Midwest Biodiversity Institute

Des Plaines River
Watershed Workgroup

Biological and Water Quality Assessment of the Upper Des Plaines River 2022

Des Plaines River at Buckley Rd. (13-16)

Des Plaines River at Palatine Frontage Rd. (16-1)

Des Plaines River at U.S. Rt. 41 (13-3)

Mill Creek at Hunt Club Rd. (11-2)

Trent A. Dougherty, MBI Executive Director
James Lane, MBI Board President

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Biological and Water Quality Assessment of the Upper Des Plaines River 2022

Lake County, IL

Technical Report MBI/2024-3-1

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ACKNOWLEDGMENTS

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List of Acronyms

AAV	Area of Attainment Value
ADV	Area of Degradation Value
AQLU	Aquatic Life Use
AWT	Advanced Wastewater Treatment
BOD	Biochemical Oxygen Demand
$CBOD_5$	5-Day Carbonaceous Biochemical Oxygen Demand
cfs	Cubic feet per second
cfu	Colony forming unit
CWA	Clean Water Act
DAF	Design Average Flow
DC	Direct Current
DMF	Design Maximum Flow
DMR	Discharge Monitoring Report
DNR	Department of Natural Resources
D.O.	Dissolved Oxygen
DPW	Department of Public Works
DRSCWG	DuPage River Salt Creek Working Group
DRWW	Des Plaines Watershed Workgroup
ECOS	Database used by MBI
EPA	Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera, Trichoptera
fIBI	Fish Index of Biological Integrity
GPP	Generator-Powered Pulse
GPS	Global Positioning System
IBI	Index of Biological Integrity
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
IL	Illinois
INHS	Illinois Natural History Survey
IPS	Integrated Prioritization System
LCDPW	Lake County Department of Public Works
MBI	Midwest Biodiversity Institute
MDL	Minimum Detection Level
MGD	Million Gallons per Day
mIBI	Macroinvertebrate Index of Biological Integrity
MIwb	Modified Index of Wellbeing
NARP	Nutrient Assessment Reduction Plan
NH_3-N	Ammonia as Nitrogen
NLRS	Nutrient Loss Reduction Strategy
NO_3-N	Nitrate as Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System

NSWRD	North Shore Water Reclamation District
OSUMB	Ohio State University Museum Biodiversity
PEL	Probable Effect Level
QAPP	Quality Assurance Project Plan
QHEI	Qualitative Habitat Evaluation Index
RM	River Mile
ROE	Risk of Eutrophication
SMC	Stormwater Management Commission
SNAP	Stream Nutrient Assessment Procedure
SQRT	Screening Quick Reference Table
STV	Statistical Threshold Value
TALU	Tiered Aquatic Life Use
TEL	Threshold Effect Level
TKN	Total Kjeldahl Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
WQS	Water quality standards
WRF	Water Reclamation Facility

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 2022 monitoring rotation included 17 sites on the Upper Des Plaines River mainstem, two sites on North Mill Creek, and a single site on Mill Creek, all within Lake County except for a single site on the lower mainstem located in Cook County. All of these sites were previously sampled in 2016, 2018, and 2020 for biological assemblages and habitat, and 73 sites annually throughout the Upper Des Plaines watershed since 2015 for water chemistry. The principal focus of the 2022 bioassessment is on the status of the Illinois General Use for aquatic life.

Scope of the 2022 Biological and Water Quality Assessment

The Midwest Biodiversity Institute (MBI) was contracted in 2016 by the Des Plaines Watershed Workgroup (DRWW) to develop a biological and water quality monitoring and assessment plan for the 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 in the major tributary subwatersheds. 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:

1. Determine the aquatic life status of each sampling location in quantitative terms, i.e., not only if a waterbody is impaired, but the spatial extent and severity of the impairment and the respective departures from established criteria;
2. Determine the proximate stressors that correspond to observed impairments to target management actions to those stressors; and,
3. Screen for any potential issues with use attainability.

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

Previous biological assessments of the Upper Des Plaines River basin streams and rivers include major surveys by Illinois EPA (IEPA 1988,), Illinois DNR (IDNR; Pescitelli 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 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 initial watershed assessment in 2016 (MBI 2017), the Year 1 watershed bioassessment of the Indian, Buffalo, or Aptakisic Creek subwatersheds (MBI 2018), the Year 3 watershed assessment of the Mill Creek, Bull Creek, and Upper Des Plaines River Tributary Subwatersheds (MBI 2021), and the Des Plaines River mainstem (MBI 2017, 2022).

The recent basin-wide fish surveys by IDNR included only a single site located on Indian Creek. Other fish surveys included two sites on Seavey Drainage Ditch (pre- and post-dam removal 2008, 2010), a qualitative fish survey in Seavey Ditch and Indian Creek in June 2016 (Bland et al. 2016) and a more recent and comprehensive survey of fish, macroinvertebrates, and mussels in streams potentially impacted by the State Route 53 extension northward through Lake Co. in 2014 and 2015 (Sherwood et al. 2016; Bilger et al. 2016; Douglas et al. 2016). This included 3 sites in the Buffalo Creek subwatershed and 7 sites in the Indian Creek subwatershed sampled for fish and 4 of these 10 sites sampled for macroinvertebrates.

The 2022 Year 4 assessment followed the Year 3 2020 mainstem assessment and continued to utilize the analyses and outputs of the Northeastern Illinois Integrated Prioritization System (NE IL IPS; MBI 2023a). Biological effect thresholds for five biological condition categories (i.e., excellent, good, fair, poor, and very poor) were developed for 87 chemical water quality, sediment chemistry, and habitat attributes that are more regionally relevant than what has been used previously. For nutrients, this includes not only more refined thresholds for nutrient parameters, but a combined assessment that assembles indicators and parameters responsive to the direct and indirect effects of nutrients. The IPS yields a Restorability factor for impaired sites, reaches, and watersheds and a Threat/Susceptibility factor for attaining sites. In combination with improved stressor thresholds across five condition categories, the IPS has provided more certainty in the delineation and severity 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 2022 Integrated Report (IEPA 2022) 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 attained the General Use support thresholds for fish or macroinvertebrates. The 2022 results showed two sites in full attainment of the General Use for aquatic life, up from one site in 2020, but down from five (5) sites in 2018 (MBI 2020b). The fish assemblage was the limiting factor as the macroinvertebrate IBI met its criteria at all sites in the effluent affected portion of the upper mainstem. The 2022 fIBI scores declined at the formerly attaining sites by anywhere from 0.5 to 3.0 fIBI units with one site missing by only 0.5 fIBI units.

The discharge of large volumes of treated municipal wastewater continues to benefit the Des Plaines River and aides in offsetting detrimental impacts that are exported downstream from the modified upper reach of the mainstem. The biological results downstream from the entry of treated wastewater via Mill Creek at site 13-3 were better both in terms of AQLU status and the fIBI and mIBI scores than at the four upstream most sites that were in non-fair in 2022 and have been and non-poor non-attainment category in prior years. Even with the lower fIBI scores in 2020, the longitudinal pattern was the same – consistent incremental improvement downstream from the Wetland Research riffle and seemingly unaffected by the entry of large volumes of treated wastewater. This and the accumulation of more poor and very poor exceedances of IPS and other thresholds in the upper modified reach affirms that impacts by nonpoint source pollutants are being exacerbated by the habitat and hydrological modifications in the upper watershed as the major limiting sources to aquatic life. After observing this phenomenon over four survey years since 2016, and examining the differences in the annual flow regime over that same period, suggests that periodic high flow events that approach or exceed flood stage export the upstream pollution out of the study area. In contrast, spates of lesser magnitude elevated flows act to deposit this pollution along the lower reaches of the study area. Besides the new revelations of the analysis of the permanent DRWW Datasonde data, the observations of nonpoint source derived muck substrates by the fish crew at site 16-2 during the first pass following one of these flow events. Different results were observed at 16-2 during the second pass later in the summer-fall index period that was reflected by a 10 point difference in the fIBI scores and the difference between non and full attainment of the General Use for aquatic life in 2022. The discovery of Round Goby at the four (4) downstream most sites in 2020 and their persistence in 2022 still adds an unknown factor for the aquatic assemblages in the future. There was no apparent movement upstream in 2022, but this bears watching in the future as it represent the furthest upstream ingress in the Des Plaines basin (Sarver 2022).

***Table 1**. Aquatic life use attainment status in the 2022 Upper Des Plaines River study area with associated causes and sources of impairment listed for partial and non-supporting sites (see footnotes for fIBI and mIBI use support thresholds). The fIBI, MIwb, and mIBI values are color coded in accordance with meeting five narrative classes (key at bottom of the table). IPS restorability scores are provided for non- and partially supporting sites and susceptibility and threat scores are provided for fully supporting sites. A glossary of causes appears at the bottom.*

Site ID	River Mile	Drainage Area (sq. mi.)	fIBI	mIBI	MIwb	QHEI	AQLU Status	2022 Causes by IPS Stressor Threshold Narrative Category				2022 Sources	Restora-bility Score (0-100)	Suscept-ibility Score (0-100)	Threat Score (0-100)
								Very Poor[1]	Poor[1]	Fair[1]	Threats				
Des Plaines River															
13-6	109.30	123.7	30.5	37.1	8.4	49.0	Non - Fair	Substr; Low D.O.; D.O.Swing; Max. D.O.	Imperv-30C; QHEI; Organic enrich.; Good QHEI attr.; Poor QHEI attr.	Chan; Chloride; TP		Alt. Flow;Habitat Mod.,NPS	57.7		
13-5	106.60	137.3	26.5	37.2	7.4	35.8	Non - Fair	Substr; Chan; D.O. Swing; QHEI Ratio; TSS; Good QHEI attr.	Imperv-30C; QHEI; Low D.O.; Organic enrich.	Imperv-500m;Imperv-30; Chloride; Organic enrich.		Alt. Flow;Habitat Mod.,NPS	51.5		
13-4	102.90	145.6	28.0	32.7	8.6	46.0	Non - Fair	Substr; Organic enrich.	QHEI; Chan; Low D.O.; D.O. Swing; QHEI Ratio; Good QHEI attr.; Poor QHEI attr.	Chloride; Organic enrich.		Alt. Flow;Habitat Mod.,NPS	54.7		
13-18	99.72	212.9	23.5	31.5	8.0	38.0	Non - Fair	Substr; Chan;	QHEI; D.O. Swing; Organic enrich.; QHEI ratio; Good QHEI attr.; Poor QHEI attr.	TKN; Chloride; Low D.O.; Max. D.O.		Alt. Flow;Habitat Mod.,NPS	51.8		
13-19	99.30	213.2	37.0	33.1	9.7	74.8	Non - Fair		Low D.O.; Organic enrich.; Poor QHEI attr.;	QHEI; Substr; Chan; Chloride; Good QHEI attr.		Habitat Mod.,NPS	70.9		
13-3	98.70	220.3	32.5	42.1	8.8	72.8	Partial	Low D.O.; D.O. Swing	Chloride; Poor QHEI attr.	Imperv-500m; TKN; QHEI; Chan; Conduct; Organic enrich.: Good QHEI attr.		Upstream Flow & Urban NPS	66.4		
13-2	96.82	225.4	43.5	46.2	8.6	78.3	Full				Imperv-500m;Nitrate;Chloride;Low D.O.;D.O. Swing			100.0	90.0
13-1	94.20	232.0	43.0	54.9	8.6	66.0	Full				Imperv-500m;TP;TKN;QHEI;Substr;Chan;			91.1	80.0
13-16	90.60	253.8	38.0	60.1	7.5	70.5	Partial	Nitrate;	Chloride; Poor QHEI attr.	Imperv-500m;TP; QHEI; Substr; Conduct;; Good QHEI attr.		Urban NPS,WWTP	66.0		
16-6	87.10	261.4	38.0	69.4	8.5	69.5	Partial		Chloride; Poor QHEI attr.	QHEI; Chan; Low D.O.; D.O. Swing; Nitrate; TP; Good QHEI attr.;		Urban NPS,WWTP	69.5		
16-7	84.60	266.5	38.0	60.1	8.0	75.3	Partial		Chloride; Nitrate; Poor QHEI attr.	Imperv-500m;Imperv-30;Imperv-30C;TP; Substr; Conduct;; Good QHEI attr.;		Urban NPS,WWTP	68.3		
16-5	83.60	268.1	33.0	48.2	7.9	60.3	Partial	Poor QHEI attr.	Chloride; Good QHEI attr.;	Imperv-500m;Imperv-30;TP; Nitrate; QHEI; Substr; Chan; Conduct; Low D.O.; D.O. Swing; Toxics; Max D.O.		Urban NPS,WWTP	59.2		
16-8	82.90	268.9	33.0	56.0	7.8	61.0	Partial	Chloride; Poor QHEI attr.	Nitrate; Good QHEI attr.;	Imperv-500m; Nitrate; QHEI; Substr; Chan; Conduct; TP		Urban NPS,WWTP	60.2		
16-4	80.00	273.2	32.5	65.8	7.2	67.0	Partial	Max. D.O.; Poor QHEI attr.	Chloride; Low D.O.; D.O. Swing; Nitrate	Imperv-500m;Imperv-30;Imperv-30C; Nitrate; QHEI; Substr; Chan; Conduct; TSS; Good QHEI attr.;		Urban NPS,WWTP,Habitat	66.0		
16-3	76.70	314.7	34.5	48.4	7.7	61.8	Partial	TSS; Poor QHEI attr.	Chloride; Nitrate; Good QHEI attr.;	Nitrate; QHEI; Substr; Chan; Conduct; Low D.O.; D.O. Swing; TP		Urban NPS,WWTP,Habitat	73.4		
16-2	75.40	324.0	40.5	61.3	8.2	59.3	Partial	Poor QHEI attr.	Imperv-30;Imperv-30C; Chan; Chloride; Good QHEI attr.;	Imperv-500m; Nitrate; QHEI; Substr; Conduct; Low D.O.; D.O. Swing; Max. D.O.		Urban NPS,WWTP,Habitat	59.3		
16-1	71.70	358.7	36.0	53.8	8.1	71.0	Partial	Chloride; Max. D.O.	Low D.O.; D.O. Swing; Good QHEI attr.; Poor QHEI attr.	Imperv-500m; Chan; Conduct; TSS;		Urban NPS,WWTP,Habitat	55.8		
Mill Creek															
11-2	1.71	62.3	30.0	44.7	8.9	83.8	Partial		Chloride;	TKN; Chloride; TSS		NPS	84.3		
North Mill Creek															
10-7	11.30	19.2	22.0	40.5	NA	28.50	Non - Fair	Substr; TSS; QHEI ratio; Chloride; Good QHEI attr.; Poor QHEI attr.	QHEI; Chan;	TKN; Organic enrich.		Urban NPS	73.9		
10-1	1.10	31.9	18.0	63.5	6.9	50.00	Non - Poor		QHEI; Substr; DO Swing; Good QHEI attr.; Poor QHEI attr.	TP; TKN; Chan; Chloride; Nitrate; Max D.O.		Habitat Modificaiton, NPS	80.6		

Narrtive Categories	**Excellent**	≥50	>73	≥9.6	>84.5	FULL	Very High	Very Low	Very Low
	Good	≥41	≥41.8	≥8.5	>75.9	FULL	High	Low	Low
	Fair	≥30	≤41.7	≥6.4	<75.9	PARTIAL	Moderate	Moderate	Moderate
	Poor	≥15	≤29	≥5.0	<50.1	NON-Fair	Low	High	High
	Very Poor	<15	<15	<5.0	<25.0	NON-Poor	Very Low	Very High	Very High

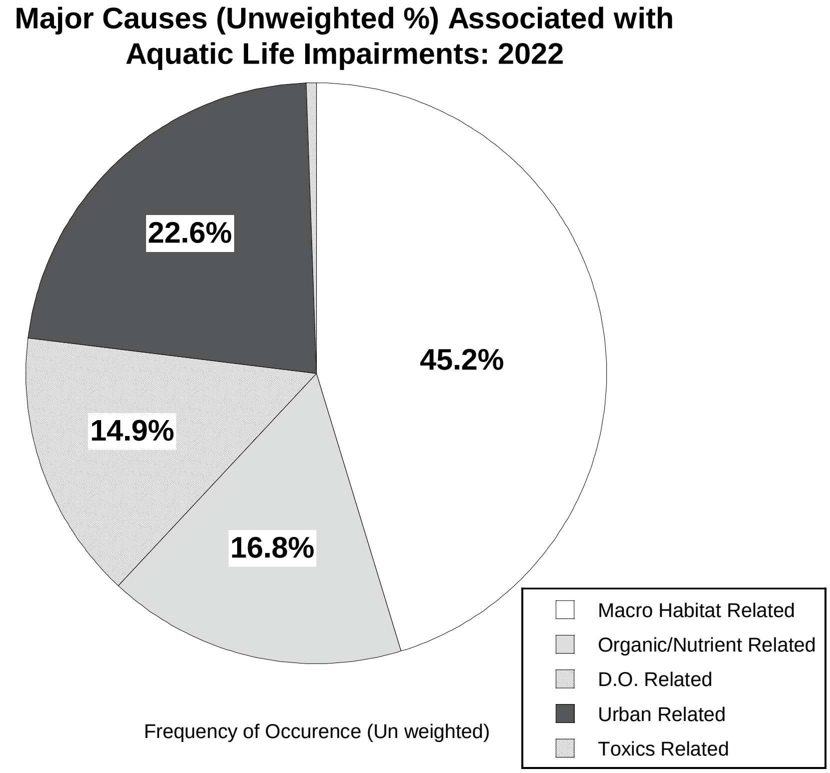
Acronym	Description	Acronym	Description	Acronym	Description
Imperv-30C	Imprevious surface 30 m buffer clipped	High Mod. Attr.	NumberHigh Influence Modified QHEI Attributes	Conduct	Specific conductivity
Imperv-500	Imprevious surface 500 m buffer	Good QHEI Attr.	Number of Good Habitat Attributes	Toxicity	Exceedance of Toxic Biological Signature
Imperv-30	Imprevious surface 30 m buffer	Poor QHEI Attr.	Number if Modified Habitat Attributes	Org. Enrich.	Exceedance of Organic Enrichment Biological Signature
QHEI	Qualitative Habitat Evaluation Index (QHEI)	Chloride	Chloride concentration in mg/L	TSS	Total suspended solids
QHEI Ratio	Ratio of Modified:Good QHEI attributes	Low D.O.	Minium Dissolved Oxygen in mg/L	TKN	Total Kjeldahl nitrogen
Chan	Channel condition from QHEI	Max. D.O.	Maximum Dissolved Oxygen in mg/L	TP	Total phosphorus
Substr	Substrate condition from QHEI	D.O. Swing	Width of Diel D.O. Variation in 24 Hrs.	Nitrate	Nitrate as N

Causes and Sources of Non-attainment

Causes and sources were determined for each impaired site and included categorical or parameter level associations and their sources (if known). With the recent availability of more comprehensive and regionally relevant analyses of stressors in the Northeast Illinois via the Integrated Prioritization System (NE IL IPS; MBI 2023a) assigning causes is now weighted by exceedances of very poor, poor, and fair IPS threshold values. This approach still involves using a lines-of-evidence approach where chemical and physical threshold exceedances generated by the NE IL IPS within a causal category (or for a parameter) is proximally related to a biological impairment. This goes well beyond the association of a coincidental exceedance of a chemical criterion or other threshold with a biological impairment. Knowing about relationships that are supported by prior empirical observations in other studies and our own experiences continues to boost the confidence in causal assignments. This process varies from that used by IEPA in that additional and regionally developed effect thresholds were used to derive causes beyond those used by IEPA (2022).

Twenty (20) causes across five (5) major categories and six (6) major sources were identified for the Upper Des Plaines River mainstem in 2022 (Figure 1). Of the 20 causes, six (6) were habitat related, eight (8) were chemical, three (3) D.O. related, and three (3) land use related. The proportion of causes was assessed based on the number of simple observations and weighted observations at an impaired site (Figure 1), the latter being based on the severity of the expression of the specific stressor within a causal category. A higher weighting was assigned based on the narrative rating of an exceedance multiplied by 5 for very poor, by 3 for poor, and by 1 for fair in 2022. This compares to nineteen (19) causes across four (4) major categories and six (6) major sources that were identified for the upper Des Plaines River mainstem in 2020 . Thirteen (13) causes across seven (7) major categories and five (5) source categories were identified for the upper Des Plaines River mainstem in 2018 (MBI 2020b). Multiple very poor and poor causes (>2) were restricted to the uppermost five (5) sites and North Mill Creek site 10-7 in 2022. One or two exceedances occurred sporadically at the remaining sites in 2022. In 2018 seven (7) sites including and downstream from site 13-3 at U.S. Rt. 41 had one or more causes with poor threshold exceedances.

The Macro Habitat Related category at 47.3% was the most pervasive cause followed by Urban Related causes at 21.0%, D.O. related issues at 17.6%, and Organic/Nutrient Enrichment at 13.9% based on the weighted frequency for each cause. Each category had poor and very poor threshold exceedances that were primarily observed in the modified upper reach upstream from the Wetland Research Riffle and the confluence with Mill Creek. Fair exceedances included more parameters and stressors and were the most frequently observed in the middle and lower reaches of the mainstem with fewer poor and very poor exceedances.
Most of the elevated levels of nitrate-N and total P were in the fair range with only four nitrate-N values in the poor or very poor range. The fair exceedances were observed primarily in the wastewater effluent influenced reaches of the middle and lower mainstem. Urban related causes exceeded mostly fair thresholds and occurred mostly in the middle and lower mainstem, but poor exceedances of the Impervious Cover-30 meter buffer occurred at the two upstream most sites.



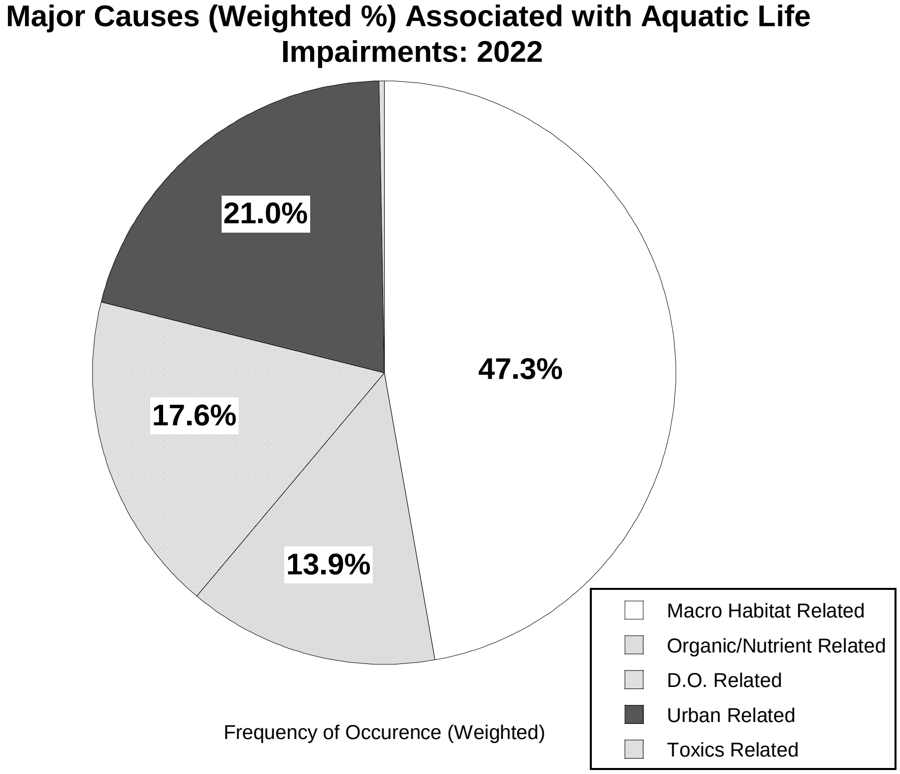


Figure 1*. Major categorical causal groupings associated with aquatic life impairments in the upper Des Plaines River mainstem in 2022 based on the number of observations (upper) and weighted observations (lower), the latter based on the narrative rating of IPS threshold exceedances (very poor = 5, poor = 3, and fair = 1).*

Poor and a few very poor exceedances of chloride occurred throughout the study area. Urban related causes had three poor results, two in the upper mainstem, but most exceeding fair thresholds in the middle and lower mainstem. These results are similar to the 2020 and 2018 although the 2020 and 2022 causal categories were further refined via the availability of IPS thresholds beginning in 2020. The principal difference between 2022 and 2020 was the order of the causal categories after Macrohabitat Related and the increased proportion of that category in terms of the weighted frequency in 2022.

IPS Restorability, Susceptibility, and Threat Results

The Northeast Illinois Integrated Prioritization System (IPS; MBI 2023a) was used to calculate the Restorability scores for non-attaining and partially attaining sites and Susceptibility and Threat scores for the two fully attaining sites. Fifteen (15) non-supporting and partially supporting mainstem sites and all three Mill Creek/North Mill Creek sites had high and very high Restorability scores. In terms of the Restorability scores, 11 of the 15 non and partially attaining mainstem sites had Restorability scores ranked as high or very high. The high and very high rankings mean that the likelihood of reaching full attainment with conventional restoration means is plausible and not precluded by insurmountable impacts and modifications. The remaining seven (7) impaired mainstem sites ranked as moderate although three (3) of the scores were within 0.7-2.3 of high and all were greater than 51.5 (60 is high). Five (5) of these sites had very poor causes assigned and four (4) were impacted by hydromodifications. The highest ranked mainstem sites were located downstream from the Wetland Research Riffle in the reach receiving the majority of the municipal wastewater effluent. Three (3) sites in the lower mainstem (16-5, 16-2, and 16-1) missed a high Restorability ranking by 0.8, 0.6, and 4.2 points respectively. The other four (4) moderate ranked sites occurred in the upper mainstem that has been subject to more severe hydromodifications including legacy channelization with little or no recovery and flow alterations. These sites also exhibited multiple poor and very poor causes of impairment including low D.O., excessive diel D.O. swings, substrate siltation, and a predominance of poor QHEI scores with high numbers of modified QHEI attributes. Addressing these impairments would require structurally oriented restoration actions to address the modified habitat (i.e., reduce or eliminate the numerous modified habitat attributes) and altered flow conditions which would be a significant undertaking for a river channel of that size.

For the two fully supporting sites, Susceptibility and Threat scores were applied. In terms of the narrative assignments being used at present (see Table 1, bottom), both the Susceptibility and Threat rankings were very low. The Threat rankings of 80 and 90 and Susceptibility scores of 100 and 91.1 at sites 13-2 and 13-1 are very low which means that impairment by the listed threats are not imminent. The threats included impervious land cover in the 500 meter riparian buffer, chloride, conductivity, total P, nitrate-N, QHEI, substrate siltation, low D.O., and the diel D.O. swing. The full attainment at site 16-2 in 2020 and two sites in 2022 indicates that the impacts from upstream sources can be mitigated via the introduction of properly treated wastewater despite having multiple threats. The reach with the five (5) previously attaining sites in 2018 that were in partial attainment in 2022, only one of which coincided in 2022, had only two very poor elevated values, nitrate-N at 13-16 and chloride at 16-8 in 2022. Poor exceedances of chloride and nitrate-N occurred at the 10 partially attaining sites with low D.O.

and a wide diel D.O. swing at two of these sites.

Synthesis of Results

The introduction of large volumes of treated municipal wastewater to the mainstem downstream from the upper modified reach continues to benefit the Upper Des Plaines River and aides biological condition by offsetting detrimental impacts of pollution that is exported downstream from the modified upper reach of the mainstem. The biological results downstream from the entry of treated wastewater at site 13-3 were better both in terms of AQLU status and the fIBI and mIBI scores than at the four upstream most sites that were in non-fair non-attainment in 2022 that have been non-poor in prior years. Even with the lower fIBI scores in 2020, the longitudinal pattern was the same – consistent incremental improvement downstream from the Wetland Research riffle and seemingly independent of the entry of large volumes of treated wastewater. This and the accumulation of more poor and very poor exceedances of IPS and other thresholds in the upper modified reach indicates that nonpoint source pollutants are being exacerbated by the poor habitat and hydrological modifications in the upper watershed as the major limiting sources to aquatic life. Observing this phenomenon over four survey years spanning 2016-22 and examining the differences in the annual flow regime over that same period, the results suggest that periodic elevated flow events that approach or exceed flood stage export most of the upstream pollution out of the study area at least temporarily. However, spates of less elevated high flows act to move and deposit this pollution in the lower reaches of the study area. Besides the revelations of the analysis of the permanent DRWW Datasondes, the observations of nonpoint source derived muck substrates by the fish crew at site 16-2 during the first sampling pass following one of these events, but finding different conditions during the second pass later in the summer-fall index period was reflected by a 10 spread in the fIBI score which was the difference between non and full attainment of the General Use for aquatic life in 2022.

Recreational Use Assessment

Levels of fecal bacteria in the form of *Escherichia coli* (*E. coli*) cfu^2/100 mL have been used to assess the status of recreation in and on the water in the Upper Des Plaines mainstem since 2015. The IEPA General Use criteria are expressed as counts of fecal coliform bacteria, but have not been measured in the DRWW study area. Hence, the U.S. EPA national criteria for *E. coli* were used instead. The U.S. EPA *E. coli* criteria are expressed as a 90- day geometric mean and a statistical threshold value (STV) which is the 90th percentile of the data distribution that is not exceeded by more than 10 percent of the samples. Given the small sample size limitations of the 2015-21 surveys, mean values of 3-6 samples were used as an approximation of the 90-day geometric mean and maximum values as an approximation of the STV. The U.S. EPA recommended 90-day geometric mean criteria value is 126 cfu/100 ml and the STV criteria value is 410 cfu/100 ml (U.S. EPA 2012).

E. coli was sampled only two times in the Des Plaines River mainstem at 12 locations in 2022 compared to 17 locations in 2020, 16 locations in 2018 and 2019, and 12 locations in 2015, 2016, and 2017 each (MBI 2022). Furthermore, the 2022 samples were collected in February

***Table 2**. E. coli values measured at 12 mainstem and two tributary sites in February and August 2022.*

Site ID	River Mile	Samples	February	August
Upper Des Plaines River				
13-6	109.3	1		12
13-5	106.6	1		73
13-4	102.9	1		105
13-3	98.7	2	249	727
13-2	96.8	2	727	228
13-1	94.2	2	2419	236
16-6	87.1	2	816	153
16-5	83.6	2	866	62
16-4	80.0	2	980	155
16-3	76.7	2	816	115
16-2	75.4	2	1120	60
16-1	71.7	2	921	613
Mill Creek				
11-2	1.7	2	687	96
North Mill Creek				
10-1	1.1	1		387
🟩	<126 cfu/mL primary contact criterion			
🟨	≥126 cfu/mL primary contact criterion			
🟥	>410 statisitical maximum value.			

and August (Table 2), the former being outside of the recreation period of May 1-October 31 within which the recreation use criteria normally apply and outside of the seasonal disinfection of treated wastewater effluent. Under the reduced sampling in 2022 an assessment of recreation use attainment could not be made. *E. coli* values were decidedly higher in February compared to August, the latter having two values that exceeded the STV and four that exceeded to geometric mean. All of the exceedances occurred at site 13-3 (RM 98.7) and downstream with the three upstream values well below the geometric mean. This clearly marks the entry of treated municipal wastewater that is not being disinfected outside of the May 1-October 31 recreation season.

The frequency of exceedances of the U.S. EPA recommended geometric mean and STV criteria have generally declined since 2015. However, exceedances of the geometric mean or maximum STV was observed at all sites in 2019. A majority of the sites had exceedances of both. The most recent valid assessment conducted in 2020 at 17 sites showed four (4) sites with maximum values that exceeded the STV and four (4) had exceedances of the geometric mean, including two (2) having exceedances of both criteria (Table 2). The dual exceedances at 13-18 (RM 99.72) were attributed to nonpoint source runoff as were exceedances at 13-1 (RM 94.2) despite being located 1.2 miles downstream of the Gurnee WRF outfall which showed consistently low cfu/100 mL counts. Years with lower flows had exceedances of *E. coli* from point sources, while during years with higher flows nonpoint sources exacerbated increased counts (MBI 2022). The low frequency of samples in a given year continues to limit the diagnostic value of the data hence a more intensive study would need to be undertaken to firm up the recreational use status and to better pinpoint sources of *E. coli* that actually interfere with recreational uses of the river.

Biological and Water Quality Assessment of the Upper Des Plaines River 2022

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 residents in Lake County and 263,360 housing units, making it the third most populated county in Illinois (USCB, 2020). The 2022 study area covers roughly 135 square miles of the upper Des Plaines River watershed including Mill Creek, North Mill Creek, and the mainstem of 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 flows 18.5 miles to its confluence with the Des Plaines River near Wadsworth, IL. The Des Plaines River originates in Wisconsin near Racine in Kenosha Co. north of where it enters Illinois in Lake County. The Des Plaines River flows due south for 110 miles joining the Kankakee River to form the Illinois River. The total watershed area is approximately 2110 square miles of which 1231 are in Illinois (Healy 1979). The watershed in Lake Co. is “trellised” meaning it is narrow relative to the length of the mainstem thus the tributaries are of comparatively shorter lengths with comparatively small drainage areas.

General Landscape Setting

The study area occurs in the Kettle Moraine subregion of the Southeastern Wisconsin Till Plains Level III ecoregion and the Valparaiso-Wheaton Morainal Complex subregion of the Central Corn Belt Plains Level III ecoregion (Table 3; Woods et al. 2006). The Kettle Moraine subregion occupies the majority of the study area to the west and northwest of the mainstem. It is characterized by poorly drained, hilly to hummocky morainal areas that include conspicuous glacial landforms, numerous lakes, and wetlands including bogs, fens, and marshes. Drainage networks are less integrated and more 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 loess deposits, where they occur, are thin. Alfisols are common, but Mollisols and Histosols also occur. Overall, organic soils are more extensive than elsewhere in Illinois, and Mollisols are less common than in subregions to the west. In the early 1800s moraines were covered by savanna, prairie, and forest (oak-hickory) with depressions containing wetlands. Landscape alterations in the 1900s reduced the tracts of forest and non-forested wetlands replacing them with urban and suburban development. However, wooded areas, lakes, and wetlands are still common, especially in the extensive forest preserves.

The Valparaiso-Wheaton Morainal Complex subregion is a hilly, hummocky to rolling area containing moraines, kames, eskers, and outwash plains with numerous small lakes and marshes. Soils are largely derived from thick, late-Wisconsinan glacial drift and loess deposits,

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

Level IV Subregion	Physiography	Geology	Soils	Potential Natural Vegetation	Land Use/Land Cover
Kettle Moraine (53b)	Glaciated, hummocky to hilly area with steeply sloping moraines, outwash plains, closed depressions, mounds, level areas, and many wetlands and natural lakes.	Wisconsinan-age glacial till, outwash gravels, and thin loess (<20”). Silurian & Ordovician dolomite, lime-stone, and shale bedrock.	Mostly Alfisols (Hapludalfs, Epiaqualfs); also, Mollisols (Argiudolls, Endoaquolls), Histosols.	Oak–hickory forest, oak savanna, & 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.

where they occur are thin. Alfisols are common and Mollisols also occur, but are less common than in neighboring subregions. In the early 1800s, prairie and forest (oak-hickory) dominated the moraines with swamp white oak forests and marshes occurring in poorly drained areas. Prairie covered slightly more than half of this subregion. Subsequent fire suppression has reduced the number of prairie openings, thereby increasing forest density. Today, pastureland is common, and urban and suburban development is increasing. However, wooded areas, lakes, and wetlands are still common, especially in the extensive County owned forest preserves. Land uses are varied and include residential (26.3%), public/private open space (19.4%), agricultural (12.2%), transportation (10.6%), forest/grassland (9.3%), water (7.0%), wetlands (5.4%), and the remainder comprised of six additional land use types (Lake Co. Local Planning Committee 2012; Figure 2).

Major Point Sources

Significant point sources of pollution were inventoried to understand the extent of the pollution impact and for the intensive pollution survey design. There are a total of 18 wastewater treatment plants (WWTP) in the 2022 study area. Eight (8) are major discharges which comprise 80 million gallons per day (MGD; average annual flows) of treated wastewater. The 2022 (Year 5) study area includes seven (7) of the eight (8) major discharges in the Upper

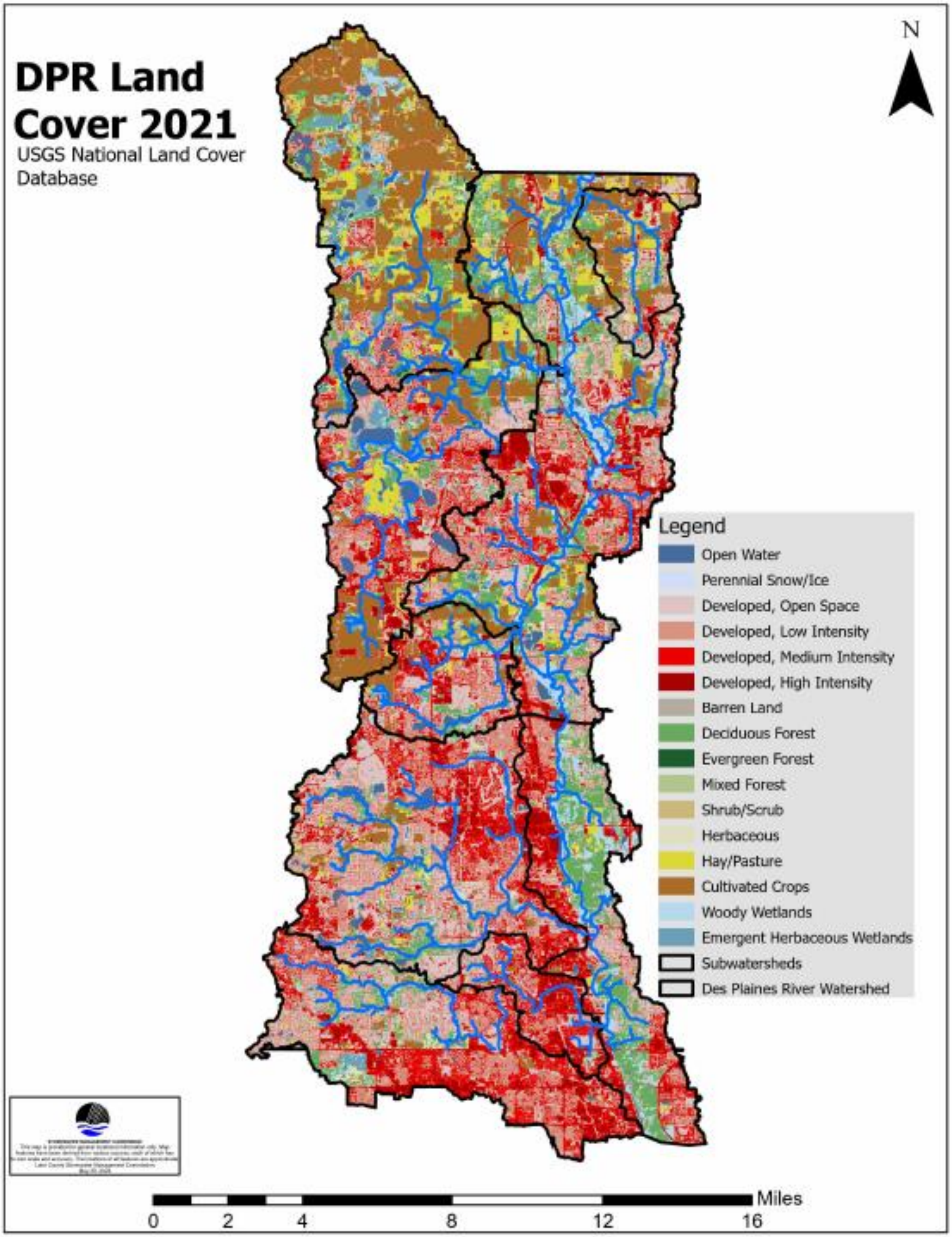


Figure 2. *Land uses in the Upper Des Plaines River subbasin based on the USGS National Land Cover Database (NLCD).*

***Table 4**. Major wastewater treatment facilities that discharge either directly or via tributaries (river miles are indicated) to the 2022 Upper Des Plaines River mainstem (DPW – Dept. of Public Works; NSWRD – North Shore Water Reclamation District; WRF – Water Reclamation Facility; WWTP – Wastewater Treatment Plant). Treatment levels and nutrient information from U.S. EPA Discharge Monitoring Report (DMR) Pollutant Loading Tool (https://cfpub.epa.gov/dmr/facility_detail.cfm).*

Facility	Receiving Water Body	River Mile	Latitude	Longitude	Design Avg. Flow (MGD)[1]	Treatment Type[2]	Nutrient Removal[3]
Lake Co. DPW Mill Creek WWTP	Mill Cr./Des Plaines River	1.0/102.0	42°25’00”N	87°55’40”W	2.1	AWT	P
NSWRD Waukegan WRF	Des Plaines R.	98.1	42°22’15”N	87°54’53”W	22.0	AWT	P
NSWRD Gurnee WRF	Des Plaines R.	95.5	42°21’25”N	87°55’36”W	23.6	AWT	P
Libertyville WWTP	Des Plaines R.	84.8	42°15’15”N	88°56’10”W	4.0	AWT	M
Mundelein WWTP	Des Plaines R.	84.6	42°15’11”N	87°50’34”W	5.0	Secondary	M
Lake Co. DPW New Town Century WWTP	Des Plaines R.	82.3	42°13’30”N	87°56’15”W	6.0	AWT	P
Lake Co. DPW Des Plaines WWTP	Aptakisic Cr./Des Plaines	0.8/76.4	42°09’47”N	87°55’40”W	16.0	AWT	P

[1] Design average flow from NPDES fact sheet; [2] AWT – Advanced Wastewater Treatment – generally 10-20 mg/L CBOD5, 1.5-3.0 NH_3-N; 12-24 mg/L TSS; Secondary – generally 30 mg/L $CBOD_5$/TSS, and no NH_3-N removal; [3] M – nutrient (N and P) monitoring only; P – 1.0 mg/L limitation.

DesPlaines River watershed (Table 4). All except one of these facilities have advanced treatment for oxygen demanding wastes (BOD), ammonia-N (NH_3-N), and suspended solids (TSS). The Mundelein WWTP is the only secondary treatment facility remaining in the Year 5 study area. Six (6) facilities have phosphorus removal technology and all seven (7) facilities monitor for N and P (MBI 2017).

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 0.2 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 Agency has determined that the Permittee's treatment plant effluent is located upstream of a waterbody or stream segment that has been determined to have a phosphorus related impairment. This determination was made upon reviewing available information concerning the characteristics of the relevant waterbody/segment and the relevant facility (such as quantity of discharge flow and nutrient load relative to the stream flow).*

A phosphorus related impairment means that the downstream waterbody or segment is listed by the Agency as impaired due to dissolved oxygen and/or offensive condition (algae and/or aquatic plant growth) impairments that is related to excessive phosphorus levels.

The Permittee shall develop, or be a part of a watershed group that develops, a Nutrient Assessment Reduction Plan (NARP) that will meet the following requirements:

A. *The NARP shall be developed and submitted to the Agency by December 31, 2023. This requirement can be accomplished by the Permittee, by participation in an existing watershed group or by creating a new group. The NARP shall be supported by data and sound scientific rationale.*

B. *The Permittee shall cooperate with and work with other stakeholders in the watershed to determine the most cost-effective means to address the phosphorus related impairment. If other stakeholders in the watershed will not cooperate in developing the NARP, the Permittee shall develop its own NARP for submittal to the Agency to comply with this condition.*

C. *ln determining the target levels of various parameters necessary to address the phosphorus related impairment, the NARP shall either utilize the recommendations by the Nutrient Science Advisory Committee or develop its own watershed-specific target levels.*

D. *The NARP shall identify phosphorus input reductions by point source discharges and non-point source discharges in addition to other measures necessary to remove phosphorus related impairments in the watershed. The NARP may determine, based on an assessment of relevant data, that the watershed does not have an impairment related to phosphorus, in which case phosphorus input reductions or other measures would not be necessary. Alternatively, the NARP could determine that phosphorus input reductions from point sources are not necessary, or that phosphorus input reductions from both point and nonpoint sources are necessary, or that phosphorus input reductions are not necessary and that other measures, besides phosphorus input reductions, are necessary.*

E. *The NARP shall include a schedule for the implementation of the phosphorus input reductions by point sources, non-point sources and other measures necessary to remove phosphorus related impairments. The NARP schedule shall be implemented as soon as possible and shall identify specific timelines applicable to the Permittee.*

F. *The NARP can include provisions for water quality trading to address the phosphorus related impairments in the watershed. Phosphorus nutrient trading*

> *cannot result in violations of water quality standards or applicable antidegradation requirements.*
>
> G. *The Permittee shall request modification of the permit within 90 days after the NARP has been completed to include necessary phosphorus input reductions identified within the NARP. The Agency will modify the NPDES permit, if necessary.*
>
> H. *If the Permittee does not develop or assist in developing the NARP, and such a NARP is developed for the watershed, the Permittee will become subject to effluent limitations necessary to address the phosphorus related impairments- The Agency shall calculate these effluent limits by using the NARP and any applicable data. If no NARP has been developed, the effluent limits shall be determined for the Permittee on a case-by-case basis, so as to ensure that the Permittee's discharge will not cause or contribute to violations of the dissolved oxygen or narrative water quality standards.*

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. A report entitled *Nutrient Assessment Reduction Plan for The Upper Des Plaines Riv*er (Geosyntec 2023) was submitted by DRWW to IEPA in compliance with the NPDES Special Conditions deadline. Depending on the acceptance of the DRWW NARP report and its conclusions and recommendations by IEPA, additional controls on discharges of N and P could be forthcoming or not.

Nonpoint Sources

Nonpoint sources in the 2022 study area included a mix of agricultural and urban sources, the latter of varying intensities ranging from light suburban to heavy urban and industrial land uses. These have been extensively classified and delineated by the Lake Co. SMC. Hydromodification of stream and river flows and habitat also occurs with the former being influenced by land uses and the latter mostly in the form of legacy channelization and riparian encroachment by agriculture and urban and suburban development. The influence of legacy hydromodification is especially severe and long lasting in the upper 10 miles of the mainstem and upstream from the Illinois:Wisconsin state line.

Sampling Sites Selection and Locations

A Monitoring Strategy for the Des Plaines River Watershed was developed by the Monitoring Committee of the Des Plaines River Watershed Workgroup 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. The 2020 survey of the Des Plaines River mainstem was the initial sampling of the mainstem Des Plaines River outside of the yearly rotation that began in 2017 following a watershed wide survey in 2016. The 2022 site locations are a continuation of the 2020 survey. Future surveys are contingent on future modifications to the Monitoring Strategy by the DRWW in the near future.

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.

The 2022 study area included 20 sites including 17 on the mainstem Des Plaines River, two (2) sites on North Mill Creek, and a single (1) site on Mill Creek(Figure 2). All sites except upstream of the wetland riffle (13-19) were sampled for habitat, fish, and macroinvertebrates, and meter-read water quality at a minimum (Figure 3). Macroinvertebrates were not collected at 13-19 due to water depths being too deep to collect a multihabitat sample. Fourteen (14) sites were sampled with YSI Datasonde recorders continuously and deployed for approximate one-week periods during July 2022. The Datasonde deployed at the former Hollister Dam site (16-7) was lost to a debris jam that formed after a period of elevated flows in July. Benthic chlorophyll-a samples were collected during the same week of short-term deployment at each Datasonde site. DRWW deployed permanent Datasondes at three locations that were used to supplement the short-term analyses and support long-term data analyses for the 2020-23 period. DRWW grab water samples in 2022 were collected in accordance with designations as Tier 1-3, for which specific analytes varied (Table 5).

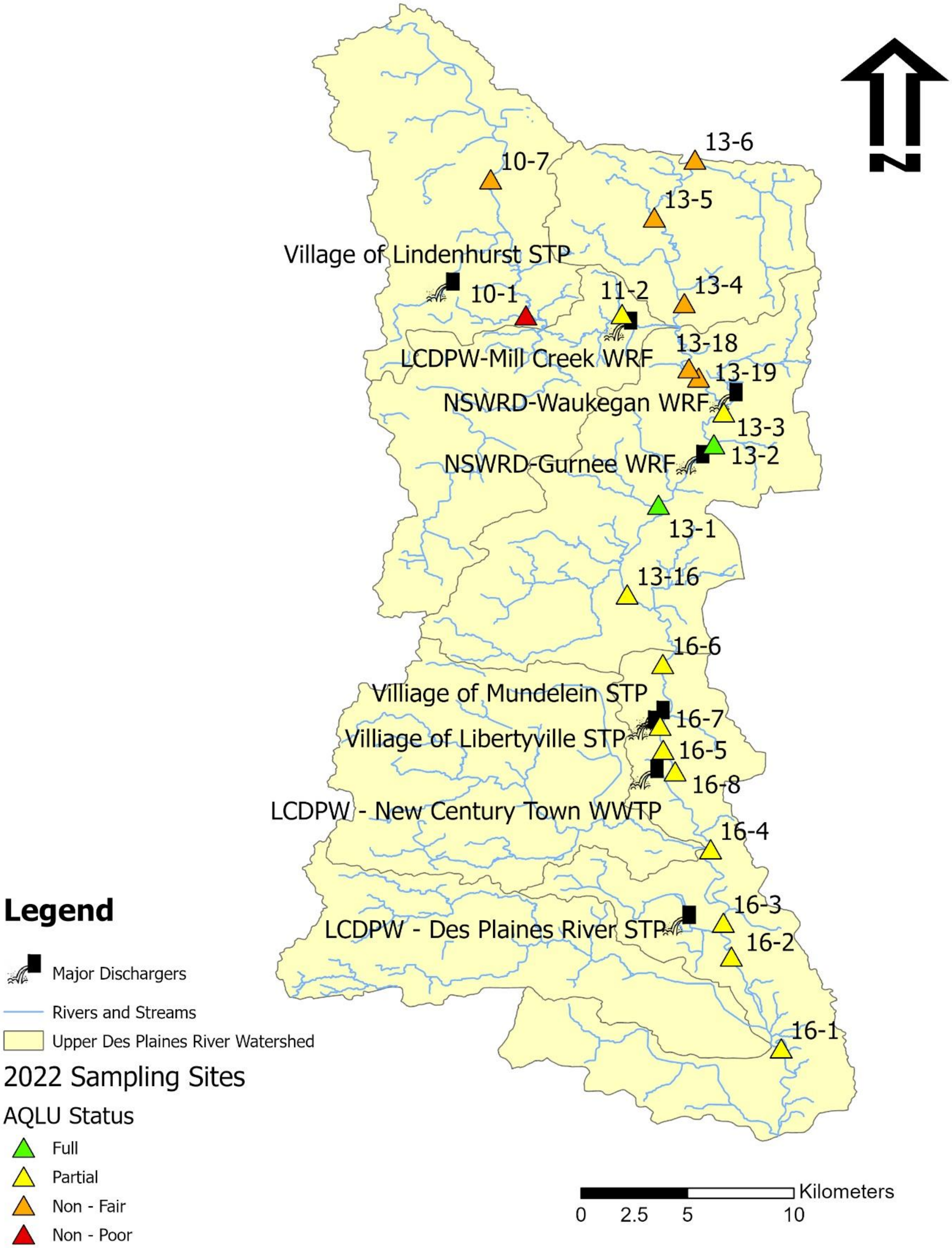


Figure 3. *Location of biological, chemical, and habitat sampling sites in the DRWW study area in 2022 showing aquatic life use (AQLU) attainment status. Site codes correspond to the sites listed in Table 5.*

***Table 5**. Locations of sampling sites in the Year 2 Des Plaines River study area in 2022 showing the site ID, river or stream, location, river mile, and what sampling was performed at each (F – fish; MH – multihabitat macroinvertebrate; QHEI – Qualitative Habitat Evaluation Index; Datasonde; Benthic Chlorophyll a, and water chemistry in accordance with Tier 1-3 designation.*

Site ID	River	Location	River Mile	Gradient	Drainage Area (mi.^{2})	Biota	Habitat	Datasonde	Benthic Chloro-phyll a	DRWW Water Chemistry		
										Tier 1	Tier 2	Tier 3
13-6	Des Plaines River	Russel Rd.	109.30	5.64	123.7	F, MH	QHEI	DRWW	X	1		
13-5	Des Plaines River	IL Rt. 173	106.60	5.15	137.3	F, MH	QHEI	July 18-21	X		2	
13-4	Des Plaines River	Wadsworth Road	102.90	4.67	145.6	F, MH	QHEI	July 18-21	X		2	
13-18	Des Plaines River	Above Riffle Structure	99.72	2.63	213.2	F, MH	QHEI	July 18-21	X			3
13-19	Des Plaines River	Below Riffle Structure	99.30	2.63	212.9	F, MH	QHEI	July 18-21	X			3
13-3	Des Plaines River	U.S. Rt. 41	98.70	4.26	220.3	F, MH	QHEI	July 18-21	X	1		
13-2	Des Plaines River	McClure Ave.	96.82	4.04	225.4	F, MH	QHEI	July 18-21	X	1		
13-1	Des Plaines River	IL Rt. 120	94.20	3.61	232.0	F, MH	QHEI	DRWW	X	1		
13-16	Des Plaines River	Buckley Rd.	90.60	3.32	253.8	F, MH	QHEI					3
16-6	Des Plaines River	Rockland Rd.	87.10	2.70	261.4	F, MH	QHEI	July 21-25	X	1		
16-7	Des Plaines River	Hollister Dam site	84.60	2.77	266.5	F, MH	QHEI	Lost	X			3
16-5	Des Plaines River	IL Rt. 60 (Town Line Rd.)	83.60	2.72	268.1	F, MH	QHEI	July 21-25	X	1		
16-8	Des Plaines River	Wright Woods Dam site	82.90	2.64	268.9	F, MH	QHEI					3
16-4	Des Plaines River	Half Day Rd.	80.00	2.39	273.2	F, MH	QHEI	DRWW	X	1		
16-3	Des Plaines River	Deerfield Rd.	76.70	2.24	314.7	F, MH	QHEI	July 22-27	X			3
16-2	Des Plaines River	E. Lake Cook Rd.	75.40	2.19	324.0	F, MH	QHEI	July 21-28	X	1		
16-1	Des Plaines River	Palantine Frontage Rd.	71.70	2.13	358.7	F, MH	QHEI	July 21-28	X	1		
11-2	Mill Creek	Hunt Club Rd.	1.71	7.40	59.9	F, MH	QHEI	July 25-28	X		2	
10-1	North Mill Creek	Milborne Rd.	1.10	5.24	31.9	F, MH	QHEI	July 25-28	X			3
10-7	North Mill Creek	Edwards Rd.	11.30	2.60	19.2	F, MH	QHEI					
🟩	SNAP sites; DRWW continuosly deployed Datasondes											
🟧	SNAP sites; short-term Datasonde data used.											

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), 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 were available from Illinois EPA.

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 Lake County Environmental Laboratory. The chemical/physical parameter categories (demand, nutrients, metals, and organics) and the frequency of sample collection are summarized in DRWW Monitoring Strategy (DRWW 2018). DRWW assigned tiers to the sampling sites based on the frequency of sampling and parameter groups as follows:

- **Tier 1:** Nine (9) sites located in the Des Plaines River mainstem were sampled monthly for water May through September, and November and March (seven times per year) for all demand, nutrient, and bacteria parameters.
- **Tier 2:** Three (3) sites (2 Des Plaines River, 1 Mill 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.
- **Tier 3:** Seven (7) sites (6 Des Plaines River, 1 North Mill Creek) were sampled from May through September, and in November and March (seven times per year) for the majority of demand, nutrient, and bacteria parameters.

The total number of analytes by parameter category in 2022 appears in Table 6.

Nutrient Effects Assessment Procedure

The 2022 assessment of the effects from nutrient enrichment was modeled after the Stream Nutrient Assessment Procedure (SNAP) and the large rivers nutrient assessment both developed by Ohio EPA (Ohio EPA 2015b; Miltner 2018). Each includes consideration of the width of the diel variation in continuously measured D.O. and the biomass of chlorophyll a in benthic and sestonic algae in addition to the concentrations of total phosphorus and inorganic nitrogen (nitrates + nitrites) at each of the 17 Datasonde and benthic chlorophyll-a locations. Other nutrient related parameters such as total suspended solids and total Kjeldahl nitrogen (TKN) are also included. Datasondes were deployed by MBI for 4-5 day periods during periods of low streamflow and elevated summer ambient temperatures (YSI 2012, 2017). DRWW were used to determine five states of nutrient enrichment, not nutrients excellent, not nutrients good, possibly nutrients, enriched by nutrients, and highly enriched by nutrients, via a operated three continuous monitoring locations starting in June 2020. Together these results weighted

***Table 6**. Summary of the number of water chemistry parameters and samples collected by parameter category in the Upper Des Plaines River study area in 2022.*

	Water Quality Analytes	
Parameters	**Parameters**	**Samples**
All	15	1704
Fecal bacteria *(E. coli)*	1	48
Field pH & Temperature	2	266
Demand[1]	21	169
Nutrients[2]	6	738
Ionic Strength[3]	4	483

scoring process. This process assigned weighted scores to each variable in accordance with the narrative (excellent, good, fair, poor, and very poor) assessment of each including the fish and macroinvertebrate IBI scores which, along with the diel D.O. swing, and chlorophyll a benthic biomass and sestonic concentrations, comprised the highest weighted primary variables. The QHEI score, total P, and maximum D.O. were weighted as secondary parameters, with nitrate-N, minimum D.O., TSS, and TKN weighted as tertiary parameters. The sum of parameter scores at each site was normalized to a 0-100 scale with lower scores indicating greater adverse effects from nutrient enrichment that can be exacerbated by local hydrological and habitat conditions in addition to low flow sources of nutrient loadings.

Biological Assemblage Sampling

Biological assemblages in the 2020 study area included fish and macroinvertebrates at 20 instream locations for fish and 19 locations for macroinvertebrates. Biological and habitat sampling adhered to a summer-early fall index period of June 16-October 15 for fish and July 1-September 30 for macroinvertebrates. A habitat evaluation was performed at all fish sites using the QHEI (Ohio EPA 2006) and a site description accompanied the Illinois EPA multihabitat macroinvertebrate samples. All sampling occurred during periods of summer-fall base flows.

Fish Assemblage Methods

Fish were collected at 20 sites using both boatable and wading electrofishing units. Larger sites located on the mainstem Des Plaines River were sampled using an inflatable raft mounted electrofishing unit in a downstream direction, and sites located in Mill Creek and North Mill Creek were sampled using a tote barge mounted or a bank set long-line electrofishing units. Wadeable sites were sampled at a distance of 0.20 km in a downstream to upstream direction, headwater sites were sampled at a distance of 0.15 km in a downstream to upstream direction, and boatable sites were sampled at a distance of 0.50 km in an upstream to downstream direction. Tote barge and bank set long-line units used pulsed D.C. current produced by a Smith-Root 2.5 GPP control box powered by a 2.5 kW alternator and a 5.5 HP gasoline mounted engine. The raft mounted unit used pulsed D.C. current produced by a Smith-Root 5.0 GPP control box powered by a 5.0 kW alternator and an 11.0 HP gasoline mounted engine.

Deference was given to the most effective method given the prevailing site and water characteristics. A dip net was used to assist in the capture of stunned fish. A two or three-person crew consisting of a fish crew leader and one or two field technicians conducted the sampling under summer-fall base flow conditions.

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 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) and refinements made by Sanders et al. (1999). Fish were released back into the water after they were identified to species, examined for external anomalies, and weighed either individually or in batches. Larval fish, 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 a standard field form.

While the majority of captured fish were identified to species in the field, any uncertainty about field identification required vouchering for laboratory identification. Voucher specimens were preserved in borax buffered 10% formalin solution and labeled by date, stream, and geographic identifier (e.g., river mile and site number). Regional ichthyology keys were used including the Fishes of Illinois (Smith 1979) and updates available through the Illinois Natural History Survey (INHS). Scientific nomenclature followed Page et al. (2012). Vouchers were deposited at The Ohio State University Museum of Biodiversity (OSUMB) in Columbus, OH. The data were used to calculate the Illinois Fish Index of Biotic Integrity (fIBI; Smogor 2000, 2005) as the primary assessment of fish assemblage quality 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 summer base flows, the absence of highly influential tributary streams, the presence of one riffle/pool sequence or analog (i.e., run/bend meander or alternate point-bar sequence) if present, and a length of at least 300 feet 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. Analyses using the lowest resolution data were accomplished.

Area of Degradation and Attainment Values

The Area of Degradation Value (ADV) and Area of Attainment Value (AAV) were used to demonstrate the trajectory of the biological assemblages and aquatic life use attainment through time and within pollution impact reaches of the Upper Des Plaines River northern tributaries, Year 4, study area. The ADV (Yoder and Rankin 1995; Yoder et al. 2005) was originally developed impact reach that is defined by the impact from one or more sources downstream through an initial zone of impact and through zones of partial to complete recovery. For results that surpass a biocriterion, this is expressed as an Area of Attainment Value (AAV) that quantifies the extent to which the minimum attainment criterion is surpassed. The ADV/AAV correspond to the area of the polygon formed by the longitudinal profile of fIBI and mIBI scores and the straight line boundary formed by their respective biocriterion, the ADV below and the AAV above. The computational formula (after Yoder et al. 2005) is:

$$\text{ADV/AAV} = \Sigma\ [(\text{aIBIa} + \text{aIBIb}) - (\text{pIBIa} + \text{pIBIb})] * (\text{RMa} - \text{RMb}), \text{ for } a = 1 \text{ to } n\text{, where;}$$

aIBIa = actual IBI at river mile a,
aIBIb = actual IBI at river mile b,
pIBIa = IBI biocriterion at river mile a,
pIBIb = IBI biocriterion at river mile b,
RMa = upstream most river mile,
RMb = downstream most river mile, and
n = number of samples

The average of two contiguous sampling sites is assumed to integrate biological assemblage status for the distance between the points. The intensive pollution survey design typically positions sites in close enough proximity to sources of stress and along probable zones of impact and recovery so that meaningful changes are adequately captured. We have observed biological assemblages as portrayed by their respective indices to change predictably in proximity to major sources and types of pollution in numerous instances (Ohio EPA1987a; Yoder and Rankin 1995; Yoder and Smith 1999; Yoder et al. 2005). Thus, the longitudinal connection of contiguous sampling points produces a reasonably accurate portrayal of the extent and severity of impairment in a specified river reach as reflected by the indices (Yoder and Rankin 1995). The total ADV/AAV for a specified river segment is normalized to ADV/AAV units/mile for making comparisons between years and rivers. The ADV is calculated as a negative (below the biocriterion) expression; the AAV is calculated as a positive (above the biocriterion) expression. Each depicts the extent and degree of impairment (ADV) and attainment (AAV) of a biological criterion, which provides a more quantitative depiction of quality than do pass/fail descriptions. It also allows the visualization of incremental changes in conditions that may not alter the pass/fail status, but are nonetheless meaningful in terms of incremental change over space and time. In these analyses, the Warmwater Habitat (WWH) biocriterion for the fish and macroinvertebrate indices, which vary by use designation and ecoregion, were used as the threshold for calculating the ADV and AAV for the upper Des Plaines River mainstem. The General Use for aquatic life biocriteria for the fIBI and mIBI represent the minimum goal required by the Clean Water Act (CWA) for the protection and propagation of aquatic life, thus these were used as a standard benchmark for the ADV/AAV analyses herein.

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 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 were managed by MBI in internal databases that permit ready access and analysis. Biological and habitat data is stored in a routine based on the Ohio ECOS format that MBI uses for all biological data management tasks. Biological data analysis included the calculation of 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 were analyzed using the QHEI and also via a QHEI attributes matrix to aid in assessing habitat related impairments. Summaries of fish species and macroinvertebrate taxa relative abundance, QHEI metrics, and QHEI field sheets by 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 2022 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 the 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.

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 IL IPS tool and dashboard to further refine the relative importance of categorical and/or parameter specific causes. The reliability of the identification of associated causes and sources is increased where other such prior associations have been observed. This process relies on multiple lines of evidence concerning the biological response which is the ultimate measure of success in water quality management. The NE IL IPS derived exceedance thresholds for chemical and habitat parameters used in the causal analyses were also used in the tabular and graphical presentation of the chemical water and sediment results. When combined with the Restorability and Susceptibility/Threat rankings this improved the certainty of the assignment of causes and sources 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 based on environmental results. A tiered approach that links the results of administrative actions with true environmental measures was employed in our analyses. This integrated approach is outlined in Figure 4 and includes a hierarchical continuum from administrative to true environmental indicators. The six “levels” of indicators include:

- Level 1 - actions taken by regulatory agencies (permitting, enforcement, grants);
- Level 2 - responses by the regulated entity (treatment works, pollution prevention);
- Level 3 - changes in discharged quantities (pollutant loadings);
- Level 4 - changes in ambient conditions (chemical/physical water quality, habitat);
- Level 5 - changes in uptake and/or assimilation (tissue contamination, biomarkers, assimilative capacity); and,

- Level 6 - changes in health, ecology, or other effects (ecological condition, human and wildlife health).

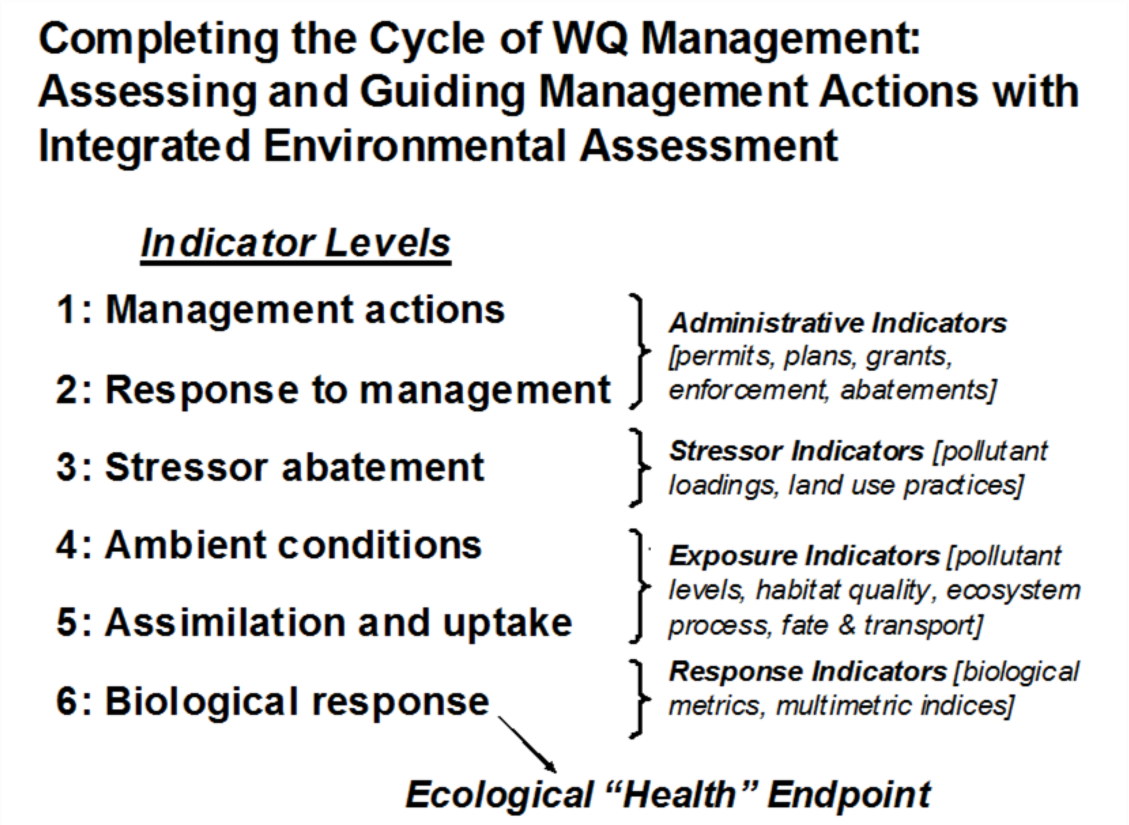


Figure 4*. The hierarchy of administrative and environmental indicators which can be used to support monitoring and assessment, reporting, and an evaluation of the effectiveness of pollution controls on a receiving stream. This is atterned after a model developed by U.S. EPA (1995a,b) and enhanced by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

In this process, the results of administrative activities (levels 1 and 2) are linked to water quality (levels 3, 4, and 5) which translates to a response (level 6). The administrative steps taken by Illinois EPA to issue NPDES permits (Level 1) and the steps taken by the permit holders (Level 2) are easily described and quantified. Quantifying changes in the loadings of pollutants (Level 3) can be affected by the quality and completeness of the effluent monitoring which includes the capture of stressors that 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.

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

- *Stressor* indicators generally include activities that 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 IL 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 2022 study area was characterized by grab sample data collection for the water column 4-6 times at each Tier 1-3 sites during summer-fall base flows and by hand held meter only at Tier 4 sites. 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 Illinois IPS tool and IPS Dashboard (MBI 2020a). 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 2022 study area during the period of May 1 – October 31 was characterized by examining the flow hydrograph for the 2016, 2018, 2020, and 2022 monitoring years based and a frequency plot of all years 2016-22 based on the U.S. Geological Survey gauge on the Des Plaines River at Gurnee, IL (05528000; Figure 4). The flow regime in 2016 had the lowest sustained flows among the four years examined in the hydrograph (Figure 5, upper) with minimum daily flows below the seven-day ten-year ($Q_{7,10}$)low flow of 37 cfs and the median below the 50th percentile flow of 110 cfs. The upper quartile flow was below the 75th percentile flow of 239 cfs and the statistical maximum was 400 cfs with the maximum outlier at 700 cfs. However, the boxplot of all years showed 2021 to have the lowest flow among the seven (7) years examined (Figure 4, lower). Spates of elevate flow were missing entirely with a maximum of less than 240 cfs. Twenty-five (25) percent of the minimum flows in 2021 were at or below the $Q_{7,10}$ low flow of 37 cfs. Flows were also low in 2022 with a pattern similar to 2016 with both having extended periods of low flows and slightly higher peak flows below 1000 cfs. Compared to 2016 and 2018 flows were much more variable and higher in 2018 and 2020. More than three fourths of daily flows exceeded the 50th percentile flow of 110 cfs and a statistical maximum of nearly 1500 cfs, well above the flood stage of 1080 cfs. The highest outlier was above 2000 cfs. Daily flows in 2020 were more compressed with a range of <100 cfs to a statistical maximum of 700 cfs, but with an extremely wide range of outliers ranging upwards to nearly 2400 cfs and most above the flood stage of 1080 cfs. All of the extreme high flows occurred prior to mid-June whereas extreme peaks in 2018 flows occurred in July, September, and October and enough to interfere with planned sampling events. Peak flows in 2020 were of a lesser magnitude, but occurred in July and September and enough to interfere with aspects of the monitoring that require extended periods of base flows.

