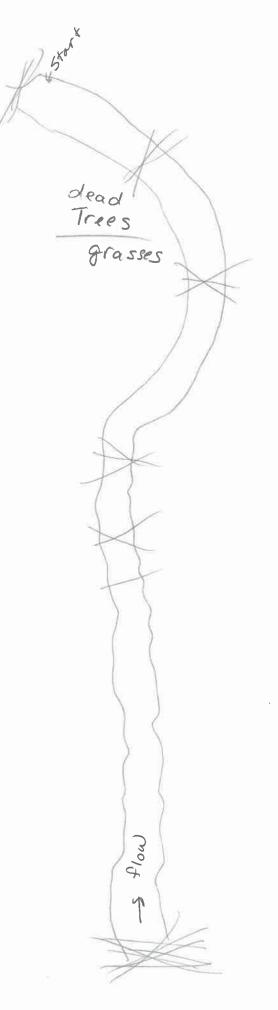


Qualitative	Habitat Evaluation Index Field Sheet QHEI Score:	63.75
River Code: 95-719 RM: 1.66 Site Code: 14-3 Project Code: DRWW19-	Stream: Bull Creek (West Branc) Location: N. Countruside Drive	4
Date: 8-29-19 Scorer: VA	Letitude: 42.31017 Longitude: -87,99065	
1.) SUBSTRATE       (Check ONLY Two Substrate TYPE BOXES; Estimate % percent of the second seco	POOL       RIFFLE       SUBSTRATE ORIGIN       SUBSTRATE QUALITY	Substrate
2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for in (Structure)       TYPE: Score All That Occur         UNDERCUT BANKS [1]       / POOLS > 70 cm [2]         OVERHANGING VEGETATION [1]       ROOTWADS [1]         SHALLOWS (IN SLOW WATER) [1]       3 BOULDERS [1]         / ROOTMATS [1]       OULDERS [1]	structions)       AMOUNT: (Check ONLY one or check 2 and AVERAGE)         OXBOWS, BACKWATERS [1]       -EXTENSIVE > 75% [11]         /       AQUATIC MACROPHYTES [1]       -MODERATE 25 - 75% [7]         /       LOGS OR WOODY DEBRIS [1]       -SPARSE 5 - 25% [3]         -       -NEARLY ABSENT < 5% [1]	Cover Max 20
3.) CHANNEL MORPHOLOGY:       (Check ONLY one PER Category OR check 2         SINUOSITY       DEVELOPMENT       CHANNELIZA         -HIGH [4]       -EXCELLENT [7]       -NONE [6]         -MODERATE [3]       -GOOD [5]       -RECOVI         -LOW [2]       -FAIR [3]       -RECOVI         -NONE [1]       -POOR [1]       -RECOVE         CHANNEL [1]       -POOR [1]       -RECOVE	TON     STABILITY     MODIFICATIONS / OTHER       J     Image: High [3]     Image: SNAGGING     Image: Image: SNAGGING       GRING [3]     Image: Image: SNAGGING     Image: Image: SNAGGING     Image: Image: SNAGGING       GRING [3]     Image: Image: SNAGGING     Image: Image: SNAGGING     Image: Image: SNAGGING       GRING [3]     Image: Image: SNAGGING     Image: Image: SNAGGING     Image: Image: SNAGGING       GRING     Image: Image: Image: SNAGGING     Image: Image: Image: SNAGGING     Image: Image: SNAGGING       GRING     Image: Image	Channel
COMMENTS:	k. Ki	
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or churk in the second s	ITY (PAST 100 Meter RIPARIAN)         BANK EROSION           L         R         L         R         (Per Bank)           Image: Description Conservation Tillage [1]         Image: Description Conservation Tillage [1]         Image: Description Conservation Conservatin Conservatin Conservation Conservation Conservatin Co	Riparian A A Max 10
5.)         POOL / GLIDE AND RIFFLE / RUN QUALITY           MAX. DEPTH         MORPHOLOGY           (Check 1 ONLYI)         (Check 1 or 2 & AVERAGE)           - 1m [6]         POOL WIDTH > RIFFLE WII           - 0.7m [4]         - POOL WIDTH = RIFFLE WII           - 0.4 to 0.7m [2]         - POOL WIDTH < RIFFLE WII	TH [1] Interstitial [-1]	Pool / Current Max 12
RIFFLE DEPTH         RUN DEPTH           -*Best Areas > 10cm [2]         - MAX > 50 cm [2]           -Best Areas 5 - 10cm [1]         - MAX < 50 cm [1]	RIFFLE / RUN SUBSTRATE       RIFFLE / RUN EMBEDDEDNESS         -STABLE (e.g., Cobble, Boulder) [2]       -NONE [2]         -MOD. STABLE (e.g., Large Gravel) [1]       -LOW [1]         -UNSTABLE (Fine Gravel, Sand) [0]       -MODERATE [0]         Image: Provide the state of th	Riffle / Run Max 8 Gradient
6.) GRADIENT (ft / mi): <u>2,85</u> DRAINAGE AREA (sq.mi.): <u>7.1</u> *Best areas must be large enough to support a population of riffle-obligate species	% POOL: % GLIDE: Gradient Score from Table 2 of Users Manual % RIFFLE: % RUN: based on gradient and drainage area.	Max 10
poor areas musi de large enougn lo support e population of fille-obligate species	Au INITTLE. 70 INUIN. Dasked on greatient and drainage area.	Max 10 - 2020