Point Source Effluent Quality

Point source discharges of treated wastewater are a significant contribution of pollutant loadings to the upper Des Plaines River mainstem with design average flows of 78.7 MGD (MGD; or 121.8 cubic feet/second [cfs]) among seven (7) major wastewater treatment plants (WWTPs; Table 4). This total comprises 329% of the $Q_{7,10}$ flow of 37 cfs and 110% of the median (50th percentile) flow of 110 cfs at the USGS Gurnee Gage. In 2022, the annual average discharge flow totaled 48.7 MGD (75.3 cfs) of treated wastewater (61.9% of the total average design flows) which comprised 68% of the median river flow of 110 cfs. As a result, the Upper Des Plaines is considered to be “effluent dominated” which consists primarily of discharged treated wastewater during periods of low flows (Onnis-Hayden et al. 2006). The NSWRD Waukegan, NSWRD Gurnee, and Lake Co. DPW Des Plaines facilities comprised 67-86% of the flow and loadings discharged to the Des Plaines River. Summaries of the 2022 flow and loads from each facility follow in their order of occurrence along the Des Plaines River mainstem from upstream to downstream (Figure 6).

Lake Co. DPW Mill Creek WWTP

The Lake Co. Department of Public Works (DPW) Mill Creek WWTP discharged an annual average flow of 0.7 MGD (NPDES Permit No. IL0071366) which was 1.4% of the total among the seven (7) major treatment plants that directly impact the mainstem of the Des Plaines River (Table 4; Figure 6). The Mill Creek WWTP discharges to Mill Creek one mile upstream of the

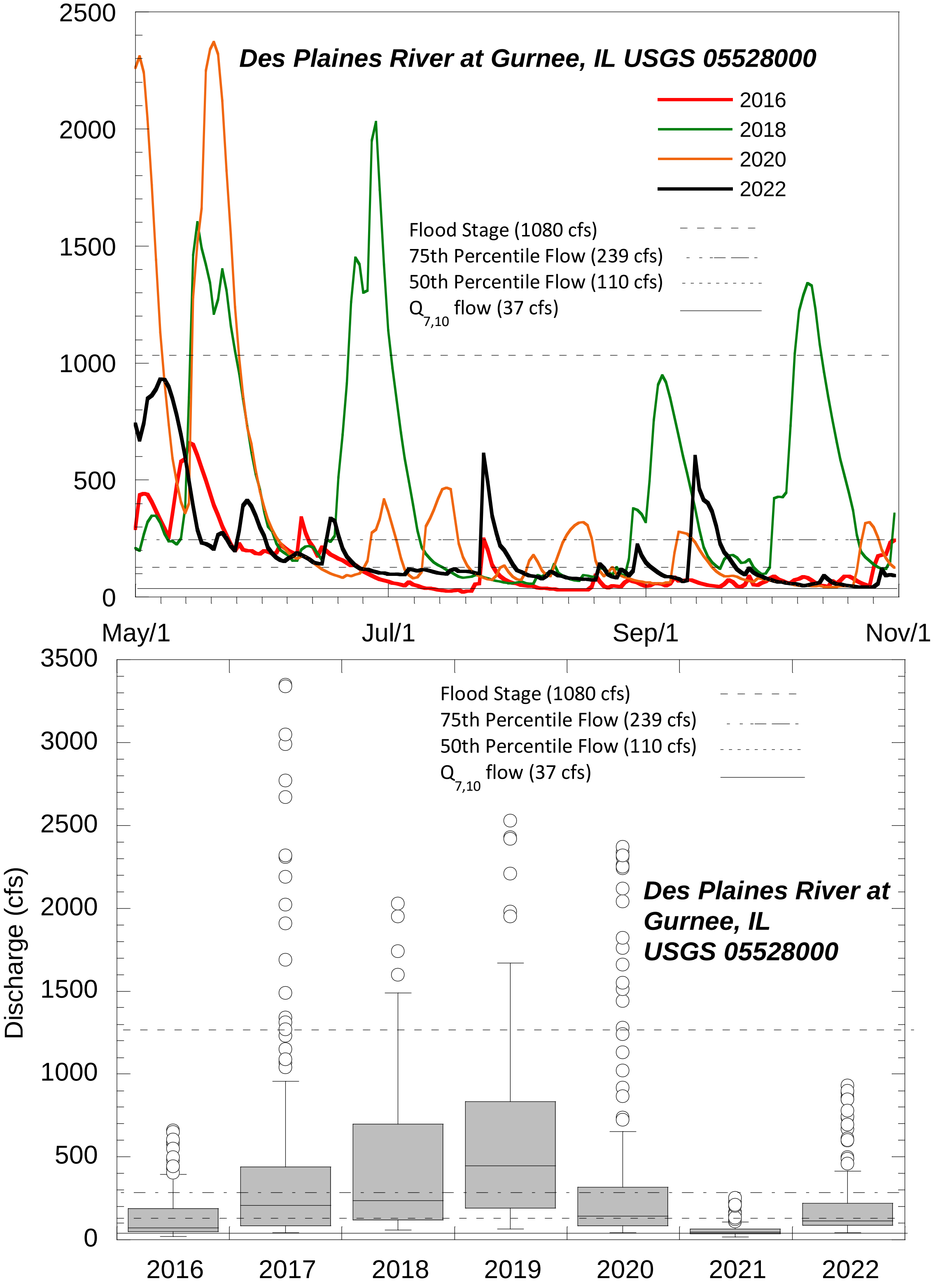
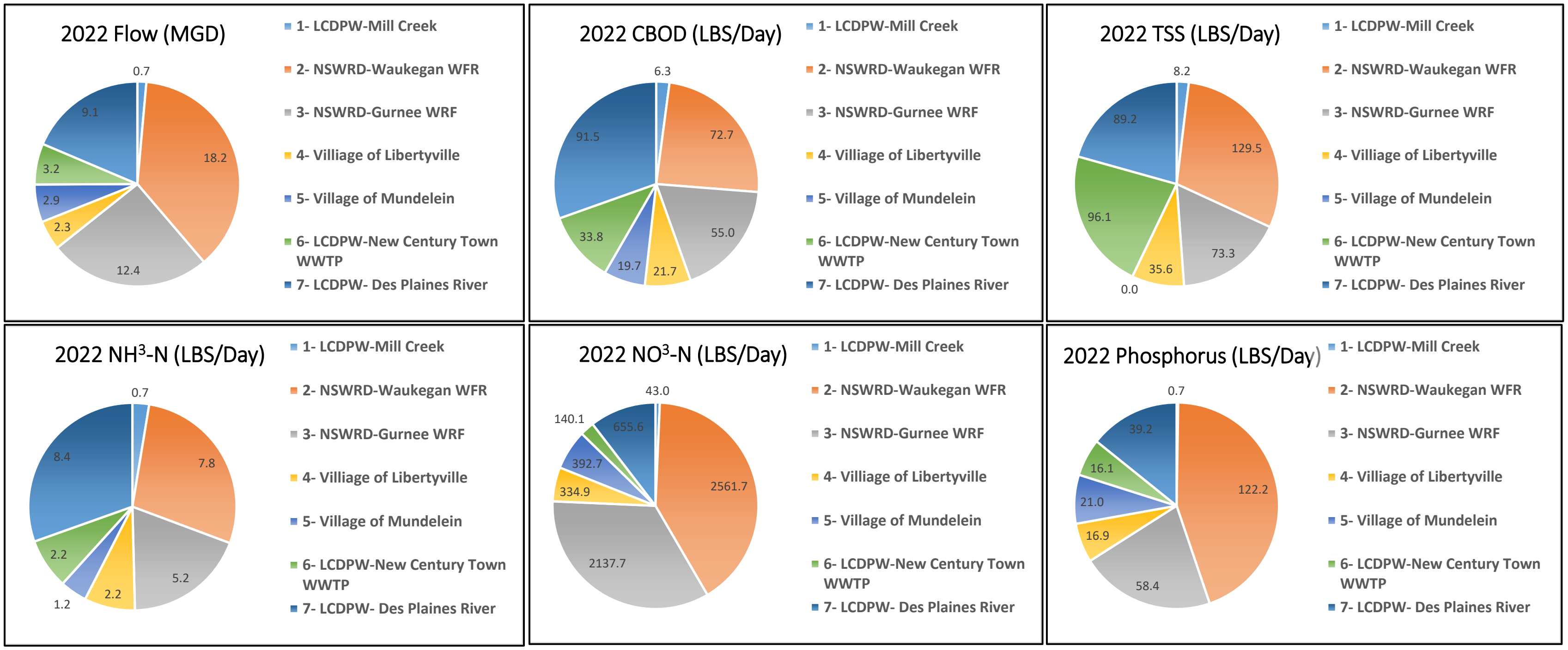


***Figure 5**. River flow measured daily (upper) and seasonally (lower) at the USGS gauge on the Des Plaines River (USGS 05528500) near Gurnee, IL during May 1-October 31, 2016-22. The horizontal lines are the flood stage, 75th percentile, 50th percentile, and the seven-day, ten year ($Q_{7,10}$) critical low flows.*



Facility	River Mile	Flow (MGD)	$CBOD_5$ (lbs/day)	TSS (lbs/day)	NH_3-N (lbs/day)	NO_3-N (lbs/day)	Total P (lbs/day)
1- LCDPW-Mill Creek	102.0	0.7	6.3	8.2	0.7	43.0	0.7
2- NSWRD-Waukegan WRF	98.1	18.2	72.7	129.5	7.8	2561.7	122.2
3- NSWRD-Gurnee WRF	95.5	12.4	55.0	73.3	5.2	2137.7	58.4
4- Villiage of Libertyville	84.8	2.3	21.7	35.6	2.2	334.9	16.9
5- Village of Mundelein	84.6	2.9	19.7	NR	1.2	392.7	21.0
6- LCDPW-New Century Town WWTP	82.3	3.2	33.8	96.1	2.2	140.1	16.1
7- LCDPW- Des Plaines River WWTP	76.4	9.1	91.5	89.2	8.4	655.6	39.2
2022 Totals		48.7	300.7	431.9	27.7	6265.7	274.6

NR - not reported.

Figure 6*. Proportions of third quarter (July 1-September 30) averages of effluent flow (MGD) and pollutant loadings (lbs./day) discharged by seven (7) major WWTPs to the mainstem Des Plaines River in 2022. Discharges are listed in order from upstream to downstream in the inset table below the pie charts.*

confluence with the Des Plaines River and it is the uppermost major facility that directly affects the mainstem. The design average flow (DAF) for the facility 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. In terms of 2022 effluent quality, the Mill Creek WWTP discharged the lowest proportion of loadings of $CBOD_5$ (2.1%), TSS (1.9%), NH_3-N (2.6%), NO_3-N (0.7%), and total P (0.2%; Figure 4).

NSWRD Waukegan WRF

The North Shore Water Reclamation District (NSWRD) Waukegan Water Reclamation Facility (WRF) discharged an annual average flow of 18.2 MGD (NPDES Permit No. IL0030244) which was 37.4% of the total among the seven (7) major treatment plants that directly impact the mainstem of the Des Plaines River (Table 4; Figure 5). The design average flow (DAF) for the facility is 22.0 million gallons per day (MGD) and the design maximum flow (DMF) is 44.0 MGD. Treatment consists of screening, grit removal, excess flow treatment, Imhoff tanks, primary settling, two-stage activated sludge, phosphorus removal, rapid sand filters, and ultraviolet (UV) disinfection. Sludge treatment includes gravity belt thickening, belt press dewatering, drying, and landfill disposal/land application. The NSWRD is a member of the Des Plaines Watershed Workgroup (DRWW). In 2022 the Waukegan WRF discharged the highest proportion of loadings of TSS (30.0%), NO_3-N (40.9%), and total P (44.5%), and the second highest loadings of $CBOD_5$ (24.2%) and NH_3-N (28.1%).

NSWRD Gurnee WRF

The NSWRD Gurnee Water Reclamation Facility (WRF) discharged an annual average flow of 12.4 MGD (NPDES Permit No. IL0035092) which was 25.5% of the total among the seven (7) major treatment plants that directly impact the mainstem of the Des Plaines River (Table 4; Figure 5). The design average flow (DAF) for the facility is 23.6 million gallons per day (MGD) and the design maximum flow (DMF) for the facility is 47.2 MGD. Treatment consists of screening, grit removal, excess flow treatment, two-stage activated sludge, primary and secondary clarifiers, biological phosphorus removal, tertiary filtration, UV disinfection, sludge processing and drying. In terms of 2022 effluent quality the Gurnee WRF discharged the second highest proportion of NO_3-N (34.1%) and total P (21.3%), the third highest proportion of $CBOD_5$ (18.3%), and NH_3-N (18.9%) loadings, and the fourth highest loading of TSS (17.0%).

Libertyville WWTP

The Libertyville WWTP discharged an annual average flow of 2.3 MGD (NPDES Permit No. IL0029530) which was 4.7% of the total among the seven (7) major treatment plants that directly impact the mainstem of the Des Plaines River (Table 4; Figure 5). The design average flow (DAF) for the facility is 4.0 million gallons per day (MGD) which is also the design maximum flow (DMF). Treatment consists of screening, grit removal, primary sedimentation, activated sludge, final clarifiers, filtration, disinfection (chlorination and dechlorination), sludge handling facilities, and excess flow treatment and disinfection. Libertyville is a member of the Des Plaines

Watershed Workgroup (DRWW). In terms of 2022 effluent quality the Libertyville WWTP discharged the fourth highest proportion of loadings of NH_3-N (7.9%), the fifth highest proportion of loadings of $CBOD_5$ (7.2%), TSS (8.2%), NO_3-N (5.3%), and total P (6.2%). The 2022 loading of NH_3-N of 2.2 lbs./day was a substantial decline from the 21.1 lbs./day in 2020.

Mundelein WWTP

The Mundelein WWTP discharged an annual average flow of 2.9 MGD (NPDES Permit No. IL0029530) which was 6.0% of the total among the seven (7) major treatment plants that directly impact the mainstem of the Des Plaines River (Table 4; Figure 5). The design average flow (DAF) for the facility is 4.0 million gallons per day (MGD) and the design maximum flow (DMF) for the facility is 5.0 MGD. Treatment consists of screening, grit removal, primary sedimentation, activated sludge, final clarifiers, filtration, disinfection (chlorination and dechlorination), sludge handling facilities, and excess flow treatment and disinfection. Mundelein *is not* a member of the Des Plaines Watershed Workgroup (DRWW). In terms of 2022 effluent quality the Mundelein WWTP discharged the fourth highest proportion of loadings of NO3-N (6.3%) and total P (7.7%), and the sixth highest loadings of $CBOD_5$ (6.5%), NH3-N (7.9%) and total P (1.2%). TSS was not reported in 2022.

Lake Co. DPW New Century Town WWTP

The Lake Co. Department of Public Works (DPW) New Century Town WWTP discharged an annual average flow of 3.2 MGD (NPDES Permit No. IL0022071) which was 6.5% of the total among the seven (7) major treatment plants that directly impact the mainstem of the Des Plaines River (Table 4; Figure 5). The design average flow (DAF) for the facility is 2.9 million gallons per day (MGD) and the designed maximum flow (DMF) for the facility is 6.0 MGD. Treatment consists of screening, grit removal, activated sludge, settling, filtration, disinfection, and sludge handling facilities. Lake Co. is a member of the Des Plaines Watershed Workgroup (DRWW). In terms of 2022 effluent quality the Lake Co. New Century Town WWTP discharged the second highest loadings of TSS (22.3%), the fourth highest proportion of loadings of $CBOD_5$ (11.2 %), and second lowest proportions of NO_3-N (2.2%) and total P (5.9%) loadings.

Lake Co. DPW Des Plaines WWTP

The Lake Co. Department of Public Works (DPW) Des Plaines WWTP discharged an annual average flow of 9.1 MGD (NPDES Permit No. IL0022055) which was 18.6% of the total among the seven (7) major treatment plants that directly impact the mainstem of the Des Plaines River (Table 4; Figure 5). The Des Plaines WWTP discharges to Aptakisic Creek 0.8 miles upstream of the confluence with the Des Plaines River and it is the lowermost major facility that directly affects the mainstem. The design average flow (DAF) for the facility is 16.0 million gallons per day (MGD) and the design maximum flow (DMF) for the facility is 51.8 MGD. Treatment consists of screening, grit removal, activated sludge, settling, filtration, disinfection, and sludge handling facilities. Lake Co. is a member of the Des Plaines Watershed Workgroup (DRWW). In terms of 2022 effluent quality the Lake Co. Des Plaines WWTP discharged the highest proportions of loadings of $CBOD_5$ (30.4%) and NH_3-N (30.5%), third highest loadings of TSS (20.6%), NO3-N (10.5%), and total P (14.3%). The 2022 total P loading of 39.2 lbs./day was a substantial reduction over the value of 552.5 lbs./day reported in 2020 when it comprised 35.7% of the 1549.2 lbs./day total discharged by the seven major discharges.

Overall POTW Loadings Summary

Overall changes between 2020 and 2022 included a 1.6 MGD or 3.1% increase in flows and increases in loadings of TSS (21.6 lbs./day or 5.3%) and NO_3-N (523.0 lbs./day or 9.1%). Decreases were more substantial and occurred for $CBOD_5$ (40.8 lbs./day or 12.3%) and NH_3-N (19.3 lbs./day or 41.1%). The 2022 total P loading of 274.6 lbs./day is a reduction of 1274.6 lbs./day or 82.3% in 2020 and was the largest effluent loading reduction. The differences between 2022 and 2018 are even greater with a 7.0 MGD reduction in effluent volume, a 394 lbs./day or 56.7% reduction in $CBOD_5$, a 335 lbs./day or 43.7% reduction in TSS, a 105.3 lbs./day or 79.2% reduction in NH_3-N, a 1476.3 lbs./day or 19.1% reduction in NO_3-N, and a 190.7 lbs./day or 41.0% reduction in total P.

Water Column Chemistry

The water column chemistry results were analyzed for spatial (longitudinal) patterns made possible by the pollution survey design in the Upper Des Plaines River mainstem and at a single site in Mill Creek and two sites in North Mill Creek. The results were screened for exceedances of Illinois WQS, Illinois non-standard benchmarks, regional reference benchmarks, and primarily for exceedances of biological effect thresholds derived from the NE Illinois IPS (MBI 2023) in the Year 5 study area.

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 causes associated with biological impairments and to determine threats at attaining sites. Chemical exceedances of biological effect thresholds are essential to that process and have previously included the Illinois WQS, regional reference benchmarks, and other 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 were used previously included 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 covered in the Illinois WQS. The more recently available NE Illinois IPS (MBI 2023) thresholds for water column chemical, sediment, and habitat and land use parameters appear in Tables 7-9 and have replaced the use of the previous thresholds. They are now the first choice for assessing these variables in the tables and figures of the results as each is applicable in the Des Plaines Year 5 study area. NE Illinois derived sediment chemical thresholds are provided in Table 8 and were supplemented with the

***Table 7**. Biological effect thresholds derived from Northeast Illinois streams and rivers for selected water column parameters as part of the NE Illinois IPS development and used to assess results from the Year 4 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 very poor biological condition along with FIT score (see Appendix D), sample N, and regional reference values for NE Illinois rivers and streams <350 mi.^{2}.*

Parameter Code	Variable Name	Units	Parameter Group	Limiting Assemblage	FIT Score	Sample N	Thresholds by Narrative Condition Category					Reference Site Values (Median-2X IQR)	Refer-ence Site N
							Excellent	Good	Fair	Poor	Very Poor		
P665	Total Phosphorus	mg/L	Nutrients	Fish	0.04	1464	≤0.106	≤0.277	>0.277	>1.002	>1.726	0.088 (0.062-0.115)	35
P94	Conductivity	µS/cm	Ionic	Fish	0.05	1464	≤739	≤1038	>1038	>1208	>1378	922 (705-1158)	40
P70300	Total Dissolved Solids	mg/L	Ionic	Fish	0.10	1464	≤453.8	≤558.0	>558.0	>651.2	>744.5	614 (512-664)	28
DO_MIN	Minimum DO	mg/L	Demand	Macros	0.10	985	>8.0	≥6.5	<5.47	<4.44	<3.40	8.6 (6.5-9.6)	29
P625	Total Kjeldahl Nitrogen	mg/L	Demand	Macros	0.14	985	≤1.07	≤1.12	>1.12	>1.63	>2.14	0.74 (0.30-0.99)	30
P940	Chloride, Total	mg/L	Ionic	Fish	0.17	1464	≤40.00	≤120.00	>120.0	>184.9	>249.8	154 (80.3-171.3)	33
P299	Mean Dissolved Oxygen	mg/L	Demand	Macros	0.21	985	>9.42	≥9.25	<9.25	<6.11	<3.05	8.6 (7.9-9.0)	40
P310	BOD (5-Day)	mg/L	Demand	Macros	0.21	985	≤1.30	≤2.35	>2.35	>3.45	>4.54	2 (2.0-2.2)	27
P610	Total Ammonia	mg/L	Nutrients	Macros	0.28	985	≤0.084	≤0.100	>0.100	>0.190	>0.280	0.1 (0.10-0.10)	34
P630	Nitrate-N	mg/L	Nutrients	Fish	0.29	1464	≤3.767	≤5.045	>5.045	>7.344	>9.643	0.39 (0.29-0.97)	32
P929	Sodium, Total	mg/L	Ionic	Fish	0.29	1464	≤16275	≤4500	>45000	>79056	>113112	14200 (10375-22500	21
P530	Total Suspended Solids	mg/L	Demand	Fish	0.32	1464	≤17.50	≤31.60	>31.60	>35.15	>38.69	9.2 (5.4-20.3)	33
P615	Nitrite-N	mg/L	Nutrients	Macros	0.41	985	≤0.014	≤0.040	>0.040	>0.068	>0.096	0.01 (0.01-0.01)	27
DO_MAX	Maximum DO	mg/L	Demand	Macros	0.94	985	≤10.36	≤12.21	>12.21	>14.24	>16.28	8.74 (8.21-9.45)	29
P82078	Turbidity	NTU	Demand	Macros	2.61	985	--	≤19.3	>19.3	>25.9	>32.5	11.0 (4.5-24.5)	7
P549	Volatile Suspended Solids	mg/L	Demand	Fish	2.81	1464	≤5.000	≤7.769	>7.769	>9.825	>11.88	6.0 (4.8-7.4)	5
P945	Sulfate, Total	mg/L	Ionic	Macros	6.49	985	≤58.27	≤73.1	>73.10	>83.45	>93.81	74.6 (61.8-81.8)	4
P937	Potassium, Total	mg/L	Ionic	Macros	10.13	985	≤3158	≤6300	>6300	>7718	>9129	2400 (1574-2817)	21
P916	Calcium, Total	mg/L	Ionic	Fish	Unimodal	1464	≤84425	≤86067	>86067	>86313	>86559	54,000 (80-74,250)	21
Metals and Toxics													
P1092	Zinc, Total	µg/L	Metal_Tox	Fish	0.13	1464	≤7.47	≤9.78 [CS: 55.5]	>9.78	>11.00	>12.22 [309.7]	2.0 (2.0-7.0)	23
P1027	Cadmium, Total	µg/L	Metal_Tox	Fish	0.93	1464	≤0.937	≤0.974 [CS: 2.70]	>0.974	>0.983	>0.991 [33.63]	<MDL (0.17)	23
P1042	Copper, Total	µg/L	Metal_Tox	Fish	1.75	1464	--	≤4.480 [CS: 18.65]	>4.480	>4.969	>5.458 [AS: 30.1]	2.00 (1.96-4.15)	22
P1051	Lead, Total	µg/L	Metal_Tox	Macros	2.11	985	≤2.851	≤3.335 [CS; 18.0]	>3.335	>3.884	>4.434 [AS: 343]	0.24 (0.20-0.57)	23
P1082	Strontium	µg/L	Metal_Tox	Fish	2.69	1464	≤169.1	≤190.8	>190.8	>280.4	>370.1	150 (135-181)	21
P1055	Manganese, Total	µg/L	Metal_Tox	Macros	2.74	985	≤53.71	≤77.03 [CS: 3319]	>77.03	>107.1	>137.2 [AS: 7808]	32.0 (24.1-38.2)	23
P1067	Nickel, Total	µg/L	Metal_Tox	Macros	3.26	985	--	≤3.470 [CS: 103.6]	>3.470	>9.585	>15.70 [AS: 932]	5.0 (1.5-21)	14
P1105	Aluminum, Total	µg/L	Metal_Tox	Fish	4.54	1464	≤310.0	≤393.3	>393.3	>560.2	>727.0	200 (128-449)	21
P1007	Barium, Total	µg/L	Metal_Tox	Fish	4.77	1464	≤74.1	<84.88	>84.88	>101.8	>118.6	56.3 (44.3-64.7)	21
P720	Cyanide, Total	µg/L	Metal_Tox	Macros	5.17	985	≤8	≤10 [CS: 5.2]	>10	>10	>10 [AS: 22]	3 (2-10)	6
P1002	Arsenic	µg/L	Metal_Tox	Macros	9.19	985	--	≤3.455 [CS: 190]	>3.455	>5.029	>6.603 [AS: 360]	Insufficient Data	
P1034	Chromium, Total	µg/L	Metal_Tox	Fish	10.17	1464	≤1.398	≤1.540 [CS: 167]	>1.540	>2.682	>3.824 [AS: 3503]	1.73 (1.30-2.00)	6

CS - Illinois WQS chronic standard equated to Good; AS - Illinois WQS acute standard equated to Very Poor.

***Table 8**. Biological effect thresholds derived from Northeast Illinois streams and rivers for selected sediment chemical parameters as part of the NE Illinois IPS development and used to assess results from the Year 4 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 very poor biological condition, FIT score (see Appendix D), and sample N for NE Illinois rivers and streams <350 mi.^{2}.*

Parameter			Parameter	Limiting			Thresholds by Narrative Condition Category					Literature Thresholds			
Code	**Variable Name**	**Units**	**Group**	**Assemblage**	**FIT Score**	**Sample N**	**Excellent**	**Good**	**Fair**	**Poor**	**Very Poor**	**TEC/LEL**	**PEC/PEL**	**Short**	**Source**
P1093	Zinc	mg/kg	Metal_Tox	Macros	2.22	985	≤75.00	≤100.0	>100.0	>133.9	>167.8	121	459	170.0	MacDonald
P34524	Benzo(g,h,i)perylene	µg/kg	PAH	Macros	2.32	985	--	≤335.0	>335.0	>792.1	>1249	170	320		MacDonald
P34406	Indeno(1,2,3-cd)pyrene	µg/kg	PAH	Macros	2.41	985	--	≤260.5	>260.5	>623.3	>986.2	200	3200		MacDonald
P1043	Copper	mg/kg	Metal_Tox	Macros	2.42	985	≤19.00	≤29.78	>29.78	>40.45	>51.12	31.6	149	37.0	MacDonald
P34233	Benzo(b)fluoranthene	µg/kg	PAH	Macros	2.51	985	--	≤520.8	>520.8	>1437	>2354	240	13400		MacDonald
P1068	Nickel	mg/kg	Metal_Tox	Macros	2.67	985	--	≤19.50	>19.50	>22.52	>25.53	22.7	48.6	26.0	MacDonald
P34250	Benzo(a)pyrene	µg/kg	PAH	Macros	2.85	985	--	≤230.0	>230.0	>798.3	>1367	150	1450		MacDonald
P34472	Pyrene	µg/kg	PAH	Macros	2.85	985	--	≤393.0	>393.0	>1570	>2747	195	1520		MacDonald
P1052	Lead	mg/kg	Metal_Tox	Macros	3.01	985	≤15.50	≤24.80	>24.80	>33.04	>41.27	35.8	128	60.0	MacDonald
P34529	Benzo[a]anthracene	µg/kg	PAH	Macros	3.48	985	--	≤239.0	>239.0	>699.4	>1160	108	1050		MacDonald
P34323	Chrysene	µg/kg	PAH	Macros	3.51	985	--	≤266.0	>266.0	>958.3	>1651	166	1290		MacDonald
P34379	Fluoranthene	µg/kg	PAH	Macros	3.91	985	--	≤774.0	>774.0	>2432	>4091	423	2230		MacDonald
P1083	Strontium	mg/kg	Metal_Tox	Macros	4.44	985	--	≤81.80	>81.80	>106.8	>131.9	None	None		
P34559	Dibenz(a,h)anthracene	µg/kg	PAH	Macros	4.57	985	--	≤101.0	>101.0	>167.3	>233.7	33	135		MacDonald
P34223	Anthracene	µg/kg	PAH	Macros	5.10	985	--	≤78.00	>78.00	>119.9	>161.8	46.9	245		CCME
P34464	Phenanthrene	µg/kg	PAH	Macros	5.10	985	--	≤243.5	>243.5	>803.3	>1363	204	1170		MacDonald
P1003	Arsenic	mg/kg	Metal_Tox	Macros	6.21	985	--	≤8.65	>8.65	>15.82	>23.67	9.79	33	7.2	MacDonald
P1029	Chromium	mg/kg	Metal_Tox	Macros	6.29	985	≤20.53	≤23.30	>23.30	>26.22	>29.15	43.4	111	37.00	MacDonald
P1053	Manganese	mg/kg	Metal_Tox	Macros	7.08	985	≤841.0	≤845.5	>845.5	>996.8	>1148	460	1100	1100	MacDonald
P1078	Silver	mg/kg	Metal_Tox	Macros	7.11	985	--	≤0.483	>0.483	>1.261	>2.039	1.6	2.2		MacDonald
P1108	Aluminum	mg/kg	Metal_Tox	Macros	8.26	985	--	≤6480	>6480	>8272	>10064				
P1008	Barium	mg/kg	Metal_Tox	Macros	8.88	985	--	≤141.0	>141.0	>150.3	>168.7			145	
P1028	Cadmium	mg/kg	Metal_Tox	Macros	11.00	985	--	≤0.745	>0.745	>1.354	>1.963	0.99	4.98	2.000	MacDonald
P1013	Beryllium	mg/kg	Metal_Tox	Macros	ND[a]	985	--	≤0.411	>0.411	>0.496	>0.581				
P1103	Tin	mg/kg	Metal_Tox	Macros	ND[a]	985	--	≤8.86	>11.00	>16.73	>24.60				
P34203	Acenaphthylene	µg/kg	PAH	Macros	ND[a]	985	--	≤86.38	>86.38	>103.6	>120.9	5.87	128		CCME
P34208	Acenaphthene	µg/kg	PAH	Macros	ND[a]	985	--	≤84.25	>84.25	>104.8	>125.3	6.71	88.9		CCME
P34262	Delta-BHC	µg/kg	PAH	Macros	ND[a]	985	--	≤2.098	>2.098	>6.19	>10.28				
P34384	Fluorene	µg/kg	PAH	Macros	ND[a]	985	--	≤84.25	>84.25	>104.8	>125.3	77.4	536		MacDonald
P34445	Naphthalene	µg/kg	PAH	Macros	ND[a]	985	--	≤86.38	>86.38	>103.6	>120.9	34.6	391		CCME

[a] - Not determined (ND) due to a high number of non-detects

MacDonald - MacDonald, D. D., C. G. Ingersoll, and T. A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39, 20–31.

CCME - Canadian Council of Ministers of the Environment (CCME). 1999. Canadian sediment quality guidelines for the protection of aquatic life. Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB.

***Table 9**. Biological effect thresholds derived from Northeast Illinois streams and rivers for selected habitat and land use variables as part of the NE Illinois IPS development and used to assess results from the Year 4 Des Plaines River study area. The most limiting of the fish or macroinvertebrate assemblages for each variable are indicated along with thresholds for excellent, good, fair, poor, and very poor biological condition along with FIT score (see Appendix D), sample N, and regional reference values for NE Illinois rivers and streams <350 mi.^{2}.*

Parameter Code	Variable Name	Units	Parameter Group	Limiting Assemblage	FIT Score	Sample N	Thresholds by Narrative Condition Category					Reference Site Values (Median - 2X IQR)	Reference Site N
							Excellent	Good	Fair	Poor	Very Poor		
EMBEDDED	Embeddedness Score	QHEI Units	Habitat	Fish	0.03	1393	≤1.3	≤1.6	>1.6	>2.4	>3.2	2 (2-2)	29
Urban	Urban (Ust. WS)	Wtd. %	Land Use	Fish	0.03	2657	≤8.8	≤45.0	>45.0	>63.2	>81.3	8.7 (3.0-9.5)	48
QHEI	QHEI Score	QHEI Units	Habitat	Fish	0.04	1393	≥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	≤15.0	<15.0	<9.9	<5.0	8 (7-9)	33
WWH_ATTR	Good Habitat Attributes	Number	Habitat	Fish	0.04	1393	≥9	≥8	<8	<5	<2	16 (15-17)	34
Imperv	Impervious (30 m)	Wtd. %	Land Use	Fish	0.04	2657	≤18.3	≤30.5	>30.5	>53.4	>76.4	2.1 (0.0-14.7)	48
Imperv	Impervious (30 m Clipped)	Wtd. %	Land Use	Fish	0.04	2657	≤13.4	≤26.7	>26.7	>50.9	>75.1	2.1 (0.0-6.1)	48
CHANNEL	Channel Score	QHEI Units	Habitat	Fish	0.07	1393	≥16.8	≥14.0	<14.0	<9.2	<4.6	16 (13-19)	34
COVER	Cover Score	QHEI Units	Habitat	Fish	0.07	1393	≥16.0	≥14.0	<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	>2.7	>3.33	2 (2-3)	29
Develop	Developed (Ust. WS)	Wtd. %	Land Use	Fish	0.07	2657	≤9.1	<45.6	>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	<4.0	<2.0	7.0 (6.0-9.5)	34
Imperv	Impervious (Ust. WS)	Wtd. %	Land Use	Macros	0.10	3096	≤5.6	≤13.2	>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	<6.6	<3.3	10 (9-11)	33
MWH_ATTR	Poor Habitat Attributes	Number	Habitat	Fish	0.12	1393	0	1	>1	>3	>6	2 (1-5)	20
HYD_QHEI	Hydro-QHEI	QHEI Units	Habitat	Fish	0.13	1393	≥17.0	≤19.5	<19.5	<12.9	<6.4	20 (14-22)	33
CURRENT	Current Score	QHEI Units	Habitat	Fish	0.14	1393	--	≥7.0	<7.0	<4.6	<2.3	11 (5.8-11.0)	33
POOL	Pool Score	QHEI Units	Habitat	Fish	0.15	1393	≥11.25	<11.25	<10.0	<6.6	<3.3	11.5 (10-12)	34
Heavurb	Heavy Urban (Ust. WS)	Wtd. %	Land Use	Macros	0.17	3096	≤7.7	<29.3	>29.3	>52.6	>76.0	5.5 (1.1-6.0)	48
RIFFLE	Riff< Score	QHEI Units	Habitat	Fish	0.27	1393	≥5.88	≥5.75	<5.75	<3.9	<1.9	6 (5-7)	34
GRADIENT	Gradient Score	QHEI Units	Habitat	Fish	0.31	1393	--	≥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	≥62.1	<62.1	<41.4	<20.5	83.9 (11.7-85.4)	48
GRADIENT	Gradient (ft/mi)	feet/mile	Habitat	Fish	12.20	1393	≥8.8	≥4.3	<4.3	<2.8	<1.4	8.6 (4.9-11.3)	34
Ag	Agricultural (30 m)	Wtd. %	Land Use	Macros	16.66	3096	≤3.4	≤10.1	>10.1	>29.7	>59.97	0.0 (0.0-0.4)	48

threshold and probable effect levels (TEL and PEL) established by MacDonald et al. (2000) and alternate levels by IEPA (Short 1998). Habitat and land use related variables appear in Table 9. The severity of exceedances of these values offered by the multiple narrative classes (i.e., excellent, good, fair, poor, and very poor) are used to support the assignment of the severity of causes of biological impairments. The chemical water column grab sample results are displayed graphically and in tabular format for selected parameters and with exceedances of the IPS derived effect thresholds. With the exception of continuously measured D.O., there were no exceedances of other parameters that have IEPA water quality criteria.

Demand and Nutrient Related Parameters

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

Dissolved Oxygen (D.O.)

D.O. was assessed with data collected by Datasondes deployed permanently at three locations and short-term deployments over 4-5 days at 14 locations. The data was used to assess exceedances of the Illinois D.O. standard, assess daily variations in D.O. as part of the Stream Nutrient Assessment Procedure (SNAP), and a new assessment of the long term data during the summer-early fall spanning the period of record 2020-2022. Each analysis revealed the importance of D.O. in the Upper Des Plaines River and important insights about causes and sources of oxygen demanding substance and effects of nutrient enrichment.

D.O. Exceedances

The most complete assessment of exceedances of the Illinois dissolved oxygen (D.O.) standards was done with continuous data obtained from three (3) DRWW permanent Datasonde locations. A less complete assessment was done with the short-term deployments at 14 additional locations during late July. The data from the continuously deployed long-term locations were used to evaluate the weekly and rolling average aspects of the IEPA D.O. standard in addition to the seasonally varied minimums. There were 36 individual exceedances at the three permanent long term and 11 short-term locations (Table 10). Certain aspects of the Illinois D.O. standard could only be assessed at the long term locations hence the higher number of exceedances at sites 13-6, 13-1, and 16-4. The most numerous exceedances occurred at site 13-6 (RM 109.3) and included excursions of the minimum D.O. (5.0 mg/L) in June, July, and August on a total of 50 days, the 7-day minimum (4.0 mg/l) from August 1-13 and August 16-October 13, and the 7-day average (<6.0 mg/l) on three separate occasions - April 28-29, May 31-June 1, and July 6-31 (Table 10). Fewer exceedances of the minimum D.O. occurred at site 13-1 (RM 94.2) for 19 days in June and July, the seven day minimum of 4.0 mg/L on August 8, and the 7-day average on two occasions in June (June 18-28 and July 25-28). The third long term Datasonde located at 16-4 (RM 80.0) had excursions of the minimum for 7 days in June and July and two exceedances of the 7-day average D.O. criterion during June 28-

Table 10. *Exceedances of the different parts of the Illinois dissolved oxygen (D.O.) water quality standard among the three continuously operated Datasondes (blue shaded) and short-term Datasondes in the upper Des Plaines River during the summer-early fall period of 2022. The month, date, and duration in days of each exceedance, the D.O. criterion, and the narrative standard that was exceeded are listed by site in an upstream to downstream direction.*

Site ID	River	Year	River Mile	Month/Date/Duration	Criterion	Narrative Standard
13-6	Des Plaines River	2022	109.3	June - # Days:11	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	109.3	July - # Days:28	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	109.3	Aug - # Days:11	<3.5 mg/l	Not to exceed
	Des Plaines River	2022	109.3	8/ 1 - 8/13	<4.0 mg/l	7-day Minimum
	Des Plaines River	2022	109.3	8/16 - 10/13	<4.0 mg/l	7-day Minimum
	Des Plaines River	2022	109.3	4/28 - 4/29	<6.0	7-day Average
	Des Plaines River	2022	109.3	5/31 - 6/ 1	<6.0	7-day Average
	Des Plaines River	2022	109.3	7/ 6 - 7/31	<6.0	7-day Average
13-5	Des Plaines River	2022	106.6	July - # Days: 4	<5.0 mg/l	Not to exceed
13-4	Des Plaines River	2022	102.9	July - # Days: 2	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	102.9	7/18 - 7/21	<6.0	7-day Average
13-19	Des Plaines River	2022	99.3	July - # Days: 2	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	99.3	7/18 - 7/21	<6.0	7-day Average
13-3	Des Plaines River	2022	98.7	July - # Days: 4	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	98.7	7/18 - 7/21	<6.0	7-day Average
13-2	Des Plaines River	2022	96.82	7/18 - 7/18	<6.0	7-day Average
13-1	Des Plaines River	2022	94.2	June - # Days:11	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	94.2	July - # Days: 8	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	94.2	8/ 8 - 8/ 8	<4.0 mg/l	7-day Minimum
	Des Plaines River	2022	94.2	6/18 - 6/28	<6.0	7-day Average
	Des Plaines River	2022	94.2	7/25 - 7/28	<6.0	7-day Average
16-6	Des Plaines River	2022	87.1	July - # Days: 3	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	87.1	7/24 - 7/27	<6.0	7-day Average
16-5	Des Plaines River	2022	83.6	July - # Days: 1	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	83.6	7/21 - 7/22	<6.0	7-day Average
16-4	Des Plaines River	2022	80	June - # Days: 1	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	80	July - # Days: 6	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	80	6/28 - 6/30	<6.0	7-day Average
	Des Plaines River	2022	80	7/ 6 - 7/30	<6.0	7-day Average
16-3	Des Plaines River	2022	76.7	July - # Days: 2	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	76.7	7/22 - 7/27	<6.0	7-day Average
16-2	Des Plaines River	2022	75.4	July - # Days: 3	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	75.4	7/25 - 7/25	<6.0	7-day Average
16-1	Des Plaines River	2022	71.7	July - # Days: 4	<5.0 mg/l	Not to exceed
	Des Plaines River	2022	71.7	7/27 - 7/27	<6.0	7-day Average
11-2	Mill Creek	2022	1.71	7/26 - 7/27	<6.0	7-day Average

20 and July 6-30. The most frequent exceedances occurred at 13-6 well upstream of the discharges of the largest loadings of oxygen demanding substances from municipal wastewater treatment facilities to the Upper Des Plaines River mainstem. This data was further evaluated as symptom of excessive nutrient enrichment in the modified SNAP assessment at 17 sites which includes the short-term data obtained at 14 sites. The short-term deployments of more numerous Datasonde continuous recorders in late July 2022 recorded exceedances of the not-to-exceed and 7-day average aspects of the IEPA D.O. standard (Figure 7). All of these deployments were made before August 1 hence the minimum was evaluated against the 5.0 mg/L criterion and the 6 mg/L 7-day average criterion. There was insufficient data to evaluate the weekly and rolling average aspects of the IEPA D.O. criteria, so the median was compared to the weekly average of 6.0 mg/L for screening purposes. Exceedances of the 5.0 mg/L minimum criterion occurred at eight locations and the 7-day average at 10 locations (Table 10).

Short-term D.O. Analysis

The short-term deployments of more numerous Datasonde continuous recorders in late July 2022 recorded exceedances of portions of the IEPA D.O. criteria (Figure 7). Since these deployments were made before August 1 the minimum was evaluated against the 5.0 mg/L criterion and the 6.0 mg/L 7-day average criterion. Excursions below the 5.0 mg/L minimum occurred at 12 of the 17 locations and were the most extensive in the upper mainstem between site 13-6 (RM 109.3) and site 13-3 (RM 98.7) and lessening in the mainstem downstream. The site at 13-18 (RM 99.72) upstream from the Wetlands riffle and downstream from Mill Creek had no exceedances presumably due to the entry of flow from the LCDPW Mill Creek WWTP. The excursions of the 5.0 mg/L minimum and 6.0 mg/L average returned and increased in magnitude at sites 13-19 (RM 99.30) and 13-2 (RM 96.8). D.O. exceedances were absent at site 13-1 downstream from the entry of flow from the NSWRD Waukegan and Gurnee WRFs, but returned, albeit at a much lesser magnitude, at sites 16-6 (RM 87.1) to 16-1 (RM 71.7) in the lower 8.3 miles of the mainstem. Maximum D.O. values above the 12 mg/L enriched threshold occurred at sites 13-18 (RM 99.72), 13-1 (RM 94.2), 16-5 (RM 83.6), 16-2 (RM 75.4), and 16-1 (RM 71.7) with exceedances of the over-enriched maximum of 14 mg/L at site 16-1 that consisted entirely of outliers above the statistical maximum D.O. The longitudinal pattern suggests that the export of nutrient enrichment effects begins in the upper mainstem and is interrupted by the influence of WWTP flows and culminating in wide diel swings and maximum D.O. values in the lower mainstem. One site in Mill Creek (11-2) and one site in North Mill Creek (10-1) had no exceedances of any D.O. standard. The range of values at site 11-2 was compressed compared to North Mill Creek site 10-1 due to the ameliorating effect of the LCDPW Mill Creek effluent. The variation was wider with an exceedance of the enriched maximum D.O. of 12 mg/L in North Mill Creek due to the more extended periods of low flow and nonpoint sources of nutrient enrichment exacerbated by the modified stream habitat.

Long-term D.O. Analysis

An analysis of the long term D.O. data from the three permanent Datasondes deployed by DRWW was conducted over the summer-early fall period for the years 2020, 2021, and 2022. The results show a more complete picture of the D.O. regime than the short-term data. The

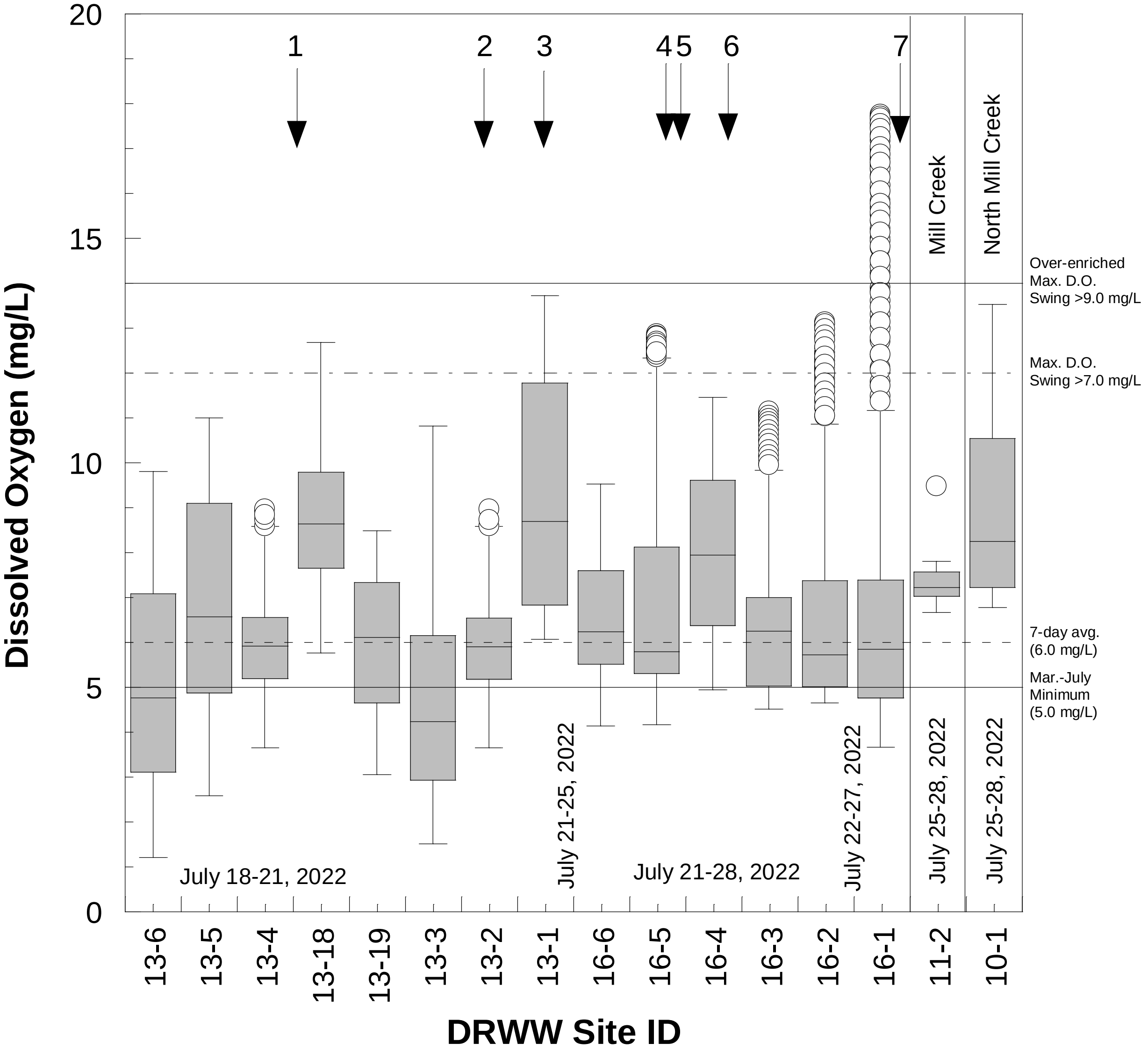


***Figure 7**. Dissolved oxygen (D.O.) concentrations (mg/L) measured continuously by Datasondes deployed for 3-4 day periods during mid to late July 2022 at 14 short-term locations and 3 long term locations operated by DRWW. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outliers (>2 interquartile ranges from the median) values. The IEPA March-July minimum (5.0 mg/L) and the 7-day average D.O. criteria (6.0 mg/L) are shown by solid and dashed lines. Maximum D.O. reflective of enriched and over-enriched diel swings are shown by dashed and solid lines. The key to major point sources (arrows and numbers) appears in Figure 5.*

analysis included the mean, maximum, and minimum D.O. and the number of hours less than a series of thresholds included in the Illinois D.O. standard for each year of deployment (Table 11). A graphical depiction of the daily summer-early fall maximum and minimum D.O. at each of the three locations and each year of deployment (Figure 7). With only two exceptions the upstream most site at 13-6 (RM 109.3) had the lowest minimum and mean and highest maximum D.O. values in each of the three years of permanent deployment. Site 13-1 (RM 94.2) had the highest maximum D.O. in 2021 and 2022. Site 13-6 had by far the most frequent

***Table 11**. Results of the analysis of long term Datasonde D.O. data during July 1-September 30 at the three permanent DRWW sites 13-6, 13-1, and 16-4. The long term D.O. statistics include the minimum, mean, maximum and % hours less than successive intervals of minimum D.O. between 3.5 and 6.0 mg/L. The short-term intervals from 2020 and 2022 are shown for comparison. Yellow highlighted values are the lowest or highest values between the three sites.*

						Long-term Interval D.O. Summary Statistics									
Site ID	River Mile	Days	Hours	Earliest Date	Latest Date	Min. D.O. (mg/L)	Mean D.O. (mg/L)	Max. D.O. (mg/L)	% Hours <3.5 mg/L	% Hours <4 mg/L	% Hours <5 mg/L	% Hours <6 mg/L	% Hours Max. >12 mg/L	% Hours Max. >14 mg/L
2022														
13-6	109.3	53	1247	1-Jul	30-Sep	1.7	6.1	12.4	10.6	17.5	33.1	51.1	0.4	0.0
13-1	94.2	55	1311	1-Jul	30-Sep	4.3	7.8	14.3	0.0	0.0	4.3	28.9	3.8	0.1
16-4	80.0	92	2199	1-Jul	30-Sep	3.7	7.1	10.7	0.0	0.4	2.5	16.7	0.0	0.0
2021														
13-6	109.3	92	2188	1-Jul	30-Sep	0.1	5.1	13.2	30.4	38.1	52.2	64.1	0.1	0.0
13-1	94.2	92	2170	1-Jul	30-Sep	3.9	8.3	15.0	0.0	0.1	5.1	21.2	10.6	0.7
16-4	80.0	92	2176	1-Jul	30-Sep	4.9	7.8	11.5	0.0	0.0	0.4	9.8	0.0	0.0
2020														
13-6	109.3	92	2206	1-Jul	30-Sep	2.7	7.4	16.3	3.4	7.4	15.8	31.4	4.7	1.3
13-1	94.2	92	2204	1-Jul	30-Sep	4.5	7.0	12.4	0.0	0.0	2.1	25.7	0.9	0.0
16-4	80.0	92	2306	1-Jul	30-Sep	5.1	7.1	10.7	0.0	0.0	0.0	21.0	0.0	0.0

						Short-term Interval D.O. Summary Statistics								
Site ID	River Mile	Days	Hours	Earliest Date	Latest Date	Min. DO (mg/L)	Mean DO (mg/L)	Max. DO (mg/L)	% Hours <3.5 mg/L	% Hours <4 mg/L	% Hours <5 mg/L	% Hours <6 mg/L	% Hours Max. >12 mg/L	% Hours Max. >14 mg/L
2022														
13-6	109.3	4	96	18-Jul	21-Jul	2.7	5.7	9.0	5.2	13.0	37.2	58.6	0.0	0.0
13-1	94.2	4	96	18-Jul	21-Jul	5.2	8.1	12.7	0.0	0.0	0.0	21.1	8.1	0.0
16-4	80.0	6	144	22-Jul	27-Jul	5.4	7.1	8.6	0.0	0.0	0.0	9.7	0.0	0.0
2020														
13-6	109.3	4	96	24-Aug	27-Aug	5.4	9.3	13.9	0.0	0.0	0.0	9.9	20.8	0.0
13-1	94.2	4	96	21-Aug	24-Aug	5.4	6.8	8.9	0.0	0.0	0.0	31.0	0.0	0.0
16-4	80.0	4	96	21-Aug	24-Aug	5.1	6.4	7.3	0.0	0.0	0.0	19.4	0.0	0.0

excursions below 3.5, 4.0, and 5.0 mg/L with 30.5% of the hours in 2021 less than 3.5 mg/L. Sites 13-1 and 16-4 had zero hours less than 3.5 mg/L and minimal excursions below 4 mg/L. Site 13-1 had the highest % of hours >12 mg/L, but none were more than 10.6% with most much less than that. The severity and extent of the exceedances at site 13-6 in 2021 was related to the extreme low flows during the summer-early fall period that were lower than the 2016 and 2022 survey years (Table 11; Figure 8). The exceedances and diel swings were lessened at 13-1 and 16-4 due the ameliorating influence of the WWTP flows upstream of each site although the diel swings were the widest in 2021 (Figures 8 and 9).

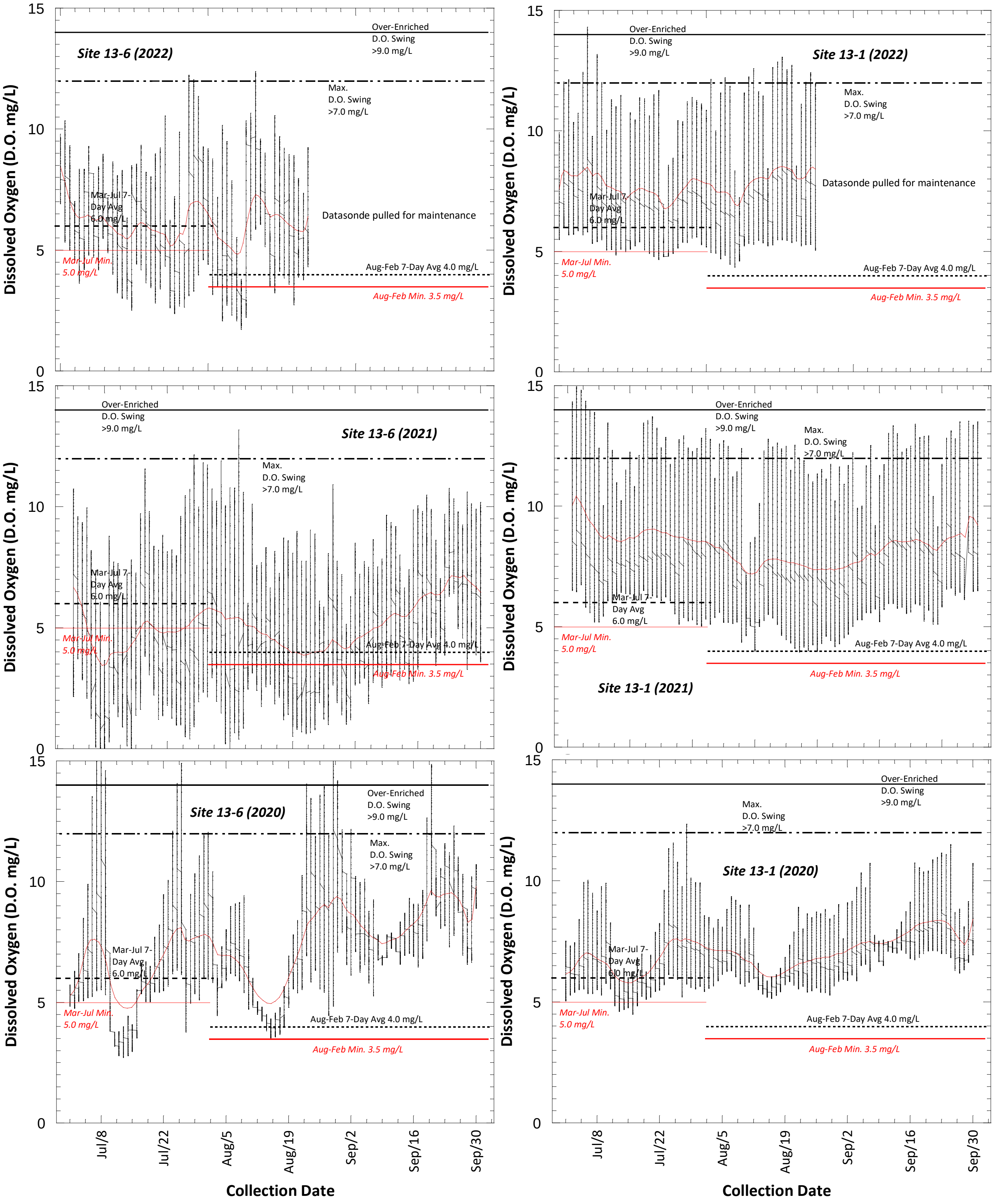


***Figure 8**. Maximum, mean, and minimum daily D.O. values at DRWW permanent Datasonde locations at sites 13-6 and 13-1 in the Upper DesPlaines River mainstem in 2022 (upper), 2021 (middle), and 2020 (lower).*

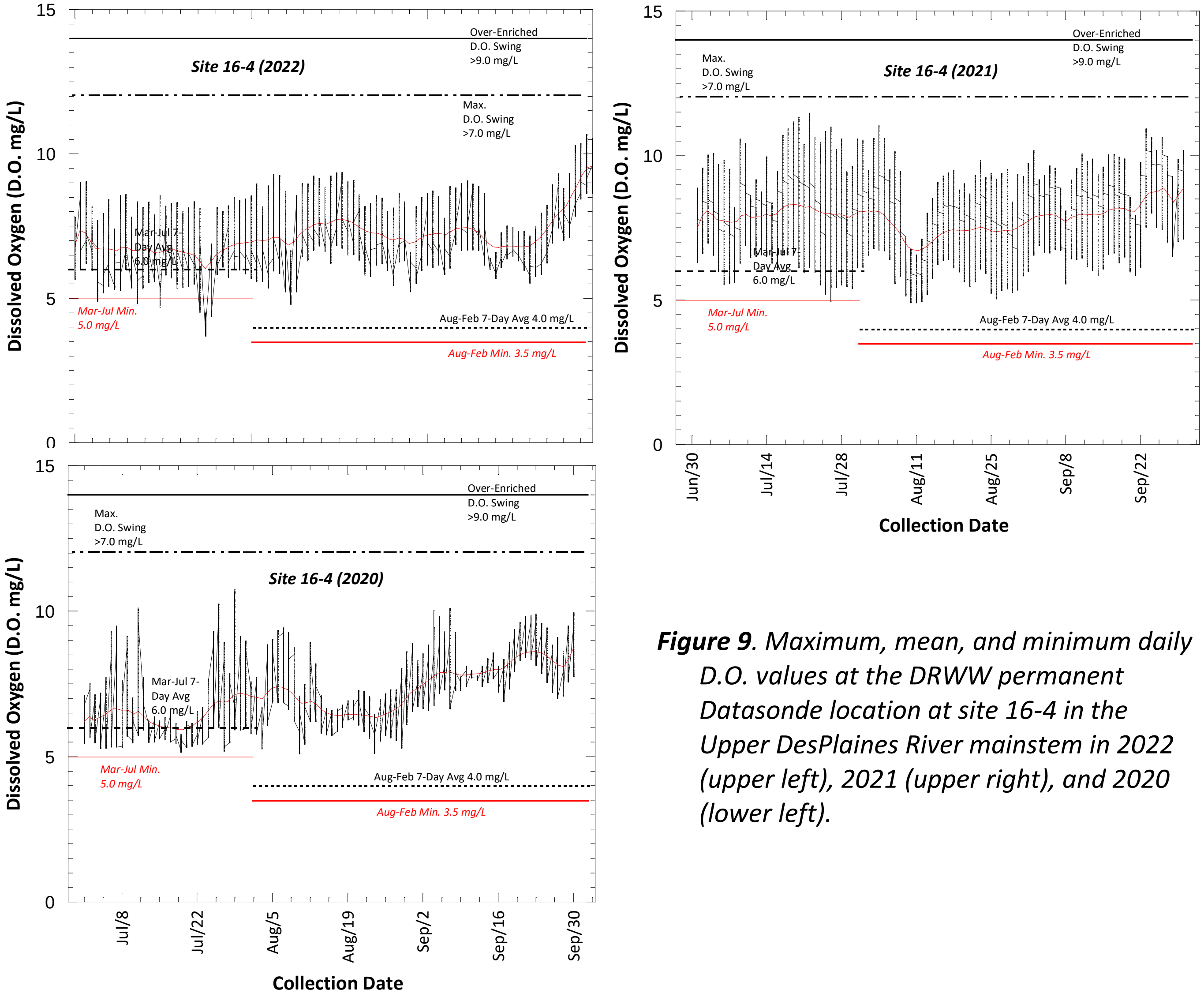


***Figure 9**. Maximum, mean, and minimum daily D.O. values at the DRWW permanent Datasonde location at site 16-4 in the Upper DesPlaines River mainstem in 2022 (upper left), 2021 (upper right), and 2020 (lower left).*

The short-term results in 2020 and 2022 had higher minimum and mean values, but lower maximum values. The frequency of exceedances below 3.5 mg/L and 4.0 mg/L were lower than the long term data, but the frequency of exceedance of the maximum >12 mg/L at 13-6 in 202and at 13-1 in 2022 was higher. No values exceeded the over-enriched threshold of 14 mg/L at any of the three DRWW permanent sites, but one short-term site at 16-1 had frequent exceedances in 2022 (Figure 7). The short-term periods are selected to maximize the effects of nutrients which are most apparent under low flow periods. The effect of low flows in the flow and habitat modified upper mainstem is the most apparent in the 2021- 22 results at 13-6.

Temperature (℃)

Temperature is a controlling factor for aquatic life, hence it is important to document the thermal regime and note any apparent alterations. Water temperature was likewise measured via grab samples at 20 sites and Datasondes at 17 locations, 14 of which were short-term deployments and three (3) that were continuously operated by DRWW during 2020-22 (Figure 10).

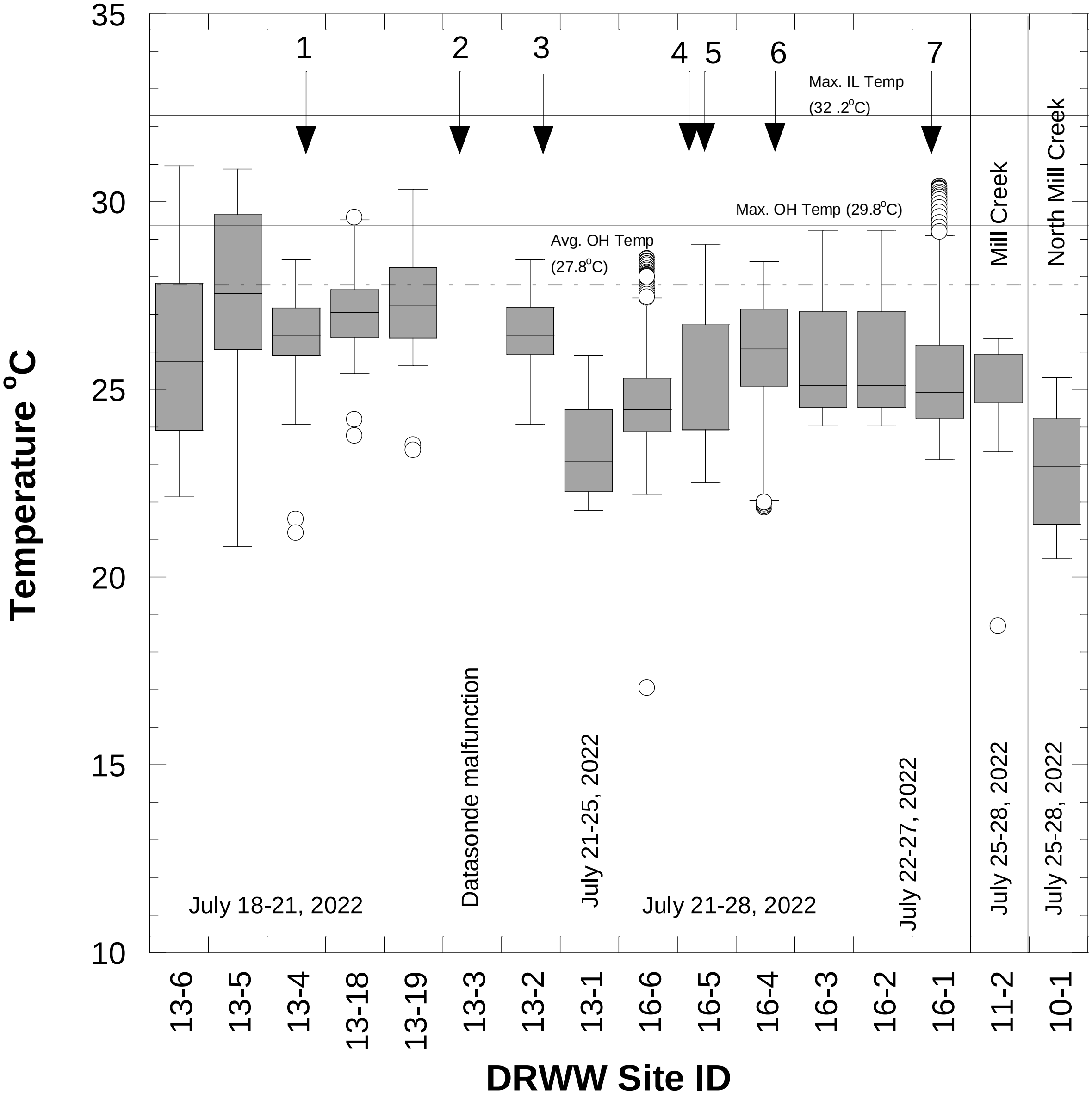


***Figure 10**. Temperature (℃) measured continuously by Datasondes deployed for 3-4 day periods during mid to late July 2022 at 14 short-term locations and 3 long term locations operated by DRWW. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outliers (>2 interquartile ranges from the median) values. The IEPA maximum standard of 32.2 ℃ and Ohio maximum (29.8 ℃) and average (27.8 ℃) criteria are shown by solid and dashed lines. The key to major point sources (arrows and numbers) appears in Figure 5.*

Short-term Temperature Analysis

The 2022 short-term results are displayed as box-and-whisker plots that include the median, upper and lower quartile, maximum, minimum, and outlier values (Figure 10). Typically, the potential for adverse thermal effects are evaluated based on the warmest period of the year and against temperature criteria that are intended to protect aquatic life. The highest summer temperatures were observed in the upper mainstem with the highest maximum at the upstream most site 13-6 (RM 109.3) and highest median at site 13-5 (RM 106.6). There were no exceedances of the Illinois maximum of 32.2°C, but exceedances of the comparable Ohio maximum of 29.8°C occurred at four of the five upstream most sites, two of which are in the channel modified reach in the upper mainstem and the other two in the Wetland Research riffle impoundment and downstream sites. The results were evaluated against the Ohio EPA temperature criteria for similarly sized streams in the Ohio River drainage basin that include a summer period average and maximum criterion based on a representative assemblage of fish species. The maximum criterion of 31.7°C is slightly more stringent than the Illinois General Use temperature standard of 32.2°C that applies between April-November. Temperatures declined slightly at site 13-2 (RM 96.82) downstream from the NSWRD Gurnee WRF outfall and declined sharply downstream from the NSWRD Gurnee WRF outfall at site 13-1. Temperatures increased downstream at sites 16-6 (RM 94.20) to 16-4 (RM 80.0) and remained at those levels through the reminder of the mainstem. Median values in the grab sample data ranged from 16.7°C at site 16-1 (RM 94.2) to 23.5°C at site 13-5 (RM 106.6; Table 12). Continuous short-term temperatures in Mill and North Mill Creeks ranged from a low of 20.5°C at site 10-1 (RM 1.10) in North Mill Creek to 26.5°C at site 11-2 (RM 11.3). Median grab sample temperatures were lower ranging from 16.4°C to 19.7°C in North Mill Creek and 17.8°C in Mill Creek (Table 12).

Long-term Temperature Analysis

An analysis of long term temperature data from the three permanent Datasondes deployed by DRWW was conducted over the summer-early fall period for the years 2020, 2021, and 2022. The DRWW site 13-6 consistently had the highest temperature values, especially the mean and maximum temperatures in both the long and short term datasets (Table 13). It was the only site with exceedances of the Ohio maximum and Illinois maximum temperature criteria, although the duration of the exceedances was relatively brief. The plots of the daily minimum, mean, and maximum temperatures showed within season variability that is influenced by flow, exposure to sunlight, and discharges of wastewater (Figures 11 and 12). The long term data revealed exceedances of the two maximum thresholds that were not revealed by either the short term Datasonde nor the grab sampling results. Site 13-6 had exceedances of the 28.9°C Ohio maximum in all years with the longest duration being 9.4% of the hours in 2021, 7.2% in 2020, and 6.9% in 2022. Site 16-4 also had exceedances of 28.9°C, but at much lower frequencies ranging from 0.2% in 2022 to 1.0% in 2020. Site 13-6 had the only exceedances of the Illinois 32.2°C maximum threshold in 2020 (0.7%) and 2021 (0.4%). The highest value of 34C was recorded in early July at 13-6 and the next highest maximum of 33.8°C in 2020. While these values surpass the avoidance thresholds of the several fish species and are higher than the lethal thresholds for sensitive fish species, they were of brief duration and offset by cooler temperatures throughout most of the summer-early fall periods. None of the long term average temperatures approached the Ohio average threshold of 27.8°C. Similar to D.O., the legacy hydrological and habitat modifications at site 13-6 were apparent in the temperature data with the highest values occurring during periods of low flow and increased retention time in that reach of the upper mainstem. While not the most limiting factor when compared to the very low D.O. levels, such temperatures provide for short term periods of stress and would become a barrier to recovery if the other and currently more severe stressors were resolved.

***Table 12**. Mean and median values for 11 selected chemical/physical water quality parameters at 20 sites in the Year 5 Upper Des Plaines River study area in 2022. NE Illinois IPS thresholds are listed at the bottom of the table and the results are color coded accordingly. The difference between total P and ortho P is reported with differences >0.10 yellow highlighted.*

Site ID	River Mile	Drainage Area (sq. mi.)	Nitrogen, Ammonia (as N) mg/L		Total Nitrates (as Nitrate+ Nitrite-N)		Phosphorus, Total (as P)		Soluble Reactive Phosphorus (as PO_4)		Total P minus Ortho P		Sestonic Chlorophyll a µg/L		Nitrogen, Kjeldahl, Total		Total Suspended Solids		Chloride mg/L		Conductivity µS/cm		Temperature (Field)		pH (Field)	
			Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Des Plaines River Mainstem																										
13-6	109.3	123.7	ND	ND	0.54	0.06	0.175	0.097	0.072	0.057	0.103	0.041	12.8	8.8	0.92	0.93	25.9	29.7	221.0	221.0	1088	1047	22.9	23.2	7.63	7.72
13-5	106.6	137.3	ND	ND	0.14	0.06	0.089	0.092	0.033	0.031	0.056	0.061	33.3	27.0	0.73	0.71	31.7	36.5	198.0	198.0	906	889	23.5	23.7	7.54	7.51
13-4	102.9	145.6	0.101	ND	0.41	0.05	0.087	0.088	0.033	0.032	0.054	0.057	64.8	58.5	1.04	1.03	31.9	25.8	189.0	189.0	1002	957	21.8	22.8	7.90	7.90
13-18	99.7	212.9	0.116	ND	0.60	0.12	0.069	0.070	0.021	0.022	0.048	0.048	29.5	29.0	1.28	1.12	24.9	26.0	221.5	221.5	1003	1013	18.2	22.8	7.88	7.79
13-19	99.3	213.2	0.114	ND	0.77	0.66	0.077	0.073	0.034	0.030	0.043	0.043	23.3	24.0	1.10	1.13	22.1	24.0	222.0	222.0	1005	1019	18.1	22.9	7.70	7.74
13-3	98.7	220.3	0.126	0.113	0.54	0.16	0.086	0.086	0.040	0.038	0.046	0.048	22.2	23.0	1.25	1.31	22.6	26.0	234.0	234.0	1106	1060	16.6	20.0	7.72	7.72
13-2	96.8	225.4	0.101	ND	7.46	3.68	0.256	0.260	0.191	0.197	0.065	0.063	14.9	14.0	1.07	1.14	20.6	19.0	217.0	217.0	1033	966	16.8	20.9	7.70	7.66
13-1	94.2	232.0	0.105	ND	9.44	5.84	0.326	0.331	0.250	0.240	0.076	0.091	8.5	8.5	1.22	1.26	18.2	16.5	250.0	250.0	1088	1032	16.8	21.2	7.60	7.59
13-16	90.6	253.8	0.154	ND	9.69	7.07	0.324	0.302	0.259	0.240	0.064	0.062	-	-	1.08	1.14	17.7	11.0	255.5	255.5	1088	1047	16.6	20.7	7.63	7.72
16-6	87.1	261.4	0.109	ND	9.13	6.11	0.271	0.276	0.213	0.210	0.058	0.066	4.0	3.2	0.91	0.92	14.8	9.3	232.5	232.5	1025	1052	18.1	21.0	7.69	7.74
16-7	84.6	266.5	0.117	ND	8.99	6.37	0.310	0.323	0.242	0.250	0.068	0.073	9.3	8.5	1.01	1.04	9.9	6.4	238.0	238.0	1110	1077	18.4	20.2	7.85	7.79
16-5	83.6	268.1	0.116	ND	6.21	5.46	0.303	0.307	0.237	0.250	0.066	0.057	7.1	8.0	0.97	0.95	15.3	5.0	260.5	260.5	1132	1072	17.6	20.3	7.75	7.73
16-8	82.9	268.9	0.100	ND	8.51	6.88	0.235	0.223	0.175	0.170	0.060	0.053	-	-	0.97	1.02	11.2	7.0	268.0	268.0	1085	1074	17.4	19.4	7.68	7.70
16-4	80.0	273.2	0.115	ND	7.94	5.77	0.293	0.306	0.230	0.250	0.062	0.056	5.4	5.6	1.01	0.97	22.5	21.2	230.0	230.0	1097	1069	17.7	20.6	7.75	7.74
16-3	76.7	314.7	0.114	ND	6.09	4.26	0.266	0.261	0.209	0.190	0.057	0.071	5.1	5.4	0.87	0.80	59.5	26.8	224.5	224.5	1054	1050	16.9	21.0	7.72	7.66
16-2	75.4	324.0	0.125	0.104	5.72	3.94	0.265	0.260	0.208	0.200	0.057	0.060	5.8	4.9	0.93	1.01	16.3	13.0	237.0	237.0	1075	1053	16.8	20.7	7.62	7.62
16-1	71.7	358.7	0.173	0.102	4.93	2.72	0.262	0.209	0.210	0.175	0.052	0.035	6.7	6.9	0.95	1.05	25.5	20.0	350.5	350.5	1147	977	16.7	21.3	7.72	7.72
Mill Creek																										
11-2	1.7	62.3	0.137	0.115	0.91	0.76	0.134	0.145	0.115	0.065	0.019	0.080	29.9	21.5	1.28	1.26	27.6	24.8	218.5	218.5	977	933	17.8	21.5	8.06	7.90
North Mill Creek																										
10-7	11.3	19.2	0.152	ND	0.28	0.34	0.051	0.045	0.014	0.012	0.036	0.033	-	-	1.03	0.93	41.0	26.0	264.0	264.0	1114	1075	16.4	18.3	7.86	7.87
10-1	1.1	31.9	0.128	ND	1.77	1.84	0.525	0.609	0.434	0.520	0.091	0.089	7.6	6.3	1.35	1.20	12.0	11.5	142.0	142.0	852	857	19.7	20.3	8.02	7.98
Condition Category Thresholds		**Excellent**	<0.084	<0.084	≤ 3.77	≤ 3.77	≤ 0.106	≤ 0.106	<0.050	<0.050	<0.050	<0.050	<2.5	<2.5	<1.07	<1.07	≤17.5	≤17.5	<40.0	<40.0	<739	<739				
		Good	<0.100	<0.100	<5.05	<5.05	<0.277	<0.277	<0.100	<0.100	<0.100	<0.100	<5.1	<5.1	<1.12	<1.12	>17.5	>17.5	<120.0	<120.0	<1038	<1038				
		Fair	<0.190	<0.190	<7.34	<7.34	<1.020	<1.020	>0.100	>0.100	>0.100	>0.100	<13.8	<13.8	<1.63	<1.63	>31.6	>31.6	<184.9	<184.9	<1208	<1208				
		Poor	<0.280	<0.280	<9.64	<9.64	<1.730	<1.730	>0.250	>0.250	>0.250	>0.250	<28.9	<28.9	<2.14	<2.14	>35.2	>35.2	<249.8	<249.8	<1378	<1378				
		Very Poor	≥0.280	≥0.280	≥9.64	≥9.64	≥1.730	≥1.730	>0.500	>0.500	>0.500	>0.500	>28.9	>28.9	≥2.14	≥2.14	>38.7	>38.7	≥249.8	≥249.8	≥1378	≥1378				
Source			**IPS**		**IPS**		**IPS**		**MBI**		**MBI**		**MBI/NSAC**		**IPS**		**IPS**		**IPS**		**IPS**					

***Table 13**. Results of the analysis of long term Datasonde temperature data during July 1-September 30 at the three permanent DRWW sites 13-6, 13-1, and 16-4. The long term temperature statistics include the minimum, mean, maximum and % hours >28.9℃ and >32.2℃. The short-term intervals from 2020 and 2022 are shown for comparison. Yellow highlighted values are the highest values between the three sites.*

						Long-term Interval T (°C) Summary Statistics				
Site ID	River Mile	Days	Hours	Earliest Date	Latest Date	Min. T (°C)	Mean T (°C)	Max. T (°C)	% Hours >28.9 (°C)	% Hours >32.2 (°C)
2022										
13-6	109.3	53	1247	16-Jun	15-Sep	20.8	25.5	31.3	6.9	0.0
13-1	94.2	55	1311	16-Jun	15-Sep	19.9	23.5	27.6	0.0	0.0
16-4	80.0	92	2199	16-Jun	15-Sep	13.7	23.1	29.1	0.2	0.0
2021										
13-6	109.3	92	2194	16-Jun	15-Sep	13.7	24.5	34.0	9.4	0.4
13-1	94.2	92	2171	16-Jun	15-Sep	16.6	23.1	28.7	0.0	0.0
16-4	80.0	92	2176	16-Jun	15-Sep	15.3	23.8	29.6	0.8	0.0
2020										
13-6	109.3	92	2206	16-Jun	15-Sep	13.7	23.4	33.8	7.2	0.7
13-1	94.2	92	2204	16-Jun	15-Sep	15.7	23.2	28.8	0.0	0.0
16-4	80.0	92	2307	16-Jun	15-Sep	14.7	23.4	29.9	1.0	0.0

						Short-term Interval T (°C) Summary Statistics				
Site ID	River Mile	Days	Hours	Earliest Date	Latest Date	Min. T (°C)	Mean T (°C)	Max. T (°C)	% Hours >28.9 (°C)	% Hours >32.2 (°C)
2022										
13-6	109.3	4	96	18-Jul	21-Jul	20.8	23.8	27.6	0.0	0.0
13-1	94.2	4	96	18-Jul	21-Jul	21.2	22.9	24.8	0.0	0.0
16-4	80.0	6	144	22-Jul	27-Jul	21.1	23.5	25.1	0.0	0.0
2020										
13-6	109.3	4	96	24-Aug	27-Aug	23.5	27.0	30.9	26.0	0.0
13-1	94.2	4	96	21-Aug	24-Aug	22.1	24.3	26.8	0.0	0.0
16-4	80.0	4	96	21-Aug	24-Aug	22.6	24.7	26.6	0.0	0.0

pH

pH reflects the degree to which a fluid is acidic or basic with 7.0 S.U. being neutral. Excessive nutrient enrichment can indirectly affect pH levels via increased algal activity and the associated photosynthesis and respiration. The natural cycle of photosynthesis during daytime and respiration during nighttime can be exaggerated leading to an increase in the diel flux of pH levels similar to how it affects D.O. (Zheng and Paul 2009). The pH values in the Upper Des Plaines River survey area were recorded via grab samples at 20 locations during the summer-fall index period and continuously using Datasonde units that were deployed for 4-5 days during mid-late July 2022. The latter was done at 14 sites in addition to the three (3) units that

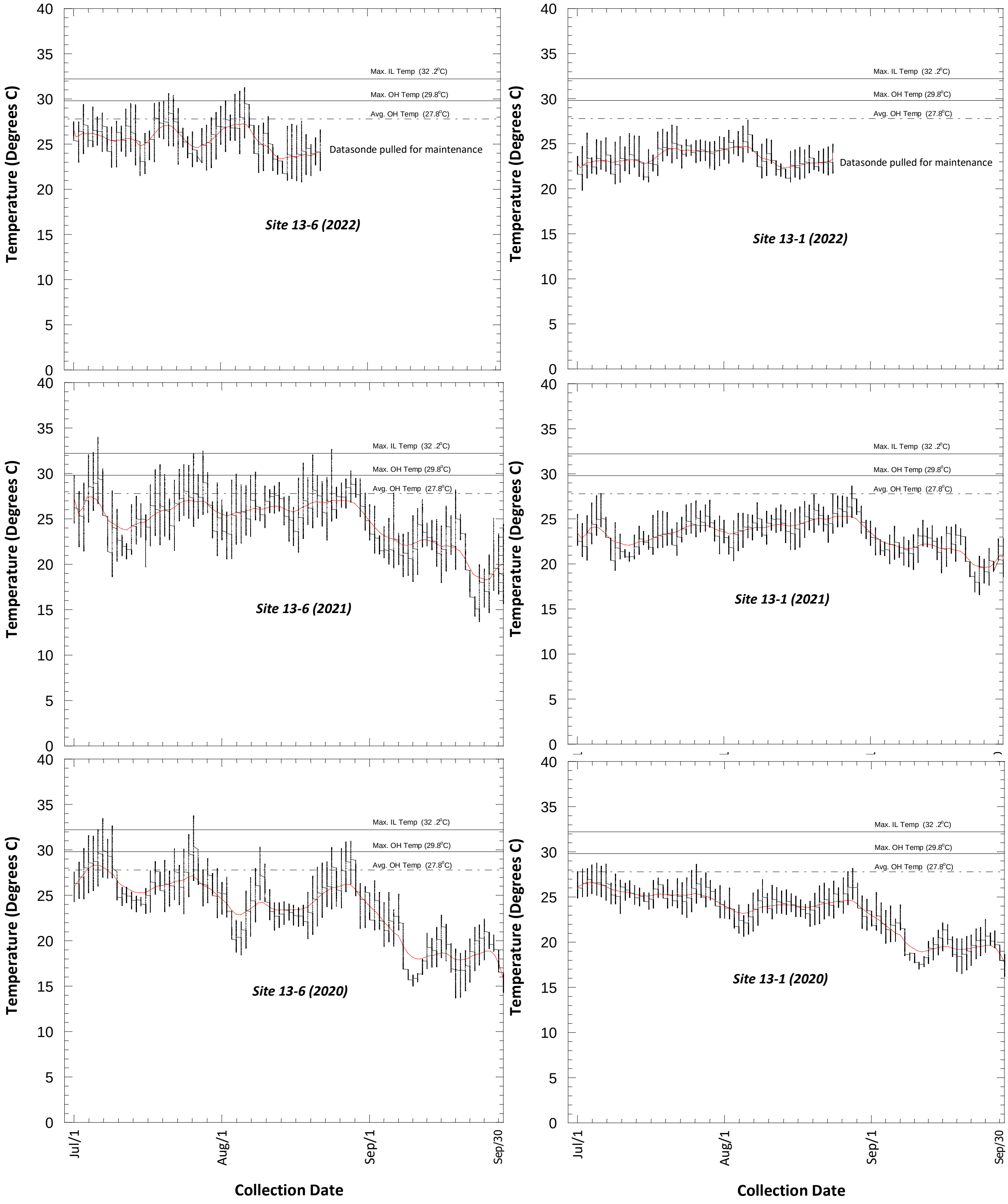
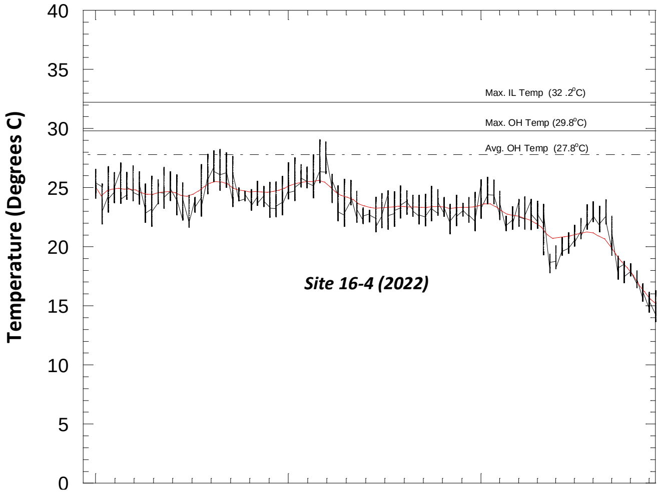
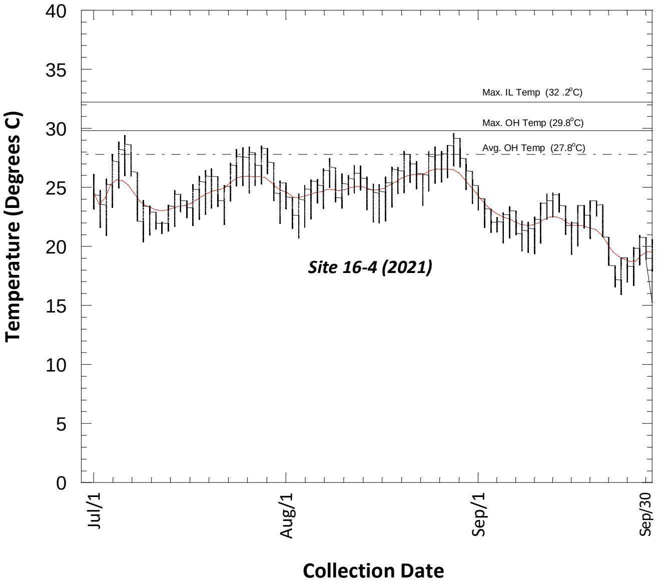


Figure 11. Maximum, mean, and minimum daily temperature values at DRWW permanent Datasonde locations at sites 13-6 and 13-1 in the Upper DesPlaines River mainstem in 2022 (upper), 2021 (middle), and 2020 (lower).





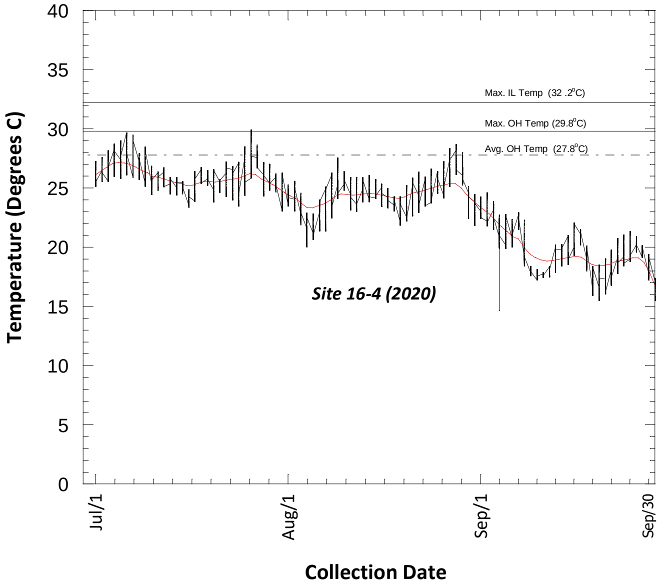


***Figure 12**. Maximum, mean, and minimum daily temperature values at the DRWW permanent Datasonde location at site 16-4 in the Upper DesPlaines River mainstem in 2022 (upper left), 2021 (upper right), and 2020 (lower left).*

were continuously operated by DRWW beginning in June 2020. Median pH levels were >8.0 S.U. between 13-6 (RM 109.3) and 13-2 (RM 96.8) with ranges of 0.4-0.6 S.U. around the median. All sites downstream beginning at site 13-1 (RM 94.2) had median values of 7.5-7.9 S.U. with wider margins between maximum and minimum values and the widest diel swing observed at site 16-1 with numerous outliers above the statistical maximum of 8.5 S.U. reaching 9.0 S.U. (Figure 13). The highest recorded maximum value was observed at site 13-18 in the Wetlands Research impoundment. The site in Mill Creek (11-2) had the most compressed range of pH values of 7.8-8.1 S.U. most likely due to the ameliorating effects of the LCDPW Mill Creek WWTP effluent. The North Fork at site 10-1 had the highest median value of 8.5 S.U. and a wide range of 8.2-9.0 S.U. The median pH values from the grab sample results ranged from 7.5-7.9 in the mainstem with the highest value occurring downstream from the Wetlands Research riffle (13-18). in the North Fork of Mill Creek at site 10-1 (RM 1.1) near the mouth (Table 10). Mill Creek (11-2) and North Mill Creek ay 10-1 had median values of 8.06 and 8.02 S.U. Taken together, the continuous results at all except site 16-1 reflected only slight to moderate effects from nutrient enrichment on pH.

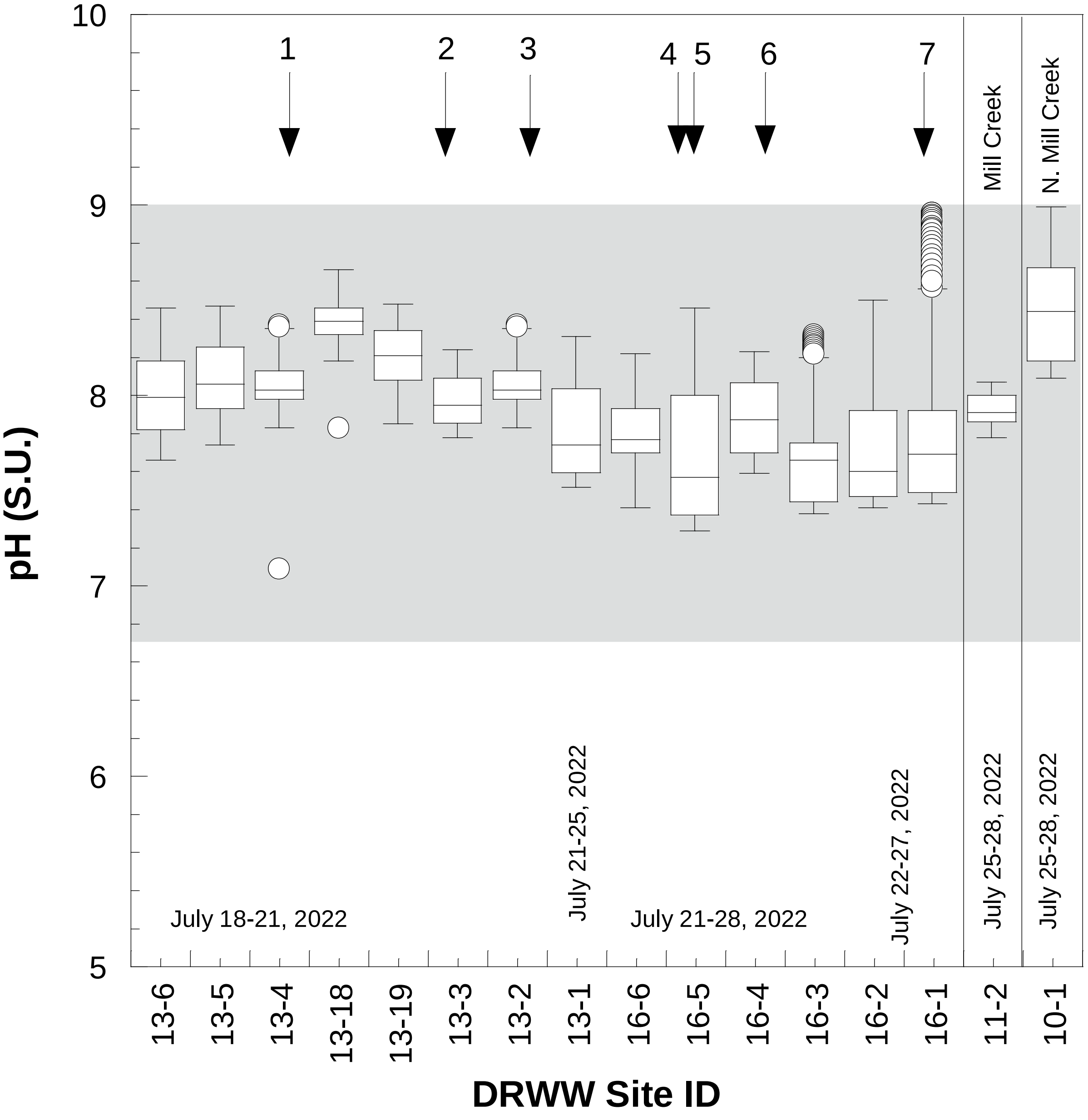


***Figure 13**. pH values measured continuously by Datasondes deployed for 3-4 day periods during mid-late July 2022 at 17 locations. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The shaded area is the range of the Illinois pH standard of 6.5-9.0 S.U. The key to major point sources (arrows and numbers) appears in Figure 5.*

Ammonia-Nitrogen (N)

Levels of ammonia-N have either been below or just above the mean detection level (MDL) in all prior survey years since 2016 with no values that would suggest significant chronic or acutely toxic effects to aquatic life during those surveys. Median values in 2022 were detected only five sites with means more frequently detected, but no more than 0.073 mg/L above the MDL (Figure 14; Table 10). Concentrations of ammonia-N in 2022 were below detection levels from the upstream most site (13-16) downstream to site 16-6 just upstream from the Libertyville WWTP. Downstream from this point median values ranged from poor and very poor at sites 16-7 (RM 84.6), 16-8 (RM 82.9), and 16-3 (RM 76.7) and fair at site 16-4 (RM 80.0). The Mundelein and Libertyville WWTP outfalls are upstream from site 16-7, potentially indicating wastewater as the source of the elevated ammonia-N concentrations at sites 16-7 and 16-8. Indian Creek enters the Des Plaines River upstream from site 16-3 which had the highest median of 0.33 mg/L and maximum value of 1.25 mg/L. DRWW recorded a total ammonia-N value of 3.34 mg/L in Indian Creek at site 15-9 on August 27, 2020 with higher values being recorded in prior years. However, this site is more than 10 miles upstream from the confluence with the mainstem so it is doubtful that these values are related to the elevated mean and maximum values observed at site 16-3 in 2020. Ammonia-N levels were low in Mill Creek with a median of 0.115 mg/L and mean of 0.137 (Table 10). Median values in the North Mill Creek were below the MDL at 10-1 and 0.141 mg/L at 10-7. Mean values were also low at 0.152 mg/L and 0.128 mg/L (Table 10).

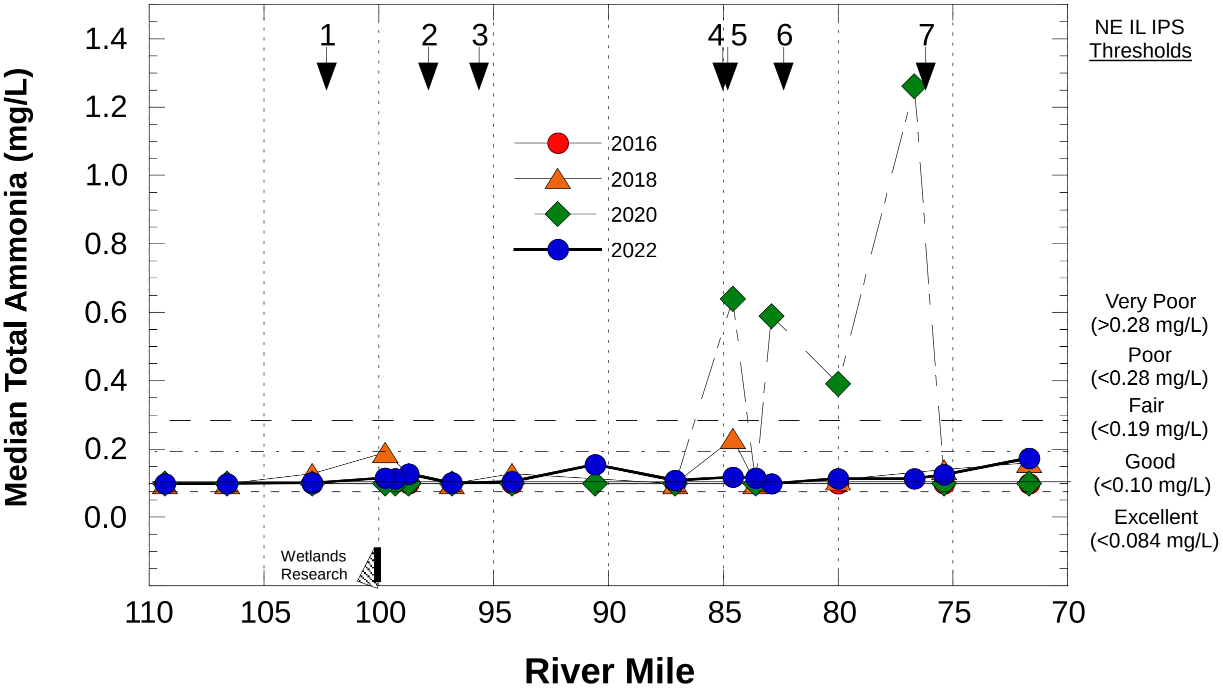


Figure 14. *Concentrations of median ammonia-N in the upper Des Plaines River mainstem during June-October 2016-2022. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in Figure 5.*

Total and Dissolved Phosphorus

Median total phosphorus levels based on grab samples in the mainstem ranged from good to fair IPS thresholds in all years 2016-2020. Median total P values in 2022 reflected a similar pattern to the values observed in 2020 except for lower values in the upper mainstem (Figure 15). The pattern downstream from the Wetlands Research riffle was similar between 2018, 2020, and 2022 and well below the higher values in 2016. Median total P values in the highly modified section of the upper Des Plaines mainstem were in the excellent range downstream to site 16-7. The median declined into the good range downstream from Libertyville where it remained downstream to site 13-3. The longitudinal pattern that was indicative of wastewater treatment plant inputs in 2016 has not been observed since and corresponds to an substantial reduction in point source total P loadings over that period. Median total phosphorus levels ranged from good to excellent in Mill Creek (11-2) and North Mill Creek (10-7), but were highly elevated at 0.525 mg/L in North Mill Creek at site 10-1 (Table 10).

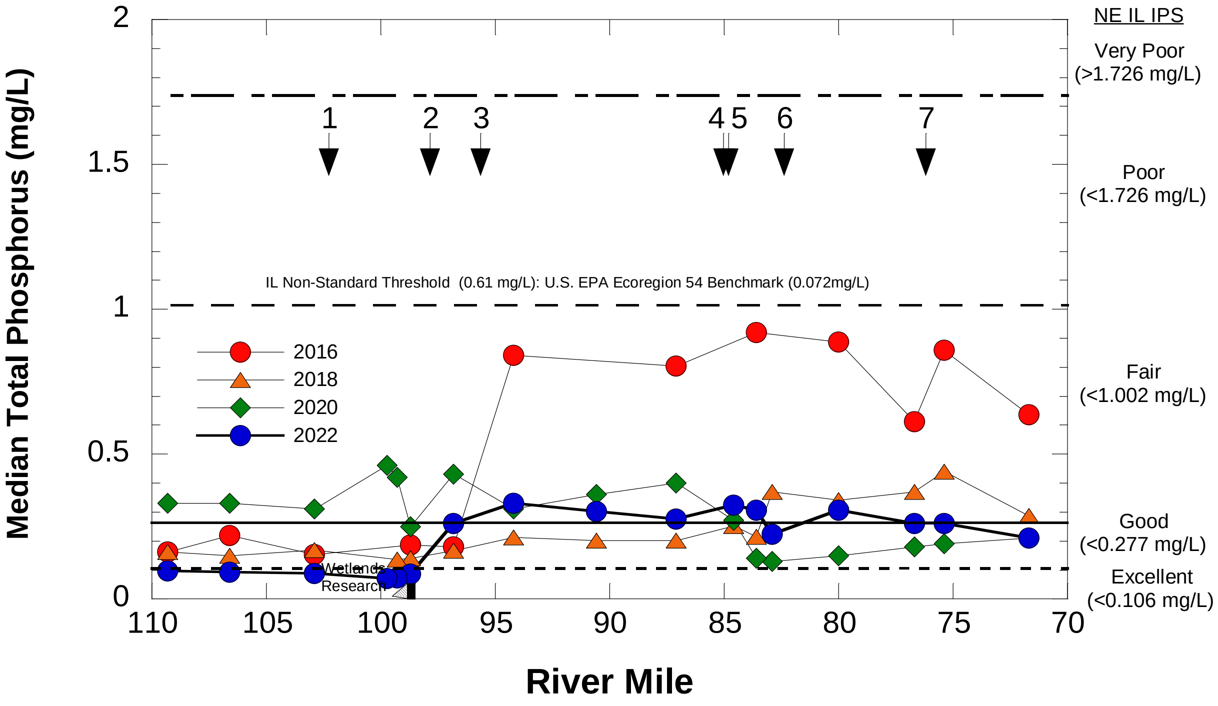


***Figure 15**. Concentrations of median total phosphorus in the upper Des Plaines River mainstem during June-October 2016-2022. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in Figure 5.*

The dissolved form of inorganic phosphorus was also measured as orthophosphate in 2022 which was compared to the total P results (Table 10). Dissolved phosphorus was analyzed for the first time in 2020 in support of NARP development for the upper Des Plaines mainstem POTWs. Median dissolved P generally tracked total P along the longitudinal continuum, but the difference between total and dissolved was greater upstream from the effluent dominated portion of the mainstem at most sites downstream from the NSWRD Waukegan WRF. This is an indication of the fraction of total P as dissolved P between nonpoint and point sources, the fraction as dissolved being higher with the latter in the mainstem. The Mill Creek and North Mill Creek dissolved P levels reflected nonpoint source inputs. The 2022 results are also reported as median values in Table 10 along with the difference between median total P and orthophosphate values at each site. Using a difference of 0.100 mg/L as a benchmark, the difference was <0.100 mg/L at site 13-6 (RM 109.3) only. The remaining sites were a difference of 0.043-0.076 mg/L. IN 2020 the differences were greatest in the upper mainstem between sites 13-6 (RM 109.3) and 13-19 (RM 99.72) which includes the channel and flow modified reach of the mainstem. The difference suggests that the fraction of total P that is readily available is lower than in the downstream effluent dominated reach of the mainstem. A difference >0.100 mg/L was also observed at 0.158 mg/L in the North Fork Mill Creek at site 10-1 (RM 1.10) in 2020, but was 0.091 mg/L in 2022. The role of total P (and other indicators) as a contributor to overall nutrient enrichment effects was evaluated as part of the modified SNAP procedure (Ohio EPA 2015b) discussed later.

Sestonic Chlorophyll a

Chlorophyll allows photosynthesis in plants (including algae) by using sunlight energy to convert simple molecules into organic compounds under aerobic conditions. Chlorophyll a is the predominant type of chlorophyll found in green plants and algae. Sestonic chlorophyll a is measured as biomass per unit volume in μg/L and benthic chlorophyll a is measured as biomass per unit area in mg/m^2. In flowing waterbodies the relationship between nutrient enrichment and chlorophyll a levels is complex. The poor relationship between the concentration of primary nutrients such as phosphorus and nuisance levels of chlorophyll a is due in part to the delay in algae being able to utilize nutrients to produce excessive chlorophyll a biomass (Miltner 2018). As a result, algal biomass as measured by chlorophyll a will increase with distance downstream from a nutrient source with factors such as flow volume, velocity, retention time and the variability of how each factor influences this dynamic. Chlorophyll a levels can vary widely within and between seasons and years again depending on factors such as the flow regime, retention time, and temperature in addition to nutrient loadings and their availability to spur algal growth. The water quality impacts of excessive algal biomass as measured by chlorophyll include a widened “swing” in the diel D.O. cycle, aesthetic impacts, and human health risks when toxic forms of algae are present. The principal emphasis in the 2022 survey is on aquatic life impacts due to modifications to the D.O. regime. However, indicators of cultural eutrophication were evaluated as well and include an enhanced version of the IEPA Risk of Eutrophication. Chlorophyll a was sampled as both sestonic and benthic forms in 2022. Sestonic chlorophyll a was collected as part of the grab water sampling during June-October and benthic chlorophyll a was collected during the short-term deployment of the Datasonde monitors at 17 locations.

Sestonic Chlorophyll a in Grab Samples

Median sestonic chlorophyll a biomass in grab samples in 2018, 2020, 2021, and 2022 appear in Figure 16 with both median and mean values in Table 10. The highest levels of mean sestonic chlorophyll a occurred mostly in the upper mainstem in 2021 and 2022 and then declining downstream from the two largest major wastewater treatment discharges, the NSWRD Gurnee and Waukegan WRFs (Figure 16, Table 10). The 2020 values were even and below 10-20 µg/L throughout the mainstem. Fewer sites were sampled in 2018 and the same pattern as 2020 with the exception of a single median value of 65 µg/L at site 16-5 (RM 83.6) in 2018. The high values in 2021 and 2022 are in the channel and flow modified upper reach that exhibits multiple indications of the effects of excessive nutrient enrichment.

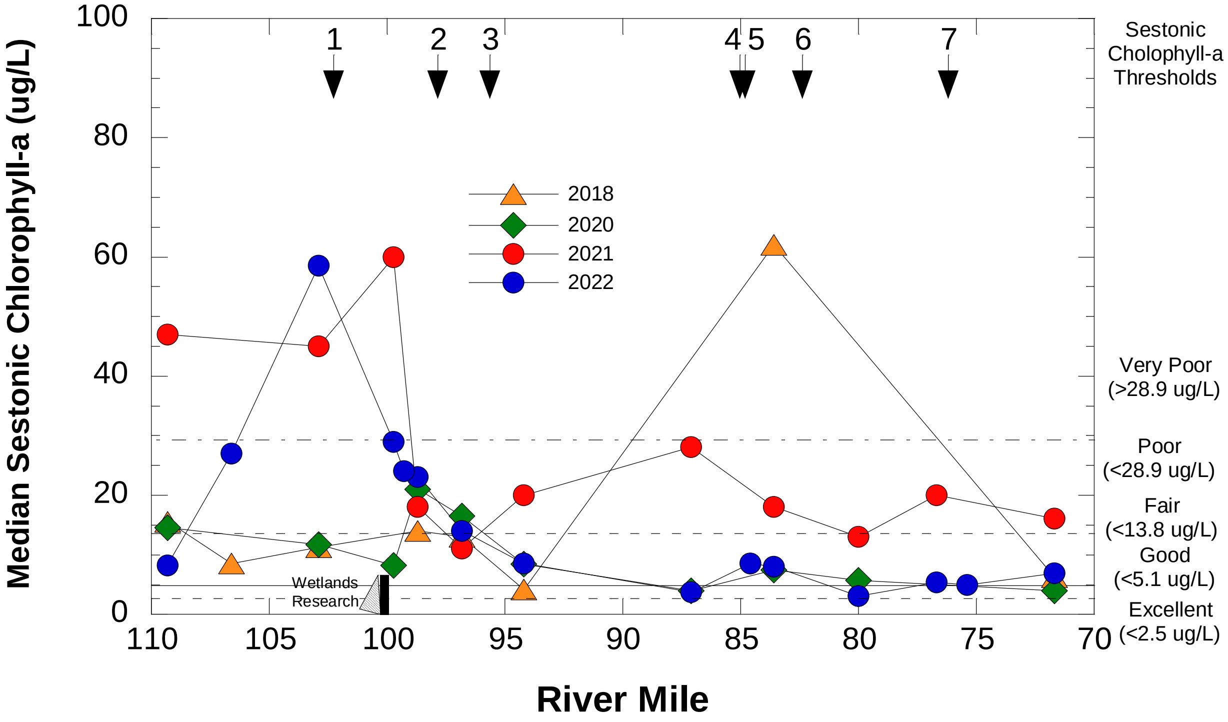


***Figure 16**. Concentrations of median sestonic chlorophyll a in the upper Des Plaines River mainstem during June-October 2018-2022. Dashed and solid lines represent various effect thresholds. A key to sources (arrows and numbers) is in Figure 5.*

Long-Term Sestonic Chlorophyll a Analysis

An analysis of long term sestonic chlorophyll a data from the three permanent Datasondes deployed by DRWW was conducted over the summer-early fall period for the years 2020, 2021, and 2022 the same as for D.O. and temperature. The statistics for minimum, mean, and maximum values and exceedance durations for the excellent to very poor thresholds and an extreme over-enrichment threshold were developed for a long term period of July 1-September 30 and a short-term period that is used in the SNAP analysis (Table 14). The upstream Datasonde at site 13-6 (RM 109.3) consistently and with few exceptions showed the highest and longest lasting exceedances of elevated values indicative of chronic nutrient enrichment. The long term data revealed two extremely high maximum values 658.4 µg/L and 221.0 µg/L in 2020 and 2021 at site 13-6 that exceeded the Ohio nuisance threshold of 165 µg/L (Miltner 2018). Another extreme outlier of 237.6 µg/L was measured at site 16-4 in 2022. Minimum and mean values were highest at 13-6 with means in 2020 and 2021 being higher by a wide margin over the other two sites. The wide difference between the mean and maximum values and visually in Figures 17 and 18 demonstrate the high variability across a season in a particular year. The daily variability at site 13-6 was not unlike the diel fluctuations in D.O. especially during low flow years like 2021. The results at 13-6 in 2020 was almost cyclical and likely related to the spates of low level increases in flow that suppressed algal activity. The results at sites 13-1 and 16-4 were consistently lower, but each had a few short term extreme maximums.

***Table 14**. Results of the analysis of long term Datasonde sestonic chlorophyll a data during July 1-September 30 at the three permanent DRWW sites 13-6, 13-1, and 16-4. The long term statistics include the minimum, mean, maximum and % hours less than the excellent, good, fair, and poor thresholds and exceedances of the very poor and over-enriched thresholds. The short-term intervals from 2020 and 2022 are shown for comparison. Yellow highlighted values are the highest values between the three sites.*

Site ID	River Mile	Days	Hours	Earliest Date	Latest Date	Long-term Interval Sestonic Chlorophyll a Summary Statistics								
						Min. Chla (µg/L)	Mean Chla (µg/L)	Max. Chla (µg/L)	% Hours <2.5 µg/L	% Hours <5.1 µg/L	% Hours <13.8 µg/L	% Hours <28.9 µg/L	% Hours Max. >28.9 µg/L	% Hours Max. >100 µg/L
2022														
13-6	109.3	53	1247	1-Jul	30-Sep	4.4	9.3	51.2	0.0	0.8	90.6	99.8	0.2	0.0
13-1	94.2	55	1311	1-Jul	30-Sep	2.2	6.7	34.8	4.1	62.0	88.8	99.2	0.8	0.0
16-4	80.0	92	2199	1-Jul	30-Sep	1.8	4.3	237.6	13.2	77.0	99.4	99.9	0.1	0.1
2021														
13-6	109.3	92	2194	1-Jul	30-Sep	6.0	26.0	222.1	0.0	0.0	20.0	67.4	32.5	0.4
13-1	94.2	92	2171	1-Jul	30-Sep	1.6	3.7	105.8	25.0	87.1	98.4	100.0	0.0	0.0
16-4	80.0	92	2175	1-Jul	30-Sep	1.8	3.3	41.0	18.2	96.4	98.5	100.0	0.0	0.0
2020														
13-6	109.3	92	2206	1-Jul	30-Sep	6.3	22.6	658.4	0.0	0.0	44.1	72.8	27.2	0.0
13-1	94.2	92	2204	1-Jul	30-Sep	2.2	9.3	43.3	0.5	13.5	87.0	99.2	0.8	0.0
16-4	80.0	88	2087	1-Jul	30-Sep	0.1	9.0	393.3	12.9	36.8	80.6	97.6	2.3	0.0

Site ID	River Mile	Days	Hours	Earliest Date	Latest Date	Short-term Interval Sestonic Chlorophyll a Summary Statistics								
						Min. Chla (µg/L)	Mean Chla (µg/L)	Max. Chla (µg/L)	% Hours <2.5 µg/L	% Hours <5.1 µg/L	% Hours <13.8 µg/L	% Hours <28.9 µg/L	% Hours Max. >28.9 µg/L	% Hours Max. >100 µg/L
2022														
13-6	109.3	4	96	18-Jul	21-Jul	4.4	9.2	33.8	0.0	2.1	91.1	99.7	0.3	0.0
13-1	94.2	4	96	18-Jul	21-Jul	2.3	3.3	6.5	14.6	93.8	100.0	100.0	0.0	0.0
16-4	80.0	6	144	22-Jul	27-Jul	2.1	2.7	4.3	29.5	100.0	100.0	100.0	0.0	0.0
2020														
13-6	109.3	4	96	24-Aug	27-Aug	23.1	45.1	82.3	0.0	0.0	0.0	10.9	89.1	0.0
13-1	94.2	4	96	21-Aug	24-Aug	5.8	7.2	26.6	0.0	0.0	99.5	100.0	0.0	0.0
16-4	80.0	4	96	21-Aug	24-Aug	1.9	5.2	16.4	2.6	57.0	99.7	100.0	0.0	0.0

The difference between the long term and short term statistics for 2022 and 2020 were evident in the relatively low maximum values, high minimum values, and the high percentage of hours >28.9 µg/L in 2020 at site 13-6. Agreement occurred for the means and that 13-6 exhibited the highest sustained sestonic chlorophyll a levels compared to the other two sites. The short-term data was used on the SNAP analysis discussed later.

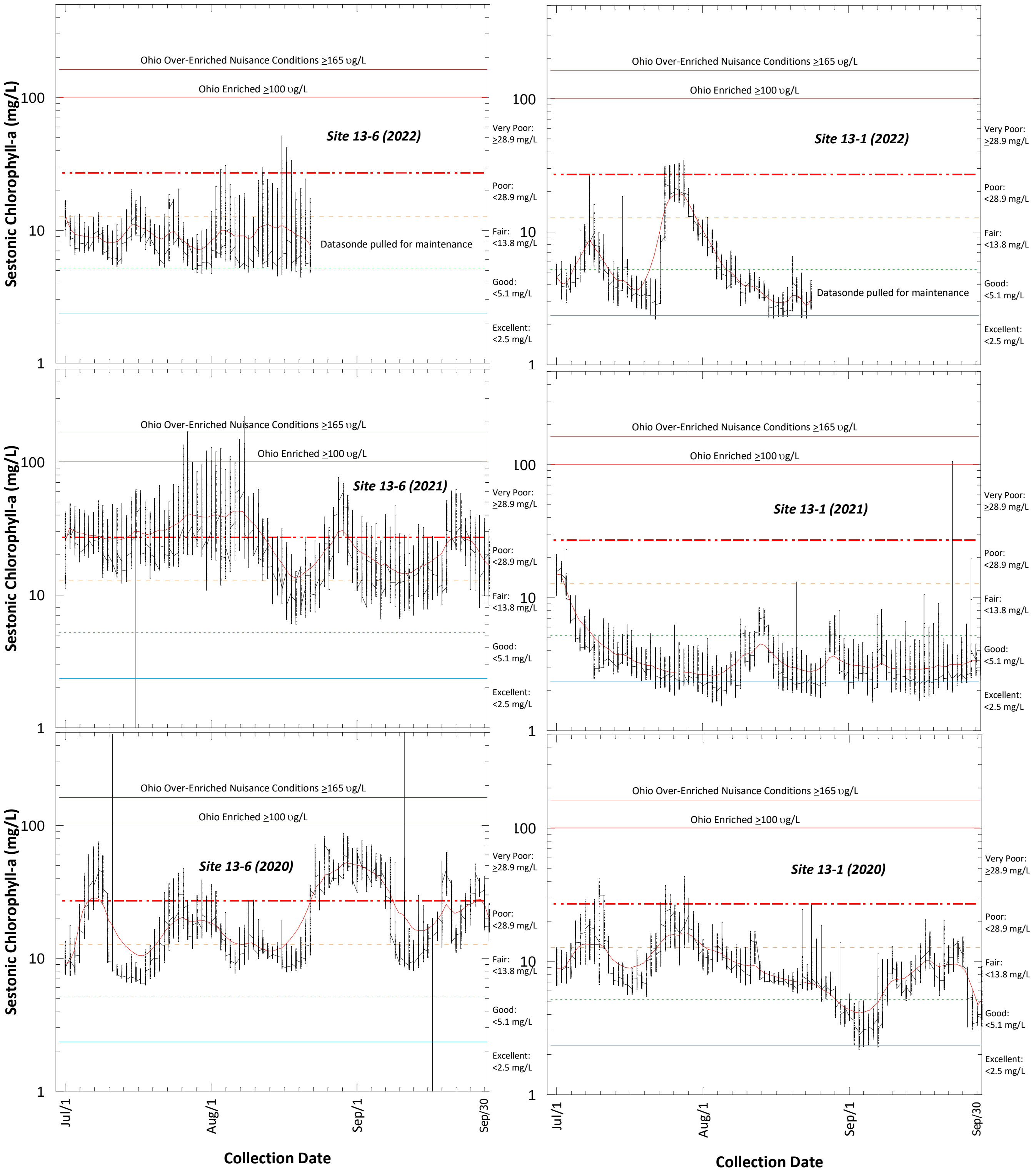


***Figure 17**. Maximum, mean, and minimum daily sestonic chlorophyll a values at DRWW permanent Datasonde locations at sites 13-6 and 13-1 in the Upper DesPlaines River mainstem in 2022 (upper), 2021 (middle), and 2020 (lower).*

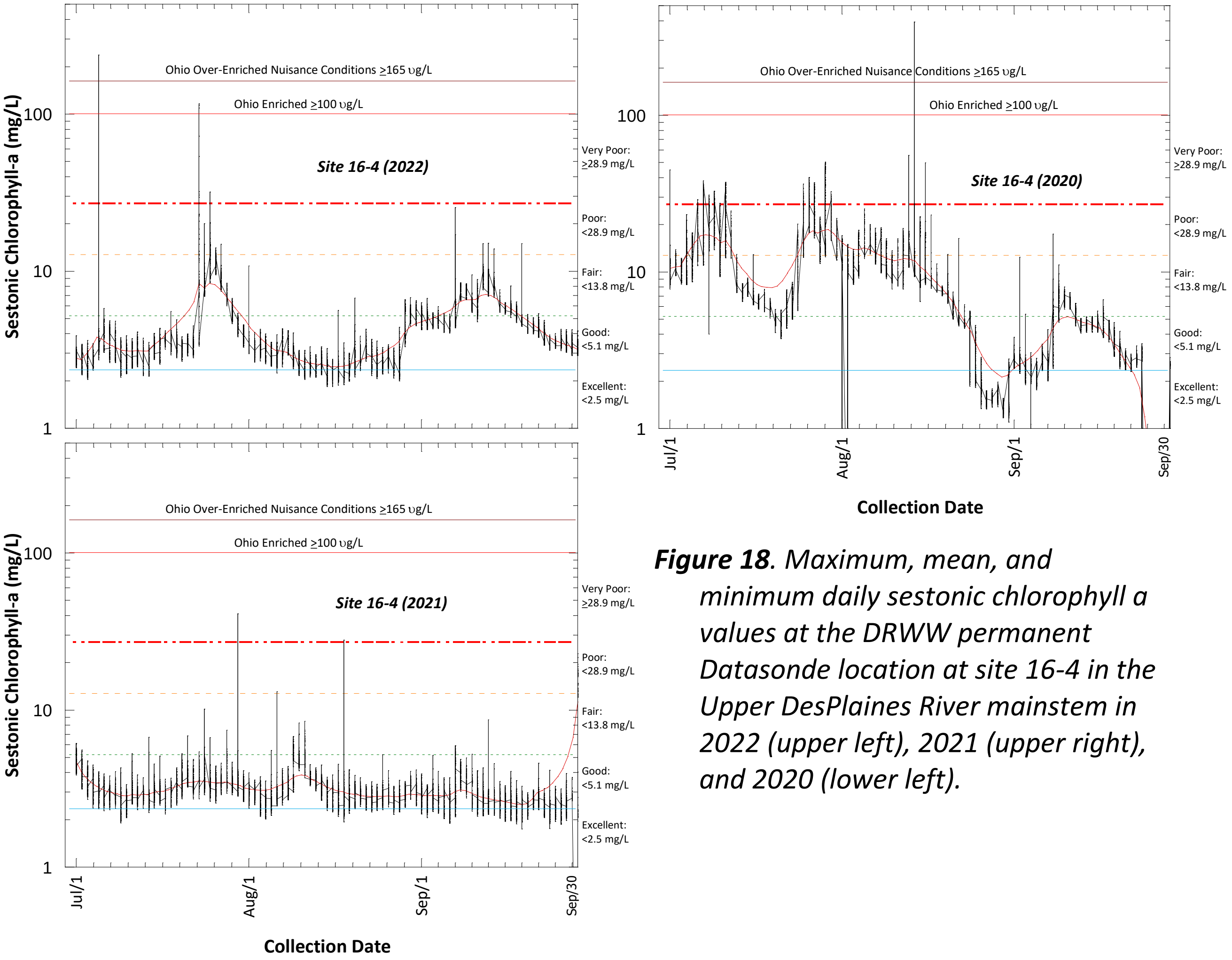


***Figure 18**. Maximum, mean, and minimum daily sestonic chlorophyll a values at the DRWW permanent Datasonde location at site 16-4 in the Upper DesPlaines River mainstem in 2022 (upper left), 2021 (upper right), and 2020 (lower left).*

Total Nitrate-N (NO_3-N)

Median total nitrate-N concentrations were very low ranging from 0.210-0.072 mg/L in the upper mainstem downstream to site 13-2 (RM 96.82) located just downstream from the NSWRD Waukegan WRF (Figure 19; Table 10). Both median and mean concentrations increased sharply downstream from this point and then declined steadily between sites 16-8 (RM 82.9) and 16-1 (RM 71.7) where the median and mean values returned to excellent and good. The longitudinal pattern reflects the nitrate-N loadings from the largest wastewater treatment facilities which by far dominate effluent mass loadings although there has been a 16.1% reduction since 2016. The trend has been similar in each year except 2016 when upstream values were >1.00 up to 3.50 mg/L. Values were in the excellent range of the IPS thresholds at and upstream from site 13-2. The median value in 2022 at site 13-1 (RM 94.2) downstream from the NSWRD Gurnee WRF increased into the good and fair ranges. The highest median value of 7.07 mg/L in the poor range occurred at site 13-16 (RM 90.6) and was accompanied by the highest and very poor mean value of 9.69 mg/L (Table 10), an indication of variability between individual results at the same location. Mean values remained elevated in the poor range downstream to 16-4 (RM 80.0) after which both the median and mean both declined The longitudinal pattern was similar to the 2016 and 2018 results except with higher median nitrate-N concentrations in the lower mainstem in 2020. Median total nitrate-N concentrations

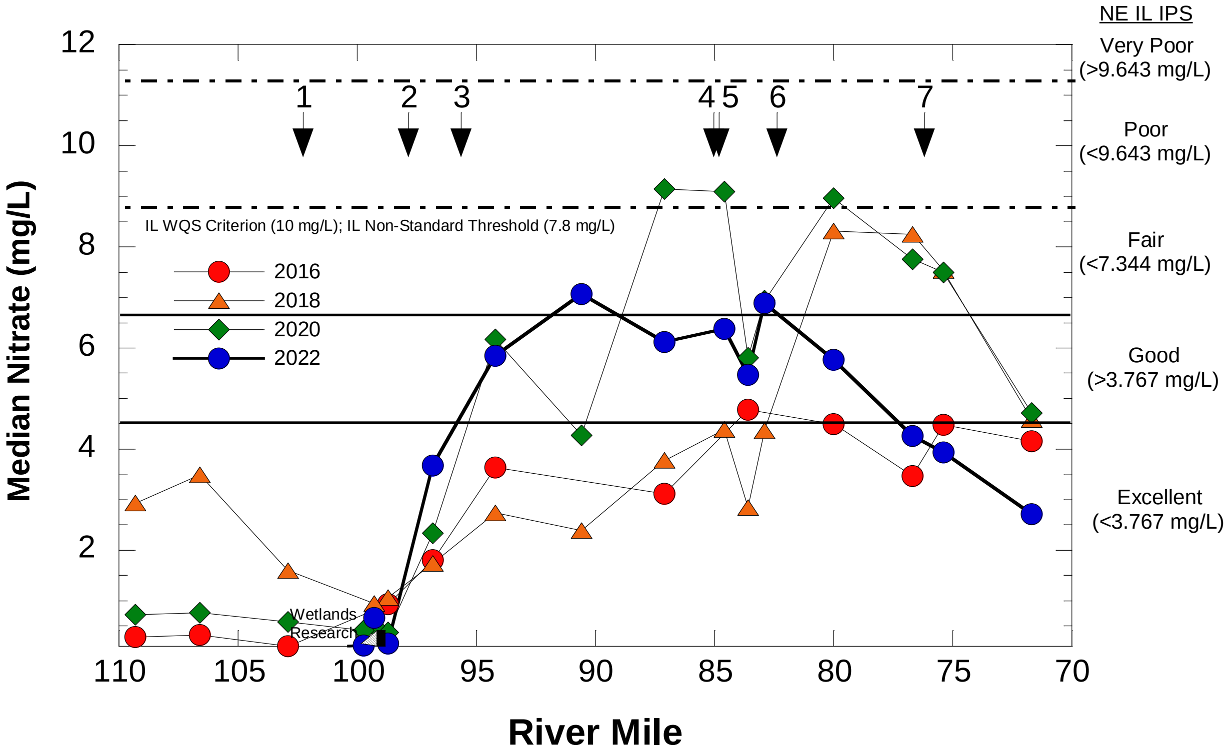


***Figure 19**. Concentrations (mg/L) of median nitrate-N in the upper Des Plaines River mainstem during June-October 2016-2022. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in Figure 5.*

in the Mill Creek and North Mill Creek sites were in the excellent or good range at each location (Table 10). The role of nitrate-N (and other indicators) as a contributor to overall nutrient enrichment effects was evaluated as part of the modified SNAP procedure (Ohio EPA 2015b) discussed later.

Total Kjeldahl Nitrogen (TKN)

Organic nitrogen as measured by Total Kjeldahl Nitrogen (TKN), an indicator of the living or recently dead fraction of sestonic algae, is an informative indicator of nutrient enrichment. While TKN is not a direct effect parameter, it is indicative of the effects of organic enrichment by nitrogenous biomass. Median TKN values in 2022 were mostly in the good range (Figure 20). In 2020 TKN ranged from mostly fair to poor at three mainstem sites. There was little variation between the mean and median values in 2022 (Table 10). Overall, median concentrations of TKN were generally lower than in 2018 and 2020, particularly in the wastewater effluent dominated reaches of the mainstem. The longitudinal pattern in the 2022 resembled 2016 and both years had extended periods of low flows. TKN values at the Mill Creek were elevated into the fair range while and North Mill Creek had an excellent value upstream at site 10-7 and a fair value at the downstream site 10-1 (Table 10). The role of TKN (and other indicators) as a contributor to overall nutrient enrichment effects was evaluated as part of the modified SNAP procedure.

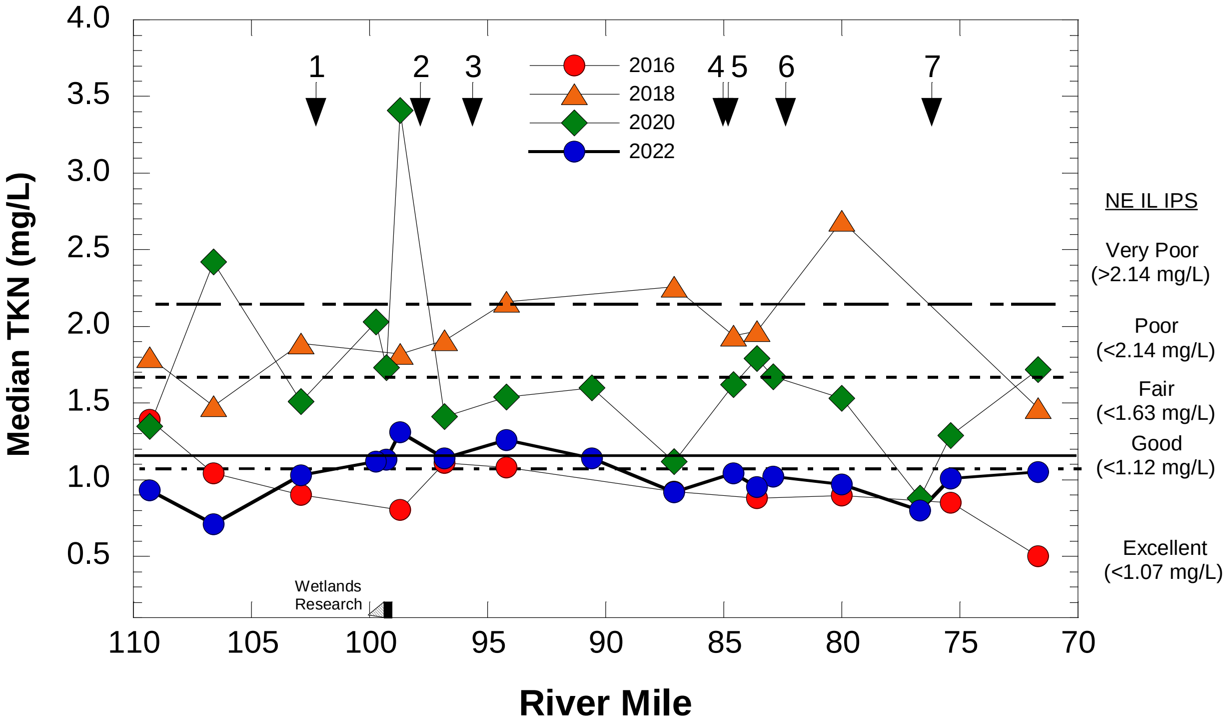


***Figure 20**. Concentrations (mg/L) of median total Kjeldahl nitrogen (TKN) in the upper Des Plaines River mainstem during June-October 2016-22. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in Figure 5.*

Total Suspended Solids (TSS)

Total suspended solids (TSS) can reflect either inorganic suspended sediment and/or organic matter in the form of sestonic algae and other organic debris. Median concentrations of TSS ranged from poor in the highly modified section of the survey area to excellent downstream of the Wetland Research riffle with a steep decline in values between those two sites in 2022 (Figure 21). The longitudinal pattern matches that observed in 2018 and 2020 and suggests that the input of treated wastewater generally coincided with decreased concentrations of TSS in the effluent dominated reach of the Des Plaines River. A spike in TSS comparable to the upstream values occurred in the lower reach at sites (16-4 (RM 80.0) and 16-3 (RM 76.7) downstream from the LCDPW New Century Town WWTP. An exceedance of the fair threshold occurred at site 11-2 (RM 1.71) in Mill Creek. North Mill Creek had a fair median, but poor mean at site 10-7 while site 10-1 had excellent levels of TSS (Table 10). The relationship between the mean and median TSS values was largely comparable except at two sites (16-3 and 10-7) that had means in the very poor range and medina values in the fair range. The role of TSS (and other indicators) as a contributor to overall nutrient enrichment effects was evaluated as part of the modified SNAP procedure (Ohio EPA 2015b).

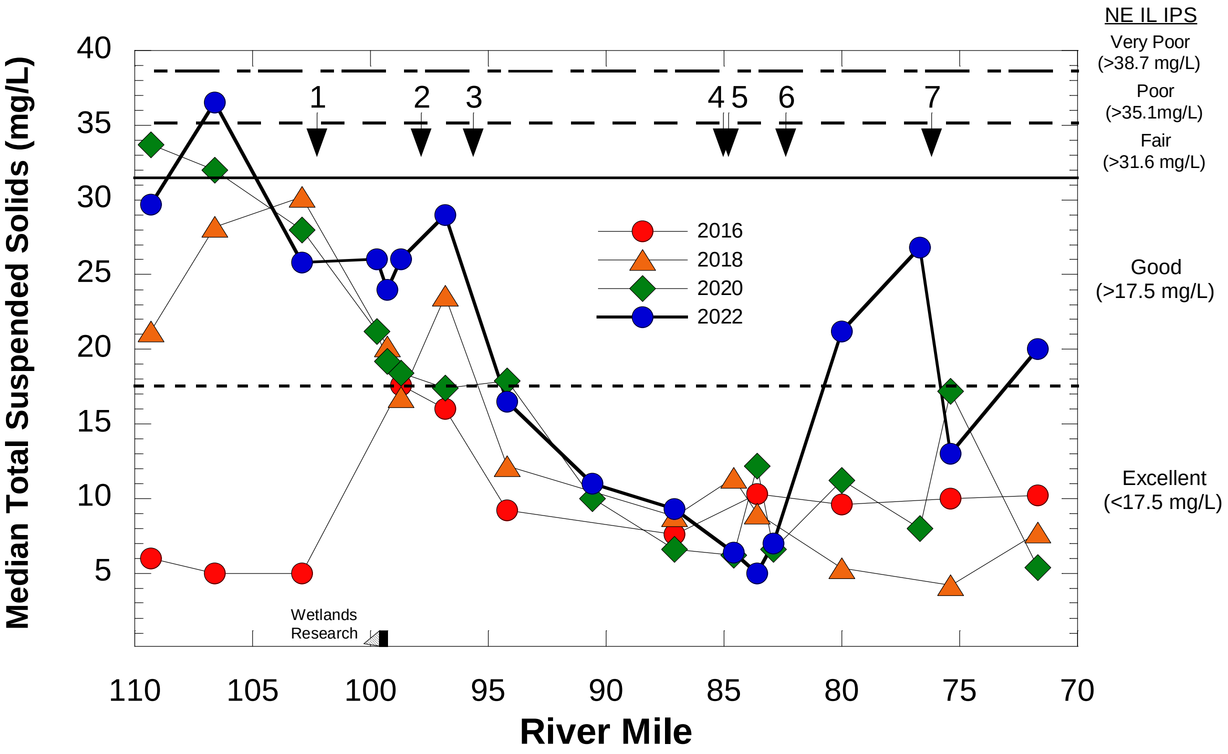


Figure 21. *Concentrations (mg/L) of median total suspended solids (TSS) in the upper Des Plaines River mainstem during June-October 2016-2022. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in Figure 5.*

Nutrient Effects Assessment

The impact of nutrients on aquatic life has been well documented (e.g., Allan 2004), but the derivation of criteria and their form and application are only just now emerging. 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 it has been a controversial issue (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 and the resulting increased magnitude of diel D.O. swings and by the oxygen demand exerted by algal decomposition. Nutrients can also affect food sources for macroinvertebrates and fish and the response of aquatic life to elevated nutrients is co-influenced by habitat (e.g., substrate composition), stream flow (e.g., scouring and dilution), temperature, and 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 to the Gulf of Mexico where an anoxic zone has developed (U.S. EPA 2008). In Illinois, as in neighboring Midwestern states that drain to the Mississippi River, efforts are underway to modernize nutrient water quality criteria. However, nutrient export is not the only concern – local impacts are also important and the focus of this evaluation is on reach scale effects in the upper Des Plaines

River mainstem. The assessment of nutrient effects on aquatic life was conducted using the modified SNAP procedure and an enhanced version of the IEPA Risk of Eutrophication (ROE) for cultural eutrophication.

The SNAP is a combined assessment that emphasizes indicators of the effects of nutrient enrichment as opposed to the more limited focus on concentrations of primary nutrient parameters. A multiparameter approach modified from the Ohio SNAP methodology (Ohio EPA 2015a) and the newer large rivers methodology (Miltner 2018), and as described in the Methods section, was employed in a progressive manner as has been done previously in other DRWW assessments since 2017. The results are detailed in a matrix that shows the fish and macroinvertebrate IBIs, the QHEI habitat score, the primary nutrient parameters total P and nitrate-N, the secondary parameters TKN and TSS, the maximum and minimum D.O. based on short-term Datasonde deployments, the width of the diel D.O. swing, benthic chlorophyll a (as biomass), and sestonic chlorophyll a. This assessment produces an overall rating of the degree of nutrient enrichment based on the frequency and magnitude of exceedances of thresholds for the aforementioned indicators and parameters expressed as the total SNAP score. This was done with data collected at 16 sites in the 2022 study area (Table 15). The SNAP score is obtained by summing the parameter-specific SNAP scores that are weighted higher for five primary indicators – fIBI, mIBI, diel D.O. swing, minimum D.O., benthic chlorophyll a, and sestonic chlorophyll a, less for three secondary parameters – QHEI, total phosphorus, and maximum D.O., and the least for three tertiary parameters – total nitrate-N, TSS, and TKN. The total SNAP score is normalized to a 0-100 scale with the severity of nutrient enrichment increasing inversely to the total SNAP score (see bottom of Table 15). 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 nutrient related parameters and SNAP indicators exceeded their respective primary, secondary, and tertiary thresholds. The Highly Enriched and Enriched narratives are assigned when the indicators are exceeded in terms of the number and magnitude of poor and very poor exceedances that are associated with a biological impairment. The Likely Nutrients narrative is assigned when there is a predominance of fair exceedances, but an insufficient number and/or magnitude of poor or very poor exceedances to warrant Enriched status. Hence, it serves as an indication where a threat for adverse effects from nutrient enrichment exists. The Not Nutrients narrative rules out nutrient effects as a cause of impairment and it is always assigned to sites that exhibit full attainment of the General use biocriteria.