Midwest Biodiversity Institute	)	Qualitative	Habit	at Evalua	ition Index I	Field She	eet	QHEI Score:	11.73
River Code: 95-719	RM:	2.54	Stream:	W. Bra	nch Bull	Creek	2		
Site Code: 14-4 Date: <u>8-29-19</u>	Project Code: Scorer:	DRWW19-	Location	: behind	L World Bi	oprodu	-87.999	oss field)	
1.) SUBSTRATE (Check ONLY Two S	Substrate TYPE B	OXES; Estimate % per	cent						
TYPE         POOL           BLDR/SLBS [10]		GRAVEL [7]	POOL	Che	BSTRATE ORIGIN eck ONE (OR 2 & AVE -LIMESTONE [1]		SUBSTRATE QUALI Check ONE (OR 2 &	AVERAGE)	Cubatrata
Lg BOULD [10]     BOULDER [9]		BEDROCK [5]			-LIMESTONE[1]	SILT:	SILT HEAVY -	-	Substrate
				/	-WETLANDS [0]		-SILT NORMAL		
		-ARTIFICIAL [0]			-HARDPAN [0]		SILT FREE [1]	[0]	Max 20
		] -SILT [2]			-SANDSTONE [0]	EMBEDDED NESS:	-EXTENSIVE [-:	-	
NUMBER OF SUBSTRATE TYPES:		-4 or More [2]			-LACUSTRINE [0]		-NORMAL [0]		
(High Quality Only, Score 5 or >)	Z	-3 or Less [0]			-SHALE [-1] -COAL FINES [-2]		-NONE [1]		
COMMENTS:	uarhma a aanna	A to 2: and hask for it	atructiona)				AMOUNT: (Ch		
2.) INSTREAM COVER (Give each co (Structure) UNDERCUT BANKS [1] OVERHANGING VEGETATIO SHALLOWS (IN SLOW WATE 2. ROOTMATS [1] COMMENTS:	TYPE:	Score All That Occur POOLS > 70 cm [2] ROOTWADS [1] BOULDERS [1]	3	OXBOWS, BACK AQUATIC MACR LOGS OR WOOI	OPHYTES [1]		AMOUNT: (Check 2 and AV - EXTENSIVE > - MODERATE 20 - SPARSE 5 - 25 - NEARLY ABSE	75% [11] 5 - 75% [7] % [3]	Cover 2 Max 20
3.) CHANNEL MORPHOLOGY: (Chee	ck ONLY one PE	R Category OR check 2	2 and AVER	RAGE)					
SINUOSITY         DEV           -HIGH [4]         -HIGH [4]           -MODERATE [3]         -           -LOW [2]         -	<u>/ELOPMENT</u> -EXCELLENT [7] -GOOD [5] -FAIR [3] -POOR [1]	CHANNELIZA -NONE [6 -RECOVI -RECOVI -RECOVI -RECEN	TION 6] ERED <b>[4]</b> ERING [3] F OR NO	STABILT	GH [3] DDERATE [2]	-SNAGO	ATION	-IMPOUNDMENT -ISLAND -LEVEED -BANK SHAPING	Channel