Stream Nutrient Assessment Procedure (SNAP) 2022 Results

The SNAP results for 2022 showed that overall nutrient enrichment status was the most serious in the upper mainstem particularly so in the flow and habitat modified reach where the Enriched status was assigned to site 13-6 (RM 109.30) and Highly Enriched to sites 13-5 (RM 106.60) and 13-4 (RM 102.9). Enriched status was assigned at site 13-18 in the Wetland Research impoundment, site 13-3 (RM 98.7), and site 16-1 (RM 71.7) in the mainstem. Enriched was also assigned to site 10-1 (RM 1.1) in North Mill Creek. Four mainstem sites (13-19, 16-5, 16-4), and 16-2). Site 11-2 in Mill Creek was also rated as Likely Nutrients. The remaining four

***Table 15**. Results of applying a modified Stream Nutrient Assessment Procedure to the 2022 Year 5 Upper Des Plaines River study area. Descriptions of how each result reflects the degree of nutrient enrichment effects and which results in an assignment of overall enrichment status are shown at the bottom of the matrix along with the source of the thresholds for each primary (blue shaded), secondary (green shaded), and tertiary (tan shaded) parameter. The weighted SNAP score for each parameter and the total SNAP score for deriving the overall enrichment status are shown adjacent to each site parameter value. Biological sampling sites that lacked continuous D.O. data were not assigned an overall enrichment status. The enhanced IEPA Risk of Eutrophication (ROE) result is listed alongside the Overall Enrichment Status.*

Site ID	River Mile	Drain-age Area (mi.^{2})	fIBI	fIBI Score	mIBI	mIBI Score	QHEI	QHEI Score	AQLU Attainment Status	Mean TP (mg/L)	Total P Score	Mean Nitrate (mg/L)	NO$_3$-N Score	Max. D.O. (mg/L)	Max. D.O. Score	Min D.O. (mg/L)	Min. D.O. Score	Max. Diel D.O. Swing (mg/L)	Diel Swing Score	Mean TSS (mg/L)	TSS Score	Mean TKN (mg/L)	TKN Score	Benthic Chloro-phyll a (mg/m^3)	BChl a Score	Sestonic Chloro-phyll a (mg/L)	Sest. Chla Score	Total SNAP Score	Overall Enrichment Status	Risk of-Eutrophica-tion
Des Plaines River																														
13-6	109.3	123.7	30.5	3.0	37.1	3.0	49.00	5.00	NON - Fair	0.18	1.00	0.54	0.00	18.29	2.00	1.72	6.00	11.42	10.00	25.9	0.5	0.92	0.00	11.8	0.0	13.9	7.0	60	Enriched	High Risk
13-5	106.6	137.3	26.5	7.0	37.2	3.0	35.80	5.00	NON - Fair	0.09	0.00	0.14	0.00	11.00	1.00	2.59	5.00	6.81	10.00	31.7	1.0	0.74	0.00	18.5	0.0	33.3	10.0	54	Highly Enriched	Very High Risk
13-4	102.9	145.6	28.0	7.0	32.7	3.0	46.00	5.00	NON - Fair	0.09	0.00	0.41	0.00	8.97	0.00	3.66	5.00	5.08	7.00	31.9	1.0	1.04	0.00	13.9	0.0	64.8	10.0	57	Highly Enriched	Very High Risk
13-18	99.7	212.9	23.5	7.0	32.3	3.0	38.00	5.00	NON - Fair	0.07	0.00	0.60	0.00	12.69	1.00	5.77	2.00	5.58	7.00	24.9	0.5	1.29	1.00	12.1	0.0	29.5	10.0	60	Enriched	High Risk
13-19	99.3	213.2	37.0	3.0	32.3	3.0	74.80	2.00	NON - Fair	0.08	0.00	0.77	0.00	8.49	0.00	3.06	5.00	3.39	1.00	22.1	0.5	1.10	0.50	36.7	1.0	23.3	7.0	75	Likely Nutrients	High Risk
13-3	98.7	220.3	32.5	3.0	42.1	1.0	72.80	2.00	NON - Part	0.09	0.00	0.54	0.00	10.82	0.50	1.52	6.00	9.30	10.00	22.6	0.5	1.25	1.00	35.9	1.0	22.2	7.0	67	Enriched	High Risk
13-2	96.8	225.4	43.5	1.0	46.2	1.0	78.30	1.00	Full	0.26	1.00	7.46	1.50	10.64	0.50	5.55	2.00	4.89	3.00	20.6	0.5	1.07	0.50	36.6	1.0	14.9	7.0	80	Not Nutrients[1]	Risk Present
13-1	94.2	232.0	43.0	1.0	54.9	1.0	66.00	2.00	Full	0.33	2.00	9.44	1.50	15.81	1.50	3.37	5.00	8.50	10.00	18.2	0.5	1.22	1.00	51.4	1.0	8.5	3.0	70	Not Nutrients[1]	Very High Risk
16-6	87.1	261.4	38.0	3.0	69.4	1.0	69.50	2.00	NON - Part	0.27	1.00	9.13	1.50	9.53	0.00	4.14	2.00	4.91	3.00	14.8	0.0	0.91	0.00	44.7	1.0	4.0	1.0	83	Not Nutrients	Risk Present
16-5	83.6	268.1	33.0	3.0	48.2	1.0	60.30	2.00	NON - Part	0.30	2.00	6.21	1.00	12.87	1.00	4.17	2.00	7.87	10.00	15.3	0.0	0.97	0.00	47.4	1.0	5.6	3.0	73	Likely Nutrients	High Risk
16-4	80.0	273.2	32.5	3.0	65.8	1.0	67.00	2.00	NON - Part	0.29	2.00	7.94	1.50	17.03	2.00	3.69	5.00	3.87	1.00	22.5	0.5	1.01	0.00	36.6	1.0	5.4	3.0	78	Likely Nutrients	No Risk
16-3	76.7	314.7	34.5	3.0	48.4	1.0	61.80	2.00	NON - Part	0.27	1.00	6.09	1.00	11.16	0.50	4.52	2.00	3.70	1.00	59.5	2.0	0.87	0.00	16.2	0.0	5.1	1.0	84	Not Nutrients	Risk Present
16-2	75.4	324.0	40.5	3.0	61.3	1.0	59.30	2.00	NON - Part	0.27	1.00	5.72	1.00	13.14	1.00	4.66	2.00	8.26	10.00	16.3	0.0	0.93	0.00	31.8	0.0	5.8	3.0	75	Likely Nutrients	High Risk
16-1	71.7	358.7	36.0	3.0	53.8	1.0	71.00	2.00	NON - Part	0.26	1.00	4.93	0.50	17.77	2.00	3.67	5.00	14.10	10.00	25.5	0.5	0.95	0.00	140.5	3.0	5.3	3.0	69	Enriched	Very High Risk
Mill Creek																														
11-2	1.7	62.3	30.0	3.0	44.7	1.0	83.80	1.00	NON - Part	0.13	1.00	0.91	0.00	7.81	0.00	6.67	1.00	1.07	0.00	27.6	0.5	1.28	1.00	27.3	0.0	29.9	10.0	81	Likely Nutrients	Very High Risk
North Mill Creek																														
10-1	1.1	31.9	18.0	7.0	63.5	1.0	50.00	5.00	NON - Poor	0.53	2.00	1.77	0.00	13.53	1.00	6.78	1.00	6.40	7.00	12.0	0.0	1.35	1.00	34.5	0.0	7.6	3.0	68	Enriched	High Risk
Condition Category Thresholds		**Excellent**	≥50	0	>73	0	>84.5	0	FULL	≤0.106	0	≤3.77	0	<10.36	0	>6.9	0	<2.0	0	<17.50	0	<1.07	0	<35	0	<2.5	0	≥94	Not Nutrients	Insuff. Data
		Good	>41-49	1	41.8-72.9	1	>75.9	1	FULL	<0.277	1	<5.05	0.5	<12.2	0.5	>6.0	1	<4.0	1	>17.50	0.5	<1.12	0.5	<79	1	<5.1	1	≥82	Not Nutrients	No Risk
		Fair	30- <41	3	30-41.7	3	<75.9	2	PARTIAL	<1.020	2	<7.34	1	<14.2	1	>4.0	2	<5.0	3	>31.60	1	<1.63	1	<150	3	<13.8	3	≥70	Likely Nutrients	Risk Present
		Poor	>15-29	7	>15-29	7	<50.1	5	NON-Fair	<1.726	5	<9.64	1.5	<16.3	1.5	>2.0	5	<6.5	7	>35.15	1.5	<2.14	1.5	<320	7	<28.9	7	≥60	Enriched	High Risk
		Very Poor	<15	10	<15	10	<25	6	NON-Poor	≥1.726	6	≥9.64	2	≥16.3	2	<2.0	6	≥6.5	**10**	>38.69	2	≥2.14	2	≥320	10	>28.9	10	<60	Highly Enriched	Very High Risk
Source			**IEPA**		**IEPA**		**IPS**		**IPS**	**IPS**		**IPS**		**IPS**		**IPS**		**MBI/SNAP**		**IPS**		**IPS**		**MBI/SNAP**		**MBI/NSAC**		**MBI/SNAP**		**IEPA ROE**

1 - Not Nutrients assigned to full attainment AQLU status.

mainstem sites were rated as Not Nutrients with two sites (13-2 and 13-1) due to full AQLU attainment. The overall pattern was similar in 2020, particularly in the hydrologically and habitat modified upstream reach between sites 13-6 and 13-4, which had one enrichment and two Highly Enriched assignments. These are related to a mix of low minimum D.O., high maximum D.O., wide diel D.O. swings, and highly elevated mean sestonic chlorophyll a values. A recent statewide analysis of short-term continuous D.O. data sponsored by the DuPage River Salt Creek Workgroup (DRSCW) concluded that low D.O. values were more related to fish and macroinvertebrate quality than to the width of diel swings or maximum D.O. as a proxy for wider diel swings (MBI 2023b). The study also derived low D.O. thresholds that for General Use attainment of the fIBI or mIBI were in line with certain aspects of the Illinois D.O. standard. The long term analysis of the permanent Datasonde at site 13-6 showed extended periods of very low D.O., especially so during periods of low flow such as was the case in 2021. The hydromodification in the upper reaches acts to increase residence or retention time during low flows a factor acknowledged as big a major factor by Mazor et al. (2022).

The frequency of exceedances of the primary SNAP and most of the secondary and tertiary indicators declined in a downstream direction which shows a diminishing effect of nutrients away from the modified reach of upper mainstem being exacerbated locally by the Wetland Research impoundment. The 2022 results in the mainstem were indicative of increased enrichment further downstream than the 2020 or 2018 results. However, it confirmed the overall conclusion of the 2018 and 2020 assessments that the predominant source of nutrient enrichment is nonpoint sources in the upper watershed the effects of which are exacerbated by the legacy of hydrological and physical modifications that are prevalent in the upper mainstem and tributaries. The entry of large volumes of permanent flow via the major wastewater treatment facilities seems to mitigate most of the negative effects that emanate from the upper watershed, but this was less apparent in the 2022 results.

Enhanced IEPA Risk of Eutrophication Results

The “Risk of Eutrophication” (ROE) was developed by IEPA to screen the potential for adverse nutrient related impacts for stream and river reaches that are not listed by IEPA for phosphorus related impairments as part of the NARP process. Developed by the IEPA Risk of Eutrophication Committee[1] the procedure utilizes a flow chart that essentially includes the exceedance of any one of three thresholds for pH (>9.0 S.U.), sestonic chlorophyll a (>26 µg/L), D.O. saturation >110%, and pH >8.35 for two (2) or more days. The Risk of Eutrophication was assessed for the same 16 sites as the SNAP analysis and appear alongside the Overall Enrichment Status (Table 15). The ROE is essentially a cultural eutrophication assessment with three of the four indicators in common with SNAP. MBI added enhancements that produced four levels of risk - Very High Risk, High Risk, Risk Present, and No Risk. The Risk Present and No Risk assignments follow the IEPA flow chart with the High and Very High categories based on greater exceedance thresholds and/or a longer duration of exceedances that result in the risk being extended over a longer period time (Table 16). The median sestonic chlorophyll a criterion was supplemented with the maximum value measured at a site. IEPA specifies examining the previous 5 years of

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[1] Proposal for Phosphorus Conditions in NPDES Permits - Phosphorus-related impairments & eutrophication (January 17, 2018).

***Table 16**. Results of applying an enhanced version of the IEPA Risk of Eutrophication methodology used to screen for the potential for adverse effects of nutrient enrichment on pH, D.O., and sestonic chlorophyll a levels. Enhancements to the ROE include categories that convey the severity of screening criteria exceedances and using the maximum sestonic chlorophyll a in addition to the mean. The results are color coded as follows: Red – Very High Risk; Orange – High Risk; Yellow – Risk Present; No Risk – Green. Specific criteria used are listed at the bottom of the table.*

Site ID	**River**	**River Mile**	**Drainage Area (sq. mi.)**	**Max. pH (S.U.)**	**% DO Saturation**	**Days D.O. Sat. >110%**	**Mean Grab Sestonic Chlorophyll a**	**Max. Grab Sestonic Chlorophyll a**	**Risk of Eutrophication**
13-6	DesPlaines River	109.30	123.7	8.37	123.4	2	13.9	29.0	High Risk
13-5	DesPlaines River	106.60	137.3	8.47	147.0	3	33.3	70.0	Very High Risk
13-4	DesPlaines River	102.90	145.6	8.37	112.5	2	64.8	130.0	Very High Risk
13-19	DesPlaines River	99.72	213.2	8.48	110.7	1	23.3	31.0	High Risk
13-18	DesPlaines River	99.30	212.9	8.66	166.5	3	29.5	37.0	High Risk
13-3	DesPlaines River	98.70	220.3	8.24	118.3	2	22.2	33.0	High Risk
13-2	DesPlaines River	96.82	225.4	8.04	134.3	3	14.9	24.0	Risk Present
13-1	DesPlaines River	94.20	232.0	8.17	150.2	4	8.5	15.0	Very High Risk
16-6	DesPlaines River	87.10	261.4	8.22	123.2	2	4.0	7.6	Risk Present
16-5	DesPlaines River	83.60	268.1	8.46	166.3	2	5.6	11.0	High Risk
16-4	DesPlaines River	80.00	273.2	8.19	110.0	0	5.4	9.0	No Risk
16-3	DesPlaines River	76.70	314.7	8.32	145.2	1	5.1	5.8	Risk Present
16-2	DesPlaines River	75.40	324.0	8.50	171.9	3	5.8	10.0	High Risk
16-1	DesPlaines River	71.70	358.7	8.96	236.9	3	5.3	11.0	Very High Risk
11-2	Mill Creek	1.71	62.3	8.07	96.7	0	29.9	72.0	Very High Risk
10-1	North Mill Creek	1.10	31.9	8.99	164.6	3	7.6	13.0	High Risk
Enhanced IEPA Risk of Eutrophication (ROE) Criteria				Max pH >9.0	%Sat. >200	4 Days	>26 µg/L	Maximum Sestonic Chlorophyll a Used in lieu of Median; >26 µg/L High Risk, >60 µg/l Very High Risk	pH >9.0 S.U.; **or** Median Sestonic Chloropyll a >26 **or** Daily Maximum pH >8.35 S.U. **and** Daily Maximum D.O. Saturation >110% for 2 or more days.
				Max pH >8.35	%Sat.>110	3 Days			
				Max pH >8.35	%Sat.>110	1-2 days			

data, but only the 2020 and 2022 data used in the SNAP analysis was sufficient to calculate the ROE status.

The 2022 results showed six (6) sites with a Very High Risk, seven (7) with a High Risk, three (3) with Risk Present, and one (1) No Risk results. The Very High Risk outcomes matched either the Highly Enriched or Enriched SNAP outcomes at three sites (Table 15) including two of the sites in the hydrologically and habitat modified upper mainstem. The other Very High Risk outcomes did not match well with the SNAP narratives including one Not Nutrients SNAP outcome. The seven (7) High Risk outcomes matched Enriched SNAP outcomes at four sites and Likely Nutrients at three sites. The three (3) Risk Present outcomes matched Likely Nutrients SNAP outcomes at all three sites. The single No Risk site matched a Likely Nutrients SNAP outcome. Four of the Very High outcomes were driven by all four indicators with sestonic chlorophyll a exceedances in the very poor range at four (4) sites and the other two (2) sites by D.O. saturation levels >110%, site 16-1 with a 236% value, and 3-4 days with excessive saturation levels (Table 16). Nine sites had maximum pH values >8.35 S.U.

Table 17. *The total SNAP score and overall enrichment status at sites with sufficient data in the upper Des Plaines River mainstem in 2018, 2020, and 2022*

	2018		**2020**		**2022**	
Site ID	**Total SNAP Score**	**Overall Enrichment Status**	**Total SNAP Score**	**Overall Enrichment Status**	**Total SNAP Score**	**Overall Enrichment Status**
13-6	75	Likely Nutrients	57.5	Highly Enriched	64	Enriched
13-5	64	Enriched	63.5	Enriched	66	Highly Enriched
13-4	66	Enriched	74.5	Likely Nutrients	72	Highly Enriched
13-18			76.0	Likely Nutrients	73	Enriched
13-19	87	Not Nutrients	65.5	Enriched	84	Likely Nutrients
13-3	83	Not Nutrients	81.0	Likely Nutrients	75	Enriched
13-2	88	Not Nutrients	80.0	Likely Nutrients	86	Not Nutrients
13-1	83	Not Nutrients	83.0	Not Nutrients	71	Not Nutrients
16-6	89	Not Nutrients			84	Not Nutrients
16-5	88	Not Nutrients			76	Likely Nutrients
16-4	86	Not Nutrients	84.5	Not Nutrients	77	Likely Nutrients
16-3	84	Not Nutrients	87.5	Not Nutrients	86	Not Nutrients
16-2	81	Not Nutrients	89.0	Not Nutrients	76	Likely Nutrients
16-1	76	Likely Nutrients	85.0	Not Nutrients	69	Enriched

Trends in SNAP Enrichment Status and Risk of Eutrophication 2018-22

The SNAP procedure was also applied in the upper Des Plaines River mainstem in 2018 and 2020, with the latter year being the first use of the weighted SNAP scoring procedure. The Overall Enrichment Status results (Table 17) show an increasing trend between 2018, 2020, and 2022 with more severe and more frequent Highly Enriched and Enriched results in succeeding survey years. One constant between each survey year was status at the three sites in the upper modified reach of the mainstem having at least two sites with an Enriched outcome and at all three sites in 2020 and 2022. The frequency of Likely Nutrients reached further downstream in 2020 than in 2018 and moreso in 2022 than in 2020. Out of the three years, 2022 had the lowest flows (see Figure 4), but all had intervening elevated flow events during the summer-early fall period. The 2022 survey followed the lowest flow year in 2021 that had no intervening high flow events which was reflected in the continuous data at site 13-6 in 2021, especially for D.O. and sestonic chlorophyll a. The legacy hydrologic alterations in the upper watershed have not recovered naturally and contribute to increased retention times in the mainstem. Coupled with the largely nonpoint sources of nutrient loadings, it creates a dynamic that exacerbates low D.O., wider diel D.O. swings, elevated sestonic chlorophyll a levels, elevated temperatures, and nuisance plant biomass including algae and macrophytes. A working hypothesis is that the increase in Enriched and Highly Enriched SNAP outcomes downstream from the hydromodified reach are the result of exporting that biomass into the lower reaches of the mainstem. The median flow just shy of the 75th percentile duration value of 239 cfs and periodic high flow events in 2018, some of which exceeded flood stage, decreased residence time and were sufficient to export the seasonal buildup of nuisance plant biomass out of the study area which in effect “cleansed” the mainstem resulting in consistent Not Nutrient SNAP outcomes downstream from the Wetlands Research riffle. The flows in 2020 were lower with the median just above the 50th percentile of 110 cfs, but with intervening high flow events, some of which exceeded flood stage, but with Not Nutrients being pushed further downstream to site 13-1 downstream from the NSWRD Waukegan and Gurnee WRFs. Flows in 2022 were lower overall with the medina below the 50th percentile of 110 cfs and the statistical maximum just over 400 cfs. Adding to the more sustained lower flows were many fewer episodes of elevated flows the highest of which was less than 1,000 cfs. These likely failed to push the excess nuisance biomass out of the upper mainstem study are resulting in more frequent Enriched and Likely Nutrients outcomes downstream from the Wetlands Research riffle. The Not Nutrient assignments at sites 13-1 and 13-2 would have been Likely Nutrient if not for the full attainment of the AQLU biocriteria. Hence, the key to resolving Enriched and Highly Enriched and Likely Nutrient outcomes is to restore the altered hydrology and habitat in the upper watershed and mainstem to prevent or reduce nuisance plant biomass that eventually is exported downstream.

Ionic Strength Parameters

Ionic strength parameters are generally in the form of dissolved solutes that can be delivered to rivers and streams in runoff events and in point source effluents - some are specifically associated with urban runoff. These include parameters measured in the water column and commonly include conductivity, total dissolved solids, and ions such as chlorides and sulfate. Typically, DRWW analyses have been geared to urban parameters that also include common heavy metals, but these were not analyzed in the water nor sediment samples in 2022.

Chlorides

In temperate climates such as exist in northern Illinois, dissolved materials in the form of chlorides are an emerging pollutant of concern because they accumulate in riparian zone soils and shallow groundwater and have been documented to reach concentrations that can threaten and impair aquatic life. Of particular concern in urban areas with high pavement density is the concentration of chlorides from winter 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), riparian 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 and mean total chloride concentrations (mg/L) in the upper Des Plaines mainstem ranged from poor to very poor at every site in 2022 (Figure 22; Table 10). This contrasts with the good to just exceeding fair values in 2020. The 2022 median values were the highest of the four years of data 2016-2022. Chloride levels were in the poor range downstream to site 13-2 (RM 96.8) downstream from which five (5) of 10 sites exceeded the very poor range. The

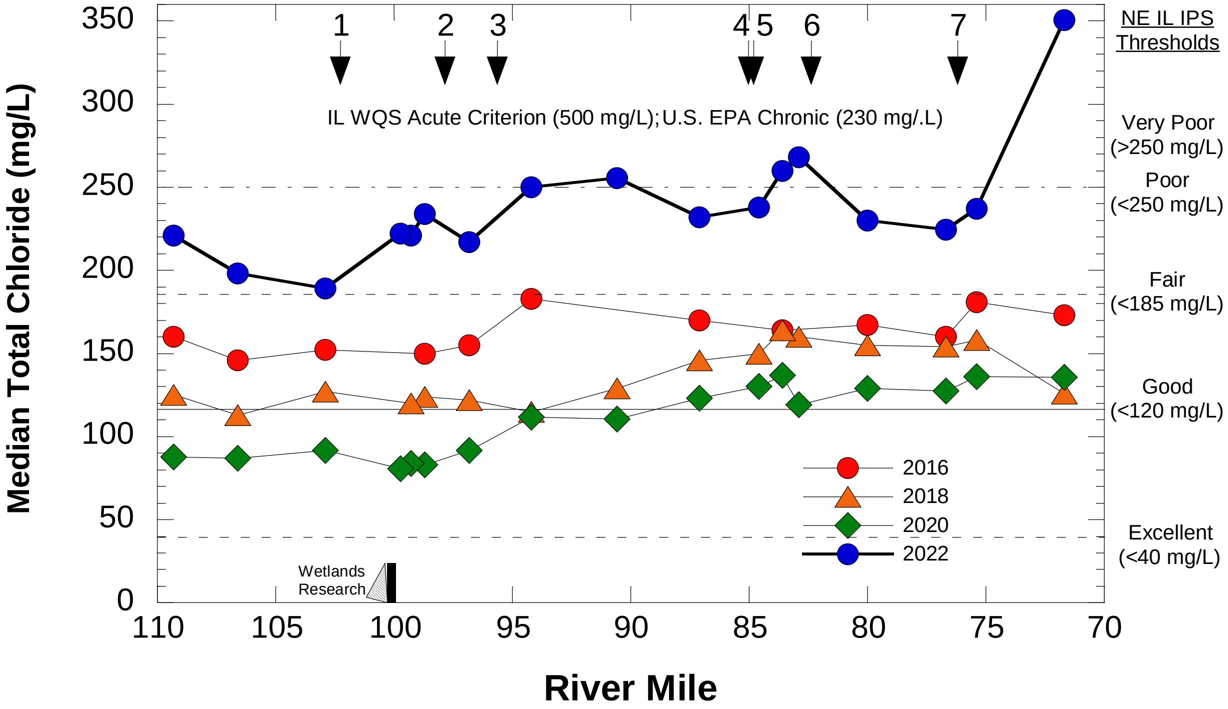

***Figure 22**. Concentrations (mg/L) of median chloride in the upper Des Plaines River mainstem during June-October 2016-2022. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in Figure 5.*

general pattern was a more than moderate increase in a downstream direction as the mainstem emerged from agricultural and suburban land uses in the upper watershed to increasingly urbanized land uses in downstream watersheds (especially the tributaries) along with effluent dominance. Median chloride values were the next highest during the low flow year of 2016 with all fair values while the 2020 values were the lowest in the excellent and good ranges. The 2018 results were borderline good-fair to fair. These results tracked with flow, the relationship being inverse with highest values under the lowest flows. Median chloride values were in the poor range at site 11-2 (RM 1.71) in Mill Creek, excellent and 10-1 in North Mill Creek (RM 1.10), and very poor at site 10-7 (RM 11.3; Table 10).

Conductivity

Dissolved materials are also measured by specific conductance or conductivity which is depicted in Figure 23 for continuous data and Figure 24 and Table 10 for grab sample results. The continuous specific conductance results showed that most sites with values exceeding the good IPS threshold and some sites with comparatively higher values in the fair, poor, and very poor ranges. Site 13-6 (RM 109.3) had the highest values by far in 2022 with 75% of readings above 1800 µS/cm and the only ones in the very poor range. The next site downstream at 13-5 (RM 106.6) had the second highest values with 75% above 1300 µS/cm. Sites 13-18 (RM 99.72), 13-19 (RM 99.3), 13-2 (RM 96.8), and 13-1 (RM 94.2) each had a very compressed range with all except 13-2 (poor range) in the fair range. Beginning at site 16-6 (RM 87.1) all of the sites with the exception of 16-4 had comparatively wide ranges of variation in their minimum to maximum and interquartile ranges of 400-800 µS/cm. The median values were mostly in the good range with upper quartiles and maximums in the fair and poor ranges. The width of the ranges without showing outliers suggests a regular and cyclic “swing” of which the cause was not determined. The results at site 16-4 were as compressed as the upstream sites previously described with all values in the fair range. Compared to 2020, the 2022 results are much more elevated and reflect the lower flows and less dilution in 2022. The two sites in Mill Creek at site 11-2 (RM 1.7) and North Mill Creek at site 10-1 (RM 1.1) were both entirely within the good range and the lowest in the 2022 study area.

Median and mean conductivity based on grab samples from the mainstem had values that were comparable or lower than the Datasonde results (Figure 24), but none of the poor and very poor exceedances revealed by the continuous results (Figure 23). Both mean and median conductance values in 2022 ranged from good to fair and followed a general pattern of increase from upstream to downstream except for site 13-6 that had median and mean value sin the fair range. The longitudinal plot shows the 2022 median conductance values being comparable to 2016 with the exception of site 13-5 which was lower and in the good range. The highest median values in 2016 occurred under substantially lower flows that 2018 and 2020, but comparable to 2022. An examination of the maximum conductivity grab sample values shows a different result with all maximums exceeding the poor threshold in the upper mainstem and increasing markedly to the very poor range beginning at site 13-3 (RM 98.7) downstream from Mill Creek and the LCDPW Mill Creek WWTP and remaining in the very poor and poor range downstream to site 16-1 with the exception of a fair value of 1204 µS/cm at site 16-8 which was almost in the poor range. This reach of river is dominated by wastewater effluent and the

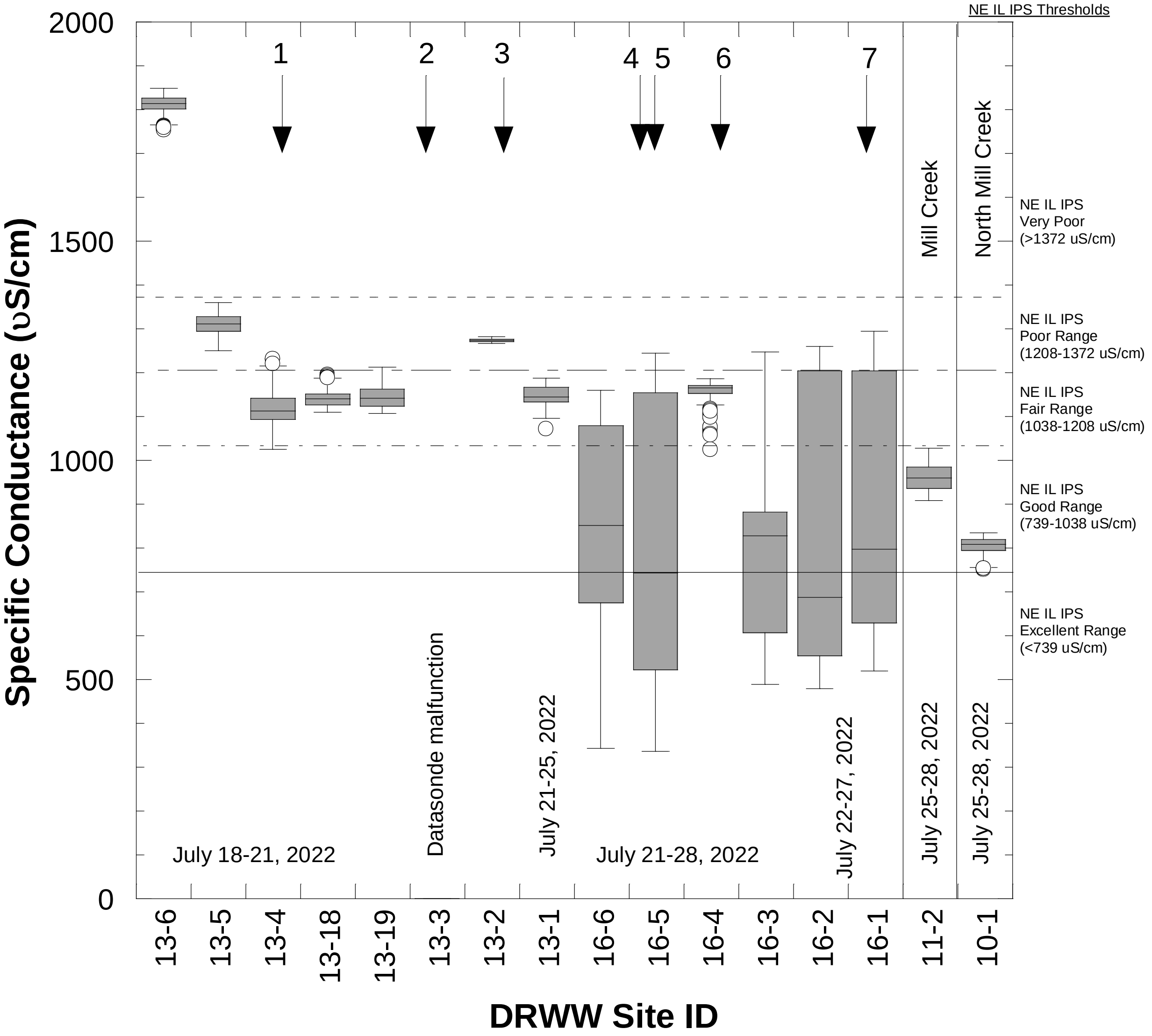

***Figure 23**. Specific conductance (µS/cm) measured continuously by Datasondes deployed for multiday periods during mid-August at 15 locations in the 2020 study area. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The IPS thresholds for five narrative ratings are shown by solid and dashed lines. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

maximums reflect that effluent dominance. The difference between the median and maximum values suggests that the poor and very poor values are intermittently present and most likely due to periodicity of low daily river flows and point source inputs.

Median conductivity values in Mill Creek and North Mill Creek were in the excellent and good ranges reflecting background conditions (Table 10). Maximum values were in the fair and a

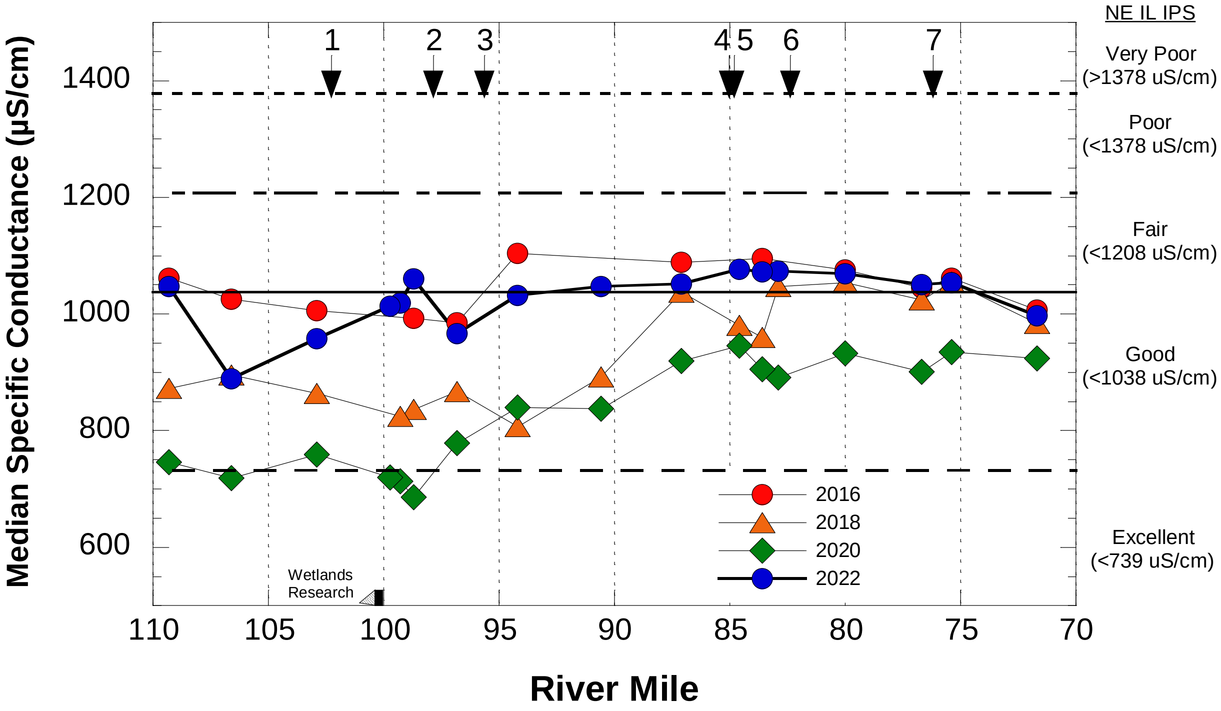

***Figure 24**. Median specific conductance in the upper Des Plaines River mainstem during June-October 2016-22. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 6. A key to sources (arrows and numbers) is in Figure 5.*

single site (11-3) located well upstream in in North Mill Creek with a poor value. Still, these maximum values were well below those observed in the effluent dominated reach of the

2021 Water Quality Results

Because of the extremely low flows in 2021 and the knowledge gained by observing the effect of low flows on certain chemical parameters in prior surveys, the median and mean values were examined (Table 18). Nearly every parameter had a more serious exceedance of an IPS or other threshold in 2021 than any other year including 2022, which was related to the extended period of extremely low flows that spanned the summer and early fall months. Minimum flows were below the $Q_{7,10}$ critical low flow of 37cfs for almost 25% of the time. A minimum flow of 12.7 cfs occurred on September 25 with flows <37 cfs occurring frequently between July 1 and September 30. The maximum flow of 297 occurred in late October. This flow regime was much lower than in 2016 or 2022 and the chemical data showed it. All 11 parameters were elevated compared to 2022 which was elevated compared to 2018 and 2020. Ammonia-N was in the poor range between 13-18 in the Wetland Research riffle impoundment to 13-16 at Buckley Rd. which was seemingly unrelated to the major WTTP discharges. Nitrate-N levels spiked to very poor levels at site 13-3 which is downstream from Mill Creek and the LCDPW Mill Creek WWTP. These values extended downstream to 16-3 which is downstream from the largest WWTP sources. Total phosphorus was likewise elevated at 13-3 mostly in the fair range, but with a single very poor and three (3) poor exceedances. Soluble reactive P was likewise elevated to

***Table 18**. Mean and median values for 11 selected chemical/physical water quality parameters at 20 sites in the Upper Des Plaines River study area in 2021. NE Illinois IPS thresholds are listed at the bottom of the table and the results are color coded accordingly. The difference between total P and ortho P is reported with differences >0.10 yellow highlighted.*

Site ID	River Mile	Drainage Area (sq. mi.)	Nitrogen, Ammonia (as N) mg/L		Total Nitrates (as Nitrate+ Nitrite-N)		Phosphorus, Total (as P)		Soluble Reactive Phosphorus (as PO_4)		Total P minus Ortho P		Sestonic Chlorophyll a µg/L		Nitrogen, Kjeldahl, Total		Total Suspended Solids		Chloride mg/L		Conductivity uS/cm		Temperature (Field)		pH (Field)	
			Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Des Plaines River Mainstem																										
13-6	109.3	123.7	ND	ND	0.20	0.31	0.153	0.107	0.037	0.039	0.116	0.067	39.7	47.0	2.00	2.04	48.8	53.9	398.0	398.0	1397	1424	24.3	24.3	7.95	7.98
13-5	106.6	137.3	ND	ND	0.06	0.07	0.094	0.105	0.034	0.035	0.060	0.070	-	-	1.56	1.54	51.7	55.8	410.0	410.0	1440	1484	24.0	23.6	8.05	8.09
13-4	102.9	145.6	ND	ND	0.08	0.11	0.111	0.116	0.069	0.079	0.042	0.037	46.0	45.0	1.56	1.29	30.0	30.3	445.0	445.0	1498	1465	23.4	23.3	7.80	7.81
13-18	99.7	212.9	0.224	0.250	0.31	0.70	0.042	0.040	0.010	0.012	0.032	0.029	35.7	34.2	1.72	1.30	30.3	36.3	246.5	246.5	1258	1328	18.6	20.7	7.86	8.17
13-19	99.3	213.2	0.259	0.267	0.33	0.08	0.075	0.081	0.036	0.025	0.038	0.055	-	-	1.24	1.15	15.5	10.2	310.0	310.0	1289	1323	17.9	18.8	7.83	7.95
13-3	98.7	220.3	0.213	0.175	11.33	13.33	1.626	0.612	1.499	0.552	0.127	0.060	18.2	18.0	0.65	0.60	11.9	10.0	170.0	170.0	1072	1083	22.1	21.9	7.87	7.90
13-2	96.8	225.4	0.208	0.190	11.25	7.73	1.927	0.772	1.768	0.673	0.158	0.100	27.1	11.5	0.46	0.56	10.8	8.9	308.0	308.0	1156	1005	17.1	20.9	7.47	7.53
13-1	94.2	232.0	0.200	0.149	11.54	12.40	1.562	0.734	1.388	0.665	0.174	0.069	11.8	12.1	0.58	0.60	6.8	4.8	372.0	372.0	1321	1140	17.5	21.2	7.55	7.60
13-16	90.6	253.8	0.190	0.175	11.09	12.40	0.951	0.316	0.858	0.254	0.094	0.062	-	-	0.54	0.54	5.3	5.0	235.0	235.0	1188	1108	18.4	18.2	7.71	7.67
16-6	87.1	261.4	0.190	0.175	14.87	14.80	0.975	0.593	0.895	0.560	0.080	0.033	46.9	28.1	0.62	0.64	6.4	6.9	238.5	238.5	1142	1066	18.4	18.8	7.71	7.67
16-7	84.6	266.5	ND	ND	12.92	12.30	1.027	0.615	0.945	0.580	0.082	0.035	-	-	ND	ND	3.3	2.7	248.0	248.0	1138	1065	18.3	20.7	7.85	7.88
16-5	83.6	268.1	ND	ND	12.78	13.20	0.959	0.588	0.773	0.555	0.186	0.033	15.8	11.6	0.52	0.55	11.6	4.9	267.0	267.0	1170	1072	18.5	20.1	7.79	7.82
16-8	82.9	268.9	ND	ND	6.72	6.44	0.575	0.244	0.485	0.169	0.090	0.075	-	-	0.84	0.87	9.0	4.4	246.0	246.0	1121	1059	17.7	18.7	7.73	7.74
16-4	80.0	273.2	ND	ND	15.48	16.10	1.133	0.581	0.995	0.541	0.138	0.040	93.4	11.2	0.56	0.61	6.8	6.3	186.0	186.0	945	1042	21.6	21.7	7.78	7.87
16-3	76.7	314.7	ND	ND	10.77	12.80	0.474	0.486	0.419	0.446	0.055	0.039	21.0	18.0	0.75	0.60	3.2	2.2	196.0	196.0	946	1020	22.9	23.0	7.88	7.86
16-2	75.4	324.0	0.197	0.137	8.34	9.71	0.451	0.439	0.324	0.362	0.127	0.078	-	-	0.66	0.56	5.9	3.8	284.0	284.0	1252	1152	17.7	17.6	7.83	7.73
16-1	71.7	358.7	0.194	0.121	6.69	6.33	0.306	0.281	0.255	0.224	0.051	0.057	13.8	16.0	0.67	0.73	5.1	4.2	383.5	383.5	1318	1204	17.6	17.5	7.93	7.83
Mill Creek																										
11-2	1.7	62.3	0.262	0.250	0.38	0.14	0.174	0.164	0.115	0.103	0.059	0.061	71.3	71.0	1.30	1.33	11.6	9.2	305.5	305.5	1165	1038	18.8	22.3	7.58	7.92
North Mill Creek																										
10-7	11.3	19.2	0.495	0.495	0.35	0.35	0.163	0.163	0.092	0.092	0.071	0.071	20.2	20.2	2.30	2.30	141.0	141.0	17.2	17.2	634	634	21.4	21.4	7.57	7.57
10-1	1.1	31.9	0.219	0.246	1.84	1.72	0.160	0.108	0.104	0.056	0.056	0.052	83.8	48.3	1.24	1.21	28.6	22.0	234.0	234.0	1016	944	17.4	21.2	7.56	7.92
Condition Category Thresholds	**Excellent**		<0.084	<0.084	≤ 3.77	≤ 3.77	≤ 0.106	≤ 0.106	<0.050	<0.050	<0.050	<0.050	<2.5	<2.5	<1.07	<1.07	≤17.5	≤17.5	<40.0	<40.0	<739	<739				
	Good		<0.100	<0.100	<5.05	<5.05	<0.277	<0.277	<0.100	<0.100	<0.100	<0.100	<5.1	<5.1	<1.12	<1.12	>17.5	>17.5	<120.0	<120.0	<1038	<1038				
	Fair		<0.190	<0.190	<7.34	<7.34	<1.020	<1.020	>0.100	>0.100	>0.100	>0.100	<13.8	<13.8	<1.63	<1.63	>31.6	>31.6	<184.9	<184.9	<1208	<1208				
	Poor		<0.280	<0.280	<9.64	<9.64	<1.730	<1.730	>0.250	>0.250	>0.250	>0.250	<28.9	<28.9	<2.14	<2.14	>35.2	>35.2	<249.8	<249.8	<1378	<1378				
	Very Poor		≥0.280	≥0.280	≥9.64	≥9.64	≥1.730	≥1.730	>0.500	>0.500	>0.500	>0.500	>28.9	>28.9	≥2.14	≥2.14	>38.7	>38.7	≥249.8	≥249.8	≥1378	≥1378				
Source			**IPS**		**IPS**		**IPS**		**MBI**		**MBI**		**MBI/NSAC**		**IPS**		**IPS**		**IPS**		**IPS**					

very poor levels between 13-3 and 16-5. Sestonic chlorophyll a, TKN, and TSS each were elevated in the modified upper reach with very poor and poor values. Chloride was elevated to poor and very poor at all sites while conductivity was elevated between 13-6 and 13-4. Temperature an pH were elevated compared to 2021 particularly at sites 13-6, 13-5, and 13-4 in the modified upper reach of the mainstem. Ammonia-N, sestonic chlorophyll a, and chloride were elevated to very poor at site 11-2 in Mill Creek which is downstream from the LCDPW Mill Creek WWTP. North Mill Creek site 10-1 also had elevated ammonia-N, sestonic chlorophyll a, and chloride. Site 10-7 exhibited strong nonpoint source indications with elevated ammonia-N, sestonic chlorophyll a, TKN, and TSS into the poor and very poor ranges. With the exception of chloride all were substantially lower in 2022.

Physical Habitat Quality for Aquatic Life – QHEI

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

Des Plaines River 2022 Mainstem Habitat Assessment Results

Habitat quality in the upper Des Plaines River in 2022 ranged from poor (4 sites) to good (1 site) with the majority of the mainstem in the middle to upper fair range (Figure 25). The upstream most four (4) sites between site 13-6 and the Wetlands Research impoundment scored in the mid to upper poor range (38.0-49.0). This was the result of the extensive hydrological and physical modifications in the upper mainstem. The lowest QHEI score of 38.0 at site 13-18 (RM 99.72) was due to the impounded habitat formed by the Wetland Research artificial riffle. The incremental decline in QHEI scores in the upper modified reach between 2018 and 2022 was due to an increased predominance by muck and silt substrates and the reduction in instream cover at site 13-6 (RM 109.3). Sites downstream from the Wetland Research riffle and through the remainder of the mainstem scored considerably higher and followed a similar trend to previous years, but were within the mid to upper fair range (Figure 24). The only good QHEI score was 78.3 at site 13-2 (RM 96.8). The incremental decline in QHEI scores between 2016 and 2018 and 2020 seemed to continue throughout the mainstem in 2022.

QHEI Attributes Matrix 2022

High influence modified attributes were present only at the four (4) sites in the upper modified

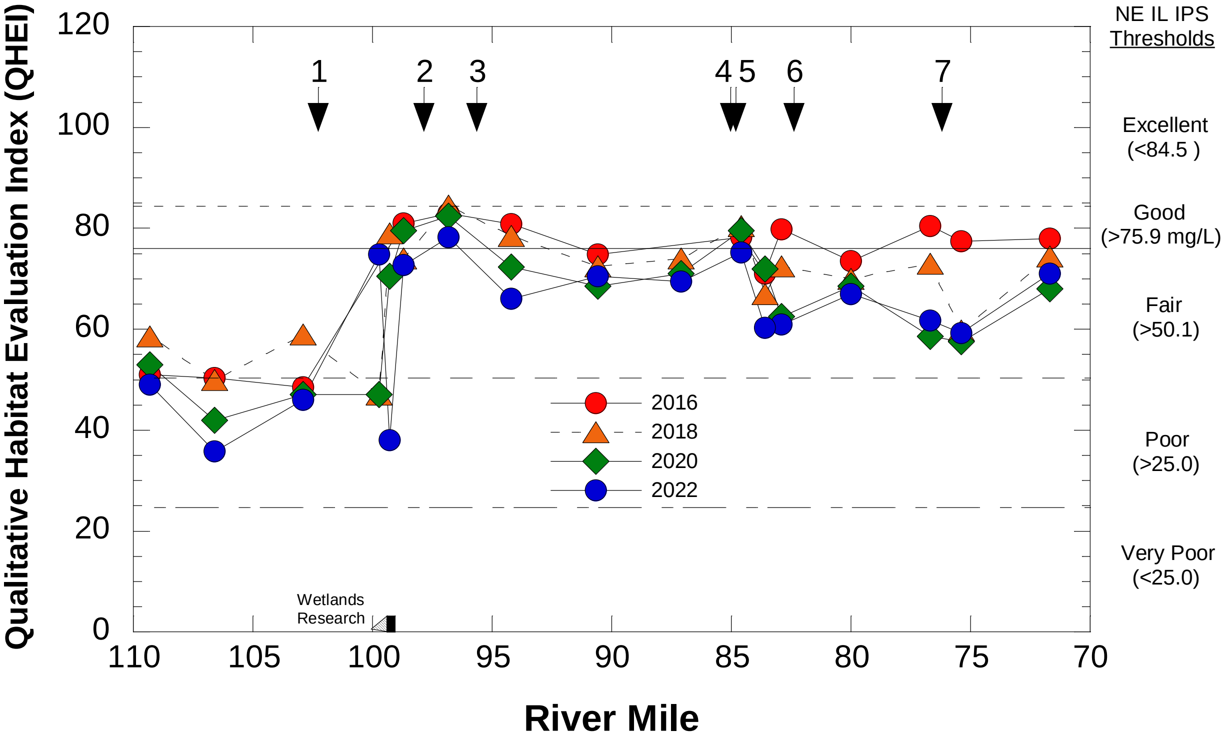

***Figure 25**. Qualitative Habitat Evaluation Index (QHEI) scores in the upper Des Plaines River mainstem in 2016, 2018, 2020, and 2022. The IPS narrative ranges of QHEI scores from excellent to very poor are indicated by solid and dashed lines. A key to sources (arrows and numbers) is in Figure 5.*

reach which resulted in the poor QHEI scores (Table 19). High influence attributes included silt/muck substrates at all four sites (13-6, 13-5, 13-4, 13-18), sparse or no instream cover (sites 13-6 and 13-5), and no recovery from channelization (sites 13-5 and 13-4). The 2020 and 2022 results were identical. The increase in high influence modified attributes since 2016 and 2018 (MBI 2017, 2020) continued to persist in 2022. Moderate influence modified attributes were numerous with the highest number (8) occurring at sites 16-5 (RM 83.6) and 16-2 (RM 75.4) and seven (7) at sites 16-8 (RM 82.9), 16-4 (RM80.0), and 16-3 (RM 76.7). The highest ratios of modified to good attributes ranging from 4.0-9.0 continued to occur at the four (4) sites upstream of the Wetland Research riffle impoundment. The ratio of modified:good attributes was poor (≥4.00) at two of the upper modified reach sites and poor (≥6.00) at 13-5. These sites also had a high number of moderate influence modified attributes ranging from 5-6, all a poor result. Modified: good ratios >2.00 generally indicate an extent of habitat modification and predominance of modified attributes that would require direct mitigation, as opposed to natural recovery, to reverse. It also means that meeting the General Use biocriteria would likely be precluded by habitat regardless of water quality conditions raising concerns about use attainability (Rankin 1995). The sites with modified:good ratios <2.00 is the result of having

***Table 19**. QHEI matrix of good and modified habitat attributes for sites in the upper Des Plaines River Year 5 study area during 2022. QHEI scores are shaded in accordance with IPS derived ranges; blue – excellent; green – good; yellow – fair; orange – poor; red – very poor. Ratios of poor and good attributes and modified:good ratios are shaded in accordance with the narrative categories at the bottom of the table.*

			Good Habitat Attributes											High Influence Modified Attributes						Moderate Influence Modified Attributes														
Site ID	**River Mile**	**QHEI**	**No Channelization**	**Boulder, Cobble, Gravel**	**Silt Free**	**Good-Excellent Development**	**Moderate-High Sinuosity**	**Moderate-Extensive Cover**	**Fast Flow w Eddies**	**Little to No Embeddedness**	**Max Depth > 40 cm**	**No Riffle Embeddedness**	**Good Habitat Attributes**	**Channelized or No Recovery**	**Silt/Muck Substrates**	**No Sinuosity**	**Sparse No Cover**	**Max Depths <40 cm**	**High Influence Poor Attributes**	**Recovering from Channelization**	**Mod-High Silt Cover**	**Sand Substrates (Boatable sites)**	**Hardpan Origin**	**Fair- Poor Development**	**Low Sinuosity**	**< 2 Cover Types**	**Intermittent Flow or Pools <20 cm**	**No Fast Current Types**	**Mod-Extensive Embeddedness**	**Mod-Extensive Riffle Embeddedness**	**No Riffle**	**Poor Habitat Attributes**	**Ratio of Modified (High) to Good**	**Ratio of Modified (All) to Good**
Des Plaines River 2022																																		
13-6	109.30	**49.00**					■				■		2		●		●		2	●	●			●				●	●	●		6	1.00	4.00
13-5	106.60	**35.80**									■		1	●	●	●	●		4		●			●				●	●		●	5	4.00	9.00
13-4	102.90	**46.00**						■			■		2	●	●				2		●			●	●			●	●		●	6	1.00	4.00
13-18	99.70	**38.00**						■			■		2		●	●			2		●			●	●			●	●		●	6	1.00	4.00
13-19	99.30	**74.80**	■	■		■	■	■			■	■	7						0		●	●		●				●	●			5	0.00	0.71
13-3	98.70	**72.80**	■	■			■	■		■	■	■	7						0		●	●		●				●				4	0.00	0.57
13-2	96.82	**78.30**	■	■		■	■	■	■	■	■	■	9						0		●	●										2	0.00	0.22
13-1	94.20	**66.00**		■			■	■			■		4						0	●	●	●		●				●	●	●		7	0.00	1.75
13-16	90.60	**70.50**	■	■		■	■	■			■		6						0		●	●						●	●	●		5	0.00	0.83
16-6	87.10	**69.50**	■	■		■		■			■		5						0			●		●	●			●	●	●		6	0.00	1.20
16-7	84.60	**75.30**	■	■		■	■	■			■	■	7						0			●						●	●	●		4	0.00	0.57
16-5	83.60	**60.30**		■				■			■		3						0	●	●	●		●	●			●	●		●	8	0.00	2.67
16-8	82.90	**61.00**		■			■	■			■		4						0	●	●	●		●				●	●		●	7	0.00	1.75
16-4	80.00	**67.00**	■	■		■		■		■	■		6						0		●	●		●	●			●	●	●		7	0.00	1.17
16-3	76.70	**61.80**	■					■			■		3						0		●	●		●	●			●	●		●	7	0.00	2.33
16-2	75.40	**59.30**		■				■			■		3						0	●	●	●		●	●			●	●		●	8	0.00	2.67
16-1	71.70	**71.00**		■			■	■			■		4						0	●		●		●				●	●	●		6	0.00	1.50
Mill Creek 2022																																		
11-2	1.71	**83.80**	■	■		■	■	■	■	■	■	■	9						0													0	0.00	0.00
North Mill Creek 2022																																		
10-7	11.3	**28.50**											0	●	●	●	●	●	5		●			●				●	●		●	5	6.00	11.00
10-1	1.10	**50.00**					■	■			■		3		●				1	●	●			●				●	●	●		6	0.33	2.33
	Excellent	≥84.5											9						0													0	0.00	<0.50
	Good	75.9-84.4											8						0													1	<0.5	<2.00
	Fair	50.1-75.8											5-7						1													2-3	≤1.00	≥2.00
	Poor	25-50											2-4						2-4													4-6	≤2.00	≥4.00
	Very Poor	<25											0-1						5													>6	>2.00	>6.00

fewer modified attributes coupled with enough good attributes to offset the negative influence of the modified attributes. Fast current types were absent except at 13-2 (RM 96.82), reflecting the lingering effect of modifications in the low gradient of the upper Des Plaines River mainstem. Sand substrates were observed at all sites excluding the four (4) upstream most sites that had muck/silt substrates. Moderate to high silt cover, moderate-extensive embeddedness, moderate-extensive riffle embeddedness, and fair-poor development were the most commonly observed moderate influence modified attributes observed during the 2022 survey. An increase in the number of good habitat attributes generally offset the elevated number of modified attributes downstream from the Wetland Research riffle with modified:good ratios <2.00 at all sites except sites 16-5 (RM 83.6), 16-2 (RM 76.70), and 16-3 (RM 75.40) a net gain of one site over 2020.

Mill Creek and North Mill Creek 2022 Habitat Assessment Results

The three tributary sites that were a part of the 2022 study area were likewise assessed for habitat quality with the QHEI. The single site in Mill Creek (11-2) had a good habitat scores of 83.8 (Table 19). Besides having the highest QHEI score in the study area in 2002, it also stood out by having zero modified attributes. The upstream site in North Mill Creek (10-7) had poor habitat quality with a QHEI score of 28.5. All five (5) of the high influence modified attributes were observed at this site. The modified:good attribute ratios were the highest in the study area at 6.00 for high influence attributes and 11.0 when moderate influence attributes are included. North Mill Creek site 10-1 had a borderline poor score of 50.0. The modified:good ratio was 2.33 which is fair. Habitat in Mill Creek at site 11-2 has remained stable with QHEI scores of 79.0 in 2016 (MBI 2017), 80.0 in 2017 (MBI 2018), 75.5 in 2020 (MBI 2022), and 83.8 in 2022. In North Mill Creek QHEI scores at the downstream site (10-1) varied from 70.0 in 2016, 59.0 in 2017, 63.0 in 2020, and 50.0 in 2022 with somewhat elevated modified:good ratios in 2017 (2.00), 2020 (1.50), 2022 (1.50), increasing in 2022 (2.33). The upstream site in North Mill Creek had declined markedly in 2020 from QHEI scores of 52.0 in 2016 and 59.0 in 2017 making the 2022 score of 28.5 a significant decline in just two years. The modified:good ratios were 1.20 in 2016, 1.67 in 2017, elevated to 4.00 in 2020, and extremely elevated to 11.0 in 2022 which is an indication of seriously declining habitat quality over time.

Biological Assemblages – Macroinvertebrates

There were 138 unique macroinvertebrate taxa collected in the upper Des Plaines River mainstem in 2022 (Appendix B). This is an increase from 103 (2016), 104 (2018), and 130 (2020) taxa collected in the prior surveys. The predominant taxa were more facultative than indicative of poor or good water quality. The most numerous was the genus Oligochaeta (segmented worms), followed by Tricorythodes sp. (a Mayfly taxon), *Gammarus sp.*(a Crustacean), Coenagrionidae (a damselfly family), *Rheotanytarsus sp.* (a midge of the Tribe Tanytarsini), *Polypedilum (P.) illinoense* (a tolerant midge species), *Hydroptila sp.* (a micro caddisfly genus), *Gammarus fasciatus* (a Nearctic amphipod), and *Hyalella azteca* (a common amphipod; Table 20).

***Table 20**. The twenty (20) most abundant macroinvertebrate taxa collected in the upper Des Plaines River mainstem in 2022 including sites collected, numbers collected, taxa group, functional group, and taxa tolerance assignments.*

Taxa Code	Taxa Name	Collection Frequency	Percent	Abundance	Ohio EPA Tolerance	Illinois Tolerance	Illinois Funct. Feeding Group	Taxa Group
03600	*Oligochaeta*	17	8.50	427	T	10	CG	N
16700	*Tricorythodes sp*	11	7.48	376	MI	5	CG	MA
06800	*Gammarus sp*	10	6.97	350	F	3	SH	N
22001	*Coenagrionidae*	15	5.79	291	T	5.5	PR	O
85625	*Rheotanytarsus sp*	12	4.04	203	F	6	CF	T
84470	*Polypedilum (P.) illinoense*	16	3.76	189	T	6	SH	D
53800	*Hydroptila sp*	13	3.60	181	F	2	SC	CA
06810	*Gammarus fasciatus*	6	3.44	173	F	3	CG	N
06201	*Hyalella azteca*	12	3.32	167	F	4	CG	N
83300	*Glyptotendipes (G.) sp*	6	3.24	163	MT	10	CF	CA
52200	*Cheumatopsyche sp*	12	2.89	145	F	6	CF	CA
11130	*Baetis intercalaris*	10	2.79	140	F	4	CG	MA
69400	*Stenelmis sp*	14	2.69	135	F	7	SC	CO
17200	*Caenis sp*	7	2.43	122	F	6	CG	MA
85265	*Cladotanytarsus vanderwulpi group sp 5*	9	2.37	119	MI	7	CG	D
68700	*Dubiraphia sp*	14	2.17	109	F	5	CG	CO
83158	*Endochironomus nigricans*	8	2.13	107	MT	6	SH	D
01801	*Turbellaria*	16	1.99	100	F	6	PR	N
93200	*Hydrobiidae*	11	1.59	80	F	6	SC	N
84450	*Polypedilum (Uresipedilum) flavum*	13	1.49	75	F	6	SH	D

Taxa Group: N - Non-Insect; MA - Mayfly; O - Odonata; CA - Caddisfly; D - Dipteran; T - Tribe Tanytarsini; CO - Coleoptera
IL Functional Group: CG - Collecter/Gatherer; PR - Predator; CF - Collectors/Filterers; SH - Shredder; SC - Scraper
IL Tolerance Score Ranges from 0 (Least Tolerant) to 10 (Most Tolerant); CG* the genus *Gammarus* does not have a group listed, but the common *Gammarus* species found are listed as CG

Des Plaines River 2022 Macroinvertebrate Assemblage Results

Macroinvertebrate assemblage quality in the upper Des Plaines River mainstem ranged from fair to good with fair results primarily being observed in the upper section of the survey area and good and even two exceptional results in the lower effluent affected reach of the mainstem (Figure 25). Twelve (12) of the 17 mainstem sites met the mIBI General Use biocriterion of 41.8, five (5) more than in 2020 and reversing the decline observed in between 2018 and 2020 . The five (5) upstream most sites were all impaired – four (4) sites upstream from the Wetland Research riffle and one (1) site downstream. The site located in the Wetland Research impoundment was sampled by the macroinvertebrate crew by moving the site upstream, but still within the influence of the impoundment. The mIBI increased steadily downstream from the Wetlands Research riffle to site 16-6 (RM 87.1) where the mIBI of 69.8 was the highest mIBI value in 2022 or in any previous survey. No mIBI values dropped below the General Use in the remainder of the mainstem with all values far in excess of the minimum General Use biocriterion and another site (16-4) with an exceptional value. An increase in the total number of intolerant taxa, Mayfly taxa, EPT taxa, and a decline in the %tolerant taxa corresponded to the increased mIBI scores (Table 21).

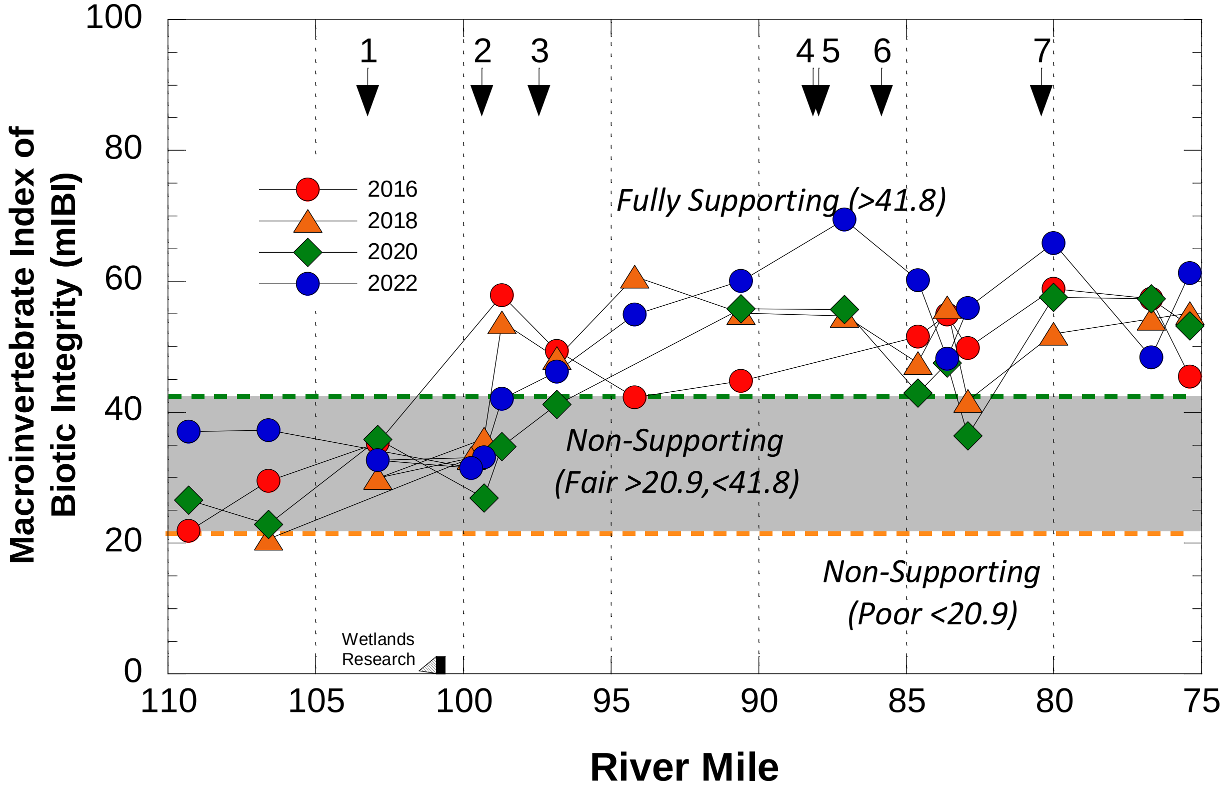

Figure 26. *Illinois macroinvertebrate IBI scores in the upper Des Plaines River mainstem in 2016, 2018, 2020, and 2022. IEPA thresholds for determining full support, non-support-fair, and non-support-poor of the General Use for aquatic life are indicated by dashed lines and grey shading. A key to sources (arrows and numbers) is in Figure 5.*

Table 21 lists the mIBI, selected mIBI metrics, and other macroinvertebrate assemblage attributes two of which are key biological response signatures associated with toxic impacts (%toxic tolerant taxa) and organic enrichment (%organic enrichment tolerant taxa; Yoder and DeShon 2003). Poor and very poor responses generally occurred upstream from site 13-19 (RM 99.3), which is downstream from the Wetland Research riffle. None of these sites met the General Use mIBI biocriterion. Only two very poor results occurred for intolerant taxa (0) at site 13-4 (RM 102.9) and %tolerant taxa (30.7%) at site 13-19 (RM 99.3) downstream from the Wetland Research riffle. Poor results occurred 12 times for five indicators at sites 13-6, 13-5, 13-18, 13-19, and 13-3. The good numbers of taxa and the absence of any toxic responses suggest that the impairments are due to organic enrichment that is exacerbated by the modified habitat and hydrologic regime in the upper mainstem. The total number of taxa collected at each site ranged from 25-39 taxa. The number of EPT taxa ranged 3-12 with all sites reflecting good or exceptional conditions. The % EPT taxa ranged from 5.7-47.4% with eight (8) sites of good quality, seven (7) sites of fair quality, and two (5) sites of poor quality. The number of intolerant taxa ranged from 0-8, with nine (9) sites exceeding the good threshold, two (3) sites in the fair range, four sites (4) in the poor range, and one (1) in the very poor range. Of the five (5) sites that did not meet the General Use mIBI biocriterion, three (3) had poor values for

***Table 21**. Selected macroinvertebrate assemblage attributes for sites sampled in the Upper Des Plaines Year 4 study area in 2022. Biological index scores selected metrics are shaded by narrative quality as follows: exceptional – blue; good (fully supporting) - green; fair (non-support) - yellow; poor (non-support) – orange; very poor – red (non-support); signatures of toxic and organic enrichment responses are based on Yoder and DeShon (2003).*

Site ID	River Mile	Drainage Area (mi.^{2})	Macroinvertebrate Assemblage Attributes								
			mIBI	Total Taxa	Intolerant Taxa	%Tolerant Taxa	EPT Taxa	%EPT	MBI	%Toxic Tolerant Taxa	%Organic Enrich. Taxa
Des Plaines River											
13-6	109.30	123.7	37.1	32	2	20.7	5	11.8	6.8	0.3	39.6
13-5	106.60	137.3	37.2	33	2	19.4	5	17.0	6.6	1.5	20.8
13-4	102.90	145.6	32.7	36	0	14.4	5	12.3	6.3	0.4	19.0
13-18	99.72	212.9	31.5	25	2	21.0	3	27.2	7.3	2.3	43.7
13-19	99.30	213.2	33.1	34	4	30.7	4	5.7	8.0	4.2	56.8
13-3	98.70	220.3	42.1	30	2	12.8	6	9.1	5.7	5.5	16.6
13-2	96.82	225.4	46.2	31	3	14.9	5	10.2	5.6	1.3	23.8
13-1	94.20	232.0	54.9	34	4	5.9	7	18.9	5.2	4.2	7.7
13-16	90.60	253.8	60.1	29	5	1.8	9	32.9	4.8	5.8	4.2
16-6	87.10	261.4	69.4	39	8	6.4	9	34.4	4.8	7.8	6.3
16-7	84.60	266.5	60.1	36	6	3.5	9	33.4	5.0	7.6	11.0
16-5	83.60	268.1	48.2	34	6	12.6	9	23.5	5.7	11.2	10.2
16-8	82.90	268.9	56.0	39	6	8.8	9	29.3	5.1	4.0	5.0
16-4	80.00	273.2	65.8	34	5	6.4	11	47.5	5.0	4.0	9.4
16-3	76.70	314.7	48.4	30	3	9.4	6	11.8	5.1	1.8	11.8
16-2	75.40	324.0	61.3	36	4	9.8	12	25.4	5.5	2.1	12.7
16-1	71.70	358.7	53.8	33	6	13.1	7	33.8	5.7	1.0	7.9
Mill Creek											
11-2	1.71	62.3	44.7	34	1	5.3	7	46.4	5.9	0.6	14.2
North Mill Creek											
10-7	11.30	19.2	40.5	29	3	14.6	2	1.0	6.0	0.3	27.6
10-1	1.10	31.9	63.5	44	6	6.8	12	30.3	5.4	2.9	6.7
Narrative Thresholds		**Exceptional**	>73	≥ 36	> 5	≤ 10	≥ 6	> 49	≤ 5.2	0.0	<5
		Good	≥41.8	< 36	≤ 5	≤ 15	≥3	>24.5 - 49	≥5.2	<5	<15
		Fair	≤41.7	≤27	≤ 3	≤ 20	2	> 10 -24.5	≥6.0	<20	≥15
		Poor	≤29	≤ 22	≤2	< 28	1	5 - 10	≥7.6	≥35	≥35
		Very Poor	<15	≤ 16	0	≥ 28	0	< 5	≥9.0	>60	>60

intolerant taxa, two (2) for %tolerant taxa, and one (1) %EPT taxa. These five sites also had three (3) %organic tolerant taxa.

Mill Creek and North Mill Creek 2022 Macroinvertebrate Assemblage Results

Macroinvertebrates were sampled at a single site in Mill Creek (11-2) and two sites in North Mill Creek (10-1 and 10-7) in 2022. Both had mIBI scores that met the General Use biocriterion (Table 21). There were 82 total taxa predominated by tolerant and facultative types. The predominant taxa included the caddisfly *Cheumatopsyche sp.*, the amphipod *Gammarus sp.*, the crustacean *Caecidotea sp.*, the segmented worm *Oligochaeta*, the caddisfly *Hydropsyche sp.*, the Chironomidae midge *Polypedilum (Uresipedilum) flavum*, the snail *Physella sp.*, the fingernail clam *Sphaerium sp.*, the beetle *Dubiraphia sp.*, and the damselfly *Coenagrionidae*. The 2022 mIBI of 44.7 and 2020 mIBI of 53.3 in Mill Creek at site 11-2 was a significant improvement from the 2016 result that had a fair mIBI of 25.3. The North Mill Creek mIBI of 63.5 in 2022 was an improvement over the mIBI of 55.8 at site 10-1 that was unchanged from the mIBI of 55.3 in 2016 and only slightly lower than the mIBI of 55.8 in 2019. One (1) poor response occurred at site 11-2 with the remainder or exceptional good responses. North Mill Creek site 11-7 located 10.2 miles upstream from 10-7 failed to meet the mIBI General Use biocriterion by only 1.3 units. This site had one very poor and four fair responses with the remainder good. A prior survey in 2019 had an mIBI value of 54.2 which meets the General Use.

Biological Assemblages – Fish

Forty-seven (47) native and three (3) non-native fish species were collected along with five (5) hybrids comprising a total number of 8,956 individual fish in the Year 5 Upper Des Plaines River mainstem in 2022. The fish assemblage continued to be predominated by tolerant, moderately tolerant, and intermediate fish species (Table 22). Bluegill Sunfish, Bluntnose Minnow, Hornyhead Chub, White Sucker, and Spotfin Shiner were the most numerous species collected in 2022. Common Carp, White Sucker, Bowfin, Channel Catfish, and Northern Pike predominated in terms of biomass. Of the top 15 species by numbers, four (4) are highly tolerant, two (2) moderately tolerant, three (3) highly intolerant, and one (1) sensitive. Two species (e.g., Bowfin and Northern Pike) are common in low gradient and wetland influenced rivers while most of the species are ubiquitous to all types of rivers and streams throughout the region. The 2022 rankings are not substantially different than in 2020 with the highest ranked species being the same.

The top 15 species by numbers and biomass were essentially unchanged between 2020 and 2022. Rosyface Shiner (formerly Carmine Shiner), a highly intolerant species, increased in numbers and rank in 2022 over 2020. Other species that were collected in 2018 were either reduced in numbers or not present in the collections in 2020 or 2022. Rock Bass *(Ambloplites rupestris),* Stonecat Madtom *(Noturus flavus)*, Rosyface Shiner *(Notropis rubellus),* Pirate Perch *(Aphredoderus sayanus)*, Logperch *(Percina caprodes),* Blackside Darter *(Percina maculata)*, and Sand Shiner *(Notropis stramineus)* were reduced by more than 50-90% in 2020 and 2022 compared to 2018. Blackstriped Topminnow *(Fundulus notatus)* was represented by a single individual.

Blackchin Shiner *(Notropis heterodon)* numbered 48 in 2018, but were absent in 2020 and 2022 in addition to Western Banded Killifish *(Fundulus diaphanus menona)* both of which are Illinois listed species. The 2018 occurrence of Blackchin Shiner was likely related to restoration efforts in Upper Des Plaines River watershed lakes (Bland 2013). A new species in 2020 was the invasive Round Goby *(Neogobius melanostomus)* which is a non-native of intercontinental origin that has been expanding throughout the Upper Des Plaines subbasins from its original introduction in ship ballast water in the late 1980s (Sarver 2022). There were 103 individuals collected in 2022 compared to 21 individuals in 2020, but they are still restricted to the four (4) lowermost sites in Upper Des Plaines River study area.

Des Plaines River 2022 Fish Assemblage Results

Fish IBI (fIBI) scores are the mean of two sampling passes within the summer-early fall index

***Table 22**. The fifteen most abundant species by number (left panel) by weight (right panel) collected in the upper Des Plaines mainstem in 2020. IL and OH tolerance assignments, numbers/weight (kg) collected, and percent collected by each (species with blank tolerance cells are intermediate).*

Common Name	Latin Name	% by Number	Number/ Km	Illinois Tolerance	Ohio Tolerance
Bluegill Sunfish	*Lepomis macrochirus*	14.6	2696		P
Bluntnose Minnow	*Pimephales notatus*	13.5	2490	T	T
Hornyhead Chub	*Nocomis biguttatus*	12.9	2382	I	I
White Sucker	*Catostomus commersoni*	9.7	1795	T	T
Spotfin Shiner	*Cyprinella spiloptera*	8.8	1621		
Pumpkinseed Sunfish	*Lepomis gibbosus*	4.8	879		P
Common Carp	*Cyprinus carpio*	4.7	863	T	T
Largemouth Bass	*Micropterus nigricans*	3.4	633		
Rosyface Shiner	*Notropis rubellus*	2.4	441	I	I
Smallmouth Bass	*Micropterus dolomieui*	2.3	431	I	M
Green Sunfish	*Lepomis cyanellus*	2.3	429	T	T
Sand Shiner	*Miniellus stramineus*	1.8	340		M
Rock Bass	*Ambloplites rupestris*	1.8	324		
Blackstripe Topminnow	*Fundulus notatus*	1.6	296		
Gizzard Shad	*Dorosoma cepedianum*	1.4	262		

Common Name	Latin Name	% by Weight	Kg/Km	Illinois Tolerance	Ohio Tolerance
Common Carp	*Cyprinus carpio*	61.45	2262.1	T	T
White Sucker	*Catostomus commersoni*	11.00	404.8	T	T
Bowfin	*Amia calva*	4.52	166.5		
Channel Catfish	*Ictalurus punctatus*	4.46	164.3		
Northern Pike	*Esox lucius*	4.22	155.4		
Spotted Sucker	*Minytrema melanops*	3.05	112.4	I	
Largemouth Bass	*Micropterus nigricans*	3.00	110.3		
Bluegill Sunfish	*Lepomis macrochirus*	1.75	64.4		P
Hornyhead Chub	*Nocomis biguttatus*	1.11	40.9	I	I
Smallmouth Bass	*Micropterus dolomieui*	1.01	37.3	I	M
Yellow Bullhead	*Ameiurus natalis*	0.58	21.3	T	T
Rock Bass	*Ambloplites rupestris*	0.51	18.7		
Black Crappie	*Pomoxis nigromaculatus*	0.46	17.1		
Sauger	*Sander canadensis*	0.45	16.4		
Common Carp X Goldfish	*HYBRID*	0.42	15.4		T

Tolerance: I - highly intolerant; M - sensitive; P - moderately tolerant; T - highly tolerant

period. The General Use fIBI biocriterion of 41 was met or surpassed at two sites in 2022 up from only a single site in 2020, but down from five (5) sites that met the General Use fIBI biocriterion (Figure 27; Table 22). One of the attaining sites (13-2) was new in 2022. The mean fIBI at 16-2 attained in both 2018 and 2020, but missed by 0.5 units in 2022. The first pass had

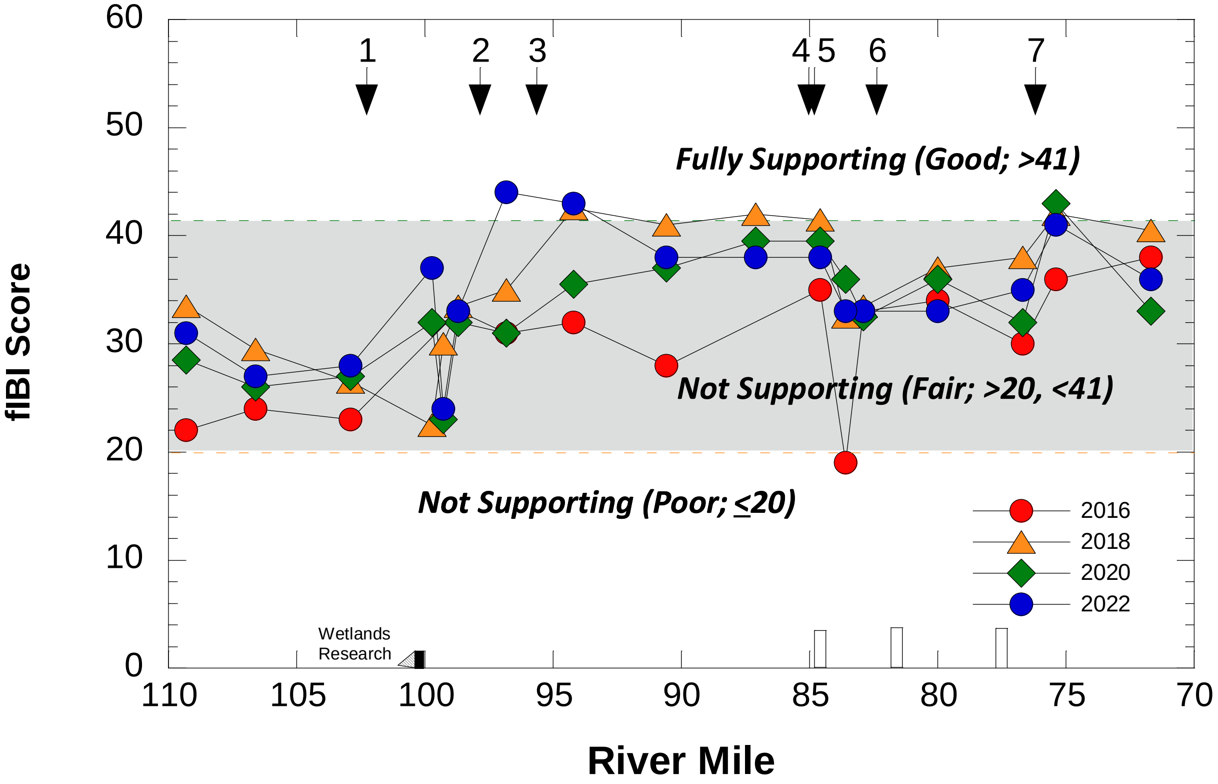

***Figure 27**. Illinois fish IBI (fIBI) scores for the upper Des Plaines River in 2016, 2018, 2020, and 2022. IEPA thresholds for determining full support, non-support-fair, and non-support poor of the General Use for aquatic life are indicated by dashed lines and grey shading. A key to sources (arrows and numbers) is in Figure 5.*

an fIBI of 36 and conditions at the site following a spate of elevated flow included an increase in silt/muck substrates and the riffle was degraded. There was a high percentage of generalist feeders and lower percentages of mineral spawners and benthic invertivores. The second pass yielded an fIBI of 45 with aforementioned substrate and habitat degradation being absent. It does confirm the effect that the low magnitude elevated flow events previously described can and do export degraded water quality and increased substrate disturbance into the lower reach of the study area. Other sites between 13-16 and 16-7 had 3.0 fIBI unit departures from the biocriterion, but the difference between the first and second sampling passes were <4 fIBI units. The departures ranged from 6.5-8.5 at all except site 16-2 (previously described) between site 16-5 and 16-1. The fIBI scores were lowest in the uppermost four (4) sites of the mainstem (23.5-30.5) the same as in 2016, 2018, and 2020.

The Modified Index of Well-Being (MIwb) has no formal biocriterion in Illinois, but using the Ohio biocriteria it attained the Ohio equivalent of the General Use at five (5) of the 17 sites, but using the Ohio non-significant departure of 0.5 units increased that number to 10 sites. The site at 13-19 was rated exceptional and the remaining sites were all fair (Figure 28; Table 22). Overall, the MIwb declined in 2022 compared to 2020. Although the MIwb excludes highly tolerant species from the biomass and numbers metrics, it can be affected by moderately

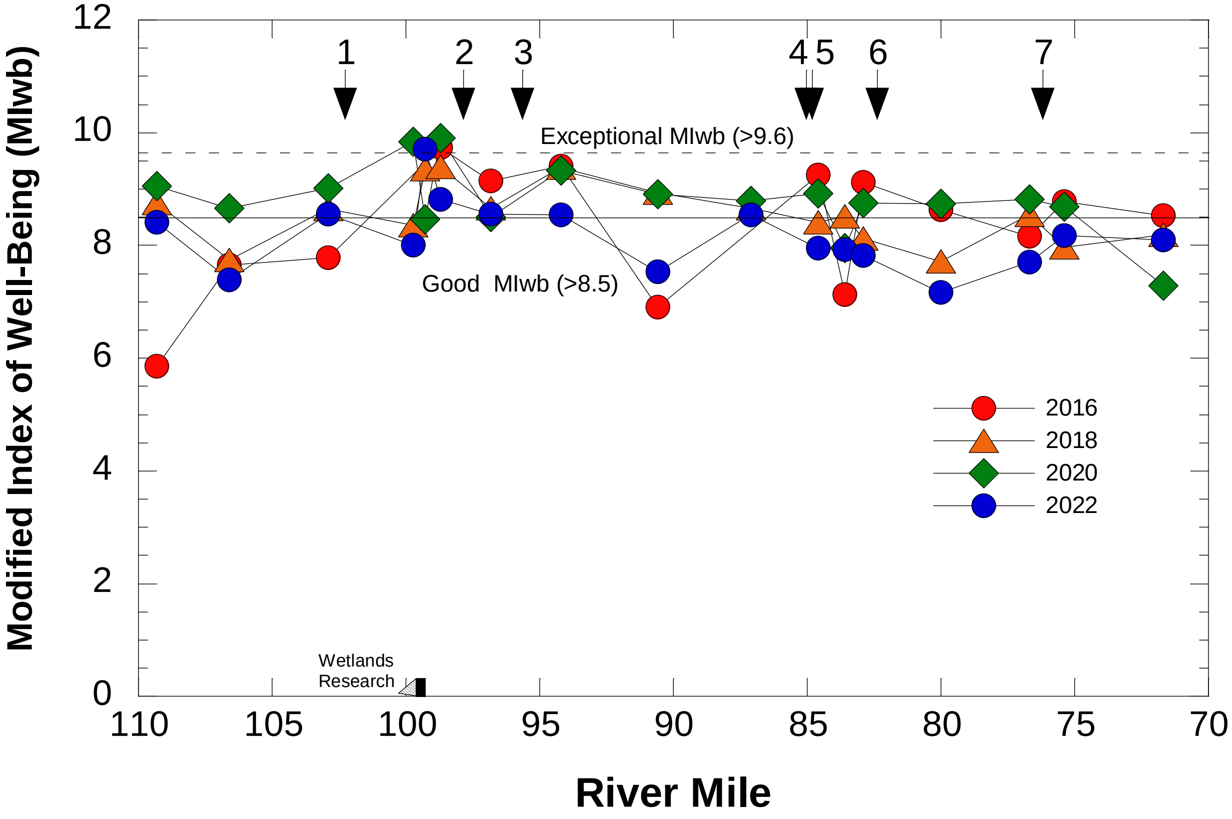

***Figure 28**. Modified Index of Well-Being (MIwb) for the upper Des Plaines River in 2016, 2018, 2020, and 2022. A key to sources (arrows and numbers) is in Figure 5.*

tolerant and intermediate fish species some of which can tolerate moderate amounts of pollution (Yoder and Smith 1999). With only a very few exceptions, the MIwb precedes the IBI in terms of showing recovery once stressor abatements have been adequately implemented. In the Upper DesPlaines River mainstem it is likely responding positively to the moderate organic and nutrient enrichment that emanates from the upper modified reach and in 2022 was exported into the downstream reach.

Table 23 lists the fIBI, selected fIBI metrics, and other fish assemblage attributes one of which exhibits key biological response signatures associated with both organic enrichment (%tolerant) and toxic impacts (%DELT anomalies). Metrics and attributes that had values predominantly in the good range were %DELT anomalies with two (2) sites recording zero (0) anomalies. The %tolerant species ranged from 17.7-33.3% with 14 sites in the good range and the remaining three (3) fair. Intolerant species ranged from 1-4 with good values at only (2) sites, fair values at 11 sites, and the remaining four (4) sites being poor (<u><</u>1). The poorest performing metric continues to be the %mineral spawners, ranging from 1.20-22.06% with nine (9) sites having poor percentages and the remainder in the fair range. The native species, %DELT, and %tolerant were mostly unchanged from 2020 and 2018. Intolerant species had eight (8) good

***Table 23**. Selected fish assemblage attributes for sites sampled in the Upper Des Plaines Year 5 study area in 2022. Biological index scores selected metrics are shaded by narrative quality as follows: exceptional – blue; good (fully supporting) – green/light green; fair (non-support) - yellow; poor (non-support) – orange; very poor – red (non-support); signatures of toxic and organic enrichment responses are based on Yoder and DeShon (2003).*

Site ID	River Mile	Drainage Area (mi.^{2})	Fish Assemblage Attributes						
			fIBI	MIwb	Native Sp.	%DELT	Intolerant Species	%Mineral Spawners	%Tolerant
Des Plaines River 2022									
13-6	109.30	123.7	30.5	8.4	21.0	0.14	1.5	1.6	23.6
13-5	106.60	137.3	26.5	7.4	17.0	0.00	1.0	1.9	20.6
13-4	102.90	145.6	28.0	8.6	19.0	0.00	1.0	3.6	31.7
13-18	99.72	212.9	23.5	8.0	14.0	0.79	1.0	5.4	17.7
13-19	99.30	213.2	37.0	9.7	25.0	0.81	3.0	22.1	22.1
13-3	98.70	220.3	32.5	8.8	21.5	0.29	3.0	14.9	25.7
13-2	96.82	225.4	43.5	8.6	23.5	0.18	4.0	35.9	21.3
13-1	94.20	232.0	43.0	8.6	21.5	0.34	3.5	56.3	18.9
13-16	90.60	253.8	38.0	7.5	17.5	0.42	3.5	49.2	31.5
16-6	87.10	261.4	38.0	8.5	20.0	0.37	3.0	46.4	27.7
16-7	84.60	266.5	38.0	8.0	21.5	0.61	4.0	22.3	20.9
16-5	83.60	268.1	33.0	7.9	18.5	0.20	3.0	14.0	27.5
16-8	82.90	268.9	33.0	7.8	20.5	0.20	3.5	10.3	24.4
16-4	80.00	273.2	32.5	7.2	15.5	0.41	2.0	22.0	26.1
16-3	76.70	314.7	34.5	7.7	19.5	0.20	3.5	16.8	26.1
16-2	75.40	324.0	40.5	8.2	19.0	1.02	3.5	29.7	23.6
16-1	71.70	358.7	36.0	8.1	18.0	0.50	3.0	23.9	33.3
Mill Creek 2022									
11-2	1.71	62.3	30.0	8.9	22.0	0.00	2.0	6.3	27.3
North Mill Creek 2022									
10-7	11.30	19.2	22.0	NA	6.0	0.00	0.0	0.0	50.0
10-1	1.10	31.9	18.0	6.9	13.0	0.39	0.0	0.0	46.2
Narrative Thresholds		**Exceptional**	≥50	>9.6	≥24	0	≥6	>44	≤16.1
		Good	≥41	>8.5	≥16	>1.3	≥4	>23	<30.3
		Fair	≥30	>5.8	≥13	>3.0	≥3	>10	<40
		Poor	≥15	<5.8	≥9	>10	≥1	>5	>50
		Very Poor	<15	<4.0	<9	>20	0	<5	≥70

results in 2020, but only two (2) in 2022. The %mineral substrate spawners were mixed with three very poor results (0 in 2020) and three (3) exceptional and two (2) good results (0 in 2020).

Mill Creek and North Mill Creek 2022 Fish Assemblage Results

Fish were sampled at a single site in Mill Creek (11-2) and two sites in North Mill Creek (10-7 and 10-1) in 2022. There were 27 native species, one (1) non-native species, and two (2) hybrids. The most numerous species included Bluegill Sunfish, Bluntnose Minnow, Spotfin Shiner, White Sucker, Green Sunfish, Pumpkinseed Sunfish, Yellow Bullhead, Orangespotted Sunfish, Creek Chub, and Hornyhead Chub. Mill Creek (11-2) had a fair fIBI score and North Mill Creek had fIBI scores that were fair (10-7) and poor (10-1) (Table 23). The 2022 fIBI of 30.0 in Mill Creek at site 11-2 was slightly higher than the 2020 result of 29.5 , and lower than the fIBI of 31.0 in 2018, with all better than the poor fIBI of 23 in 2019. The North Mill Creek poor fIBI of 18.0 at site 10-1 was slightly lower than the fIBI of 20.5 in 2020 and 22.0 in 2016 and the same as the poor fIBI of 18.0 in 2019. The poor fIBI of 18.0 at site 10-7 was lower than the 20.5 fIBI in 2020 at site 10.7 and similar to the poor fIBI of 18 in 2019. The MIwb in Mill Creek 11-2 was 8.9 (good) and in North Mill Creek 10-1 was 6.9 (Fair).

Mill Creek at 11-2 had one poor response (%mineral substrate spawners), one fair response (intolerant species), two (2) good, and one (1) exceptional response. North Mill Creek site 10-1 had two (2) very poor, three (3) fair responses, and only one (1) good and one (1) exceptional response. Site 10-7 had three (3) very poor, two (2) fair, and one (1) poor response signature (Table 23).

SYNTHESIS

The baseline biological condition of the upper Des Plaines River mainstem has been shaped by the naturally low gradient and wetland-origins of the region. The current condition of the biological assemblages reflects changes that have altered these natural features mostly via hydrological and physical alterations in the upper watershed related to agricultural and suburban development with more intensive urban development in the lower portions of the study area. Altered hydrology and habitat alterations in the upper mainstem and greater watershed continue to impair the biological assemblages due to the sluggish flows, excessive siltation, substrate embeddedness, nuisance growths of algae and macrophytes, and indicators of excessive organic and nutrient enrichment. The sources are primarily nonpoint in origin that are further exacerbated by the altered flows and habitat in the upper 10 miles of the mainstem. The longitudinal pattern in biological index scores and several chemical parameters strongly suggest that this impact is exported downstream into the effluent dominated reach of the mainstem. This “pollution footprint” varies between years and seems the most related to the duration of low flows that allow nuisance conditions to build up in the upper modified reach and the magnitude and frequency of elevated flows that move this material downstream. The magnitude of the elevated flows determines if it resides in the lower reach of the study area or if it carried and dispersed beyond the study area. Overall, biological performance improved from 2016 to 2018 with the longest reach of full attainment occurring over nearly 10 miles between site 13-1 (RM 94.2) to site 16-7 (RM 84.6) where habitat quality improved and the entry of large volumes of treated wastewater from several point sources acted to “dilute” upstream pollution. Despite the backsliding observed in 2020 at four of the former fully attaining sites, the continuing attainment at site 16-2 (RM 75.4) is downstream from all wastewater inputs. Of the four (4) sites that did not attain the full General Use in 2020 that were in attainment in 2018, three (3) did not significantly depart from the fIBI which was the most limiting of the two biological indices. The number of fully attaining sites improved relative to 2020 at sites 13-2 and 13-1. The next three sites (13-16 to 16-7) missed the fIBI biocriterion by only 3.0 units and by only 0.5 unit at site 16-2 which was the lone site in full attainment in 2020. The macroinvertebrate mIBI easily met its biocriterion with most values far surpassing the General Use threshold.

The Area of Degradation and Area of Attainment Values (ADV/AAV; ; Yoder et al. 2005, 2019) were used to quantify the extent and severity of biological impairment and the extent of changes that have been taken place in the upper Des Plaines mainstem 2016, 2018, 2020, and 2022. The ADV/AAV is calculated individually for each index and was done here for the fIBI and mIBI (Figure 29) and by separating the upper 10 mile habitat and hydrologically modified reach from the remainder of the mainstem downstream to the Lake-Cook Co. line with the upstream boundary of the lower reach at the confluence with Mill Creek and the progressive entry of significant volumes of treated wastewater downstream. The miles of non-attainment of the General Use for aquatic life in the upper modified reach of the mainstem was essentially unchanged in 2022 compared to all prior years (Figure 28). It continues to reflect the enduring chemical, hydrological, and habitat alterations in this reach. The miles of non-attainment in the lower reach was unchanged from 2020 and 2016 with 2018 having about one-half than in 2020 and 2022. Full attainment was the highest in 2018 which was reduced in 2020, but less so in 2022. The ADV/AAV values for the mIBI and fIBI are improving, but in different ways and with different trajectories.

The mIBI ADVs declined (improved) in 2022, but with a zero ADV meaning that no mIBIs attained their General Use biocriterion. The mIBI ADVs in the lower reach have improved especially in 2022. These improvements in the ADV were accompanied by substantial increases in the AAV which means that mIBI values are increasing along the entire reach.

The fIBI ADVs in the upper reach have lessened somewhat, but with no corresponding AAVS continue to show the persistent and severe non-attainment with consistently observed poor fIBI values. The lower reach showed an overall decrease (improvement) in the fIBI ADVs from 2016 through 2022, but without a consistent showing of AAVs that would accompany fIBI values above the General Use biocriterion. The overall trajectory is unchanged in the modified upper reach and a continuing improvement in the lower reach from 2016.

NE Illinois IPS thresholds for water quality, habitat, and land use attributes were used in concert with other variables to determine causes of impairment. Having these thresholds across five narrative categories (excellent, good, fair, poor, and very poor) provides a graded approach to the assignment of causes and sources for impairments of the Illinois General Use for aquatic life. These tools were integrated with previously used approaches and indicators to assign weighted causes associated with the biological impairments

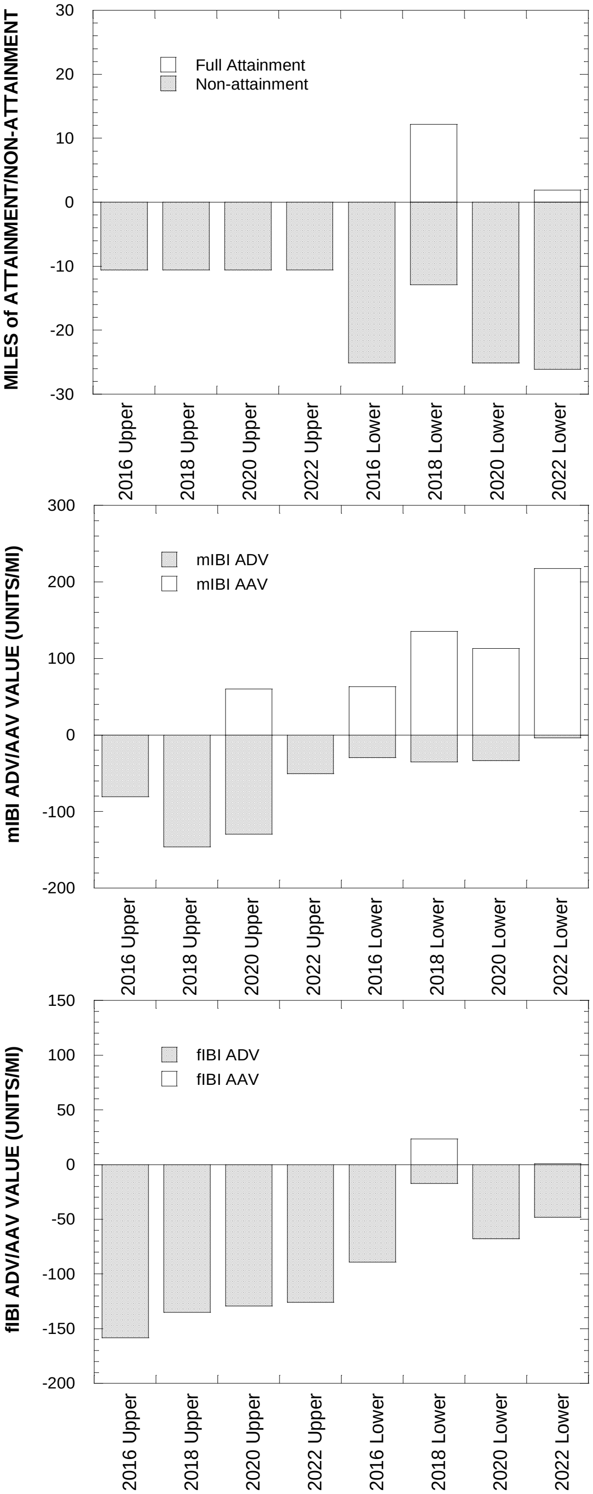

***Figure 29**. Area of Degradation (ADV; cross hatched) and Area of Attainment (AAV; open shading) values in the upper reach and remaining lower reach of the upper Des Plaines River in 2016, 2018, 2020, and 2022 (upper and middle panels). The miles of full and non-attainment appear in the lower*

observed in 2022 the same as was done in 2020.

The biological criteria for fish and macroinvertebrates used by Illinois EPA 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 (IEPA 2022) assessment guidelines, but is supplemented by the more extensive biological effect thresholds provided by the IPS (MBI 2023a). 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 are included in Table 24 along with the fish and macroinvertebrate IBI scores. Habitat alteration is represented by the QHEI and the QHEI modified:good attributes ratio, D.O. includes the minimum measured by Datasondes, the effect of nutrient enrichment by the diel D.O. swing narrative, the nutrient enrichment effect status, new IPS chemical threshold exceedances for water and sediment, and biological response signatures for organic enrichment and toxic tolerant indicators. The rationale for listing the predominant causal categories in 2022 follows:

- **Macro Habitat Related** (94 observations (64 in 2020); weighted frequency of 47.3% [39.5% in 2020]) – including the number of high influence or moderate influence poor or good attributes in the QHEI attributes matrix (Table 19), a fair, poor, or very poor QHEI score, or an IPS habitat metric;
- **Organic/Nutrient Enrichment** (35 observations [66 in 2020]; weighted frequency of 13.9% [36.5% in 2020) – includes ammonia-N, total P, nitrate-N, or TKN median/mean value exceedance of IPS fair, poor, or very poor thresholds (Table 7), and any fair, poor, or very poor organic enrichment response signature (Tables 21 and 23);
- **D.O. Related** (31 observations [22 in 2020]; weighted frequency of 17.6% [13.8% in 2020]) – includes any fair, poor, or very poor maximum or minimum D.O. or diel D.O. swing from continuous measurements (Table 15).
- **Urban Related** (47 observations [26 in 2020]; weighted frequency of 21.0% [10.2% in 2020]) – includes any chloride, conductivity, or TSS median value exceedance of IPS fair, poor, or very poor thresholds in Table 10 and any IPS derived urban land use variable exceeding a fair, poor, or very poor threshold.
- Toxics (1 observation [0 in 2020]; weighted frequency 0.2% [0.0% in 2020]) – any exceedance of Illinois WQC or IPS fair, poor, or very poor thresholds for a toxic compound (none recorded) or any toxic response signature (Table 21 and 23).

Macro Habitat Related at 47.3% was the most pervasive cause followed by Urban Related causes at 21.0% then by D.O. related issues at 17.6% and then by Organic/Nutrient Enrichment at 13.9% based on the weighted frequency of each. Each category had poor and very poor threshold exceedances that were primarily observed in the modified upper reach upstream from the Wetland Research Riffle and the confluence with Mill Creek. Fair exceedances included more parameters and stressors and were the most frequently observed in the middle and lower reaches of the mainstem with fewer poor and very poor exceedances.

***Table 24**. Key chemical, physical, and biological response indicators of impairment observed at each site in the Upper Des Plaines River study area in 2022. The causes associated with biological impairments are drawn from analyses of habitat, nutrient effects, chemical IPS and other threshold exceedances, sediment chemical IPS exceedances, and biological response signatures. Causes of impairment are classified as fair, poor, or very poor in accordance with the exceedance of corresponding thresholds. See footnotes for table references and biological, physical, and chemical threshold intervals. IPS restorability score are provided for non- and partially supporting sites and susceptibility and threat scores are provided for fully supporting sites. A glossary of causes is at the bottom.*

Site ID	River Mile	Drain-age Area (sq. mi.)	fIBI	mIBI	QHEI	AQLU Status	QHEI Modified: Good Ratio	Max. D.O. (Sonde)	Min. D.O. (Sonde)	Diel D.O. Swing	Overall Enrich-ment Status	>Poor Chemical Threshold	%Organic Enrich-ment Signatures	%Toxic Tolerant Signatures	2022 Causes by IPS Stressor Threshold Narrative Category					Restor-ability Score (0-100)	Suscept-ibility Score (0-100)	Threat Score (0-100)
															Very Poor[1]	Poor[1]	Fair[1]	Threats	2022 Sources			
Des Plaines River																						
13-6	109.30	123.7	30.5	37.1	49.00	Non-Fair	4.00	18.29	1.72	11.42	Highly Enriched	1	39.6	0.3	Substr; Low D.O.; D.O.Swing; Max. D.O.	Imperv-30C; QHEI; Organic enrich.; Good QHEI attr.; Poor QHEI attr.	Chan; Chloride; TP		Altered Flow; Habitat	57.7		
13-5	106.60	137.3	26.5	37.2	35.75	Non-Fair	9.00	11.00	2.59	6.81	Highly Enriched	1	20.8	1.5	Substr; Chan; D.O. Swing; QHEI Ratio; TSS; Good QHEI attr.	Imperv-30C; QHEI; Low D.O.; Organic enrich.	Imperv-500m;Imperv-30; Chloride; Organic enrich.		Altered Flow; Habitat	51.49		
13-4	102.90	145.6	28.0	32.7	46.00	Non-Fair	4.00	8.97	3.66	5.08	Highly Enriched	1	19.0	0.4	Substr; Organic enrich.	QHEI; Chan; Low D.O.; D.O. Swing; QHEI Ratio; Good QHEI attr.; Poor QHEI attr.	Chloride; Organic enrich.		Altered Flow; Habitat	54.71		
13-18	99.72	212.9	23.5	31.5	38.00	Non-Fair	4.00	12.69	5.77	5.58	Enriched	1	43.7	2.3	Substr; Chan;	QHEI; D.O. Swing; Organic enrich.; QHEI ratio; Good QHEI attr.; Poor QHEI attr.	TKN; Chloride; Low D.O.; Max. D.O.		Altered Flow; Habitat	51.82		
13-19	99.30	213.2	37.0	33.1	74.75	Non-Fair	0.71	8.49	3.06	3.39	Likely Nutrients	1	56.8	4.2		Low D.O.; Organic enrich.; Poor QHEI attr.;	QHEI; Substr; Chan; Chloride; Good QHEI attr.		Habitat Modification,	70.87		
13-3	98.70	220.3	32.5	42.1	72.75	Partial	0.57	10.82	1.52	9.30	Enriched	2	16.6	5.5	Low D.O.; D.O. Swing	Chloride; Poor QHEI attr.	Imperv-500m; TKN; QHEI; Chan; Conduct; Organic enrich.: Good QHEI attr.		Upstream Flow & Urban NPS	66.41		
13-2	96.82	225.4	43.5	46.2	78.25	Full	0.22	10.64	5.55	4.89	Likely Nutrients	1	23.8	1.3				Imperv-500m; Nitrate; Chloride; Low D.O.; D.O. Swing			100	90
13-1	94.20	232.0	43.0	54.9	66.00	Full	1.75	15.81	3.37	8.50	Likely Nutrients	2	7.7	4.2				Imperv-500m;TP; TKN; QHEI; Substr; Chan; Conduct; Chloride; Low D.O.; D.O. Swing			91.12	80
13-16	90.60	253.8	38.0	60.1	70.50	Partial	0.83				Not Nutrients	1	4.2	5.8	Nitrate;	Chloride; Poor QHEI attr.	Imperv-500m;TP; QHEI; Substr; Conduct;; Good QHEI attr.		Urban NPS, WWTP	65.99		
16-6	87.10	261.4	38.0	69.4	69.50	Partial	1.20	9.53	4.14	4.91	Not Nutrients	1	6.3	7.8		Chloride; Poor QHEI attr.	QHEI; Chan; Low D.O.; D.O. Swing; Nitrate; TP; Good QHEI attr.;		Urban NPS, WWTP	69.54		
16-7	84.60	266.5	38.0	60.1	75.25	Partial	0.57				Not Nutrients	1	11.0	7.6		Chloride; Nitrate; Poor QHEI attr.	Imperv-500m;Imperv-30;Imperv-30C;TP; Substr; Conduct;; Good QHEI attr.;		Urban NPS, WWTP	68.32		
16-5	83.60	268.1	33.0	48.2	60.25	Partial	2.67	12.87	4.17	7.87	Likely Nutrients	1	10.2	11.2	Poor QHEI attr.	Chloride; Good QHEI attr.;	Imperv-500m;Imperv-30;TP; Nitrate; QHEI; Substr; Chan; Conduct; Low D.O.; D.O. Swing; Toxics; Max D.O.		Urban NPS, WWTP	59.17		
16-8	82.90	268.9	33.0	56.0	61.00	Partial	1.75				Not Nutrients	1	5.0	4.0	Chloride; Poor QHEI attr.	Nitrate; Good QHEI attr.;	Imperv-500m; Nitrate; QHEI; Substr; Chan; Conduct; TP		Urban NPS, WWTP	60.15		
16-4	80.00	273.2	32.5	65.8	67.00	Partial	1.17	17.03	3.69	3.87	Likely Nutrients	2	9.4	4.0	Max. D.O.; Poor QHEI attr.	Chloride; Low D.O.; D.O. Swing; Nitrate	Imperv-500m;Imperv-30;Imperv-30C; Nitrate; QHEI; Substr; Chan; Conduct; TSS; Good QHEI attr.;		Urban NPS, WWTP, Habitat	66.04		
16-3	76.70	314.7	34.5	48.4	61.75	Partial	2.33	11.16	4.52	3.70	Not Nutrients	2	11.8	1.8	TSS; Poor QHEI attr.	Chloride; Nitrate; Good QHEI attr.;	Nitrate; QHEI; Substr; Chan; Conduct; Low D.O.; D.O. Swing; TP		Urban NPS, WWTP, Habitat	73.44		
16-2	75.40	324.0	40.5	61.3	59.25	Partial	2.67	13.14	4.66	8.26	Likely Nutrients	1	12.7	2.1	Poor QHEI attr.	Imperv-30;Imperv-30C; Chan; Chloride; Good QHEI attr.;	Imperv-500m; Nitrate; QHEI; Substr; Conduct; Low D.O.; D.O. Swing; Max. D.O.		Urban NPS, WWTP, Habitat	59.33		
16-1	71.70	358.7	36.0	53.8	71.00	Partial	1.50	17.77	3.67	14.10	Likely Nutrients	2	7.9	1.0	Chloride; Max. D.O.	Low D.O.; D.O. Swing; Good QHEI attr.; Poor QHEI attr.	Imperv-500m; Chan; Conduct; TSS;		Urban NPS, WWTP, Habitat	55.81		
Mill Creek																						
11-2	1.71	62.3	30.0	44.7	83.75	Partial	0.00	7.81	6.67	1.07	Likely Nutrients	0	14.2	0.6		Chloride;	TKN; Chloride; TSS		NPS	84.25		
North Mill Creek																						
10-7	11.30	19.2	22.0	40.5	28.50	Non-Fair	11.00				Enriched	0	27.6	0.3	Substr; TSS; QHEI ratio; Chloride; Good QHEI attr.; Poor QHEI attr.	QHEI; Chan;	TKN; Organic enrich.		Urban NPS	73.85		
10-1	1.10	31.9	18.0	63.5	50.00	Non-Poor	2.33	13.53	6.78	6.40	Enriched	1	6.7	2.9		QHEI; Substr; DO Swing; Good QHEI attr.; Poor QHEI attr.	TP; TKN; Chan; Chloride; Nitrate; Max D.O.		Habitat Modification,	80.63		
Narrative Thresholds		**Excellent**	≥50	>73	>84.5	FULL	<0.50	<10.36	>6.9	<2.0	Not Nutrients	None	<5	0						Very High	Very Low	Very Low
		Good	≥41	≥41.8	>75.9	FULL	<2.00	<12.2	>6.0	<4.0	Not Nutrients	None	<15	>1.3						High	Low	Low
		Fair	≥30	≤41.7	<75.9	PARTIAL	≥2.00	<14.2	>4.0	<5.0	Likely Nutrients	≤1	≥15	>3.0						Moderate	Moderate	Moderate
		Poor	≥15	≤29	<50.1	NON-Fair	≥4.00	<16.3	>2.0	<6.5	Enriched	≤3	≥35	>10						Low	High	High
		Very Poor	<15	<15	<25.0	NON-Poor	≥6.00	≥16.3	<2.0	≥6.5	Highly Enriched	>3	>60	>20						Very Low	Very High	Very High

Acronym	Description	Acronym	Description	Acronym	Description
Imperv-30C	Imprevious surface 30 m buffer clipped	High Mod. Attr.	NumberHigh Influence Modified QHEI Attributes	Conduct	Specific conductivity
Imperv-500	Imprevious surface 500 m buffer	Good QHEI Attr.	Number of Good Habitat Attributes	Toxicity	Exceedance of Toxic Biological Signature
Imperv-30	Imprevious surface 30 m buffer	Poor QHEI Attr.	Number if Modified Habitat Attributes	Org. Enrich.	Exceedance of Organic Enrichment Biological Signature
QHEI	Qualitative Habitat Evaluation Index (QHEI)	Chloride	Chloride concentration in mg/L	TSS	Total suspended solids
QHEI Ratio	Ratio of Modified:Good QHEI attributes	Low D.O.	Minium Dissolved Oxygen in mg/L	TKN	Total Kjeldahl nitrogen
Chan	Channel condition from QHEI	Max. D.O.	Maximum Dissolved Oxygen in mg/L	TP	Total phosphorus
Substr	Substrate condition from QHEI	D.O. Swing	Width of Diel D.O. Variation in 24 Hrs.	Nitrate	Nitrate as N

[1] IPS derived very poor, poor, and fair causes assigned by weighting the stressor rank * FIT factor - see Appendix D; very poor causes rank >8-10, poor causes rank >6-8, fair causes rank >4-6; other stressor rankings are described throughout the report.

Only a few elevated levels of Nitrate-N were in the poor and very poor ranges with most along with total P most frequently in the fair range. These were primarily observed in the effluent influenced reaches of the middle and lower mainstem. Urban related causes exceeding mostly fair thresholds occurred mostly in the middle and lower mainstem, but poor exceedances of the Impervious Cover-30 meter buffer occurred at the two upstream most sites and poor and a few poor exceedances of chloride occurred throughout the study area. The differences between 2022 and 2020 were for the order of the causal categories after Macrohabitat Related changing and the former increasing in terms of the weighted frequency.

The introduction of large volumes of treated municipal wastewater to the mainstem downstream from the upper modified reach continues to benefit the Upper Des Plaines River and aides biological condition by offsetting detrimental impacts of pollution that is exported downstream from the modified upper reach of the mainstem. The biological results downstream from the entry of treated wastewater at site 13-3 were better both in terms of AQLU status and the fIBI and mIBI scores than at the four upstream most sites that were in non-fair in 2022 and have been and non-poor in prior years. Even with the lower fIBI scores in 2020, the longitudinal pattern was the same – consistent incremental improvement downstream from the Wetland Research riffle and seemingly independent of the entry of large volumes of treated wastewater. This and the accumulation of more poor and very poor exceedances of IPS and other thresholds in the upper modified reach points to nonpoint sources being exacerbated by the habitat and hydrological modifications in the upper watershed as the major limiting sources to aquatic life. After observing this phenomenon over four survey years spanning 2016-22 and examining the differences in the annual flow regime over that same period suggests that periodic elevated flow events that approach or exceed flood stage export most of the upstream pollution out of the study area. However, spates of less elevated high flows act to deposit this pollution in the lower reaches of the study area. Besides the revelations of the analysis of the permanent DRWW Datasondes, the observations of nonpoint source derived muck substrates by the fish crew at site 16-2 during the first sampling pass following one of these events, but finding different conditions during the second pass later in the index period was reflected by a 10 point spread in the fIBI score and was the difference between non and full attainment of the General Use for aquatic life in 2022

Two sites (13-2 and 13-1) were in full attainment of the General Use for aquatic life in 2022, up from one site in 2020, but down from the five sites in 2018, all within the effluent dominated reach of the study area. Partial attainment was observed in the reach between these sites and site 16-1 at the lower terminus of the study area. Each of these sites were limited by the non-attainment of the fIBI biocriterion with most scores marginally lower than in 2018 and similar to 2020. Four sites immediately upstream and downstream from the Libertyville and Mundelein WWTPs missed full attainment by only 3.0 units and at site 16-2 by 0.5 units. The discovery of Round Goby at the four (4) downstream most sites in 2020 and their persistence in 2022 still adds an unknown factor for the aquatic assemblages. There was no apparent movement upstream in 2022, but this bears watching in the future as it represent the furthest upstream ingress in the Des Plaines basin (Sarver 2022).

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APPENDIX A

Upper Des Plaines 2022 Fish Assemblage Data

A1: Fish Index of Biotic Integrity (fIBI) Metrics & Scores 2022
A-2: Fish Species Grand Des Plaines River Mainstem (all sites combined) 2022
A-3: Fish Species Grand Mill Creek/North Mill Creek (all sites combined) 2022
A-4: Fish Species by Sampling Event (2022)

Appendix Table A-1. Fish IBI results for data collected in the Upper Des Plaines River watershed in 2022.

DESPLAINES RIVER - (95656)

Year: 2022

							Number of						Percent						
Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI 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)	IBI	Modified Iwb
13-6	109.30	P	06/24/2022	123.6	84.2	3	22(5)	7(6)	2(2)	2(2)	3(2)	6(4)	2(1)	27(5)	72(4)	1(1)	1172	32.0	8.3
13-6	109.30	P	09/28/2022	123.6	84.2	3	20(4)	5(5)	2(2)	1(1)	3(2)	5(3)	2(1)	20(5)	60(5)	1(1)	584	29.0	8.6
13-5	106.60	P	06/24/2022	137.2	86.1	3	17(3)	7(6)	1(1)	1(1)	1(1)	5(3)	3(1)	24(5)	58(6)	0(0)	378	27.0	7.4
13-5	106.60	P	09/28/2022	137.2	86.1	3	17(3)	5(5)	1(1)	1(1)	1(1)	4(3)	1(1)	18(6)	62(5)	0(0)	498	26.0	7.4
13-4	102.90	P	06/24/2022	145.5	87.2	3	20(4)	8(6)	2(2)	1(1)	1(1)	3(2)	3(1)	30(5)	48(6)	0(0)	374	28.0	8.4
13-4	102.90	P	09/28/2022	145.5	87.2	3	18(4)	7(6)	2(2)	1(1)	1(1)	2(2)	4(1)	33(5)	59(6)	0(0)	448	28.0	8.8
13-19	99.72	P	06/26/2022	213.1	94.2	3	24(5)	8(6)	2(2)	3(3)	3(2)	5(4)	25(4)	25(5)	53(6)	3(1)	750	38.0	9.7
13-19	99.72	P	10/01/2022	213.1	94.2	3	26(5)	8(6)	2(2)	3(3)	3(2)	4(3)	20(4)	19(5)	63(5)	0(1)	1372	36.0	9.8
13-18	99.30	P	06/24/2022	212.8	94.2	3	13(2)	6(6)	1(1)	1(1)	1(1)	1(1)	6(2)	15(6)	73(4)	0(0)	252	24.0	7.9
13-18	99.30	P	09/28/2022	212.8	94.2	3	15(3)	4(4)	1(1)	1(1)	2(2)	2(2)	4(1)	20(5)	82(3)	0(1)	408	23.0	8.1
13-3	98.70	P	06/25/2022	220.2	94.8	3	19(4)	6(6)	2(2)	3(3)	2(2)	3(2)	18(3)	26(5)	70(4)	1(1)	680	32.0	8.2
13-3	98.70	P	10/01/2022	220.2	94.8	3	24(5)	6(6)	2(2)	3(3)	3(2)	6(4)	12(2)	25(5)	76(3)	1(1)	878	33.0	9.5
13-2	96.82	P	06/23/2022	225.3	95.2	3	23(5)	8(6)	2(2)	4(4)	4(3)	7(5)	42(6)	22(5)	58(6)	5(2)	468	44.0	7.8
13-2	96.82	P	10/01/2022	225.3	95.2	3	24(5)	6(6)	2(2)	4(4)	5(4)	7(5)	30(5)	21(5)	66(5)	4(2)	1090	43.0	9.4
13-1	94.20	P	06/22/2022	232.0	95.8	3	19(4)	6(6)	1(1)	3(3)	3(2)	5(4)	54(6)	21(5)	42(6)	2(1)	510	38.0	7.6
13-1	94.20	P	09/29/2022	232.0	95.8	3	24(5)	7(6)	2(2)	4(4)	5(4)	7(5)	58(6)	17(6)	33(6)	9(4)	684	48.0	9.5
13-16	90.60	P	06/22/2022	253.7	97.4	3	18(4)	6(6)	2(2)	4(4)	3(2)	5(4)	47(6)	28(5)	50(6)	2(1)	486	40.0	7.1
13-16	90.60	P	09/28/2022	253.7	97.4	3	17(3)	5(5)	1(1)	3(3)	2(2)	5(4)	51(6)	35(4)	40(6)	4(2)	610	36.0	8.0
16-6	87.10	P	06/22/2022	261.4	98.0	3	21(4)	5(5)	1(1)	3(3)	3(2)	8(5)	43(6)	24(5)	50(6)	2(1)	484	38.0	8.3

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

Appendix Table A-1. Fish IBI results for data collected in the Upper Des Plaines River watershed in 2022.

							Number of						Percent						
Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI 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)	Modified IBI	Iwb
16-6	87.10	P	09/29/2022	261.4	98.0	3	19(4)	6(6)	1(1)	3(3)	2(2)	5(4)	49(6)	32(5)	42(6)	1(1)	668	38.0	8.7
16-7	84.60	P	06/21/2022	266.4	98.3	3	20(4)	6(6)	2(2)	4(4)	4(3)	7(5)	21(4)	20(5)	74(4)	2(1)	666	38.0	7.3
16-7	84.60	P	09/27/2022	266.4	98.3	3	23(5)	6(6)	2(2)	4(4)	3(2)	7(5)	23(4)	22(5)	68(4)	3(1)	488	38.0	8.6
16-5	83.60	P	06/21/2022	268.0	98.4	3	16(3)	6(6)	2(2)	2(2)	2(2)	4(3)	12(2)	31(5)	77(3)	1(1)	208	29.0	7.5
16-5	83.60	P	09/27/2022	268.0	98.4	3	21(4)	6(6)	2(2)	4(4)	4(3)	6(4)	16(3)	24(5)	74(4)	4(2)	510	37.0	8.3
16-8	82.90	P	06/21/2022	268.9	98.5	3	20(4)	6(6)	2(2)	4(4)	2(2)	6(4)	11(2)	25(5)	83(3)	1(1)	312	33.0	7.4
16-8	82.90	P	09/27/2022	268.9	98.5	3	21(4)	7(6)	2(2)	3(3)	3(2)	4(3)	10(2)	24(5)	61(5)	1(1)	512	33.0	8.2
16-4	80.00	D	06/27/2022	273.2	98.8	3	17(3)	5(5)	1(1)	2(2)	2(2)	5(4)	24(4)	24(5)	67(5)	7(3)	185 *	34.0	7.5
16-4	80.00	D	09/30/2022	273.2	98.8	3	14(3)	6(6)	1(1)	2(2)	2(2)	3(2)	20(4)	29(5)	71(4)	4(2)	168 *	31.0	6.9
16-3	76.70	P	06/26/2022	314.6	101.4	3	17(3)	5(5)	2(2)	3(3)	2(2)	5(4)	12(3)	29(5)	71(4)	2(1)	260	32.0	7.3
16-3	76.70	P	10/02/2022	314.6	101.4	3	22(4)	7(6)	2(2)	4(4)	3(2)	5(4)	21(4)	23(5)	60(5)	3(1)	500	37.0	8.1
16-2	75.40	P	06/26/2022	323.9	101.9	3	18(4)	6(6)	1(1)	3(3)	3(2)	6(4)	20(4)	22(5)	71(4)	6(3)	332	36.0	7.6
16-2	75.40	P	10/02/2022	323.9	101.9	3	20(4)	5(5)	2(2)	4(4)	5(4)	5(4)	39(6)	25(5)	43(6)	12(5)	720	45.0	8.8
16-1	71.70	P	06/23/2022	358.7	103.8	3	15(3)	5(5)	1(1)	3(3)	1(1)	5(4)	25(5)	33(5)	56(6)	1(1)	244	34.0	7.8
16-1	71.70	P	09/30/2022	358.7	103.8	3	21(4)	6(6)	2(2)	3(3)	4(3)	5(4)	22(4)	33(5)	61(5)	4(2)	598	38.0	8.4

MILL CREEK - (95995)

Year: 2022

11-2	1.71	D	06/27/2022	62.2	71.6	3	22(5)	7(6)	1(1)	2(2)	3(2)	5(3)	6(1)	27(5)	71(4)	2(1)	594	30.0	8.9

NORTH MILL CREEK - (95996)

Year: 2022

10-7	11.30	E	06/27/2022	19.2	50.0	3	6(1)	1(2)	0(0)	0(0)	1(1)	2(2)	0(0)	50(4)	54(6)	15(6)	39 * *	22.0	

na - Qualitative data, Modified Iwb not applicable.

X - IBI extrapolated

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table A-1. Fish IBI results for data collected in the Upper Des Plaines River watershed in 2022.

							Number of						Percent						
Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI 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)	IBI	Modified Iwb
10-1	1.10	E	06/27/2022	31.9	59.3	3	13(3)	4(5)	1(1)	0(0)	1(1)	3(2)	0(0)	46(4)	92(1)	0(1)	514	18.0	6.9

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

Appendix Table B-2 *. Total fish species collected in the Upper Des Plaines River mainstem in 2022.*

Family Code	Species Code	Common Name	Latin Name	IEPA Tolerance	Number Counted	Number Weighed	Number/Km	% by Number	Avg. Weight (g)	Biomass (Kg/km)	% by Weight
77	009	Bluegill Sunfish	*Lepomis macrochirus*	P	1302	1286	2696	14.59	26.0	64.4	1.76
43	043	Bluntnose Minnow	*Pimephales notatus*	T	1171	1157	2490	13.46	2.9	8.1	0.22
43	004	Hornyhead Chub	*Nocomis biguttatus*	I	1188	1178	2382	12.88	17.5	40.9	1.11
40	016	White Sucker	*Catostomus commersoni*	T	891	888	1795	9.71	252.5	404.8	11.00
43	032	Spotfin Shiner	*Cyprinella spiloptera*		771	762	1621	8.76	3.2	4.5	0.12
77	013	Pumpkinseed Sunfish	*Lepomis gibbosus*	P	403	394	879	4.75	18.9	12.5	0.34
43	001	Common Carp	*Cyprinus carpio*	T	414	133	863	4.67	2674.6	2262.1	61.45
77	006	Largemouth Bass	*Micropterus nigricans*		305	303	633	3.42	235.7	110.3	3.00
43	022	Rosyface Shiner	*Notropis rubellus*	I	219	217	441	2.39	2.1	1.0	0.03
77	004	Smallmouth Bass	*Micropterus dolomieui*	M	216	213	431	2.33	65.3	37.3	1.01
77	008	Green Sunfish	*Lepomis cyanellus*	T	222	218	429	2.32	16.1	6.3	0.17
43	034	Sand Shiner	*Miniellus stramineus*	M	168	168	340	1.84	2.2	0.7	0.02
77	003	Rock Bass	*Ambloplites rupestris*		163	162	324	1.75	84.5	18.7	0.51
54	002	Blackstripe Topminnow	*Fundulus notatus*		141	140	296	1.60	1.2	0.3	0.01
20	003	Gizzard Shad	*Dorosoma cepedianum*		131	131	262	1.42	134.3	12.8	0.35
80	011	Logperch	*Percina caprodes*	M	122	120	242	1.31	8.8	2.1	0.06
40	018	Spotted Sucker	*Minytrema melanops*		114	114	234	1.26	625.5	112.4	3.05
77	010	Orangespotted Sunfish	*Lepomis humilis*		94	94	225	1.21	5.0	1.0	0.03
87	001	Round Goby	*Neogobius melanostomus*		103	100	204	1.10	7.9	1.4	0.04
74	006	Yellow Bass	*Morone mississippiensis*	P	86	85	178	0.96	40.1	8.2	0.22
47	004	Yellow Bullhead	*Ameiurus natalis*	T	82	81	162	0.88	149.1	21.3	0.58
43	028	Spottail Shiner	*Hudsonius hudsonius*	P	68	68	156	0.84	6.9	0.9	0.03
37	003	Northern Pike	*Esox lucius*		75	74	153	0.83	1059.9	155.4	4.22
77	002	Black Crappie	*Pomoxis nigromaculatus*		76	75	154	0.83	99.0	17.1	0.46
80	005	Blackside Darter	*Percina maculata*		74	72	150	0.81	4.9	0.8	0.02
47	002	Channel Catfish	*Ictalurus punctatus*		69	68	141	0.76	1302.5	164.3	4.46
15	001	Bowfin	*Amia calva*		56	54	127	0.68	1565.3	166.5	4.52
43	003	Golden Shiner	*Notemigonus crysoleucas*	T	41	41	90	0.49	18.9	1.4	0.04
70	001	Brook Silverside	*Labidesthes sicculus*	M	35	35	81	0.44	1.1	0.1	0.00
80	014	Johnny Darter	*Etheostoma nigrum*		35	34	71	0.38	1.1	0.1	0.00
77	007	Warmouth Sunfish	*Lepomis gulosus*		21	21	44	0.24	23.3	1.2	0.03
80	001	Sauger	*Sander canadensis*		18	18	36	0.20	462.1	16.4	0.45
43	026	Common Shiner	*Luxilus cornutus*		13	13	27	0.15	12.6	0.4	0.01
77	015	Green X Bluegill Sunfish	*HYBRID*		14	14	28	0.15	57.3	1.6	0.04
47	008	Stonecat Madtom	*Noturus flavus*	I	8	8	16	0.09	36.3	0.6	0.02
34	001	Central Mudminnow	*Umbra limi*	T	4	4	10	0.06	3.8	0.0	0.00
43	033	Bigmouth Shiner	*Ericymba dorsalis*		5	5	10	0.05	2.0	0.0	0.00

***Appendix Table B-2** . continued.*

Family Code	Species Code	Common Name	Latin Name	IEPA Tolerance	Number Counted	Number Weighed	Number/Km	% by Number	Avg. Weight (g)	Biomass (Kg/km)	% by Weight
47	013	Tadpole Madtom	*Noturus gyrinus*		5	5	10	0.05	2.3	0.0	0.00
10	004	Longnose Gar	*Lepisosteus osseus*		4	4	8	0.04	225.0	1.5	0.04
43	002	Goldfish	*Carassius auratus*	T	4	4	8	0.04	129.2	0.9	0.02
43	044	Central Stoneroller	*Campostoma anomalum*		4	4	8	0.04	3.5	0.0	0.00
43	045	Common Carp X Goldfish	*HYBRID*	T	4	4	8	0.04	1816.7	15.4	0.42
80	003	Yellow Perch	*Perca flavescens*		4	4	8	0.04	46.3	0.4	0.01
68	001	Pirate Perch	*Aphredoderus sayanus*		2	2	5	0.03	6.5	0.0	0.00
77	001	White Crappie	*Pomoxis annularis*		2	2	4	0.02	75.0	0.3	0.01
43	013	Creek Chub	*Semotilus atromaculatus*	T	1	1	2	0.01	8.0	0.0	0.00
43	025	Striped Shiner	*Luxilus chrysocephalus*		1	1	2	0.01	3.0	0.0	0.00
47	006	Black Bullhead	*Ameiurus melas*	P	1	1	2	0.01	300.0	0.6	0.02
47	007	Flathead Catfish	*Pylodictis olivaris*		1	0	2	0.01	300.0	0.0	0.00
54	002	Blackstriped Topminnow	*Fundulus notatus*		1	1	2	0.01	1.0	0.0	0.00
77	014	Bluegill X Pumpkinseed	*HYBRID*		1	1	2	0.01	35.0	0.1	0.00
77	016	Green X Pumpkinseed	*HYBRID*		1	1	2	0.01	20.0	0.0	0.00
77	025	Warmouth X Pumpkinseed	*HYBRID*		1	1	2	0.01	10.0	0.0	0.00
80	002	Walleye	*Sander vitreus*		1	1	2	0.01	1850.0	3.7	0.10
Totals		47 species; 2 non-native species; 5 hybrids			8956	8585	18497	100.0		3680.7	100.0

Appendix Table B-3 *. Total fish species collected in Mill Creek/North Mill Creek in 2022.*

Common Name	Latin Name	Ohio Tolerance	Number Counted	Number Weighed	Number /Km	% by Number	Avg. Wt. (g)	Kg/Km	% by Weight
Bluegill Sunfish	*Lepomis macrochirus*	P	135	135	237.5	20.71	9.9	2.32	7.34
Bluntnose Minnow	*Pimephales notatus*	T	113	113	189.5	16.52	2.7	0.52	1.65
Spotfin Shiner	*Cyprinella spiloptera*		98	95	165.5	14.43	3.9	0.64	2.03
White Sucker	*Catostomus commersoni*	T	73	72	136.0	11.86	71.9	6.39	20.27
Green Sunfish	*Lepomis cyanellus*	T	34	34	66.0	5.75	9.5	0.47	1.49
Pumpkinseed Sunfish	*Lepomis gibbosus*	P	39	39	58.5	5.10	11.3	0.66	2.09
Yellow Bullhead	*Ameiurus natalis*	T	38	38	57.5	5.01	74.1	1.27	4.01
Orangespotted Sunfish	*Lepomis humilis*		32	30	49.5	4.32	4.1	0.23	0.73
Creek Chub	*Semotilus atromaculatus*	T	13	13	30.0	2.62	24.7	0.74	2.35
Hornyhead Chub	*Nocomis biguttatus*	I	14	13	21.0	1.83	16.2	0.34	1.08
Blackstripe Topminnow	*Fundulus notatus*		11	10	20.0	1.74	1.4	0.03	0.08
Largemouth Bass	*Micropterus nigricans*		10	10	17.0	1.48	54.7	0.98	3.12
Channel Catfish	*Ictalurus punctatus*		11	11	16.5	1.44	290.9	4.80	15.22
Yellow Perch	*Perca flavescens*		6	6	12.0	1.05	16.7	0.20	0.63
Johnny Darter	*Etheostoma nigrum*		4	4	9.5	0.83	1.0	0.01	0.03
Central Mudminnow	*Umbra limi*	T	3	3	9.0	0.78	6.7	0.06	0.19
Blackside Darter	*Percina maculata*		6	6	9.0	0.78	3.3	0.03	0.10
Golden Shiner	*Notemigonus crysoleucas*	T	5	5	7.5	0.65	18.0	0.14	0.43
Common Carp	*Cyprinus carpio*	T	4	4	7.0	0.61	923.8	5.64	17.89
Rosyface Shiner	*Notropis rubellus*	I	4	4	6.0	0.52	1.5	0.01	0.03
Green X Bluegill Sunfish	*HYBRID*		2	2	4.0	0.35	5.0	0.02	0.06
Bowfin	*Amia calva*		2	2	3.0	0.26	1450.0	4.35	13.80
Fathead Minnow	*Pimephales promelas*	T	1	1	3.0	0.26	3.0	0.01	0.03
Stonecat Madtom	*Noturus flavus*	I	2	2	3.0	0.26	25.0	0.08	0.24
Black Bullhead	*Ameiurus melas*	P	1	1	2.0	0.17	90.0	0.18	0.57
Northern Pike	*Esox lucius*		1	1	1.5	0.13	800.0	1.20	3.81
Black Crappie	*Pomoxis nigromaculatus*		1	1	1.5	0.13	30.0	0.05	0.14
Warmouth Sunfish	*Lepomis gulosus*		1	1	1.5	0.13	60.0	0.09	0.29
Bluegill X Pumpkinseed Sunfi	*HYBRID*		1	1	1.5	0.13	20.0	0.03	0.10
Walleye	*Sander vitreus*		1	1	1.5	0.13	45.00	0.07	0.22

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 13-6 River: 95-656 DesPlaines River RM: 109.30 Date: 06/24/2022

Time Fished: 1269 Distance: 0.320 Drainge (sq mi): 123.6 Depth: 0

Location: Dst. Russell Rd. Lat: 42.48905 Long: -87.92523

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		C		7	21.9	1.87	19375	22.47	885.7
40-016	White Sucker	O	T	S	W	9	28.1	2.40	2125	2.46	75.5
40-018	Spotted Sucker	I		S	R	2	6.3	0.53	1406	1.63	225.0
43-001	Common Carp	O	T	M	G	22	68.8	5.87	48703	56.49	708.4
43-003	Golden Shiner	I	T	M	N	5	15.6	1.33	250	0.29	16.0
43-004	Hornyhead Chub	I	I	N	N	3	9.4	0.80	125	0.14	13.3
43-028	Spottail Shiner	I	P	M	N	16	50.0	4.27	218	0.25	4.3
43-032	Spotfin Shiner	I		M	N	69	215.6	18.40	625	0.72	2.8
43-034	Sand Shiner	I	M	M	N	3	9.4	0.80	31	0.04	3.3
43-043	Bluntnose Minnow	O	T	C	N	106	331.3	28.27	1218	1.41	3.6
47-002	Channel Catfish			C	F	2	6.3	0.53	6250	7.25	1000.0
47-004	Yellow Bullhead	I	T	C		1	3.1	0.27	968	1.12	310.0
54-002	Blackstripe Topminnow	I		M		8	25.0	2.13	31	0.04	1.2
74-006	Yellow Bass	P	P	M		5	15.6	1.33	406	0.47	26.0
77-002	Black Crappie	I		C	S	2	6.3	0.53	156	0.18	25.0
77-006	Largemouth Bass	C		C	F	5	15.6	1.33	1409	1.63	90.2
77-007	Warmouth Sunfish	C		C	S	1	3.1	0.27	31	0.04	10.0
77-008	Green Sunfish	I	T	C	S	4	12.5	1.07	25	0.03	2.0
77-009	Bluegill Sunfish	I	P	C	S	32	100.0	8.53	1125	1.30	11.2
77-010	Orangespotted Sunfish	I		C	S	21	65.6	5.60	312	0.36	4.7
77-013	Pumpkinseed Sunfish	I	P	C	S	50	156.3	13.33	1406	1.63	9.0
80-005	Blackside Darter	I		S	D	1	3.1	0.27	9	0.01	3.0
80-014	Johnny Darter	I		C	D	1	3.1	0.27	3	0.00	1.0

No Species: 23 **Nat. Species:** 22 **Hybrids:** 0 **Total Counted:** 375 **Total Rel. Wt. :** 86212

IBI: 32.0 **MIwb:** 8.3

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-6 River: 95-656 DesPlaines River RM: 109.30 Date: 09/28/2022

Time Fished: 1117 Distance: 0.320 Drainge (sq mi): 123.6 Depth: 0

Location: Dst. Russell Rd. Lat: 42.48905 Long: -87.92523

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		C		6	18.8	3.21	23125	39.23	1233.3
34-001	Central Mudminnow	I	T	C		2	6.3	1.07	31	0.05	5.0
37-003	Northern Pike	P		M	F	3	9.4	1.60	3906	6.63	416.6
40-016	White Sucker	O	T	S	W	2	6.3	1.07	1328	2.25	212.5
40-018	Spotted Sucker	I		S	R	2	6.3	1.07	4062	6.89	650.0
43-001	Common Carp	O	T	M	G	6	18.8	3.21	20781	35.25	1108.3
43-003	Golden Shiner	I	T	M	N	2	6.3	1.07	31	0.05	5.0
43-028	Spottail Shiner	I	P	M	N	1	3.1	0.53	21	0.04	7.0
43-032	Spotfin Shiner	I		M	N	11	34.4	5.88	31	0.05	0.9
43-034	Sand Shiner	I	M	M	N	1	3.1	0.53	3	0.01	1.0
43-043	Bluntnose Minnow	O	T	C	N	28	87.5	14.97	171	0.29	1.9
54-002	Blackstripe Topminnow	I		M		6	18.8	3.21	15	0.03	0.8
68-001	Pirate Perch	I		C		1	3.1	0.53	15	0.03	5.0
70-001	Brook Silverside	I	M	M		10	31.3	5.35	46	0.08	1.5
77-006	Largemouth Bass	C		C	F	17	53.1	9.09	1859	3.15	35.0
77-007	Warmouth Sunfish	C		C	S	1	3.1	0.53	156	0.27	50.0
77-009	Bluegill Sunfish	I	P	C	S	60	187.5	32.09	2250	3.82	12.0
77-010	Orangespotted Sunfish	I		C	S	11	34.4	5.88	218	0.37	6.3
77-013	Pumpkinseed Sunfish	I	P	C	S	15	46.9	8.02	875	1.48	18.6
80-005	Blackside Darter	I		S	D	1	3.1	0.53	15	0.03	5.0
80-014	Johnny Darter	I		C	D	1	3.1	0.53	3	0.01	1.0

No Species: 21 **Nat. Species:** 20 **Hybrids:** 0 **Total Counted:** 187 **Total Rel. Wt. :** 58950

IBI: 38.0 **MIwb:** 8.6

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-5 River: 95-656 DesPlaines River RM: 106.60 Date: 06/24/2022

Time Fished: 1594 Distance: 0.500 Drainge (sq mi): 137.2 Depth: 0

Location: dst. IL-173 Lat: 42.46472 Long: -87.94289

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		C		6	12.0	3.17	11800	23.58	983.3
37-003	Northern Pike	P		M	F	1	2.0	0.53	2000	4.00	1000.0
40-018	Spotted Sucker	I		S	R	5	10.0	2.65	2440	4.88	244.0
43-001	Common Carp	O	T	M	G	15	30.0	7.94	29800	59.56	993.3
43-003	Golden Shiner	I	T	M	N	9	18.0	4.76	240	0.48	13.3
43-028	Spottail Shiner	I	P	M	N	2	4.0	1.06	40	0.08	10.0
43-032	Spotfin Shiner	I		M	N	19	38.0	10.05	160	0.32	4.2
43-034	Sand Shiner	I	M	M	N	1	2.0	0.53	4	0.01	2.0
43-043	Bluntnose Minnow	O	T	C	N	9	18.0	4.76	60	0.12	3.3
54-002	Blackstripe Topminnow	I		M		3	6.0	1.59	20	0.04	3.3
74-006	Yellow Bass	P	P	M		4	8.0	2.12	180	0.36	22.5
77-002	Black Crappie	I		C	S	2	4.0	1.06	440	0.88	110.0
77-006	Largemouth Bass	C		C	F	2	4.0	1.06	802	1.60	200.5
77-007	Warmouth Sunfish	C		C	S	1	2.0	0.53	10	0.02	5.0
77-008	Green Sunfish	I	T	C	S	8	16.0	4.23	220	0.44	13.7
77-009	Bluegill Sunfish	I	P	C	S	41	82.0	21.69	1060	2.12	12.9
77-010	Orangespotted Sunfish	I		C	S	13	26.0	6.88	80	0.16	3.0
77-013	Pumpkinseed Sunfish	I	P	C	S	48	96.0	25.40	680	1.36	7.0

No Species: 18 **Nat. Species:** 17 **Hybrids:** 0 **Total Counted:** 189 **Total Rel. Wt. :** 50036

IBI: 36.0 **MIwb:** 7.4

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-5 River: 95-656 DesPlaines River RM: 106.60 Date: 09/28/2022

Time Fished: 2015 Distance: 0.500 Drainge (sq mi): 137.2 Depth: 0

Location: dst. IL-173 Lat: 42.46472 Long: -87.94289

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		C		2	4.0	0.80	6100	12.86	1525.0
20-003	Gizzard Shad	O		M		30	60.0	12.05	1860	3.92	31.0
34-001	Central Mudminnow	I	T	C		2	4.0	0.80	10	0.02	2.5
37-003	Northern Pike	P		M	F	1	2.0	0.40	1800	3.79	900.0
40-018	Spotted Sucker	I		S	R	3	6.0	1.20	440	0.93	73.3
43-001	Common Carp	O	T	M	G	14	28.0	5.62	31000	65.33	1107.1
43-003	Golden Shiner	I	T	M	N	10	20.0	4.02	320	0.67	16.0
43-028	Spottail Shiner	I	P	M	N	3	6.0	1.20	50	0.11	8.3
43-032	Spotfin Shiner	I		M	N	5	10.0	2.01	20	0.04	2.0
43-043	Bluntnose Minnow	O	T	C	N	4	8.0	1.61	10	0.02	1.2
54-002	Blackstripe Topminnow	I		M		22	44.0	8.84	50	0.11	1.1
70-001	Brook Silverside	I	M	M		1	2.0	0.40	2	0.00	1.0
74-006	Yellow Bass	P	P	M		7	14.0	2.81	1080	2.28	77.1
77-002	Black Crappie	I		C	S	1	2.0	0.40	70	0.15	35.0
77-006	Largemouth Bass	C		C	F	8	16.0	3.21	2630	5.54	164.3
77-009	Bluegill Sunfish	I	P	C	S	85	170.0	34.14	1220	2.57	7.1
77-010	Orangespotted Sunfish	I		C	S	26	52.0	10.44	140	0.30	2.6
77-013	Pumpkinseed Sunfish	I	P	C	S	25	50.0	10.04	650	1.37	13.0

No Species: 18 **Nat. Species:** 17 **Hybrids:** 0 **Total Counted:** 249 **Total Rel. Wt. :** 47452

IBI: 38.0 **MIwb:** 7.4

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-4 River: 95-656 DesPlaines River RM: 102.90 Date: 06/24/2022

Time Fished: 2878 Distance: 0.500 Drainge (sq mi): 145.5 Depth: 0

Location: dst. Wadsworth Rd. Lat: 42.42844 Long: -87.92982

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		C		5	10.0	2.67	10000	15.82	1000.0
20-003	Gizzard Shad	O		M		3	6.0	1.60	2020	3.20	336.6
37-003	Northern Pike	P		M	F	2	4.0	1.07	5000	7.91	1250.0
40-016	White Sucker	O	T	S	W	4	8.0	2.14	2540	4.02	317.5
40-018	Spotted Sucker	I		S	R	5	10.0	2.67	2230	3.53	223.0
43-001	Common Carp	O	T	M	G	20	40.0	10.70	20600	32.59	515.0
43-003	Golden Shiner	I	T	M	N	2	4.0	1.07	90	0.14	22.5
43-032	Spotfin Shiner	I		M	N	1	2.0	0.53	4	0.01	2.0
43-043	Bluntnose Minnow	O	T	C	N	3	6.0	1.60	20	0.03	3.3
47-002	Channel Catfish			C	F	4	8.0	2.14	9800	15.50	1225.0
47-004	Yellow Bullhead	I	T	C		1	2.0	0.53	580	0.92	290.0
54-002	Blackstripe Topminnow	I		M		5	10.0	2.67	20	0.03	2.0
74-006	Yellow Bass	P	P	M		2	4.0	1.07	80	0.13	20.0
77-001	White Crappie	I		C	S	1	2.0	0.53	290	0.46	145.0
77-002	Black Crappie	I		C	S	3	6.0	1.60	740	1.17	123.3
77-006	Largemouth Bass	C		C	F	11	22.0	5.88	5600	8.86	254.5
77-007	Warmouth Sunfish	C		C	S	4	8.0	2.14	50	0.08	6.2
77-008	Green Sunfish	I	T	C	S	1	2.0	0.53	30	0.05	15.0
77-009	Bluegill Sunfish	I	P	C	S	46	92.0	24.60	2380	3.76	25.8
77-010	Orangespotted Sunfish	I		C	S	12	24.0	6.42	140	0.22	5.8
77-013	Pumpkinseed Sunfish	I	P	C	S	52	104.0	27.81	1000	1.58	9.6

No Species: 21 **Nat. Species:** 20 **Hybrids:** 0 **Total Counted:** 187 **Total Rel. Wt. :** 63214

IBI: 36.0 **MIwb:** 8.4

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-4 River: 95-656 DesPlaines River RM: 102.90 Date: 09/28/2022