COMMENTS:		RECOVE				U-UNE SI	IDE CHANNEL MODIF	ICATIONS	
4.) RIPARIAN ZONE AND BANK ERO         RIPARIAN WIDTH         L       R (Per Bank)         □       -VERY WIDE > 100m [5]         □       -WIDE > 50m [4]         □       -MODERATE 10 - 50m [3]         □       Q-NARROW 5- 10m [2]         □       -VERY NARROW < 5m [1]	L R (Most	IE box PER bank or ch <u>FLOOD PLAIN QUA</u> Predominant Per Bank EST, SWAMP [3] JB OR OLD FIELD [2] DENTIAL, PARK, NEW SED PASTURE [1]	<u>LITY (PAS)</u> )	L R C - CC C - CC C - CC C - CF C - CF C - CF		6 <b>E [</b> 1] L [0] CROP [0]	ght Looking Downstrea BANK EROSIO L R (Per E -NON -NON HEA	<u>V</u> lank) E / LITTLE [3]	Riparian 515 Max 10
5. POOL/GLIDE AND RIFFLE / RUN									
MAX. DEPTH [Check 1 ONLY]] - 1m [6] - 0.7m [4] - 0.2 to 0.4m [1] - < 0.2m [POOL = 0] COMMENTS:	(Che -POOI -POOI	MORPHOLOGY ck 1 or 2 & AVERAGE) . WIDTH > RIFFLE WII . WIDTH = RIFFLE WII . WIDTH < RIFFLE WII UNDED [-1]	DTH [2] DTH [1] <sup></sup>		CURRENT VELOCI (Check / - EDDIES [1] - FAST [1] - MODERATE [1] - SLOW [1] - NONE [-1]	All That Apply)	ential [-1] Stitial [-1] Mittent [-2]		Pool / Current J Max 12
RIFFLE DEPTH -*Best Areas > 10cm [2] -Best Areas 5 - 10cm [1] -Best Areas 5 cm [0] -NO RIFFLE but RUNS preser -NO RIFFLE / NO RUN [Metric	- MAX	H > 50 cm [2]	RIFFLE	2 AND ADVERAG / RUN SUBSTRAT (e.g., Cobble, Boi FABLE (e.g., Large BLE (Fine Gravel, S	E ulder) [2] 9 Gravel) [1]	-NONE	]		Riffle / Run Max 8 Gradient
COMMENTS:		A log mile E		8/ POOL	a/ 01/0	e. []			A
6.) GRADIENT (ft / mi): 4.4 *Best areas must be large enough to support a	_	EA (sq.mi.): 5,1	-	% POOL:	% GLID % RU			Gradient Score from Table 2 of Users Manual based on gradient and drainage area.	Max 10

diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools. 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 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 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



Is Sampling Reach Representative of the Stream? (Y/ N)	ve of the Stream? ()	(/ N)		If Not, Explain:			Major Suspected Sources of
Lat / Long (Beg):							Impacts (Cneck All That Apply):
l at / I ong (Mid)·							
Lat / Long (End):							
Lat/Long (X-Loc):							
	First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:	Suburban Impacts
e		Yes/ No					Ripanan Removal
(1-10) (1-10)			Is Stream Ephemeral (no pools, to) Is there water upstream? How far:	Is Stream Ephemeral (no pools, totally dry of only damp spots)? Is there water upstream? How far:	f only damp spots)?		Natural
Gradient:			Is there water close is Dry Channel most	Is there water close downstream? How far: Is Dry Channel mostly natural?			Other Flow Alteration
Stream Drawing:							

Qualitative	Habitat Evaluation Inde	ex Field Sheet	QHEI Score: 51.25
River Code: 95-05/ RM: 4.7	Stream: Bull Cree	K	
Site Code: 14 - S Project Code: DRWW19	Location: CSt. Mary of	the lace college	
Date: 10-13-19 Scorer: MAS	Latitude: 42,27954/	Longitude: - 98.00300	>
1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % pe	rcent		
TYPE POOL RIFFLE	POOL RIFFLE SUBSTRATE ORIG	IN SUBSTRATE QUAL	ITY
	Check ONE (OR 2 8	AVERAGE) Check ONE (OR 2 8	AVERAGE)
□ □ -Lg BOULD [10]	LIMESTONE	[1] SILT: SILT HEAVY [	-2] Substrate
	-TILLS [1]	SILT MODER	ATE [-1]
	-wetlands	[0] -SILT NORMA	_[0]
		)]	Max 20
		E [0] EMBEDDED -EXTENSIVE [	.2]
	RIP / RAP [0]	NESS: -MODERATE [	-1]
NUMBER OF SUBSTRATE TYPES: -4 or More [2]	-LACUSTRINE	E [0] -NORMAL [0]	
(High Quality Only, Score 5 or >) -3 or Less [0]	-SHALE [-1]	-NONE [1]	
	-COAL FINES	; [-2]	
COMMENTS:			
2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for			eck ONLY one or
(Structure) TYPE: Score All That Occur		check 2 and A	
UNDERCUT BANKS [1]     OVERHANGING VEGETATION [1]     ROOTWADS [1]	OXBOWS, BACKWATERS [1]	-MODERATE 2	
3 SHALLOWS (IN SLOW WATER) [1] 0 BOULDERS [1]	3 LOGS OR WOODY DEBRIS [1]	-SPARSE 5 - 2	
/ ROOTMATS [1]		- NEARLY ABS	
COMMENTS:			
3.) CHANNEL MORPHOLOGY:         (Check ONLY one PER Category OR check           SINUOSITY         DEVELOPMENT         CHANNELIZ           -HIGH [4]         -EXCELLENT [7]         -NONE           -MODERATE [3]         -GOOD [5]         -RECOV           -LOW [2]         -FAIR [3]         -RECOV           -NONE [1]         -POOR [1]         -RECEN	ATION         STABILTIY           [6]         -HIGH [3]           /ERED [4]         -MODERATE [2]           /ERING [3]         -LOW [1]           IT OR NO         -LOW [1]	-RELOCATION	-IMPOUNDMENT Channel -ISLAND -LEVEED -BANK SHAPING Max 20 FICATIONS
COMMENTS:			
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or clear the second seco	ALITY (PAST 100 Meter RIPARIAN) k) L R CONSERVATION L -URBAN OR INDUS	STRIAL [0] 2 -MOI ROWCROP [0] 2 -HEA	<u>DN</u>
5.) POOL/GLIDE AND RIFFLE/RUN QUALITY MAX, DEPTH MORPHOLOGY	CURRENT VE	ELOCITY (POOLS & RIFFLES!)	
(Check 1 ONLYI) (Check 1 or 2 & AVERAGE	-	heck All That Apply)	Pool /
- 1m [6]     -POOL WIDTH > RIFFLE W		-TORRENTIAL [-1]	Current
- 0.7m [4] -POOL WIDTH = RIFFLE W		-INTERSTITIAL [-1]	4
- 0.4 to 0.7m [2] -POOL WIDTH < RIFFLE W			
- 0.2 to 0.4m [1] -IMPOUNDED [-1]	SLOW [1]	-VERY FAST [1]	Max 12
- < 0.2m [POOL = 0] COMMENTS:	-NONE [-1]		
eenmelti Vi			
CHECK ONE	OR CHECK 2 AND ADVERAGE		Riffle / Run
RIFFLE DEPTH RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS	
	-STABLE (e.g., Cobble, Boulder) [2]	-NONE [2]	<u>\</u>
-Best Areas 5 - 10cm [1] - MAX < 50 cm [1]	-MOD. STABLE (e.g., Large Gravel) [1]		Max 8
	-UNSTABLE (Fine Gravel, Sand) [0]		0
-NO RIFFLE but RUNS present [0]	0.1	-EXTENSIVE [-1]	Gradient
-NO RIFFLE / NO RUN [Metric = 0] COMMENTS:			
6.) GRADIENT (ft / mi): (3.1) DRAINAGE AREA (sq.mi.):			Gradient Score from Table 2 of Users Manual
*Best areas must be large enough to support a population of riffle-obligate species	% RIFFLE:	% RUN:	based on gradient and drainage area. Max 10