Time Fished: 2675 Distance: 0.500 Drainge (sq mi): 145.5 Depth: 0

Location: dst. Wadsworth Rd. Lat: 42.42844 Long: -87.92982

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		C		1	2.0	0.45	3800	8.05	1900.0
20-003	Gizzard Shad	O		M		33	66.0	14.73	900	1.91	13.6
37-003	Northern Pike	P		M	F	2	4.0	0.89	5200	11.02	1300.0
40-016	White Sucker	O	T	S	W	7	14.0	3.13	5580	11.83	398.5
40-018	Spotted Sucker	I		S	R	10	20.0	4.46	7000	14.84	350.0
43-001	Common Carp	O	T	M	G	4	8.0	1.79	16500	34.97	2062.5
43-002	Goldfish	O	T	M	G	3	6.0	1.34	560	1.19	93.3
43-003	Golden Shiner	I	T	M	N	2	4.0	0.89	40	0.08	10.0
43-043	Bluntnose Minnow	O	T	C	N	3	6.0	1.34	10	0.02	1.6
54-002	Blackstripe Topminnow	I		M		4	8.0	1.79	4	0.01	0.5
70-001	Brook Silverside	I	M	M		1	2.0	0.45	2	0.00	1.0
74-006	Yellow Bass	P	P	M		6	12.0	2.68	350	0.74	29.1
77-002	Black Crappie	I		C	S	10	20.0	4.46	1100	2.33	55.0
77-006	Largemouth Bass	C		C	F	8	16.0	3.57	3600	7.63	225.0
77-007	Warmouth Sunfish	C		C	S	1	2.0	0.45	6	0.01	3.0
77-008	Green Sunfish	I	T	C	S	1	2.0	0.45	40	0.08	20.0
77-009	Bluegill Sunfish	I	P	C	S	70	140.0	31.25	1280	2.71	9.1
77-010	Orangespotted Sunfish	I		C	S	7	14.0	3.13	30	0.06	2.1
77-013	Pumpkinseed Sunfish	I	P	C	S	49	98.0	21.88	1120	2.37	11.4
77-025	Warmouth X Pumpkinseed Sunfish					1	2.0	0.45	20	0.04	10.0
80-003	Yellow Perch			M		1	2.0	0.45	40	0.08	20.0

No Species: 20 **Nat. Species:** 18 **Hybrids:** 1 **Total Counted:** 224 **Total Rel. Wt. :** 47182

IBI: 36.0 **MIwb:** 8.8

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-19 River: 95-656 DesPlaines River RM: 99.30 Date: 06/26/2022

Time Fished: 2435 Distance: 0.500 Drainge (sq mi): 213.1 Depth: 0

Location: dst. WR1 Riffle Lat: 42.39616 Long: -87.92359

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		C		4	8.0	1.07	14600	17.00	1825.0
37-003	Northern Pike	P		M	F	2	4.0	0.53	3400	3.96	850.0
40-016	White Sucker	O	T	S	W	46	92.0	12.27	11500	13.39	125.0
40-018	Spotted Sucker	I		S	R	3	6.0	0.80	3200	3.73	533.3
43-001	Common Carp	O	T	M	G	2	4.0	0.53	10000	11.64	2500.0
43-003	Golden Shiner	I	T	M	N	2	4.0	0.53	70	0.08	17.5
43-004	Hornyhead Chub	I	I	N	N	72	144.0	19.20	2300	2.68	15.9
43-028	Spottail Shiner	I	P	M	N	4	8.0	1.07	60	0.07	7.5
43-032	Spotfin Shiner	I		M	N	22	44.0	5.87	200	0.23	4.5
43-043	Bluntnose Minnow	O	T	C	N	39	78.0	10.40	340	0.40	4.3
43-045	Common Carp X Goldfish	O	T		G	3	6.0	0.80	12200	14.20	2033.3
47-002	Channel Catfish			C	F	8	16.0	2.13	14640	17.04	915.0
47-004	Yellow Bullhead	I	T	C		1	2.0	0.27	180	0.21	90.0
54-002	Blackstripe Topminnow	I		M		2	4.0	0.53	4	0.00	1.0
74-006	Yellow Bass	P	P	M		20	40.0	5.33	920	1.07	23.0
77-001	White Crappie	I		C	S	1	2.0	0.27	10	0.01	5.0
77-002	Black Crappie	I		C	S	3	6.0	0.80	220	0.26	36.6
77-004	Smallmouth Bass	C	M	C	F	3	6.0	0.80	200	0.23	33.3
77-006	Largemouth Bass	C		C	F	11	22.0	2.93	4880	5.68	221.8
77-007	Warmouth Sunfish	C		C	S	4	8.0	1.07	120	0.14	15.0
77-008	Green Sunfish	I	T	C	S	1	2.0	0.27	40	0.05	20.0
77-009	Bluegill Sunfish	I	P	C	S	68	136.0	18.13	3560	4.14	26.1
77-013	Pumpkinseed Sunfish	I	P	C	S	39	78.0	10.40	1300	1.51	16.6
77-015	Green X Bluegill Sunfish					1	2.0	0.27	140	0.16	70.0
80-001	Sauger	P		S	F	4	8.0	1.07	1700	1.98	212.5
80-005	Blackside Darter	I		S	D	6	12.0	1.60	60	0.07	5.0
80-011	Logperch	I	M	S	D	4	8.0	1.07	60	0.07	7.5

No Species: 25 **Nat. Species:** 24 **Hybrids:** 2 **Total Counted:** 375 **Total Rel. Wt. :** 85904

IBI: 38.0 **MIwb:** 9.7

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 13-19 River: 95-656 DesPlaines River RM: 99.30 Date: 10/01/2022

Time Fished: 2065 Distance: 0.500 Drainge (sq mi): 213.1 Depth: 0

Location: dst. WR1 Riffle Lat: 42.39616 Long: -87.92359

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		C		6	12.0	0.87	17700	17.05	1475.0
20-003	Gizzard Shad	O		M		10	20.0	1.46	900	0.87	45.0
37-003	Northern Pike	P		M	F	2	4.0	0.29	3800	3.66	950.0
40-016	White Sucker	O	T	S	W	60	120.0	8.75	22580	21.75	188.1
40-018	Spotted Sucker	I		S	R	7	14.0	1.02	4360	4.20	311.4
43-001	Common Carp	O	T	M	G	12	24.0	1.75	23540	22.67	980.8
43-004	Hornyhead Chub	I	I	N	N	122	244.0	17.78	5300	5.11	21.7
43-026	Common Shiner	I		S	N	1	2.0	0.15	20	0.02	10.0
43-032	Spotfin Shiner	I		M	N	33	66.0	4.81	100	0.10	1.5
43-043	Bluntnose Minnow	O	T	C	N	208	416.0	30.32	1640	1.58	3.9
47-002	Channel Catfish			C	F	9	18.0	1.31	8050	7.75	447.2
47-004	Yellow Bullhead	I	T	C		6	12.0	0.87	520	0.50	43.3
54-002	Blackstripe Topminnow	I		M		26	52.0	3.79	40	0.04	0.7
70-001	Brook Silverside	I	M	M		3	6.0	0.44	6	0.01	1.0
74-006	Yellow Bass	P	P	M		28	56.0	4.08	4300	4.14	76.7
77-002	Black Crappie	I		C	S	9	18.0	1.31	1070	1.03	59.4
77-004	Smallmouth Bass	C	M	C	F	1	2.0	0.15	120	0.12	60.0
77-006	Largemouth Bass	C		C	F	17	34.0	2.48	3040	2.93	89.4
77-007	Warmouth Sunfish	C		C	S	8	16.0	1.17	760	0.73	47.5
77-008	Green Sunfish	I	T	C	S	5	10.0	0.73	110	0.11	11.0
77-009	Bluegill Sunfish	I	P	C	S	79	158.0	11.52	3370	3.25	21.3
77-010	Orangespotted Sunfish	I		C	S	1	2.0	0.15	20	0.02	10.0
77-013	Pumpkinseed Sunfish	I	P	C	S	27	54.0	3.94	1300	1.25	24.0
77-016	Green X Pumpkinseed Sunfish					1	2.0	0.15	40	0.04	20.0
80-001	Sauger	P		S	F	1	2.0	0.15	900	0.87	450.0
80-003	Yellow Perch			M		1	2.0	0.15	160	0.15	80.0
80-005	Blackside Darter	I		S	D	1	2.0	0.15	10	0.01	5.0
80-011	Logperch	I	M	S	D	2	4.0	0.29	60	0.06	15.0

No Species: 27 **Nat. Species:** 26 **Hybrids:** 1 **Total Counted:** 686 **Total Rel. Wt. :** 103816

IBI: 32.0 **MIwb:** 9.8

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-18 River: 95-656 DesPlaines River RM: 99.72 Date: 06/24/2022

Time Fished: 2769 Distance: 0.500 Drainge (sq mi): 212.8 Depth: 0

Location: ust. WR1 Riffle Lat: 42.40100 Long: -87.92822

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		C		5	10.0	3.97	10200	15.20	1020.0
20-003	Gizzard Shad	O		M		3	6.0	2.38	3460	5.16	576.6
40-018	Spotted Sucker	I		S	R	8	16.0	6.35	7000	10.43	437.5
43-001	Common Carp	O	T	M	G	22	44.0	17.46	21200	31.60	481.8
43-032	Spotfin Shiner	I		M	N	1	2.0	0.79	4	0.01	2.0
47-002	Channel Catfish			C	F	4	8.0	3.17	10200	15.20	1275.0
54-002	Blackstriped Topminnow	I		M		1	2.0	0.79	2	0.00	1.0
74-006	Yellow Bass	P	P	M		5	10.0	3.97	220	0.33	22.0
77-002	Black Crappie	I		C	S	4	8.0	3.17	1240	1.85	155.0
77-006	Largemouth Bass	C		C	F	10	20.0	7.94	8840	13.18	442.0
77-007	Warmouth Sunfish	C		C	S	1	2.0	0.79	100	0.15	50.0
77-008	Green Sunfish	I	T	C	S	1	2.0	0.79	10	0.01	5.0
77-009	Bluegill Sunfish	I	P	C	S	53	106.0	42.06	4400	6.56	41.5
77-013	Pumpkinseed Sunfish	I	P	C	S	8	16.0	6.35	220	0.33	13.7

No Species: 14 **Nat. Species:** 13 **Hybrids:** 0 **Total Counted:** 126 **Total Rel. Wt. :** 67096

IBI: 34.0 **MIwb:** 7.9

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-18 River: 95-656 DesPlaines River RM: 99.72 Date: 09/28/2022

Time Fished: 2077 Distance: 0.500 Drainge (sq mi): 212.8 Depth: 0

Location: ust. WR1 Riffle Lat: 42.40100 Long: -87.92822

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		C		9	18.0	4.41	25000	29.77	1388.8
20-003	Gizzard Shad	O		M		50	100.0	24.51	3620	4.31	36.2
37-003	Northern Pike	P		M	F	1	2.0	0.49	2200	2.62	1100.0
40-018	Spotted Sucker	I		S	R	7	14.0	3.43	6100	7.26	435.7
43-001	Common Carp	O	T	M	G	21	42.0	10.29	26600	31.68	633.3
43-003	Golden Shiner	I	T	M	N	2	4.0	0.98	10	0.01	2.5
43-043	Bluntnose Minnow	O	T	C	N	2	4.0	0.98	4	0.00	1.0
47-002	Channel Catfish			C	F	2	4.0	0.98	4800	5.72	1200.0
70-001	Brook Silverside	I	M	M		1	2.0	0.49	2	0.00	1.0
74-006	Yellow Bass	P	P	M		1	2.0	0.49	150	0.18	75.0
77-002	Black Crappie	I		C	S	3	6.0	1.47	650	0.77	108.3
77-006	Largemouth Bass	C		C	F	12	24.0	5.88	6120	7.29	255.0
77-009	Bluegill Sunfish	I	P	C	S	83	166.0	40.69	4700	5.60	28.3
77-013	Pumpkinseed Sunfish	I	P	C	S	8	16.0	3.92	310	0.37	19.3
80-002	Walleye	P		S	F	1	2.0	0.49	3700	4.41	1850.0
80-005	Blackside Darter	I		S	D	1	2.0	0.49	10	0.01	5.0

No Species: 16 **Nat. Species:** 15 **Hybrids:** 0 **Total Counted:** 204 **Total Rel. Wt. :** 83976

IBI: 32.0 **MIwb:** 8.1

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-3 River: 95-656 DesPlaines River RM: 98.70 Date: 06/25/2022

Time Fished: 2210 Distance: 0.500 Drainge (sq mi): 220.2 Depth: 0

Location: ust. US-41 Lat: 42.38323 Long: -87.91466

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		C		2	4.0	0.59	5200	7.02	1300.0
37-003	Northern Pike	P		M	F	1	2.0	0.29	3000	4.05	1500.0
40-016	White Sucker	O	T	S	W	47	94.0	13.82	7800	10.53	82.9
40-018	Spotted Sucker	I		S	R	3	6.0	0.88	2400	3.24	400.0
43-001	Common Carp	O	T	M	G	27	54.0	7.94	28600	38.61	529.6
43-004	Hornyhead Chub	I	I	N	N	45	90.0	13.24	1180	1.59	13.1
43-032	Spotfin Shiner	I		M	N	59	118.0	17.35	580	0.78	4.9
43-043	Bluntnose Minnow	O	T	C	N	49	98.0	14.41	520	0.70	5.3
47-002	Channel Catfish			C	F	5	10.0	1.47	16400	22.14	1640.0
47-004	Yellow Bullhead	I	T	C		1	2.0	0.29	580	0.78	290.0
54-002	Blackstripe Topminnow	I		M		1	2.0	0.29	2	0.00	1.0
68-001	Pirate Perch	I		C		1	2.0	0.29	16	0.02	8.0
74-006	Yellow Bass	P	P	M		7	14.0	2.06	300	0.40	21.4
77-003	Rock Bass	C		C	S	1	2.0	0.29	240	0.32	120.0
77-004	Smallmouth Bass	C	M	C	F	8	16.0	2.35	600	0.81	37.5
77-006	Largemouth Bass	C		C	F	10	20.0	2.94	2580	3.48	129.0
77-008	Green Sunfish	I	T	C	S	3	6.0	0.88	180	0.24	30.0
77-009	Bluegill Sunfish	I	P	C	S	44	88.0	12.94	2940	3.97	33.4
77-013	Pumpkinseed Sunfish	I	P	C	S	20	40.0	5.88	700	0.94	17.5
77-015	Green X Bluegill Sunfish					1	2.0	0.29	200	0.27	100.0
80-005	Blackside Darter	I		S	D	5	10.0	1.47	60	0.08	6.0

No Species: 20 **Nat. Species:** 19 **Hybrids:** 1 **Total Counted:** 340 **Total Rel. Wt. :** 74078

IBI: 28.0 **MIwb:** 8.2

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-3 River: 95-656 DesPlaines River RM: 98.70 Date: 10/01/2022

Time Fished: 2303 Distance: 0.500 Drainge (sq mi): 220.2 Depth: 0

Location: ust. US-41 Lat: 42.38323 Long: -87.91466

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		C		1	2.0	0.23	4700	9.02	2350.0
20-003	Gizzard Shad	O		M		1	2.0	0.23	60	0.12	30.0
37-003	Northern Pike	P		M	F	6	12.0	1.37	8280	15.88	690.0
40-016	White Sucker	O	T	S	W	38	76.0	8.66	18320	35.15	241.0
40-018	Spotted Sucker	I		S	R	15	30.0	3.42	1630	3.13	54.3
43-001	Common Carp	O	T	M	G	4	8.0	0.91	400	0.77	50.0
43-003	Golden Shiner	I	T	M	N	1	2.0	0.23	90	0.17	45.0
43-004	Hornyhead Chub	I	I	N	N	25	50.0	5.69	840	1.61	16.8
43-028	Spottail Shiner	I	P	M	N	3	6.0	0.68	20	0.04	3.3
43-032	Spotfin Shiner	I		M	N	89	178.0	20.27	220	0.42	1.2
43-034	Sand Shiner	I	M	M	N	3	6.0	0.68	10	0.02	1.6
43-043	Bluntnose Minnow	O	T	C	N	77	154.0	17.54	420	0.81	2.7
47-002	Channel Catfish			C	F	2	4.0	0.46	410	0.79	102.5
47-004	Yellow Bullhead	I	T	C		8	16.0	1.82	2880	5.53	180.0
54-002	Blackstripe Topminnow	I		M		8	16.0	1.82	10	0.02	0.6
70-001	Brook Silverside	I	M	M		1	2.0	0.23	2	0.00	1.0
74-006	Yellow Bass	P	P	M		1	2.0	0.23	90	0.17	45.0
77-002	Black Crappie	I		C	S	13	26.0	2.96	2840	5.45	109.2
77-004	Smallmouth Bass	C	M	C	F	7	14.0	1.59	1260	2.42	90.0
77-006	Largemouth Bass	C		C	F	27	54.0	6.15	5610	10.76	103.8
77-008	Green Sunfish	I	T	C	S	5	10.0	1.14	160	0.31	16.0
77-009	Bluegill Sunfish	I	P	C	S	88	176.0	20.05	3340	6.41	18.9
77-013	Pumpkinseed Sunfish	I	P	C	S	10	20.0	2.28	490	0.94	24.5
80-005	Blackside Darter	I		S	D	4	8.0	0.91	40	0.08	5.0
80-014	Johnny Darter	I		C	D	2	4.0	0.46	4	0.01	1.0

No Species: 25 **Nat. Species:** 24 **Hybrids:** 0 **Total Counted:** 439 **Total Rel. Wt. :** 52126

IBI: 36.0 **MIwb:** 9.5

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-2 River: 95-656 DesPlaines River RM: 96.82 Date: 06/23/2022

Time Fished: 2463 Distance: 0.430 Drainge (sq mi): 225.3 Depth: 0

Location: dst. McClare Ave. Lat: 42.36967 Long: -87.91834

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	39	90.7	19.60	10118	13.51	111.5
40-018	Spotted Sucker	I		S	R	4	9.3	2.01	7675	10.25	825.0
43-001	Common Carp	O	T	M	G	11	25.6	5.53	45822	61.17	1790.9
43-004	Hornyhead Chub	I	I	N	N	50	116.3	25.13	1860	2.48	16.0
43-022	Rosyface Shiner	I	I	S	N	11	25.6	5.53	93	0.12	3.6
43-026	Common Shiner	I		S	N	3	7.0	1.51	197	0.26	28.3
43-028	Spottail Shiner	I	P	M	N	3	7.0	1.51	81	0.11	11.6
43-032	Spotfin Shiner	I		M	N	13	30.2	6.53	186	0.25	6.1
43-034	Sand Shiner	I	M	M	N	1	2.3	0.50	4	0.01	2.0
43-043	Bluntnose Minnow	O	T	C	N	14	32.6	7.04	127	0.17	3.9
47-002	Channel Catfish			C	F	1	2.3	0.50	4652	6.21	2000.0
47-004	Yellow Bullhead	I	T	C		1	2.3	0.50	279	0.37	120.0
47-008	Stonecat Madtom	I	I	C		1	2.3	0.50	104	0.14	45.0
77-002	Black Crappie	I		C	S	1	2.3	0.50	186	0.25	80.0
77-003	Rock Bass	C		C	S	3	7.0	1.51	721	0.96	103.3
77-004	Smallmouth Bass	C	M	C	F	2	4.7	1.01	255	0.34	55.0
77-006	Largemouth Bass	C		C	F	3	7.0	1.51	1046	1.40	150.0
77-008	Green Sunfish	I	T	C	S	8	18.6	4.02	209	0.28	11.2
77-009	Bluegill Sunfish	I	P	C	S	17	39.5	8.54	511	0.68	12.9
77-010	Orangespotted Sunfish	I		C	S	2	4.7	1.01	23	0.03	5.0
77-013	Pumpkinseed Sunfish	I	P	C	S	1	2.3	0.50	18	0.02	8.0
80-001	Sauger	P		S	F	1	2.3	0.50	465	0.62	200.0
80-005	Blackside Darter	I		S	D	5	11.6	2.51	93	0.12	8.0
80-011	Logperch	I	M	S	D	4	9.3	2.01	174	0.23	18.7

No Species: 24 **Nat. Species:** 23 **Hybrids:** 0 **Total Counted:** 199 **Total Rel. Wt. :** 74908

IBI: 34.0 **MIwb:** 7.8

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-2 River: 95-656 DesPlaines River RM: 96.82 Date: 10/01/2022

Time Fished: 2571 Distance: 0.500 Drainge (sq mi): 225.3 Depth: 0

Location: dst. McClare Ave. Lat: 42.36967 Long: -87.91834

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	8	16.0	1.47	12100	17.96	756.2
40-016	White Sucker	O	T	S	W	49	98.0	8.99	26320	39.07	268.5
40-018	Spotted Sucker	I		S	R	7	14.0	1.28	2980	4.42	212.8
43-001	Common Carp	O	T	M	G	1	2.0	0.18	7800	11.58	3900.0
43-004	Hornyhead Chub	I	I	N	N	97	194.0	17.80	3420	5.08	17.6
43-022	Rosyface Shiner	I	I	S	N	16	32.0	2.94	50	0.07	1.5
43-026	Common Shiner	I		S	N	8	16.0	1.47	160	0.24	10.0
43-032	Spotfin Shiner	I		M	N	131	262.0	24.04	520	0.77	1.9
43-034	Sand Shiner	I	M	M	N	18	36.0	3.30	60	0.09	1.6
43-043	Bluntnose Minnow	O	T	C	N	109	218.0	20.00	760	1.13	3.4
43-044	Central Stoneroller	H		N	N	1	2.0	0.18	4	0.01	2.0
47-002	Channel Catfish			C	F	1	2.0	0.18	3900	5.79	1950.0
47-004	Yellow Bullhead	I	T	C		9	18.0	1.65	3070	4.56	170.5
47-008	Stonecat Madtom	I	I	C		2	4.0	0.37	170	0.25	42.5
70-001	Brook Silverside	I	M	M		16	32.0	2.94	40	0.06	1.2
77-003	Rock Bass	C		C	S	4	8.0	0.73	420	0.62	52.5
77-004	Smallmouth Bass	C	M	C	F	12	24.0	2.20	2100	3.12	87.5
77-006	Largemouth Bass	C		C	F	6	12.0	1.10	520	0.77	43.3
77-008	Green Sunfish	I	T	C	S	14	28.0	2.57	620	0.92	22.1
77-009	Bluegill Sunfish	I	P	C	S	13	26.0	2.39	250	0.37	9.6
77-013	Pumpkinseed Sunfish	I	P	C	S	1	2.0	0.18	10	0.01	5.0
80-001	Sauger	P		S	F	2	4.0	0.37	1700	2.52	425.0
80-005	Blackside Darter	I		S	D	5	10.0	0.92	40	0.06	4.0
80-011	Logperch	I	M	S	D	12	24.0	2.20	340	0.50	14.1
80-014	Johnny Darter	I		C	D	3	6.0	0.55	10	0.01	1.6

No Species: 25 **Nat. Species:** 24 **Hybrids:** 0 **Total Counted:** 545 **Total Rel. Wt. :** 67364

IBI: 36.0 **MIwb:** 9.4

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-1 River: 95-656 DesPlaines River RM: 94.20 Date: 06/22/2022

Time Fished: 1901 Distance: 0.500 Drainge (sq mi): 232.0 Depth: 0

Location: dst. Belvidere Rd. Lat: 42.34354 Long: -87.94105

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	2	4.0	0.78	7200	9.35	1800.0
40-016	White Sucker	O	T	S	W	40	80.0	15.69	23400	30.39	292.5
43-001	Common Carp	O	T	M	G	14	28.0	5.49	32700	42.47	1167.8
43-004	Hornyhead Chub	I	I	N	N	110	220.0	43.14	3380	4.39	15.3
43-022	Rosyface Shiner	I	I	S	N	14	28.0	5.49	60	0.08	2.1
43-032	Spotfin Shiner	I		M	N	17	34.0	6.67	200	0.26	5.8
43-043	Bluntnose Minnow	O	T	C	N	9	18.0	3.53	60	0.08	3.3
43-044	Central Stoneroller	H		N	N	1	2.0	0.39	10	0.01	5.0
47-002	Channel Catfish			C	F	3	6.0	1.18	4000	5.20	666.6
47-004	Yellow Bullhead	I	T	C		1	2.0	0.39	400	0.52	200.0
47-008	Stonecat Madtom	I	I	C		1	2.0	0.39	120	0.16	60.0
54-002	Blackstripe Topminnow	I		M		2	4.0	0.78	4	0.01	1.0
77-003	Rock Bass	C		C	S	3	6.0	1.18	940	1.22	156.6
77-004	Smallmouth Bass	C	M	C	F	5	10.0	1.96	320	0.42	32.0
77-006	Largemouth Bass	C		C	F	3	6.0	1.18	2600	3.38	433.3
77-009	Bluegill Sunfish	I	P	C	S	23	46.0	9.02	1500	1.95	32.6
77-010	Orangespotted Sunfish	I		C	S	1	2.0	0.39	10	0.01	5.0
77-013	Pumpkinseed Sunfish	I	P	C	S	1	2.0	0.39	40	0.05	20.0
80-005	Blackside Darter	I		S	D	4	8.0	1.57	30	0.04	3.7
80-011	Logperch	I	M	S	D	1	2.0	0.39	20	0.03	10.0

No Species: 20 **Nat. Species:** 19 **Hybrids:** 0 **Total Counted:** 255 **Total Rel. Wt. :** 76994

IBI: 36.0 **MIwb:** 7.6

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-1 River: 95-656 DesPlaines River RM: 94.20 Date: 09/29/2022

Time Fished: 3089 Distance: 0.500 Drainge (sq mi): 232.0 Depth: 0

Location: dst. Belvidere Rd. Lat: 42.34354 Long: -87.94105

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	3	6.0	0.88	6150	6.51	1025.0
40-016	White Sucker	O	T	S	W	31	62.0	9.06	28600	30.29	461.2
40-018	Spotted Sucker	I		S	R	7	14.0	2.05	14900	15.78	1064.2
43-001	Common Carp	O	T	M	G	5	10.0	1.46	14000	14.83	1400.0
43-004	Hornyhead Chub	I	I	N	N	129	258.0	37.72	4400	4.66	17.0
43-022	Rosyface Shiner	I	I	S	N	15	30.0	4.39	80	0.08	2.6
43-026	Common Shiner	I		S	N	1	2.0	0.29	4	0.00	2.0
43-028	Spottail Shiner	I	P	M	N	2	4.0	0.58	20	0.02	5.0
43-032	Spotfin Shiner	I		M	N	21	42.0	6.14	140	0.15	3.3
43-043	Bluntnose Minnow	O	T	C	N	25	50.0	7.31	150	0.16	3.0
43-044	Central Stoneroller	H		N	N	1	2.0	0.29	4	0.00	2.0
47-002	Channel Catfish			C	F	2	4.0	0.58	8300	8.79	2075.0
47-013	Tadpole Madtom	I		C		1	2.0	0.29	4	0.00	2.0
54-002	Blackstripe Topminnow	I		M		4	8.0	1.17	8	0.01	1.0
70-001	Brook Silverside	I	M	M		1	2.0	0.29	2	0.00	1.0
77-002	Black Crappie	I		C	S	8	16.0	2.34	3850	4.08	240.6
77-003	Rock Bass	C		C	S	4	8.0	1.17	360	0.38	45.0
77-004	Smallmouth Bass	C	M	C	F	15	30.0	4.39	5290	5.60	176.3
77-006	Largemouth Bass	C		C	F	13	26.0	3.80	7160	7.58	275.3
77-008	Green Sunfish	I	T	C	S	1	2.0	0.29	90	0.10	45.0
77-009	Bluegill Sunfish	I	P	C	S	19	38.0	5.56	360	0.38	9.4
77-013	Pumpkinseed Sunfish	I	P	C	S	3	6.0	0.88	200	0.21	33.3
80-005	Blackside Darter	I		S	D	9	18.0	2.63	80	0.08	4.4
80-011	Logperch	I	M	S	D	19	38.0	5.56	250	0.26	6.5
80-014	Johnny Darter	I		C	D	3	6.0	0.88	6	0.01	1.0

No Species: 25 **Nat. Species:** 24 **Hybrids:** 0 **Total Counted:** 342 **Total Rel. Wt. :** 94408

IBI: 42.0 **MIwb:** 9.5

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-16 River: 95-656 DesPlaines River RM: 90.60 Date: 06/22/2022

Time Fished: 2553 Distance: 0.500 Drainge (sq mi): 253.7 Depth: 0

Location: dst. Buckley Rd. Lat: 42.30575 Long: -87.95456

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	1	2.0	0.41	0	0.00	0.0
40-016	White Sucker	O	T	S	W	69	138.0	28.40	16500	48.91	119.5
40-018	Spotted Sucker	I		S	R	1	2.0	0.41	2600	7.71	1300.0
43-001	Common Carp	O	T	M	G	5	10.0	2.06	9200	27.27	920.0
43-004	Hornyhead Chub	I	I	N	N	81	162.0	33.33	1500	4.45	9.2
43-022	Rosyface Shiner	I	I	S	N	20	40.0	8.23	100	0.30	2.5
43-028	Spottail Shiner	I	P	M	N	3	6.0	1.23	20	0.06	3.3
43-034	Sand Shiner	I	M	M	N	1	2.0	0.41	6	0.02	3.0
43-043	Bluntnose Minnow	O	T	C	N	19	38.0	7.82	100	0.30	2.6
47-002	Channel Catfish			C	F	1	2.0	0.41	0	0.00	0.0
47-004	Yellow Bullhead	I	T	C		5	10.0	2.06	1320	3.91	132.0
77-003	Rock Bass	C		C	S	6	12.0	2.47	720	2.13	60.0
77-004	Smallmouth Bass	C	M	C	F	2	4.0	0.82	120	0.36	30.0
77-006	Largemouth Bass	C		C	F	3	6.0	1.23	260	0.77	43.3
77-008	Green Sunfish	I	T	C	S	1	2.0	0.41	16	0.05	8.0
77-009	Bluegill Sunfish	I	P	C	S	17	34.0	7.00	1040	3.08	30.5
77-013	Pumpkinseed Sunfish	I	P	C	S	3	6.0	1.23	200	0.59	33.3
80-005	Blackside Darter	I		S	D	4	8.0	1.65	20	0.06	2.5
80-011	Logperch	I	M	S	D	1	2.0	0.41	10	0.03	5.0

No Species: 19 **Nat. Species:** 18 **Hybrids:** 0 **Total Counted:** 243 **Total Rel. Wt. :** 33732

IBI: 30.0 **MIwb:** 7.1

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 13-16 River: 95-656 DesPlaines River RM: 90.60 Date: 09/28/2022

Time Fished: 2561 Distance: 0.500 Drainge (sq mi): 253.7 Depth: 0

Location: dst. Buckley Rd. Lat: 42.30575 Long: -87.95456

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	3	6.0	0.98	3540	3.88	590.0
40-016	White Sucker	O	T	S	W	26	52.0	8.52	21620	23.72	415.7
43-001	Common Carp	O	T	M	G	5	10.0	1.64	49900	54.74	4990.0
43-003	Golden Shiner	I	T	M	N	1	2.0	0.33	120	0.13	60.0
43-004	Hornyhead Chub	I	I	N	N	124	248.0	40.66	4400	4.83	17.7
43-022	Rosyface Shiner	I	I	S	N	5	10.0	1.64	20	0.02	2.0
43-032	Spotfin Shiner	I		M	N	22	44.0	7.21	80	0.09	1.8
43-043	Bluntnose Minnow	O	T	C	N	54	108.0	17.70	280	0.31	2.5
47-002	Channel Catfish			C	F	1	2.0	0.33	3400	3.73	1700.0
47-004	Yellow Bullhead	I	T	C		2	4.0	0.66	300	0.33	75.0
54-002	Blackstripe Topminnow	I		M		7	14.0	2.30	10	0.01	0.7
77-003	Rock Bass	C		C	S	9	18.0	2.95	1380	1.51	76.6
77-004	Smallmouth Bass	C	M	C	F	16	32.0	5.25	3960	4.34	123.7
77-006	Largemouth Bass	C		C	F	6	12.0	1.97	880	0.97	73.3
77-008	Green Sunfish	I	T	C	S	4	8.0	1.31	200	0.22	25.0
77-009	Bluegill Sunfish	I	P	C	S	8	16.0	2.62	1020	1.12	63.7
80-005	Blackside Darter	I		S	D	2	4.0	0.66	40	0.04	10.0
80-014	Johnny Darter	I		C	D	10	20.0	3.28	10	0.01	0.5

No Species: 18 **Nat. Species:** 17 **Hybrids:** 0 **Total Counted:** 305 **Total Rel. Wt. :** 91160

IBI: 36.0 **MIwb:** 8.0

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-6 River: 95-656 DesPlaines River RM: 87.10 Date: 06/22/2022

Time Fished: 2705 Distance: 0.500 Drainge (sq mi): 261.4 Depth: 0

Location: dst. Rockland Rd. Lat: 42.27629 Long: -87.93925

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		C		1	2.0	0.41	5800	7.01	2900.0
37-003	Northern Pike	P		M	F	7	14.0	2.89	18000	21.77	1285.7
40-016	White Sucker	O	T	S	W	29	58.0	11.98	16800	20.32	289.6
43-001	Common Carp	O	T	M	G	9	18.0	3.72	35800	43.30	1988.8
43-004	Hornyhead Chub	I	I	N	N	64	128.0	26.45	1400	1.69	10.9
43-013	Creek Chub	G	T	N	N	1	2.0	0.41	16	0.02	8.0
43-022	Rosyface Shiner	I	I	S	N	23	46.0	9.50	80	0.10	1.7
43-028	Spottail Shiner	I	P	M	N	2	4.0	0.83	20	0.02	5.0
43-032	Spotfin Shiner	I		M	N	13	26.0	5.37	100	0.12	3.8
43-034	Sand Shiner	I	M	M	N	11	22.0	4.55	40	0.05	1.8
43-043	Bluntnose Minnow	O	T	C	N	23	46.0	9.50	140	0.17	3.0
43-044	Central Stoneroller	H		N	N	1	2.0	0.41	10	0.01	5.0
47-002	Channel Catfish			C	F	1	2.0	0.41	40	0.05	20.0
47-004	Yellow Bullhead	I	T	C		2	4.0	0.83	40	0.05	10.0
47-008	Stonecat Madtom	I	I	C		1	2.0	0.41	80	0.10	40.0
77-003	Rock Bass	C		C	S	9	18.0	3.72	1260	1.52	70.0
77-004	Smallmouth Bass	C	M	C	F	2	4.0	0.83	120	0.15	30.0
77-006	Largemouth Bass	C		C	F	3	6.0	1.24	1040	1.26	173.3
77-009	Bluegill Sunfish	I	P	C	S	30	60.0	12.40	1640	1.98	27.3
77-013	Pumpkinseed Sunfish	I	P	C	S	2	4.0	0.83	50	0.06	12.5
77-015	Green X Bluegill Sunfish					2	4.0	0.83	140	0.17	35.0
80-005	Blackside Darter	I		S	D	1	2.0	0.41	8	0.01	4.0
80-011	Logperch	I	M	S	D	5	10.0	2.07	60	0.07	6.0

No Species: 22 **Nat. Species:** 21 **Hybrids:** 1 **Total Counted:** 242 **Total Rel. Wt. :** 82684

IBI: 34.0 **MIwb:** 8.3

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-6 River: 95-656 DesPlaines River RM: 87.10 Date: 09/29/2022

Time Fished: 2782 Distance: 0.500 Drainge (sq mi): 261.4 Depth: 0

Location: dst. Rockland Rd. Lat: 42.27629 Long: -87.93925

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
10-004	Longnose Gar	P		M		1	2.0	0.30	200	0.39	100.0
37-003	Northern Pike	P		M	F	7	14.0	2.10	18500	35.89	1321.4
40-016	White Sucker	O	T	S	W	11	22.0	3.29	6860	13.31	311.8
43-001	Common Carp	O	T	M	G	5	10.0	1.50	14440	28.01	1444.0
43-003	Golden Shiner	I	T	M	N	1	2.0	0.30	4	0.01	2.0
43-004	Hornyhead Chub	I	I	N	N	85	170.0	25.45	2860	5.55	16.8
43-022	Rosyface Shiner	I	I	S	N	43	86.0	12.87	240	0.47	2.7
43-032	Spotfin Shiner	I		M	N	30	60.0	8.98	120	0.23	2.0
43-043	Bluntnose Minnow	O	T	C	N	70	140.0	20.96	280	0.54	2.0
47-002	Channel Catfish			C	F	1	2.0	0.30	6	0.01	3.0
47-004	Yellow Bullhead	I	T	C		6	12.0	1.80	550	1.07	45.8
54-002	Blackstripe Topminnow	I		M		9	18.0	2.69	10	0.02	0.5
77-002	Black Crappie	I		C	S	2	4.0	0.60	480	0.93	120.0
77-003	Rock Bass	C		C	S	23	46.0	6.89	2160	4.19	46.9
77-004	Smallmouth Bass	C	M	C	F	12	24.0	3.59	2220	4.31	92.5
77-006	Largemouth Bass	C		C	F	8	16.0	2.40	1650	3.20	103.1
77-008	Green Sunfish	I	T	C	S	9	18.0	2.69	440	0.85	24.4
77-009	Bluegill Sunfish	I	P	C	S	8	16.0	2.40	500	0.97	31.2
80-005	Blackside Darter	I		S	D	2	4.0	0.60	30	0.06	7.5
80-014	Johnny Darter	I		C	D	1	2.0	0.30	2	0.00	1.0

No Species: 20 **Nat. Species:** 19 **Hybrids:** 0 **Total Counted:** 334 **Total Rel. Wt. :** 51552

IBI: 38.0 **MIwb:** 8.7

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-7 River: 95-656 DesPlaines River RM: 84.60 Date: 06/21/2022

Time Fished: 3005 Distance: 0.500 Drainge (sq mi): 266.4 Depth: 0

Location: ust. dam site Lat: 42.25085 Long: -87.93957

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	22	44.0	6.61	11940	23.73	271.3
40-018	Spotted Sucker	I		S	R	1	2.0	0.30	3800	7.55	1900.0
43-001	Common Carp	O	T	M	G	23	46.0	6.91	28000	55.66	608.6
43-004	Hornyhead Chub	I	I	N	N	33	66.0	9.91	780	1.55	11.8
43-022	Rosyface Shiner	I	I	S	N	27	54.0	8.11	120	0.24	2.2
43-028	Spottail Shiner	I	P	M	N	9	18.0	2.70	110	0.22	6.1
43-032	Spotfin Shiner	I		M	N	24	48.0	7.21	200	0.40	4.1
43-033	Bigmouth Shiner	I		M	N	5	10.0	1.50	20	0.04	2.0
43-034	Sand Shiner	I	M	M	N	91	182.0	27.33	420	0.83	2.3
43-043	Bluntnose Minnow	O	T	C	N	37	74.0	11.11	260	0.52	3.5
47-006	Black Bullhead	I	P	C		1	2.0	0.30	600	1.19	300.0
54-002	Blackstripe Topminnow	I		M		1	2.0	0.30	2	0.00	1.0
77-002	Black Crappie	I		C	S	4	8.0	1.20	700	1.39	87.5
77-004	Smallmouth Bass	C	M	C	F	4	8.0	1.20	220	0.44	27.5
77-006	Largemouth Bass	C		C	F	2	4.0	0.60	440	0.87	110.0
77-008	Green Sunfish	I	T	C	S	4	8.0	1.20	160	0.32	20.0
77-009	Bluegill Sunfish	I	P	C	S	28	56.0	8.41	1700	3.38	30.3
77-013	Pumpkinseed Sunfish	I	P	C	S	11	22.0	3.30	300	0.60	13.6
80-001	Sauger	P		S	F	1	2.0	0.30	420	0.83	210.0
80-005	Blackside Darter	I		S	D	1	2.0	0.30	6	0.01	3.0
80-011	Logperch	I	M	S	D	4	8.0	1.20	110	0.22	13.7

No Species: 21 **Nat. Species:** 20 **Hybrids:** 0 **Total Counted:** 333 **Total Rel. Wt. :** 50308

IBI: 36.0 **MIwb:** 7.3

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-7 River: 95-656 DesPlaines River RM: 84.60 Date: 09/27/2022

Time Fished: 2633 Distance: 0.500 Drainge (sq mi): 266.4 Depth: 0

Location: ust. dam site Lat: 42.25085 Long: -87.93957

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	Gizzard Shad	O		M		1	2.0	0.41	10	0.01	5.0
37-003	Northern Pike	P		M	F	4	8.0	1.64	9900	14.37	1237.5
40-016	White Sucker	O	T	S	W	22	44.0	9.02	12520	18.18	284.5
40-018	Spotted Sucker	I		S	R	2	4.0	0.82	3600	5.23	900.0
43-001	Common Carp	O	T	M	G	20	40.0	8.20	22200	32.23	555.0
43-004	Hornyhead Chub	I	I	N	N	28	56.0	11.48	500	0.73	8.9
43-022	Rosyface Shiner	I	I	S	N	4	8.0	1.64	20	0.03	2.5
43-025	Striped Shiner	I		S	N	1	2.0	0.41	6	0.01	3.0
43-028	Spottail Shiner	I	P	M	N	1	2.0	0.41	20	0.03	10.0
43-032	Spotfin Shiner	I		M	N	47	94.0	19.26	300	0.44	3.1
43-034	Sand Shiner	I	M	M	N	10	20.0	4.10	30	0.04	1.5
43-043	Bluntnose Minnow	O	T	C	N	36	72.0	14.75	120	0.17	1.6
47-002	Channel Catfish			C	F	3	6.0	1.23	7500	10.89	1250.0
47-004	Yellow Bullhead	I	T	C		2	4.0	0.82	560	0.81	140.0
54-002	Blackstripe Topminnow	I		M		3	6.0	1.23	8	0.01	1.3
77-002	Black Crappie	I		C	S	1	2.0	0.41	240	0.35	120.0
77-003	Rock Bass	C		C	S	4	8.0	1.64	1000	1.45	125.0
77-004	Smallmouth Bass	C	M	C	F	10	20.0	4.10	1680	2.44	84.0
77-006	Largemouth Bass	C		C	F	12	24.0	4.92	4860	7.06	202.5
77-008	Green Sunfish	I	T	C	S	4	8.0	1.64	140	0.20	17.5
77-009	Bluegill Sunfish	I	P	C	S	18	36.0	7.38	600	0.87	16.6
80-001	Sauger	P		S	F	2	4.0	0.82	3000	4.36	750.0
80-011	Logperch	I	M	S	D	6	12.0	2.46	50	0.07	4.1
80-014	Johnny Darter	I		C	D	1	2.0	0.41	2	0.00	1.0
87-001	Round Goby				E	2	4.0	0.82	10	0.01	2.5

No Species: 25 **Nat. Species:** 23 **Hybrids:** 0 **Total Counted:** 244 **Total Rel. Wt. :** 68876

IBI: 32.0 **MIwb:** 8.6

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-5 River: 95-656 DesPlaines River RM: 83.60 Date: 06/21/2022

Time Fished: 2213 Distance: 0.500 Drainge (sq mi): 268.0 Depth: 0

Location: dst. E. Townline Rd. Lat: 42.24028 Long: -87.93909

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		C		1	2.0	0.96	3400	6.73	1700.0
37-003	Northern Pike	P		M	F	2	4.0	1.92	5600	11.08	1400.0
40-016	White Sucker	O	T	S	W	12	24.0	11.54	8520	16.86	355.0
40-018	Spotted Sucker	I		S	R	5	10.0	4.81	7400	14.65	740.0
43-001	Common Carp	O	T	M	G	13	26.0	12.50	21800	43.15	838.4
43-028	Spottail Shiner	I	P	M	N	8	16.0	7.69	100	0.20	6.2
43-032	Spotfin Shiner	I		M	N	1	2.0	0.96	10	0.02	5.0
43-034	Sand Shiner	I	M	M	N	1	2.0	0.96	6	0.01	3.0
43-043	Bluntnose Minnow	O	T	C	N	4	8.0	3.85	20	0.04	2.5
47-004	Yellow Bullhead	I	T	C		1	2.0	0.96	220	0.44	110.0
77-003	Rock Bass	C		C	S	3	6.0	2.88	520	1.03	86.6
77-004	Smallmouth Bass	C	M	C	F	3	6.0	2.88	240	0.48	40.0
77-006	Largemouth Bass	C		C	F	3	6.0	2.88	100	0.20	16.6
77-008	Green Sunfish	I	T	C	S	5	10.0	4.81	220	0.44	22.0
77-009	Bluegill Sunfish	I	P	C	S	30	60.0	28.85	1960	3.88	32.6
77-013	Pumpkinseed Sunfish	I	P	C	S	11	22.0	10.58	400	0.79	18.1
80-011	Logperch	I	M	S	D	1	2.0	0.96	10	0.02	5.0

No Species: 17 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 104 **Total Rel. Wt. :** 50526

IBI: 32.0 **MIwb:** 7.5

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-5 River: 95-656 DesPlaines River RM: 83.60 Date: 09/27/2022

Time Fished: 2205 Distance: 0.500 Drainge (sq mi): 268.0 Depth: 0

Location: dst. E. Townline Rd. Lat: 42.24028 Long: -87.93909

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	2	4.0	0.78	3000	4.71	750.0
40-016	White Sucker	O	T	S	W	29	58.0	11.37	19600	30.78	337.9
40-018	Spotted Sucker	I		S	R	4	8.0	1.57	6650	10.44	831.2
43-001	Common Carp	O	T	M	G	12	24.0	4.71	20400	32.03	850.0
43-004	Hornyhead Chub	I	I	N	N	8	16.0	3.14	420	0.66	26.2
43-022	Rosyface Shiner	I	I	S	N	7	14.0	2.75	30	0.05	2.1
43-028	Spottail Shiner	I	P	M	N	1	2.0	0.39	10	0.02	5.0
43-032	Spotfin Shiner	I		M	N	9	18.0	3.53	40	0.06	2.2
43-034	Sand Shiner	I	M	M	N	2	4.0	0.78	8	0.01	2.0
43-043	Bluntnose Minnow	O	T	C	N	48	96.0	18.82	180	0.28	1.8
47-004	Yellow Bullhead	I	T	C		6	12.0	2.35	1820	2.86	151.6
54-002	Blackstripe Topminnow	I		M		6	12.0	2.35	12	0.02	1.0
77-003	Rock Bass	C		C	S	4	8.0	1.57	320	0.50	40.0
77-004	Smallmouth Bass	C	M	C	F	11	22.0	4.31	1150	1.81	52.2
77-006	Largemouth Bass	C		C	F	16	32.0	6.27	6580	10.33	205.6
77-008	Green Sunfish	I	T	C	S	39	78.0	15.29	1100	1.73	14.1
77-009	Bluegill Sunfish	I	P	C	S	38	76.0	14.90	2040	3.20	26.8
77-013	Pumpkinseed Sunfish	I	P	C	S	2	4.0	0.78	100	0.16	25.0
80-003	Yellow Perch			M		1	2.0	0.39	130	0.20	65.0
80-005	Blackside Darter	I		S	D	2	4.0	0.78	10	0.02	2.5
80-011	Logperch	I	M	S	D	6	12.0	2.35	80	0.13	6.6
80-014	Johnny Darter	I		C	D	1	2.0	0.39	2	0.00	1.0
87-001	Round Goby				E	1	2.0	0.39	6	0.01	3.0

No Species: 23 **Nat. Species:** 21 **Hybrids:** 0 **Total Counted:** 255 **Total Rel. Wt. :** 63688

IBI: 34.0 **MIwb:** 8.3

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 16-8 River: 95-656 DesPlaines River RM: 82.90 Date: 06/21/2022

Time Fished: 2547 Distance: 0.500 Drainge (sq mi): 268.9 Depth: 0

Location: ust. dam Lat: 42.23111 Long: -87.93430

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	1	2.0	0.64	1700	2.76	850.0
40-016	White Sucker	O	T	S	W	20	40.0	12.82	14820	24.07	370.5
40-018	Spotted Sucker	I		S	R	5	10.0	3.21	7600	12.35	760.0
43-001	Common Carp	O	T	M	G	19	38.0	12.18	27400	44.51	721.0
43-004	Hornyhead Chub	I	I	N	N	2	4.0	1.28	60	0.10	15.0
43-022	Rosyface Shiner	I	I	S	N	2	4.0	1.28	8	0.01	2.0
43-028	Spottail Shiner	I	P	M	N	5	10.0	3.21	40	0.06	4.0
43-032	Spotfin Shiner	I		M	N	8	16.0	5.13	80	0.13	5.0
43-034	Sand Shiner	I	M	M	N	14	28.0	8.97	40	0.06	1.4
43-043	Bluntnose Minnow	O	T	C	N	8	16.0	5.13	40	0.06	2.5
47-004	Yellow Bullhead	I	T	C		1	2.0	0.64	600	0.97	300.0
47-007	Flathead Catfish	P		C	F	1	2.0	0.64	0	0.00	0.0
54-002	Blackstripe Topminnow	I		M		1	2.0	0.64	2	0.00	1.0
77-002	Black Crappie	I		C	S	1	2.0	0.64	120	0.19	60.0
77-004	Smallmouth Bass	C	M	C	F	6	12.0	3.85	680	1.10	56.6
77-006	Largemouth Bass	C		C	F	4	8.0	2.56	3400	5.52	425.0
77-008	Green Sunfish	I	T	C	S	2	4.0	1.28	20	0.03	5.0
77-009	Bluegill Sunfish	I	P	C	S	48	96.0	30.77	2800	4.55	29.1
77-013	Pumpkinseed Sunfish	I	P	C	S	4	8.0	2.56	170	0.28	21.2
77-015	Green X Bluegill Sunfish					2	4.0	1.28	160	0.26	40.0
80-001	Sauger	P		S	F	1	2.0	0.64	1800	2.92	900.0
80-011	Logperch	I	M	S	D	1	2.0	0.64	20	0.03	10.0

No Species: 21 **Nat. Species:** 20 **Hybrids:** 1 **Total Counted:** 156 **Total Rel. Wt. :** 61560

IBI: 32.0 **MIwb:** 7.4

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-8 River: 95-656 DesPlaines River RM: 82.90 Date: 09/27/2022

Time Fished: 2373 Distance: 0.500 Drainge (sq mi): 268.9 Depth: 0

Location: ust. dam Lat: 42.23111 Long: -87.93430

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
10-004	Longnose Gar	P		M		1	2.0	0.39	200	0.23	100.0
37-003	Northern Pike	P		M	F	1	2.0	0.39	2700	3.10	1350.0
40-016	White Sucker	O	T	S	W	50	100.0	19.53	24190	27.76	241.9
40-018	Spotted Sucker	I		S	R	2	4.0	0.78	2800	3.21	700.0
43-001	Common Carp	O	T	M	G	13	26.0	5.08	32500	37.30	1250.0
43-004	Hornyhead Chub	I	I	N	N	2	4.0	0.78	120	0.14	30.0
43-028	Spottail Shiner	I	P	M	N	1	2.0	0.39	30	0.03	15.0
43-034	Sand Shiner	I	M	M	N	1	2.0	0.39	6	0.01	3.0
43-043	Bluntnose Minnow	O	T	C	N	29	58.0	11.33	220	0.25	3.7
47-002	Channel Catfish			C	F	2	4.0	0.78	12200	14.00	3050.0
47-004	Yellow Bullhead	I	T	C		1	2.0	0.39	580	0.67	290.0
53-032						49	98.0	19.14	220	0.25	2.2
54-002	Blackstripe Topminnow	I		M		5	10.0	1.95	10	0.01	1.0
77-002	Black Crappie	I		C	S	3	6.0	1.17	1470	1.69	245.0
77-003	Rock Bass	C		C	S	6	12.0	2.34	430	0.49	35.8
77-004	Smallmouth Bass	C	M	C	F	12	24.0	4.69	900	1.03	37.5
77-006	Largemouth Bass	C		C	F	13	26.0	5.08	3920	4.50	150.7
77-008	Green Sunfish	I	T	C	S	4	8.0	1.56	140	0.16	17.5
77-009	Bluegill Sunfish	I	P	C	S	54	108.0	21.09	4100	4.71	37.9
77-013	Pumpkinseed Sunfish	I	P	C	S	3	6.0	1.17	330	0.38	55.0
80-005	Blackside Darter	I		S	D	2	4.0	0.78	20	0.02	5.0
80-011	Logperch	I	M	S	D	1	2.0	0.39	2	0.00	1.0
87-001	Round Goby				E	1	2.0	0.39	50	0.06	25.0

No Species: 23 **Nat. Species:** 21 **Hybrids:** 0 **Total Counted:** 256 **Total Rel. Wt. :** 87138

IBI: 32.0 **MIwb:** 8.2

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-4 River: 95-656 DesPlaines River RM: 80.00 Date: 06/27/2022

Time Fished: 1342 Distance: 0.200 Drainge (sq mi): 273.2 Depth: 0

Location: dst. Half Day Rd. Lat: 42.19816 Long: -87.91911

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
10-004	Longnose Gar	P		M		1	1.5	0.81	900	11.20	600.0
37-003	Northern Pike	P		M	F	1	1.5	0.81	1425	17.73	950.0
40-016	White Sucker	O	T	S	W	23	34.5	18.70	1875	23.33	54.3
43-004	Hornyhead Chub	I	I	N	N	14	21.0	11.38	315	3.92	15.0
43-022	Rosyface Shiner	I	I	S	N	1	1.5	0.81	3	0.04	2.0
43-032	Spotfin Shiner	I		M	N	1	1.5	0.81	3	0.04	2.0
43-034	Sand Shiner	I	M	M	N	2	3.0	1.63	6	0.07	2.0
43-043	Bluntnose Minnow	O	T	C	N	2	3.0	1.63	6	0.07	2.0
47-004	Yellow Bullhead	I	T	C		3	4.5	2.44	540	6.72	120.0
54-002	Blackstripe Topminnow	I		M		2	3.0	1.63	3	0.04	1.0
77-002	Black Crappie	I		C	S	1	1.5	0.81	97	1.21	65.0
77-003	Rock Bass	C		C	S	6	9.0	4.88	105	1.31	11.6
77-006	Largemouth Bass	C		C	F	2	3.0	1.63	1440	17.91	480.0
77-008	Green Sunfish	I	T	C	S	25	37.5	20.33	270	3.36	7.2
77-009	Bluegill Sunfish	I	P	C	S	26	39.0	21.14	915	11.38	23.4
77-015	Green X Bluegill Sunfish					1	1.5	0.81	15	0.19	10.0
80-005	Blackside Darter	I		S	D	4	6.0	3.25	15	0.19	2.5
80-011	Logperch	I	M	S	D	5	7.5	4.07	90	1.12	12.0
87-001	Round Goby				E	3	4.5	2.44	15	0.19	3.3

No Species: 18 **Nat. Species:** 17 **Hybrids:** 1 **Total Counted:** 123 **Total Rel. Wt. :** 8038

IBI: 34.0 **MIwb:** 7.5

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 16-4 River: 95-656 DesPlaines River RM: 80.00 Date: 09/30/2022

Time Fished: 1233 Distance: 0.200 Drainge (sq mi): 273.2 Depth: 0

Location: dst. Half Day Rd. Lat: 42.19816 Long: -87.91911

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	3	4.5	2.68	285	7.47	63.3
43-004	Hornyhead Chub	I	I	N	N	17	25.5	15.18	420	11.01	16.4
43-032	Spotfin Shiner	I		M	N	30	45.0	26.79	172	4.52	3.8
43-043	Bluntnose Minnow	O	T	C	N	13	19.5	11.61	52	1.38	2.6
47-004	Yellow Bullhead	I	T	C		4	6.0	3.57	177	4.64	29.5
54-002	Blackstripe Topminnow	I		M		2	3.0	1.79	4	0.12	1.5
77-002	Black Crappie	I		C	S	1	1.5	0.89	45	1.18	30.0
77-003	Rock Bass	C		C	S	1	1.5	0.89	45	1.18	30.0
77-004	Smallmouth Bass	C	M	C	F	3	4.5	2.68	30	0.79	6.6
77-006	Largemouth Bass	C		C	F	3	4.5	2.68	1680	44.03	373.3
77-008	Green Sunfish	I	T	C	S	20	30.0	17.86	435	11.40	14.5
77-009	Bluegill Sunfish	I	P	C	S	9	13.5	8.04	412	10.81	30.5
80-011	Logperch	I	M	S	D	1	1.5	0.89	22	0.59	15.0
80-014	Johnny Darter	I		C	D	3	4.5	2.68	4	0.12	1.0
87-001	Round Goby				E	2	3.0	1.79	30	0.79	10.0

No Species: 15 **Nat. Species:** 14 **Hybrids:** 0 **Total Counted:** 112 **Total Rel. Wt. :** 3816

IBI: 34.0 **MIwb:** 6.9

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-3 River: 95-656 DesPlaines River RM: 76.70 Date: 06/26/2022

Time Fished: 2311 Distance: 0.500 Drainge (sq mi): 314.6 Depth: 0

Location: dst. Deerfield Rd. Lat: 42.16706 Long: -87.91377

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	4	8.0	3.08	8800	19.06	1100.0
40-016	White Sucker	O	T	S	W	4	8.0	3.08	4120	8.92	515.0
40-018	Spotted Sucker	I		S	R	1	2.0	0.77	1800	3.90	900.0
43-001	Common Carp	O	T	M	G	18	36.0	13.85	22200	48.08	616.6
43-004	Hornyhead Chub	I	I	N	N	5	10.0	3.85	180	0.39	18.0
43-028	Spottail Shiner	I	P	M	N	1	2.0	0.77	10	0.02	5.0
43-032	Spotfin Shiner	I		M	N	9	18.0	6.92	60	0.13	3.3
43-034	Sand Shiner	I	M	M	N	1	2.0	0.77	4	0.01	2.0
43-043	Bluntnose Minnow	O	T	C	N	11	22.0	8.46	100	0.22	4.5
47-004	Yellow Bullhead	I	T	C		1	2.0	0.77	440	0.95	220.0
54-002	Blackstripe Topminnow	I		M		3	6.0	2.31	6	0.01	1.0
77-004	Smallmouth Bass	C	M	C	F	7	14.0	5.38	1040	2.25	74.2
77-006	Largemouth Bass	C		C	F	5	10.0	3.85	4500	9.75	450.0
77-008	Green Sunfish	I	T	C	S	4	8.0	3.08	80	0.17	10.0
77-009	Bluegill Sunfish	I	P	C	S	42	84.0	32.31	2500	5.41	29.7
77-013	Pumpkinseed Sunfish	I	P	C	S	5	10.0	3.85	220	0.48	22.0
80-003	Yellow Perch			M		1	2.0	0.77	40	0.09	20.0
80-005	Blackside Darter	I		S	D	3	6.0	2.31	30	0.06	5.0
87-001	Round Goby				E	5	10.0	3.85	40	0.09	4.0

No Species: 19 **Nat. Species:** 17 **Hybrids:** 0 **Total Counted:** 130 **Total Rel. Wt. :** 46170

IBI: 30.0 **MIwb:** 7.3

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 16-3 River: 95-656 DesPlaines River RM: 76.70 Date: 10/02/2022

Time Fished: 2449 Distance: 0.500 Drainge (sq mi): 314.6 Depth: 0

Location: dst. Deerfield Rd. Lat: 42.16706 Long: -87.91377

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
10-004	Longnose Gar	P		M		1	2.0	0.40	200	0.26	100.0
37-003	Northern Pike	P		M	F	5	10.0	2.00	12700	16.41	1270.0
40-016	White Sucker	O	T	S	W	20	40.0	8.00	16500	21.31	412.5
40-018	Spotted Sucker	I		S	R	3	6.0	1.20	4600	5.94	766.6
43-001	Common Carp	O	T	M	G	37	74.0	14.80	23900	30.87	322.9
43-004	Hornyhead Chub	I	I	N	N	2	4.0	0.80	40	0.05	10.0
43-022	Rosyface Shiner	I	I	S	N	4	8.0	1.60	12	0.02	1.5
43-028	Spottail Shiner	I	P	M	N	2	4.0	0.80	40	0.05	10.0
43-032	Spotfin Shiner	I		M	N	2	4.0	0.80	4	0.01	1.0
43-043	Bluntnose Minnow	O	T	C	N	42	84.0	16.80	220	0.28	2.6
47-002	Channel Catfish			C	F	2	4.0	0.80	4800	6.20	1200.0
47-004	Yellow Bullhead	I	T	C		1	2.0	0.40	400	0.52	200.0
54-002	Blackstripe Topminnow	I		M		6	12.0	2.40	10	0.01	0.8
70-001	Brook Silverside	I	M	M		1	2.0	0.40	2	0.00	1.0
77-002	Black Crappie	I		C	S	3	6.0	1.20	1100	1.42	183.3
77-003	Rock Bass	C		C	S	15	30.0	6.00	720	0.93	24.0
77-004	Smallmouth Bass	C	M	C	F	22	44.0	8.80	7040	9.09	160.0
77-006	Largemouth Bass	C		C	F	18	36.0	7.20	2060	2.66	57.2
77-008	Green Sunfish	I	T	C	S	1	2.0	0.40	20	0.03	10.0
77-009	Bluegill Sunfish	I	P	C	S	40	80.0	16.00	2540	3.28	31.7
77-013	Pumpkinseed Sunfish	I	P	C	S	2	4.0	0.80	100	0.13	25.0
77-015	Green X Bluegill Sunfish					1	2.0	0.40	160	0.21	80.0
80-005	Blackside Darter	I		S	D	4	8.0	1.60	40	0.05	5.0
80-011	Logperch	I	M	S	D	3	6.0	1.20	6	0.01	1.0
87-001	Round Goby				E	13	26.0	5.20	200	0.26	7.6

No Species: 24 **Nat. Species:** 22 **Hybrids:** 1 **Total Counted:** 250 **Total Rel. Wt. :** 77414

IBI: 34.0 **MIwb:** 8.1

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 16-2 River: 95-656 DesPlaines River RM: 75.40 Date: 06/26/2022

Time Fished: 2812 Distance: 0.500 Drainge (sq mi): 323.9 Depth: 0

Location: dst. Lake Cook Rd. Lat: 42.15276 Long: -87.91022

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	77	154.0	46.39	22400	43.70	145.4
43-001	Common Carp	O	T	M	G	1	2.0	0.60	6000	11.71	3000.0
43-004	Hornyhead Chub	I	I	N	N	4	8.0	2.41	40	0.08	5.0
43-022	Rosyface Shiner	I	I	S	N	3	6.0	1.81	10	0.02	1.6
43-028	Spottail Shiner	I	P	M	N	1	2.0	0.60	10	0.02	5.0
43-032	Spotfin Shiner	I		M	N	8	16.0	4.82	80	0.16	5.0
43-034	Sand Shiner	I	M	M	N	1	2.0	0.60	4	0.01	2.0
43-043	Bluntnose Minnow	O	T	C	N	10	20.0	6.02	60	0.12	3.0
43-045	Common Carp X Goldfish	O	T		G	1	2.0	0.60	3200	6.24	1600.0
47-002	Channel Catfish			C	F	3	6.0	1.81	11000	21.46	1833.3
47-008	Stonecat Madtom	I	I	C		1	2.0	0.60	20	0.04	10.0
77-003	Rock Bass	C		C	S	8	16.0	4.82	2620	5.11	163.7
77-004	Smallmouth Bass	C	M	C	F	7	14.0	4.22	920	1.79	65.7
77-006	Largemouth Bass	C		C	F	4	8.0	2.41	3220	6.28	402.5
77-008	Green Sunfish	I	T	C	S	4	8.0	2.41	140	0.27	17.5
77-009	Bluegill Sunfish	I	P	C	S	12	24.0	7.23	600	1.17	25.0
77-013	Pumpkinseed Sunfish	I	P	C	S	3	6.0	1.81	40	0.08	6.6
80-001	Sauger	P		S	F	1	2.0	0.60	600	1.17	300.0
80-005	Blackside Darter	I		S	D	3	6.0	1.81	10	0.02	1.6
80-011	Logperch	I	M	S	D	7	14.0	4.22	100	0.20	7.1
87-001	Round Goby				E	7	14.0	4.22	180	0.35	12.8

No Species: 20 **Nat. Species:** 18 **Hybrids:** 1 **Total Counted:** 166 **Total Rel. Wt. :** 51254

IBI: 32.0 **MIwb:** 7.6

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-2 River: 95-656 DesPlaines River RM: 75.40 Date: 10/02/2022

Time Fished: 2415 Distance: 0.500 Drainge (sq mi): 323.9 Depth: 0

Location: dst. Lake Cook Rd. Lat: 42.15276 Long: -87.91022

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	2	4.0	0.56	3200	4.54	800.0
40-016	White Sucker	O	T	S	W	22	44.0	6.11	4250	6.02	96.5
40-018	Spotted Sucker	I		S	R	1	2.0	0.28	2300	3.26	1150.0
43-001	Common Carp	O	T	M	G	15	30.0	4.17	26800	37.99	893.3
43-004	Hornyhead Chub	I	I	N	N	53	106.0	14.72	3760	5.33	35.4
43-022	Rosyface Shiner	I	I	S	N	5	10.0	1.39	10	0.01	1.0
43-032	Spotfin Shiner	I		M	N	22	44.0	6.11	160	0.23	3.6
43-034	Sand Shiner	I	M	M	N	3	6.0	0.83	20	0.03	3.3
43-043	Bluntnose Minnow	O	T	C	N	57	114.0	15.83	300	0.43	2.6
47-002	Channel Catfish			C	F	4	8.0	1.11	12810	18.16	1601.2
47-004	Yellow Bullhead	I	T	C		10	20.0	2.78	1500	2.13	75.0
47-013	Tadpole Madtom	I		C		4	8.0	1.11	20	0.03	2.5
54-002	Blackstripe Topminnow	I		M		1	2.0	0.28	2	0.00	1.0
77-003	Rock Bass	C		C	S	33	66.0	9.17	2340	3.32	35.4
77-004	Smallmouth Bass	C	M	C	F	18	36.0	5.00	2160	3.06	60.0
77-006	Largemouth Bass	C		C	F	21	42.0	5.83	9320	13.21	221.9
77-008	Green Sunfish	I	T	C	S	12	24.0	3.33	400	0.57	16.6
77-009	Bluegill Sunfish	I	P	C	S	7	14.0	1.94	340	0.48	24.2
77-015	Green X Bluegill Sunfish					1	2.0	0.28	60	0.09	30.0
80-005	Blackside Darter	I		S	D	4	8.0	1.11	60	0.09	7.5
80-011	Logperch	I	M	S	D	28	56.0	7.78	460	0.65	8.2
80-014	Johnny Darter	I		C	D	7	14.0	1.94	20	0.03	1.4
87-001	Round Goby				E	30	60.0	8.33	260	0.37	4.3

No Species: 22 **Nat. Species:** 20 **Hybrids:** 1 **Total Counted:** 360 **Total Rel. Wt. :** 70552

IBI: 32.0 **MIwb:** 8.8

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 16-1 River: 95-656 DesPlaines River RM: 71.70 Date: 06/23/2022

Time Fished: 2012 Distance: 0.500 Drainge (sq mi): 358.7 Depth: 0

Location: ust. E. Palatine Rd. Lat: 42.11399 Long: -87.88923

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	28	56.0	22.95	14020	37.10	250.3
43-001	Common Carp	O	T	M	G	1	2.0	0.82	3000	7.94	1500.0
43-004	Hornyhead Chub	I	I	N	N	3	6.0	2.46	130	0.34	21.6
43-022	Rosyface Shiner	I	I	S	N	19	38.0	15.57	30	0.08	0.7
43-032	Spotfin Shiner	I		M	N	3	6.0	2.46	20	0.05	3.3
43-034	Sand Shiner	I	M	M	N	1	2.0	0.82	6	0.02	3.0
43-043	Bluntnose Minnow	O	T	C	N	2	4.0	1.64	10	0.03	2.5
47-002	Channel Catfish			C	F	5	10.0	4.10	11700	30.96	1170.0
47-004	Yellow Bullhead	I	T	C		1	2.0	0.82	100	0.26	50.0
77-003	Rock Bass	C		C	S	1	2.0	0.82	640	1.69	320.0
77-004	Smallmouth Bass	C	M	C	F	4	8.0	3.28	120	0.32	15.0
77-006	Largemouth Bass	C		C	F	2	4.0	1.64	2800	7.41	700.0
77-008	Green Sunfish	I	T	C	S	8	16.0	6.56	90	0.24	5.6
77-009	Bluegill Sunfish	I	P	C	S	19	38.0	15.57	980	2.59	25.7
77-015	Green X Bluegill Sunfish					2	4.0	1.64	350	0.93	87.5
80-001	Sauger	P		S	F	3	6.0	2.46	3440	9.10	573.3
80-011	Logperch	I	M	S	D	1	2.0	0.82	10	0.03	5.0
87-001	Round Goby				E	19	38.0	15.57	340	0.90	8.9

No Species: 17 **Nat. Species:** 15 **Hybrids:** 1 **Total Counted:** 122 **Total Rel. Wt. :** 37786

IBI: 30.0 **MIwb:** 7.8

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID: 16-1 River: 95-656 DesPlaines River RM: 71.70 Date: 09/30/2022

Time Fished: 2461 Distance: 0.500 Drainge (sq mi): 358.7 Depth: 0

Location: ust. E. Palatine Rd. Lat: 42.11399 Long: -87.88923

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
37-003	Northern Pike	P		M	F	1	2.0	0.33	2300	2.52	1150.0
40-016	White Sucker	O	T	S	W	52	104.0	17.39	26860	29.42	258.2
40-018	Spotted Sucker	I		S	R	1	2.0	0.33	1300	1.42	650.0
43-001	Common Carp	O	T	M	G	18	36.0	6.02	31400	34.40	872.2
43-002	Goldfish	O	T	M	G	1	2.0	0.33	330	0.36	165.0
43-003	Golden Shiner	I	T	M	N	4	8.0	1.34	140	0.15	17.5
43-004	Hornyhead Chub	I	I	N	N	10	20.0	3.34	740	0.81	37.0
43-032	Spotfin Shiner	I		M	N	2	4.0	0.67	10	0.01	2.5
43-034	Sand Shiner	I	M	M	N	2	4.0	0.67	6	0.01	1.5
43-043	Bluntnose Minnow	O	T	C	N	21	42.0	7.02	80	0.09	1.9
47-002	Channel Catfish			C	F	3	6.0	1.00	9350	10.24	1558.3
47-004	Yellow Bullhead	I	T	C		7	14.0	2.34	2380	2.61	170.0
47-008	Stonecat Madtom	I	I	C		2	4.0	0.67	80	0.09	20.0
54-002	Blackstripe Topminnow	I		M		4	8.0	1.34	20	0.02	2.5
77-002	Black Crappie	I		C	S	1	2.0	0.33	4	0.00	2.0
77-003	Rock Bass	C		C	S	20	40.0	6.69	1360	1.49	34.0
77-004	Smallmouth Bass	C	M	C	F	24	48.0	8.03	4240	4.64	88.3
77-006	Largemouth Bass	C		C	F	17	34.0	5.69	3470	3.80	102.0
77-008	Green Sunfish	I	T	C	S	24	48.0	8.03	550	0.60	11.4
77-009	Bluegill Sunfish	I	P	C	S	47	94.0	15.72	3460	3.79	36.8
77-014	Bluegill X Pumpkinseed Sunfish					1	2.0	0.33	70	0.08	35.0
77-015	Green X Bluegill Sunfish					3	6.0	1.00	380	0.42	63.3
80-001	Sauger	P		S	F	2	4.0	0.67	2400	2.63	600.0
80-011	Logperch	I	M	S	D	10	20.0	3.34	160	0.18	8.0
80-014	Johnny Darter	I		C	D	2	4.0	0.67	2	0.00	0.5
87-001	Round Goby				E	20	40.0	6.69	200	0.22	5.0

No Species: 24 **Nat. Species:** 21 **Hybrids:** 2 **Total Counted:** 299 **Total Rel. Wt. :** 91292

IBI: 32.0 **MIwb:** 8.4

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 11-2 River: 95-995 Mill Creek RM: 1.71 Date: 06/27/2022

Time Fished: 1310 Distance: 0.200 Drainge (sq mi): 62.2 Depth: 0

Location: ust. Mill Creek WWTP Lat: 42.42115 Long: -87.95678

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		C		2	3.0	0.51	4350	17.75	1450.0
37-003	Northern Pike	P		M	F	1	1.5	0.25	1200	4.90	800.0
40-016	White Sucker	O	T	S	W	20	30.0	5.05	3495	14.26	116.5
43-001	Common Carp	O	T	M	G	2	3.0	0.51	5250	21.42	1750.0
43-003	Golden Shiner	I	T	M	N	5	7.5	1.26	135	0.55	18.0
43-004	Hornyhead Chub	I	I	N	N	14	21.0	3.54	315	1.29	15.0
43-022	Rosyface Shiner	I	I	S	N	4	6.0	1.01	9	0.04	1.5
43-032	Spotfin Shiner	I		M	N	61	91.5	15.40	315	1.29	3.4
43-043	Bluntnose Minnow	O	T	C	N	73	109.5	18.43	330	1.35	3.0
47-002	Channel Catfish			C	F	11	16.5	2.78	4800	19.59	290.9
47-004	Yellow Bullhead	I	T	C		37	55.5	9.34	1005	4.10	18.1
47-008	Stonecat Madtom	I	I	C		2	3.0	0.51	75	0.31	25.0
54-002	Blackstripe Topminnow	I		M		6	9.0	1.52	9	0.04	1.0
77-002	Black Crappie	I		C	S	1	1.5	0.25	45	0.18	30.0
77-006	Largemouth Bass	C		C	F	6	9.0	1.52	975	3.98	108.3
77-007	Warmouth Sunfish	C		C	S	1	1.5	0.25	90	0.37	60.0
77-008	Green Sunfish	I	T	C	S	8	12.0	2.02	90	0.37	7.5
77-009	Bluegill Sunfish	I	P	C	S	65	97.5	16.41	1035	4.22	10.6
77-010	Orangespotted Sunfish	I		C	S	29	43.5	7.32	195	0.80	4.4
77-013	Pumpkinseed Sunfish	I	P	C	S	39	58.5	9.85	660	2.69	11.2
77-014	Bluegill X Pumpkinseed Sunfish					1	1.5	0.25	30	0.12	20.0
80-002	Walleye	P		S	F	1	1.5	0.25	67	0.28	45.0
80-005	Blackside Darter	I		S	D	6	9.0	1.52	30	0.12	3.3
80-014	Johnny Darter	I		C	D	1	1.5	0.25	1	0.01	1.0

No Species: 23 **Nat. Species:** 22 **Hybrids:** 1 **Total Counted:** 396 **Total Rel. Wt. :** 24507

IBI: 38.0 **MIwb:** 8.9

Appendix Table A-4. Midwest Biodiversity Institute
Fish Species List

Site ID:	10-7	River: 95-996	North Mill Creek			RM:	11.30	Date: 06/27/2022	
Time Fished:	1152	Distance:	0.100	Drainge (sq mi):	19.2	Depth:	0		
Location:	ust. Edwards Rd.					Lat:	42.48087	Long:	-87.01184

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	Central Mudminnow	I	T	C		3	9.0	23.08	60	12.74	6.6
43-013	Creek Chub	G	T	N	N	4	12.0	30.77	300	63.69	25.0
43-042	Fathead Minnow	O	T	C	N	1	3.0	7.69	9	1.91	3.0
54-002	Blackstripe Topminnow	I		M		1	3.0	7.69	6	1.27	2.0
77-008	Green Sunfish	I	T	C	S	2	6.0	15.38	90	19.11	15.0
80-014	Johnny Darter	I		C	D	2	6.0	15.38	6	1.27	1.0

No Species: 6 **Nat. Species:** 6 **Hybrids:** 0 **Total Counted:** 13 **Total Rel. Wt. :** 471

IBI: 16.0 **MIwb:** N/A

Appendix Table A-4. Midwest Biodiversity Institute Fish Species List

Site ID: 10-1 River: 95-996 North Mill Creek RM: 1.10 Date: 06/27/2022

Time Fished: 1233 Distance: 0.150 Drainge (sq mi): 31.9 Depth: 0

Location: dst. Millburn Rd. Lat: 42.42346 Long: -87.99722

Species Code:	Species Name:	Feed Guild	Toler- ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	White Sucker	O	T	S	W	53	106.0	20.62	2840	44.11	26.7
43-001	Common Carp	O	T	M	G	2	4.0	0.78	390	6.06	97.5
43-013	Creek Chub	G	T	N	N	9	18.0	3.50	440	6.83	24.4
43-032	Spotfin Shiner	I		M	N	37	74.0	14.40	310	4.82	4.1
43-043	Bluntnose Minnow	O	T	C	N	40	80.0	15.56	190	2.95	2.3
47-004	Yellow Bullhead	I	T	C		1	2.0	0.39	260	4.04	130.0
47-006	Black Bullhead	I	P	C		1	2.0	0.39	180	2.80	90.0
54-002	Blackstripe Topminnow	I		M		4	8.0	1.56	8	0.12	1.0
77-006	Largemouth Bass	C		C	F	4	8.0	1.56	8	0.12	1.0
77-008	Green Sunfish	I	T	C	S	24	48.0	9.34	290	4.50	6.0
77-009	Bluegill Sunfish	I	P	C	S	70	140.0	27.24	1280	19.88	9.1
77-010	Orangespotted Sunfish	I		C	S	3	6.0	1.17	20	0.31	3.3
77-015	Green X Bluegill Sunfish					2	4.0	0.78	20	0.31	5.0
80-003	Yellow Perch			M		6	12.0	2.33	200	3.11	16.6
80-014	Johnny Darter	I		C	D	1	2.0	0.39	2	0.03	1.0

No Species: 14 **Nat. Species:** 13 **Hybrids:** 1 **Total Counted:** 257 **Total Rel. Wt. :** 6438

IBI: 30.0 **MIwb:** 6.9

APPENDIX B

Upper Des Plaines 2022 Macroinvertebrate Assemblage Data

B-1: Macroinvertebrate IBI (mIBI) Metrics & Scores 2022
B-2: Total Macroinvertebrate Taxa DesPlaines River Grand (all sites combined) 2022
B-3: Total Macroinvertebrate Taxa Mill/North Mill Creek Grand (all sites combined) 2022
B-4: Macroinvertebrate Taxa by Site and Sample 2022

Appendix Table B-1. Illinois Macroinvertebrate IBI metrics and values from Upper Des Plaines River study area during 2022.

						Number of					Percent:		
River Mile	Site ID	Sample	Date	Drainage Area (sq mi)	Sub-samp	Total Taxa	Coleoptera Taxa	Mayfly Taxa	Intolerant Taxa	MBI	Percent Scrapers	Percent EPT	MIBI
DesPlaines River (95-656)													
Year: 2022													
109.30	G-08		07/18/2022	122.80		32(70.0)	2(40.0)	3(29.4)	2(22.2)	6.8(68.9)	3.8(12.9)	11.8(16.0)	37.1
106.60	13-5		07/18/2022	137.29		33(72.0)	1(20.0)	3(29.4)	2(22.2)	6.6(72.1)	6.4(21.7)	17.0(23.0)	37.2
102.90	G-25		07/18/2022	144.80		36(78.0)	1(20.0)	3(29.4)	0(0.0)	6.3(77.1)	2.2(7.6)	12.3(16.6)	32.7
99.72	13-18		07/18/2022	212.87		25(54.0)	1(20.0)	1(9.8)	2(22.2)	7.3(60.7)	5.0(16.8)	27.2(36.7)	31.5
99.30	13-19		07/18/2022	213.17		34(74.0)	2(40.0)	1(9.8)	4(44.4)	8.0(49.2)	1.9(6.4)	5.7(7.7)	33.1
98.70	13-3		07/19/2022	220.29		30(65.0)	2(40.0)	3(29.4)	2(22.2)	5.7(86.9)	11.5(38.7)	9.1(12.3)	42.1
96.82	13-2		07/19/2022	225.36		31(67.0)	2(40.0)	3(29.4)	3(33.3)	5.6(88.5)	15.2(51.3)	10.2(13.8)	46.2
94.20	G-07		07/19/2022	237.70		34(74.0)	2(40.0)	4(39.2)	4(44.4)	5.2(95.1)	19.6(66.1)	18.9(25.6)	54.9
90.60	13-16		07/19/2022	253.75		29(63.0)	3(60.0)	6(58.8)	5(55.6)	4.8(100)	11.5(38.9)	32.9(44.5)	60.1
87.10	16-6		07/19/2022	261.38		39(85.0)	3(60.0)	4(39.2)	8(88.9)	4.8(100)	19.7(66.5)	34.4(46.5)	69.4
84.60	16-7		07/19/2022	266.48		36(78.0)	3(60.0)	4(39.2)	6(66.7)	5.0(98.4)	9.9(33.5)	33.4(45.2)	60.1
83.60	16-5		07/20/2022	268.07		34(74.0)	2(40.0)	3(29.4)	6(66.7)	5.7(86.9)	2.5(8.3)	23.5(31.8)	48.2
82.90	16-8		07/22/2022	268.90		39(85.0)	2(40.0)	5(49.0)	6(66.7)	5.1(96.7)	4.3(14.6)	29.3(39.6)	56.0
80.00	16-4		07/20/2022	273.21		34(74.0)	3(60.0)	6(58.8)	5(55.6)	5.0(98.4)	14.7(49.7)	47.5(64.2)	65.8
76.70	16-3		07/20/2022	314.68		30(65.0)	4(80.0)	3(29.4)	3(33.3)	5.1(96.7)	5.5(18.6)	11.8(15.9)	48.4
75.40	R5W07648-9		07/20/2022	315.80		36(78.0)	2(40.0)	6(58.8)	4(44.4)	5.5(90.2)	24.6(83.0)	25.4(34.4)	61.3
71.70	16-1		07/21/2022	358.68		33(72.0)	2(40.0)	3(29.4)	6(66.7)	5.7(86.9)	10.7(36.1)	33.8(45.7)	53.8
Mill Creek (95-995)													
Year: 2022													
1.71	11-2		07/21/2022	62.25		34(74.0)	2(40.0)	3(29.4)	1(11.1)	5.9(83.6)	3.6(12.3)	46.4(62.7)	44.7

Appendix Table B-1. Illinois Macroinvertebrate IBI metrics and values from Upper Des Plaines River study area during 2022.

						Number of					Percent:		
River Mile	Site ID	Sample	Date	Drainage Area (sq mi)	Sub-samp	Total Taxa	Coleoptera Taxa	Mayfly Taxa	Intolerant Taxa	MBI	Percent Scrapers	Percent EPT	MIBI
North Mill Creek (95-996)													
Year: 2022													
11.30	10-7		07/21/2022	19.20		29(63.0)	1(20.0)	1(9.8)	3(33.3)	6.0(82.0)	21.9(74.0)	1.0(1.4)	40.5
1.10	10-1		07/21/2022	31.97		44(96.0)	3(60.0)	5(49.0)	6(66.7)	5.4(91.8)	11.8(39.8)	30.3(40.9)	63.5

***Appendix Table B-2** . Total macroinvertbrate taxa collected in the Upper Des Plaines mainstem in 2022.*

Taxa Code	Taxa Name	Collection Frequency	Percent	Abundance	Ohio EPA Tolerance	Illinois Tolerance	Illinois Funct. Feeding Group	Taxa Group
03600	*Oligochaeta*	17	8.50	427	T	10	CG	
16700	*Tricorythodes sp*	11	7.48	376	MI	5	CG	MA
06800	*Gammarus sp*	10	6.97	350	F	3		
22001	*Coenagrionidae*	15	5.79	291	T	5.5	PR	
85625	*Rheotanytarsus sp*	12	4.04	203	F	6	CF	
84470	*Polypedilum (P.) illinoense*	16	3.76	189	T	6	SH	
53800	*Hydroptila sp*	13	3.60	181	F	2	SC	CA
06810	*Gammarus fasciatus*	6	3.44	173	F	3	CG	
06201	*Hyalella azteca*	12	3.32	167	F	4	CG	
83300	*Glyptotendipes (G.) sp*	6	3.24	163	MT	10	CF	
52200	*Cheumatopsyche sp*	12	2.89	145	F	6	CF	CA
11130	*Baetis intercalaris*	10	2.79	140	F	4	CG	MA
69400	*Stenelmis sp*	14	2.69	135	F	7	SC	CO
17200	*Caenis sp*	7	2.43	122	F	6	CG	MA
85265	*Cladotanytarsus vanderwulpi group sp 5*	9	2.37	119	MI	7	CG	
68700	*Dubiraphia sp*	14	2.17	109	F	5	CG	CO
83158	*Endochironomus nigricans*	8	2.13	107	MT	6	SH	
01801	*Turbellaria*	16	1.99	100	F	6	PR	
93200	*Hydrobiidae*	11	1.59	80	F	6	SC	
84450	*Polypedilum (Uresipedilum) flavum*	13	1.49	75	F	6	SH	
68708	*Dubiraphia vittata group*	5	1.39	70	F	5	CG	CO
83040	*Dicrotendipes neomodestus*	14	1.33	67	F	6	CG	
84540	*Polypedilum (Tripodura) scalaenum group*	9	1.33	67	F	6	SH	
78655	*Procladius (Holotanypus) sp*	13	1.31	66	MT	8	PR	
85800	*Tanytarsus sp*	15	1.31	66	F	7	CF	
98001	*Pisidiidae*	10	1.19	60		5		
95100	*Physella sp*	9	1.05	53	T	9	SC	
85500	*Paratanytarsus sp*	12	0.96	48	F	6	CG	
78600	*Pentaneura inconspicua*	10	0.84	42	F	3	PR	
85821	*Tanytarsus glabrescens group sp 7*	7	0.80	40	F	7	CF	
53501	*Hydroptilidae*	4	0.74	37	F	3.5	PH	CA
77750	*Hayesomyia senata or Thienemannimyia norena*	11	0.74	37	F	5		
84520	*Polypedilum (Tripodura) halterale group*	9	0.64	32	MT	6	SH	
11200	*Callibaetis sp*	4	0.56	28	MT	4	CG	MA
06501	*Gammaridae*	4	0.52	26		4	CG	
78680	*Procladius (Psilotanypus) bellus*	3	0.52	26	MT	8	PR	
80420	*Cricotopus (C.) bicinctus*	8	0.52	26	T	8	SH	
97601	*Corbicula fluminea*	9	0.52	26	F	4	CF	
98200	*Pisidium sp*	6	0.50	25	MT	5	CF	
11120	*Baetis flavistriga*	4	0.48	24	F	4	CG	MA
82820	*Cryptochironomus sp*	9	0.44	22	F	8	PR	
82800	*Cladopelma sp*	3	0.42	21	T	6	CG	
13400	*Stenacron sp*	6	0.36	18	F	4	SC	MA
11620	*Paracloeodes minutus*	4	0.34	17	MI	5		MA
79000	*Tanypus sp*	2	0.32	16	T	8	PR	
05800	*Caecidotea sp*	6	0.30	15	T	6	CG	
82880	*Cryptotendipes sp*	5	0.30	15	F	6	CG	
11001	*Baetidae*	7	0.28	14		4	CG	MA
68901	*Macronychus glabratus*	6	0.28	14	F	2		CO
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 198*	4	0.28	14	MI	6	CF	

***Appendix Table B-2** . continued.*

Taxa Code	Taxa Name	Collection Frequency	Percent	Abundance	Ohio EPA Tolerance	Illinois Tolerance	Illinois Funct. Feeding Group	Taxa Group
77130	*Ablabesmyia rhamphe group*	5	0.26	13	MT	6	CG	
77140	*Ablabesmyia peleensis*	5	0.26	13		6		
82882	*Cryptotendipes sp 2*	1	0.26	13	MT	6	CG	
93900	*Elimia sp*	2	0.26	13	MI	6	SC	
80510	*Cricotopus (Isocladius) sylvestris group*	6	0.24	12	T	8	SH	
98600	*Sphaerium sp*	6	0.24	12	F	5	CG	
58505	*Helicopsyche borealis*	4	0.22	11	MI	2	SC	CA
59500	*Oecetis sp*	8	0.22	11	F	5	PR	CA
82822	*Cryptochironomus eminentia*	5	0.20	10	F	0		
83700	*Microchironomus sp*	3	0.20	10	MT	6	CG	
59550	*Oecetis inconspicua complex sp A (sensu Floyd, 1995)*	5	0.18	9	F	5	PR	CA
77355	*Clinotanypus pinguis*	3	0.18	9	MT	6	PR	
82885	*Cryptotendipes pseudotener*	5	0.18	9	F	6	CG	
52570	*Hydropsyche simulans*	3	0.16	8	MI	5	CF	CA
77120	*Ablabesmyia mallochi*	6	0.16	8	F	6	CG	
85230	*Cladotanytarsus mancus group*	4	0.16	8	F	7	CG	
83051	*Dicrotendipes simpsoni*	2	0.14	7	T	6	CG	
84700	*Stenochironomus sp*	5	0.14	7	F	3	SH	
80001	*Orthocladiinae*	5	0.12	6		6	CG	
83000	*Dicrotendipes sp*	4	0.12	6	F	6	CG	
85840	*Tanytarsus sepp*	4	0.12	6	F	7	CF	
95501	*Planorbidae*	4	0.12	6	MT	6.5	SC	
12501	*Heptageniidae*	4	0.10	5		3.5	SC	MA
13550	*Maccaffertium mexicanum integrum*	1	0.10	5	MI	0		
13570	*Maccaffertium terminatum*	4	0.10	5	MI	4	SC	MA
82710	*Chironomus (C.) sp*	3	0.10	5	MT	11	CG	
83400	*Harnischia sp*	2	0.10	5	F	6	CG	
84800	*Tribelos jucundum*	5	0.10	5	MT	5	CG	
08250	*Orconectes (Procericambarus) rusticus*	2	0.08	4	F	5	CG	
59407	*Nectopsyche candida*	3	0.08	4	MI	3	SH	CA
78130	*Labrundinia neopilosella*	2	0.08	4		4	PR	
22300	*Argia sp*	2	0.06	3	F	5	PR	
28500	*Libellula sp*	2	0.06	3	MT	8	PR	
59580	*Oecetis persimilis*	1	0.06	3	MI	5	PR	CA
68601	*Ancyronyx variegata*	2	0.06	3	F	2	CG	CO
83050	*Dicrotendipes lucifer*	2	0.06	3	MT	6	CG	
84300	*Phaenopsectra obediens group*	1	0.06	3	F	4	SC	
84315	*Phaenopsectra flavipes*	3	0.06	3	MT	4	SC	
84612	*Saetheria tylus*	3	0.06	3	F	4		
04660	*Helobdella sp*	2	0.04	2	MT	8	PA	
04664	*Helobdella stagnalis*	2	0.04	2	T	8	PR	
15501	*Ephemerellidae*	2	0.04	2	MI	3.5	CG	
18700	*Hexagenia sp*	2	0.04	2	F	6	CG	MA
23600	*Aeshna sp*	2	0.04	2	MT	4	PR	
27001	*Corduliidae*	2	0.04	2		4.5	PR	
59570	*Oecetis nocturna*	1	0.04	2	F	5	PR	CA
74100	*Simulium sp*	2	0.04	2	F	6	CF	
77001	*Tanypodinae*	2	0.04	2		6	PR	
77470	*Coelotanypus sp*	2	0.04	2	T	4	PR	
81825	*Rheocricotopus (Psilocricotopus) robacki*	2	0.04	2	F	6	CG	

***Appendix Table B-2** . continued.*

Taxa Code	Taxa Name	Collection Frequency	Percent	Abundance	Ohio EPA Tolerance	Illinois Tolerance	Illinois Funct. Feeding Group	Taxa Group
82141	*Thienemanniella xena*	2	0.04	2	F	2	CG	
84000	*Parachironomus sp*	1	0.04	2	MT	8	PR	
84155	*Paralauterborniella nigrohalteralis*	2	0.04	2	F	6	CG	
84210	*Paratendipes albimanus or P. duplicatus*	2	0.04	2	F	3	CG	
84230	*Paratendipes subaequalis*	1	0.04	2	F	0		
85001	*Tanytarsini*	1	0.04	2		6	CF	
85921	*Zavrelia aristata*	2	0.04	2	MI	0		
96801	*Ancylidae*	2	0.04	2	F	7	SC	
04601	*Glossiphoniidae*	1	0.02	1	MT	8	PR	
04964	*Erpobdella microstoma*	1	0.02	1	MT	8	PR	
06700	*Crangonyx sp*	1	0.02	1	MT	4	CG	
08200	*Orconectes sp*	1	0.02	1	F	5	CG	
11590	*Paracloeodes sp*	1	0.02	1	MI	4	SC	MA
11670	*Procloeon viridoculare*	1	0.02	1	MI	4		MA
21001	*Calopterygidae*	1	0.02	1	F	3.5	PR	
47600	*Sialis sp*	1	0.02	1	MT	4	PR	
48200	*Chauliodes sp*	1	0.02	1	MT	4	PR	
59400	*Nectopsyche sp*	1	0.02	1	MI	3	SH	CA
59415	*Nectopsyche exquisita*	1	0.02	1	MI	3		CA
71910	*Tipula abdominalis*	1	0.02	1	F	0		
72501	*Culicidae*	1	0.02	1	MT	8	CG	
72700	*Anopheles sp*	1	0.02	1	F	6	CF	
78200	*Larsia sp*	1	0.02	1	MT	6	PR	
79020	*Tanypus neopunctipennis*	1	0.02	1	T	8	PR	
79040	*Tanypus stellatus*	1	0.02	1	MT	8		
80400	*Cricotopus sp*	1	0.02	1	F	8	SH	
81200	*Nanocladius sp*	1	0.02	1	F	3	CG	
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	1	0.02	1	F	3	CG	
82100	*Thienemanniella sp*	1	0.02	1		2	CG	
82121	*Thienemanniella lobapodema*	1	0.02	1	F	2	CG	
84400	*Polypedilum sp*	1	0.02	1		6	SH	
84750	*Stictochironomus sp*	1	0.02	1	F	5		
85201	*Cladotanytarsus species group A*	1	0.02	1	F	7	CG	
85261	*Cladotanytarsus vanderwulpi*	1	0.02	1	MI	7	CG	
85814	*Tanytarsus glabrescens group*	1	0.02	1	F	7		
86501	*Stratiomyidae*	1	0.02	1		10	CG	
89501	*Ephydridae*	1	0.02	1	F	8	CG	
94400	*Fossaria sp*	1	0.02	1	MT	7	SC	

Appendix Table B-3 *. Total macroinvertebrat taxa collected in Mill Creek and North Mill Creek in 2022.*

Taxa Name	Ohio EPA Tolerance	Illinois Tolerance	Feeding Group	Taxa Group	Numbers	Percent	Collection Frequency
Cheumatopsyche sp	F	6	CF	CA	131	13.52	2
Gammarus sp	F	3	N		63	6.50	1
Caecidotea sp	T	6	CG		58	5.99	3
Oligochaeta	T	10	CG		57	5.88	3
Hydropsyche sp	F	5	CF	CA	51	5.26	1
Polypedilum (Uresipedilum) flavum	F	6	SH		46	4.75	2
Physella sp	T	9	SC		46	4.75	3
Sphaerium sp	F	5	CG		46	4.75	2
Dubiraphia sp	F	5	CG	CO	39	4.02	3
Coenagrionidae	T	5.5	PR		32	3.30	3
Pisidium sp	MT	5	CF		31	3.20	1
Turbellaria	F	6	PR		24	2.48	3
Stenelmis sp	F	7	SC	CO	21	2.17	2
Hydrobiidae	F	6	SC		19	1.96	2
Baetis flavistriga	F	4	CG	MA	17	1.75	1
Macronychus glabratus	F	2		CO	14	1.44	1
Hayesomyia senata or Thienemannimyia noren	F	5			14	1.44	3
Dicrotendipes neomodestus	F	6	CG		14	1.44	1
Hyalella azteca	F	4	CG		13	1.34	2
Baetis intercalaris	F	4	CG	MA	11	1.14	2
Polypedilum (P.) illinoense	T	6	SH		11	1.14	3
Stenacron sp	F	4	SC	MA	10	1.03	1
Tricorythodes sp	MI	5	CG	MA	9	0.93	1
Dubiraphia vittata group	F	5	CG	CO	9	0.93	1
Microtendipes "caelum" (sensu Simpson & Bode	MI	6	CF		9	0.93	1
Paratanytarsus sp	F	6	CG		9	0.93	2
Lirceus sp	MT	4	CG		8	0.83	1
Cryptotendipes pseudotener	F	6	CG		8	0.83	2
Helobdella stagnalis	T	8	PR		7	0.72	1
Gammarus fasciatus	F	3	CG		7	0.72	1
Procladius (Holotanypus) sp	MT	8	PR		7	0.72	2
Rheotanytarsus sp	F	6	CF		7	0.72	2
Tanytarsus sp	F	7	CF		7	0.72	2
Clinotanypus pinguis	MT	6	PR		6	0.62	1
Heptageniidae		3.5	SC	MA	5	0.52	2
Caenis sp	F	6	CG	MA	5	0.52	2
Hydropsychidae		5.5	CF	CA	5	0.52	1
Oecetis sp	F	5	PR	CA	5	0.52	2
Polypedilum (Tripodura) scalaenum group	F	6	SH		5	0.52	2
Pisidiidae		5			5	0.52	1
Hydropsyche depravata group	F	5	CF	CA	4	0.41	2
Hydroptila sp	F	2	SC	CA	4	0.41	1
Conchapelopia sp	F	6	PR		4	0.41	2
Glyptotendipes (G.) sp	MT	10	CF		4	0.41	1
Paralauterborniella nigrohalteralis	F	6	CG		4	0.41	1
Stagnicola sp	T	7	SC		4	0.41	1
Ceratopsyche morosa group	MI	4		CA	3	0.31	1
Chironomus (C.) decorus group	T	11			3	0.31	1
Cryptochironomus sp	F	8	PR		3	0.31	2

***Appendix Table B-3**. continued.*

Taxa Name	Ohio EPA Tolerance	Illinois Tolerance	Feeding Group	Taxa Group	Numbers	Percent	Collection Frequency
Stenochironomus sp	F	3	SH		3	0.31	1
Gyraulus sp	MT	6	SC		3	0.31	1
Baetidae		4	CG	MA	2	0.21	1
Hydroptilidae	F	3.5	PH	CA	2	0.21	1
Ablabesmyia mallochi	F	6	CG		2	0.21	2
Ablabesmyia rhamphe group	MT	6	CG		2	0.21	2
Chironomini		6	CG		2	0.21	1
Phaenopsectra obediens group	F	4	SC		2	0.21	1
Cladotanytarsus mancus group	F	7	CG		2	0.21	1
Tanytarsus glabrescens group sp 7	F	7	CF		2	0.21	1
Orconectes sp	F	5	CG		1	0.10	1
Aeshnidae		4.5	PR		1	0.10	1
Libellula sp	MT	8	PR		1	0.10	1
Chauliodes rastricornis	T	4	PR		1	0.10	1
Simulium sp	F	6	CF		1	0.10	1
Ceratopogonidae	T	5	PR		1	0.10	1
Ablabesmyia peleensis		6			1	0.10	1
Nilotanypus fimbriatus	F	6	PR		1	0.10	1
Pentaneura inconspicua	F	3	PR		1	0.10	1
Cricotopus (C.) bicinctus	T	8	SH		1	0.10	1
Nanocladius (N.) crassicornus or N. (N.) "rectine	F	3	CG		1	0.10	1
Nanocladius (N.) distinctus	MT	3	CG		1	0.10	1
Parametriocnemus sp	F	4	CG		1	0.10	1
Thienemanniella xena	F	2	CG		1	0.10	1
Cladopelma sp	T	6	CG		1	0.10	1
Cryptotendipes sp	F	6	CG		1	0.10	1
Endochironomus nigricans	MT	6	SH		1	0.10	1
Parachironomus frequens	F	8	PR		1	0.10	1
Paratendipes albimanus or P. duplicatus	F	3	CG		1	0.10	1
Cladotanytarsus vanderwulpi group sp 5	MI	7	CG		1	0.10	1
Tanytarsus sepp	F	7	CF		1	0.10	1
Hemerodromia sp	F	6	PR		1	0.10	1
Planorbella (Pierosoma) pilsbryi	T	6.5	SC		1	0.10	1

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: Dst. Russell Rd.

Site ID: **13-6**

Subsample:

RM: 109.30

Collection Date: 07/18/2022 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	10
03600	Oligochaeta		10.0	102
04664	Helobdella stagnalis		8.0	1
06201	Hyalella azteca		4.0	52
06501	Gammaridae		4.0	3
06800	Gammarus sp		3.0	6
11200	Callibaetis sp	MA	4.0	10
15501	Ephemerellidae		3.5	1
17200	Caenis sp	MA	6.0	10
18700	Hexagenia sp	MA	6.0	1
22001	Coenagrionidae		5.5	16
22300	Argia sp		5.0	2
53501	Hydroptilidae	CA	3.5	10
59580	Oecetis persimilis	CA	5.0	3
68700	Dubiraphia sp	CO	5.0	4
69400	Stenelmis sp	CO	7.0	2
77140	Ablabesmyia peleensis		6.0	2
78200	Larsia sp		6.0	1
78600	Pentaneura inconspicua		3.0	1
78655	Procladius (Holotanypus) sp		8.0	6
79000	Tanypus sp		8.0	1
80510	Cricotopus (Isocladius) sylvestris group		8.0	1
82882	Cryptotendipes sp 2		6.0	13
83040	Dicrotendipes neomodestus		6.0	2
83158	Endochironomus nigricans		6.0	5
84470	Polypedilum (P.) illinoense		6.0	1
84520	Polypedilum (Tripodura) halterale group		6.0	3
85001	Tanytarsini		6.0	2
85500	Paratanytarsus sp		6.0	1
85800	Tanytarsus sp		7.0	5
85921	Zavrelia aristata		0.0	1
93900	Elimia sp		6.0	8
94400	Fossaria sp		7.0	1
98600	Sphaerium sp		5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa: 34 Total Taxa: 34

Number of Organisms: 288 mIBI: 37.05

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site ID: **13-5**

Site: dst. IL-173

Subsample: RM: 106.60

Collection Date:07/18/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	3
03600	Oligochaeta		10.0	45
06501	Gammaridae		4.0	1
06800	Gammarus sp		3.0	1
11200	Callibaetis sp	MA	4.0	15
17200	Caenis sp	MA	6.0	12
18700	Hexagenia sp	MA	6.0	1
22001	Coenagrionidae		5.5	29
23600	Aeshna sp		4.0	1
53800	Hydroptila sp	CA	2.0	15
59570	Oecetis nocturna	CA	5.0	2
68700	Dubiraphia sp	CO	5.0	3
72700	Anopheles sp		6.0	1
77120	Ablabesmyia mallochi		6.0	2
77140	Ablabesmyia peleensis		6.0	8
77355	Clinotanypus pinguis		6.0	1
77470	Coelotanypus sp		4.0	1
78130	Labrundinia neopilosella		4.0	1
78655	Procladius (Holotanypus) sp		8.0	12
78680	Procladius (Psilotanypus) bellus		8.0	16
79000	Tanypus sp		8.0	15
79040	Tanypus stellatus		8.0	1
80510	Cricotopus (Isocladius) sylvestris group		8.0	2
82800	Cladopelma sp		6.0	7
82820	Cryptochironomus sp		8.0	2
82880	Cryptotendipes sp		6.0	6
83000	Dicrotendipes sp		6.0	2
83158	Endochironomus nigricans		6.0	27
83300	Glyptotendipes (G.) sp		10.0	5
83700	Microchironomus sp		6.0	6
84230	Paratendipes subaequalis		0.0	2
84450	Polypedilum (Uresipedilum) flavum		6.0	1
84470	Polypedilum (P.) illinoense		6.0	4
84520	Polypedilum (Tripodura) halterale group		6.0	1
84750	Stictochironomus sp		5.0	1
85500	Paratanytarsus sp		6.0	8
85800	Tanytarsus sp		7.0	3
95100	Physella sp		9.0	2

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa: 38 Total Taxa: 38

Number of Organisms: 265 mIBI: 37.20

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. Wadsworth Rd.

Site ID: **13-4**

Subsample:

RM: 102.90

Collection Date:07/18/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	2
03600	Oligochaeta		10.0	43
04601	Glossiphoniidae		8.0	1
05800	Caecidotea sp		6.0	4
06201	Hyalella azteca		4.0	45
11001	Baetidae	MA	4.0	3
12501	Heptageniidae	MA	3.5	1
15501	Ephemerellidae		3.5	1
17200	Caenis sp	MA	6.0	20
22001	Coenagrionidae		5.5	28
23600	Aeshna sp		4.0	1
27001	Corduliidae		4.5	1
47600	Sialis sp		4.0	1
48200	Chauliodes sp		4.0	1
53501	Hydroptilidae	CA	3.5	8
59500	Oecetis sp	CA	5.0	1
68700	Dubiraphia sp	CO	5.0	1
72501	Culicidae		8.0	1
77130	Ablabesmyia rhamphe group		6.0	6
77355	Clinotanypus pinguis		6.0	7
77470	Coelotanypus sp		4.0	1
78130	Labrundinia neopilosella		4.0	3
78680	Procladius (Psilotanypus) bellus		8.0	9
82800	Cladopelma sp		6.0	9
82820	Cryptochironomus sp		8.0	3
82880	Cryptotendipes sp		6.0	3
83040	Dicrotendipes neomodestus		6.0	1
83051	Dicrotendipes simpsoni		6.0	1
83158	Endochironomus nigricans		6.0	32
83300	Glyptotendipes (G.) sp		10.0	2
83700	Microchironomus sp		6.0	3
84000	Parachironomus sp		8.0	2
84800	Tribelos jucundum		5.0	1
85800	Tanytarsus sp		7.0	13
85921	Zavrelia aristata		0.0	1
95100	Physella sp		9.0	3
95501	Planorbidae		6.5	2
98200	Pisidium sp		5.0	3

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa: 38 Total Taxa: 38

Number of Organisms: 268 mIBI: 32.67

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site ID: **13-18**

Site: dst. WR1 Riffle

Subsample: RM: 99.72

Collection Date:07/18/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant	Taxa Code	Taxa	Feed Grp	Tol.	Quant
01801	Turbellaria		6.0	6					
03600	Oligochaeta		10.0	51					
05800	Caecidotea sp		6.0	2					
06201	Hyalella azteca		4.0	13					
06700	Crangonyx sp		4.0	1					
06810	Gammarus fasciatus		3.0	2					
17200	Caenis sp	MA	6.0	67					
22001	Coenagrionidae		5.5	11					
53800	Hydroptila sp	CA	2.0	14					
59500	Oecetis sp	CA	5.0	1					
68700	Dubiraphia sp	CO	5.0	2					
68708	Dubiraphia vittata group	CO	5.0	1					
77130	Ablabesmyia rhamphe group		6.0	2					
77140	Ablabesmyia peleensis		6.0	1					
78655	Procladius (Holotanypus) sp		8.0	1					
80001	Orthocladiinae		6.0	1					
80510	Cricotopus (Isocladius) sylvestris group		8.0	1					
82820	Cryptochironomus sp		8.0	1					
82880	Cryptotendipes sp		6.0	2					
83158	Endochironomus nigricans		6.0	29					
83300	Glyptotendipes (G.) sp		10.0	72					
84155	Paralauterborniella nigrohalteralis		6.0	1					
84315	Phaenopsectra flavipes		4.0	1					
84470	Polypedilum (P.) illinoense		6.0	7					
84520	Polypedilum (Tripodura) halterale group		6.0	4					
84540	Polypedilum (Tripodura) scalaenum group		6.0	3					
85500	Paratanytarsus sp		6.0	3					
85800	Tanytarsus sp		7.0	1					
98200	Pisidium sp		5.0	1					

No. Quantitative Taxa: 29 Total Taxa: 29

Number of Organisms: 302 mIBI: 31.45

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: ust. WR1 Riffle

Site ID: **13-19**

Subsample:

RM: 99.30

Collection Date:07/18/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	10
03600	Oligochaeta		10.0	58
05800	Caecidotea sp		6.0	5
06201	Hyalella azteca		4.0	3
06501	Gammaridae		4.0	4
06810	Gammarus fasciatus		3.0	3
17200	Caenis sp	MA	6.0	10
53800	Hydroptila sp	CA	2.0	1
59500	Oecetis sp	CA	5.0	3
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1
68700	Dubiraphia sp	CO	5.0	13
68708	Dubiraphia vittata group	CO	5.0	2
69400	Stenelmis sp	CO	7.0	3
77130	Ablabesmyia rhamphe group		6.0	1
77355	Clinotanypus pinguis		6.0	1
78655	Procladius (Holotanypus) sp		8.0	13
79020	Tanypus neopunctipennis		8.0	1
80001	Orthocladiinae		6.0	1
82710	Chironomus (C.) sp		11.0	3
82800	Cladopelma sp		6.0	5
82820	Cryptochironomus sp		8.0	6
82885	Cryptotendipes pseudotener		6.0	2
83040	Dicrotendipes neomodestus		6.0	3
83050	Dicrotendipes lucifer		6.0	1
83051	Dicrotendipes simpsoni		6.0	6
83158	Endochironomus nigricans		6.0	3
83300	Glyptotendipes (G.) sp		10.0	70
83400	Harnischia sp		6.0	3
83700	Microchironomus sp		6.0	1
84210	Paratendipes albimanus or P. duplicatus		3.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	2
84470	Polypedilum (P.) illinoense		6.0	5
84540	Polypedilum (Tripodura) scalaenum group		6.0	8
84700	Stenochironomus sp		3.0	1
84800	Tribelos jucundum		5.0	1
85230	Cladotanytarsus mancus group		7.0	1
85800	Tanytarsus sp		7.0	6
89501	Ephydridae		8.0	1
93200	Hydrobiidae		6.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Quant
98001	Pisidiidae		5.0	1

No. Quantitative Taxa: 40 Total Taxa: 40

Number of Organisms: 264 mIBI: 33.07

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: ust. US-41

Site ID: **13-3**

Subsample:

RM: 98.70

Collection Date: 07/19/2022 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant	Taxa Code	Taxa	Feed Grp	Tol.	Quant
01801	Turbellaria		6.0	2					
03600	Oligochaeta		10.0	19					
05800	Caecidotea sp		6.0	1					
06201	Hyalella azteca		4.0	12					
06800	Gammarus sp		3.0	47					
11001	Baetidae	MA	4.0	1					
12501	Heptageniidae	MA	3.5	1					
13400	Stenacron sp	MA	4.0	1					
22001	Coenagrionidae		5.5	19					
52200	Cheumatopsyche sp	CA	6.0	8					
53501	Hydroptilidae	CA	3.5	11					
59500	Oecetis sp	CA	5.0	1					
68700	Dubiraphia sp	CO	5.0	29					
69400	Stenelmis sp	CO	7.0	18					
78655	Procladius (Holotanypus) sp		8.0	3					
78680	Procladius (Psilotanypus) bellus		8.0	1					
80420	Cricotopus (C.) bicinctus		8.0	5					
80510	Cricotopus (Isocladius) sylvestris group		8.0	2					
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"		3.0	1					
82820	Cryptochironomus sp		8.0	1					
82885	Cryptotendipes pseudotener		6.0	2					
83000	Dicrotendipes sp		6.0	1					
83158	Endochironomus nigricans		6.0	9					
83300	Glyptotendipes (G.) sp		10.0	9					
84470	Polypedilum (P.) illinoense		6.0	14					
84540	Polypedilum (Tripodura) scalaenum group		6.0	10					
85230	Cladotanytarsus mancus group		7.0	1					
85625	Rheotanytarsus sp		6.0	5					
85800	Tanytarsus sp		7.0	3					
85821	Tanytarsus glabrescens group sp 7		7.0	1					
93200	Hydrobiidae		6.0	6					
95100	Physella sp		9.0	2					
95501	Planorbidae		6.5	1					
98001	Pisidiidae		5.0	6					

No. Quantitative Taxa: 34 Total Taxa: 34

Number of Organisms: 253 mIBI: 42.07

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. McClare Ave.
Site ID: **13-2**
Subsample:
RM: 96.82

Collection Date:07/19/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant	Taxa Code	Taxa	Feed Grp	Tol.	Quant
03600	Oligochaeta		10.0	25					
05800	Caecidotea sp		6.0	1					
06800	Gammarus sp		3.0	72					
08250	Orconectes (Procericambarus) rusticus		5.0	3					
11130	Baetis intercalaris	MA	4.0	1					
13400	Stenacron sp	MA	4.0	5					
16700	Tricorythodes sp	MA	5.0	1					
52200	Cheumatopsyche sp	CA	6.0	16					
53800	Hydroptila sp	CA	2.0	8					
68700	Dubiraphia sp	CO	5.0	17					
69400	Stenelmis sp	CO	7.0	27					
77120	Ablabesmyia mallochi		6.0	2					
77130	Ablabesmyia rhamphe group		6.0	3					
77750	Hayesomyia senata or Thienemannimyia norena		5.0	2					
78655	Procladius (Holotanypus) sp		8.0	1					
80420	Cricotopus (C.) bicinctus		8.0	1					
82820	Cryptochironomus sp		8.0	6					
82822	Cryptochironomus eminentia		0.0	1					
82880	Cryptotendipes sp		6.0	2					
83040	Dicrotendipes neomodestus		6.0	7					
83158	Endochironomus nigricans		6.0	1					
83300	Glyptotendipes (G.) sp		10.0	5					
83400	Harnischia sp		6.0	2					
84450	Polypedilum (Uresipedilum) flavum		6.0	4					
84470	Polypedilum (P.) illinoense		6.0	4					
84540	Polypedilum (Tripodura) scalaenum group		6.0	35					
84700	Stenochironomus sp		3.0	1					
84800	Tribelos jucundum		5.0	1					
85201	Cladotanytarsus species group A		7.0	1					
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	8					
85625	Rheotanytarsus sp		6.0	2					
85800	Tanytarsus sp		7.0	15					
85840	Tanytarsus sepp		7.0	1					
93200	Hydrobiidae		6.0	6					
97601	Corbicula fluminea		4.0	10					
98001	Pisidiidae		5.0	6					

No. Quantitative Taxa: 36 Total Taxa: 36
Number of Organisms: 303 mIBI: 46.19

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. Belvidere Rd.

Site ID: **13-1**

Subsample:

RM: 94.20

Collection Date:07/19/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	10
03600	Oligochaeta		10.0	7
06201	Hyalella azteca		4.0	4
06810	Gammarus fasciatus		3.0	33
11001	Baetidae	MA	4.0	2
11130	Baetis intercalaris	MA	4.0	2
13400	Stenacron sp	MA	4.0	5
16700	Tricorythodes sp	MA	5.0	15
22001	Coenagrionidae		5.5	9
52200	Cheumatopsyche sp	CA	6.0	17
53800	Hydroptila sp	CA	2.0	17
58505	Helicopsyche borealis	CA	2.0	1
68700	Dubiraphia sp	CO	5.0	3
68708	Dubiraphia vittata group	CO	5.0	64
69400	Stenelmis sp	CO	7.0	19
71910	Tipula abdominalis		0.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	4
78600	Pentaneura inconspicua		3.0	3
78655	Procladius (Holotanypus) sp		8.0	6
80001	Orthocladiinae		6.0	1
82710	Chironomus (C.) sp		11.0	1
82820	Cryptochironomus sp		8.0	1
82885	Cryptotendipes pseudotener		6.0	1
83040	Dicrotendipes neomodestus		6.0	5
83158	Endochironomus nigricans		6.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	4
84470	Polypedilum (P.) illinoense		6.0	13
84540	Polypedilum (Tripodura) scalaenum group		6.0	1
85500	Paratanytarsus sp		6.0	4
85625	Rheotanytarsus sp		6.0	20
85800	Tanytarsus sp		7.0	1
86501	Stratiomyidae		10.0	1
93200	Hydrobiidae		6.0	16
95100	Physella sp		9.0	1
95501	Planorbidae		6.5	2
97601	Corbicula fluminea		4.0	4
98200	Pisidium sp		5.0	7
98600	Sphaerium sp		5.0	6

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa: 38 Total Taxa: 38

Number of Organisms: 312 mIBI: 54.91

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. Buckley Rd.

Site ID: **13-16**

Subsample: RM: 90.60

Collection Date:07/19/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant	Taxa Code	Taxa	Feed Grp	Tol.	Quant
01801	Turbellaria		6.0	4					
03600	Oligochaeta		10.0	3					
04664	Helobdella stagnalis		8.0	1					
06201	Hyalella azteca		4.0	6					
06810	Gammarus fasciatus		3.0	65					
11001	Baetidae	MA	4.0	2					
11130	Baetis intercalaris	MA	4.0	33					
13400	Stenacron sp	MA	4.0	1					
13570	Maccaffertium terminatum	MA	4.0	1					
16700	Tricorythodes sp	MA	5.0	20					
17200	Caenis sp	MA	6.0	1					
22001	Coenagrionidae		5.5	4					
52200	Cheumatopsyche sp	CA	6.0	26					
53800	Hydroptila sp	CA	2.0	18					
58505	Helicopsyche borealis	CA	2.0	1					
68601	Ancyronyx variegata	CO	2.0	1					
68708	Dubiraphia vittata group	CO	5.0	1					
69400	Stenelmis sp	CO	7.0	2					
74100	Simulium sp		6.0	1					
77750	Hayesomyia senata or Thienemannimyia norena		5.0	3					
78600	Pentaneura inconspicua		3.0	8					
80400	Cricotopus sp		8.0	1					
80420	Cricotopus (C.) bicinctus		8.0	1					
83040	Dicrotendipes neomodestus		6.0	5					
84450	Polypedilum (Uresipedilum) flavum		6.0	1					
84470	Polypedilum (P.) illinoense		6.0	18					
85500	Paratanytarsus sp		6.0	6					
85625	Rheotanytarsus sp		6.0	61					
85800	Tanytarsus sp		7.0	3					
93200	Hydrobiidae		6.0	13					
98200	Pisidium sp		5.0	1					
98600	Sphaerium sp		5.0	1					

No. Quantitative Taxa: 32 Total Taxa: 32

Number of Organisms: 313 mIBI: 60.10

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. Rockland Rd.

Site ID: **16-6**

Subsample:

RM: 87.10

Collection Date:07/19/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	2
03600	Oligochaeta		10.0	6
06201	Hyalella azteca		4.0	5
06800	Gammarus sp		3.0	30
08200	Orconectes sp		5.0	1
11130	Baetis intercalaris	MA	4.0	10
12501	Heptageniidae	MA	3.5	2
13400	Stenacron sp	MA	4.0	1
16700	Tricorythodes sp	MA	5.0	41
22001	Coenagrionidae		5.5	40
28500	Libellula sp		8.0	2
52200	Cheumatopsyche sp	CA	6.0	2
52570	Hydropsyche simulans	CA	5.0	1
53800	Hydroptila sp	CA	2.0	51
59415	Nectopsyche exquisita	CA	3.0	1
59500	Oecetis sp	CA	5.0	1
68700	Dubiraphia sp	CO	5.0	4
68901	Macronychus glabratus	CO	2.0	2
69400	Stenelmis sp	CO	7.0	2
77120	Ablabesmyia mallochi		6.0	1
77130	Ablabesmyia rhamphe group		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	3
78600	Pentaneura inconspicua		3.0	8
78655	Procladius (Holotanypus) sp		8.0	5
80420	Cricotopus (C.) bicinctus		8.0	1
81200	Nanocladius sp		3.0	1
82121	Thienemanniella lobapodema		2.0	1
82141	Thienemanniella xena		2.0	1
82822	Cryptochironomus eminentia		0.0	1
82880	Cryptotendipes sp		6.0	2
83040	Dicrotendipes neomodestus		6.0	6
84450	Polypedilum (Uresipedilum) flavum		6.0	4
84470	Polypedilum (P.) illinoense		6.0	25
84700	Stenochironomus sp		3.0	2
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	2
85500	Paratanytarsus sp		6.0	7
85625	Rheotanytarsus sp		6.0	15
85800	Tanytarsus sp		7.0	3
85821	Tanytarsus glabrescens group sp 7		7.0	14
95100	Physella sp		9.0	6

Taxa Code	Taxa	Feed Grp	Tol.	Quant
95501	Planorbidae		6.5	1
97601	Corbicula fluminea		4.0	1
98001	Pisidiidae		5.0	5

No. Quantitative Taxa:	43	Total Taxa:	43
Number of Organisms:	320	mIBI:	69.44

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: ust. dam site

Site ID: **16-7**

Subsample:

RM: 84.60

Collection Date:07/19/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	25
03600	Oligochaeta		10.0	9
05800	Caecidotea sp		6.0	2
06201	Hyalella azteca		4.0	1
06810	Gammarus fasciatus		3.0	58
11001	Baetidae	MA	4.0	2
11120	Baetis flavistriga	MA	4.0	7
11130	Baetis intercalaris	MA	4.0	21
11620	Paracloeodes minutus	MA	5.0	1
16700	Tricorythodes sp	MA	5.0	38
22001	Coenagrionidae		5.5	4
27001	Corduliidae		4.5	1
52200	Cheumatopsyche sp	CA	6.0	25
53800	Hydroptila sp	CA	2.0	20
59407	Nectopsyche candida	CA	3.0	2
59500	Oecetis sp	CA	5.0	2
68700	Dubiraphia sp	CO	5.0	1
68901	Macronychus glabratus	CO	2.0	2
69400	Stenelmis sp	CO	7.0	6
77750	Hayesomyia senata or Thienemannimyia norena		5.0	1
78600	Pentaneura inconspicua		3.0	6
78655	Procladius (Holotanypus) sp		8.0	2
80001	Orthocladiinae		6.0	1
81825	Rheocricotopus (Psilocricotopus) robacki		6.0	1
82100	Thienemanniella sp		2.0	1
83040	Dicrotendipes neomodestus		6.0	2
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	4
84450	Polypedilum (Uresipedilum) flavum		6.0	21
84470	Polypedilum (P.) illinoense		6.0	27
84520	Polypedilum (Tripodura) halterale group		6.0	1
84540	Polypedilum (Tripodura) scalaenum group		6.0	3
84800	Tribelos jucundum		5.0	1
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	3
85500	Paratanytarsus sp		6.0	1
85625	Rheotanytarsus sp		6.0	15
85821	Tanytarsus glabrescens group sp 7		7.0	2
85840	Tanytarsus sepp		7.0	2
93200	Hydrobiidae		6.0	8

Taxa Code	Taxa	Feed Grp	Tol.	Quant
96801	Ancylidae		7.0	1
97601	Corbicula fluminea		4.0	2
98001	Pisidiidae		5.0	8
98200	Pisidium sp		5.0	12
98600	Sphaerium sp		5.0	1

No. Quantitative Taxa: 43 Total Taxa: 43

Number of Organisms: 353 mIBI: 60.13

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. E. Townline Rd.

Site ID: **16-5**

Subsample:

RM: 83.60

Collection Date:07/20/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	8
03600	Oligochaeta		10.0	8
06800	Gammarus sp		3.0	20
11120	Baetis flavistriga	MA	4.0	1
11130	Baetis intercalaris	MA	4.0	19
11620	Paracloeodes minutus	MA	5.0	3
16700	Tricorythodes sp	MA	5.0	29
22001	Coenagrionidae		5.5	15
52200	Cheumatopsyche sp	CA	6.0	9
53800	Hydroptila sp	CA	2.0	3
59407	Nectopsyche candida	CA	3.0	1
59500	Oecetis sp	CA	5.0	1
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1
68901	Macronychus glabratus	CO	2.0	3
69400	Stenelmis sp	CO	7.0	3
77001	Tanypodinae		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	5
78600	Pentaneura inconspicua		3.0	2
80001	Orthocladiinae		6.0	2
80420	Cricotopus (C.) bicinctus		8.0	13
80510	Cricotopus (Isocladius) sylvestris group		8.0	2
81825	Rheocricotopus (Psilocricotopus) robacki		6.0	1
82820	Cryptochironomus sp		8.0	1
82822	Cryptochironomus eminentia		0.0	2
83040	Dicrotendipes neomodestus		6.0	11
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	3
84155	Paralauterborniella nigrohalteralis		6.0	1
84210	Paratendipes albimanus or P. duplicatus		3.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	5
84470	Polypedilum (P.) illinoense		6.0	32
84520	Polypedilum (Tripodura) halterale group		6.0	6
84540	Polypedilum (Tripodura) scalaenum group		6.0	2
84612	Saetheria tylus		4.0	1
85230	Cladotanytarsus mancus group		7.0	1
85261	Cladotanytarsus vanderwulpi		7.0	1
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	33
85500	Paratanytarsus sp		6.0	3

Taxa Code	Taxa	Feed Grp	Tol.	Quant
85625	Rheotanytarsus sp		6.0	11
85800	Tanytarsus sp		7.0	1
85821	Tanytarsus glabrescens group sp 7		7.0	8
85840	Tanytarsus sepp		7.0	1
93200	Hydrobiidae		6.0	1
97601	Corbicula fluminea		4.0	1
98001	Pisidiidae		5.0	9

No. Quantitative Taxa: 44 Total Taxa: 44

Number of Organisms: 285 mIBI: 48.15

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: ust. dam

Site ID: **16-8**

Subsample:

RM: 82.90

Collection Date:07/22/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	1
03600	Oligochaeta		10.0	2
06201	Hyalella azteca		4.0	9
06501	Gammaridae		4.0	18
06800	Gammarus sp		3.0	36
08250	Orconectes (Procericambarus) rusticus		5.0	1
11001	Baetidae	MA	4.0	2
11120	Baetis flavistriga	MA	4.0	2
11130	Baetis intercalaris	MA	4.0	16
11620	Paracloeodes minutus	MA	5.0	7
12501	Heptageniidae	MA	3.5	1
16700	Tricorythodes sp	MA	5.0	40
21001	Calopterygidae		3.5	1
22001	Coenagrionidae		5.5	30
52200	Cheumatopsyche sp	CA	6.0	15
53800	Hydroptila sp	CA	2.0	2
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	3
68901	Macronychus glabratus	CO	2.0	1
69400	Stenelmis sp	CO	7.0	4
77001	Tanypodinae		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	8
78600	Pentaneura inconspicua		3.0	5
78655	Procladius (Holotanypus) sp		8.0	2
80420	Cricotopus (C.) bicinctus		8.0	3
80510	Cricotopus (Isocladius) sylvestris group		8.0	4
82141	Thienemanniella xena		2.0	1
82820	Cryptochironomus sp		8.0	1
82822	Cryptochironomus eminentia		0.0	3
83000	Dicrotendipes sp		6.0	2
83040	Dicrotendipes neomodestus		6.0	7
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	6
84315	Phaenopsectra flavipes		4.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	2
84470	Polypedilum (P.) illinoense		6.0	12
84520	Polypedilum (Tripodura) halterale group		6.0	1
84612	Saetheria tylus		4.0	1
84700	Stenochironomus sp		3.0	2
84800	Tribelos jucundum		5.0	1
85230	Cladotanytarsus mancus group		7.0	5

Taxa Code	Taxa	Feed Grp	Tol.	Quant
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	22
85625	Rheotanytarsus sp		6.0	6
85800	Tanytarsus sp		7.0	2
85814	Tanytarsus glabrescens group		7.0	1
85840	Tanytarsus sepp		7.0	2
95100	Physella sp		9.0	5
97601	Corbicula fluminea		4.0	1
98600	Sphaerium sp		5.0	2

No. Quantitative Taxa: 47 Total Taxa: 47

Number of Organisms: 300 mIBI: 55.95

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. Half Day Rd.
Site ID: **16-4**
Subsample:
RM: 80.00

Collection Date 07/20/2022 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	9
03600	Oligochaeta		10.0	11
06800	Gammarus sp		3.0	35
11001	Baetidae	MA	4.0	2
11130	Baetis intercalaris	MA	4.0	21
11590	Paracloeodes sp	MA	4.0	1
13400	Stenacron sp	MA	4.0	5
13550	Maccaffertium mexicanum integrum		0.0	5
13570	Maccaffertium terminatum	MA	4.0	2
16700	Tricorythodes sp	MA	5.0	71
22001	Coenagrionidae		5.5	2
52200	Cheumatopsyche sp	CA	6.0	15
52570	Hydropsyche simulans	CA	5.0	6
53800	Hydroptila sp	CA	2.0	15
59407	Nectopsyche candida	CA	3.0	1
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	3
68700	Dubiraphia sp	CO	5.0	5
68708	Dubiraphia vittata group	CO	5.0	2
68901	Macronychus glabratus	CO	2.0	2
69400	Stenelmis sp	CO	7.0	18
77120	Ablabesmyia mallochi		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	5
78600	Pentaneura inconspicua		3.0	3
82885	Cryptotendipes pseudotener		6.0	1
83040	Dicrotendipes neomodestus		6.0	6
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	9
84470	Polypedilum (P.) illinoense		6.0	12
84520	Polypedilum (Tripodura) halterale group		6.0	1
84540	Polypedilum (Tripodura) scalaenum group		6.0	1
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	1
85500	Paratanytarsus sp		6.0	4
85625	Rheotanytarsus sp		6.0	3
85800	Tanytarsus sp		7.0	2
85821	Tanytarsus glabrescens group sp 7		7.0	5
93200	Hydrobiidae		6.0	2
95100	Physella sp		9.0	1
97601	Corbicula fluminea		4.0	2

Taxa Code	Taxa	Feed Grp	Tol.	Quant
98001	Pisidiidae		5.0	6
98200	Pisidium sp		5.0	1
98600	Sphaerium sp		5.0	1

No. Quantitative Taxa: 41 Total Taxa: 41
Number of Organisms: 299 mIBI: 65.81

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. Deerfield Rd.

Site ID: **16-3**

Subsample: RM: 76.70

Collection Date: 07/20/2022 River Code: 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	3
03600	Oligochaeta		10.0	15
04660	Helobdella sp		8.0	1
06201	Hyalella azteca		4.0	5
06800	Gammarus sp		3.0	74
11200	Callibaetis sp	MA	4.0	2
13570	Maccaffertium terminatum	MA	4.0	1
16700	Tricorythodes sp	MA	5.0	19
22001	Coenagrionidae		5.5	38
28500	Libellula sp		8.0	1
52200	Cheumatopsyche sp	CA	6.0	1
53501	Hydroptilidae	CA	3.5	8
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1
68601	Ancyronyx variegata	CO	2.0	2
68700	Dubiraphia sp	CO	5.0	13
68901	Macronychus glabratus	CO	2.0	4
69400	Stenelmis sp	CO	7.0	4
77120	Ablabesmyia mallochi		6.0	1
77140	Ablabesmyia peleensis		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	2
78655	Procladius (Holotanypus) sp		8.0	11
83000	Dicrotendipes sp		6.0	1
83040	Dicrotendipes neomodestus		6.0	5
83050	Dicrotendipes lucifer		6.0	2
84300	Phaenopsectra obediens group		4.0	3
84315	Phaenopsectra flavipes		4.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	2
84470	Polypedilum (P.) illinoense		6.0	5
84520	Polypedilum (Tripodura) halterale group		6.0	1
84540	Polypedilum (Tripodura) scalaenum group		6.0	4
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	1
85500	Paratanytarsus sp		6.0	4
85625	Rheotanytarsus sp		6.0	9
85800	Tanytarsus sp		7.0	7
85821	Tanytarsus glabrescens group sp 7		7.0	8
93200	Hydrobiidae		6.0	3
95100	Physella sp		9.0	3
98001	Pisidiidae		5.0	6

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa: 38 Total Taxa: 38

Number of Organisms: 272 mIBI: 48.42

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. Lake Cook Rd.

Site ID: **16-2**

Subsample:

RM: 75.40

Collection Date: 07/20/2022 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	3
03600	Oligochaeta		10.0	7
06201	Hyalella azteca		4.0	12
06800	Gammarus sp		3.0	29
11120	Baetis flavistriga	MA	4.0	14
11130	Baetis intercalaris	MA	4.0	13
11200	Callibaetis sp	MA	4.0	1
11670	Procloeon viridoculare	MA	4.0	1
13570	Maccaffertium terminatum	MA	4.0	1
16700	Tricorythodes sp	MA	5.0	25
17200	Caenis sp	MA	6.0	2
22001	Coenagrionidae		5.5	19
22300	Argia sp		5.0	1
52200	Cheumatopsyche sp	CA	6.0	9
52570	Hydropsyche simulans	CA	5.0	1
53800	Hydroptila sp	CA	2.0	13
58505	Helicopsyche borealis	CA	2.0	5
59500	Oecetis sp	CA	5.0	1
68700	Dubiraphia sp	CO	5.0	12
69400	Stenelmis sp	CO	7.0	21
77120	Ablabesmyia mallochi		6.0	1
77140	Ablabesmyia peleensis		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	2
78600	Pentaneura inconspicua		3.0	3
78655	Procladius (Holotanypus) sp		8.0	3
80420	Cricotopus (C.) bicinctus		8.0	1
82885	Cryptotendipes pseudotener		6.0	3
83040	Dicrotendipes neomodestus		6.0	3
84400	Polypedilum sp		6.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	18
84470	Polypedilum (P.) illinoense		6.0	7
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	2
85500	Paratanytarsus sp		6.0	5
85625	Rheotanytarsus sp		6.0	47
85821	Tanytarsus glabrescens group sp 7		7.0	2
93200	Hydrobiidae		6.0	8
93900	Elimia sp		6.0	5
95100	Physella sp		9.0	30
97601	Corbicula fluminea		4.0	1
98001	Pisidiidae		5.0	5

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa: 40 Total Taxa: 40

Number of Organisms: 338 mIBI: 61.25

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site ID: **16-1**

Site: ust. E. Palatine Rd.

Subsample: RM: 71.70

Collection Date:07/21/2022 River Code95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	2
03600	Oligochaeta		10.0	16
04660	Helobdella sp		8.0	1
04964	Erpobdella microstoma		8.0	1
06810	Gammarus fasciatus		3.0	12
11130	Baetis intercalaris	MA	4.0	4
11620	Paracloeodes minutus	MA	5.0	6
16700	Tricorythodes sp	MA	5.0	77
22001	Coenagrionidae		5.5	27
52200	Cheumatopsyche sp	CA	6.0	2
53800	Hydroptila sp	CA	2.0	4
58505	Helicopsyche borealis	CA	2.0	4
59400	Nectopsyche sp	CA	3.0	1
68700	Dubiraphia sp	CO	5.0	2
69400	Stenelmis sp	CO	7.0	6
74100	Simulium sp		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	2
78600	Pentaneura inconspicua		3.0	3
78655	Procladius (Holotanypus) sp		8.0	1
80420	Cricotopus (C.) bicinctus		8.0	1
82710	Chironomus (C.) sp		11.0	1
82822	Cryptochironomus eminentia		0.0	3
83040	Dicrotendipes neomodestus		6.0	4
84450	Polypedilum (Uresipedilum) flavum		6.0	2
84470	Polypedilum (P.) illinoense		6.0	3
84520	Polypedilum (Tripodura) halterale group		6.0	14
84612	Saetheria tylus		4.0	1
84700	Stenochironomus sp		3.0	1
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	47
85500	Paratanytarsus sp		6.0	2
85625	Rheotanytarsus sp		6.0	9
85800	Tanytarsus sp		7.0	1
93200	Hydrobiidae		6.0	16
96801	Ancylidae		7.0	1
97601	Corbicula fluminea		4.0	4
98001	Pisidiidae		5.0	8

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa: 36 Total Taxa: 36

Number of Organisms: 290 mIBI: 53.82

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: ust. Mill Creek WWTP

Site ID: **11-2**

Subsample:

RM: 1.71

Collection Date:07/21/2022 River Code95-995 River: Mill Creek

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	12
03600	Oligochaeta		10.0	14
05800	Caecidotea sp		6.0	1
06201	Hyalella azteca		4.0	6
11130	Baetis intercalaris	MA	4.0	10
16700	Tricorythodes sp	MA	5.0	9
17200	Caenis sp	MA	6.0	1
22001	Coenagrionidae		5.5	2
28500	Libellula sp		8.0	1
52200	Cheumatopsyche sp	CA	6.0	91
52500	Hydropsyche sp	CA	5.0	51
52530	Hydropsyche depravata group	CA	5.0	1
59500	Oecetis sp	CA	5.0	3
68700	Dubiraphia sp	CO	5.0	14
69400	Stenelmis sp	CO	7.0	5
74100	Simulium sp		6.0	1
77120	Ablabesmyia mallochi		6.0	1
77130	Ablabesmyia rhamphe group		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	3
78655	Procladius (Holotanypus) sp		8.0	5
80420	Cricotopus (C.) bicinctus		8.0	1
81240	Nanocladius (N.) distinctus		3.0	1
82730	Chironomus (C.) decorus group		11.0	3
82800	Cladopelma sp		6.0	1
82820	Cryptochironomus sp		8.0	1
82885	Cryptotendipes pseudotener		6.0	4
83040	Dicrotendipes neomodestus		6.0	14
83158	Endochironomus nigricans		6.0	1
83300	Glyptotendipes (G.) sp		10.0	4
84040	Parachironomus frequens		8.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	43
84470	Polypedilum (P.) illinoense		6.0	1
84540	Polypedilum (Tripodura) scalaenum group		6.0	2
85800	Tanytarsus sp		7.0	2
87540	Hemerodromia sp		6.0	1
93200	Hydrobiidae		6.0	7
95100	Physella sp		9.0	1
98600	Sphaerium sp		5.0	38

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa: 38 Total Taxa: 38

Number of Organisms: 358 mIBI: 44.72

Site: ust. Edwards Rd.

Site ID: **10-7**

Subsample:

RM: 11.30

Collection Date: 07/21/2022 River Code 95-996 River: North Mill Creek

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	7
03600	Oligochaeta		10.0	31
04664	Helobdella stagnalis		8.0	7
05800	Caecidotea sp		6.0	36
05900	Lirceus sp		4.0	8
06800	Gammarus sp		3.0	63
12501	Heptageniidae	MA	3.5	1
22001	Coenagrionidae		5.5	6
48220	Chauliodes rastricornis		4.0	1
53501	Hydroptilidae	CA	3.5	2
68700	Dubiraphia sp	CO	5.0	7
74501	Ceratopogonidae		5.0	1
77120	Ablabesmyia mallochi		6.0	1
77130	Ablabesmyia rhamphe group		6.0	1
77355	Clinotanypus pinguis		6.0	6
77500	Conchapelopia sp		6.0	3
77750	Hayesomyia senata or Thienemannimyia norena		5.0	5
78600	Pentaneura inconspicua		3.0	1
82880	Cryptotendipes sp		6.0	1
84210	Paratendipes albimanus or P. duplicatus		3.0	1
84470	Polypedilum (P.) illinoense		6.0	1
85500	Paratanytarsus sp		6.0	1
85625	Rheotanytarsus sp		6.0	2
85840	Tanytarsus sepp		7.0	1
93200	Hydrobiidae		6.0	12
94800	Stagnicola sp		7.0	4
95100	Physella sp		9.0	44
95900	Gyraulus sp		6.0	3
96264	Planorbella (Pierosoma) pilsbryi		6.5	1
98200	Pisidium sp		5.0	31
98600	Sphaerium sp		5.0	8

Taxa Code	Taxa	Feed Grp	Tol.	Quant

No. Quantitative Taxa:	31	Total Taxa:	31
Number of Organisms:	297	mIBI:	40.49

Appendix Table B-4. Macroinvertebrate taxa collected in the 2022 Upper Des Plaines River study area.