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type 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.	Ripe Start	Stream Drawing:	Image: Control of the state of the stat	Is Sampling Reach Representative of the Stream? (Y/ N)       If Not, Explain:         Lat / Long (Beg):
:: 0 = Cover type absent; 1 = cover type in very : quality or in small amounts of highest rge boulders in deep or fast water, large	x End Ferce		CSOS	Major Suspected Sources of Impacts (Check All That Apply): Industrial I WWTP I Livestock I Livestock I Urban Runoff

Qualitative Habitat Evaluation Index Field Sheet QHEI Score	51.5
River Code: 95-05/ RM: 5,95 Stream: Bull Creek	
Site Code: 14-6 Project Code: DRW 14 Location: @ Hazelout Xing	_
Date: 8-29-19 Scorer: VA Latitude: 42.28815 Longhude: -88.02155	-
1. SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent	
TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE ORIGIN SUBSTRATE QUALITY	
🗇 🗇 -BLDR/SLBS [10] 🖸 🗹 -GRAVEL [7] Check ONE (OR 2 & AVERAGE) Check ONE (OR 2 & AVERAGE)	
	Substrate
BOULDER [9] D - BEDROCK [5] D - TILLS [1] - SILT MODERATE [-1]	1.0
COBBLE [8]     OFTRITUS [3]     OFT	18
-HARDPAN [4]	Max 20
NUMBER OF SUBSTRATE TYPES: 12 -4 or More [2] -LACUSTRINE [0] 12 -NORMAL [0]	
(High Quality Only, Score 5 or >)	
COMMENTS:	
2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions) AMOUNT: (Check ONLY one or	-
(Structure) TYPE: Score All That Occur gkeck 2 and AVERAGE)	Cover
UNDERCUT BANKS [1] POOLS > 70 cm [2] OXBOWS, BACKWATERS [1] -EXTENSIVE > 75% [11]	
3 OVERHANGING VEGETATION [1] ROOTWADS [1] AQUATIC MACROPHYTES [1] S-MODERATE 25 - 75% [7]	17
SHALLOWS (IN SLOW WATER) [1] BOULDERS [1] LOGS OR WOODY DEBRIS [1] SPARSE 5 - 25% [3]	Max 20
ROOTMATS [1]	
COMMENTS:	-
3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)	
SINUOSITY DEVELOPMENT CHANNELIZATION STABILITY MODIFICATIONS / OTHER	0
-HIGH [4]     -EXCELLENT [7]     -NONE [6]     -HIGH [3]     -SNAGGING     -IMPOUNDMENT     -MODERATE [3]     -RELOCATION     -ISLAND     -ISLAND	Channel
Image: Moderate [3]	13
	Max 20
RECOVERY [1] CONCENTRATIONS	1000120
-IMPOUNDED [-1]	
COMMENTS:	
4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)	
RIPARIAN WIDTH FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) BANK EROSION	<b>.</b>
L R (Per Bank) L R (Most Predominant Per Bank) L R L R (Per Bank)	Riparian
□ □ -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]	6.5
□ □ -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]	Max 10
	INEX TO
□ □ -VERY NARROW < 5m [1]	
5.) POOL / GLIDE AND RIFFLE / RUN QUALITY	
MAX_DEPTH MORPHOLOGY CURRENT VELOCITY (POOLS & RIFFLES!)	
(Check 1 ONLY!) (Check 1 or 2 & AVERAGE) (Check All That Apply)	Pool /
-rm [6] -POOL WIDTH > RIFFLE WIDTH [2] -EDDIES [1] -TORRENTIAL [-1]     -0.7m [4] -POOL WIDTH ≈ RIFFLE WIDTH [1] -FAST [1] -INTERSTITIAL [-1]	Current
-0.7m [4]      -POOL WIDTH ≈ RIFFLE WIDTH [1]      -FAST [1]      -INTERSTITIAL [-1]	2
	Max 12
□ -<0.2m [POOL = 0}	1100 12
COMMENTS:	
CHECK ONE OR CHECK 2 AND ADVERAGE	Riffle / Run
RIFFLE DEPTH RIFFLE / RUN SUBSTRATE RIFFLE / RUN EMBEDDEDNESS	0
□ -*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]     -LOW [1]     -LOW [1]	Max 8
-Best Areas < 5cm [0]     -UNSTABLE (Fine Gravel, Sand) [0]     -MODERATE [0]     -MODERATE [0]     -MODERATE [0]	Orealise
-NO RIFFLE but RUNS present [0]     -EXTENSIVE [-1]     -NO RIFFLE / NO RUN [Metric = 0]	Gradient
COMMENTS:	
9.05	
Gradient Score from Table 2 of Users Manua	
*Best areas must be large enough to support a population of riffle-obligate species % RIFFLE: % RUN: besed on gradient and drainage area.	Max 10