Site: dst. Millburn Rd.
Site ID: 10-1
Subsample:
RM: 1.10
Collection Date: 07/21/2022
River Code: 95-996
River: North Mill Creek

Taxa Code	Taxa	Taxa Grp	Tol.	Quant
01801	Turbellaria		6.0	5
03600	Oligochaeta		10.0	12
05800	Caecidotea sp		6.0	21
06201	Hyalella azteca		4.0	7
06810	Gammarus fasciatus		3.0	7
08200	Orconectes sp		5.0	1
11001	Baetidae	MA	4.0	2
11120	Baetis flavistriga	MA	4.0	17
11130	Baetis intercalaris	MA	4.0	1
12501	Heptageniidae	MA	3.5	4
13400	Stenacron sp	MA	4.0	10
17200	Caenis sp	MA	6.0	4
22001	Coenagrionidae		5.5	24
23501	Aeshnidae		4.5	1
52001	Hydropsychidae	CA	5.5	5
52200	Cheumatopsyche sp	CA	6.0	40
52430	Ceratopsyche morosa group	CA	4.0	3
52530	Hydropsyche depravata group	CA	5.0	3
53800	Hydroptila sp	CA	2.0	4
59500	Oecetis sp	CA	5.0	2
68700	Dubiraphia sp	CO	5.0	18
68708	Dubiraphia vittata group	CO	5.0	9
68901	Macronychus glabratus	CO	2.0	14
69400	Stenelmis sp	CO	7.0	16
77140	Ablabesmyia peleensis		6.0	1
77500	Conchapelopia sp		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	6
78450	Nilotanypus fimbriatus		6.0	1
78655	Procladius (Holotanypus) sp		8.0	2
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"		3.0	1
81650	Parametriocnemus sp		4.0	1
82141	Thienemanniella xena		2.0	1
82501	Chironomini		6.0	2
82820	Cryptochironomus sp		8.0	2
82885	Cryptotendipes pseudotener		6.0	4
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	9
84155	Paralauterborniella nigrohalteralis		6.0	4
84300	Phaenopsectra obediens group		4.0	2
84450	Polypedilum (Uresipedilum) flavum		6.0	3

Taxa Code	Taxa	Feed Grp	Tol.	Quant
84470	Polypedilum (P.) illinoense		6.0	9
84540	Polypedilum (Tripodura) scalaenum group		6.0	3
84700	Stenochironomus sp		3.0	3
85230	Cladotanytarsus mancus group		7.0	2
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	1
85500	Paratanytarsus sp		6.0	8
85625	Rheotanytarsus sp		6.0	5
85800	Tanytarsus sp		7.0	5
85821	Tanytarsus glabrescens group sp 7		7.0	2
95100	Physella sp		9.0	1
98001	Pisidiidae		5.0	5

No. Quantitative Taxa: 50
Total Taxa: 50
Number of Organisms: 314
mIBI: 63.45

APPENDIX C

Upper Des Plaines River 2022 Habitat Data

C-1: Upper Des Plaines 2022 QHEI Metrics & Scores
C-2: QHEI Field Sheets 2022

***Appendix Table C-1** . QHEI and metric scores in the Year 5 Upper Des Plaines River study area.*

Site ID	River Mile	Year	QHEI	Substrate Score	Cover Score	Channel Score	Riparian Score	Pool Score	Riffle Score	Gradient Value	Gradient Score
Des Plaines River- (94-656) - 2022											
13-6	109.3	2022	49.00	4.5	8.0	10.5	10.50	5.0	1.0	5.64	10
13-5	106.6	2022	35.75	0.0	10.0	4.5	6.25	5.0	0.0	5.15	10
13-4	102.9	2022	46.00	0.0	15.0	6.0	11.00	5.0	0.0	4.67	10
13-19	99.72	2022	74.75	14.0	17.0	13.0	8.75	10.0	4.0	2.63	8
13-18	99.3	2022	38.00	0.0	15.0	2.5	7.50	5.0	0.0	2.63	8
13-3	98.7	2022	72.75	15.0	16.0	12.0	8.75	7.0	4.0	4.26	10
13-2	96.82	2022	78.25	15.0	15.0	14.0	6.25	10.0	8.0	4.03	10
13-1	94.2	2022	66.00	14.0	17.0	11.0	7.00	8.0	1.0	3.61	8
13-16	90.6	2022	70.50	14.0	17.0	14.0	5.50	10.0	2.0	3.32	8
16-6	87.1	2022	69.50	15.0	16.0	12.0	7.50	9.0	2.0	2.70	8
16-7	84.6	2022	75.25	13.0	16.0	14.0	8.75	10.0	5.5	2.77	8
16-5	83.6	2022	60.25	11.5	15.0	10.0	8.75	7.0	0.0	2.72	8
16-8	82.9	2022	61.00	11.0	15.0	11.0	9.00	7.0	0.0	2.63	8
16-4	80	2022	67.00	14.5	17.0	12.0	4.50	9.0	2.0	2.38	8
16-3	76.7	2022	61.75	10.5	16.0	13.0	7.25	7.0	0.0	2.23	8
16-2	75.4	2022	59.25	11.0	17.0	9.0	7.25	7.0	0.0	2.19	8
16-1	71.7	2022	71.00	15.0	16.0	12.0	10.00	8.0	2.0	2.13	8
Mill Creek (95-995) - 2022											
11-2	1.71	2022	83.75	16.0	16.0	17.5	9.25	9.0	8.0	7.30	8
North Mill Creek (95-996) - 202											
10-7	11.3	2022	28.50	2.0	9.0	6.0	6.50	1.0	0.0	2.60	4
10-1	1.1	2022	50.00	6.0	15.0	10.0	5.00	6.0	2.0	5.24	6
	Excellent	≥84.5									
	Good	75.9-84.4									
	Fair	50.1-75.8									
	Poor	25-50									
	Very Poor	<25									

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 49

River Code: 95-656 **RM:** 109.3 **Stream:** Des Plaines River
Site Code: 13-6 **Project Code:** DRWW22 **Location:** Dst Russell Rd
Date: 6-24-2022 **Scorer:** MAS **Latitude:** 42.48905 **Longitude:** -87.97523

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

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

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

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

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

Substrate 4.5 Max 20

COMMENTS:

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

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

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

Cover 8 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 10.5 Max 20

COMMENTS:

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

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

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

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

Riparian 10 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 5 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 1 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 5.64 DRAINAGE AREA (sq.mi.): 123.67 % POOL: % GLIDE:
% RIFFLE: % RUN:

Gradient 10 Max 10

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

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

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

Lat / Long (Beg):

Lat / Long (Mid):

Lat / Long (End):

Lat / Long (X-Loc):

If Not, Explain: Becoming shallower with more sand entering the site

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

Other:

Subjective Rating (1-10): 4

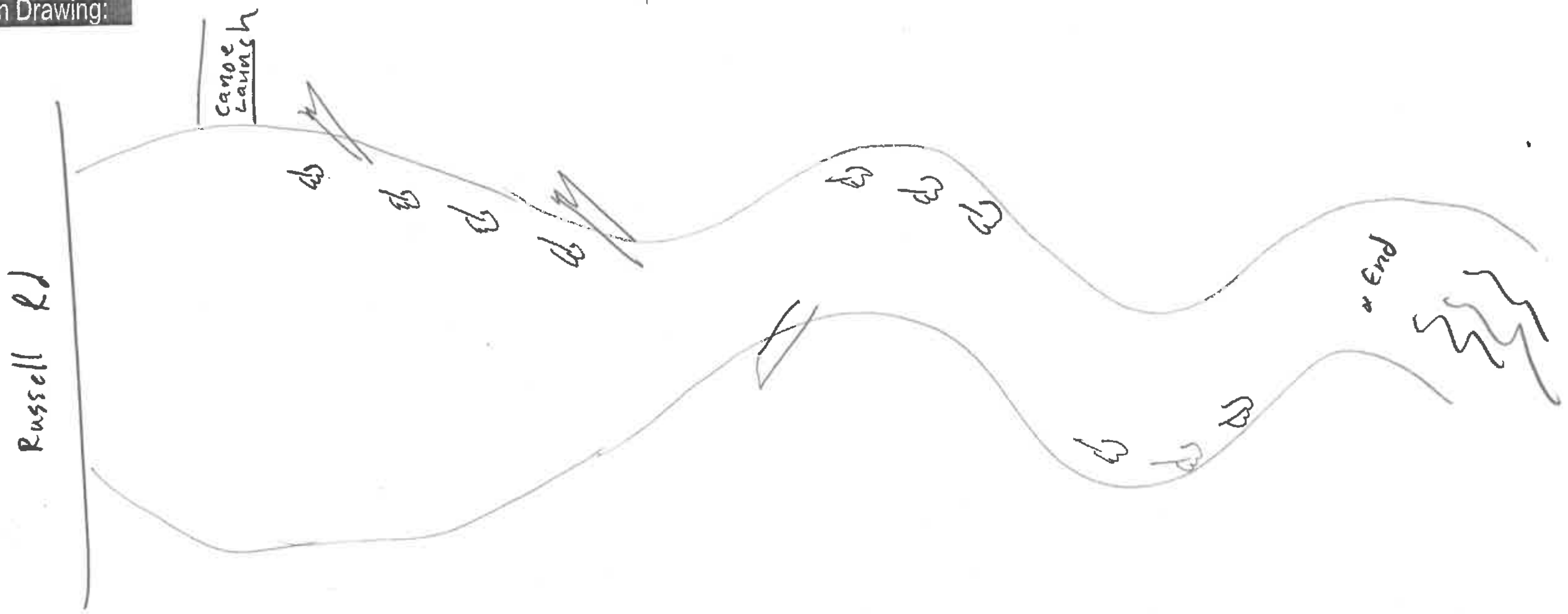
Aesthetic Rating (1-10): 4

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	320	Turbid	Normal	100

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

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 35.75

River Code: 95-656 **RM:** 106.6 **Stream:** Des Plaines River
Site Code: 13-S **Project Code:** DEWW22 **Location:** Dst IL-173
Date: 6-24-2022 **Scorer:** MAS **Latitude:** 42.46472 **Longitude:** -87.94289

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

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

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

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

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

Substrate: 0
Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 10
Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 4.5
Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
☑ ☑ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]

L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☑ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian: 6.25
Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current: 5
Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 0
Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 5.15 DRAINAGE AREA (sq.mi.): 137.29

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

Gradient: 10
Max 10

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

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

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

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

If Not, Explain:

Subjective Rating (1-10)	Aesthetic Rating (1-10)
3	3

Gradient:
☐ -Low ☐ -Moderate ☐ -High

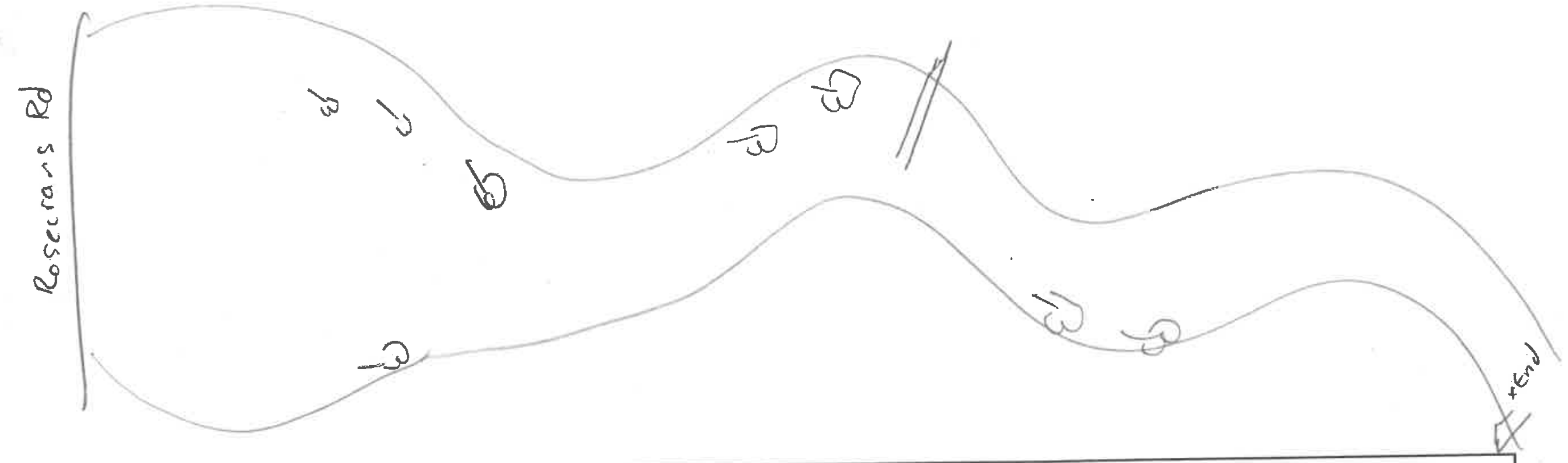
	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Normal	100

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

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

Other: ____

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 46

River Code: 95-656 **RM:** 102.9 **Stream:** Des Plaines River
Site Code: 13-4 **Project Code:** DRWW22 **Location:** dst. Wadsworth Rd.
Date: 6-24-2022 **Scorer:** MAS **Latitude:** 42.42844 **Longitude:** -87.92982

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

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

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

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

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

Substrate 0 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 15 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 6 Max 20

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian 11 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 5 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 4.67 DRAINAGE AREA (sq.mi.): 145.55 % POOL: % GLIDE:
% RIFFLE: % RUN:

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

Gradient 10 Max 10

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

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

If Not, Explain: ____

Lat / Long (Beg): ____

Lat / Long (Mid): ____

Lat / Long (End): ____

Lat / Long (X-Loc): ____

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

Other: ____

Subjective Rating (1-10): 4

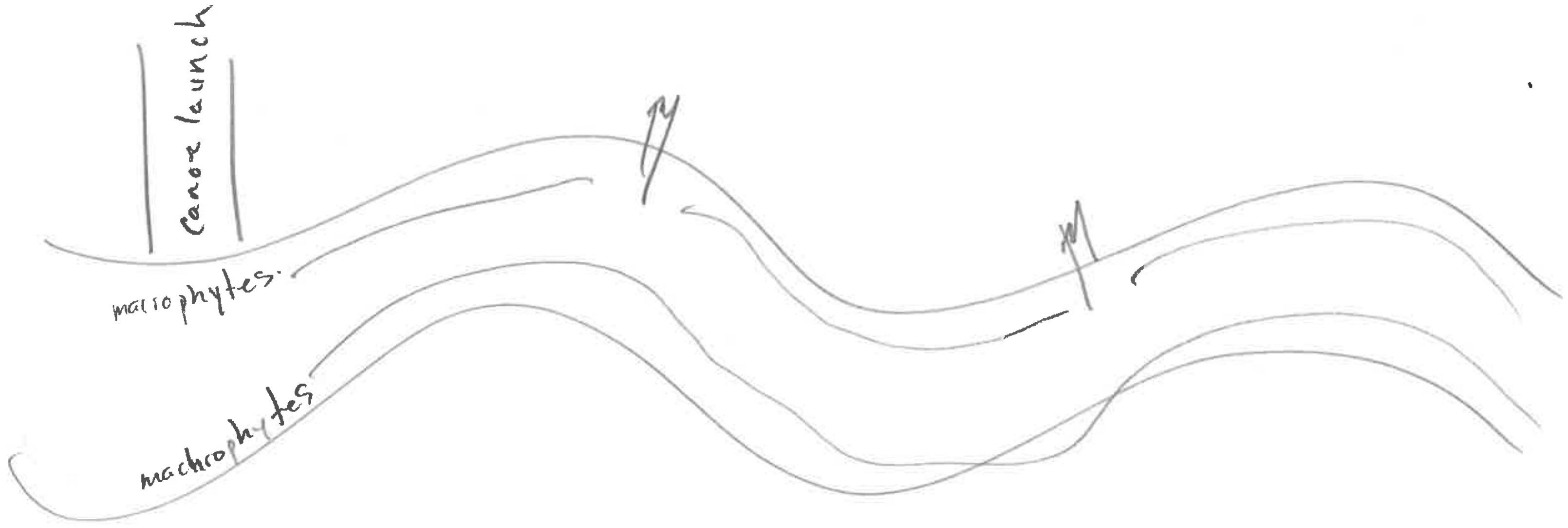
Aesthetic Rating (1-10): 4

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	300	Turbid	Normal	100

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

Stream Drawing:



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

Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 38

River Code: 95-656 **RM:** 99.72 **Stream:** Des Plaines River
Site Code: 13-18 **Project Code:** DEWW22 **Location:** Ust wel Riffle
Date: 6-24-2022 **Scorer:** MAS **Latitude:** 42.40100 **Longitude:** -87.92827

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

Substrate: 0
Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 15
Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 2.5
Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
- ☒ ☒ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian: 7.5
Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current: 5
Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 0
Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.63 DRAINAGE AREA (sq.mi.): 212.87

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

Gradient: 8
Max 10

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

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

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

If Not, Explain: ____

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

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

Subjective Rating (1-10): 4

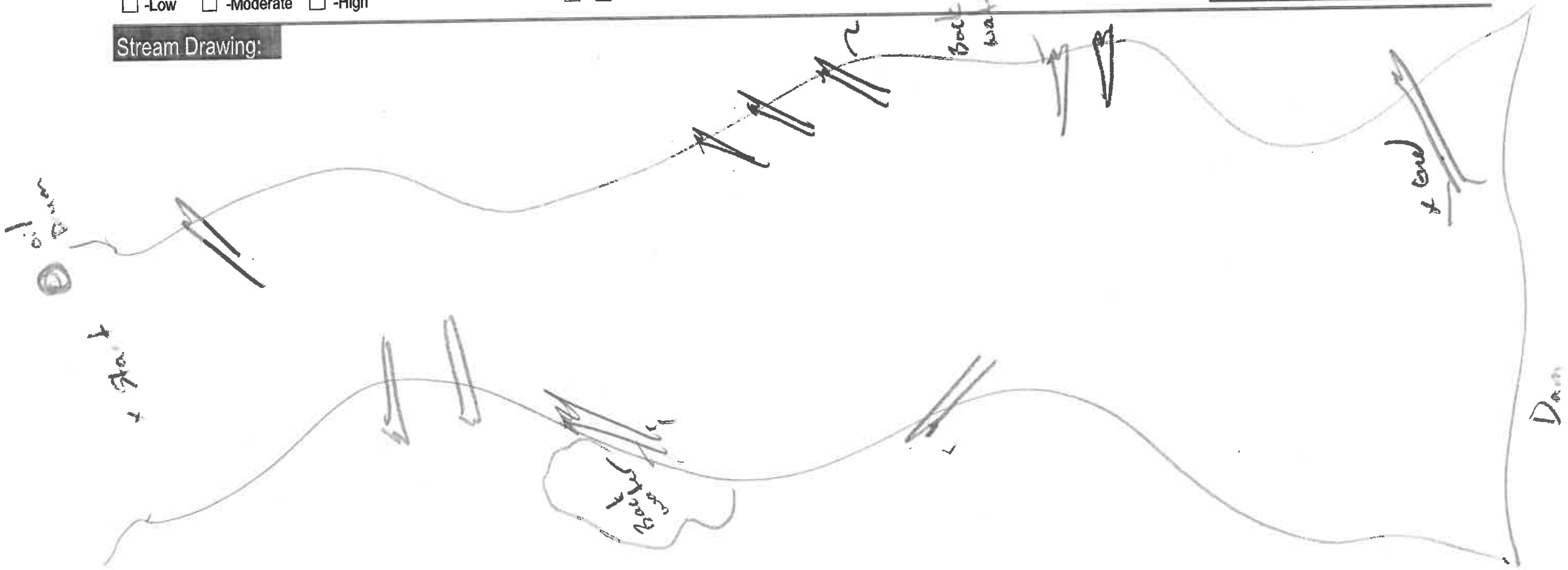
Aesthetic Rating (1-10): 5

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Normal	100

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

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 74.75

River Code: 95-656 RM: 99.3D Stream: Des Plaines River
Site Code: 13-19 Project Code: DLWW22 Location: Dst. WZI Ri[illegible]
Date: 10-25-2022 Scorer: MAS Latitude: 42.39416 Longitude: -87.92359

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

Substrate: 14 Max 20

COMMENTS:

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

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

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

Cover: 17 Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 13 Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
- ☑ ☑ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☑ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian: 8.75 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current: 10 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 4 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.63 DRAINAGE AREA (sq.mi.): 213.17

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

Gradient: 8 Max 10

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

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

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

If Not, Explain: ____

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

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

Subjective Rating (1-10): 6

Aesthetic Rating (1-10): 6

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P		Turbid	Normal	100

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

Stream Drawing:

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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 72.75

River Code: 95-656 **RM:** 98.7 **Stream:** Des Plaines River
Site Code: 13-3 **Project Code:** DRWW22 **Location:** Ust US-41
Date: 6-25-2022 **Scorer:** MAS **Latitude:** 42.38323 **Longitude:** -87.91466

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

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

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

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

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

Substrate: 15 Max 20

COMMENTS:

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

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

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

Cover: 16 Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 12 Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)*
L R (Most Predominant Per Bank)
☑ ☑ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]

L R
☐ ☐ -CONSERVATION TILLAGE [1]
☑ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian: 8.75 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current: 7 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 4 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 4.261 DRAINAGE AREA (sq.mi.): 220.29
% POOL: % GLIDE:
% RIFFLE: % RUN:

Gradient: 10 Max 10

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

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

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

If Not, Explain: ____

Lat / Long (Beg): ____

Lat / Long (Mid): ____

Lat / Long (End): ____

Lat / Long (X-Loc): ____

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

Other: ____

Subjective Rating (1-10): 6

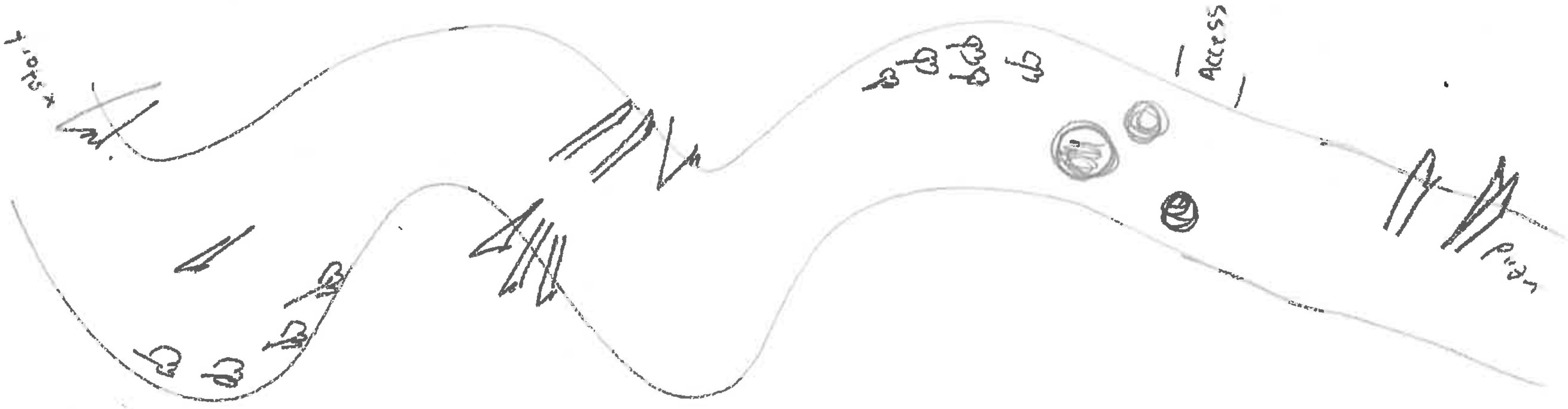
Aesthetic Rating (1-10): 6

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Normal	30

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

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 78.25

River Code: 95-656 **RM:** 96.82 **Stream:** Des Plaines Rives
Site Code: 13-2 **Project Code:** DRWW22 **Location:** dst. McClare Ave.
Date: 6-23-2022 **Scorer:** MAS **Latitude:** 42.36967 **Longitude:** -87.91834

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

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

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

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

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

Substrate 15 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 15 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 14 Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
☐ ☑ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]

L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☑ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian 6.25 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 10 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 8 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 4.037 DRAINAGE AREA (sq.mi.): 225.36 % POOL: % GLIDE:
% RIFFLE: % RUN:

Gradient 10 Max 10

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

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

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

If Not, Explain: ____

Lat / Long (Beg): ____

Lat / Long (Mid): ____

Lat / Long (End): ____

Lat / Long (X-Loc): ____

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

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

Other: ____

Subjective Rating (1-10): 6

Aesthetic Rating (1-10): 6

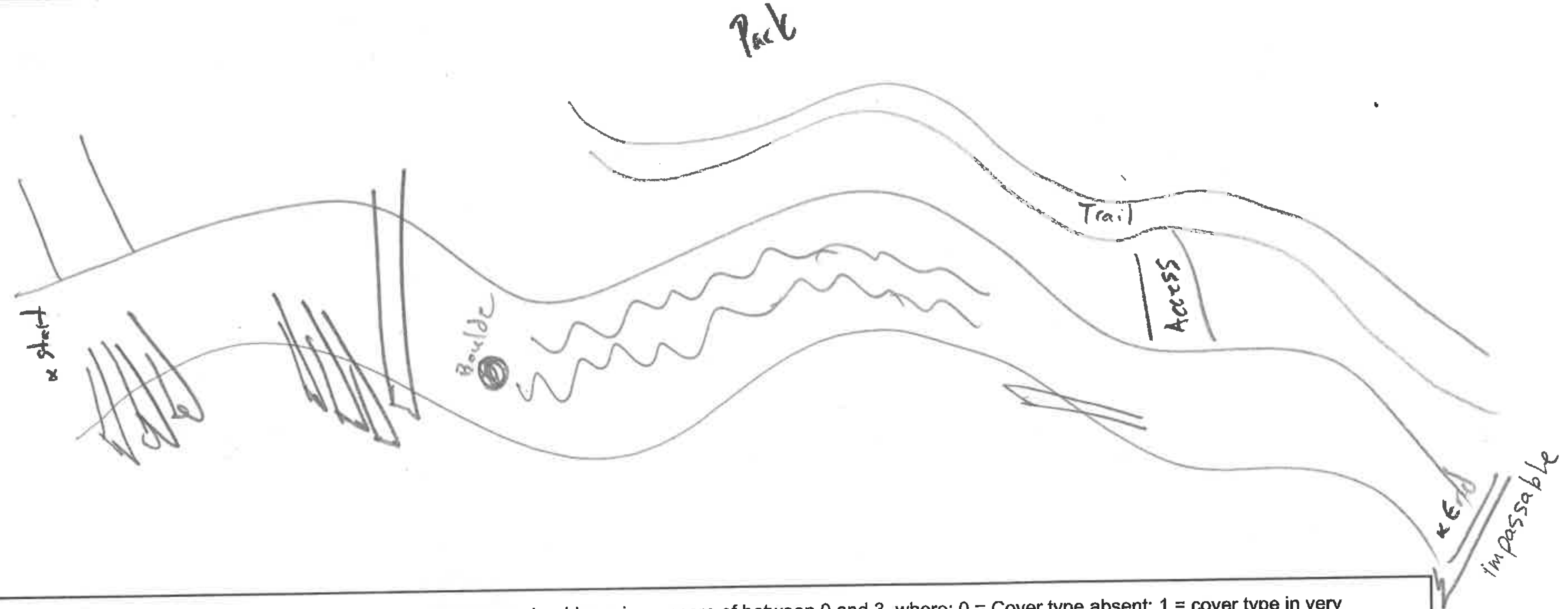
	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	425	Turbid	Normal	90%

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

Gradient:

☐ -Low ☐ -Moderate ☐ -High

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 66

River Code: 95-656 **RM:** 94.2 **Stream:** Des Plaines River
Site Code: 13-1 **Project Code:** DEWW22 **Location:** Dst Belvidere Rd
Date: 6-22-2022 **Scorer:** MAS **Latitude:** 42.34354 **Longitude:** -87.94105

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

Substrate 14 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 17 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 11 Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
- ☒ ☐ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☒ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian 7 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 8 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 1 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 3.61 DRAINAGE AREA (sq.mi.): 232.03 % POOL: % GLIDE:
% RIFFLE: % RUN:

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

Gradient 8 Max 10

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

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

If Not, Explain: ______

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

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

Other: ______

Subjective Rating (1-10): 6

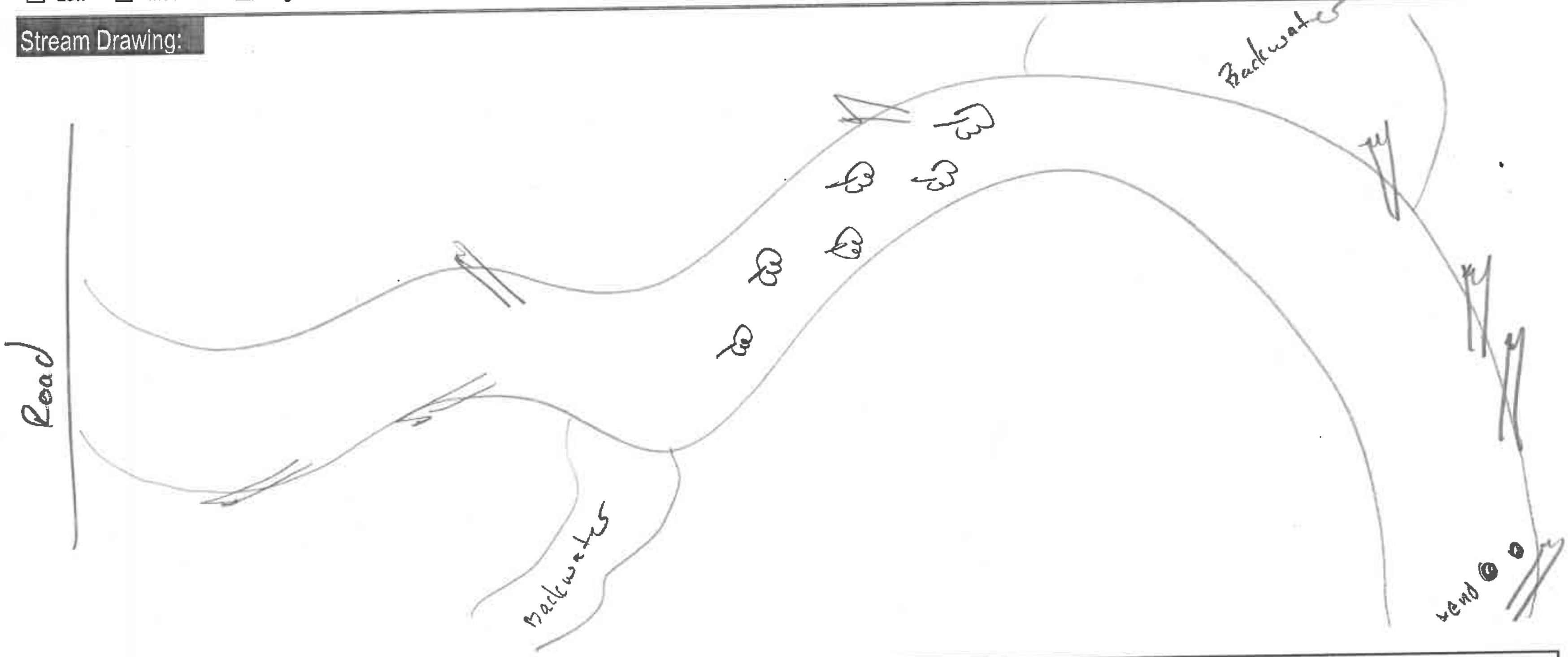
Aesthetic Rating (1-10): 6

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Normal	100

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

Gradient:
☐ -Low ☐ -Moderate ☐ -High

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 70.5

River Code: 95-656 **RM:** 90.6 **Stream:** Des Plaines River
Site Code: 13-16 **Project Code:** DLWW22 **Location:** dst. Buckley Rd.
Date: 6-22-2022 **Scorer:** MAS **Latitude:** 42.30575 **Longitude:** -87.95456

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

Substrate: 14
Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 17
Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 14
Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)*
L R (Most Predominant Per Bank)
- ☐ ☑ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian: 5.5
Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current: 10
Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 2
Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 3.32 DRAINAGE AREA (sq.mi.): 253.75

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

Gradient: 8
Max 10

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

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

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

If Not, Explain: ____

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

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

Other: ____

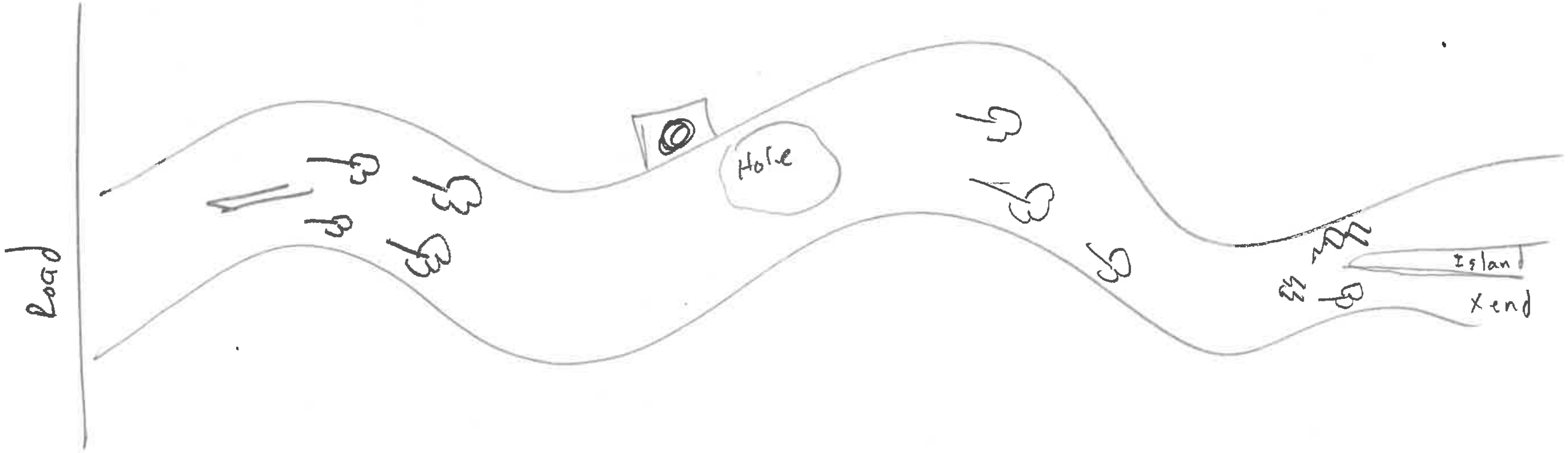
Subjective Rating (1-10)	Aesthetic Rating (1-10)
6	6

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Clear	Normal	100

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 75.25

River Code: 95-656 **RM:** 84.6 **Stream:** Des Plaines River
Site Code: 16-7 **Project Code:** DRWW22 **Location:** ust. dam site
Date: 6-21-2022 **Scorer:** MAS **Latitude:** 42.25085 **Longitude:** -87.93957

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

TYPE POOL RIFFLE

☐ ☐ -BLDR/SLBS [10]
☐ ☐ -Lg BOULD [10]
☐ ☐ -BOULDER [9]
☐ ☐ -COBBLE [8]
☐ ☐ -HARDPAN [4]
☐ ☐ -MUCK [2]

POOL RIFFLE

☐ ☒ -GRAVEL [7]
☒ ☐ -SAND [6]
☐ ☐ -BEDROCK [5]
☐ ☐ -DETRITUS [3]
☐ ☐ -ARTIFICIAL [0]
☐ ☐ -SILT [2]

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT:
☐ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☒ -SILT NORMAL [0]
☐ -SILT FREE [1]

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

Substrate 13 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 16 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 14. Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
☒ ☒ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]

L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☒ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

COMMENTS:

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

Riparian 8.75 Max 10

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 10 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 5.5 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.771 DRAINAGE AREA (sq.mi.): 266.48 % POOL: ☐ % GLIDE: ☐ % RIFFLE: ☐ % RUN: ☐

Gradient 8 Max 10

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

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

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

If Not, Explain: ____

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

Subjective Rating (1-10): 6

Aesthetic Rating (1-10): 6

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Normal-up	100

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

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

Other: ____

Stream Drawing:

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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 69.5

River Code: 95-656 **RM:** 87.1 **Stream:** Des Plaines River
Site Code: 16-6 **Project Code:** DPWW22 **Location:** Dst. Rockland Rd
Date: 6-27-2022 **Scorer:** MAS **Latitude:** 42.27629 **Longitude:** -87.93925

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

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

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

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

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

Substrate 15 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 16 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 12 Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☑ ☑ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]

L R
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian 7.5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 9 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 2 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.7 DRAINAGE AREA (sq.mi.): 261.41

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

Gradient 8 Max 10

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

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

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

If Not, Explain: ____

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

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

Subjective Rating (1-10): 7

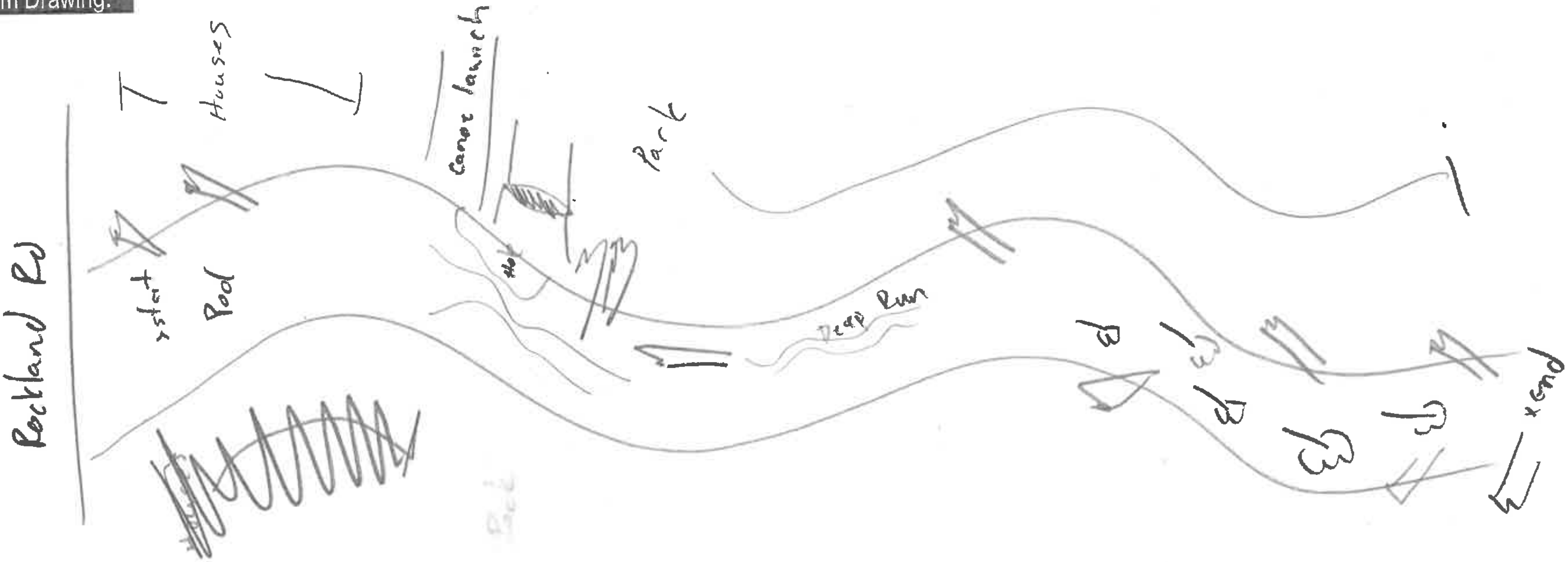
Aesthetic Rating (1-10): 7

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Normal	100

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 60.25

River Code: 95-656 **RM:** 83.6 **Stream:** Des Plaines River
Site Code: 16-5 **Project Code:** DRWW22 **Location:** Dst E Townline Rd
Date: 6-21-2022 **Scorer:** MAS **Latitude:** 42.24028 **Longitude:** -87.93909

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

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

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

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

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

Substrate 11.5 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 15 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 10 Max 20

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian 8.75 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 7 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.72 DRAINAGE AREA (sq.mi.): 268.07

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

Gradient 8 Max 10

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

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

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

If Not, Explain: ____

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

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

Subjective Rating (1-10): 6

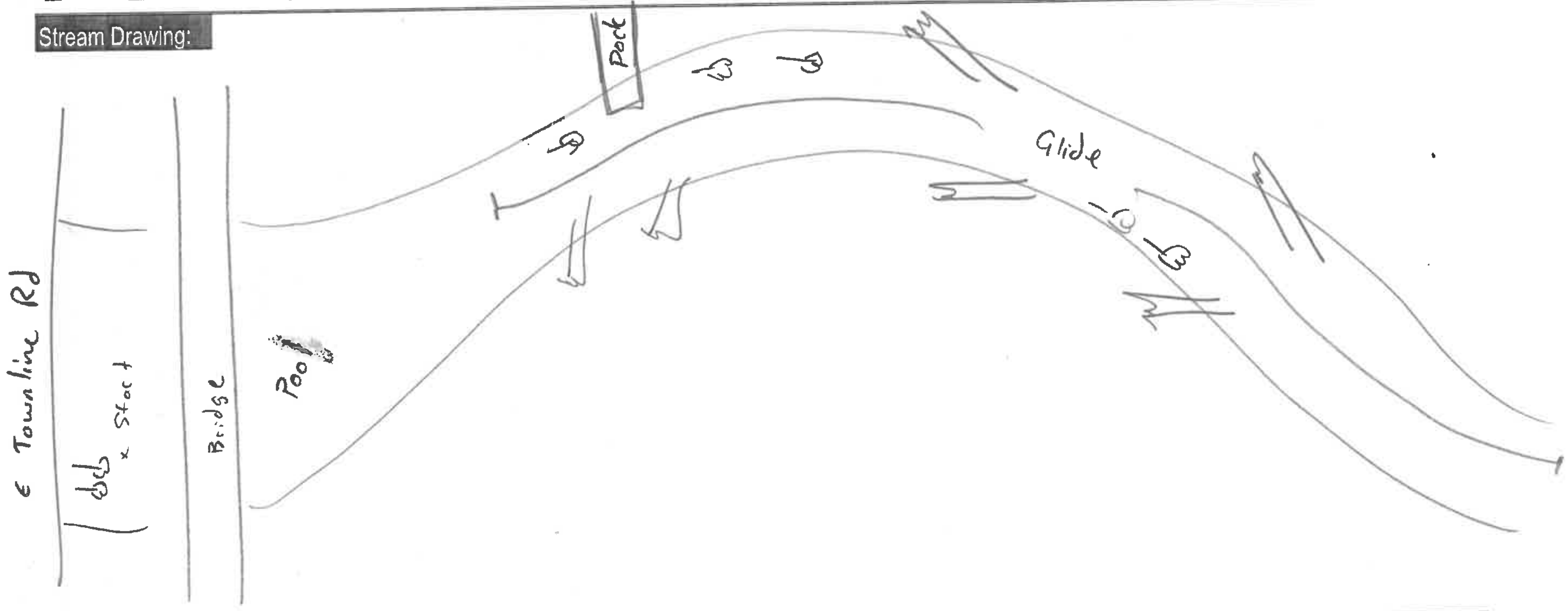
Aesthetic Rating (1-10): 6

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Normal	100

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

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 67

River Code: 95-656 **RM:** 80.0 **Stream:** Des Plaines River
Site Code: 16-4 **Project Code:** DRWW22 **Location:** Dst Half Day Rd
Date: 6-27-2022 **Scorer:** MAS **Latitude:** 42.19816 **Longitude:** -87.91911

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

Substrate 14.5 Max 20

COMMENTS:

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

(Structure)
- 1 UNDERCUT BANKS [1]
- 0 OVERHANGING VEGETATION [1]
- 3 SHALLOWS (IN SLOW WATER) [1]
- 1 ROOTMATS [1]

TYPE: Score All That Occur
- 2 POOLS > 70 cm [2]
- 1 ROOTWADS [1]
- 1 BOULDERS [1]
- 2 OXBOWS, BACKWATERS [1]
- 3 AQUATIC MACROPHYTES [1]
- 2 LOGS OR WOODY DEBRIS [1]

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

Cover 17 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 12 Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
- ☐ ☐ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian 4.5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 9 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 2 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.387 DRAINAGE AREA (sq.mi.): 273.21

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

Gradient 8 Max 10

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

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

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

Lat / Long (Beg): ____

Lat / Long (Mid): ____

Lat / Long (End): ____

Lat / Long (X-Loc): ____

If Not, Explain: ____

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

Subjective Rating (1-10): 6

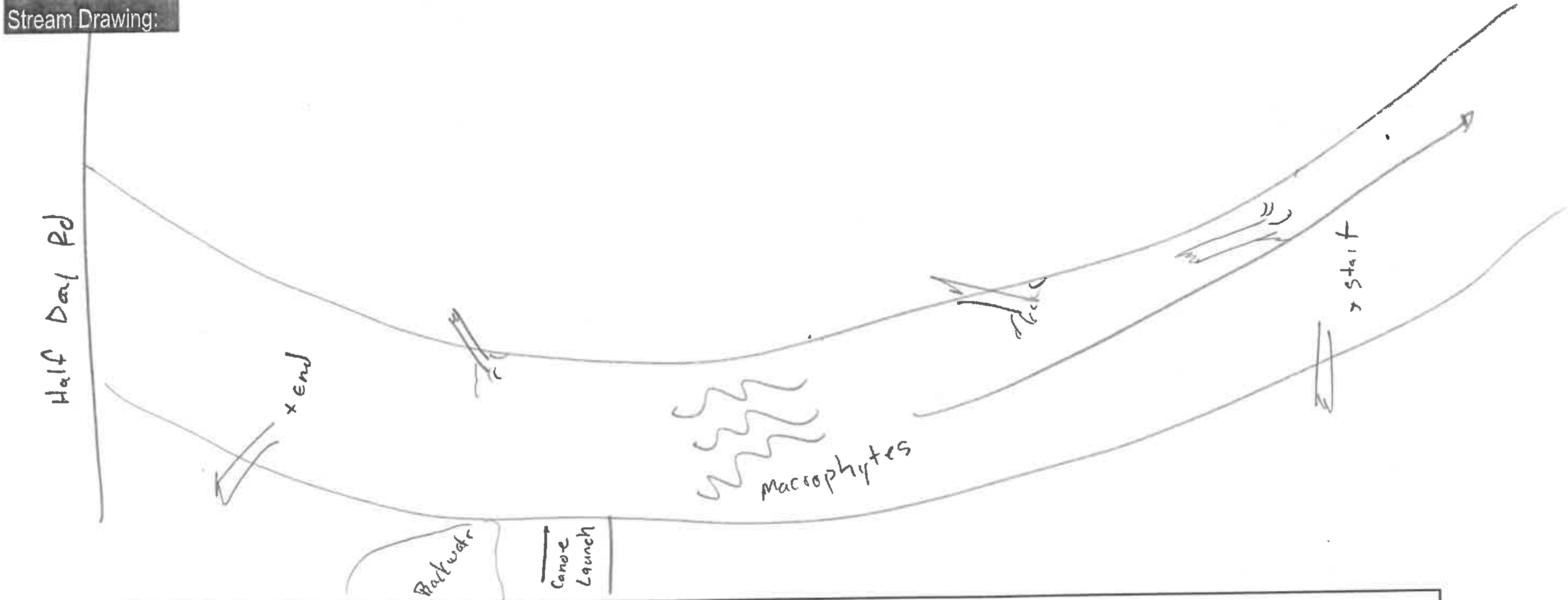
Aesthetic Rating (1-10): 6

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	D	200	Clear	Low	100

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 61

River Code: 95-656 **RM:** 82.9 **Stream:** Des Plaines River
Site Code: 16-8 **Project Code:** DRWW22 **Location:** ust. dam
Date: 6-21-2022 **Scorer:** MAS **Latitude:** 42.2311 **Longitude:** -87.93436

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

Substrate: 11 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 15 Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 11 Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
- ☑ ☑ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☑ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian: 9 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current: 7 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.635 DRAINAGE AREA (sq.mi.): 268.9 % POOL: % GLIDE:
% RIFFLE: % RUN:

Gradient: 8 Max 10

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

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

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

Lat / Long (Beg): ____

Lat / Long (Mid): ____

Lat / Long (End): ____

Lat / Long (X-Loc): ____

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

Other: ____

Subjective Rating (1-10): 6

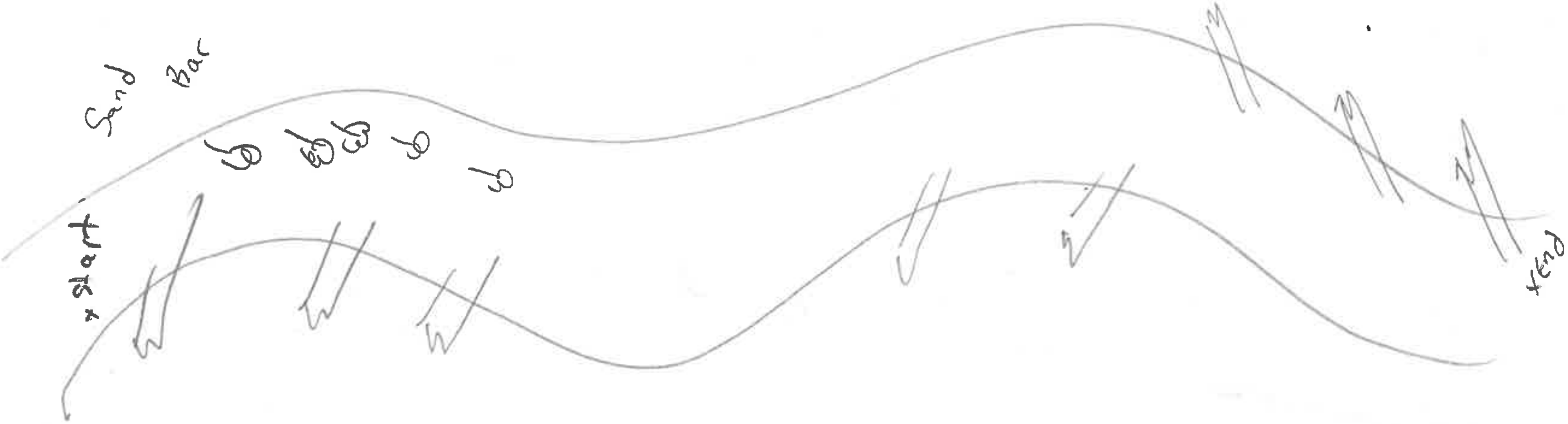
Aesthetic Rating (1-10): 6

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Normal	100

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

Stream Drawing:



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

Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 61.75

River Code: 95-656 **RM:** 76.7 **Stream:** Des Plaines River
Site Code: 16-3 **Project Code:** DRWW22 **Location:** dst. Deerfield Rd.
Date: 6-26-2022 **Scorer:** MAS **Latitude:** 42.16706 **Longitude:** -87.91377

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

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

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

COMMENTS:

Substrate 10.5 Max 20

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

(Structure) TYPE: Score All That Occur

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

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

COMMENTS:

Cover 16 Max 20

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

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

COMMENTS:

Channel 13 Max 20

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

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

COMMENTS:

Riparian 7.25 Max 10

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

COMMENTS:

Pool / Current 7 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]	☐ -MOD. STABLE (e.g., Large Gravel) [1]	☐ -LOW [1]
☐ -Best Areas < 5cm [0]		☐ -UNSTABLE (Fine Gravel, Sand) [0]	☐ -MODERATE [0]
☐ -NO RIFFLE but RUNS present [0]			☐ -EXTENSIVE [-1]
☒ -NO RIFFLE / NO RUN [Metric = 0]			

COMMENTS:

Riffle / Run 0 Max 8

6.) GRADIENT (ft / mi): 2.235 DRAINAGE AREA (sq.mi.): 314.68 % POOL: ☐ % GLIDE: ☐
% RIFFLE: ☐ % RUN: ☐

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

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

Gradient 8 Max 10

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

If Not, Explain: ____

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

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

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

Other: ____

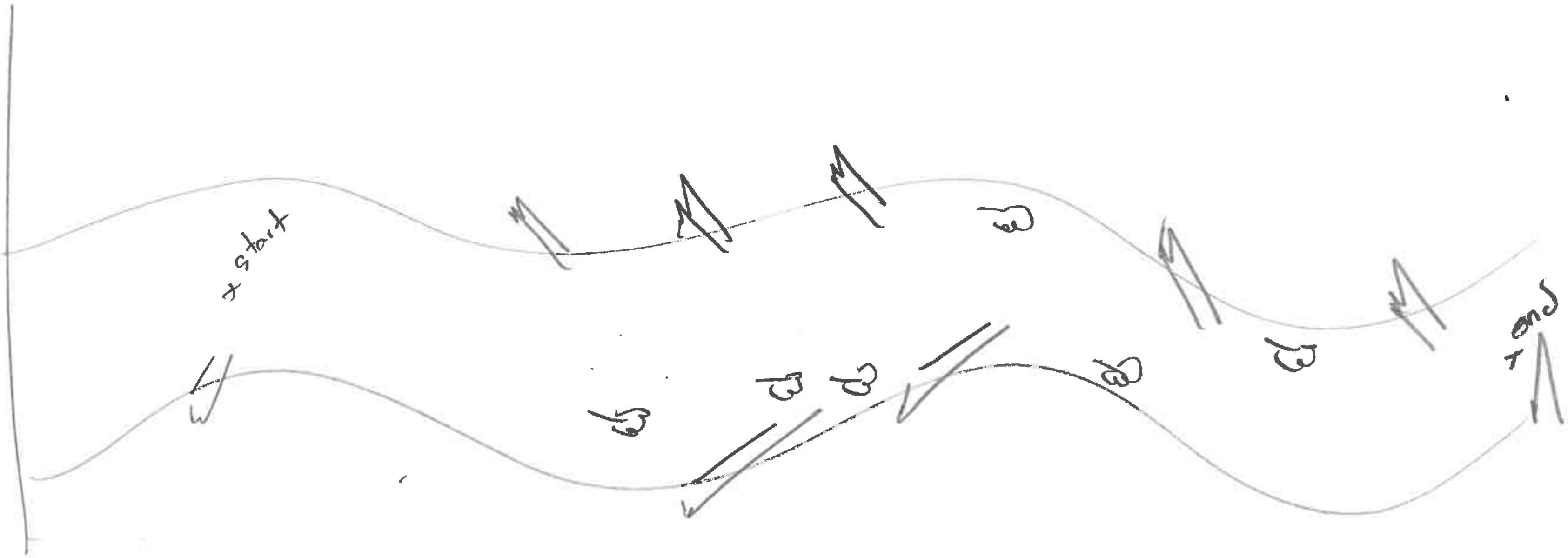
Subjective Rating (1-10)	Aesthetic Rating (1-10)
5	5

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Clear	Normal	100

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

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 59.25

River Code: 95-656 **RM:** 75.4 **Stream:** Des Plaines River
Site Code: 16-2 **Project Code:** DEWRS22 **Location:** Dst. Lake Cook Rd
Date: 6·26·2022 **Scorer:** MAS **Latitude:** 42.15276 **Longitude:** -87.91022

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

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

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

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

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

Substrate 11 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 17 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 9 Max 20

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian 7.25 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 7 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.19 DRAINAGE AREA (sq.mi.): 323.96 % POOL: ☐ % GLIDE: ☐
% RIFFLE: ☐ % RUN: ☐

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

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

Gradient 8 Max 10

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

Lat / Long (Beg):

Lat / Long (Mid):

Lat / Long (End):

Lat / Long (X-Loc):

If Not, Explain: The riffle has been blown out and replaced with a shallow glide. In addition macrophytes have choked the site

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

Subjective Rating (1-10): 5

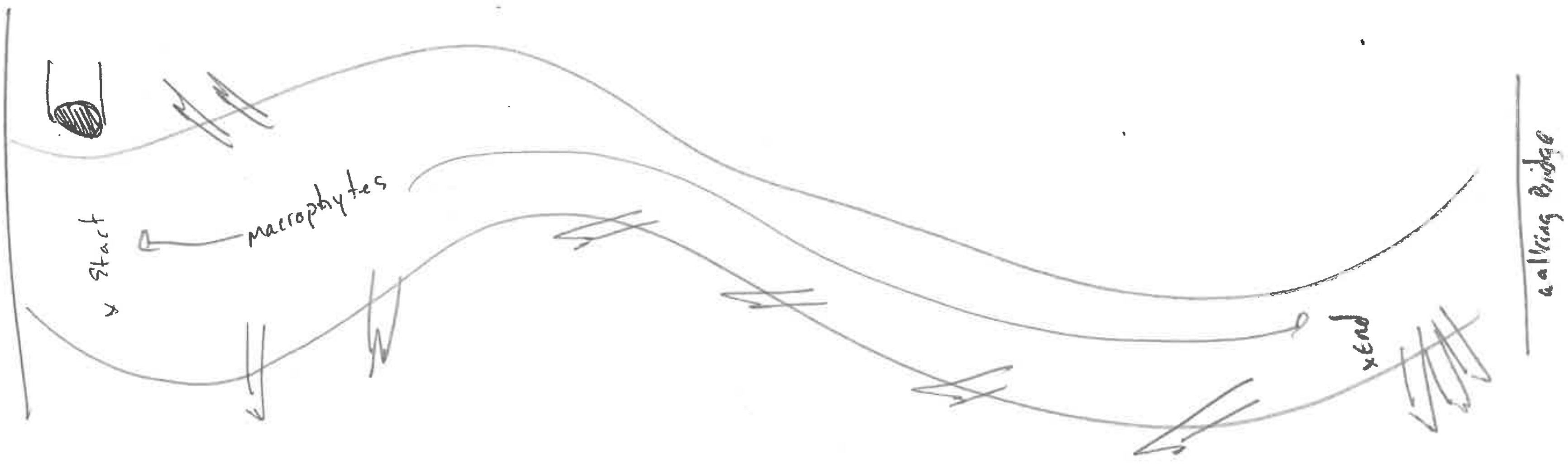
Aesthetic Rating (1-10): 5

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Clear	Normal	100

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

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 71

River Code: 95-656 **RM:** 71.7 **Stream:** Des Plaines River
Site Code: 16-1 **Project Code:** DEWU22 **Location:** U/S of Palatine Rd
Date: 6-23-2022 **Scorer:** MAS **Latitude:** 42.11399 **Longitude:** -87.89923

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

Substrate 15 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

0	UNDERCUT BANKS [1]	3	POOLS > 70 cm [2]	6	OXBOWS, BACKWATERS [1]
1	OVERHANGING VEGETATION [1]	1	ROOTWADS [1]	3	AQUATIC MACROPHYTES [1]
3	SHALLOWS (IN SLOW WATER) [1]	1	BOULDERS [1]	2	LOGS OR WOODY DEBRIS [1]
1	ROOTMATS [1]				

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

Cover 16 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 12 Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
- ☒ ☒ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☐ ☐ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian 10 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 8 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 2 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.13 DRAINAGE AREA (sq.mi.): 358.7 % POOL: % GLIDE:
% RIFFLE: % RUN:

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

Gradient 8 Max 10

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

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

Lat / Long (Beg): ____

Lat / Long (Mid): ____

Lat / Long (End): ____

Lat / Long (X-Loc): ____

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

Subjective Rating (1-10): 6

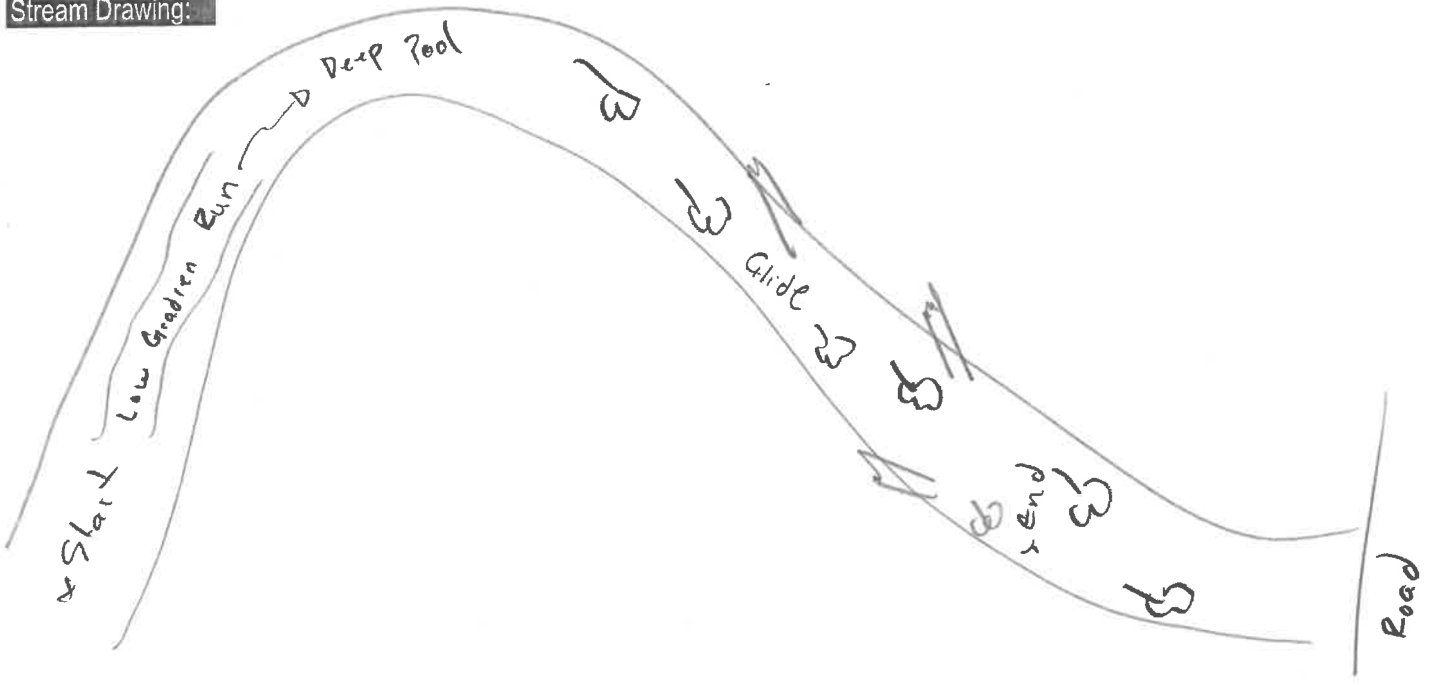
Aesthetic Rating (1-10): 6

Gradient:
☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Clear	Normal	100

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

Stream Drawing:



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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 83.75

River Code: 95-995 **RM:** 1.71 **Stream:** Mill Creek
Site Code: 11-2 **Project Code:** OLWU22 **Location:** Ust Mill Creek WWTP
Date: 6-27-2022 **Scorer:** MAS **Latitude:** 42.42115 **Longitude:** -87.95678

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

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

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

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

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

Substrate 16 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 16 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 17.5 Max 20

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian 9.25 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 9 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 8 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 7.3 DRAINAGE AREA (sq.mi.): 62.25

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

Gradient 8 Max 10

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

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

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

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

If Not, Explain: ____

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

Other: ____

Subjective Rating (1-10): 7

Aesthetic Rating (1-10): 7

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	D	200	Turbid	Normal	50

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

Stream Drawing:

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

Midwest Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 50

River Code: 95-996 **RM:** 1.10 **Stream:** North Mill Creek
Site Code: 10-1 **Project Code:** DRWW22 **Location:** Dst Millburn Rd
Date: 6-27-2022 **Scorer:** MAS **Latitude:** 42.42346 **Longitude:** -87.99722

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)
SILT:
- ☑ -SILT HEAVY [-2]
- ☐ -SILT MODERATE [-1]
- ☐ -SILT NORMAL [0]
- ☐ -SILT FREE [1]

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

Substrate 6 Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover 15 Max 20

COMMENTS:

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

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

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

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

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

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

Channel 10 Max 20

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian 5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current 6 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run 2 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 5.24 DRAINAGE AREA (sq.mi.): 31.93

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

Gradient 6 Max 10

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

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

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

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

If Not, Explain: ____

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

Other: ____

Subjective Rating (1-10): 4.5

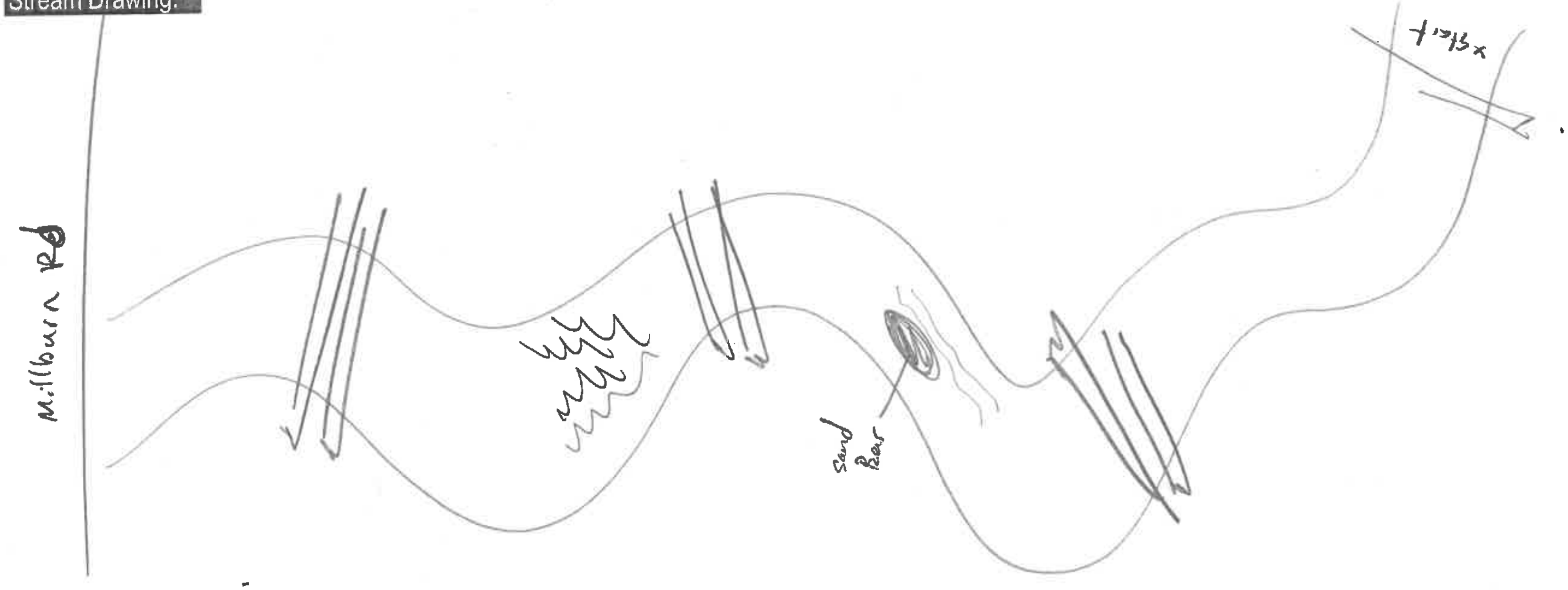
Aesthetic Rating (1-10): 4.5

Gradient:
☐ -Low ☐ -Moderate ☑ -High

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

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

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate 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.

Biodiversity Institute

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 28.5

River Code: 95-996 **RM:** 11.3 **Stream:** North Mill Creek
Site Code: 10-7 **Project Code:** DRWW22 **Location:** Ust Edwards Rd
Date: 6-27-2022 **Scorer:** MAS **Latitude:** 42,48087 **Longitude:** -88.01184

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

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

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

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

SUBSTRATE QUALITY
Check ONE (OR 2 & AVERAGE)

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

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

Substrate: 2
Max 20

COMMENTS:

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

(Structure) TYPE: Score All That Occur

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

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

Cover: 9
Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 6
Max 20

COMMENTS:

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

River Right Looking Downstream

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

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
- ☐ ☐ -FOREST, SWAMP [3]
- ☐ ☐ -SHRUB OR OLD FIELD [2]
- ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ -FENCED PASTURE [1]

L R
- ☐ ☐ -CONSERVATION TILLAGE [1]
- ☐ ☐ -URBAN OR INDUSTRIAL [0]
- ☑ ☑ -OPEN PASTURE, ROWCROP [0]
- ☐ ☐ -MINING / CONSTRUCTION [0]

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

Riparian: 6.5
Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current: 1
Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 0
Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.6 DRAINAGE AREA (sq.mi.): 19.23 % POOL: % GLIDE:
% RIFFLE: % RUN:

Gradient: 4
Max 10

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

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

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

If Not, Explain: ____

Lat / Long (Beg): ____

Lat / Long (Mid): ____

Lat / Long (End): ____

Lat / Long (X-Loc): ____

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

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

Subjective Rating (1-10): 3

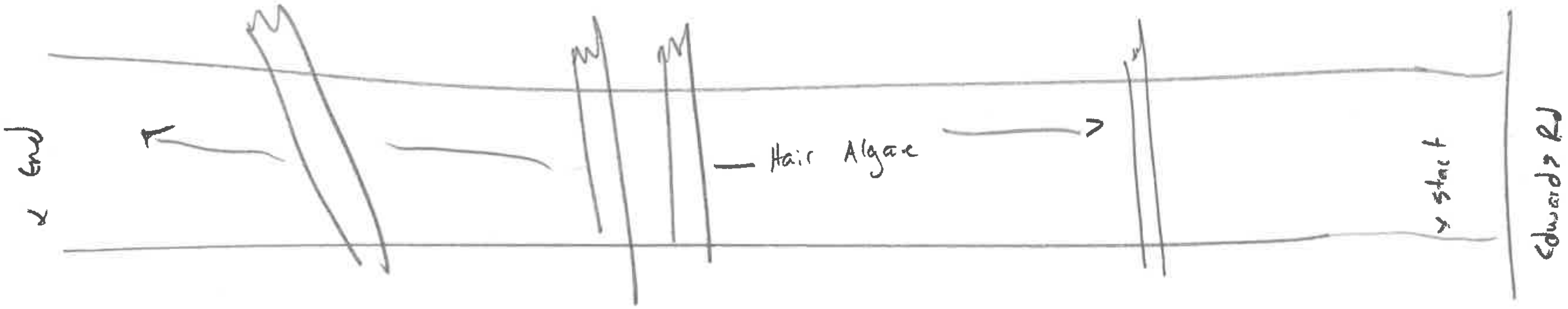
Aesthetic Rating (1-10): 3

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	E	100	Clear	Normal	10

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

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate 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.

APPENDIX D

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

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 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. 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 E-2.

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

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.*

Stressor	FIT Value	Stressor	FIT 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 E

E-1: DRWW Weighted and Unweighted Causes of Impairment

Appendix Table E-1 *. Year 5 DRWW22 Upper DesPlaines Mainstem Causes by Narrative Class of Severity.*

Causal Agents	Very Poor	VP%	VP Wtd.	VP Wtd.%	Poor	Poor%	Poor Wtd.	Poor Wtd.%	Fair	Fair%	Fair Wtd.%	Total	Total%	Total Wtd.	Wtd. %
QHEI Score	0	0.0%	0	0.0%	6	2.9%	18	3.7%	12	5.8%	2.5%	18	8.7%	30	6.2%
QHEI Ratios	1	0.5%	5	1.0%	2	1.0%	6	1.2%	4	1.9%	0.8%	7	3.4%	15	3.1%
Substrate	4	1.9%	20	4.1%	2	1.0%	6	1.2%	8	3.8%	1.7%	14	6.7%	34	7.1%
#Poor Attributes	7	3.4%	35	7.3%	15	7.2%	45	9.3%	2	1.0%	0.4%	24	11.5%	82	17.0%
#Good Attributes	2	1.0%	10	2.1%	10	4.8%	30	6.2%	6	2.9%	1.2%	18	8.7%	46	9.5%
Channel Condition	1	0.5%	5	1.0%	2	1.0%	6	1.2%	10	4.8%	2.1%	13	6.3%	21	4.4%
Macro Habitat Related	**15**	**3.1%**	**75**	**15.6%**	**37**	**17.8%**	**111**	**23.0%**	**42**	**20.2%**	**8.7%**	**94**	**45.2%**	**228**	**47.3%**
TKN	0	0.0%	0	0.0%	0	0.0%	0	0.0%	4	1.9%	0.8%	4	1.9%	4	0.8%
Ammonia-N	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0.0%	0	0.0%	0	0.0%
Total P	0	0.0%	0	0.0%	0	0.0%	0	0.0%	7	3.4%	1.5%	7	3.4%	7	1.5%
Nitrate-N	1	0.5%	5	1.0%	4	1.9%	12	2.5%	8	3.8%	1.7%	13	6.3%	25	5.2%
Organic Enrichment	3	1.4%	15	3.1%	4	1.9%	12	2.5%	4	1.9%	0.8%	11	5.3%	31	6.4%
Organic/Nutrient_Enrichment	**4**	**0.8%**	**20**	**4.1%**	**8**	**3.8%**	**24**	**5.0%**	**23**	**11.1%**	**4.8%**	**35**	**16.8%**	**67**	**13.9%**
Minimum D.O.	2	1.0%	10	2.1%	5	2.4%	15	3.1%	4	1.9%	0.8%	11	5.3%	29	6.0%
Maximum D.O.	3	1.4%	15	3.1%	1	0.5%	3	0.6%	4	1.9%	0.8%	8	3.8%	22	4.6%
Diel D.O.	3	1.4%	15	3.1%	5	2.4%	15	3.1%	4	1.9%	0.8%	12	5.8%	34	7.1%
D.O. Related	**8**	**3.8%**	**40**	**8.3%**	**11**	**5.3%**	**33**	**6.8%**	**12**	**5.8%**	**2.5%**	**31**	**14.9%**	**85**	**17.6%**
Chlorides	3	1.4%	15	3.1%	11	5.3%	33	6.8%	7	3.4%	1.5%	21	10.1%	55	11.4%
Conductivity	0	0.0%	0	0.0%	0	0.0%	0	0.0%	9	4.3%	1.9%	9	4.3%	9	1.9%
TSS	3	1.4%	15	3.1%	0	0.0%	0	0.0%	0	0.0%	0.0%	3	1.4%	15	3.1%
Impervious 30	0	0.0%	0	0.0%	4	1.9%	12	2.5%	2	1.0%	0.4%	6	2.9%	14	2.9%
Impervious 500	0	0.0%	0	0.0%	0	0.0%	0	0.0%	8	3.8%	1.7%	8	3.8%	8	1.7%
Urban Related	**6**	**2.9%**	**30**	**6.2%**	**15**	**7.2%**	**45**	**9.3%**	**26**	**12.5%**	**5.4%**	**47**	**22.6%**	**101**	**21.0%**
Toxicity	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.5%	0.2%	1	0.5%	1	0.2%
Toxics	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**1**	**0.5%**	**0.2%**	**1**	**0.5%**	**1**	**0.2%**
Total Observations	**33**	**10.7%**	**165**	**34.2%**	**71**	**34.1%**	**213**	**44.2%**	**104**	**50.0%**	**21.6%**	**208**	**100.0%**	**482**	**100.0%**