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type 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.	Plour -	Stream Drawing:	Subjective       Aesthetic       First       Gear:       Distance:       Water Clarity:       Water Stage:       Canopy-% open:       Multiple       Suburban Im         Rating       Aesthetic       Sampling Pass       F       JOO       JOO       JOO       JOO       Channeliz       Channeliz       Multiple       Multiple       Multiple       Channeliz       Multiple       Channeliz       Multiple       Channeliz       Multiple       Channeliz       Multiple       Channeliz       Multiple       Multiple       Channeliz       Multiple       Multiple       Channeliz       Multiple       Multiple       Multiple       Channeliz       Multiple       Multiple	Is Sampling Reach Representative of the Stream?(V/N)       If Not, Explain: Mash and with the stream?(V/N)         Lat / Long (Mid):       If Not, Explain: Mash and with the stream?(V/N)         Lat / Long (Mid):       If Not, Explain: Mash and with the stream?(V/N)         Lat / Long (End):       If Not, Explain: Mash and with the stream?(V/N)         Lat / Long (X-Loc):       If Not, Explain: Mash and with the stream?(V/N)         Lat / Long (X-Loc):       If Not, Explain: Mash and with the stream?(V/N)
r type in very jhest , large			Suburban lı Channe Riparian R N Other Flow Alte	Check All That Apply): (Check All That Apply): Industrial I WWTP I Agriculture I Livestock I Construction I Urban Runoff I CSCon I

## APPENDIX D

D-1: FIT Factors for Deriving Primary, Secondary, and Tertiary Causes of Impairment D-2: Northeast Illinois IPS Nutrient Ranking Index

## Appendix D-1: Development of FIT Factors for Deriving Primary, Secondary, and Tertiary Causes of Impairment

The NE IL IPS thresholds were developed for the primary nutrient and nutrient-related parameters based on grab sample data. The thresholds were based on relationships between that data and stressor-specific sensitive fish species and macroinvertebrate taxa. The relationship between the sensitive species/taxa with the fIBI and mIBI supported benchmarking these thresholds to the General Use criteria and an "Excellent" level of biological performance.

The FIT weighting score influences the categories of narrative condition (i.e., very poor, poor, or fair) each cause of impairment is placed. Each stressor is ranked from 0.1 (excellent) to 10 (very poor) based on the respective relationships with the number of stressor-sensitive fish species

Appendix Table D-1. FIT
weighting scores based on FIT
coefficients.
FIT (< 0.10) X 1;
FIT (> 0.10 - <0.3) X 0.8
FIT (> 0.30 - < 1.0) X 0.6
FIT (> 1.00 - < 3.0) X 0.5
FIT (> 3.00 - < 10.0) X 0.2
FIT (> 10 0) X 0.1

or macroinvertebrate taxa as the response variable with a particular stressor. Where the association is very strong (i.e., FIT value < 0.1) it means there were few outliers and a stronger power of prediction. The weighting factor is 1 and stressors that scored as very poor are still considered to be predictive of very poor biological assemblages Appendix Table D-1). As the FIT value increases (i.e., >0.1 to 0.3) it signals increased variability (more outliers are observed). The weighting factor declines to 0.8 and a stressor value of 9 (very poor) would be down weighted to a score of 7.2

(poor) because the stress:response relationship had more outliers. While the ability to distinguish poor vs. very poor assemblages is reduced, it still reflects a severe impairment. A FIT value of >0.3-1 indicates a weaker causative relationship and has lower weighting factor (X 0.6). This would change a stressor score of 9 (very poor) to a score of 5.4 (fair). Parameters with FIT vales of >3 were not used to identify causes of impairment. A summary of FIT values for 69 variables is in Appendix Table D-2.

Stressor relationships can become stronger as more data is added to the IPS databases hence the need for continued monitoring. Some parameters that have weak FIT scores are because of a lack of data along a complete stressor gradient. For example, there are fewer data points at excellent biological sites for parameters such as sediment PAHs and sediment metals. This weakens the FIT values for the excellent narrative range thus in these situations only a good narrative threshold is derived. There are other important variables (e.g., benthic chlorophyll a) where the current datasets are insufficient to develop a ranking thus highlighting the need to build up the dataset.

The severity of effect of some stressors (e.g., FIT Scores <0.1) could possibly mask the effects of other stressors. As more data is collected and as some of the more prevalent stressors are abated, the influence of masked stressors may become more evident. As such, the FIT values and scores could change in future iterations of the IPS. More data will also improve the accuracy of assigning species and taxa as sensitive or tolerant to a particular stressor.

Appendix Table D-2. FIT values based on the deviation between ambient stressor rank vs. predicted stressor rank based on fish species or macroinvertebrate taxa for streams in the NE IL IPS study area. The algorithm for FIT calculation is summarized in the text. The cell shading is related to FIT weighting coefficients: □ 1.0; □ 0.8; □ 0.6; □ 0.5; □ 0.2.

			FIT
Stressor	FIT Value	Stressor	Value
Impervious Land Use (500m)	0.01	Copper (Wat.)	1.75
QHEI Embeddedness Score	0.03	Lead (Wat.)	2.11
Urban Land Uses (WS)	0.03	Zinc (Sed.)	2.22
QHEI Overall Score	0.04	Benzo(g,h,i)perylene	2.32
QHEI Substrate Score	0.04	Indeno(1,2,3-cd)pyrene (Sed.)	2.41
QHEI Good Attributes	0.04	Copper (Sed.)	2.42
Total Phosphorus	0.04	Benzo(b)fluoranthene (Sed.)	2.51
Impervious Land Use (30m)	0.04	Turbidity	2.61
Impervious Land Use (30m Clipped)	0.04	Nickel (Sed.)	2.67
Conductivity	0.05	Manganese (Wat.)	2.74
QHEI Channel Score	0.07	Benzo(a)pyrene (Sed.)	2.85
QHEI Silt Cover Score	0.07	Pyrene (Sed.)	2.85
Developed Land Use (WS)	0.07	Voluble Suspended Solids	2.81
Minimum Dissolved Oxygen	0.10	Lead (Sed.)	3.01
Total Dissolved Solids	0.10	Nickel (Wat.)	3.26
Impervious Land Use (WS)	0.10	Benzo(a)anthracene (Sed.)	3.48
Hydro-QHEI Depth Score	0.11	Chrysene (Sed.)	3.51
QHEI Poor Habitat Attributes	0.12	Fluoranthene (Sed.)	3.91
Hydro-QHEI Overall Score	0.13	Strontium (Sed.)	4.44
Zinc (Wat.)	0.13	Dibenz(a,h)anthracene (Sed.)	4.57
Hydro-QHEI Current Score	0.14	Agricultural Land Use (WS)	4.82
TKN	0.14	Anthracene (Sed.)	5.10
QHEI Pool Score	0.15	Phenanthrene (Sed.)	5.10
Heavy Urban Land Use (WS)	0.17	Arsenic (Sed.)	6.21
Chloride	0.17	Chromium (Sed.)	6.29
QHEI Cover Score	0.17	Sulfate	6.49
BOD (5-Day)	0.21	Manganese (Sed.)	7.08
QHEI Riffle Score	0.27	Silver (Sed.)	7.11
Total Ammonia	0.28	Aluminum (Sed.)	8.26
Nitrate	0.29	Barium (Sed.)	8.88
Sodium	0.29	Arsenic (Wat.)	9.19
QHEI Gradient Score	0.31	Potassium (Wat.)	10.13
Total Suspended Solids	0.32	Cadmium (Sed.)	11.0
Maximum Dissolved Oxygen	0.94		
Cadmium (Wat.)	0.93		
Arsenic (Sed.)	1.26		

## Appendix D-2: Northeast Illinois IPS Nutrient Ranking Index

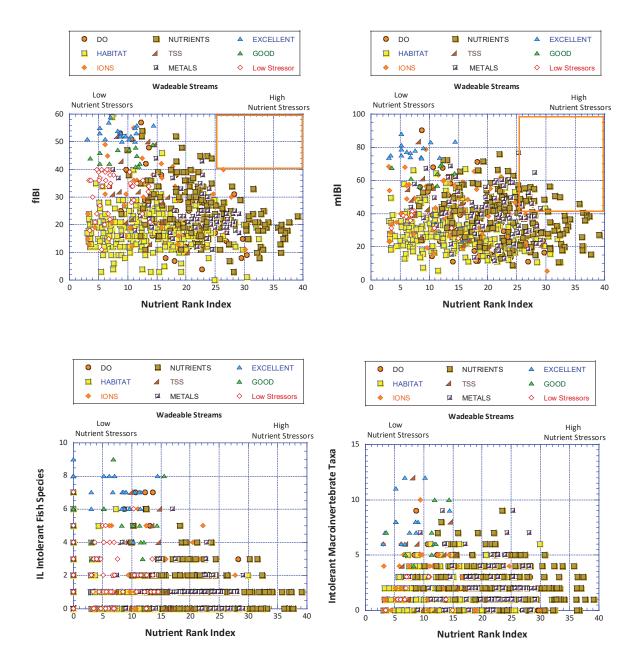
With the emphasis on nutrients in NE Illinois a Nutrient Ranking Index (NRI) was developed by summing the ranking of each of the individual primary nutrient or nutrient-related parameters with each weighted based on the FIT coefficient (Appendix Table E-2). The equation is as follows:

Nutrient Rank Index = (TPR\*1) + (Min. DOR\*1) + (TKNR\*0.8) + (BOD<sub>5</sub>R\*0.8) + (NITRR\*0.8) + (Max. DOR\*0.6)

Where; TPR = Total Phosphorus Rank Min. DOR = Minimum Dissolved Oxygen Rank TKNR = Total Kjeldahl Nitrogen Rank BODR = Biochemical Oxygen Demand (5-day) Rank NITRR = Nitrate Rank Max. DOR = Maximum Dissolved Oxygen Rank

Appendix Figure D-1 illustrates the correlation between the Nutrient Rank Index (NRI) and the fIBI (top, left), mIBI (top, right), the number of Illinois intolerant fish species (bottom, left) and the number of Illinois intolerant macroinvertebrate taxa (bottom, right). In these graphs points were coded to the strongest stressor rank for all categories of stressors (excluding land use parameters) and where the most limiting stressor rank was greater than a score of four (i.e., General Use benchmark). Boxes in the upper right corner reflect Nutrient Rank Index ranges where biological performance is clearly limited. In these plots fish appear a bit more limited than macroinvertebrates. We expect the relationship between the NRI and biological response variables to improve other indicators such as continuous dissolved oxygen-based maximum daily D.O. swings and algal indicator (benthic chlorophyll). Even so there is a strong enough relationship to make this indicator a useful marker for stressor identification efforts eutrophication in a study area. NRI values of >25 are always associated with degraded fish assemblages and often associated with degraded macroinvertebrate indices (Appendix Figure D-1).

Where a biological assemblage is of excellent quality NRI values are nearly always less than 15. The Power BI dashboard for nutrients will provide this data for all sites where it is available and will also provide individual parameter (e.g., TP, TKN, min D.O.) rankings for nutrients and other parameter categories as well. Such data can be matched to recent local data on continuous D.O., and benthic and sestonic chlorophyll where it exists. Sites with high NRI values and high D.O. swings from continuous data can be examined along with biological data responses to see if patterns of response are similar. The Power BI will also have NRI values, among other data, summarized at both the reach and Huc12 scale to determine whether nutrient signatures are rare or prevalent nearby and across the watershed. The goal for developing the NRI is to have a screening value that can then be matched to more site specific data to conduct a stressor identification analysis.



**Appendix Figure D-1**. Correlation between the Nutrient Rank Index and the fIBI (top, left), MIBI (top, right), the number of Illinois intolerant fish species (bottom, left) and the number of Illinois intolerant macroinvertebrate taxa (bottom, right). In these graphs points are coded by the strongest stressor rank for all categories of stressors (excluding land use) and where the most limiting stressor rank was greater than a score of four (i.e., General Use benchmark).